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TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY

STATED MEETING, JANUARY 5, 1903.

The President, Richard H. Harte, M.D., in the Chair.

THE DIAGNOSIS OF INTESTINAL INJURY FOLLOWING ABDOMINAL CONTUSION.[1]

BY ROBERT G. LE CONTE, M.D.,

Surgeon to the Pennsylvania, to the Children's, and to the Bryn Mawr Hospitals; Consulting Surgeon to the Germantown Hospital.

When external signs of penetration of the abdominal cavity are present, as in gunshot or stab wounds, the indications for operative treatment are plain and direct, and scarcely ever is there any hesitancy in the course to be pursued. Not so, however, if a force of unknown velocity or energy has expended itself within the abdomen, leaving perhaps no trace of violence upon the skin or muscular surface. Then it becomes necessary to make a most careful examination of both the subjective and objective symptoms presented by the patient, to separate the trivial from the important points, and with our best judgment to sum up the evidence for or against operative procedure. A few years ago the diagnosis of grave internal injuries was considered sufficient, the patient at the same time being left to the tender mercies of a non-interfering policy. The mortality was correspondingly high, as illustrated by

[1] Annual Address on Surgery.

Petry's collection of 160 cases of rupture of the intestine, where 93 per cent. died and 7 per cent. recovered through the formation of abscess with fæcal fistulæ. Other collections of cases give even a higher mortality, up to 97 per cent. and 98 per cent. Unfortunately, there is no pathognomonic symptom present in injury to the intestinal tract, but there are a number of symptoms which, when assembled in the same case, may lead us to form a fairly accurate diagnosis. I purpose, therefore, to review these symptoms and discuss them under separate headings, for the sooner operation is undertaken after the diagnosis is made the greater will be the number of recoveries. The operative mortality at present stands somewhere between 50 per cent. and 60 per cent.

I. *Mechanical Considerations of the Intestine, the Force, and the Abdominal Wall.*—The stomach and intestine may be injured in one of four ways, depending upon the character and energy of the force and the portion of the abdominal wall upon which this force expends itself. It may be crushed, burst, torn, or the blood supply so interfered with that death of the part follows.

First, and perhaps most frequently, the viscus is crushed between the force on the one hand and some resistant portion of the body on the other, as the pelvis or spinal column, or even an object outside of the body, as the ground or a wall. As a result, a more or less circular opening is made in the bowel in a position usually opposite to the mesenteric attachment. If the force is not sufficiently strong to at once make an opening in the bowel, it may so damage the coats of the viscus as to produce a slough, which some time later separates with perforation. Again the force may expend itself upon the weakest coat of the bowel, namely, the mucous, producing an ulcerated or necrotic condition, while the muscular and peritoneal coats remain uninjured, as exemplified in traumatic gastric ulcer or traumatic appendicitis. Such an ulcer may heal without further symptoms or may be the forerunner of perforation, or in healing may produce so much fibrous tissue as eventually to lead to obstruction of the bowels.

Secondly, if the stomach or bowel is filled with food or gas and the force is applied in such a manner as to distend the organ to its utmost, bursting may occur. Under such conditions the peritoneal coat will be more widely lacerated than the mucous. This form of injury is not, however, as common as was formerly thought to be the case, and I have not seen a single example in which I believed that bursting had taken place.

Thirdly, if the force expends itself at some fixed portion of the alimentary canal, as the lesser curvature of the stomach and the duodenojejunal juncture, tearing of the gut may take place. This may also be the form of injury if the peritoneal cavity has previously been the seat of an inflammation with the production of adhesions.

Lastly, the bowel itself may slip away and escape from the direct force of the injury, leaving the mesentery to be torn or crushed. Then, the nutrition or blood supply to part of the bowel having been destroyed, gangrene of the gut will take place at some later time.

The character of the force will in a way determine the kind of injury that will take place. If it be circumscribed, of high velocity and small inertia, as a kick or a blow from some small, rapidly moving object, crushing of the intestine is more likely to take place; while if the force is diffuse, as in a slow-moving ponderous object of great inertia, the passage of a wheel or a blow from a car-bumper, the bowel is more apt to be torn at one of its fixed points or the mesentery injured.

The rapidity with which grave symptoms will develop depends upon three things:

First, *The amount of food present in the alimentary tract.* When the stomach or intestine contains food or liquid fæces, immediate extravasation takes place with correspondingly rapid development of symptoms. If, however, the injury occurs after a prolonged fast, there may be scarcely a symptom for many hours, as there is no intestinal contents to escape, and also the usual bacterial flora of the mucous membrane is diminished by fasting.

Second, *The portion of the alimentary tract ruptured.* A tear of the stomach or one at the beginning of the jejunum will give symptoms of peritoneal involvement less rapidly than a rupture at the end of the ileum, owing to the fact that the upper intestinal tract contains relatively fewer and less virulent organisms than the lower portion.

Third, When the damage has been less than an immediate perforation, as in mesenteric injury or injury to one of the coats of the bowel, grave symptoms may not appear for hours, days, or even months.

Abdominal Muscles and Fat. — The condition of the abdominal wall, whether it be muscular or not, or thickly covered with fat, may very greatly alter the concentration of the blow, as the thicker the walls the more diffuse does the force become in its passage through, the energy being deflected in radiating lines by the fat and bundles of muscular tissue. Also, the fact that the abdominal muscles are strongly contracted in anticipation of the blow may save the intestine from the violence of a very great force. We have all seen in sparring contests the tremendous blows which one opponent will give the other over the epigastrium; and yet I cannot now recall a single case where such violence produced an injury to the intestinal tract, for the abdominal muscles are strongly contracted in anticipation of such a blow. We have in these various mechanical considerations good reasons why blows of the same force and energy produce different lesions and results in different individuals. Let me relate a few cases illustrative of these mechanical considerations.

Case I.—A cavalryman during an Indian campaign out West was kicked in the abdomen by a horse. Food was scarce, and the man had been fasting for some time. He picked himself up, rode for hours, and not until he had partaken of food did symptoms of intestinal rupture appear. The post-mortem examination revealed a ruptured gut. I do not know the reference to this case, but think I have quoted rightly the main points of the history.

Case II.—A strong colored man, aged forty-two years, was struck a glancing blow in the abdomen by a rolling steel ingot

weighing two tons. He was knocked down and the ingot rolled over on his left thigh, producing a simple comminuted fracture of the femur. This happened at 8.30 A.M., and the man had not partaken of food since the previous evening. He was much shocked by the accident, but reacted promptly. Fifteen hours later no symptoms had appeared indicative of severe intestinal injury; temperature, 99° F.; pulse, 88; respiration, 22; slight tympany; no vomiting; no rigidity; some pain in region of umbilicus, with natural respiration and no abdominal facies. During the next six hours symptoms of perforation rapidly appeared; pulse and respiration rapidly increased; temperature fell below normal; vomiting began; tympany appeared with marked tenderness in the region of the umbilicus, and the expression of the face was anxious and drawn. Operation revealed the first part of the jejunum completely torn across, the laceration extending for two and one-half inches into the mesentery; and in another place there was a two and one-half inch tear in the mesentery which had extended into the small gut, and about a foot of the intestine showed beginning gangrene. Death speedily followed the operation. The late appearance of the symptoms in this case was undoubtedly due to the complete emptiness of the upper intestinal tract, and my reason for not operating at once was that I could not believe so enormous a mass of steel would strike the abdomen without inflicting a damage which would at once be patent to the eye.

Case III.—E. A., white, aged thirty-seven years, a sawyer, was struck in the right inguinal region, at 4.30 P.M., by part of a board which slipped from a circular saw. Shock was profound but reaction good. The abdomen was flat, with some tenderness and pain; no rigidity; breathing regular; no distention. The physician in attendance gave calomel and applied an ice-cap to the abdomen. I saw the patient next day shortly after noon, twenty hours after the injury. There was then present severe pain; rigidity and marked local tenderness; increasing distention; liver-dulness absent; abdominal facies present, but no vomiting. Incision was made in the right semilunar line below the umbilicus, and a perforation found in the lower ileum the size of a lead-pencil on the free border of the gut. The perforation was sharply defined and punched-out in character. Considerable turbid fluid was present in the peritoneal cavity. The opening was

sutured, the abdomen flushed with hot salt solution and closed with drainage. Recovery was uneventful. It is interesting to note that the fluid removed from the abdomen at the time of operation gave a pure culture of colon bacillus. This probably represents a crush of the bowel, in which separation of the damaged area with extravasation did not take place for twelve or fifteen hours after the injury.

Case IV.—G. L., white, aged thirty-five years. A large man of very powerful build, with a thick layer of abdominal fat; a constant and heavy consumer of alcohol; injured at 8.05 P.M., the rear wheel of a chemical fire-engine passing diagonally across the abdomen from the crest of the right ileum to the left short ribs. No record of the patient's condition for fifteen hours is obtainable. When seen by me his temperature was 101° F.; respiration, 24; pulse, 120 and running; abdominal facies; respiration rapid, shallow, and thoracic; abdomen greatly distended, great pain, and exquisite tenderness, much discoloration of the skin in the track of the wheel.

Operation.—Median incision around umbilicus. Skin and underlying fat entirely stripped from abdominal muscles, with much bruising of the muscles and infiltration of blood. On opening the peritoneum a large amount of blood or bloody fluid gushed out. Three tears were found in the mesentery of the small bowel, two of which were bleeding freely, but the bowel itself was not opened. A beginning gangrene of the gut had appeared in two places from lack of blood supply, and it became necessary to make two resections, one removing fifty-three inches and the other eighteen inches of the small bowel. The abdomen was flushed with hot salt solution and closed without drainage. As much salt solution as possible was left within the abdominal cavity. Drainage was not employed for fear of infection through the bruised and lacerated abdominal wall. At the time of operation two quarts of salt solution were given intravenously. On recovering from the ether he vomited twice, the vomited material containing two small blood-clots. For thirty hours his condition was good. There was moderate distention, which was relieved by two enemata, both bringing away a large amount of flatus and some fæcal material. During the evening of the second day he became delirious, and during the night the delirium became very violent and characteristic of mania a potu. On the third day very little distention was present; there were no abdominal symptoms and no signs of peritonitis; the heart, however, was growing weaker, and the delirium was very active and uncontrolled by drugs. Seventy-three hours after operation the heart suddenly failed and the patient was dead in a minute. No post-mortem allowed. This is an example of the intestines escaping from the direct violence of a slow-moving force of great inertia, the force expending itself upon the fixed portion of the mesentery.

Case V.—Mr. A. E. Barker (*Lancet,* July 21, 1900, p. 164) reports a most interesting case of damage to the upper part of the jejunum which resulted in the formation of a stricture with enormous dilatation of the gut above. A man aged twenty-one years was run over by a loaded wagon, two broad wheels of which passed across the lower thorax, breaking five ribs. The man recovered from his injuries, but seven years later was operated upon, when a firm fibrous stricture of the jejunum was found seven feet from the duodenum. The wheels had evidently injured the bowel just short of perforation, and during healing a large amount of fibrous tissue had formed, which slowly contracting produced the stricture.

Case VI is another example of long-delayed perforation after the injury. I am indebted to my colleague, Dr. Harte, for being present at the operation. M. D., white, laborer, aged forty years. Twelve days previously to his admission to the Pennsylvania Hospital he was run over by an empty wagon, the wheel passing across the lower portion of the abdomen. For eight days his temperature remained normal and then became irregular. He complained of pain in the right side of the abdomen. On admission there was marked rigidity of all the abdominal muscles, particularly of the right side, with universal tenderness; slight distention; no vomiting. The abdominal distention gradually increased and the pain became more severe. The next day under ether an incision was made in the right semilunar line below the umbilicus. The muscles were found to be bruised and infiltrated with old blood-clot. On opening the peritoneum there was an escape of gas, followed by fæcal material of very foul odor. A large quantity of this material was evacuated; much lymph on the coils of intestine; no perforation of the intestine could be found. The abdomen was irrigated with salt solution and the cavity packed with iodoform gauze; no closure of the wound was attempted. He reacted

well after operation, and the next day the abdomen was less distended and the patient more comfortable. He was fed by rectum, nothing being given by mouth. On the second day the wound was dressed and a considerable amount of pus-like fluid evacuated, but with no marked fæcal odor. The wound drained well without further fæcal characteristics, and the patient made an uneventful recovery.

From a consideration of the various mechanical principles involved in abdominal contusion we gain but small material knowledge. We see that certain kinds of force tend to produce certain kinds of injury in special regions of the abdomen, but symptoms of the resultant damage may be immediate or greatly delayed through the action of a flaccid or resistant abdominal wall, and the condition of the intestine, whether it be full or empty. However, it is important to gather from the history of the injury as much evidence as possible of the foregoing mechanical principles, for in a case that is doubtful these straws may point to the proper line of treatment.

II. *Symptoms which can be elicited in the Patient, both Subjective and Objective.*—(*a*) *Shock.* From shock alone we can tell very little. Occasionally very severe injuries will be followed by no appreciable shock, as illustrated in Case I, and again trivial injuries will be followed by most profound shock.

Case VII.—J. A., white, laborer, aged thirty-eight years. While working at the top of a building, the roof caved in, and the patient fell a distance of thirty or forty feet. He was admitted to the hospital in a condition of profound shock. Complained of pain in the lower lumbar region, buttocks, thighs, and over the short ribs and abdomen, particularly on the right side. There was some rigidity of the abdominal muscles. He reacted fairly quickly, and the next day was more comfortable. The abdomen was then slightly distended, tender, and moderately rigid. Sweating was profuse, respirations short and mostly costal. No abdominal facies and no vomiting. Under calomel his bowels were freely moved and the abdominal distention went down. Within two or three days all signs of abdominal injury had disappeared.

Case VIII.—M. C., aged two years, was struck by a wagon and rolled along the ground, but the wheels did not pass across the body. On admission to the hospital the patient was in a state of profound shock. Numerous contused areas were visible on the legs, head, and abdomen. Abdominal pain and tenderness very marked; also slight rigidity of the muscles. No vomiting. Reacted well, but was extremely restless for forty-eight hours, at the end of which time the abdominal symptoms had disappeared and recovery speedily followed.

The speed with which reaction from shock takes place tells us nothing, for when shock is unassociated with hæmorrhage, very severe injuries may react promptly to stimulation.

(*b*) Temperature at first is a guide only to the degree of shock; but when reaction has taken place and it has risen above normal, a secondary fall to below the normal, with an increasing rapidity of pulse and respiration, is indicative of most serious trouble.

(*c*) A steadily rising pulse after reaction has taken place is also a bad sign, but it must be associated with other symptoms to prove alarming.

(*d*) Respiration in the presence of shock is usually quiet and shallow. To be indicative of an intra-abdominal lesion, it must be short, frequent, and thoracic in type. It may have all of these characteristics, however, from a simple severe contusion of the abdominal wall where the muscles are bruised and painful, and also in the presence of marked tympany where the abdominal muscles are prevented from acting by the distention.

Case IX.—S. G., white, a driver, was kicked by a horse in the epigastric region. Shock moderate; complained of intense pain in the abdomen. There was a contused area over the epigastrium, with great tenderness and muscular rigidity. Respiration was painful, jerky, and thoracic. Abdominal facies and vomiting absent. He reacted well and promptly. In two days he was very much more comfortable, and in another two days had entirely recovered, although some tenderness still remained in the epigastric region.

CASE X.—L. S., white, brakeman, aged twenty-eight years, fell off a bicycle and was thrown under the wheels of an automobile cab, one wheel of which is said to have passed over his body about the epigastric region. On admission he was in profound collapse; pulse imperceptible; extremities cold. He complained of great pain over the abdomen, especially in the epigastrium. Respirations short and thoracic; marked epigastric tenderness and rigidity; no vomiting. Reacted well and quickly. Next day there was evidence of swelling in the epigastric region. The patient, however, continued to improve, and in a week's time was entirely free from pain and tenderness.

When, however, we have increasing shallow thoracic breathing without distention and without sign of abdominal bruise, and associated with muscular rigidity, it becomes an important symptom of considerable value.

(*e*) *Facial Expression.* The abdominal facies consists of a peculiar drawing of the lines and deepening of the furrows of the face, which give an anxious, careworn, and painful expression to the countenance, while the eyes are questioning and anxious, and search the faces of the people about. A lack of knowledge of drawing prevents me from painting this picture in words, but when it has been seen a few times it gives a very characteristic expression or stamp to many different types of face. It is not present in shock, but comes on after reaction has taken place, and is perhaps concomitant with development of peritoneal inflammation. When present, it is to me the most positive of all the symptoms of severe intra-abdominal injury. I have failed to see it, though, in several injuries, but I cannot recall ever having noted it as present in a case which failed to show a serious lesion. I suppose there must be exceptions to this, but I judge they are rare.

(*f*) *Pain, Tenderness, and Muscular Rigidity.* Pain and tenderness are always present in severe injury, but they are also present in simple contusion of the abdominal wall. Often, however, we can elicit from the patient the fact that the pain or tenderness seems superficial, or that it is deep and radiates to the back or loin or pelvis. Under such circumstances, when

pain is deep and radiating, it becomes significant. Marked rigidity of one or both recti muscles is frequently present in simple abdominal contusion, but it is usually at its height from the start, and gradually diminishes as time passes. Again, if the palpating fingers are moved gently over the abdomen for some time while the attention of the patient is distracted from this region of the body, the rigidity will be felt to yield slowly, to become prominent again on sudden pressure. In other words, the patient, knowing that the part is sensitive, voluntarily keeps the muscles contracted for fear palpation will increase the pain. The rigidity which is characteristic of an intra-abdominal lesion is progressive in its firmness, and when well developed is of board-like hardness, neither increasing nor decreasing under palpation. However, such a distinction is not always characteristic, as the following cases will show.

CASE XI.—A. L., white, plumber, aged nineteen years. Two days before admission to the hospital he fell against a box, bruising the right flank and right side of the abdomen, since which time he has had increasing intra-abdominal pain, with increasing distention, vomiting, and no movement of the bowels. On catheterization the urine was found quite bloody. The right rectus was rigid, with great tenderness over the whole right side of the abdomen and flank. Moderate tympany was present; liver-dulness decreased. Operation was urged and declined. Under treatment the man gradually improved, with less abdominal pain and a decrease of tympany. The bowels were well moved. Hæmaturia persisted, but at the end of two weeks the blood in the urine was only microscopic. Recovery was uneventful.

CASE XII.—J. C., white, laborer, aged thirty-nine years. While unloading a wagon he was struck in the back by a sack of grain, causing him to fall forward against the pole of the wagon, the pole striking him in the pit of the stomach. There was immediate nausea, almost unconsciousness, with great abdominal pain. When seen a few hours later no shock was present. There was considerable tenderness over the abdomen, with rigidity of the muscles of the upper portion. No further vomiting, no abdominal facies. The next day the patient felt quite comfortable, except for abdominal tenderness. The recovery was uneventful.

CASE XIII.—M. P., white, aged eight years, was knocked down and run over by a wagon, the wheel or wheels having apparently passed over the abdomen above the iliac crests, with evidence of contusion of the abdominal wall. The patient was dazed and considerably shocked; abdomen rigid and tender; no vomiting; no abdominal facies. Reacted well and abdominal pain gradually disappeared. Recovery was uneventful.

(*g*) *Tympany.* Frequently a small amount of tympany or even moderate distention is present a few hours after abdominal contusion without any severe intestinal lesion. Under such circumstances it is probably a manifestation of a transient intestinal paresis, readily yielding to a high enema with the passage of flatus. Distention, however, which is progressive and extensive, or which appears late, a day or more after the injury, is worthy of very serious thought, especially when associated with other signs of obstruction. It then becomes a grave symptom.

(*h*) *Liver-Dulness.* Diminished or absent liver-dulness in the right nipple or anterior axillary line has been a most unsatisfactory symptom to me. It may at times indicate free gas in the peritoneal cavity, but intestinal distention will give the same sign, and I have seen liver-dulness completely absent without a particle of gas in the peritoneal cavity. In my experience I have been unable to place a just value upon this symptom.

(*i*) *Vomiting.* Vomiting that occurs immediately after the accident has no practical significance, for there are few people who can stand a sharp blow in the abdomen without being nauseated. When it appears after reaction has taken place, or even a day or more after injury, it becomes a symptom of great importance. It is then usually associated with distention and obstruction.

(*j*) *Singultus.* Obstinate and continuous hiccough I have seen but once, where it was a late symptom in a contusion of the epigastric region. I should judge that it occurred only in injury of the bowel adjacent to the diaphragm, and was due

to the irritation of the peritoneal covering of the diaphragm. When present, it must be a symptom of the greatest import.

(*k*) *Leucocytosis.* So many factors at the time of injury besides a ruptured intestine may induce an increased leucocyte count that I feel little reliance can be placed upon this symptom when present in the first twenty-four hours. In such cases, where perforation takes place late, it might be an aid to diagnosis, but owing to the frequency with which we see contusions and injuries to other portions of the body associated in the same case with abdominal contusion, it would be impossible to say to which injury we should attribute the increased leucocyte count.

The histories of the cases presented in this paper have been chosen for the most part from thirty or thirty-five patients that have come under my own observation. They were picked out because they illustrated one or more of the points under discussion, and I have tried as far as possible to be brief and to omit all useless repetitions.

Conclusions.—What conclusions may we fairly draw from these remarks and the histories just detailed?

First. That a moderately assured diagnosis of grave injury must be made before operation is undertaken, or we will open many abdomens to find the trauma confined to the abdominal wall. In a series of 100 consecutive cases of abdominal contusion as they enter a general hospital, perhaps thirty or forty will have received a grave injury demanding operation, while the other sixty or seventy recover without any operative procedure. For the sake of argument, I am willing to grant that if the abdomen is immediately opened in each one of the 100 cases there will result a smaller percentage of deaths than if the surgeon waits for some other symptoms of intestinal damage. But can we call such radical and empirical treatment the science of surgery? Would any of us receiving a blow on the stomach sufficient to shock and nauseate say, "Have Dr. ——— see me, for I want my abdomen opened at once?" Answering for myself, I say, No; for I should wish the surgeon in attendance to be moderately assured of his diagnosis

before I took that smallest of risks, viz., an abdominal section in the hands of the most skilful surgeon. If I were one who always, without exception, advocated immediate operation in appendicitis as soon as the diagnosis is made, I could with greater force urge immediate operation in all cases of abdominal contusion, for the seriousness of the two conditions is scarcely comparable to my mind.

The teaching of many of the modern writers when they urge operation in all cases presenting pain, rigidity, and local tenderness seems to me too radical, for we have various kinds of pain and tenderness and different degrees of rigidity, and many times these symptoms are due to injury of the abdominal wall alone. Had I followed such teaching, I should have opened the abdomen in Cases VII, VIII, IX, X, XII, and XIII, for each of them presented pain, localized tenderness, and rigidity, and yet they all recovered without an exploratory operation.

My belief, then, is that we should wait for some symptom or symptoms indicative of intestinal injury.

Second. In the presence of shock we cannot make a diagnosis of intestinal injury, no matter how profound the shock may be or how slowly reaction takes place. We may diagnose hæmorrhage, which would lead to an immediate operation, and at the same time presume the presence of a lacerated gut, but primary shock is of itself no aid to our diagnosis. I would therefore wait for reaction to take place.

Third. No one symptom is pathognomonic of intestinal injury, but the two most reliable are gradually increasing rigidity and facial expression. In the next group I would place deep and perhaps radiating abdominal pain, respiration which becomes more and more thoracic, vomiting after the shock has ceased; distention, increasing pulse-rate, and secondary fall in temperature. The order in which I have mentioned them has no significance, for any one or two of these symptoms may be prominent to the exclusion of the others.

Fourth. Any individual who has received an abdominal contusion sufficiently severe to call for your services demands

also the most careful and constant watching in order that you may detect at the earliest possible moment the appearance of grave symptoms. I do not mean that we should wait for these symptoms to become so pronounced that a positive diagnosis is assured, for then operation is for the most part too late. There is a position, however, midway between operating on every case and waiting for an assured diagnosis, where we can say that, owing to the gradual appearance of certain symptoms, we have fair reasons to think the intestinal tract may be injured, and that under such circumstances an immediate operation will give the patient the best chance. In such a case we must not forget the possibility of perforation taking place hours or even days after the injury.

Lastly. As our individual experience increases, we gain the power to place a more just value upon the symptoms present and to perceive the grave symptoms in their early stages. In other words, we gain in acuteness of perception, and there is scarcely any injury to the body which requires this more for a successful result.

DISCUSSION.

Dr. John H. Gibbon mentioned the case of a boy who was brought to the Polyclinic Hospital in a state of marked shock, he having fallen and struck his abdomen upon the edge of a basket containing thirty-five or forty pounds of meat. When seen one hour after the receipt of injury, the boy was suffering a great deal of pain and his abdomen was rigid. It was thought that operation would later be required, but within five hours the boy was much better and went on to a speedy and entire recovery. This case illustrated the wisdom of not operating during shock. A second case was that of a boy crushed by a trolley-car and seen at the Pennsylvania Hospital soon after his admission at 6 P.M. At that time he was vomiting, but there was no marked rigidity nor pain. At 11 P.M. a telephone message stated that the only prominent symptom had been vomiting, which still continued, there being as yet no local pain nor rigidity. Considering that the symptoms of most value as indicating operation were pain, rigidity, and facial expression, with perhaps increased thoracic respiration, intervention was not regarded as necessary. The fol-

lowing day the patient developed rigidity with abdominal distention, and still had vomiting, which had persisted from the first. Operation revealed the fact that the lower two feet of the ileum, with the exception of two inches immediately at the colon, were stripped from its mesentery, and that the middle six inches of this portion were entirely denuded of its peritoneal coat. This part of the bowel was gangrenous, but there was no perforation. The bowel was resected, but the patient afterwards died, no aggravation of symptoms following the operation. The cause of death is believed to have been peritonitis. This case impressed Dr. Gibbon with the importance of vomiting as a diagnostic symptom in these cases, and he would regard it as having even more value than that attributed to it by the essayist. The vomiting in the case under consideration was probably due to the stripping of the bowel.

Dr. Gwilym G. Davis considered intense pain and rigidity as being symptoms indicative of a grave lesion in cases of abdominal contusion. If the surgeon waits until peritonitis sets in, the evidence will of course be more positive, but the two symptoms mentioned, with possibly vomiting, may be looked upon as the earlier symptoms that are indicative of a grave lesion necessitating operation.

Dr. Henry R. Wharton emphasized the principle of not operating in the early stages of shock. He had seen many cases appear unfavorable for a few hours, but afterwards go on to uneventful recovery. These cases of contusion are most difficult ones to decide. Rigidity and pain after the subsidence of shock are valuable in guiding the surgeon to a decision.

Dr. George G. Ross, in commenting on Dr. Le Conte's statement that he had never seen abdominal injury follow the blow of a fist, mentioned the case of a man who exhibited grave symptoms following such trauma. Operation showed that five inches of the mesosigmoid had been torn loose. The patient recovered from operation, but later died from intestinal obstruction.

Dr. John B. Roberts believed that obscurity of diagnosis in these cases makes the surgeon timid. His opinion is that we often do not operate early enough. In grave, obscure cases he would apply the same principles that govern the treatment of injuries to the skull. There the scalp is opened to inspect the skull, and if that does not suffice, the skull is opened to allow

examination of the brain. In similar abdominal cases make an incision, under cocaine if necessary, that will admit of one or two fingers, and thus allow determination of the injury present. This procedure may save many patients.

Captain Charles Kieffer, U. S. A., who had seen the cavalryman mentioned by Dr. Le Conte, said that the high mortality among cavalrymen from abdominal injury was due to the fact that they would disclaim injury from being thrown, and probably not report until peritonitis had begun. He had seen three such cases. He operated upon one man who had been kicked in the abdomen and found a transverse tear of the bladder. The bladder was sutured and the patient recovered. In many cases of abdominal injury a symptom of particular value is singultus. This is especially significant of injury to the upper portion of the intestinal tract.

STATED MEETING, FEBRUARY 2, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

BILATERAL BONY ANKYLOSIS OF THE TEMPOROMAXILLARY ARTICULATION OF TRAUMATIC ORIGIN AND ITS SURGICAL TREATMENT.

WITH REPORT AND PRESENTATION OF TWO CASES RECENTLY TREATED BY OPERATION.

BY W. J. ROE, M.D., D.D.S.,

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BONY ankylosis of the temporomaxillary articulation of traumatic origin, not complicated by the results of infection, is probably comparatively rare, and I am strongly of the opinion that it invariably results from some variety of fracture involving the bones comprising the joint. It could therefore quite properly be considered among the sequelæ of fractures of these bones. The title of this paper, therefore, not only excludes many other etiological factors producing fixation of the mandible, but all the other forms of ankylosis of whatever degree.

In this report I hope to establish the true etiology in each of the two cases presented; to point out a symptom very apt to mislead in reference to the true condition; to demonstrate a most valuable method for determining the true condition of the articulations, a method which shows whether both articular surfaces are involved and also the degree of involvement of each; the report also deals with the practicability of the treatment employed, the dangers to be anticipated, and the methods of meeting them.

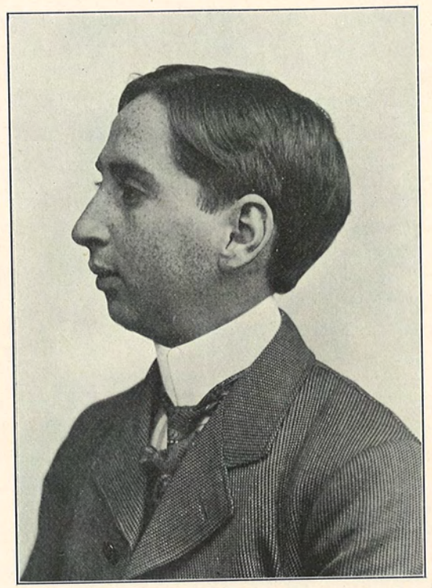


FIG. 1.—Case I. Showing the recession of the chin and the fulness in the region of the temporomaxillary articulation.

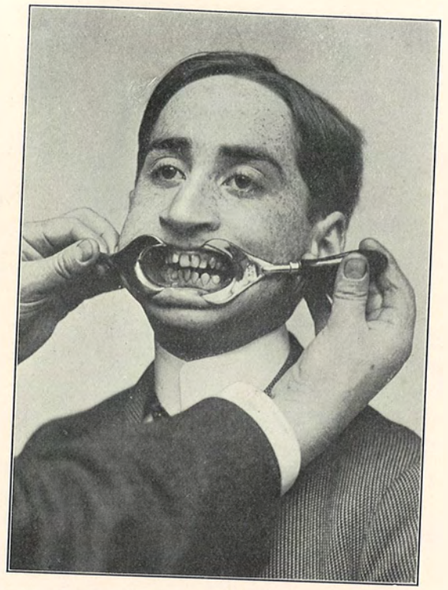


FIG. 2.—Case I. Showing the posterior teeth in occlusion and the anterior teeth separated some distance.

CASE I.—F. H. H., aged eighteen years, when eight years of age met with an accident while coasting. The sled which he and two others were upon ran into a barbed wire fence, and he was thrown violently against a post, striking his chin. He was unconscious for a short time, but regained consciousness while being conveyed home. He again became unconscious, and remained so until the following morning, a period of about twelve hours. He had a wound about one and one-half inches long beneath the chin, exposing the bone, and there were evidently multiple fractures of the mandible. The wound was dressed, and the mandible was bandaged for five weeks, at the end of which time the bandages were discontinued, when, in attempting to open the mouth, it was found that ankylosis had taken place.

About five years after the accident, he said, he came under the care of Dr. Fowler, at the Seney Methodist Hospital, Brooklyn, who gave him ether and forcibly opened his mouth by means of levers. This treatment was followed by the use of a screw-gag three or four times daily during a period of about three months, at the end of which time fixation was again practically complete. Two years later, Dr. Glass, of Utica, repeated the same operation and after-treatment, and subsequently on two occasions, at intervals of two years and one year, with like results. An additional attempt was made under ether in the office of a dentist.

The patient was kindly referred to me in October, 1901, by Drs. Roy E. Jones and Joshua T. Pritchard, of Remsen, New York. Photographs taken at that time show the appearance which he presented (Figs. 1 and 2). The noticeable features were marked recession of the chin and considerable fulness in the region of each temporomaxillary articulation. The facial measurements were as follows: from the hair-line to the glabella two and three-fourths inches, from the glabella to the line of the union between the nose and upper lip two and three-fourths inches, from the latter line to the point of the chin two and three-fourths inches, and from the point of the chin to the line of harmony one and one-fourth inches. The mandible was firmly ankylosed with the posterior teeth in occlusion, and the anterior teeth separated some distance, as seen in the photograph (Figs. 1 and 2). He was able voluntarily to separate the teeth in occlusion about one-tenth of a centimetre. Upon examination of the muscles of mastication, I found them fairly well developed,

evidently free from adhesions, and able to contract strongly, he having daily exercised their limited power. The size of the mandible led me to believe that development had practically ceased at the time of injury, as it apparently was not larger than that of a boy of eight years of age. The rami formed almost right angles with the body, and they were decidedly more vertical than normal. There was no apparent deviation of the chin to either side. There was no difference manifested in motion between either half of the mandible.

Being still in doubt in regard to the exact position of the condyles, I was fortunate in securing very excellent skiagraphs, which were taken by Dr. Charles Lester Leonard (Fig. 3). Each skiagraph shows the greatly enlarged condyle or mass of bone connecting the ramus with the temporal bone, about one-half of which is behind the posterior border of the ramus. This led me to believe that part of the original injury was a fracture through the neck of each condyle and union between the condyle and ramus at almost a right angle.

I decided to operate first upon the right side, and about one week later upon the left side, by the following method, which I will give in detail.

On December 2, 1901, while the patient was under ether anæsthesia, I made an incision opposite the neck of the condyle of the right side, beginning just below the zygoma and extending downward for a distance of one and one-fourth inches. The anterior border of the parotid gland was next retracted backward, exposing the masseter muscle. With a blunt-pointed dissector the fascia and fibres of the masseter muscle and periosteum were separated about opposite the middle of the skin incision; after dilating this opening with forceps two index-fingers could be introduced. Through this opening there was made a subperiosteal excision, with a chisel, of the mass of callus, including the condyle and neck, and a bridge of bone which was found present. It connected the outer surface of the head and neck of the condyloid process with the outer surface and lower border of the posterior portion of zygoma, and was about one-third of an inch in thickness and three-quarters of an inch in width. There was no union between the articular surfaces, and there was an apparent absence of the interarticular fibrocartilage. After clearing the border of the zygoma and making smooth the excised border

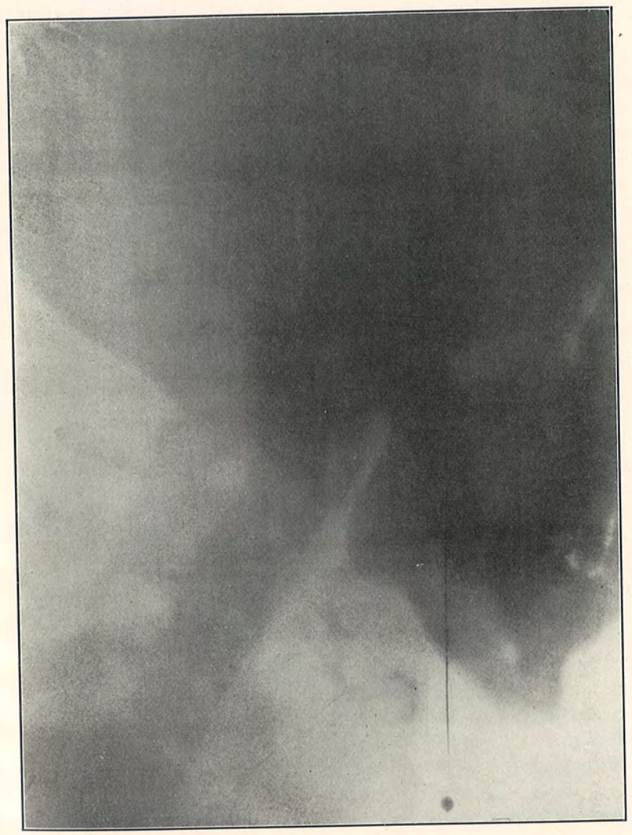


FIG. 3.—Case I. Skiagraph showing the bridge of bone connecting the right temporo-maxillary articulation, the angle formed by the occiput and mandible with the cervical vertebræ, and the position of the hyoid bone.

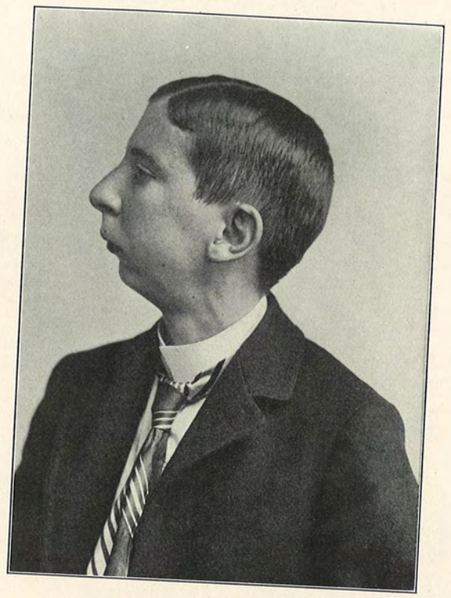


FIG. 4.—Case II. Showing the recession of the chin.

of the ramus, it became possible to pass the index-finger freely between the ramus and glenoid fossa, and to spring the mandible sufficiently to demonstrate that, except for its muscular attachments, it was free upon that side. After carefully flushing with water to remove any chips of bone, the separated fibres of the masseter muscle and fascia were brought together with buried catgut sutures. The skin wound was closed with Halsted's subcuticular suture, using silkworm gut. This is in accordance with the view of Gregg, who recommends closing the wound without drainage. (*Practitioner,* December, 1899.)

The same procedure was repeated on December 9 upon the left side, and almost precisely the same condition of the articulation was found. As soon as the section through the neck of the condyle was complete, the mandible dropped a little distance. When the excision was completed, and before the wound was closed, an ordinary mouth gag was placed between the teeth and opened until the mouth seemed about the normal size. Then by grasping the mandible some lateral manipulations were made, after which the wound was closed.

There was no special interference with respiration during either operation, and the patient made a rapid and uninterrupted recovery from each. The wounds healed by primary union, and in each case the sutures were removed on the eighth day. He was allowed to open his mouth as freely as the bandages would permit, and ten days after the second operation, when he left for his home, he could voluntarily separate the anterior teeth to the extent of one inch, and was learning to masticate solid food. Three weeks later he could open his mouth one and one-eighth inches. There was paralysis of the muscles supplied by the malar and infraorbital branches of the temporofacial division of the seventh nerve, from which condition he gradually but completely recovered in two months. He has actively exercised the muscles connected with the mandible, and at the present time can open his mouth one and one-quarter inches, and has considerable lateral movement.

CASE II.—E. W., aged eighteen years, when five years of age fell from a roof to the brick pavement, a distance of about fourteen feet, striking his mouth and chin. He bled profusely from the mouth and nose, and two of the upper front teeth were knocked out. Dr. Winter was called, and upon examining him

found nothing wrong except injury to the teeth and gums, and, after controlling the hæmorrhage, ordered the application of ice-bags to the sides of the face. Considerable swelling took place in the region of the mandible, and the tumefaction was especially marked upon each side at the sites of the articulations. He was referred by Dr. Winter to Dr. Brown, a dentist, who removed two other teeth that were loose, and then fastened several lower teeth in place by wiring them. The patient was never able to open his mouth as wide after the fall as before, and a gradual decrease in the movements of the mandible was noticed, until at the end of nine months only very slight motion was possible. He applied for treatment at several hospitals in Philadelphia, and at one institution he received treatment three times each week for a period of five months. The following plan was pursued: His teeth were separated as far as possible by means of a screw-gag, and then a wedge of soft wood was placed between them, after which the gag was removed, leaving the wedge of wood between the teeth for three days, provided he was able to bear the pain. It being necessary to use the gag in order to remove the wedge of wood, the patient almost invariably returned in twenty-four hours, but occasionally endured the suffering for two days. When the wedge was removed, the mandible could not be moved voluntarily, but would gradually close the space acquired between the teeth, and in doing so would give pain at the site of the articulations. The treatment was abandoned by the patient at the end of five months, owing to the suffering caused and the absence of any improvement in his disability.

He was referred to me by his family physician, Dr. Heller, about fifteen months previous to the time at which I operated. Photographs taken at that time show the appearance which he presented (Figs. 4 and 5). The noticeable features were marked recession of the chin and absence of any fulness in the region of each articulation. The relative displacement of the point of the chin was three-eighths of an inch below and one and three-eighths inches behind its proper position, according to the line of harmony, the divisions of which measured as follows: from the hair-line to glabella two and one-fourth inches, from the glabella to the line of union between the nose and upper lip two and one-fourth inches, from the latter line to the point of the chin two and five-eighths inches, and from the point of the chin to

FIG. 5.—Case II. Showing the posterior teeth in occlusion and the anterior teeth separated some distance.

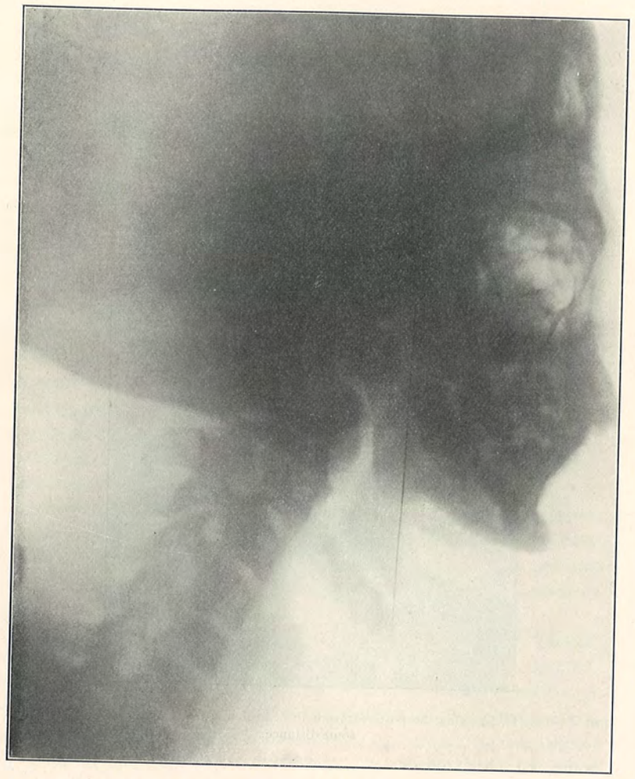


FIG. 6.—Case II. Skiagraph showing the bridge of bone connecting the right temporo-maxillary articulation, the angle formed by the occiput and mandible with the cervical vertebræ, and the position of the hyoid bone as compared with Fig. 3, Case I.

the line of harmony one and three-eighths inches. The mandible was ankylosed with the posterior teeth in occlusion, and the anterior teeth separated the distance shown in the photograph (Fig. 5). He was able voluntarily to separate the teeth in occlusion about three-tenths of a centimetre. The muscles of mastication were fairly well developed, evidently free from adhesions, and able to contract strongly, he having exercised their limited power daily. The development of the mandible had evidently ceased at the time of the injury, as the bone was apparently not larger than that of a boy five years of age. The rami were almost at right angles to the body and were decidedly more vertical than normal. There was no apparent deviation of the chin to either side, and no difference during passive or induced motion in either half of the mandible. I was again fortunate in securing skiagraphs (Fig. 6) taken by Dr. Charles Lester Leonard. Each skiagraph shows practically the same condition as did those of the other case, and I therefore concluded that the original injuries and the results were similar. Having decided to employ the method used in the previous case, I operated February 13, 1902, upon the right side, and found the assumed condition existing, except that the dimensions of the bridge of bone were somewhat less. The details of the operation were precisely as those previously described. The operation was uneventful, and the only point of interest, especially in connection with future developments, was the occurrence three times of embarrassed respiration, followed by slight cyanosis, which disappeared upon the temporary discontinuance of the ether; this, however, did not cause any alarm or apprehension, as I have frequently seen the same condition more marked under ordinary circumstances. His convalescence was rapid and uninterrupted, and on February 20 I operated upon the left side, employing the same method, and found practically the same condition. In this, as in the first operation, the ether was administered by Dr. W. R. Roe; some slight difficulty was experienced, as noted in the first operation, and special care was therefore exercised to administer the minimum quantity under which the operation could be performed, and he was barely under the influence of ether at any time. When the section through the neck of the condyle was completed and the mandible dropped slightly, more decidedly embarrassed respiration occurred, and continued to some extent while the work of

removing the condyle and making smooth the zygoma and upper portion of the ramus was being completed. When the mouth gag was placed between his teeth and the jaws separated, respiration ceased; in order to restore it, rhythmical tractions were made upon the tongue, while an assistant made artificial respiration by Sylvester's method. In addition, the patient was placed in the Trendelenburg position and given hypodermically one-tenth grain of strychnia sulphate. Different positions of the head were also tried. These means failing, an attempt was also made to reach the epiglottis with the index-finger; but this failed, there not being sufficient separation between the teeth. Having spent probably more than a minute in these unsuccessful attempts, and the patient being in a state of complete relaxation, with extreme cyanosis, a rapid laryngotomy was performed by plunging a scalpel through the cricothyroid membrane, cutting down to the cricoid cartilage in a vertical direction. Finding this space insufficient, the incision was extended upward between the two lateral halves of the thyroid cartilage. This gave ample room to open the larynx widely, and, as the artificial respiration was continued, the cyanosis lessened and soon natural respiration was re-established. Fearing that infection of the wound upon the left side might have occurred during the attempts at restoration of the patient, and also because some hæmorrhage was taking place, the wound was packed with gauze, and then closed as in the other operations, except at the lower portion which the gauze occupied. As soon as the dressings were applied and the mandible was held in its original position with the bandages, he began to breathe partially through the mouth and nose. A tracheotomy tube was kept ready to introduce at once if such a step should become necessary to keep the laryngotomy wound open. The laryngotomy wound was closed one hour after it was made, as he was breathing naturally, and there seemed no further use for the artificial opening. In closing it, three sutures were placed in the skin, allowing the lateral cartilages and cricothyroid membrane to approximate, as they readily did. A gauze drain was placed between the cartilages and the skin, and was brought out at the lower angle of the wound. He made an uninterrupted recovery, not a single dose of medicine was given, and the only thing he complained of was some swelling of the tongue (the result of the application of the forceps), and insomnia. The

gauze drain in the laryngotomy wound was removed in two days, the sutures in five days, and on the eighth day the wound was entirely healed. The packing was removed from the left articulation on the third day, the sutures on the eighth day, and the wound was entirely healed on the twelfth day, no infection having taken place.

In the first case, while the patient was under ether, the mouth was opened widely by stretching the muscles and fascia connecting the mandible, and it was made readily movable. In the second case a similar procedure had been begun, but the mouth was opened only about half-way when respiration failure occurred. It is unfortunate that this procedure was not completed while the patient was breathing through the laryngotomy wound, as it could then have been done with safety. Fearing a repetition of interference to respiration if he were given an anæsthetic to complete the opening of the mouth, the use of the mouth gag was begun twelve days after the operation. This plan is to be noted, for each method had its advantages and disadvantages. In the first case, the overstretching of the muscles so long contracted would necessarily result in strain and laceration of some of their fibres, and thus cause weakening of the muscles. The cicatricial contraction of healing would also lessen their ultimate functional power. In the second case, although believing that the slight stretching of the muscles was free of the dangers incident to the overstretching of the same, and promised better development, it seems possible that the resistance of the fascia would not be sufficiently overcome to secure an extensive range of motion to the mandible. The mouth gag was used at intervals of two and three days, and then only with very moderate force, owing to the fact that slight pressure upon the teeth caused considerable pain, as the tissues of the alveoli had never been accustomed to resisting pressure by mastication.

Considering both cases carefully, it appears that the results are just as good after the second plan as after the first. Paralysis of the same group of muscles as occurred in the first case was present in the second, but it had entirely disappeared at the end of two months. The laryngotomy was followed by some functional disturbances, for instance, slight hoarseness and inability to speak loud, from both of which conditions he entirely recovered. His present condition is very satisfactory. He can open his

mouth one and one-quarter inches, but has practically no lateral motion.

With a view of ascertaining the strength of the muscles of mastication in these two patients, I used an instrument, the gnathodynamometer, invented by Dr. G. V. Black, Dean of the Northwestern University Dental School of Chicago. As to the average strength of the human bite, trials taken two years ago by Dr. Black in his senior class gave pressures with the molar teeth all the way from forty to 275 pounds, or the total number of pounds registered by the instrument. The average of these trials was $171^{6}/_{10}$ pounds. Trials taken a year later in his senior class averaged 132 pounds on the molars and but fifty-two pounds on the incisors, and varied all the way from thirty to 275 pounds on the molars. These trials included about 125 persons each, and were taken without any selection of persons whatever, and usually a person made but a single effort.

The results seem to depend almost entirely upon the condition of the peridental membranes. The large majority stop because of pain in the peridental membranes, not because they have used their full muscular strength; consequently, the results, taken as a whole, do not give the muscular strength of the jaws, but are simply an index to the condition of the peridental membranes.

I was disappointed by not being able to use this instrument satisfactorily in either of these cases for the following reasons: The first molars were badly decayed and were extracted subsequent to the operation, and, owing to the lack of development of the mandible, the position of the second molars was so far posterior and the distance between the blades of the instrument being thirteen-sixteenths of an inch, there was not sufficient space between the occlusive surfaces of these teeth to introduce the instrument sufficiently to prevent its slipping.

In the first case, with the instruments between the anterior teeth, it registered fifty pounds and in the second case forty pounds. It was quite evident that neither patient exerted his full muscular power, but stopped owing to pain in the peridental membranes.

The first thing which this report seeks to establish is the true etiology in each of the cases. It seems evident that ankylosis resulted from fractures through the neck of the condyloid processes, for the following reasons:

Fracture of the neck of the condyle is not as infrequent as is generally supposed. In forty-one cases of fracture of the mandible which Dr. W. R. Roe and myself have treated, the line of fracture in six cases (two of which had multiple fractures) was through the neck of one condyle, and in one case the lines were through the necks of both condyles. The displacement at the site of the fracture in each of these cases was forward and upward, the fragments being brought closer to or in contact with the lower border of the posterior portion of the zygoma. If the sharp ends of the fragments are in contact with the zygoma, they may have denuded this process of its periosteum at the time of the injury; or if the fragments are not in contact with the zygoma, but are nearer the same than if they were retained in their proper relation to each other, and not completely immobilized, the irregular masses of callus which form in the process of repair frequently reach the lower border of the zygoma, and mechanically denude the same of its periosteum. This will explain the gradual and frequently slow occurrence of bony ankylosis in a number of reported cases. The skiagraphs in each case show clearly the angular displacement upward and forward of the neck of the condyle. This displacement, in connection with the more vertical position of the posterior border of the rami, together with the separation of the anterior teeth and the occlusion of the posterior teeth, tallies accurately with the conditions which theoretically should result from such fractures. The delineation of the skiagraphs was verified at the time of operation, and the bridge of bone was found to exist.

A very misleading symptom in reference to the true condition was the ability to move the mandible one-tenth of a centimetre in the first case, and three-tenths in the second case. This might seem to prove that true bony ankylosis was absent, because we assume that in true bony ankylosis there can be no motion. Cabot first called attention to this, and said it was due to the springing of the bone. In both of my cases it certainly was due to this cause. The skiagraphs demonstrate a most valuable method for learning the true condition of the

articulation, and they also show whether both articulations are involved and to what extent. The negative is placed against the side of the head, and the tube is adjusted so that the rays pass through the articulation in a direction obliquely upward, in this way avoiding the opposite ramus and angle, the shadow of which would not be as clearly defined as the ramus, which is in close contact with the negative.

As regards the practicability of the treatment employed, it is preferable to operate upon one side at a séance, choosing for the first operation the side most involved. Both articulations could be operated upon consecutively during the same séance. The advantages of this would be that the operator could satisfy himself, while the wounds were still open, that sufficient bone had been removed to obtain freedom of movement; the necessity of the second etherization would be avoided, and possibly there would be a lessened period of convalescence. Against this, however, is the increased danger from shock by prolonging the operation to just twice the length of time, as it is practically impossible to do synchronous operations; also the great danger of infecting the first wound, as it is very difficult to keep it protected from the fluids escaping from the mouth when the head is turned to that side while operating upon the opposite articulation. The wound in one week after operation will be sufficiently healed to obviate the danger of infection during a second operation.

The results in these cases depend largely upon the preservation of the function of the muscles of mastication; and it is important not to cut through the masseter muscles by a horizontal incision below the zygoma, as many operators have done. The method which is best is a vertical incision one and one-fourth inches in length, carried through the skin only, the fascia and fibres of the masseter muscles and the periosteum being split; this mode of division does not weaken the muscles to any appreciable extent. If the incision is limited to the skin, it is not possible to divide Stenson's duct or the temporofacial branches of the facial nerve. The temporary paralysis in each case was probably the result of overstretching of

the nerves. If special retractors are used, this method gives sufficient room for thorough and careful work. The function of the external pterygoid muscle is necessarily lost. Considerable lateral motion has been observed in many cases of unilateral ankylosis operated upon, due to the action of the opposite external pterygoid; but in bilateral cases lateral motion is frequently entirely lost. It is best to close the wounds without drainage when safe, as the facial contour is better preserved, especially if the muscles and fascia are held together by buried sutures. There is always considerable danger of the wound becoming infected when drainage is employed; and it is of the greatest importance to prevent infection, not only on account of its immediate danger, but also because it causes formation of a much greater quantity of cicatricial tissue, which will greatly limit the functional results; a depression inevitably results when drainage is employed. Some have packed the articulation with gauze for the purpose of keeping the surfaces of the bones more widely separated. When the wound is closed, the empty space will become distended with blood-clot, which will to some extent serve the same purpose; but if a wider separation of the false joints is desired, it is better to employ the method suggested by Cabot, of placing wedges of cork between the posterior teeth to maintain separation. Although this method was not used in the above cases, it seems to have special advantages, and should be used when practicable.

The most important question of all is the consideration of the dangers to be anticipated, and how to meet them.

I quite agree with Ranke, who said the greatest danger is from asphyxia; and I heartily sympathize with any operator who is confronted with this difficulty. In studying these two cases, I have endeavored to explain the occurrence of this condition in so serious a form in one, and to so slight an extent in the other. The ages of the patients were practically the same; they were both in good general physical condition, and the same care and technique were employed in each. The following reasons exist for believing that asphyxia is dependent

upon mechanical conditions, and a knowledge of them may be of some help in anticipating its occurrence in the future.

The normal position and function of the larynx are dependent upon the muscles which suspend it, the anterior group being connected with the mandible. It is reasonable to infer that the earlier in adolescence that development of the mandible ceases, the more abnormal will be the position of the tongue and larynx. In consequence of the mandible maintaining a fixed position in relation to the head while ankylosed, the muscles connecting the hyoid bone, the tongue and epiglottis, with the mandible, are accustomed to perform their functions with a limited power of contraction. If the mandible is dropped to a very slight extent, you can readily see how the functions of these muscles would be greatly disturbed. The relative difference in the two patients is quite marked and easily demonstrated. The first patient was eight years of age when the injury occurred, and the second five; and, although the subsequent development of the mandible practically ceased, the three years' difference in the ages of the patients at the time of the injury has made a marked difference in the condition of each. In the skiagraphs of the first patient, the position of the head in relation to the cervical vertebra is about normal, the lower border of the mandible making an angle with the bodies of the vertebra, five degrees less than a right angle, and the hyoid bone is shown one centimetre below the border of the mandible. The skiagraphs in the second case show considerable extension of the head upon the cervical vertebra; there is an angle of five degrees greater than a right angle, and the hyoid bone is seen three centimetres below the lower border of the mandible. The position of the hyoid bone is two centimetres lower in its relation to the mandible in the second case than in the first. The displacement of the larynx, hyoid bone, and the base of the tongue can be approximately estimated by the following measurements: there are one and one-half inches of the trachea above the manubrium, which can be increased on extension to one and three-quarters inches; in an adult there should be an average of two and

three-quarters inches; at ten years of age there should be two and one-quarter, and at six about two inches. The cricoid cartilage is opposite the body of the seventh cervical vertebra instead of the sixth. Therefore it is a reasonable calculation that the position of the base of the tongue, hyoid bone, and larynx is one inch lower than it normally should be, and their position remains practically the same in their relation to the manubrium as it was when the injury occurred, at five years of age. There are, I believe, two factors, both dependent upon the arrested development of the mandible, to which the faulty position of these organs is due. The position of the larynx and base of the tongue is dependent upon the position of the hyoid bone, it being suspended from the base of the skull by a duplicate set of muscles, namely, the stylohoid, the posterior belly of the diagastric, and the middle constrictor of the pharynx; and from the mandible by the geniohyoid, the mylohoid, and a portion of the geniohyoglossus, and the anterior belly of the diagastric. We will recall the fact that the position of the chin is one and three-eighths inches posterior to the position it normally should occupy, therefore it is evident that, if the chin should be carried forward to its normal position, the anterior group of muscles acting from that point would raise the hyoid bone at least one inch, which would be its normal position. And of still greater importance is this: that it would not only raise the hyoid bone, but would carry it forward, and with the bone the base of the tongue and larynx would be carried away from the posterior pharyngeal wall. The importance of this as regards the function of these organs, you will readily appreciate. I have gone into these details in order to make clear that, in the present condition of the patient, the hyoid bone with the organs which depend upon it for their position are not only displaced downward to the extent already given, but are also displaced backward, leaving practically very little pharyngeal space; and when the mandible is lowered to a very slight extent, the base of the tongue and the posterior surface of the larynx lie in contact with the posterior pharyngeal wall, making respiration very

difficult. I have frequently demonstrated this fact by retaining the mandible in a depressed position by means of the mouth gag, when the patient would become partly cyanosed and make violent efforts at respiration. At first I was inclined to believe that the obstruction to respiration was due to closure of the glottis by the epiglottis, the control of which having been lost by the changed position of the hyoid bone, as the movements of the epiglottis are practically dependent upon the position of that bone. It would be folly to attempt to exclude this as a factor, but I am strongly of the belief that the obstruction to respiration is due to the crowding of the larynx and base of the tongue against the posterior pharyngeal wall, leaving no space for air to reach the glottis, and, as a natural consequence, the epiglottis is forced against the glottis. In favor of this view are the following observations made at the time of operation. The respiration did not become impeded until the mandible was completely detached, in other words, until it dropped one-quarter of an inch; and it did not entirely cease until the mandible was depressed about one-half an inch by means of the mouth gag. Traction upon the tongue with the mandible depressed was of no avail, and it could not be while the base of the tongue was crowded against the pharyngeal wall.

How are we to anticipate the danger of asphyxia in any special case before operation? The first practical point would be the age at which ankylosis occurred, and at which the development of the mandible ceased. But this in itself has little significance if the operation is done soon after the occurrence of ankylosis, as the displacement of the hyoid bone, base of tongue, and larynx evidently increase with growth and reach the maximum at adult life. Consequently, the danger of asphyxia would increase in proportion to the time intervening between the occurrence of the ankylosis with arrested development and maturity. Further, ankylosis occurring after maturity would not cause any displacement or abnormality of the larynx, hyoid bone, and tongue, and consequently there would be no more danger of asphyxia than in any ordinary case.

Upon this important part of the subject I consulted by letter one who is recognized as an authority, Dr. Thomas Dwight, Professor of Anatomy in the Harvard Medical School, whose recent very valuable contribution upon the "Growth of the Face and especially the Pharynx" bears directly upon this subject. I quote the following from his reply:

"I am quite of your opinion that the very serious danger in your case was caused by the tongue (carrying the epiglottis with it) falling back and obliterating the pharyngeal space. I think it is not generally recognized how very small that space is under any circumstances, as it is well shown on frozen sections in the median line. Very probably in your patient the space was even smaller than usual.

"I cannot, however, agree with you concerning one point. You suggest that the want of development of the mandible was the cause that the hyoid was not carried up to its normal position. The fact is that in the infant the hyoid and larynx are very high and gradually descend, and for that matter the lower jaw descends too, for at birth its lower border is nearly in the same horizontal plane as the occiput. Consequently its function is not to pull the hyoid up. The uncommonly low position of the hyoid is a puzzle. So far as I know, it must be extremely rare. Can it be that the want of development of the jaw in some way failed to restrain its descent? I own I do not see how this should occur. I am sorry that this is all I can say."

I would answer the above question in the affirmative, believing that it is the proper solution. As already described, the bringing of the occipital and mandibular attachments of the muscles which suspend the hyoid bone closer together allows the muscles to assume an almost vertical instead of an almost horizontal position; and, again, the growth of the tongue would necessarily displace the hyoid bone downward, owing to the fact that it could not extend anteriorly on account of the teeth in an ankylosed and undeveloped mandible.

The external measurements of the mandible are as follows: between angles nine and one-half centimetres; between

angle and symphysis seven and one-tenth centimetres; between angle and zygoma four and one-half centimetres. Therefore not only the anteroposterior measurement, but the lateral measurement, was lessened, which, with the inward displacement of the teeth, would greatly restrict the space normally occupied by the tongue. My attention was called to this lateral narrowing of the pharyngeal cavity by Dr. D. Braden Kyle, who made an examination of the pharyngeal space, and coincided with the above views as to the cause of asphyxia. Having considered the age of the patient and its significance, a carefully elicited clinical history will aid materially in anticipating the danger of asphyxia. In Case II, ordinary respiration was attended by considerable stertor, and during the entire period in which the mandible was ankylosed he was never known to sleep without snoring loudly. To secure sleep he would generally assume the prone position, with the head turned to one side and extended over a pillow, or, if in a supine position, he would place one or two pillows beneath his shoulders, thus placing the head in full extension. In each of these positions he unconsciously followed the advice of Dr. Howard of London, who claims that "the best way to raise the epiglottis is not by pulling the tongue forward, but by extending the head and neck."

The necessity for full extension of the head during these years explains the acquired faulty position of the same with the vertebra, as shown in the skiagraph, and as already described, together with a marked prominence or anterior projection of the bodies of the first and second cervical vertebra, against which the soft palate is closely drawn.

Having considered at some length the dangers to be anticipated, the question of how to meet these dangers is of vital importance. When the danger of asphyxia is imminent, the absolute necessity of using the mouth gag while the patient is under the anæsthetic is disproved by the results in the two cases reported. In the second case the condition is quite satisfactory and equally as good as in the first case. This demonstrates the practicability of obtaining sufficient stretching of

the muscles and fascia subsequent to the operation. In any case, where more active use of the mouth gag is required, the metal shields should be used to cover the teeth. Greater force can then be applied. This plan was originally recommended by Dr. Goodwillie, of New York. (*New York Medical Journal,* July, 1875.)

To relieve asphyxia when present, instead of attempting to further depress the mandible, to make traction upon the tongue or reach the epiglottis as was done in my case, at once restore the mandible to the position it occupied when ankylosed, and thus place the parts in the best possible condition for easy respiration. In addition, if necessary, hook a tenaculum under the hyoid bone and lift it away from the posterior pharyngeal wall. This means failing, do a quick laryngotomy. The low position of the hyoid bone and the corresponding small amount of trachea above the manubrium would have rendered in my case a tracheotomy both difficult and dangerous, and hardly practicable in such an emergency. It is scarcely necessary to state that, in conjunction with different means employed, artificial respiration should be continued and all other necessary aids be used.

The clinical history of Case II would be incomplete without giving briefly the condition of the mouth, nose, and throat when examined subsequent to the operation. Besides several cavities in the remaining teeth, the first four molars were so badly decayed that practically only the roots remained, and these were extracted about three weeks after the operation. The second lower molars are opposite to the anterior angle, and are in a horizontal position, the crowns looking inward and towards each other. These teeth were so far within the arch that it was not possible to determine their presence until after the mouth was opened. For the care of his nose and throat, he consulted Dr. Walter J. Freeman, who very kindly sent me the following report of the condition which he found:

"After your operation . . . I found his difficulty in breathing due to the adenoids and relaxation of the soft palate. The velum lay on the back of the tongue, and the uvula

was so broad that the faucial opening was almost completely shut off from the throat. View of the vault could not be obtained through the throat, but the obstructing mass of pharyngeal tonsil could be plainly recognized through the nasal fossæ. I amputated the uvula, and the noisy respiration was immediately improved. With a snare I then removed a mass of the adenoids through the nose, and operations on this were continued by my associate, Dr. Baldwin, until the vault was completely cleared."

What prophylactic measures can be used to prevent possible ankylosis in cases of severe injury to the mandible similar to the two cases here reported? A careful examination of the mandible in the regions of the articulations will frequently disclose a fracture which, when present, should invariably be treated with an interdental splint with a closed bite, or the application of Dr. Angle's system of treating fractures with the teeth in occlusion. By either plan the fragments will be maintained in their proper relation to each other and be carried away from the zygoma, the danger of ankylosis being thus obviated. In seven cases so treated there was no appreciable interference in the movement of the mandible.

Of all the operations and methods resorted to in the past for treating permanent ankylosis of the mandible, only two are now being generally employed.

Excision of the head and neck of the condyle was first performed by Professor Humphrey, of Cambridge, in 1856 (*Medical Association Journal,* 1856), for the relief of ankylosis due to chronic rheumatic arthritis. The other operation is known as Esmarch's, who suggested it at the Congress of Göttingen in 1855. It was first successfully performed by Dr. Wilms in 1858. It consists in establishing a false joint in front of existing cicatricial tissue.

I cannot agree with David M. Gregg (*Practitioner,* December, 1899), who says "the only operation worth considering is excision of the neck and condyle;" nor can I agree with

the conclusion of Dr. Paul Swain (*Lancet,* July 28, 1894). "Taking, therefore, into consideration the simplicity of the operation as compared with the excision of the condyle and the superiority of the results, I think it may fairly be suggested that the modifications of Esmarch's operation is the one which surgeons in the future should prefer." I do, however, practically agree with the opinion expressed by Dr. A. C. Cabot (*Lancet,* August 7, 1897), "in cicatricial contraction due to noma, burns, or lupoid inflammation, the section of the bone must be in front of the cicatrix, forming a false joint in front of the detaining bands; Esmarch's operation producing the best mechanical condition possible. In bony ankylosis, the nearer the section is made to the joint, the nearer do the conditions simulate the normal."

The condition of the articulation and the surrounding tissue is the proper guide in deciding which operation to employ. In the absence of cicatricial tissue, as in my two cases, or when the tissue is present in such small amount that there is a reasonable assurance that it can be overcome by appropriate treatment, excision of the head and neck of the condyle is the proper operation. Where the muscles are destroyed or their function is held in abeyance by dense cicatricial tissue which cannot be overcome, the Esmarch's operation is clearly indicated and gives the best results. The preservation of the maximum amount of muscular function in bilateral cases is of the greatest importance. In unilateral cases it is quite possible to have good masticating power from the muscles of the uninvolved side, even if Esmarch's operation is done upon the opposite side and in front of the masseter and internal pterygoid. But when Esmarch's operation is done in bilateral ankylosis, the power of mastication is very feeble or is lost; and in one case reported the central portion of the mandible was so beyond the control of the elevator muscles that for two days after the operation it caused grave danger of asphyxia by its depressed condition.

Of considerable concern to me was the question whether

new bone would form from the periosteum after excision of the head and neck of condyle, which would subsequently lessen the range of motion. The results in these two cases and in the others reported demonstrate that this danger is scarcely to be apprehended, and that it is perfectly safe to make a subperiosteal excision.

STATED MEETING, MARCH 2, 1903.

The President, Richard H. Harte, M.D., in the Chair.

PAPILLOMA OF THE VULVA IN A CHILD.

Dr. George Erety Shoemaker reported the case of a girl, aged six, who was seen with her physician because of a bleeding growth protruding from the vagina, accompanied by a persistent irritating discharge. The general health of the child had been impaired for a year, and adenoids of the nasopharynx had been recently removed by another surgeon. About eight months before a white vaginal discharge had appeared, and had since resisted treatment at the hands of various physicians. Bleeding had appeared six weeks before his visit, but the growth had been noted only for a few days, and had increased decidedly.

Examination showed several soft, easily bleeding, prominent papillomatous masses occluding the vulvar cleft. There was no involvement of the skin surfaces, or of the anus. The masses were pale pink in color, sharply elevated, pedunculated, and quite fragile, while some were flattened from side to side and serrated on top like the comb of a cock. One rounded portion half an inch in diameter sprang from within the urethra by a stem. Smaller growths sprang from pits beside the urethra, while inside the posterior commissure the bases of others, which were large and irregular, were attached. None appeared higher in the vagina. The discharge showed diplococci within the cells of typical gonorrhœal character.

After twisting off the growths, their bases were burned with the thermocautery, the one springing from the urethra being, however, tied off to avoid contraction. Protargol solution was ordered for the discharge. Recovery was prompt. The reporter added that these vascular tumors of the urethra were said by Pozzi to occur in poorly nourished children, and to be due to irritating discharges. They are more common in the adult. It is not thought necessary by some authors to consider them venereal in origin, though they are apt to accompany gonorrhœal or

syphilitic disease. Two varieties are described, the flat condyloma.ata which are of syphilitic origin and frequently spread over the perineum and about the anus. The acuminated variety assumes a more typical papillomatous form and is the variety seen in this case.

The theory that they may occur independent of gonorrhœa is quite doubtful. Gynæcologists who have had occasion to make systematic microscopical tests of apparently innocent vaginal discharges have been many times impressed with the impossibility of excluding gonorrhœa by the macroscopical appearance of the surfaces involved or of the discharge; and if they were subjected to careful search, it is probable that all cases would show the gonococcus at some period of their history.

Boldt says (Keating and Coe, "Clinical Gynæcology," page 528) of these condylomata that observation has shown their occurrence even in children, though bacteriologists have not yet succeeded in proving the presence of gonococci in pointed condylomata. This case would seem to prove the presence of this exciting cause. Dr. J. Dutton Steele, of the Pathological Laboratory of the Presbyterian Hospital, kindly examined the growths and pronounced them papillomata with round-cell infiltration at some points.

The child was remarkably submissive to free exposure and examination, which suggested the possibility that she had been accustomed to handling, and that gonorrhœal infection might not have been accidental.

THE DRAINAGE OF THE CHEST IN EMPYEMA WITHOUT THE USE OF TUBES.

Dr. Leon Brinkman read a paper on the above subject.

After reviewing the state of present knowledge and practice in cases of empyema of the thorax, he continued with a description of a method whereby immediate adequate drainage could be secured without the use of drainage tubes.

He said that the operation advocated by Estlander, while a distinct advance in the treatment of empyema, is a very extensive one, and does not present any advantage over the method described below. Among twenty-seven cases in which it had been applied by him there were several in which, had it not been adopted, he would have been compelled to do the Estlander operation, entailing as it does a greater amount of manipulation, destruction of tissue, and a great mortality.

Dr. Carl Beck had devised a method somewhat similar to the one advocated by the author, differing, however, in several vital points. He was not aware of the operation advocated by Beck until in September, 1902, when it was brought to his notice by Dr. Gibbon, of Scranton. He had since gone over the literature carefully, and had found that Dr. Beck had reported his experience with suture of the pleura to the skin as early as 1894; he, however, introduced a drainage tube after three days to avoid hæmorrhage.

The operation recommended by Beck consists in making an incision over the seventh rib, parallel to the rib, reflecting back the superficial structures, denuding the rib of its periosteum, introducing a special scissors beneath the rib, which also served the purpose of a periosteal elevator, and excising four inches of the rib.

The great point of difference between the operation advocated by Beck and the one he was about to describe is, that in the latter additional facility is afforded to manipulate within the chest cavity; that with each inspiratory movement of the chest wall a wider range of lung expansion is possible; a freer inspection of the chest cavity is permitted, making it easy to avoid the formation of pockets and doing away with the necessity for packing the chest cavity.

His own operation for immediate drainage of the chest for empyema is performed after the following manner. The patient having been prepared, a vertical incision is made in the mid-axillary line down to and exposing the fifth, sixth, and seventh ribs, more if necessary. The skin, superficial fascia, and muscles are dissected back on either side of the wound, so as to expose at least two inches of the ribs; the periosteum is freed from the anterior surface of the ribs, to permit the introduction of the periosteal elevator beneath the ribs. An elevator is then carefully introduced beneath each rib successively, denuding them of their periosteum and underlying structures. The ribs are divided; the pleura is protected from injury by a special elevator, which performs a twofold function,—elevation and fixation of the ribs,—so as to facilitate division of the ribs with bone-cutting forceps.

The pleura having been exposed, a small vertical incision is

made in it at the lower angle of the wound, at about the middle of the space, to permit the more gradual escape of the purulent secretion. Upon the complete evacuation of the purulent contents, the incision in the pleura is continued upward until it reaches the upper angle of the wound.

A free inspection of the interior of the chest cavity is now possible by retraction of the wound; if the lung is found fixed and collapsed in the upper portion of the cavity, an attempt should be gently made to separate the adhesions; if these are too firm to permit this, then they must be incised and blunt dissection resorted to, avoiding unnecessary force, which might produce extensive laceration of the lung tissue.

When the condition within the chest cavity is complicated by encysted pockets of pus, either interlobular or between the lung and the posterior chest wall, it may be necessary to go as high as the third rib in the excision.

The operation is completed by stitching the pleura and the skin together around the entire wound, thus offering a large, free opening for the escape of the succeeding secretion. In order to avoid injury to the diaphragm, all incisions are made with this organ in view.

A serous membrane like the pleura, which under normal circumstances has great absorptive powers, is capable of taking up a toxic amount of drug from any fluid thrown into the chest cavity which would contain a sufficiently strong antiseptic to alter the character of the pus. Although the character of the membrane is altered by the inflammatory process, still it is capable of absorption.

In commenting upon the practice of irrigation of the chest cavity, the dangers of this procedure should be well borne in mind; fatal syncope and hemiplegia are prominent among these. From experience, he had found that irrigation of the chest cavity does not diminish the amount of discharge, but rather, on the other hand, favors an increase.

The periosteum must be carefully dissected away, otherwise, during the process of repair and closure of the wound, pain-creating masses of fibrous and calcareous tissues are formed.

During the past five and a half years he had spent considerable time and thought in perfecting the detail of the immediate method of drainage without tubes, and had had an opportunity to

compare it with excision and tubular drainage. The total number of cases operated upon for empyema was forty-seven, twenty of which were by excision and tubular drainage, the remaining twenty-seven were by the immediate type of drainage, stitching the pleura to the skin. The results in the latter method had been so conclusive that he believed the benefits from it were unquestionable. Of the twenty-seven cases treated by this method of drainage but two had had a protracted convalescence, and these would have occurred under any method employed. The first was a young girl with a tubercular empyema complicated by extensive tubercular involvement of the base of the right lung. It is now two years since she was operated upon. Her condition at the present time is as follows. A small discharging sinus is seen at about the middle of the scar of the former operation, from which a slight amount of semipurulent material makes its escape. Microscopical examination of the discharge from the sinus and of the sputum fail to reveal tubercle bacilli. Her general condition has improved in the past four months to a remarkable degree, her weight having increased thirty pounds. The area of lung involvement in the impaired lung has decreased to one-half its former dimensions.

The other case occurred likewise in a young female. The empyema was a secondary complication to pneumonia. In addition to the empyema, there was a localized patch of gangrene in the anterior pleural surface of the lung, which upon separation developed into a bronchial fistula. With the gradual decrease in the size of the wound, there has been a perceptible decrease in the amount of discharge and of the air making its escape through the sinus. At the present time there is scarcely any discharge, and air can only be forced through the sinus when the breath is held and forcible compression of the chest wall made. It is now seven months and two weeks since she was operated upon.

The remaining twenty-five cases by this method have all done well, the shortest time for a cure to be established was three weeks and the longest five months.

It will be found necessary in some cases to freshen the edges of the wound and bring them together with sutures, so as to hasten the closure. This was done in five of the twenty-seven cases, the discharge having ceased after three weeks.

Dr. Henry R. Wharton said that he had found simple

incision with the insertion of tubular drainage very satisfactory, especially in cases of empyema in children, though in later years he has often excised a rib. He rarely excises more than one rib, and only from one to two inches are removed. The success of these operations in children depends on the elasticity of the chest wall. Preliminary aspiration is wise in many cases, this being done some hours or even days before the radical operation. He has never practised the operation recommended by Dr. Brinkman, but thinks the only objection to the operation is the time required, for time is a very important element in operations for empyema in children. The danger from irrigation in these cases is very great, and it should not be employed. Decortication of the lung, recommended by Fowler in the case of adults, is theoretically a very good method; but hæmorrhage is apt to be profuse, and the time consumed is necessarily so great as to make the operation dangerous. Resection of ribs and tubular drainage, or stitching the pleura to the skin if that is preferred, are probably the best operations that can be done for the patient. It is a mistake to drain without having broken up adhesions. The incision should be made large enough to allow search for and breaking of adhesions, as prolonged suppuration is often due to their presence.

Dr. John H. Gibbon said that the operation recommended by Dr. Brinkman appealed to him, and had in it many points to be commended. In one class of cases, however, he does not think it practicable, namely, the acute empyemas of children. These cases he believes will do as well with tubular drainage as when operated on by the method advocated by Dr. Brinkman. In adults, and where the condition is not so acute, the latter method is no doubt a good one. Dr. Gibbon briefly reported two cases. The first was that of acute empyema in a child of twelve months, which he thinks is an unusually early age for that affection. The child had been extremely ill from pneumonia for a number of weeks. Prior to operation, which consisted of simple incision with tubular drainage, six ounces of pus were aspirated from the pleural cavity. The child was well in six weeks. The second case was one of sudden death in a child during the application of a dressing three weeks after operation. This case was reported because we generally hear of sudden death in these cases as being due to irrigation. In this instance irrigation had never been employed. The case was one of double empyema, operation upon

which illustrated very well the advantage of chloroform anæsthesia and the necessity for rapid operation. Resection of one rib on each side and the opening of an abscess of the shoulder were performed in eleven minutes. The child was taken from the hospital against advice, but was dressed at home by a competent physician. Three weeks after operation the child was turned from one side to the other while being dressed, and died at once. In reply to Dr. Gibbon's question as to age incidence of empyema at the Children's Hospital, Dr. Wharton said that the youngest patient he remembered operating upon was eighteen months of age. The child did perfectly well under simple incision and tubular drainage. Empyema is certainly unusual in children under one year of age.

Dr. Richard H. Harte said that as to technique he was convinced that there is nothing better than the straight, mid-axillary incision, provided it gives perfect access to the cavity. Time is of the greatest importance in these operations. With care two or more ribs can be rapidly exposed and a suitable director passed underneath them separating the costal pleura. Then by introducing a heavy pair of bone forceps a section of the ribs can be readily cut and removed, and it is rarely necessary to apply any sutures to the bleeding vessels. The patient can then be turned over on the side, the costal pleura broken through, and the chest contents drained, thus avoiding all the annoyance of air being drawn into the pleura and the unnecessary soiling of the patient by the escaping pus. The greatest care should be taken after the pus has escaped that all masses of fibrin are carefully removed from the pleural cavity with a suitable pair of forceps, since, if masses of fibrin are left, great annoyance will be occasioned by the blocking up and occluding of the drainage tube. This drainage tube should be double and of as large a size as can be obtained. It is advisable to use two tubes side by side, and retain them in position by the suture which is used for closing the skin wound. Care should be taken that the ends are not allowed to irritate the lung, and therefore the tubes should be used either just passing through the costal pleura or else sufficiently long to drain over and pass down deeply into the pleural cavity, thus avoiding the ends of the tubes coming in contact with the lungs, which is always a source of irritation and discomfort to the patient. In Dr. Harte's experience nearly all cases of em-

pyema heal in a comparatively short time, provided the cases are seen early and before the lung has an opportunity to become tied down by old adhesions, which prevent its expanding and close the pleural space.

Dr. Brinkman, in rejoinder, said that Dr. Wharton's method would suffice for acute empyema in children. His experience has been mainly with late cases, in which his own method is more applicable. By this method, adhesions, especially those between the lobes, can be easily separated, and the lung allowed to expand, which is the secret of success in these cases. Patients will get well if only a simple incision be made, but the method described facilitates recovery. The operation can be done in from fifteen to eighteen minutes. He thinks the death reported by Dr. Gibbon was due to shock or to an embolus in the brain. Shock is now recognized as the cause of deaths which occur during irrigation. The writer knows of no deaths from chloroform, but has heard of one resulting from struggles during etherization. The straight incision is undoubtedly the best. If it is carried below the seventh rib, the diaphragm is apt to be injured, but the finger can be carried down much farther. Dr. Brinkman has seen one case where the patient wore a silver tube in his side for fifteen years. Removal of the tube was followed in a week by healing of the cavity.

THE SURGICAL TREATMENT OF EXOPHTHALMIC GOITRE.

BY JOHN B. DEAVER, M.D.,
Surgeon-in-Chief to the German Hospital.

It is now nearly a century since exophthalmic goitre was first described by Caleb Parry and seventy years since Graves wrote his classical essay upon the subject, and yet the treatment of the disease has never been satisfactory, in most instances merely alleviating the symptoms. The clinical picture of exophthalmic goitre is so typical that the diagnosis is always easily made unless exophthalmos is absent, when careful inquiry of the early symptoms and course should correct any doubt as to the true condition.

Miss A. B., aged twenty-four years, referred to me by Dr. Charles K. Ladd, of Towanda, Pa., was admitted to the German Hospital on December 30, 1902. The family history is quite interesting; her father is living and well, but is frequently nervous and irritable; her grandmother and mother died from heart trouble, and were also of nervous temperaments. A brother died from heart disease, chorea, and rheumatism. She had measles, whooping-cough, and varicella when a child; menstruated first at fourteen, continuing regular and without dysmenorrhœa until last summer, when she missed several periods. There is a history of frequent convulsions up to the age of eight, but their nature could not be determined. At the time of beginning menstruation there was distinct enlargement of the thyroid gland, lasting about one year and disappearing under the use of electricity. There was no palpitation nor dyspnœa at this time, but she had a number of fainting spells. She suffered from slight rheumatic attacks during girlhood.

Four years ago the thyroid gland became enlarged and the eyeballs prominent, with attacks of indigestion, abdominal colic, and nervousness. The goitre continued with a gradual increase in the symptoms of indigestion until March, 1902, when the entire

symptom complex of exophthalmic goitre manifested itself. Her neck increased in size, with resulting dyspnœa and inability to wear a collar or anything tight around the neck; she became nervous, irritable, and easily upset; worried over trifles, always anxious to finish anything undertaken, and restless until the task was finished. Palpitation of the heart was present and increased by exertion. She became breathless and weak after climbing stairs, and suffered from frequent spells of profuse perspiration over the entire body, most marked over the chest, neck, and arms.

Her appetite became capricious, and for two months she suffered from diarrhœa. There has never been any jaundice present. These symptoms have been continuous until admission, when the following observations were made:

The eyes are prominent, easily irritated with frequent lachrymation, widely dilated pupils, and an injected conjunctiva; winking is infrequent. The palpebral angle is widened, but the sclera is not visible below the upper lid, and the lid readily follows the movements of the eye. No lagophthalmos can be observed, nor is there corrugation or wrinkling of the eyebrows when the patient looks up. There is slight internal convergence.

The thyroid is symmetrically enlarged, without a thrill, and by auscultation a venous hum can be heard over the struma and the carotid vessels. Slight hoarseness is present, the patient's voice becoming husky after talking to any extent. Tachycardia is present with arrhythmia.

The pulse averages 120 when quiet, but increases with the slightest exertion up to 160. The apex beat is in the fifth interspace, diffuse, and seen beyond the nipple; the impulse is moderately forcible, and a slight initial systolic murmur can be heard, transmitted to the axilla.

The lungs and abdomen were negative. A tremor of the fingers can be seen upon extension of the hand, especially noticeable when the patient becomes excited.

There was no polyuria, the urine containing a trace of albumen, but no sugar or casts. The blood count showed no anæmia, with 10,320 leucocytes and an eosinophile of 10.5 per cent. The temperature was always normal before operation, the respirations ranging from 20 to 24.

One week after admission, bilateral resection of the cervical sympathetics was performed under ether anæsthesia. An incision

five inches long was made along the posterior border of the right sternomastoid muscle, which was reflected forward along with the great vessels and pneumogastric nerve. The sympathetic nerve and its three ganglia were found and removed entire from a point one-half inch above the superior ganglion to one-half inch below the inferior ganglion. The middle ganglion was located as lying upon the inferior thyroid artery, the inferior ganglion being behind the subclavian artery. After checking all hæmorrhage, the wound was closed with a continuous silk suture and a collodion dressing applied.

The operation was repeated on the left side, the middle ganglion being found just above the inferior thyroid artery and the inferior ganglion just below the same blood-vessel. On account of the high position of the lower ganglion, the nerve was cut well below it, in order to remove the entire origin of the inferior cardiac nerve. Silk sutures and a collodion dressing closed this wound also.

Patient took ether badly from the start; was cyanosed and full of mucus; had some trouble with nasopharynx previous to operation. Operation was interrupted several times on account of the anæsthetic. At completion of operation the patient's color was very bad and pulse rapid and irregular; was given oxygen for an hour after operation. On coming out of the anæsthetic she vomited clear mucus in gushes. Commenced cough almost at once, and cough continued, accompanied by intermittent expectoration of large quantities of seromucus. Several hours after operation both lungs were noted to be full of moist bubbling râles, and respiration was labored and harsh. Patient remained cyanotic, and received oxygen at fifteen-minute intervals for several days. The day following operation she was bled from left arm and lungs cupped posteriorly. Both bases flat. Patient remained cyanotic and with rapid pulse for several days. Symptoms gradually subsided, and patient made satisfactory recovery.

The immediate benefit of the operation to the tachycardia could not, unfortunately, be observed, as the patient developed a severe pneumonia twelve hours after the operation, and for several days she was in a perilous condition, the temperature reaching 105° F. and slowly declining, reaching the normal seven days after operation.

The exophthalmos was noticed to have disappeared almost

entirely twenty-four hours after the operation, and, after her recovery from the lung condition, convalescence was rapid. The wound healed by first intention, and on January 31, twenty-six days after operation, the patient was discharged, with no appreciable exophthalmos and with entire disappearance of all nervous symptoms. The goitre, though diminishing, was still present, but causing no discomfort. On February 26 the patient writes that she is quite well and markedly improved by the operation.

The underlying causes of exophthalmic goitre are obscure and subject to much debate; whether a direct or reflex stimulation of the sympathetic, a neurosis, a lesion, a compression, or an intoxication has not definitely been determined. The progress in the study of the internal secretion of this gland, like all the other ductless glands, has been slow, and has not furnished a satisfactory cause beyond the probable alteration of the secretion.

At the present time three theories are advanced, viz., hyperthyroidization, disease of the central nervous system, or alteration in the sympathetic system.

The arguments in favor of a lesion of the thyroid gland itself are mainly based on the failure to find reliable post-mortem evidence of disease of the nervous system, and the altered secretion of the thyroid is supposed to exert a direct or indirect toxic action upon the heart, nervous system, and general nutrition, the exophthalmos being caused by a local deposit of fat behind the eyeball. Mikulicz and Reinbach believe that while the presence of Basedow's disease cannot be explained by an excessive function of the thyroid, yet the hypertrophy of this gland plays a prominent rôle by adding the phenomena of thyroidism to the other symptoms. The failure of thyroidectomy is therefore to be ascribed to the fact that, in spite of the removal of this factor, the primary injury, viz., the nerve lesion, is sufficiently severe to render the phenomena of the disease continuous. The influences of heredity, age, sex, and temperament tend with remarkable unanimity to point to a nervous origin.

The tachycardia, hyperidrosis, tremor, decrease of electrical resistance, and general nervous unrest which are so constantly present would also denote a nerve influence. There are some cases, also, in which the enlargement of the thyroid is very slight or even absent.

For the present, at least, we must assume that exophthalmic goitre is dependent upon all these factors, and that a lesion of one may cause specific alterations in the others, with the production of the well-marked symptoms denoting the disease.

The diagnosis from simple parenchymatous goitre must be made in those cases where the exophthalmos is absent, particularly when the ordinary form of goitre is accompanied by cardiovascular symptoms. The most marked points in which the simple goitre differs are the irregularity of the position of the enlarged thyroid, the direct pressure upon the trachea from the size of the growth with dyspnœa and stridor, and the more mild character of the nervous and vascular phenomena if present together, of course with the absence of the exophthalmos.

The treatment of Graves's disease with drugs is unsatisfactory, and all like diseases, the medical cure of which has been unsuccessful, the number of so-called curative remedies is a large one. Digitalis, belladonna, bromine preparations, iron, and various nerve sedatives have been most frequently used.

Electricity, galvanic and faradic, has been tried without any benefit; iodine and thyroid feeding aggravate the symptoms.

There are four surgical procedures adopted:

1. Partial thyroidectomy.
2. Ligature of the thyroid vessels.
3. Operations upon the cervical sympathetic nerves.
4. Operations upon distant parts of the body.

In addition to these operations, exothyropexy has sometimes been employed, performed by exposing the gland and drawing it out of the wound and leaving it exposed to the

air. Atrophy is supposed to result, but the operation is dangerous, ineffectual, and very disfiguring.

Thyroidectomy has been the operation usually performed for the relief of exophthalmic goitre, especially when the cause is believed to be hypersecretion of the thyroid epithelium. It must be admitted that this operation has furnished good results, especially in the hands of Kocher, but the mortality has been very high. Starr, Sorgo, and Iricomi have published statistics up to 1896 with a mortality varying between 12 and 15 per cent. and a cure obtained from 25 to 39 per cent. Partial resection has been the method used, because, unlike the simple goitre, that in Graves's disease cannot be enucleated. Ætherization of these patients is difficult and fraught with danger, especially from a postoperative pneumonia, and Kocher, recognizing this fact, always uses local anæsthesia. The escape of the thyroid secretion over the cut surfaces during the removal has been believed to aid in the production of a postoperative thyroid intoxication.

Ligature of the thyroid vessels has been tried, especially by Kocher, in the hope that by cutting off the blood supply the gland will undergo atrophy. The exposure of the inferior thyroid vessels may be a difficult task. Kocher usually ties off both superior and one inferior thyroid artery, and frequently combined this operation with partial resection of the gland or resection of the cervical sympathetics in severe cases; the combined operations are often performed in several sittings.

Section of the cervical sympathetic for exophthalmic goitre was first performed by Jaboulay, of Lyons, in 1896, and later in the same year, Jonnesco, of Bucharest, resected part of the nerve together with the superior cervical ganglion. The results were not sufficient, however, and Jonnesco and others extended the operation until complete bilateral excision of the entire cervical sympathetic nerve with its three ganglia, and even in some cases the upper thoracic ganglion, was advocated.

The theory upon which the operation is based presupposes

the nervous origin of the disease with alteration of the sympathetic nerve. Each of the three cardinal and also the subsidiary symptoms are believed to be dependent upon stimulation of this nerve. Exophthalmos is caused by a stimulation of the cervical sympathetic leading to an energetic contraction of Müller's smooth muscle at the posterior pole of the bulb, the dilatation of the pupil is due to the same irritation of the cervical sympathetic which communicates with the lenticular ganglion and its ciliary branches to the iris.

The goitre depends either upon an enormous dilatation of the vessels of the thyroid from stimulation of the vasodilator fibres of the neck, or, as Jonnesco believes, it is due to an increased activity of the thyroid epithelium with hypersecretions which are dependent upon the permanent stimulation of the secretory nerve-fibres of the thyroid. Resection of the sympathetic, and consequently of the vasodilator, vasoconstrictor, and secretory nerve-fibres, results in atrophy of the thyroid.

Tachycardia is likewise to be attributed to the irritation of the sympathetic which communicates with the cardiac plexuses by several branches, the accelerator nerves of the heart muscle.

The nervous and digestive phenomena are dependent upon changes in the cerebral circulation, possibly a permanent cerebral anæmia produced by a continuous stimulation of the vasoconstrictor fibres of the cervical sympathetic. The vertebral nerve containing a number of vasomotor filaments is given off from the inferior ganglion. Removal of these fibres produces cerebral congestion.

The various operations on the cervical sympathetic for the relief of exophthalmic goitre are the following: (1) Simple division of the cervical sympathetic; (2) ablation of the cervical sympathetic by means of Jaboulay's operation, which, without a large incision, is devised to stretch and twist the nerve by means of forceps attached to its upper and lower ends; (3) simple stretching the cervical sympathetic; (4) partial resection of the latter; (5) partial and extensive resection; and (6) total resection.

Belacescue believes that extensive *partial* resection is only indicated in the cases of Basedow's disease in which the tachycardia is not intense. He believes that the entire bilateral resection with removal of the uppermost thoracic ganglion is easy of performance and harmless in its results, with a far greater percentage of cures than any other operation for the relief of exophthalmic goitre, and practically no mortality.

His statistics show 59 per cent. of cures, 29 per cent. of improvements, and 12 per cent. of failures, with no deaths directly due to the operation.

Jonnesco is also very enthusiastic, having performed over 130 bilateral sympathectomies in the last five years, in two cases removing the first thoracic ganglion. He has not observed in any of these cases any trophic or circulatory disturbances. Of this series, fifteen were performed upon patients suffering with exophthalmic goitre, with a complete cure or marked improvement. The three cardinal symptoms of the disease disappeared completely, nutrition became normal, and the nervous condition was restored to its original stability.

The operation should not be undertaken unless the surgeon is perfectly familiar with the anatomy of the area of operation and able to cope with any anomaly in the course of the nerve or the position of its ganglia. The difficulties encountered during anæsthesia are similar to those in all operations upon the thyroid, and require the careful attention of the anæsthetist at all times.

In severe cases with marked exophthalmos and pronounced nervous irritation, the operation may be performed in two sittings about a fortnight apart, removing one side at each sitting. This undoubtedly insures a more successful result.

In addition to exophthalmic goitre, cervical sympathectomy has furnished excellent results in chronic glaucoma. Jonnesco was the originator, and has collected thirty-five cases, twelve his own, with marked improvement in all but about six cases.

Suker has collected twelve cases, operated upon in this country, with removal of the superior cervical ganglion, with good results, and believes the operation should be performed

in absolute and hæmorrhagic glaucoma; in chronic glaucoma, especially when an iridectomy or sclerotomy has failed, and at all times when other operative measures are refused, irrespective of the form of glaucoma.

The removal of the ganglion causes: (1) Contraction of the iris, (2) relaxation of the circumbulbar muscle, (3) vascular dilatation, (4) lower intraocular tension, and (5) a decrease in the elements constituting the aqueous.

Only the side affected should be operated upon. Jonnesco has also obtained brilliant results in epilepsy by resection of the sympathetics, on the hypothesis that epileptic attacks are due to cerebral anæmia from irritation of the cervical sympathetics with narrowing of the lumen of the cerebral blood-vessels. "Section of the cervical sympathetics by cutting off the avenue through which such impulses are carried prevents the occurrence of brain anæmia, and so permits the uniform and constant nutrition of brain tissues on which cerebral stability depends. The section of the cervical sympathetic also seems to act favorably by preventing the flood of nervous impulse or reflexes from irritated abdominal or pelvic organs to the brain." (Jonnesco.)

Jonnesco has operated on over 100 epileptics, and records the results for 1896, '97, and '98.

During these years forty-nine were operated upon, with twelve cures and four improvements. These results are accurate, because they have been frequently observed after operation, and he does not regard any of his results as definitive until at least two years have passed.

In migraine, facial neuralgia, and maniacal irritation the operation has failed to produce results, though but few cases have been subjected to operation.

From my own simple observation, and from a study of the works of those whose experience with the operation has been extensive, I can make the following conclusions:

1. That as surgical treatment is recognized as the most satisfactory in exophthalmic goitre, so is complete bilateral cervical sympathectomy to be considered the operation of choice.

2. The operation should not be performed during the height of psychical irritation or tachycardia, nor by an operator who has not an absolute knowledge of the anatomy of the neck and a large experience in dealing with difficult operative procedures, or the means at hand to cope with any emergency.

3. The results of the operation are far better than the other procedures, the mortality is much lower, and in cured cases the improvement is permanent.

4. In chronic glaucoma, especially after the failure of iridectomy and sclerotomy, this operation may restore vision completely, unless the disease is too far advanced with absence of light perception.

5. In recurring attacks of epilepsy, sympathectomy should be resorted to. The results warrant the operation.

MYOSITIS OSSIFICANS.

WITH A REPORT OF TWO CASES,—ONE TRAUMATIC, THE OTHER NON-TRAUMATIC.

BY WILLIAM J. TAYLOR, M.D.

ALTHOUGH knowledge concerning the etiology of "myositis ossificans" is obscure, there have been enough cases recorded to establish it as a definite condition; but we are still very uncertain as to its cause. There are two great classes. The first those where bone has formed in the softer tissues, with or without history of injury, and in which no connection can be found apparently with the bones of the skeleton or their periosteum; and again, in others there may be osteophytes to which muscle tissue is attached and which has undergone osseous change.

The second is where there is a formation of new bone resulting directly from an accident to bone or its periosteum and involving the muscles and fibrous structures. All these conditions are found in youth. Those of the first class are characterized by local swelling, and, later, loss of function, with gradual ossification of the muscle. This is the most common. A number of cases have been reported under the second heading, in which the muscles become ossified quickly after a single injury, generally, as in my own case, following the kick of a horse, and, as in F. Munro's case, from an injury to the thigh received in a foot-ball game. (F. Munro, *Lancet*, February 21, 1891, p. 427.)

In Munro's case, a young man of twenty-four received a blow on the right thigh while playing foot-ball. He was incapacitated from work for three days. A week after the accident he noticed a hard swelling an inch and a half above the outer side of the knee-joint. This got larger, and five weeks after the accident he sought medical advice. On examination, there was found what seemed to be a lump of bone lying loose in the muscle of the outer

side of the thigh. It was about eight inches long, narrow, and projecting at its lower end and approaching the surface, but broadening out as it passed up the thigh and lying more in the muscles. It was slightly movable except at its upper end. The patient could walk about fairly well with the assistance of a stick, but was able to flex his thigh only very slightly. After about two weeks an incision three inches long was made over the projecting portion, and in the substance of the vastus externus was a mass which had to be removed with bone forceps. There were no complications, and the patient left the hospital well in the course of a few weeks.

Mr. Bilton Pollard (*Lancet,* December 31, 1892, p. 1491) reports a case of "myositis ossificans" in a boy of nine, where a large number of the muscles became ossified without there being any particular injury to account for it. An operation was performed and the teres major muscle was exposed. The bone was found to occupy the substance of the muscle in nearly its whole extent.

Dr. F. W. Burton-Fanning (*Lancet,* September 28, 1901, p. 849) reports a case of a man aged thirty-three, who at the age of eight years had gradual stiffening of the left shoulder without previous injury or pain. At the age of twelve the right knee became impaired until all power of motion had gone. Following this in order came stiffness of the left hip, sides of chest, and lower part of back. At the age of twenty-eight the right arm from the shoulders downward was much swollen, the skin being red and tender. The inflammation was so acute that the arm was thought to be poisoned, but the swelling gradually passed off, and the arm was found to be flexed in the extended position, while the movements of the shoulder previously impaired were diminished. Flexion and extension remained at the wrist, but the forearm could only be supinated through half the natural extent. Two years later stiffness of the right hip was noticed, and this gradually extended until the legs became affected and the patient had numerous falls, but he had never seriously hurt himself, and could not attribute an increase of his malady directly to any injury. He was remarkably free from any other disease.

There was a family history of his father having had "myositis ossificans," and dying at the age of thirty-three from an accident.

Mr. Charles Stonham (*Lancet,* December 31, 1892, p. 1485) speaks of the causation of the disease as being shrouded in obscurity, but that it is essentially one of early life. While heredity is supposed to be a large factor, there are comparatively few in which this can be traced. Most of the cases of "myositis ossificans" cannot be directly traced to any trauma, and there is a history resembling in large part muscular rheumatism; in the cases which he reports and the illustrations which he gives, there seems to be an overgrowth of the bony tissues and the formation of osteomata and osteophytes, as well as ossification of certain of the muscles.

In the illustrations which he gives, the osseous formations are many of them independent of the skeleton, but in some parts they are attached to it, spreading into the muscular insertions as pointed, stalactite-like masses. True spongy exostoses may also be met with. Usually in the form of flattened, perforated plates, the bony tissue may be in nodular masses or sharp and pointed.

He appends a large number of references to cases in English, American, and Continental journals.

Dr. Lydia M. Dewitt (in *The American Journal of Medical Sciences,* September, 1900, p. 295) published a very elaborate pathological report from two cases of "myositis ossificans."

The first case resulted from chronic inflammation (possibly tuberculous), in which ossified masses were found immediately surrounding the femoral vessels, and extending in all directions between the degenerating and regenerating muscle-fibres.

The second case resulted from an injury to bone,—a fracture of the thigh,—which may have injured also the muscles and other soft parts.

Munro (*Lancet,* February 21, 1891, p. 427) speaks of "myositis ossificans" as a result of chronic inflammation either localized or general. In the localized variety the inflammation of the connective tissue is usually the result of repeated slight injuries, the bony tumor in one case appearing five weeks after the injury.

Heredity, although claimed by many writers to be a factor in the causation of the disease, does not seem to play any large rôle in its production, although there are a few cases where it would seem to be operative.

Treatment in the non-traumatic variety has been of little avail in the majority of cases; excision of the muscles doing little or no good, as the ossification of some of the degenerated muscles has very soon taken place.

In Dr. Keen's case, reported in the present communication, excision of the ossified muscle has, however, been of distinct advantage, as in nearly two years there has been no recurrence nor apparently any disability resulting.

In the traumatic variety, or if we might use such a term as acute traumatic, where the condition has followed the receipt of one severe injury, operation and the complete excision of the degenerated muscle and fibrous tissues have resulted in complete relief.

Through the kindness of Dr. Keen, I am able to report his case, and thus give an illustration of the two great varieties of this very peculiar affection. It was my privilege also to assist him in the operation performed upon his patient, and to see her constantly during her convalescence.

These are the only cases I have ever been fortunate enough to see, and in my own case I was at a loss at first to account for the condition which I found at operation; indeed, for a time, and until I received the report of the pathological findings, I feared that it might be sarcoma. The complete freedom from pain made me feel somewhat reassured.

Case I. *Myositis Ossificans Traumatica.*—A young man, twenty-six years of age, of robust health and fine general physique, whose occupation was that of schooling young hunters, was kicked by a horse, December 15, 1900. He had never had rheumatism, but had a slight mitral murmur. The hoof struck him in the middle of the thigh on the anterior surface. The blow was so severe that he was knocked down, and he thought the thigh broken, but in a short while he was able to get up and walk, walked his horse for some distance, and then with the assistance

of some farmers was lifted into the saddle and rode home. The pain was intense, but not completely disabling. A remarkable thing about his injury was that the horse kicked him on Saturday with such force that he thought the thigh was broken, but he was able to walk; and the next day, being Sunday, he did not ride, for this is their custom at his stock farm; but on Monday he got on a horse and had ridden every day until I saw him. He had comparatively little pain except upon extending the thigh and flexing the leg upon the thigh; and he found of late that he did not feel secure in his seat when riding a restless horse, and that his efforts to clutch with his knees gave him pain. He had none of the dull aching or throbbing pain of a sarcoma.

When first seen by me on January 5, 1901, just three weeks after the receipt of the injury, there was a marked swelling on the anterior surface of the left thigh about its middle, and over which the muscles readily rolled. The swelling was hard, but did not feel bony; it gave rather the sense of an organized hæmatoma beneath the periosteum. With the limb at rest there was no pain whatever, but on certain movements of the limb there was pain; this was most marked upon flexing the leg upon the thigh.

On January 8 I made an incision through the rectus muscle down to the periosteum. I found the whole area of the bone—especially of the anterior surface—enlarged and the periosteum thickened, and the muscles—particularly the deeper fibres—containing small bony particles. The pieces of bone and muscular tissue that I removed were directly in contact with the periosteum, which was elevated and the bone beneath found roughened. At one place I removed a small spicule of loose bone. I curetted the bone, removed all the thickened portion of the muscles that I could, and closed the wound with an iodoform gauze wick for drainage. He made an absolutely uneventful recovery, and he had no pain or discomfort.

The muscles and fibrous tissue removed were sent to Dr. W. M. L. Coplin, who sent me the following report:

After a very detailed and minute description of the methods employed in making the examination and of the microscopic appearances of the specimen, he states:

"A definite diagnosis from the examination of disconnected fragments of tissue, such as those submitted in this case, may

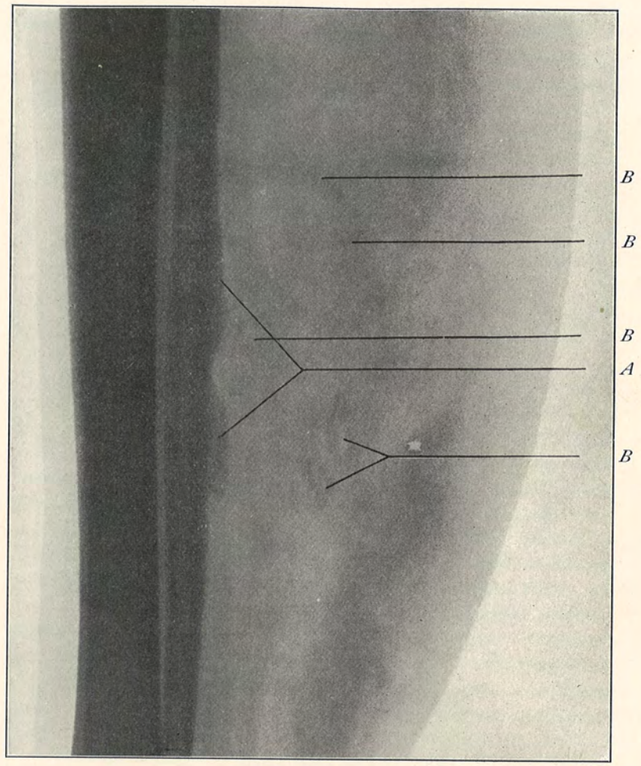
seem hazardous, but the findings recorded above strongly suggest the diagnosis of ossifying myositis."

Case II. *Myositis Ossificans.*—Miss A., aged forty years, first consulted Dr. W. W. Keen on April 22, 1901. At nine years of age her mother discovered a slightly tender lump over the left fibula near the junction of the middle and lower thirds of the leg. She had some pain in the leg, which was thought to be rheumatism. At fourteen, walking became distinctly painful, and the muscles gradually contracted until her foot was in marked extension, *i.e.*, an acquired equinus. At sixteen, tenotomy was done, the deformity, however, returning immediately. Some X-ray pictures which she had had taken in Washington showed that there was apparently an irregular, sharp osteophyte growing from the fibula at the point indicated (Fig., A), and that the bone was thickened for some distance above and below this point. There were some other spots in the picture which made me suspect myositis ossificans, though I was doubtful whether they might not be defects in the photographic plate.

The muscles of the right calf were distinctly harder than those of the left calf. I advised operation, which was accepted at once.

Operation by Dr. Keen, May 3, 1901.—I had three objects in view: first, to chisel away the supposed osteophyte, which was still quite painful; second, to lengthen the tendo Achillis, and, third, to remove all of the supposed ossified plates if I could do so.

I made an incision somewhat posterior to the fibula. This passed through quite a thick layer of fat. The deep fascia I found to be irregularly thickened with plates of what I judged to be bone at various places. These multiple bone plates extended well back to the middle of the calf, but, apparently, not to the inner side of the leg. There were also a considerable number of them in the muscular tissue. There was no osteophyte growing from the fibula, but the irregular plates of bone were in contact with the fibula. In order to remove the whole of these bone plates, I was obliged to prolong my incision, so that it finally reached from the upper end of the calf nearly to the heel. At one place there was very annoying though not serious bleeding, which I could not control by repeated ligature and suture-ligature. What I thought to be a large vein ran along with the bleeding artery. Finally, in order to control the bleeding, I cut across



Skiagraph of the bony plates in Dr. Keen's case of myositis ossificans. *A*, the apparent exostosis from the fibula; *B*, the other osseous plates in the muscle.

both artery and vein, and to my surprise found that the supposed vein was a large nerve. It was very much enlarged, was beaded, and so intimately involved in one of the plates of bone and fibrous tissue constituting the disease that it could not be dissected out, and would have had to be sacrificed in any case. I stretched the two ends of the nerve (for they were separated 2.5 centimetres when the foot was flexed to a right angle), when I discovered what it was, and united them with two silk ligatures. The tendo Achillis was divided after Mr. Anderson's and my own method and lengthened by four centimetres, which allowed the foot to be placed at a right angle with the leg.

On May 12 I removed two small tumors, one from the right and one from the left breast under cocaine anæsthesia. Professor Coplin reported them to be "peri- and intercanalicular fibromata of the breast."

Recovery from all three operations was *per primam,* and she left the hospital on May 18. She was then able to move the foot quite freely both in flexion and extension.

I was extremely doubtful at the time, and still am, as to what nerve was divided. The day that she left the hospital, a hair lightly drawn across the foot was felt distinctly at every point, with the exception of the sole (due probably to the thickness of the epidermis), and at a small area above the heel, where sensation was quite imperfect. On the sole of the foot, however, a touch of a pencil was readily perceived. The nerve divided lay almost in the middle line of the leg between the calf muscles and the skin. This would exclude, of course, the posterior tibial; yet it was so large,—its size being about that of the normal posterior tibial,—that it did not correspond with any ordinary cutaneous nerve. Sensation, moreover, was but slightly affected by its division, as I have indicated. Unfortunately, I was not able to make more accurate and frequent examinations on account of absence from the city.

Miss A. writes me under date of December 17, 1902, nearly twenty months after operation, that she has suffered no pain in the muscles since leaving the hospital, that the foot can be flexed to a right angle, and that she can bear her weight on her toes. Non-recurrence of the disease, especially in view of the evidently diseased condition at the margin of the portions of tissue removed, as shown by Dr. W. G. Spiller's report, is especially noteworthy.

Dr. Spiller's report on the nerve and muscle is as follows:

"The tissue removed at operation and sent to me by Dr. Keen is exceedingly dense, much denser than any normal muscle, and in some places has a gritty feel. It can, however, be easily cut with a knife, and when embedded does not turn the edge of a microtome knife. It is not necessary to employ decalcification. To the naked eye the tissue has little or no resemblance to muscle, but appears like dense, fibrous material. In microscopical sections where the alteration is greatest the tissue resembles tendon, and has a glassy appearance when stained with eosine. Numerous masses of closely packed round cells are found throughout the sections, and much recent infiltration of red blood-corpuscles, the result of the operation, is found. The walls of the blood-vessels in the dense fibrous tissue are much thickened, and are infiltrated with round cells, and the lumen in some is very small. Where the tissue is most altered, the muscle-fibres are extremely atrophied, and in a large portion of the tissue have entirely disappeared. The sections in some parts consist almost entirely of fibrous and fatty connective tissue, and here the muscle-fibres are widely separated from one another by this fibrous tissue. In these places the muscle-fibres appear as long slender bundles in longitudinal section, and are many times smaller than normal muscle-fibres, and are without any striation, either transverse or longitudinal. The tendon-like appearance of certain parts of the sections is due to the fibrous proliferation which has caused more and more pressure upon these atrophying muscle-fibres until they have entirely disappeared. Here and there in these tendon-like masses a few scattered muscle-fibres may be seen. The Weigert hæmatoxylin stain shows their presence very beautifully. Where the muscle-fibres are very much atrophied, the sarcolemma nuclei appear unusually numerous; but this is chiefly because the atrophied fibres occupy less space, and the sarcolemma nuclei are, therefore, brought closer together. There is, however, some increase in the number of the sarcolemma nuclei. Only in tissue taken from the edges of the mass removed at operation have I been able to find muscle-fibres of anywhere near normal size; and here they are irregular in outline, are cleft transversely in longitudinal section, and have lost the transverse and longitudinal striations. The sarcolemma nuclei in these muscle-fibres are proliferated, and in places form chains of nuclei within a muscle-fibre.

"Osseoid plates are not very numerous, but are found in some sections. They are irregular in shape, and stain a deeper purple at the edges with hemalum and faintly in the interior. They contain concentric lines and numerous irregular starlike bone cells. The formation of the latter has not been of very long duration, as in old bone the cells do not possess these numerous proliferations. Although the tissue feels gritty before it is embedded, the sections under the microscope do not contain a large amount of osseoid tissue. I have found a mass in one of the sections that appears more like cartilage than bone. In this the nuclei are small and round and the cells resemble cartilage cells. The ground substance is pale yellow, and does not show the concentric markings seen in the distinctly osseoid tissue.

"The condition is one of myositis fibrosa passing into myositis ossificans.

"The nerve that was cut during the operation is much degenerated, and is embedded in the proliferated fibrous tissue, so that even under the microscope it forms an intimate part of this tissue. The connective tissue between the individual nerve-fibres is greatly increased in amount, and for this reason the nerve appears abnormally large.

"In regard to the recent literature on myositis ossificans, I may refer to the valuable paper by Lydia M. Dewitt (*The American Journal of the Medical Sciences,* September, 1900, page 295), and to the monograph on diseases of the muscles by H. Lorenz (Nothnagel's 'Specielle Pathologie und Therapie,' Band xi; 3. Theil; 1. Abtheilung). In these two publications most of what is known of myositis ossificans may be found."

DISCUSSION.

Dr. James K. Young reported a case of myositis ossificans that occurred in a man aged fifty. The rectus of the quadriceps extensor was the muscle involved, the exciting cause being the kick of a horse. The resulting mass was two and one-half inches wide and one inch thick. It was movable and very dense.

Dr. William J. Taylor said he wished to modify slightly the statement in his paper that the patient had had no trouble since. One year after the operation, a horse ridden by the man fell, and threw him in such a way that a root ran into the old operation scar. This was followed for a time by the discharge of

inflammatory material and dark-colored blood, but the wound afterwards healed entirely and has given no trouble since.

Dr. W. M. L. Coplin, who had reported the histological findings in the tissue removed by Dr. Taylor, spoke of the difficulty experienced by pathologists in making diagnoses from very small fragments of tissue, as in the case under discussion. The tissue in question contained masses of marrow cells in a cellular matrix, altogether resembling the cell picture of myeloid sarcoma. The suspicion of myositis ossificans was first aroused by finding newly-formed bone along the degenerating muscle-bundles. Ossifying myositis has been classified as idiomatic or traumatic, and disseminated or local. Regarding the origin of the condition, there is some question as to its inflammatory nature. It is held by some writers to be a dystrophy, thus belonging to the group of diseases including pseudohypertrophic muscular paralysis. This view, however, is not generally accepted. The fact that traumatism is frequently a cause, the presence of lymphoid infiltration and the formation of new fibrous tissue point to the inflammatory nature of the process. It has been thought that it might depend upon the presence of congenital or acquired ectopia of osteogenetic tissue which is stimulated to growth by irritation; the view that the bony change originates in a congenital defect in the involved parts is an adaptation of this theory. Regarding the condition as one that is essentially inflammatory in nature, places it in close relation to the ossifying inflammations of tendon sheaths and glands. Still another view is that myositis ossificans is essentially neoplastic in nature, and thus comparable to cases of multiple osteomata in the lungs, glands, etc. The many suggestions offered prove that the origin of the change is yet unknown. That it is infectious in character has even been suggested. In a reported case of gonorrhœal myositis and in a case of staphylococcus infection, similar but not identical changes have been recorded. It is not uncommon to find near tuberculous foci osteoid or chondroid or, perhaps better, cretaceous areas that may resemble bone. In closing, Dr. Coplin emphasized the possible difficulty in differentiating ossifying myositis from myeloid sarcoma, especially in tissue from the region of the jaw. This difficulty is particularly marked when the specimen consists of only fragments of tissue.

Captain Charles F. Keiffer, U. S. A., stated that he had excised a bony fragment from the deltoid muscle of a cavalryman who had first noticed the condition ten years before. The fragment was true bone and had reached the size of a half-dollar. In looking up the literature, he had found that in the times of Gustavus Adolphus and Frederick the Great the soldiers were troubled with what they called sesamoid bones in the deltoid muscles. Their formation was attributed to the irritation and pressure of the guns carried by the soldiers. This cause was probably active in the case of the cavalryman, whose gun was slung in such a manner as to jog against the deltoid.

Dr. William G. Spiller, who made a histologic study of the tissue removed by Dr. Keen, said that the large size of the nerve, of which a piece had been removed, was owing to connective-tissue proliferation. The removal of the segment may have been of advantage, as benefit has at times followed a similar operation, inasmuch as the ends brought together contain more nearly normal nerve tissue than the portion removed.

STATED MEETING, APRIL 6, 1903.

The President, Richard H. Harte, M.D., in the Chair.

CONGENITAL DISLOCATION OF BOTH ULNÆ AT THE WRISTS.

Dr. Charles F. Kieffer reported the case of a negro man, thirty years old, by occupation a soldier, who, on presenting himself for physical examination for re-enlistment, attracted attention by the prominence of the head and styloid process of the ulna at each wrist. On examination, the left ulna was found completely displaced, overriding the dorsal surface of the carpus. The right ulna was similarly displaced, but not so completely. By strong pressure on the head of the ulna and counter-pressure on the carpus, the bone on each side could be forced a little way in the direction of its proper position. The photographs show the deformity quite well. Two radiographs also were presented,—one with the hands flat on the plate and the other with the hands on the ulnar edges, the light in both instances coming from above. The radiograph with the hands flat shows the ulna in each wrist slightly displaced outwardly. It gives no hint in either wrist of the presence or condition of the triangular fibrocartilages. The radiograph with the hands on edge is, unfortunately, not quite so clear as the first, but it shows very well how completely the ulna in both wrists is lifted above the plane of the wrist-joint.

The man says that, to the best of his knowledge, his wrists have always been as they are now. Indeed, he never suspected that there was anything unusual about them. He has been a good deal of an athlete and is a very good ball-player, showing that the deformity, as such, has produced no loss of function. Mobility is not impaired, nor would we expect much impairment on account of the secondary part the ulna takes in the function of the wrist-joint.

This condition is very rare. What may be considered a partial development of it is sometimes encountered, where there is unusual mobility of the radio-ulnar articulation due to relaxation

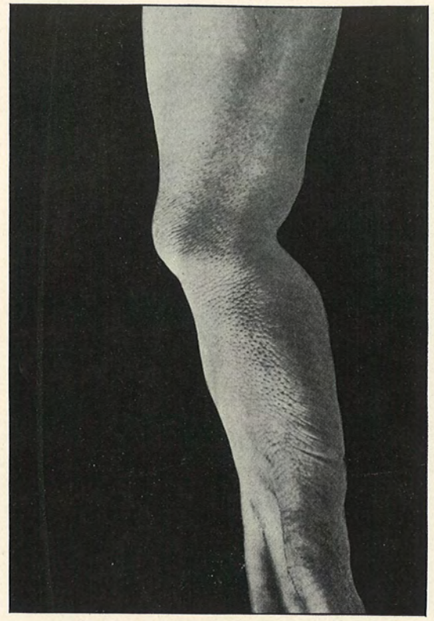


Fig. 1.—Congenital dislocation of ulna.

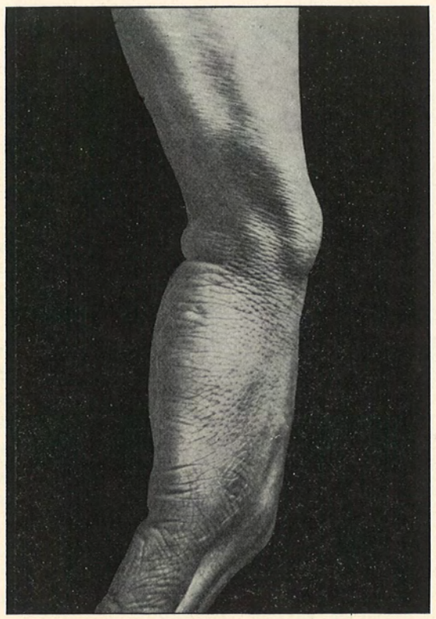


FIG. 2.—Congenital dislocation of ulna.

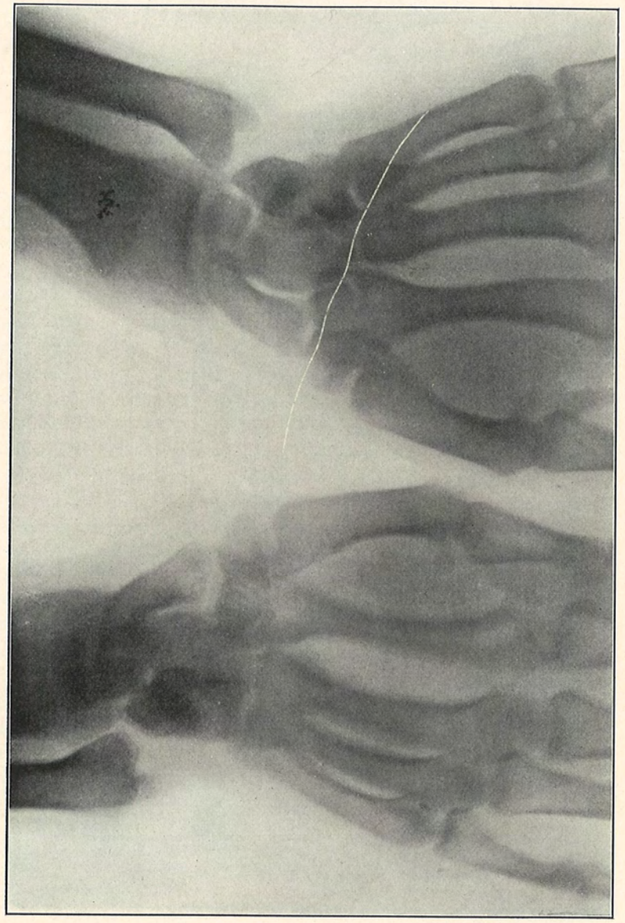


FIG. 3.—Congenital dislocation of both ulnæ; anteroposterior skiagram.

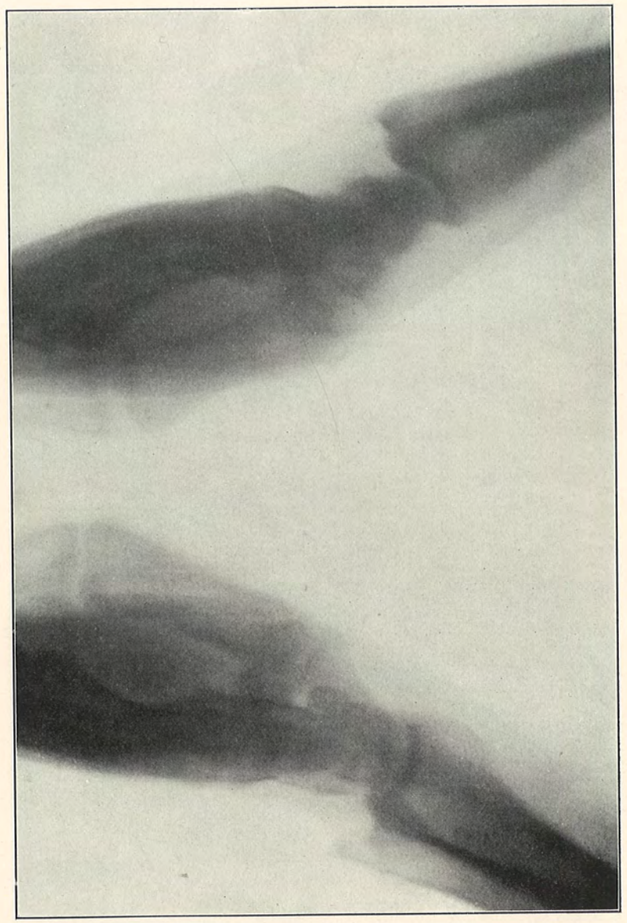


FIG. 4.—Congenital dislocation of both ulnæ; lateral skiagram.

of the anterior and posterior radio-ulnar ligaments. In these cases the ulna slips a little bit out of place and back into place again with a click like a cracking knuckle.

A WELL-PROPORTIONED ANATOMICAL MODEL.

DR. GEORGE MCCLELLAN showed a young man who, from an artistic stand-point, is one of the most perfectly formed men he has ever seen. For many years Dr. McClellan had endeavored to find a man possessing properly proportioned measurements, but from a study of hundreds of living and dead bodies this is the first that answers the requirements. There are so many fads in physical training that all sorts of disproportionate results are seen when men are closely examined. Sandow has developed wonderful strength, but from an artistic view is only a monstrosity. In the man exhibited, the muscles are covered by a normal amount of fat, and only come into relief when exercised, which gives the most perfect form. Dr. McClellan holds that the standard measurement is that when the distance from the top of the head to the soles is eight head-lengths, and this is the only man he has ever found that possesses exactly this measurement. The head-length is eight and one half inches and the body sixty-eight inches. Attention was called to several points showing remarkable symmetry in the various measurements of the body. Between the points of the shoulders is two head-lengths; between the trochanters, one and one-half; between the nipples, one; the trunk is two and one-half head-lengths long; the upper limbs, three; the lower limbs, four. The difficulty in finding a figure that is perfectly developed is not understood by must people, the trouble being that one part, particularly the upper or lower portion of the body, is often well developed, and the others are lacking. The famous statues made 400 to 500 B.C. are all, with possibly the exception of one,—the Resting Mercury,—made as composites.

RUPTURE OF THE LIVER AND LACERATION OF THE RIGHT KIDNEY; RECOVERY AFTER OPERATION.

DR. THOMAS R. NEILSON reported the history of a man, twenty-six years of age, who was admitted to the Episcopal Hospital on June 7, 1902. On the evening of June 4, while standing on a high step-ladder for the purpose of decorating a church,

he lost his balance and fell a distance of some ten feet, striking his right side from the lower ribs to the crest of the ilium upon the arm of a pew. Immediately after the injury he was taken to his home, walking with the aid of friends. The history for the time previous to his admission to the hospital was that there was pain, especially on deep breathing, in the region of the right lower ribs; there was great accumulation of gas in the stomach, and for a time general distention of the abdomen; twice a little blood was vomited; dark-colored urine was voided naturally; there was no evacuation of the bowels, although considerable flatus was expelled.

On admission to the hospital the condition was as follows: The lips and conjunctivæ were blanched; temperature, $97^{2}/_{5}$° F.; pulse, 120, and almost imperceptible; respiration, 24 to 26; chest negative; abdomen, tenderness in upper right quadrant, with marked rigidity of the rectus muscle in that portion; tenderness in axillary line over lower ribs; liver-dulness extends two and one-fourth inches below right costal margin. Once after admission the patient vomited a small amount of blood. About an ounce of bloody urine was voided. A catheter was passed, but no more urine could be obtained. Boric acid solution was injected into the bladder and the whole amount returned clear. The leucocyte count was 12,600.

The indications of hæmorrhage were of course plain. The hæmaturia pointed to kidney injury, but the increased extent of liver-dulness, and the tenderness in the right upper abdominal region with rigidity of the upper part of the right rectus muscle, caused him to believe that the chief injury had been sustained by the liver, and accordingly operation was done with that in view.

Tincture of digitalis, ten drops, and strychnine sulphate, $^{1}/_{40}$ grain, were given hypodermically, and normal salt solution, one and three-fourths pints, was given by hypodermoclysis. The patient's condition was somewhat improved after this.

Through the right rectus, a five-inch incision was made, beginning at the costal border. On opening the peritoneum a considerable amount of dark fluid blood was found in the cavity. The peritoneal and fibrous coats of the liver were greatly distended. The parietal peritoneum in front of the upper pole of the right kidney was torn, and the kidney at this part was found to have been slightly lacerated. No fracture of the lower ribs was found.

An incision through the coverings of the liver was made, and a large amount of dark blood escaped. A considerable quantity of clots was removed by the hand, which on being passed to the posterior border of the right lobe of the liver discovered a rupture of the organ at that position. The region was flushed with hot sterile water, and the bleeding appeared to be arrested.

The patient was then turned partly on the left side, and an incision made between the eleventh and twelfth ribs of the right side just about the posterior axillary line. A long piece of iodoform gauze was then placed in a large rubber drainage tube, the latter being split lengthwise and passed into the abdominal wound, then into the wound made in the serous and fibrous coverings of the liver and brought out through the wound made between the ribs. Another piece of iodoform gauze was packed below the liver and over the upper end of the right kidney and brought out through the posterior wound. The abdominal wound was closed, except around the through-and-through gauze pack, with interrupted silkworm-gut sutures.

The patient did well after the operation, and made steady progress towards recovery. The small gauze pack was removed and replaced one week after operation, and the large one was taken out on the tenth day, being replaced by small iodoform gauze drains inserted into both the abdominal and the posterior wounds, and these were gradually dispensed with. Healing of the wounds progressed favorably.

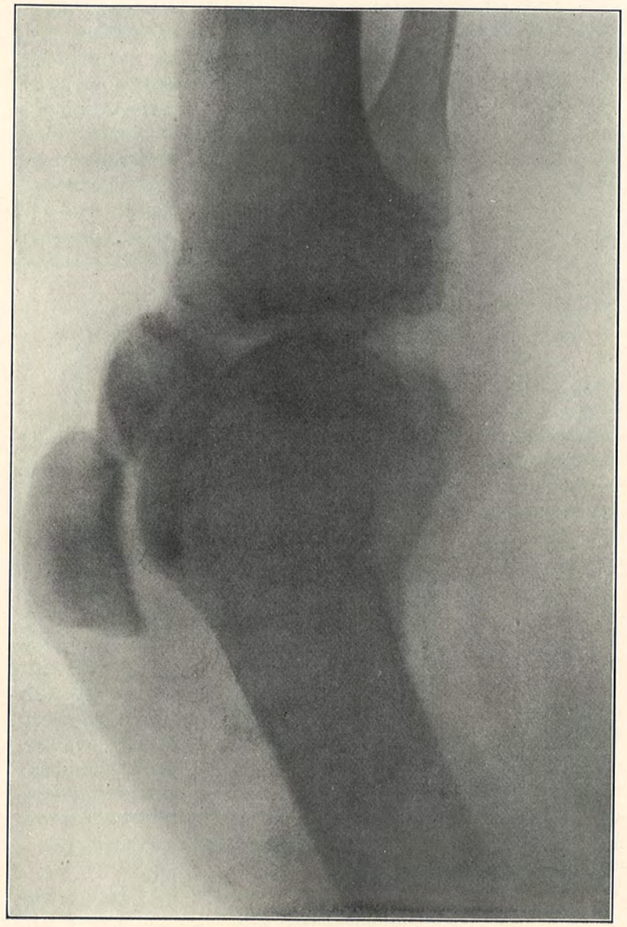
On July 24 the patient was able to get out of bed, and on the 28th, fifty-one days after operation and fifty-four days after the injury, he was discharged recovered.

Dr. De Forest Willard said that about two years ago he had operated on a case of ruptured gall-bladder. The patient was a child who had been crushed by a wagon wheel, but, as it was not seen until two months after the injury, it was uncertain whether the liver had also been ruptured. The extravasated blood and bile had been walled off from the peritoneal cavity, and from this cavity he had removed sixty-four ounces of almost pure bile. (*New York Medical Journal,* lxxv, 369.)

Dr. G. G. Davis related the case of a man who received a blow in the right side, which was followed by acute symptoms consisting of intense pain and abdominal rigidity. There was also dulness in the flanks. Rupture of the liver was suspected

and median incision above the umbilicus was made. Blood gushed forth when the peritoneum was opened, and search revealed that it came from between the liver and diaphragm. This space was tightly packed, but the man died soon after from shock. Autopsy showed a rent four inches long in the upper surface of the liver near its ligamentous attchment.

Dr. John H. Gibbon referred to a case which came under his care at the Bryn Mawr Hospital, which in many ways resembled Dr. Neilson's case, and which at first was thought to be one of rupture of the liver, but which on operation proved to be a rupture of the spleen. The patient was a boy who fell from a tree on Friday afternoon. In a short time he recovered from the immediate shock of the fall and said nothing about the injury when he arrived at home. The following morning, however, he was found very much shocked. He was admitted to the hospital on Saturday, but it was thought at this time he was too ill to be operated upon. Dr. Gibbon saw the patient first on Sunday afternoon. The patient presented every symptom of severe intra-abdominal hæmorrhage. His pallor was marked, his pulse was rapid and weak, and his respirations very much increased. Examination of the abdomen revealed no particular point of pain, tenderness, or rigidity. The abdomen was somewhat distended, with a dull percussion note in both flanks when the patient was recumbent. When the child was turned over on his side, the upper flank became resonant and the dulness of the other greatly increased. There was no evidence of confined blood in either kidney region, nor was there any tenderness here. The patient's urine showed considerable macroscopic blood on the day of admission, but this had become much less when he was seen on Sunday. There seemed little doubt that the kidney was involved in the injury, but at the same time it was clear that the abdomen contained a large amount of free blood. Although the child's condition was very bad, it was deemed wise to open the abdomen and attempt to arrest the bleeding. In the absence of any particular indication, it was thought that the liver was the most likely organ to be lacerated, and therefore an incision was made on the right side of the abdomen below the costal border. A quantity of free blood escaped when the peritoneum was opened, but the liver and other organs on the right side were uninjured. The blood appeared to come from the opposite side of the abdo-



Fragment of bone in cavity of knee-joint.

men, and therefore a second opening was made below the left costal border. The descending mesocolon and the peritoneum over the kidney were markedly injected with blood. When exploration was carried upward, clots were discovered, and later a laceration of the spleen, which admitted three fingers. The wound was firmly packed with gauze, the abdominal cavity irrigated with hot salt solution, and the wound on the right side closed. When these procedures were completed, it was found that the packing had thoroughly controlled the bleeding, and therefore it was left in position and the wound partially closed. The patient made an uneventful recovery, excepting for a slight left-sided pleurisy with some effusion, from which, however, he rapidly recovered.

REMOVAL OF A LARGE LOOSE PIECE OF BONE FROM THE KNEE-JOINT ONE YEAR AFTER BEING RUN OVER BY A FREIGHT-CAR; FUNCTIONAL RECOVERY.

Dr. H. Augustus Wilson said that he was indebted to Dr. John M. Bertolet, of Reading, for the opportunity of operating upon the case, notes of which he now gave. Dr. Bertolet's radiograph (see Fig.) clearly shows the position of the piece of bone. It is a matter of interest to record the difficulty that was experienced in interpreting this radiograph by the many surgeons who saw it. The majority expressed the opinion that it was a piece torn from the tuberosity of the tibia, the error of which was demonstrated at the time of its removal.

The patient, a man aged twenty-six years, on March 17, 1903, while on a very slowly moving freight train, attempted to step from one buffer platform to the other, in doing which he slipped. In falling, he tried to escape the wheel, but did not succeed, for it passed obliquely over his right knee. The engineer saw him fall, and instantly stopped the engine in time to prevent the second wheel also passing over him, but the right hip was severely contused by the second wheel striking against it. The trousers were badly torn at his knee, but the skin was not broken. The greatest pain was experienced at the hip. He voided bloody urine for several days, and suffered very great pain in the right hip and knee as well as in the back and left thoracic region. He was at this time in a hospital in the interior of the State, where the treatment—the exact nature of which could not be ascertained, but from the patient's account appears to have

been directed principally to the right knee. He remained in the hospital for five weeks, and used crutches for three weeks after dismissal. He was again admitted, and was kept in bed for four weeks because of the severe pain in the back, knee, and hip. Until September, 1902, when he discontinued the use of crutches, he was confined to bed at irregular intervals for periods of a week or two. Not until he attempted to walk without crutches was it noticed that he was unable to fully extend or fully flex his hip and knee, and there seemed to be marked shortening, which was in a large measure due to the lack of ability to extend the leg. He was admitted to the Jefferson Medical College Hospital and operated on on March 9, 1903.

A longitudinal incision five inches in length was made from the lower edge of the patella to about the middle of the tuberosity of the tibia, and immediately upon entering the joint a hard, movable mass was encountered. Efforts at removal very quickly showed that, while apparently movable, it was firmly attached by fibrous bands to the tibia, from which it was dissected. The condyles of the femur were scrutinized, but gave no evidence of having lost any of their contour. The articulating surface of the tibia appeared normal in its anterior and outer aspect, but there seemed to be an irregularity in the posterior inner portion that led to a surmise that the piece of bone had had its origin from there. Subsequent repair had largely obliterated any cavity that may have been made at the time of the accident. The bone when removed was found to have two surfaces that were covered with cartilage and were smoothly polished as though they had been in contact with the patella and condyles of the femur. The firm attachment of the bone to the tibia and its vascularity would seem to indicate that it had formerly been much smaller, but had gradually grown to its present size, which was found to be two inches long, seven-eighths of an inch thick, and one and one-eighth of an inch wide. The wound was closed without drainage. The stitches were removed on the sixth day. There was no temperature. Mild passive motion was instituted on the eighth day and increased daily in extent and duration. On the twelfth day he was permitted to use crutches, avoiding weight bearing upon the affected leg. On the fourteenth day he walked without crutches, with very nearly full normal flexion of the knee, but with incomplete extension. There has been no severe

pain in the joint nor swelling since the operation, and on the fourteenth day he was discharged from the hospital. He was again seen two weeks later, when the function of the joint was almost complete, lacking only the ability to fully extend the knee-joint.

The very unusual amount of traumatism to which the joint was necessarily subjected in the operation of removal of the piece of bone gave rise to fear that ankylosis would follow. It was for this reason that passive motion followed by active manipulation was instituted early, and weight-bearing encouraged at an earlier period than usual in operations upon the knee-joint. It is evident that the knee-joint is sometimes capable of resisting very severe injury, and the recovery in this case from the traumatism of the accident and from the extensive operation shows that with careful technique the joint may be freely invaded without loss of function. Many writers urge that only smooth steel instruments be inserted into the joints and never the fingers, whether gloved or not, but experience in this and other cases shows that such prohibition is unnecessary. Owing to a radiographic dermatitis over the right hip, it has been found impossible to obtain a satisfactory skiagraph of the hip. The study of a very faint negative by Dr. S. A. S. Metheney at the Jefferson Medical College Hospital, and the conditions around the hip, would appear to indicate an impacted fracture of the neck of the femur with complete consolidation, but leaving a slight limitation to the function. He was able four weeks after the operation to walk and go up and down stairs with only a slight perceptible limp, without pain, and with only the fatigue that would be expected in a leg that had had so little use for a year.

Dr. Henry R. Wharton recalled a case previously reported by him in which, following a compound fracture of both bones of the leg and injury of the knee, the knee could not be completely extended. A skiagraph showed that there was a loose mass in the joint. Several weeks later this mass was removed, and proved to be the inner condyle of the femur, which had been torn off and reversed so that the articular surface was directed upward. Good recovery followed its removal, no inversion or eversion being caused by its absence, and the man being able to walk without crutch or cane.

THREE CASES OF RECOVERY FOLLOWING OPERATION FOR PERFORATION IN TYPHOID FEVER.

Dr. Richard H. Harte read a paper with the above title, for which see page 80.

INTESTINAL PERFORATION PRODUCING PERITONITIS AND OBSTRUCTION THREE WEEKS AFTER OPERATION FOR STRANGULATED HERNIA; RESECTION OF BOWEL; RECOVERY.

Dr. John H. Gibbon reported the history of a woman, aged thirty-five years, who was admitted to the Jefferson Hospital on the night of April 1, 1901, suffering from a strangulated left femoral hernia. The symptoms of strangulation were well marked, there being fæcal vomiting, moist skin, and a weak and rapid pulse. The hernia was large, extending for a considerable distance upward over Poupart's ligament. A curved incision was made along the upper border of the tumor with its concavity downward. The sac was opened and found to contain considerable dark-colored fluid, together with about five or six inches of very dark small intestine. The constriction was divided and healthy bowel drawn down into the wound. Hot water was then used freely for the purpose of re-establishing the circulation in the herniated bowel, and was followed by considerable improvement; but there was one portion which, although it had not lost its lustre, yet its wall was extremely thin, and at one point presented very much the sensation of an ulcer threatening perforation. This, of course, was due to pressure at the point of constriction. After considerable deliberation and the free use of hot salt solution, it was determined to restore the bowel to the abdominal cavity. The sac of the hernia was ligated and removed, and a portion of the pectineus muscle with its fascia was brought up and sutured to Poupart's ligament. The wound was closed with a subcutaneous suture of catgut and a subcuticular one of silkworm gut. The patient made an uneventful operative recovery. The postoperative condition was watched with a great deal of interest for ten days, but after that time it was thought there was little danger of any subsequent trouble from the injured bowel. On the eighteenth day, however, the patient experienced considerable pain and discomfort in the abdomen, but this

was promptly relieved by an enema. She was then comfortable until the twenty-second day, when she again had the same pain and discomfort. The enema was repeated, but the result was not as satisfactory as on the former occasion. To the symptoms of pain and discomfort were soon added those of vomiting, slight distention, more marked on the left than on the right side, and a pulse ranging between 120 and 130. At this time there was entire absence of fever. The abdomen was then opened. As the pain was located on both sides, a median incision was made a little below the umbilicus. On incising the peritoneum, there escaped a thick, light-colored fluid, and when the hand was introduced it discovered a mass of adherent intestine on the right side. This was delivered, and more fluid escaped from the abdominal cavity. The adherent bowel was then separated and about one ounce of thick pus escaped. The portion of bowel which had been herniated was bent upon itself, and the mesentery belonging to another portion was adherent to it, and between these two structures the pus was located. When they were further separated, a perforation of considerable size was found at the site of the former constriction. As a large portion of the bowel was deprived of its peritoneal coat in the process of separating the adhesions, it was determined that resection of the diseased portion of the bowel and end-to-end anastomosis would be the best treatment. This was accomplished without difficulty with the aid of the O'Hara forceps. Three rows of sutures were employed,—the first of silk and the last two of catgut. The portion of bowel removed measured about eight inches. A large portion of the intestine was covered by flakes of lymph, and the pelvic cavity was found to contain considerable fluid of a dirty color. The entire small intestine was drawn out of the abdominal cavity and all of the deposits of lymph were carefully wiped away with gauze sponges, and the abdominal and pelvic cavities thoroughly and for a long time irrigated with warm, normal salt solution. The intestine was then returned to the abdomen and the wound closed, except for a small space in its centre, through which a gauze drain was passed down to the seat of anastomosis. The patient was considerably shocked by the operation, and not only required hypodermic and rectal stimulation, but also the use of the intravenous injection of salt solution. During the night following the operation the patient vomited at frequent intervals.

The rectal tube was introduced repeatedly and considerable fæcal matter and flatus passed through it. The next day the patient was much better, and from this time on made a rapid recovery. She was heard from within the past few months, when she had had no recurrence of the hernia and no symptoms of obstruction.

Dr. Gibbon recalled the fact that Dr. T. S. K. Morton reported before this Academy in May, 1901 (ANNALS OF SURGERY, Vol. xxxiv, 1901, p. 318), the case of a woman upon whom he operated for a strangulated femoral hernia, who developed marked symptoms of obstruction of the bowel several weeks later. The abdomen was opened and the bowel resected, the patient making a good recovery. The obstruction in this case was entirely due to adhesion of the bowel.

In the *Lancet* of April 27, 1901, Barker reports a case in which he resected thirty-seven inches of small intestine four months subsequent to an operation for strangulated hernia. In this case, at the time of operation, the strangulated bowel was not gangrenous, although considerably congested. Subsequently the patient suffered from two attacks of severe obstruction. At the time of the second operation there was found extensive adhesion of the intestine, with nearly complete obstruction of its caliber due to a kink. The patient made a good recovery.

Both of these cases differ from the case reported by Dr. Gibbon in the important respect that there were no abscess, no perforation, and no peritonitis present in either; but nevertheless they all illustrate the occasional necessity for opening an abdomen for obstruction a number of weeks after operation for strangulated hernia.

He added that while it was not his purpose to discuss the immediate treatment of the bowel in strangulated hernia, he desired to say, however, that it was his own practice, when the circumstances permitted of it, always to operate at once upon cases of strangulated hernia and never to employ taxis. He was also of opinion that when there is great doubt as to the vitality of the bowel, the surgeon will display better judgment by doing an immediate resection than by restoring the bowel, temporarily fixing it in the wound, or performing an artificial anus. Of course, cases which are moribund are not included in this statement.

The point which each of the three cases already quoted emphasized was that, when symptoms of obstruction of peritonitis

develop after an operation for strangulated hernia, immediate opening of the abdomen is demanded. Delay at such a time is disastrous, and early operation gives wonderfully good results, even under the most discouraging circumstances.

DR. FRANCIS T. STEWART briefly reported two cases of intestinal resection. One followed a previous operation, by another surgeon, for strangulated inguinal hernia in which resection had been performed. The obstruction necessitating the second resection in this case was caused by a diaphragm made by the O'Hara forceps, which was used in the first operation. This patient died. The second patient is now convalescing from a resection made necessary by the results of an ovariectomy performed some months before. Obstruction was due to a kink in the bowel. A perforation was found at the site of kinking. This was sutured and the abdomen closed. In three weeks symptoms of obstruction again developed due to the formation of a stricture at the point of suturing. The stricture was resected without mechanical aid.

DR. GIBBON, in closing, said that the first case referred to by Dr. Stewart was one that he had operated upon, the obstruction being due to a diaphragm following the use of the O'Hara forceps. He has entirely given up the use of these forceps and unites the intestines without mechanical aid.

THREE SUCCESSFUL LAPAROTOMIES FOR INTESTINAL PERFORATION IN TYPHOID FEVER.

BY RICHARD H. HARTE, M.D.,

Surgeon to the Pennsylvania and Episcopal Hospitals; Consulting Surgeon to St. Mary's, St. Timothy's, and Bryn Mawr Hospitals.

I WISH to report briefly three cases of perforation of the intestine following typhoid fever which were operated upon and recovered. These three cases occurred out of a series of thirteen in my service at the Episcopal and Pennsylvania Hospitals.

CASE I.—December 4, 1900, Episcopal Hospital. Male, aged twenty-nine years. Perforation in the third week of the disease. Since being in bed has had some sharp pain in lower abdomen. At 11 A.M. had a sharp, severe pain in the hypogastrium immediately after using the bedpan. Two hours later had a severe chill, after which the pulse became rapid and weak. The abdomen was hard, rigid, tender, and painful. I saw the patient in consultation about that time and advised immediate operation, but, owing to delay in obtaining permission from his family, he was not operated upon until five and one-half hours from the time of perforation.

Operation.—Ether. Incision along the right rectus muscle. On opening the abdomen a large amount of turbid fluid escaped; intestines and omentum red and congested; appendix adherent but not perforated. After the withdrawal of a number of coils of ileum, a small perforation was found about ten inches from the cæcum, apparently the centre of a Peyer's patch that was ulcerated, and which was easily closed with silk. A small amount of fæcal matter had escaped, which was easily washed off with hot salt solution. After the abdomen and pelvis were thoroughly douched with normal salt solution the intestines were replaced. A glass drainage tube was carried well down into the pelvis, and the wound partially closed. The appendix was removed. Temperature, $103^{3}/_{5}$° F.

The convalescence was slow. In about three weeks the

wound was closed. A week later the patient developed an empyema, which necessitated the introduction of a large drainage tube into the pleural cavity. Cultures from pus showed colon bacilli, streptococci, and bacillus fœtidus. The patient rapidly recovered, and was discharged cured eighty-three days after operation for typhoid perforation.

CASE II.—Male, thirty-nine years of age. Pennsylvania Hospital. Admitted May 4, 1902. Had been sick for about ten days. On admission presented symptoms of peritonitis. Abdomen was tender and board-like. As soon as possible the patient was prepared for operation. Under ether, incision was made on edge of right rectus muscle; on opening abdomen about two pints of lemon-colored fluid escaped with flakes of lymph. Appendix much swollen and congested and was removed. Some distance from the cæcum a perforation was found in the ileum, which was closed with two rows of Lembert silk sutures. Much fæcal matter had escaped. The abdomen was flushed out with hot salt solution, followed with equal parts of normal salt solution and hydrogen peroxide, and finally with normal salt solution, being then packed with five large pieces of gauze and the wound left open. On the third day after operation the packing was removed. The condition was good; abdomen flat. The gauze was replaced. Two weeks later temperature was normal, wound clean, but not healed. When apparently convalescent, the patient had a typical typhoid relapse, and was removed to the medical ward, where he had a second relapse two months after admission. He was discharged cured three months after operation, with slight ventral hernia.

CASE III.—Male, aged thirteen years. Pennsylvania Hospital. Operation, May 11, 1902. Patient was admitted to the medical ward with typhoid fever on April 4; present illness began on March 28. Ten days before admission had had headache, backache, cough, epistaxis, and diarrhœa. On admission, spleen was enlarged, abdomen soft and flat, temperature high. On the forty-sixth day of the disease the abdomen became distended and tender, with great muscular rigidity, although there was no marked evidence of any sudden perforation. Operation was advised, although the patient's condition hardly warranted surgical interference. Ether. Rigid cyanotic abdomen, with intense tenderness, rapid dicrotic pulse, and cold extremities. Incision on right side permitting the escape of about half a pint of straw-

colored fluid and flakes of lymph. Appendix found in an ounce of pus, gangrenous and perforated, and was ligated and removed. On examination of the ileum, two perforations were found with some escape of fæcal matter, and closed with silk sutures. Abdomen and bowel irrigated with hot salt solution, then with equal parts of salt solution and hydrogen peroxide, and finally with normal salt solution. Abdomen packed with large pieces of gauze; wound left open.

The convalescence was protracted and interrupted by two distinct relapses. The patient was finally discharged cured over three months from time of operation. Abdominal wound quite firm.

In reviewing these three successful cases, it will be noticed that they represent one from each of the three classes that are ordinarily brought to the surgeon's notice for operation. In the first one the perforation occurred during the middle of the disease with the patient in good condition, and was immediately recognized and operation advised. The only delay which arose was waiting for the consent of the patient's family, during which time the patient lost considerable ground. The second was of the ambulatory character, coming on suddenly in a patient who was not much exhausted from the effects of the disease, and presenting many of the characteristic symptoms of an acute appendicitis with perforation. This class is decidedly the most favorable for operation, and from it the greatest number of recoveries will be gathered. The third class is the most unfavorable, as the vital energies are almost entirely exhausted as the result of a prolonged and exhausting disease; and it is in these cases that the greatest difficulty is experienced in arriving at an accurate diagnosis whether perforation really does exist or not. Nevertheless, this third class illustrates how ill a case can be when operated upon and yet recover.

The key-note of success in dealing successfully with typhoid perforations is the early recognition of the lesion. At the best this is a most difficult procedure, and the diagnosis can best be made by the medical attendant who has carefully

followed the case from the beginning, noticing all the trifling changes that occur in the abdomen. When any undue symptom arises, the surgeon should immediately be consulted, and with his aid and the carefully acquired knowledge of the medical attendant a correct diagnosis can generally be made. The classic symptoms of perforation when well marked can hardly be mistaken, such as pain, tenderness, rigidity, shock, chill, facial expression, and all the symptoms of peritonitis. To make an accurate diagnosis of perforation in the early stage, the medical attendant must be thoroughly conversant with the condition of the abdomen, and must be alert for the first symptom of muscular rigidity, which is one of the earliest and most important signs of intraperitoneal irritation.

Rigidity and spasm are terms so loosely used and so difficult of apprehension that it is not easy to reconcile oneself to these recorded statements. I believe that rigidity as understood by the surgeon differs from that interpreted by the physician, and, as just stated, is most difficult to properly estimate its significance in many cases; but if this sign is rightly interpreted, it is the key-note to the early detection of a perforation in a large proportion of cases. The ideal method would be for the surgeon to see regularly, in conjunction with the physician, all cases of typhoid fever day by day. The leucocyte count has proven of very little value at the time when most needed.

Cases with hæmorrhage are most perplexing, as these two conditions—hæmorrhage and perforation—may exist together, although they did not occur in my series. The absence of liver-dulness and the presence of flank-dulness are late signs, and are of little corresponding value. The facies is of value if carefully noted by the person in attendance, but is difficult to read by a stranger until peritoneal involvement is very marked.

Shock is regarded by some as an important symptom, and is undoubtedly present if sufficient time is allowed for its development. No time should be wasted hoping that reaction will take place, for as every hour passes the greater will be the leakage from the intestine, causing greater soiling of the peritoneum. Immediate operation will enable us to prevent further

soiling of the peritoneum, to repair the injury to the bowel, and reduce the danger of septic inflammation by suitable toilet followed by drainage, and also combat the existing shock and aid reaction by douching the abdominal cavity with hot salt solution.

Immediate operation should be urged even in the presence of profound shock, as every hour of delay proportionately decreases the chances of recovery.

The incision is preferably made on the right side, and is almost sure to lead down to the seat of perforation, which is always within a short distance of the cæcum. In hunting for the perforation, it is a good rule to start with the cæcum and appendix; then the last three or four feet of the ileum are examined, and as much of the ascending colon as can be exposed. If no signs of peritoneal infection are recognized during this examination, an error in diagnosis has been made, and further operative interference should be discontinued. If, however, signs of peritonitis are apparent, and the cause is not detected, a median incision should be made so that the entire length of the colon and the remaining small bowel can be carefully examined. A perforation may be easily hidden from sight by a piece of lymph, therefore all portions of the bowel that are indurated or covered by lymph should be carefully examined. It is safe to say that the lateral incision will be found the most satisfactory in 95 per cent. of cases operated upon. Out of 332 cases which I have carefully analyzed, in ninety-six the median incision was made with a mortality of 78.12 per cent. In the right lateral incision there were 123, with a mortality of 68.37 per cent. In the other cases operated upon, the site of incision was not mentioned. The more improved technique has undoubtedly reduced the mortality in these operations, which will be noticed in the appended table.

TYPHOID PERFORATION.

Recovered, 87; died, 245; total, 332; mortality, 73.79 per cent.

Operations.	Recovered.	Died.	Total.	Mortality.
1884–1888.....	1	9	10	90 per cent.
1889–1893.....	2	14	16	87.5 per cent.
1894–1898.....	28	82	110	74.5 per cent.
1899–1903.....	45	101	146	69.1 per cent.

In fifty cases, year of operation not stated.
Mortality for male sex, 78.5 per cent.
Mortality for female sex, 61.4 per cent.

When the perforation has been found and its closure will not produce too great stenosis of the bowel, it should be rapidly closed with silk sutures in whichever direction, either transversely or longitudinally, to the lumen of the bowel which produces the least narrowing of the gut. No time should be wasted on attempting to trim or freshen the edge of the ulcer, as the area of the bowel near a perforation is always so friable that stitches are liable to tear out. The best stitch for this purpose is the so-called mattress suture, as a running Lembert is liable to cut or tear through the friable tissues. When the opening is closed, the bowel should be carefully inspected for other perforations, as not infrequently these openings are multiple. Often dark necrotic spots will be found where the ulcer has destroyed the coats of the bowel down to the peritoneum, giving the appearance that in a short time another opening would be formed. All such suspicious places should be treated as though a perforation had taken place, and the weakened area fortified by being folded in with stitches. Occasionally, cases will be met with where the opening in the bowel is too large or the area inflamed too great, so that closure is not practicable. When this condition exists, there are four procedures offered. First, a plug of omentum may be so fashioned and stitched against the opening in the bowel as to form a simple patch, after the manner in which Nature sometimes deals with these conditions. Second, resection of the

bowel and an end-to-end anastomosis either with stitches or with a Murphy button, the latter being much more rapid. Third, the formation of an artificial anus by stitching the bowel to the abdominal wall, and, fourth, cutting off the damaged area of the bowel from the general peritoneal cavity by carefully placing pieces of gauze between the folds of the bowel.

The cleansing of the peritoneum and drainage are the most important procedures. It has been decided by some that when only the right lower quadrant of the abdomen is infected, the intestine should be brought outside of the abdomen and carefully cleansed with salt solution and gauze sponges, while the cavity within is sponged dry.

My best results have been where the peritoneum has been dealt with by vigorously flushing with salt solution, then with equal parts of salt solution and hydrogen peroxide, and finally douching with normal salt solution. This is best done by carrying a large tube down into the pelvis, and with vigorous flushing all foreign matter can be much more easily removed than by attempts at dry sponging. After the intestines are carefully replaced in the abdomen, a number of large gauze wicks are carried down to the bottom of the pelvis and to the different parts of the abdomen between the coils of intestine, so as to secure good free drainage. Little or no attempt should be made to close the abdominal wound, except it has been unusually large, when a couple of sutures at the upper angle can be introduced. The wound should have a liberal dressing of gauze applied over it, as it will in a short time become thoroughly saturated with fluid from the abdominal cavity through the medium of the gauze drains. These should not be disturbed for three or four days, after which time they can be removed without much difficulty by thoroughly saturating them with salt solution or hydrogen peroxide. They then should be replaced with a fresh gauze pack, which may be of less quantity, according to circumstances.

In reviewing my work in this gloomy field of surgery, I feel convinced that there are two important factors to be carefully considered. First, the early recognition of the lesion and

dealing with it as rapidly as possible, in order that as little time as possible will elapse from the time of perforation until operation has been performed; and, second, that the operation should be so planned, since time is so important an element, that not a moment should be wasted during it, the technique being of the simplest character, as every moment of delay will cause a much higher percentage of mortality.

DISCUSSION.

Dr. G. G. Davis said that Dr. Harte need not feel chagrined over a mortality of 76 per cent. in his operations for typhoid perforation, as the mortality in these cases hinges on the character of the case rather than on the character of the operation. The importance lies not so much in operative technique as in diagnosis. The present high mortality will be lowered only when the physician and surgeon respectively are not afraid to suggest operation and to operate. Dr. Davis had operated on three cases during the past year and all died. All had general peritonitis, but the condition of each after operation was as good as it was before, hence he does not believe that operation *per se* markedly diminishes the chances of recovery. He thought formerly that inflammation of the appendix was not frequent in typhoid fever, but the number of cases he had lately seen show this to be not a rare complication. Some cases showing pain and tenderness over the appendix recovered without operation. In one case operated by Dr. Davis he found two perforations, one in the ileum and one in the appendix. The latter organ, although perforated, did not show marked inflammatory involvement, such as is found in cases of true appendicitis when the appendix alone is diseased.

Dr. D. J. Milton Miller, who made an early diagnosis of perforation in one of Dr. Harte's successful cases, said there was at times no more difficult condition to decide upon than that of perforation in typhoid fever. There are a few signs, however, which, in a certain number of cases, enable one to make the diagnosis early. This is especially true in cases that previous to perforation have had no marked abdominal symptoms. When the latter conditions have been present through the course of the disease, a diagnosis is very difficult to make, and is often first

made in the post-mortem room. Typhoid fever patients should be watched very closely, no symptom being too trivial to be noted. The most important symptoms pointing to perforation are pain, rigidity, and increased pulse-rate. The temperature does not help us much. A rise is just as likely to occur as a fall, and distinct falls are unusual, except late in the attack, when general peritonitis or collapse is present. He had often noticed a fall of two or three degrees, but in looking back over the chart very often many similar variations could be found. The leucocyte count is unreliable. Leucocytosis is not so very uncommon in typhoid fever when there is no explanation for its occurrence. By this is meant a count of 8000 to 10,000. In one case under Dr. Miller's observation the leucocyte count was 10,000 when the patient entered the hospital. It afterwards fell slightly, and was only 9400 at the time of operation for perforation, six days after admission. Of all the symptoms pain is the most important, and the patient is usually able to fix definitely the time of its beginning. Pain during the course of typhoid fever is usually rare, and its onset of the greatest significance. Tenderness in perforation is usually localized in the lower right quadrant of the abdomen. Rigidity is usually present and comes on early. Some increase of the pulse is present in all cases. Dr. Miller does not believe in the so-called preperforative stage. The symptoms ascribed to that stage are really those of the early stage of perforation.

Dr. J. P. Hutchinson said he believed that if the records of general hospitals were examined it would be found that the majority of cases of perforation saved by operation were among those patients that came into the receiving ward and were operated on at once. Three of his successful cases were from the receiving ward, and in all there was an element of doubt as to the exact condition present. There was no difference in their condition externally from cases of perforation in hospital wards. These statements regarding receiving ward cases are based on the fact that there are different rules for visiting surgeons and visiting physicians, the latter having fairly definite visiting hours at the hospitals, the former being accustomed to go whenever they are sent for. Hence, with medical ward cases there is apt to be some lapse of time after a change in symptoms, unless they are very pronounced, before the patient is seen by the chief.

With receiving ward cases the resident surgeon perhaps makes a diagnosis, or at least sends at once for the surgeon. Most of these cases should be operated upon even if there is an element of doubt. Dr. Hutchinson has opened two cases which were doubtful and found no perforation. One was supposed to be appendicitis, but proved to be typhoid fever. In that one there was marked improvement for two days after the operation. Operation *per se* does no marked harm. In closing perforations, the longitudinal method of suturing is the better. In every case where the speaker has tried to reinforce the sutures, there has been escape of fæces.

Dr. W. L. Rodman said he coincided with Dr. Harte's statement that the incision should be made on the right side, although in his own case the median incision fortunately was made directly over the perforation. As little time as possible should be spent in the operation. The continuous suture for closing the perforation is less effective than the Lembert with packing around the area to protect in case of giving away. In doubtful cases gauze may be sutured over the wound with catgut as practised by Mayo. The diagnosis is not always easy. He operated one case which two medical men pronounced perforation, but which he thought was a case of hæmorrhage. The latter diagnosis was found to be the correct one. The patient recovered from the operation and died later from a second hæmorrhage. This case was operated upon under local anæsthesia produced by carbolic acid. No pain was experienced by the patient except when the parietal peritoneum was handled. A second case in which carbolic acid anæsthesia was used was one of strangulated hernia. No pain whatever was caused by manipulation of the intestines, but there was some, as in the first case, when the parietal peritoneum was handled. Flushing of the abdominal cavity in perforative cases is better than wiping. It saves time and more thoroughly gets rid of sepsis. The solution should be as hot as can be borne. Dr. Rodman is interested in the question of a preperforative stage. He thinks there is such a stage, but it cannot be recognized with sufficient certainty to warrant laparotomy in all instances. When so much difficulty is experienced in diagnosing perforation itself, how is the preperforative stage to be recognized? In his own case he believes there was such a stage, showing itself twenty-four hours before the perforation. There

is much in this suggestion of Cushing, and, if possible, the surgeon can at least get ready for operation; if there is a probability of perforation, he can operate at once under cocaine anæsthesia. He was glad to hear Dr. Harte emphasize the danger of waiting for reaction in these cases. The same rule as for gunshot wounds of the intestines should hold,—operate during shock in both instances. Perforations of the intestine and of the appendix have a different pathology, the small intestine being movable and the large more or less fixed. This same reason makes gunshot wounds of the small intestine more serious than those of the large bowel. Hence there is lessened gravity in appendiceal perforation, even during typhoid fever; there being less shock and sepsis than in typhoid perforation, when the lesion is usually in the small intestine.

Dr. J. Alison Scott believes that statistics of the time of perforation will show that in the majority of cases it occurs earlier in the course of the disease than the surgeon anticipates. He finds that many cases occur as early as the fourteenth or fifteenth day. He would explain the good results from receiving ward cases mentioned by Dr. Hutchinson by the fact that these are mild and practically walking cases. Such are in comparatively good condition and have a higher peritoneal resistance. They will get well. In cases with marked distention and pain throughout (and he finds that pain is a common symptom in typhoid), the toxæmia is great and the diagnosis of perforation is difficult. In these patients it is often impossible to make the diagnosis early. In 165 cases of typhoid under his care this winter there were three cases of perforation. All were operated upon and all died. Three things are of prime importance in diagnosis,—pain, rigidity, and tenderness. In six of eight cases of perforation coming under his knowledge pain was very sudden in onset. As a rule, it is paroxysmal. In three cases there was a chill. The temperature is of decided importance. In four of the eight cases studied it rose, fell gradually, and then rose again, the pulse meanwhile going up. Rigidity alone is not of so much importance, as it may be present in cases of pleurisy and pneumonia. The leucocyte count is not of great importance. It is usually from 4000 to 5000 in cases of typhoid, but it may jump to 6000 or 8000 at times. A differential count, if the physician has time for it, may be of value in some instances. In the Johns

Hopkins Hospital hæmorrhage with perforation has been frequently noted. Dr. Scott has not seen this combination, as in none of the cases of hæmorrhage seen by him has there been perforation; other observers have recently, however, seen the combination of the two.

Dr. R. P. McReynolds gave brief notes of four cases of perforation that he had operated upon. The first was operated upon four days after the perforation; a localized abscess had formed upon the right side; this was opened and drained. The man made a complete recovery.

The second case was operated upon about eight hours after perforation; a large opening in the bowel (the size of a twenty-five-cent piece) was found and closed. The man died some hours later.

The third case was operated upon for appendicitis, but at autopsy it was found that the cause of the general peritonitis had been a perforated typhoid ulcer.

The fourth case was operated upon about twelve hours after perforation. The diagnosis was obscured on account of severe intestinal hæmorrhages preceding the perforation. The gradual increase in the leucocytes was considered of considerable diagnostic value. The boy died about seven hours after the operation.

In these cases the incision was made in right semilunar line; chloroform used for anæsthesia. In three of them cocaine was also injected along the line of incision in order to diminish the quantity of chloroform necessary for anæsthesia.

The first case shows the possibility of a localized abscess forming after a perforation from typhoid fever ulcer, just as it does from perforation of the appendix.

Dr. Joseph M. Spellissy briefly detailed a case which he believed illustrated diagnosis in the preperforative stage. In that case there was a sudden rise of temperature, abdominal rigidity, tenderness, and pain. The leucocyte count was negative. Dr. Spellissy saw the patient two hours after the initial symptoms at the request of Dr. T. L. Coley, and agreed with the latter's diagnosis of possible perforation, and operated. Beside the symptoms detailed, there was present some bronchitis, and a slight dulness over the left apex. Operation under ether anæsthesia revealed a patch on the intestine covered by lymph; the

lymph was wiped off, but no perforation was present; although from the appearance of the ulcer it seemed imminent. The affected area was buried by means of Lembert's sutures. There was a free amount of peritoneal fluid, but it was clear. The case terminated fatally in twenty-four hours from pneumonia.

Dr. John B. Roberts said that increase in respiration was an important point. A sudden increase of respirations to 30 or 36, accompanied by pain in the abdomen, probably means perforation.

Dr. Harte, in closing, said that as regards cocaine he had never used it, but believed there was no doubt of its value in the hands of some surgeons. The time of recognition of the condition and the time of operation cannot be too close together, and but little time can be spent in making the toilet, which should be simple but thorough. One must get the patient off the table and into bed if any reasonable percentage of cases are to be saved. No one definite rule as to the manner of stitching the intestine can be followed, as this should be determined by the character of the perforation. It is less apt to tear when closed longitudinally. The leucocyte count is of no value, being only misleading in cases of perforation. Localized abscess is possible only when the lesion is associated with the appendix, as in typhoid fever the peritoneum does not have an opportunity to form well-marked collections of pus, as are noticed in other peritoneal conditions. After operation for perforation, the patient should be nourished by the bowel for a long time. As to the preperforative stage, there are no symptoms in typhoid perforation until perforation itself occurs; then the whole train of symptoms rapidly follow.

STATED MEETING, MAY 11, 1903.

The President, Richard H. Harte, M.D., in the Chair.

A REVIEW OF THREE HUNDRED AND THREE OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.

WITH TABULATED REPORT OF THREE HUNDRED AND THIRTEEN OPERATED CASES.

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Functionally the small bowel begins at the entrance of the common duct of the liver and pancreas, which about marks the primitive division between the foregut and the midgut (Huntington). The first portion of the duodenum may be said to be the vestibule of the intestinal tract, and its diseases partake more of the character of those of the stomach rather than the intestine. In the large majority of instances, lesions at this point cannot be diagnosticated accurately from similar diseases in the stomach, and are usually due to the same causes. For this reason I have associated all of the cases of this description into a single group for the purpose of study. Total number of cases, 303. Of these 286 are taken from the records of St. Mary's Hospital, Rochester, Minnesota, and the remainder are from the records of the Minnesota State Hospital for the Insane at Rochester and St. Peter. The average age was forty-two; males, 42 per cent.; females, 58 per cent.

Duodenum, twenty-six cases, two deaths, 7.6 per cent. Lesions of the first portion of the duodenum can be divided into two groups; first, those due to ulcer, and, second, those associated with gall-bladder disease.

Ulcer limited to the duodenum was found eleven times,—one acute perforating, two chronic perforating protected by adhesions, five active, and three cicatricial contraction with obstructive symptoms. Two died after operation,—one from pneumonia following excision of the ulcer, one from exhaustion after gastro-enterostomy. In three cases, the signs and symptoms were not to be distinguished from gall-stone disease, and the operation was undertaken under the supposition that the trouble was in the gall-bladder. Five times ulcers existed upon both the duodenum and stomach. Of the sixteen cases in this group, fourteen were in males. The duodenum was frequently associated with gall-stone disease, and usually secondary to it; but in eleven cases the duodenum was the prominent feature. Five were due to gall-stone perforation, requiring intestinal suture. In three of these the gall-bladder was completely separated functionally from the bile-tract, and had become an appendage to the duodenum. Four times, crippling adhesions to the gall-bladder, but without stones or evidence of cholecystitis, were encountered, requiring dissection to loosen,—a periduodenitis of unknown origin. In one case an inflammation of an accessory lobe of the pancreas was the cause of dense adhesions. All but one of the cases in which the gall-bladder was involved occurred in females. There were no deaths in this group. In no instance was the duodenum the seat of primary malignant disease, and in but two cases was there any evidence of extension from pyloric cancer, and then it was not marked. In two patients the diagnosis of lesions originating in the duodenum was made previous to operation. The differentiating features of these cases were, good appetite, delayed pain, general absence of vomiting, and in only one case, and that on one occasion, was there hæmatemesis. In two cases there was evidence of blood in the stool. Otherwise the signs and symptoms were similar to lesions of the stomach or gall-bladder, and, even in the light of operative investigation, points of differentiation did not become evident. Our experience leads us to believe that surgical diseases of the duodenum are much more frequent than has been thought.

The subject of perforating and bleeding ulcers of the stomach has been so thoroughly dealt with by Keen and Foot, Weir, Robson, Rodman, and Andrews, and lesions of a similar character in the duodenum by Weir and Murphy, that it seems unnecessary to dwell upon the few cases which have occurred in this series, and for further information, the classified table appended may be examined at leisure. In the present communication I will discuss briefly the results obtained and some practical deductions based upon two large classes of cases. First, Gastric ulcer and associated causes of serious disturbance. Second, Cancer of the stomach.

Stomach, 277 cases, twenty-eight deaths, 10.1 per cent. In the benign group there are 168 operated cases with eleven deaths (6.5 per cent.), and nearly all of these operations were for chronic ulcer and its late cicatricial results. Included in this class are all of the non-malignant obstructions. The conditions calling for operation were gastric pain with or without acute exacerbations, repeated hæmorrhages, emaciation from inability to retain sufficient nourishment. In a few cases, dilatation due to known or unknown cause gave mechanical reasons for interference.

Without going into the controversy as to the causation of gastric ulcer, there is no doubt that perverted stomach secretion is the most important manifestation in the majority of cases. This is shown by the almost constant association of excessive secretion in ulcer, and the fact that similar ulcers in the duodenum are in that part of the intestine not protected by the alkaline juices poured in through the common duct. In this connection, most interesting information is furnished by those reported cases in which a typical peptic ulcer has developed in the jejunum immediately below a gastrojejunostomy made for the purpose of drainage, the lesion in the jejunum in every particular resembling the original ulcer for which the gastro-enterostomy was performed. In operating upon cases of this description, the excessive amount of gastric secretion is constantly in evidence, and the results of drainage operations in relieving the distress and healing the ulcer bear out the importance of this view of the case.

Attempts to classify ulcers of the stomach have been based largely upon post-mortem experience and accidental complications, such as perforation and hæmorrhage. Such classifications tend to exaggerate the importance of fatal complications, which render surgery a desperate resource rather than a well planned effort at cure.

Further surgical observations are necessary to clarify the confusion which surrounds gastric ulcer. In attempting to group our operated cases, we found that there were such wide variations in the conditions present that no orderly classification could be made on a purely clinical basis. In a general way, the following answered the purpose most satisfactorily:

1. Round and fissure ulcers; (*a*) acute, (*b*) chronic. They have the distinguishing feature that there is but little thickening about the base of the ulcer. Many amount to little more than a fissure, and are closely associated with group 2.

2. Mucous erosions; a condition which must be accepted with caution.

3. Chronic ulcer with a thickened base and usually irregular in form, probably an extensive variety of the chronic round ulcer.

4. Benign obstructions without regard to cause, although usually of inflammatory origin.

In our experience at the operating table, it is the last two varieties which are most frequently met with. The acute round ulcer of Cruveilhier occurs by preference in the chlorotic type of adolescent females and usually responds to medical treatment. Operation is most often called for in the acute cases by that peculiar perforation so graphically portrayed by Rokitansky, "cut out by a punch;" or by severe hæmorrhage from the stomach. Chronic round ulcer and fissure ulcer do not often lead to harmful cicatricial contraction on account of their small size. Near the pylorus they may be the starting-point for a band-like stenosis encircling the pyloric ring. Chronic round ulcer is usually found in adults, and in our experience has been more frequent in females. It would seem that there is little difference between the chronic round ulcer

and the chronic cicatricial ulcer, excepting that as the outer coats are involved the extent of ulceration increases and loses its characteristic round or oval form, while usually a healing process is apparent in some part of its extent. A subvariety of this group is the "pore-like" ulcer described by Murchison, which is met with more often in adults and gives rise to grave hæmorrhages, and yet is so minute that it is difficult to locate, even at post-mortem. The mucous "erosion," limited to a small area or several such patches, was seen in a few instances. The large "mucous erosion" described by Dieulafoy as giving rise to alarming hæmorrhages was not met with. I am unable to say just how much importance is to be attached to the surface erosion of limited extent. In the first place, the detection is difficult. The whole question of the surgical exploration for round ulcers and erosions is one surrounded with difficulty and uncertainty. There are usually no external manifestations which lead to location of the lesion, and the only way a diagnosis can be established is to open the stomach and with a short, wide speculum explore the interior. The margin of the instrument may and frequently does produce a traumatism to the superficial mucous layers, and the result is very like the pathological erosion. We have seen undoubted and typical examples covered with a membranous film of mucous character which, when brushed off, allows the nature of the trouble to become apparent. The chief obstacle to accurate diagnosis lies in the surgical indications which are to be met. Round ulcers and erosions are often multiple, and, as a rule, do not cause cicatricial contraction at the pylorus. Clinical experience has demonstrated that drainage is the best method of surgical treatment with which we are acquainted, therefore an exploration, however attractive to the surgeon, is often not completed; but the surgical indications are fulfilled by some form of gastro-intestinal operation and the diagnosis remains unproved. The surgeon hesitates to expose the patient to even a slight risk for purely diagnostic purpose. The old adage, "a good prognosis is better than a good diagnosis," leads to operations based upon symptoms. If round ulcer is found, excision is the proper

course; but there is always the chance that the ulcer excised is not the only one, and that others may exist undetected or in an inaccessible situation.

We may well ask ourselves in such cases, Does an ulcer exist? and usually we may answer yes, and base the diagnosis upon such symptoms as would establish a medical diagnosis. Clinically, these cases come to us after medical treatment has failed utterly, and either the diagnosis is unquestioned or there is secondary interference with motility, resulting in retardation or retention and gastric dilatation, giving mechanical reasons for interference. The theory of pyloric spasm is most interesting, and is a hypothesis rather than a definite condition. I have examined the pylorus in over 300 cases at the operating table with a view of establishing a normal under anæsthesia. Usually, the normal pylorus in the anæsthetized patient will allow the thumb and the forefinger to nicely meet, about the caliber of a silver dime, and under some conditions of deep anæsthesia it may be found dilated to the diameter of a silver twenty-five-cent piece. I am satisfied, however, that spasm of the whole or some part of the pyloric portion of the stomach may and often does take place, and that it is one of the causes of the retention of the excessive secretions and distress; but I am by no means sure that it is confined to the pyloric sphincter.

The so-called "chronic ulcer" of Robson has a thickened base and is frequently of large size and irregular outline, in this respect differing from the chronic round and fissure ulcer, in which there is but little new tissue deposit about the ulcer. Does the round ulcer lead to the chronic cicatricial ulcer? It is probable that the difference is merely one of degree, although the fact that the latter is much more common in males is rather against this theory.

The majority of operations were for thick-based chronic ulcer of the stomach or its late results, and these cases were very satisfactory, the irregular thickened patch of stomach or duodenal wall often locating the process with exactitude. As a rule, the ulcer was located near the lesser curvature and not infrequently at the pylorus. The posterior wall was affected

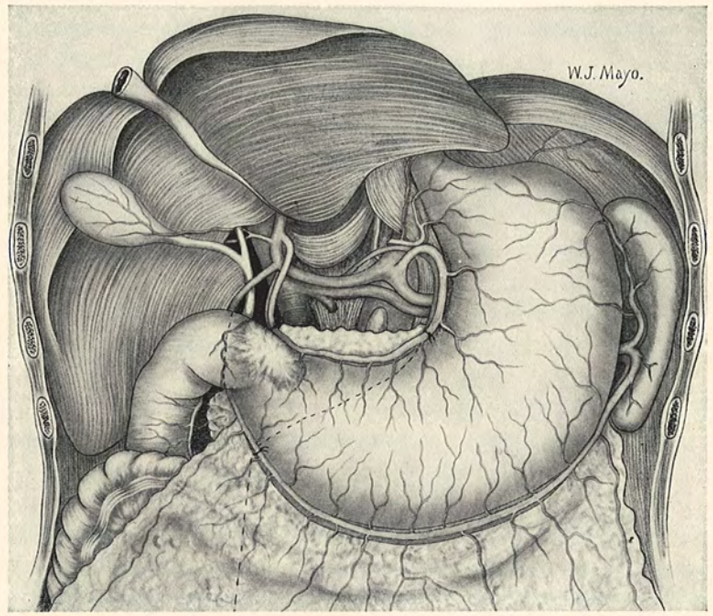


FIG. 1.—Showing line for incision in cases of ulcer of the stomach.

more often than the anterior, if only one surface was involved. On the duodenum the anterior wall was most often the seat of ulceration. The youngest patient was a girl of seventeen and the oldest a man of sixty-four. In 60 per cent. of our malignant cases, a previous history of ulcer was obtained. In two cases, malignant degeneration of the margin of a chronic gastric ulcer was demonstrated; certainly a strong argument for the excision of such ulcers when possible. We found conditions favorable for excision of ulcer in only three cases. On six occasions we either excised or turned an ulcer in by suture. in combination with pyloroplasty or gastroduodenostomy. In two of these cases, three-fourths of the pylorus was excised and closed by suture.

Lund has pointed out that "sentinel" enlarged lymph nodes in either the lesser or greater omenta may aid the surgeon in locating the ulcer. We have found this a valuable observation.

In all of the ulcers of every description which we examined, the upper two inches of the duodenum, pylorus, pyloric antrum, and that part of the stomach lying to the right of a line drawn downward from the œsophagus was the seat of disease, and in only a few instances of extensive hour-glass contraction did the ulcer extend to the left of this line. In handling the stomach during operation, limited contraction of the wall could often be noticed in the pyloric third, but not towards the cardiac end. Cannon's experiments are very interesting in this respect. He demonstrated with bismuth and the X-ray that the fundus of the stomach did not contract strongly, but that the pyloric portion, by a backward action, kept up a current in the fundus. Ulcers occur in all parts of the stomach; but in the cardiac end it is a question if they are often the cause of chronic symptoms calling for operation.

Twelve chronic dilatations without ulcer or obstruction were operated upon. In all of the cases, the stomach wall was of normal or increased thickness, indicating that an obstruction, either from a high-lying but non-stenosed pylorus, or beyond the pylorus, existed. In 1895 I reported several cases of inter-

ference with free gastric drainage by "valve formation," due to a short gastrohepatic omentum holding the pylorus high, the body of the stomach sagging sharply downward. More than half were of this description. In a few instances the medical diagnosis was extreme atonic dilatation; but even in these cases there was no great thinning of the gastric wall. We have not considered simple gastroptosis sufficient cause for operation, but in a few cases exploration revealed this condition, and in all the stomach wall was either of normal thickness or thinner than normal. In three of these cases, shortening of the gastrohepatic ligament after the method of Beyea was done.

Cancer of the stomach, 109 cases, seventeen deaths, 15.6 per cent. Late diagnosis and cachexia make the aspect of this group discouraging. Palliative operations predominate with considerable immediate mortality and no great prolongation of life. The hope of the future lies in early exploratory incision, and the necessity for this depends upon clinical observation rather than laboratory methods, which too often only become valuable when the extent of the disease is beyond cure. Given a patient of middle or later life who begins to lose flesh and appetite and suffer from indigestion without apparent cause, the possibility of cancer should be considered; and if the source of the symptoms cannot be shown within a few weeks, the situation should be explained to the patient, and the choice between exploration and procrastination allowed him. When we consider that early operation is the only hope, we may not wait on our own responsibility. The public in this way will soon become educated and cures will be more frequent. Gastrojejunostomy for malignant disease, in our hands, has had an increasing mortality, due to the fact that the better cases are selected for gastrectomy, and the late hopeless obstructions are given the meagre benefits of gastro-enterostomy, thirty-four cases, ten deaths, 30 per cent.

Is there an outlook for cancer of the stomach? We know of the prime necessity for early operation; it now remains to demonstrate how the procedure can be made more effective. In a general way, the lymphatics of the stomach lie in three groups; first, the lesser curvature and lesser omentum; second,

along the greater curvature and the gastrocolic omentum; third, in the gastrosplenic omentum. The main lymphatic channels follow the direction of the blood-vessels to the deep glands about the cœliac axis. The dome of the stomach, as pointed out by Robson, has no main lymphatic channels and few lymphatic glands. If all of the stomach excepting this portion be excised, the remaining part will be adequately nourished on the right side by cardiac branches derived from the gastric artery which joins the stomach at a point from one to one and one-half inches below the œsophagus. On the left, the vasa brevia given off from the splenic artery distal to the origin of left gastro-epiploic vessel, a distance of four and one-half to eight inches from the œsophagus, give an adequate blood-supply. These vessels anastomose with the inferior phrenic vessels. Therefore, excision of all the stomach lying below and to the right of a line drawn between the gastric artery and the left gastro-epiploic vessel is the logical operation. The advantage of this line of section is obvious. All of the main lymphatic connections are removed at the primary operation. The remaining portion of the stomach we know clinically is seldom involved unless the primary lesion is at the cardiac orifice, and the retention of the dome of the stomach enables comparatively easy intestinal anastomosis. One reason that only from 5 to 8 per cent. of gastric cancers have been cured by extirpation lies in the fact that a part of the organ has been retained in which the vascular and lymphatic connections with the diseased area have not only been close but direct. In the dome of the stomach, the lymph current is feeble through small vessels, and, most important of all, is in the other direction. Mikulicz has already called attention to the necessity of removing the whole of the lesser curvature with its gastrohepatic omentum, and has done much to elucidate the question of lymphatic infection by showing that in twenty cases of gastric cancer only one was completely free from lymphatic involvement, although, in a total of 189 glands examined, 110 were found to be without contamination. In making this radical operation we have proceeded as follows:

First, ligate the gastrohepatic omentum from the pylorus to the gastric artery, which is tied. The section is made as close to the liver as possible, and includes nearly the whole of the lesser omentum. This mobilizes the pyloric end of the stomach, which is drawn down and out. Second, with the fingers in the lesser cavity of the peritoneum, the gastrocolic omentum is ligated at a safe distance. The duodenum, on the one side, and the pylorus, on the other, are doubly clamped and divided between with the cautery knife. A purse-string suture of silk is placed around the duodenum three-fourths of an inch below the divided end, and, after suturing with catgut through the cauterized area, the stump is inverted and the purse-string suture drawn tight. This disposed of the duodenum permanently. Third, ligation of the gastrocolic omentum to a point near the origin of the left gastro-epiploic artery, which is tied. Fourth, a groove is made by heavy pressure forceps, separating the dome from the balance of the stomach and with catgut on two needles, a shoemaker stitch in the pressure furrow renders section with the actual cautery bloodless and avoids opening the portion of the stomach to be retained. This line of suture is turned in by a continuous silk Cushing suture supported occasionally by an independent Halsted stitch of the same material. In this step of the operation we sometimes use the Kocher clamp and suture each layer separately. Fifth, gastrojejunostomy between the gastric pouch, which is just about large enough for the purpose, and the jejunum. Sixth, entero-anastomosis between the two limbs of jejunum, short circuiting the biliary and pancreatic secretions as nearly as possible at the same level as the origin of the jejunum. It took two deaths to teach us the value of this manœuvre. The deaths were not from regurgitant vomiting; but when the anastomosis was affected in some cases, the intestine was sharply bent at the site of union, being drawn upward and to the left in such a manner as to leave from fourteen to sixteen inches of jejunum hanging upon the anastomosed area, a situation in which peristalsis does not materially aid in onward flow of the biliary and pancreatic secre-

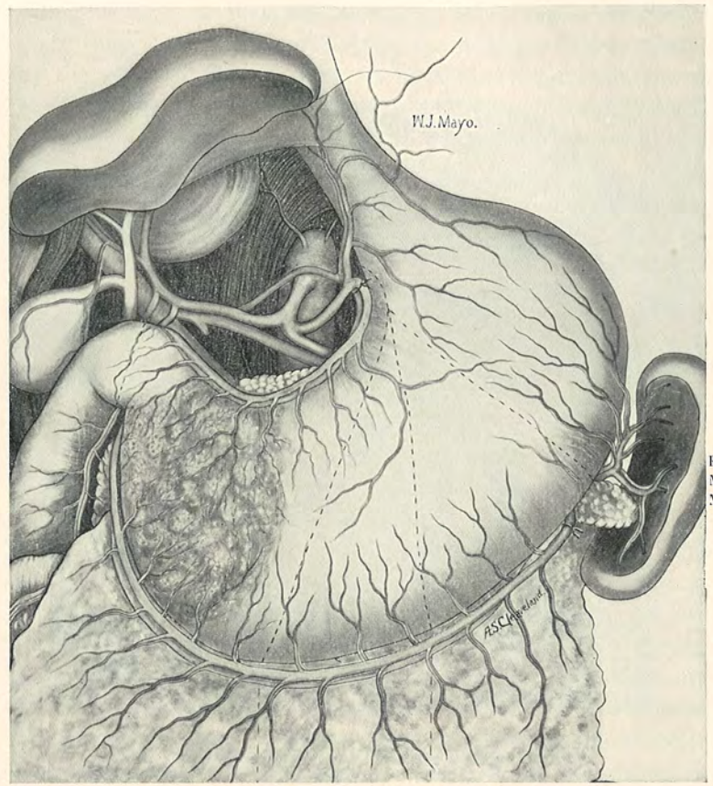


FIG. 2.—Lines of incision practised by different surgeons in the removal of cancer of the stomach.

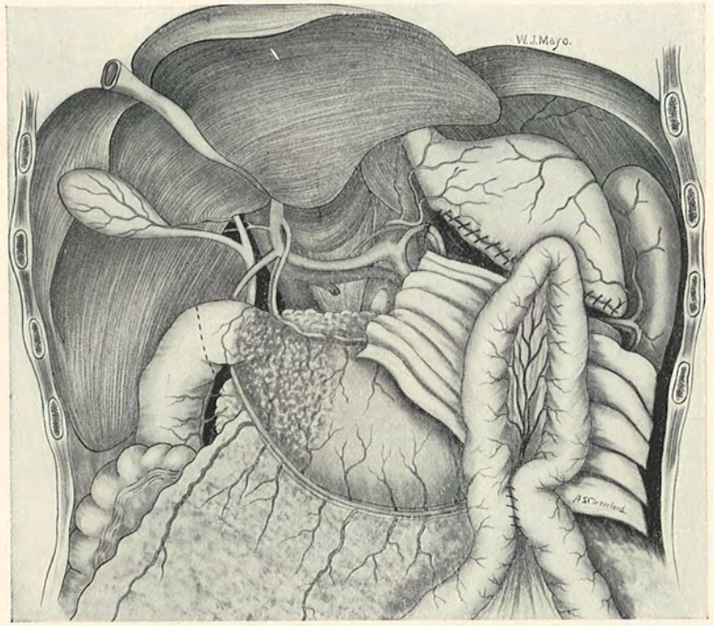


FIG. 3.—The completed operation for cancer of the stomach.

tions. The proximal loop becomes distended with these juices to the level of the anastomosis, giving a traction weight of a column of fluid the diameter of the distended intestine. In one patient on the fifth and in one on the ninth day union suddenly gave way entirely, or in part, in patients apparently doing well. This does not happen in every case,—two out of eight only; but in at least half of the cases the bad mechanics of the situation was evident on inspection. Seventh, the remains of the gastrocolic omentum are attached to the posterior wall and the abdomen closed. This operation should give all the benefits of complete gastrectomy in pyloric cancer. (I find that Mr. Moynihan, of Leeds, has recommended and practised a similar procedure, but his work was buried in the Clinical Society of London, which does not permit of journal publication. I did not know of it until he informed me personally during his visit in May, 1903.)

In view of the splendid work of Hartman and Cuneo, it is a question whether the operation outlined should be the routine one, or for exceptional cases only. That the whole of the lesser curvature with the glands in the corresponding portion of the lesser omentum should be removed is the conclusion of all of large experience; but the advantage of removing the major part of the greater curvature is open to debate. Cuneo demonstrated that the lymph current along the greater curvature was from the left to the right, and that in pyloric cancer not only is there comparatively little tendency to lymphatic involvement in this region, but that it is confined to the glands in the immediate vicinity of the growth, and does not extend to the left of the pyloric portion. Hartman therefore bases his line of section upon this fact, and removes all of the lesser curvature and saves as much as possible of the greater curvature. We have several times made an operation very similar to that described by Hartman, as it is certainly much easier than the one which we have outlined, and, as the mechanics of the anastomosis is better, entero-anastomosis is unnecessary. Occasionally, however, growths or glands are found to the left along the greater curvature. It may be said that such cases are inoper-

able, yet we have had two such patients live beyond a year. In the eight cases operated upon by the radical method given above, there were three deaths, while there were but two deaths in the eighteen remaining cases operated by various methods from simple pylorectomy to the operation of Hartman. The former group comprises only a small number of the worst cases, and some of the deaths were avoidable by a better technique. Be this as it may, some form of radical extirpation has been the only reasonably satisfactory operation we have performed for cancer of the stomach, twenty-seven cases, five deaths, 18.5 per cent. (Since completing this paper, one case died after five weeks from abscess of the lung, making six deaths, 22.5 per cent.) One patient lived three years and seven months before recurrence. Several are alive and well over two years, and the general average has been over a year. It is surprising how few of those recovering from the operation have failed to live a year or more.

It may not be out of place to briefly discuss the merits of the three chief methods of improving stomach drainage, namely, pyloroplasty, gastro-enterostomy, and gastroduodenostomy.

Nineteen cases were subjected to the pyloroplasty of Heinicke-Mikulicz; six of these came to secondary gastrojejunostomy through failure of the operation to adequately drain the stomach. The remaining cases are well. There were no deaths. The opening can be made of sufficient size, but the increase in caliber is not in the line of gravity drainage, or, at least, the enlargement of the opening is as much above the pylorus as below it, and the greatly dilated stomach with its overstretched and degenerated musculature is unable to elevate the food, and the stagnation is not entirely relieved. Again, in the six reoperated cases, the pylorus was found adherent at a high level, due to the abstinence of food and other causes of downward traction during the healing process. In three cases we fastened the pylorus, after plastic operation, to the neighborhood of the umbilicus by suture, to secure a low point. These patients have remained well; but as we were also careful to

choose only moderate dilatations, the value of the manœuvre is uncertain, and there are objections to the plan.

Gastro-enterostomy was done 168 times, divided as follows: Gastrojejunostomy, 121; gastroduodenostomy after Finney, twenty-six; independent gastrojejunostomies in connection with pylorectomy and gastrectomy, twenty-two. Of the 121 cases of gastrojejunostomy made purely for drainage purposes, there were seventeen deaths. The percentage of mortality in the benign cases was 8 per cent., in the malignant, 30 per cent.; the great mortality of the latter being due to the choice of favorable cases for radical operation, the hopelessly advanced and cachectic coming to gastro-enterostomy, and, could the condition have been known beforehand, an operation would not have been undertaken in some of these cases.

Gastrojejunostomy for benign obstruction at the pylorus is one of the most satisfactory operations with which we are acquainted. It rapidly drains from the lowest point, and if the obstruction at the pylorus is permanent, the new opening does not contract materially. Again, if the opening be made at the bottom of the stomach-pouch at or near the greater curvature, regurgitant vomiting will not take place and entero-anastomosis is unnecessary, providing either the Murphy button or Robson bone bobbin be used to mechanically maintain an opening during the early critical period. We can only speak from these two methods, as we have had no experience with any other plans. In some instances a feeling of distention or vomiting after operation may take place, and, under such circumstances, we promptly direct gentle stomach lavage. We now use the posterior suture operation over the bone bobbin for benign obstructions and the Murphy button for malignant disease, and in the latter instance the anterior method. However, as between the suture and the Murphy button and the anterior and posterior operation we have been unable to see any marked difference in results beyond the occasional retention of the button in the stomach, which seems to be of no practical importance.

During the recent visit of Professor Mikulicz to this country (May, 1903), he had the kindness to do a posterior

gastro-enterostomy in our clinic by a method which I believe is greatly superior to the one we had been in the habit of doing. It avoids the possibility of angulation, as it does not form a loop with its attendant dangers. The operation as performed depends on two simple principles. First, the origin of the jejunum lies above the greater curvature of the stomach. After opening the transverse mesocolon and fastening it to the posterior wall of the stomach, the upper three or four inches of the jejunum lie directly in contact with the gastric wall, hanging perpendicularly with its free border (opposite the mesentery) facing the stomach wall. Second, by making a transverse incision in the jejunum three or four inches from its origin and an incision close to the greater curvature of the stomach, a suture anastomosis is made in which the stomach is drained at the lowest point without the possibility of kinking the intestine. The whole trouble has been that in making a longitudinal incision in the intestine it was necessary to form the misfortune-breeding loop. The scheme of the operation is much the same as used by Czerny. The good mechanics of the procedure has been especially dwelt upon by Peterson of the Heidelberg Clinic.

Gastrojejunostomy, if the pylorus be unobstructed, is far from satisfactory. In a paper read before the American Surgical Association, June, 1902, I reported four cases in which contraction at the site of the anastomosis took place, and we have reoperated upon four similar cases since that time. In six of these cases we did a secondary entero-anastomosis between the limbs of the loop. Four times the entero-anastomosis was effected with the Murphy button, and two of these patients died from sudden separation of the anastomosed area at the end of the first week. This did not take place in two suture operations. In all of these cases the proximal limb of jejunum from the point of anastomosis to its origin looked enlarged and thickened, a condition that might be called water-logged and in marked contrast to the bowel immediately distal to the anastomosis. In this condition of the afferent loop lay the reason for the failure of the plastic union after the button,

and merely illustrates the well-known danger of setting up pressure necrosis in damaged tissues. Primary entero-anastomosis with the button is safe, but not so secondary operations. If the obstruction at the pylorus is complete, this condition of the jejunum above the gastro-intestinal anastomosis has not been found. A large number of cases of benign affections of the stomach without pyloric stenosis require operation. This is particularly true in ulcer, and relapse after this operation has been frequent. Our observations would seem to show the following course of events. After the operation there is at least temporary healing of the ulcer. The pylorus begins to functionate normally and the unnecessary gastro-intestinal fistula contracts. There is renewed irritation from retained secretions, followed by reopening of the ulcer, return of pyloric spasm, and failure of the operation to effect a permanent cure. In some cases the double stomach drainage seems to give rise to unpleasant symptoms without contraction of the fistula. In twenty-eight cases of gastrojejunostomy with open pylorus, eight came to secondary operation from contraction of the gastro-intestinal opening, while in all cases with permanent obstruction at the pylorus there were no cases of secondary operation from this cause. This has also been the experience of Ochsner, who also points out the fact that if relapse takes place, symptoms will arise within four months. To obviate this sequela, in one case, at the primary operation, we divided the pylorus and closed both the gastric and duodenal ends by suture, thus creating the favorable condition of complete obstruction. Once we sutured the pylorus high up under the liver, causing valve formation, as first suggested by Cordier. Once we placed a circular purse-string suture about the pylorus, closing sufficiently tight to obstruct the opening. This idea was adopted from Dawbarn. I may say that all of the methods proved satisfactory; but there was the grave objection of too much operating for a benign condition, and it introduced unnecessary elements of danger. In June, 1902, Dr. Finney introduced his method of so-called pyloroplasty, but which is in reality a gastroduodenostomy. The opening is

downward in the line of gravity, and in most of the suitable cases for this operation the gastric dilatation is not extreme. In two cases of rather extensive dilatation and pouching we combined with it shortening of the gastrohepatic ligament as described by Beyea. The operation of Finney is especially adapted to those cases in which there is little disease about the pylorus. It enables careful examination of the pyloric end of the stomach, and excision of a neighboring ulcer can be easily combined with it. We had two such cases. It is less suitable if there be extensive involvement of the pylorus; but it is in just this class of cases that gastrojejunostomy is at its best. The question to be settled by further experience is, whether the operation of Finney will as rapidly cure active ulcer of the stomach as gastrojejunostomy. In the latter operation the drainage is from the cardiac end to the left of the muscular pyloric portion; while, even if the pylorus be made of ample size by the Finney procedure, the food and secretions must pass the ulcer site before it leaves the stomach, and we know that obstruction is not all necessary to the formation of ulcer, as they exist beyond the pylorus in the duodenum. In twenty-six cases operated upon by the method of Finney, we had one death, and that from avoidable cause. Were it not for the mortality, resection of the muscular pyloric portion of the stomach would be indicated in gastric ulcer, as in this way the ulcer-bearing area would be permanently disposed of and an absolute cure insured. This was first suggested by Rodman, and I believe with him that this will be the operation of the near future.

A TABLE OF 313 OPERATIONS UPON THE STOMACH AND FIRST PORTION OF THE DUODENUM.

STOMACH.

Benign.	Total.	Recovered.	Died.
Gastrojejunostomy	89	82	7
Gastroduodenostomy	28	27	1
Pyloroplasty	19	19	..
Gastrostomy	4	4	..
Gastrotomy	5	5	..
Excision of ulcer	3	3	..
Perforating ulcer	2	1	1

Benign.	Total	Recovered	Died.
Gunshot	1	1	..
Gastrorrhaphy	1	1	..
Gastroplication	1	1	..
Hour-glass stomach	3	2	1
Adhesions	8	8	..
Shortening of gastrohepatic ligament (Beyea)	6	..	..
Subdiaphragmatic abscess from gastric ulcer	2	1	1
Fistula of stomach and gall-bladder	1	1	..
	173	156	11

Cancer.	Total.	Recovered.	Died.
Gastrectomy and pylorectomy	27	22	6
Gastro-enterostomy	34	24	10
Gastrostomy	13	11	2
Exploratory	38	38	..
	112	95	18

First Portion of Duodenum.	Total.	Recovered.	Died.
Excision of ulcer	3	2	1
Perforating, acute	1	1	..
Perforating, chronic	2	2	..
Chronic ulcer	6	5	1
Ulcer of both duodenum and stomach	5	5	..
Anastomosis between the first and second portion of duodenum for ulcer	1	1	..
Adhesions, result of periduodenitis	4	4	..
Adhesions, result of inflammation of accessory lobe of pancreas	1	1	..
Fistula between gall-bladder and duodenum requiring suture	5	5	.
	28	26	2

DISCUSSION.

Professor von Mikulicz, of Breslau, said that the question discussed by Dr. Mayo as to which is the best operation for establishing a new communication between stomach and small intestine is of the greatest importance, but he did not consider this question to have been finally decided. There is no doubt but that operation is the best one which most completely restores the physiological relations. From this stand-point the operation of pyloroplasty stands at the head. Next in importance is the operation of gastroduodenostomy. If one of these two operations for technical reasons should not be feasible, one then has to consider the

operation of posterior gastrojejunostomy according to Von Hacker, which, if correctly performed, yields excellent results. Least to be recommended is the operation of anterior gastro-enterostomy. He would no longer perform this latter operation in benign affections of the stomach, on account of the most recent experiences which have shown that a peptic ulcer of the jejunum occurs after such operations with relative frequency. He considered this operation permissible only in gastric carcinoma in which the normal acidity of the gastric juice is absent.

As to Finney's operation, he considered it a very practical technical modification of pyloroplasty, but in the main one accomplishes precisely the same with the original operation of pyloroplasty, providing this operation is only properly executed. As to the Murphy button, in benign affections of the stomach, he did not employ it. In operations for gastric carcinoma, however, he employed it very frequently, as also in gastro-enterostomy and in resection. In the latter operation he considered the Murphy button indispensable, whether he operated according to the first or second method of Billroth. The technique is simpler, quicker, and much safer. When it is possible, he employed the first method of Billroth, which is the joining of the stump of the stomach with the duodenum, because this method again restores completely the physiological relations. Only in cases where this method cannot be performed, on account of either shortness or immobility on the part of the duodenum, did he employ the second method of Billroth, namely, the joining of the stump of the stomach with the jejunum. Regarding the relation between the number of benign and malignant diseases of the stomach, it had impressed him that in America the former, especially gastric ulcer, was the more numerous class, while carcinoma of the stomach occurred relatively less frequently. In Germany this proportion is reversed: at least he as a surgeon saw four times as many gastric carcinomata as gastric ulcers with their complications. Perhaps the frequency of gastric ulcer in America may be associated with what in our estimation is the not very natural nourishment which the American ingests, namely, ice-cold drinks and highly seasoned foods.

As far as the indications for operative procedure in gastric ulcer are concerned, it must not be forgotten that in this disease medical treatment is able to contribute much benefit. Furthermore, the surgical experience in this direction is still far too meagre to enable one to positively contend that in the operative procedure there is an infallible remedy for gastric ulcer itself. The whole question is by no means as yet decided, and therefore German surgeons are very reserved in considering the indications that are present in simple gastric ulcer.

Other cases, of course, are to be considered according to the complications which offer clear indications for operation, as, for instance, stenosis of the pylorus and hour-glass stomach.

In acute hæmorrhage they refrain, as a rule, from looking for the bleeding ulcer, as this is generaly a too difficult and unsafe a procedure. They do, however, perform gastro-enterostomy and at the same time a jejunostomy, as by means of the latter the patient may be exclusively nourished for weeks, and only in this manner the functional activity of the stomach is eliminated. As far as the localization of gastric carcinoma is concerned, his experiences did not coincide entirely with those of Mayo. If the results of post-mortem examinations are compiled, it will be found that certainly in the majority of cases the pylorus is included in the carcinomatous process. If, however, the results of the operations are considered, that is in the earlier stages of carcinoma, it will be found that the lesser curvature is most frequently affected by the carcinoma, which then attacks the pylorus secondarily. According to his experience, carcinoma of the stomach is situated in about 40 per cent. of cases primarily in the lesser curvature, and only in 20 per cent. of cases primarily in the pylorus. As far as the technique of the radical operation for gastric carcinoma is concerned, he referred to his numerous publications on this subject. For the last eight years, as a matter of principle, he had not only extirpated all the lymphatic glands at the greater curvature, but also the whole omentum with the lymphatic glands and lymph channels as far as the cardia. The technique is accurately published in the text-book of practical surgery by Von Bergmann, Von Bruns, and Von Mikulicz. The permanent results following resection of gastric carcinoma are in the main quite encouraging. His statistics show that 16 per cent. of those operated upon remain free from recurrences for over three years. But also in those cases which are not radically cured, resection of the stomach yields more than gastro-enterostomy. Some of the cases do not have any local

recurrence, but after a longer period has elapsed metastases develop, living from one and one-half to two and one-half years without gastric disturbances. He therefore preferred resection of the stomach to gastro-enterostomy, even if there are no positive prospects present for a radical cure of the carcinoma.

MR. B. G. A. MOYNIHAN, Leeds, England, said that he thought the operation of pyloroplasty might be practically discarded. He had only done the operation three times. In the first the patient made a good recovery, and was one of the most satisfactory stomach patients that he had ever operated upon. Of the remaining two cases, one was partially improved; in the other a gastro-enterostomy was performed four or five months after the original operation. He felt very decided that the operation of pyloroplasty was by no means so satisfactory in any single particular as the operation of gastro-enterostomy. For simple diseases of the stomach he had operated up to the time of his leaving England upon about seventy-five cases with only one death.

He had used the Murphy button, but in the last sixty-five operations that he had done he had not used it. The button had, however, been a very important step in perfecting his operation of gastro-enterostomy. It had taught him to remove the mucous membrane, which is so necessary in order to secure perfect anastomosis with an opening patent from the first.

Dr. Mayo had laid down the laws for the treatment of malignant disease of the stomach on almost the same lines as he had emphasized some two years ago in a paper read before the Clinical Society of London. The extension of malignant disease occurs principally through the lymphatic system. He described three areas,—one along the greater curvature, one along the lesser curvature, and one at the fundus, an area which he had described as an "isolated area." In the beginning he removed the whole of the lesser curvature, and the whole of the greater curvature up to the level of the hilum of the spleen. This leaves the "isolated area" of the stomach, and the only disadvantage that it has is that the pathology is not perfect, because the lymphatics of this area are in association with the lymphatics of the lower end of the œsophagus. In reference to the question of duodenal ulcer, as the cases had come to him, he thought it is very seldom primary. He did not remember ever seeing duodenal ulcer without a gastric ulcer. It is known that gastric ulcer is frequently associated at some period with hyperchlorhydria. There result first the gastric ulcer, and then a peptic ulcer in the first portion of the duodenal wall. He had seen cases similar to those which Dr. Mayo had described in which there was gastric ulcer, and a gastro-enterostomy was done, and peptic ulcer was formed in the outside loop of the jejunum. Gastric ulcer is frequently multiple. In a very considerable number of cases, roughly speaking, gastric ulcer is not a solitary condition; there are more ulcers than one in the majority of cases. Therefore excision of gastric ulcer is very rarely necessary. He had excised the ulcer for hæmorrhage in one case only, and that case died. This was the only case which he had lost. In the other cases he had performed the operation of gastro-enterostomy without bothering much about the ulcers.

DR. ALBERT VANDERVEER, of Albany, said that although in past years he had felt that ulcers of the stomach could be largely benefited and brought to recovery by a medical line of treatment, and he had presented a number of cases in an article on the subject some years since, yet he realized the very impressive lesson brought out by Dr. Mayo in his large number of cases, the great majority being chronic ulcers, which gave a very positive evidence of the tendency of the cicatricial areas to later present malignant degeneration. He endorsed all that Mayo had said upon this subject, and could not agree with some of our writers at the present day that ulcer of the stomach is not a surgical lesion.

In regard to the surgical treatment of cancer of the stomach, he quite agreed with Dr. Mayo that laboratory methods of investigation are not yet as clearly developed and positive in their conclusions as could be wished, so far as rendering aid in doing an early operation. Medical men who are making this subject a specialty, as regards investigation of the contents of the stomach, as to the presence or absence of hydrochloric acid, the presence of lactic acid, the Boas bacillus, etc., are apt to procrastinate, and not infrequently the patient's chances are seriously interfered with by waiting too long before advising operation.

There is much truth in the remark that when once a tumor is felt, cancer of the stomach has become a very serious complication.

He quite agreed with Dr. Mayo that a clinical diagnosis can

generally be made sufficiently correct to make it quite proper to advise a prompt operation. When once the abdominal cavity has been opened, and one is able to investigate the stomach carefully, then the extent of the glandular involvement should control largely as to a resection. He was quite positive that unless one made a complete removal of the infiltrated glands, and in doing a resection got well beyond the diseased portion of the stomach, or in doing a gastrectomy did it completely, some of the palliative operations were very much more desirable, and of greater service to the patient.

From a personal experience with quite a large number of cases of gastric cancer he had seen great good result from a simple gastro-enterostomy or gastrostomy.

In pyloric stenosis, without many adhesions to the surrounding portions, and when it is plainly apparent that the lesion is non-malignant, he endorsed most earnestly Dr. Mayo's statement in regard to pyloroplasty.

Gastrojejunostomy had been with him a gratifying operation. It is certainly very pleasing to see the relief these patients obtain from this procedure from the perfect gastric drainage that is afforded.

Gastroduodenostomy had been with him a very difficult operation, and one that he had not done very frequently.

Dr. J. M. T. Finney, of Baltimore, remarked, as to the treatment of pyloric stenosis of benign origin, that the solution of this problem could be expressed in one word, "Drainage," and this must be both permanent and effective. Any method, it seemed to him, that fulfilled these two requirements would be satisfactory; but it remains to be proven which is the best method.

At the present time, the advocates of gastro-enterostomy are certainly in the majority, both in numbers and professional eminence; but some of the other methods are or have been advocated by men whose opinions are worthy of consideration.

He had seen many cases of pyloric stenosis from one cause or another which had been much benefited by medical treatment, and a few in which the up-to-date physician had been able to avoid a surgical operation. He believed that if we were more careful in our methods of examination, if we studied our cases a little more closely for longer periods of time, and if we called

in the aid of the physician more often, we would accomplish results, not as speedily perhaps, but in a way fully as satisfactory to the patient as if we rushed hastily into a surgical operation.

Early operation, certainly in the majority of cases, has many points to commend it; but in doubtful cases the surgeon should call to his aid the physician, and that speedily, and so should the physician call upon the surgeon, not perhaps with the idea of immediate operation, but in order that the case may be more intelligently and satisfactorily considered. He was an advocate of early operation in proper cases, but he could not subscribe to all that had been said in this respect. He believed, also, that cocaine was a valuable agent in cases where, for any reason, the general anæsthetic is contraindicated in making an exploratory incision. He had used it frequently with the greatest satisfaction and had never seen any untoward results. The mortality in all operations upon the stomach is growing steadily less until now the mortality rate is extremely low.

As to operation for the relief of benign stenosis of the pylorus, the operation of pyloroplasty, after the Heineke-Mikulicz method, has not given general satisfaction, although in the hands of Von Mikulicz it had been productive of excellent results; but, as Dr. Mayo suggested in his paper, in the way in which it has been performed in this country, at any rate, it has been followed by a considerable number of recurrences.

The operation of pylorectomy must of necessity always be attended with a relatively high mortality, and for this reason it is only to be recommended in cancer. Dr. Finney had during the last two years performed pylorectomy eight times. He had followed practically the method of Hartman. Six of these cases made good recoveries from the operation and lived varying lengths of time; two or three are still living. It would seem, however, that so far as cure is concerned, from the nature and extent of the tissues affected and the lymphatic involvement which necessarily follows, that it is, and very likely always will be, next to impossible to eradicate entirely the cancerous growth, and that we must always look forward to a recurrence of the trouble, either locally or elsewhere. For this reason, the operation which offers the greatest amount of temporary relief at the least possible risk is the operation of choice.

In regard to gastro-enterostomy, he hesitated to say any-

thing against it, because so much had been said in its favor by those whose opinion and experience were both greater and more weighty than his, but, unfortunately, the results of all surgeons, he was sure, were not the same as those they had listened to. Most surgeons had met all too frequently with unfortunate results after the employment of this operation They are constantly meeting with cases which may have done well perhaps from the immediate operation, but which have later vomited themselves to death or have given other obstructive symptoms. Many efforts have been made to overcome the objections which have been urged, and which have made themselves evident after this operation, and the satisfactory results reported by some of the previous speakers bore witness to the efficacy of their efforts, but the majority of operators had not had the same satisfaction.

Some of the objections that have been urged are inherent in the operation, and cannot be overcome as long as the operation is performed in the manner in which it is at present. Some of these objections may be more theoretical than practical, but it would seem that the normal position of the pylorus was the proper one, and any operation which preserves the normal relations is better than one which disturbs them.

Of course, the final test of an operation is what it does so far as the patient's health and comfort are concerned. Scientific observation of the work done by the stomach will throw a great light upon the relative value of the different methods.

Dr. Friedenwald, of Baltimore, had kindly made repeated chemical examinations of the stomach contents in five of his cases of pyloroplasty, in all of which it was found that, from very abnormal conditions before the operation, the patients had all returned to a practically normal condition in a comparatively short time after the operation.

With regard to the operation of pyloroplasty as suggested by himself at the Meeting of the American Surgical Association in Albany in 1902, and which it is unnecessary to describe again, this operation has this advantage over all operations in that it both makes the point of drainage at the lowest or approximately lowest point in the stomach and yet still preserves the normal relation. At the same time it is easy of accomplishment. It offers immediate relief to the patient in that the drainage is accomplished at once, and the outlet is so large as to make it very

free. The after troubles are surprisingly little, and adhesions are no bar to the performance of the operation. It can be carried out in the presence of still active ulceration. He recently excised an ulcer on the posterior portion of the pylorus with very satisfactory result. It remains to be seen by a more extended use of the operation whether or not it is really the best at our disposal for the relief of benign stenosis of the pylorus. Of the thirty-eight cases which he had been able to collect, the mortality had been seven and one-eighth per cent.

ON THE RESULTS OBTAINABLE BY OPERATIVE MEASURES IN AFFECTIONS OF THE STOMACH.

BY JOHN B. MURPHY, M.D.,
OF CHICAGO.

On the basis of the frequency with which surgical diseases of the stomach are brought to the surgeon's notice, we may divide them into:

(*a*) Gastric Carcinoma; (*b*) Gastric Ulcer; (*c*) Pyloric Obstruction; (*d*) Pyloric Retention; (*e*) Gastroduodenal or Pyloroduodenal Lesions.

If surgery is to accomplish for the stomach all that it is capable of, the frequency with which the surgeon deals with the stomach must be for lesions in substantially the reverse order, except in the class of gastroduodenal diseases, *i.e.*, to obtain the greatest results from a prophylactic as well as therapeutic stand-point. The order of frequency with which the surgeon should be consulted must be:

(1) Pyloric Retention; (2) Pyloric Obstruction; (3) Gastric Ulcer; (4) Gastric Carcinoma; (5) Gastroduodenal Lesion.

If the first three of this second classification be timely and properly treated from a surgical stand-point, the surgeon will be consulted very much less frequently for carcinoma of the stomach. Thirty-five per cent. to 45 per cent. of all carcinomata occur in the stomach; from 1 per cent. to 3½ per cent. of all deaths are caused by this disease, varying in the hospitals in different countries,—in English hospitals, in 8468 necropsies, 1 per cent., Brinton; in Vienna, in 61,287 necropsies, 1½ per cent., Gussenbauer; in Prague, in 11,175 necropsies, 3½ per cent., Welch.

The possibilities of surgery in carcinoma will not be materially increased by any improvements in technique over the

magnificent showing of Dr. Mayo's results in 109 cases with 15.5 per cent. mortality.

The improvement in the surgery of carcinoma of the stomach must come from:

(*a*) The prophylaxis in the recognition and removal of conditions which tend to the production of carcinoma;

(*b*) Pronounced improvement in our diagnosis of the early stage of the disease;

(*c*) Early radical removal.

Before the prophylaxis can be effected, the clinician must answer a few questions. First, Are there precancerous pathologic conditions recognizable by a symptom complex? Second, What are the pathologic conditions and the symptoms? Third, How are they to be treated?

The first may be answered. They are recognized, and, as illustrated beyond controversy, may be mentioned the gastric ulcer and pyloric retentions with their sequences, cicatrices, and gastrectases;

Second, the pathologic conditions and symptoms. If we mentally review the cases of carcinoma that have presented themselves, we find that the manifestations of carcinomata have not appeared, unless in the rarest possible circumstance, as a thunder-bolt from a clear sky, but have implanted themselves on a train of gastric symptoms that have existed for months and even years. It is only fair to assume that these gastric irritations and retentions have played a prominent pathologic rôle in the production of carcinomata of the stomach, the same as the mild irritation of the pipe on the lip, the gall-stone in the gall-bladder, the impacted fæces in the colon. I refrain from speaking of the treatment of the pathologic factors here, as we will insist later that these pathologic conditions from the suffering and incapacity which they entail demand radical surgical treatment in themselves, and are up to this hour grossly neglected both by the surgeon and the physician, with few exceptions, like in the Mayo, Mikulicz, Czerny, Mayo Robson, and Moynihan clinics.

Improvement in the medical diagnosis has been immate-

rial, as far as positive knowledge is concerned, in the last decade, and does not promise much for the immediate future. We have stated that carcinoma of the stomach in a large percentage of the cases is preceded by other pathologic conditions, be it ulcer, pyloric obstruction, pyloric retention with their sequences, pyloric irritation, gastrectasis, and secondary ulceration. The questions to be answered now are, " Do we recognize the transition from these precancerous conditions to the cancerous?" No. " Can we?" Yes. First, How soon after the penetration of the basement membrane by these erratic epithelial cells are symptoms manifest, and what are the symptoms? Second, How soon after the penetration of the basement membrane by these erratic epithelial cells are the cells transmitted (*a*) through the lymph spaces to adjacent areas in stomach walls, (*b*) through lymphatic drains to neighboring lymph-nodes, (*c*) through the lymphatics to the first filter gland, (*d*) from the primary filter gland to second and subsequent filter glands, (*e*) from the last filter gland to the chyle duct? How do they pass through the pulmonary capillaries? Where and how do they produce elective metastases?

Until these questions are answered, there will be little improvement in our results from a surgical stand-point with carcinoma ventriculi, as the technique of gastrectomy has well-nigh attained the ideal, as illustrated in its application to a large number of cases with magnificent results reported by Mayo and Van der Veer.

The solution of these pathologic questions herein submitted cannot come from post-mortem examinations, except in cases of accidental death occurring in the early stage of gastric carcinoma. They must be determined on the surgical table (*a*) in operations for the pathologic conditions which lead to carcinoma and (*b*) in explorations for suspected carcinoma by celiotomy and gastrotomy.

The results of the mechanical surgical treatment of pyloric obstructions and retentions are gratifying, first, as to the relief afforded the patients, and, second, as to their freedom from danger. The former is well recognized; the latter, the freedom from danger, is represented in Mayo Robson's results (reported to me in a personal communication, February 9, 1903) in 101 cases of posterior gastro-enterostomy with 3.9 per cent. mortality, and twenty cases of pyloroplasty without a single mortality. A study of the mortality shows that the deaths were due primarily to the extremely low condition of the patient at the time of operation. With these facts in view, it is fair to presume that the physician will call on the surgeon more frequently for exploratory laparotomy for diagnostic purposes; furthermore, that the surgeon will not only perform exploratory laparotomy for the diagnosis of gastric lesions, but that he will do as a routine the rational operation, which is the large longitudinal gastrotomy, and make an inspection of the gastric mucosa, which is so necessary for the recognition of the early carcinomatous changes. That this operation is practically without danger will be accepted from the great number of more difficult operations which have been performed with their *nil* mortality from the operation *per se*. Exploratory gastrotomy, therefore, will be the ideal procedure for the early diagnosis of suspected gastric carcinoma. By this procedure many lives will be saved, much suffering avoided, and the operation for gastric carcinoma will give entirely different results in their immediate mortality, and the permanency of the cure. The time and frequency of transmission of carcinoma from the original focus of invasion to the neighboring lymphatics and glands depend upon the portion of the stomach primarily attacked. They are at a minimum in the greater curvature and reach the maximum in the lesser curvature and pyloric area. This is in direct ratio to the richness of the lymphatic supply, and is analogous to the same pathologic predisposition in the gall-bladder, uterus, and urinary bladder. Unfortunately for the patients, however, the areas of least likelihood of transmission are also the areas of least primary invasion. Fortunately for the surgeon, the area most frequently attacked by carcinoma is the one most easily exposed for ocular examination in exploratory gastrotomy.

Do the results of operations for carcinoma ventriculi so far obtained justify us in hoping for much better results in the future? Yes; on the following basis, supported by the statistics herewith submitted. First, There is a small percentage of unquestioned permanent cures already secured, notwithstanding delayed or tardy diagnoses. Second, Life has been materially prolonged in the cases in which the operation was not performed *in extremis*. Third, The suffering of those who survived the operations of radical removal was materially less, as death was caused by the metastatic growths rather than by the recurrence of the disease *in loco*. Fourth, The price in mortality is not too great for the profit in longevity and freedom from suffering. Fifth, The future will give more fruitful results, with ever increasing early recognition of the disease and our greatly improved technique. That the number of permanent cures will increase may be estimated from the accessibility of the primary location of the disease, as shown in 1300 cases reported in Mikulicz's article. It was in the pylorus, 791 times, 60.8 per cent.; lesser curvature, 148, 11.4 per cent.; cardia, 104, 8 per cent.; posterior wall, 68, 4.7 per cent.; very late cases (whole or part of stomach), 61, 4.6 per cent. Multiple tumors occurred with pylorus as primary focus in forty-five cases, 3.5 per cent.

With greater curvature, thirty-four cases, 2.6 per cent.; anterior wall, thirty cases, 2.3 per cent.; fundus, nineteen cases, 1.5 per cent.

Illustrating the frequency of location reported by individual operators, we quote the following:

Location in pylorus, 60 per cent.; fundus, 30 per cent.; cardia, 10 per cent. (Gussenbauer).

Location in pylorus, 54 per cent.; lesser curve, 16 per cent.; cardia, 9 per cent.; anterior wall, 3 per cent.; posterior wall, 4 per cent.; both walls, 4 per cent.; greater curve, 4 per cent.; diffuse, 6 per cent. (Lebert).

Location in 1796 cases: pylorus, 1110; lesser curve, 197; cardia, 158; rest of stomach, 331 (Furnivall).

Age. Seventy-five per cent. between forty and seventy years (Welch).

Age. Any period of adult life; most common forty to sixty years (Mayo Robson, 1903).

Sex. Thirty-six males to twenty-three females.

Metastases. In 59 per cent. (Gussenbauer and Winiwarter).

The frequency of prominent symptoms: In 86.6 per cent. of cases pain is present; in 85.3 per cent. of cases vomiting is present; in 76.6 per cent. of cases tumor is present (Robson, 1903).

Mikulicz, in writing on cancer of stomach, states: Results are unsatisfactory because (1) patients do not seek advice soon enough, but (2) mainly because a sufficiently radical operation is not done. To be radical, the resection must extend up the duodenum five to ten millimetres.

In papillary cancer with a large base, the prognosis is relatively good, as it is least malignant. Since the radical operation takes some time, Schleich's anæsthesia is recommended, which even debilitated patients can stand.

Mikulicz claims that in most cases anastomosis between the duodenum and the stump of the stomach is impossible. Hence he generally closes the duodenum by a purse-string suture and establishes an anastomosis between the inferior angle of the gastric wound and the jejunum. This is simpler, takes less time, and is more rational, since it changes the position of the stomach the least.

Indications for operations in gastric cancer, as given by Mayo Robson (April 25, 1903, *British Medical Journal*):

(1) In irremovable growth at the cardiac end, if it involve the cardiac end and adjacent portion, gastrostomy should be performed in order that starvation may be staved off.

(2) Where the disease involves a great part or the whole of the stomach, is irremovable, and gastro-enterostomy impracticable, and in which any attempt at taking food brings on pain and vomiting, so that the patient must rapidly die in great distress, here a jejunostomy should be performed, and through a Jaques catheter sufficient food can be given to ward off starvation, and relieve the pain caused by attempts at taking

food by the mouth. The operation can be done through the small exploratory incision, and need involve very little longer time.

(3) If the disease produces pyloric obstruction, but where, on account of extreme feebleness, or because of extensive adhesions, secondary growths of involvement of glands, it is considered unwise to attempt pylorectomy or partial gastrectomy, a gastro-enterostomy may be performed.

He concluded as follows: 1. How desirable it is to make an early diagnosis of cancer of the stomach in order that a radical operation may be performed at the earliest possible moment.

2. That it may be needful to perform an exploratory operation in order to complete or confirm the diagnosis.

3. That such exploration may be done with little or no risk in the early stages of the disease.

4. That even where the disease is more advanced and a tumor perceptible, an exploratory operation is, as a rule, still advisable in order to carry out radical or palliative treatment.

5. That where the disease is too extensive for any radical operation to be done, the palliative operation of gastro-enterostomy, which can be done with very small risk, may considerably prolong life and make the remainder of it much more comfortable and happy.

6. That some cases, thought at the time to be cancer, too extensive for removal, may, after gastro-enterostomy, clear up completely and get quite well.

7. That in cases of disease of the cardiac end of the stomach too extensive for removal, the operation of gastro-enterostomy may considerably prolong life and prove of great comfort to the patient by preventing death by starvation.

8. That even where the disease is too extensive either for removal or for a gastro-enterostomy being performed with a fair chance of success, the operation of jejunostomy may occasionally prove of service to the patient.

9. That where a radical operation can be performed, the thorough removal of the disease may bring about as much

relief to the patient as does the operation for the removal of cancer in the breast, uterus, and other organs of the body, and that in some cases a complete cure may follow.

A great improvement in the permanent results can be obtained by recognizing and taking advantage of the "area of immunity from cancer," demonstrated by Mayo. Here we note that, with the exception of 17.4 per cent. of the cases (viz., those occurring in the cardia, 8 per cent.; in the posterior wall, 4.7 per cent.; involving the whole stomach, 4.7 per cent.), cancer involves the pyloric area. This "immune area" can be preserved in gastrectomy, and furthermore all but that portion can be safely removed, permitting the surgeon to go wide of the primary focus, thus diminishing the liability of recurrence *in loco* or in the adjacent glands.

It seems to me, however, that the surgeon has a still greater field, which up to the present time has been grossly neglected, viz., *the prophylaxis of carcinoma of the stomach.* That carcinoma of the stomach can be prevented by the removal or cure of the conditions which lead to its production, it seems to me, is a perfectly justifiable conclusion, from our present knowledge of the pathologic conditions which precede and predispose to produce carcinoma of the stomach.

As shown by the epoch-making article of Professor Von Mikulicz, "Die chirurgische Behandlung des chronischen Magengeschwürs." (*Mittheilungen aus den Grenzgebieten der Medicin und der Chirurgie*). It is estimated that on an average 4 per cent. to 5 per cent. of the race suffer from gastric ulcer, and one-fifth die as a result of these gastric ulcerations. Friedler found in 2200 post-mortems that in 20 per cent. of the women and 1½ per cent. of the men fresh or cicatrized gastric ulcers were present. These ulcers and scars were frequently the seat of carcinomatous degeneration; their proper treatment is, therefore, an important factor in the prophylaxis of carcinoma. That carcinoma is induced or invoked by mild and repeated sub-inflammatory irritations of normal or cicatrical epithelial surfaces is an accepted fact. The other conditions which tend to carcinoma of the stomach are those which prevent the nor-

mal emptying of the viscus, as the retention conditions of the pylorus.

The prophylactic treatment of carcinoma, therefore, involves the early relief and removal of all the conditions which tend to this retention and its sequential gastric irritation. The surgery of these conditions, in the following order, should most concern us at the present time.

The radical removal of the pylorus, even for non-malignant disease, cannot be considered, except for complete occlusions, as it involves a mortality not to be overlooked. However, the relief of the obstructive conditions can be overcome by a safe and very satisfactory operation,—gastro-enterostomy. The results in malignant and non-malignant cases may be gleaned from the following statistics:

GASTRO-ENTEROSTOMY.

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Robson	1900	.....	1978	...	...	36.4
	(This series of 1978 evidently has many duplicates, as it is made by adding up several series of cases.)					
Mayo Brothers	1902	Cancer, etc.	107	97	10	9.0
Chlumsky in cases of Mikulicz	1881–5	Cancer, etc.	35	12	23	65.71
	1886–90	Cancer, etc.	114	61	53	46.47
	1891–6	Cancer, etc.	401	265	136	33.91
To June,	1897	.....	...	...	24	32.5
Czerny	1897	.....	53	(All with Murphy button)	...	24.5
Keen	1898	.....	7	3	4	57.1
Hochenegg	1897	Cicatrices	3	3	...	0.0
	1897	Cancer	3	2	1	33.0
Ewald's Clinic	1894–7	.....	25	9	16	64.0
	1898	.....	11	...	..	64.7
Kappeler	1887–98	31 Cancer, 8 Ulcer, etc.	39	27	12	30.76
Carle and Fantino.	1901	24 Cancer	24	15	9	37.5
	1901	27 Stricture	27	.	1	3.8
	Carle and Fantino's mortality of 3.8 per cent., so much referred to, is for *stricture* only.					
Korte and Herzfeld	1902	Anterior Method	10	7	3	30.0
	1902	Posterior Method	20	16	4	20.0

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Eiselsberg	1897–1900	.....	37	32	5	13.5
Terrier	1902	Cancer and Ulcer	22	21	1	4.54
Kronlein	1902	Cancer	74	...	...	24.3
Murphy	1903	Cancer, Ulcer, etc.	18	15	3	16.6
Hartmann (Paris).	1900	.....	40	32	8	20.0

PERSONAL CASES.

Males, 13. Females, 6. Average age, 41.7 years.

	Males.	Females.	
Pyloric Obstruction	2	2	..
Carcinoma Pylorus	2	..	1 death.
Carcinoma Stomach	4	1	1 death.
Ulcer Stomach	3	1	1 death (continued hæmorrhage).
Dilatation of Stomach	1	1	..
Gastroptosis	1	..	..
Vicious Circle	..	1	..
	13	6	3

Anterior Method	4
Posterior Method	13
Posterior with Entero-enterostomy	1
	18

Average time of passing button, sixteen days.

COMPARISON OF ANTERIOR AND POSTERIOR METHODS.

	Anterior.		Posterior.	
	Cases.	Mortality. Per cent.	Cases.	Mortality. Per cent.
Chlumsky	231	38.09	152	35.52
Mayo (W. J. and C. H.)	83	....	24	.....
	(Results equally good.)			
Kappeler	8	60.0	10	33.0
Carle and Fantino	12	33.0	10	40.0
Korte and Herzfeld	10	33.0	20	40.0
Terrier	..	....	22	4.54

The operative technique was as follows:

Mayo Brothers. Button, either anterior or posterior.

Czerny. Button, posterior.

Kocher. Suture, posterior.

Mikulicz (benign). Suture, anterior.

Mikulicz (malign). Button, anterior.

Carle and Fantino. Posterior only.

Terrier. Posterior only.

Jacobson ("Text-Book of Operative Surgery"). Halsted's method of suture best. Posterior gastro-enterostomy with the button gives as good results as any other method.

Mayo Robson has used the following successfully: (1) Simple suture, (2) Senn's plates, (3) Robson's bobbin, (4) Murphy button. Prefers No. 3.

Keen. In benign cases, slight difference between anterior and posterior methods. In cancer, posterior more desirable. In non-malignant cases, gastro-enterostomy preferable to pyloroplasty.

Monprofit (France) uses the anterior method only when the posterior is contraindicated by the anatomic conditions. The functional results are much more defective than in the posterior or in Y. As between the posterior method and that in Y, the functions are about the same. As Roux's operation (in Y) is more difficult and takes longer, he uses the posterior method in cachectic patients. Silk sutures always; no mechanical devices.

Kappeler resects stomach, if possible, instead of performing gastro-enterostomy.

Hochenegg prefers posterior method, which avoids compression of the colon and kinking of the small intestine.

Gastro-enterostomy may be done as a preliminary operation, as advised by Quénu and Lauenstein. The patient gains in strength, and the tumor, no longer irritated, may decrease in size; so later pylorectomy may be undertaken.

Eiselsberg (1901) in a woman of thirty-four made the following operations in succession: Jejunostomy, gastrotomy, jejunorrhaphy, posterior gastro-enterostomy, and, lastly, gastrorrhaphy. Recovery.

Influence of Gastro-Enterostomy on Gastric Function.—Kovesi. Man of fifty-six years, with lead poisoning, and symptoms of gastric trouble for eight months. Pyloric cicatrix found. Repeated examinations of gastric juice after operation showed acidity and decreased proportion of hydrochloric acid

much lessened. Amylolysis increased; saccharification more complete. The organ, however, remained dilated, and its motor power was but slightly increased. Our personal experience in this non-malignant case was most gratifying, and the operation will be performed with increasing frequency and, I am sure, with great benefit to the patients; in malignant cases it promises but little.

The removal of the pylorus in fibrous stricture or in complete cicatrical closure gives most gratifying results, considering the condition. The general results of pylorectomy for all conditions may be estimated from the following statistics:

PYLORECTOMY.

Author.	Year.	Disease.	Cases.	Recovery.	Deaths.	Mortality. Per cent.
Robson	1900	Cancer, etc.	572	398	174	30.4
Von Hacker-Billroth	1885	Cancer, etc.	18	8	10	55.0
Winslow	1885	Cancer, etc.	59	17	42	71.0
Rydygier	1885	Cancer, etc.	48	17	31	64.0
Jonnesco	1892	Cancer, etc.	130	46	84	65.0
Wölfler	1888–96	Cancer, etc.	219	..	...	31.2
Hahn	1898	Cancer, etc.	28	18	10	35.6
Gussenbauer	1898	Cancer, etc.	13	9	4	35.7
Von Hacker	1898	Cancer, etc.	9	8	1	11.1
Eiselsberg	1897–1900	Cancer, etc.	8	7	1	12.5
Ewald	1894–97	Cancer, etc.	12	3	9	75.0
	1898	Cancer, etc.	6	..	...	62.0
Carle and Fantino	1901	Cancer, etc.	...	...	...	20.0
Hartmann (Paris)	1900	Cancer, etc.	20	15	5	25.0
Brauer	1885	Cancer, etc.	72	17	55	76.0
Kocher	1898	Cancer, etc.	57	52	5	8.78
Maydl	1899	Cancer, etc.	25	21	4	.16.0
Rydygier	1901	Cancer, etc.	25	8	17	66.0
Czerny	1881–98	Cancer, etc.	29	18	11	39.0
Morison	1901	Cancer, etc.	16	9	7	45.0
Kronlein and Schlatter	1881–88	Cancer, etc.	4	1	3	75.0
	1888–98	Cancer, etc.	20	18	2	10.0
(Included is Schlatter's total gastrectomy.)						
Murphy	1903	Cancer, etc.	14	10	4	28.6

KOCHER'S METHOD.

		Cases.	Recovery.	Deaths.	Mortality. Per cent.
Kronlein		19	9	10	....
Czerny		21	13	8	....
Kocher	To 1894	25	21	4	28.6
	since	10	9	1	....
Watten		2	1	1 (pneumonia).	

PERSONAL CASES.

Males, 11. Females, 3. Average age, 40.5 years.

	Males.	Females.	
Carcinoma Pylorus	3	1	2 deaths.
Carcinoma Stomach	1	..	1 death.
Ulcer Stomach	2	..	..
Ulcer Stomach (Perforating)	2	1	1 death.
Pyloric Obstruction	3	..	..
Gastroptosis	..	1	..
	11	3	4

The results in complete gastrectomies are as follows:

1. Conner (Cincinnati); patient died on table.
2. Schlatter (Zurich); lived eleven months.
3. Brigham (San Francisco); alive two years after.
4. Delatour (Brooklyn); alive seventeen months after.
5. Richardson (Boston); died at eleven months.
6. McDonald (Albany); alive eighteen months after.
7. Chavasse (Birmingham); died.
8. Noble (Philadelphia); died on table.
9. Bernays (St. Louis); died thirty-six hours after.
10. Ricord (France); stomach, first part of duodenum, part of pancreas, alive eleven months after.
11. Boeckel; too recent.
12. Harvie; too recent.
13. Dr. Carvalho (Brazil); reported ten days after, alive.

These results are not discouraging, considering the extent of tissue involved at the time of operation.

Effect of Adhesions.—Of 542 cases of carcinoma of the pylorus, in 370 adhesions were present (Gussenbauer and Winiwarter).

If adhesions are extensive, 72.5 per cent. mortality.

If no adhesions, 27.2 per cent. mortality (Haberkant).

Two cases, no adhesions; two recoveries.

Seven cases, slight adhesions; four recoveries; three deaths.

Five cases, extensive adhesions; no recovery; five deaths (Von Hacker and Billroth).

The changes in technique practised by Mr. Moynihan (Leeds) may give better immediate and permanent results. The plan is based on good anatomic lines, and careful consideration has been given the routes of distribution of the cells in the lymph spaces and lymphatic drainage tracts and filter glands.

The results of the various operative techniques may be judged from the following statistics:

Pylorectomy with end-to-end anastomosis, 148 cases; 56 deaths; 37.8 per cent.

Pylorectomy with terminal and lateral anastomosis, 64 cases; 10 deaths; 15.6 per cent.

Pylorectomy with lateral anastomosis, 54 cases; 24 deaths; 44.4 per cent.

Pylorectomy by invagination, 4 cases; 4 deaths; 100 per cent.

Pylorectomy by two stages, 3 cases; 0 deaths; 0 per cent.

Rydygier resects a large portion, two to four inches beyond the apparent limits of the growth.

Hochenegg uses no lavage, thinks it is insufficient, and fatigues the patients. He uses Kocher's method only; believes pylorectomy is always indicated when the tumor is not too adherent, when there are no metastases in the peritoneum or the great omentum, and the patient's condition allows it. Extent of the growth is no contraindication, for Maydl resected three-fourths of the stomach, with a survival of seven years. Nor is adhesion to the pancreas a contraindication any longer.

Hartmann (of Paris). Half of his patients were living at the time of report. He attributes this to a special technique, removing the lesser curvature and the glands along the right branch of the coronary artery, as follows: The stomach is pulled forward, the right branch of coronary is ligated, elastic forceps are then placed protecting the greater tuberosity and the cardia. The pylorus is thrown back on the right lip of the

incision, and the gastroduodenalis is found at the bottom of the pancreaticoduodenal groove and ligated. The diseased mass is then removed.

Kocher. If many adhesions exist, circular resection is less dangerous than excision of ulcer. In suspected cancer, when in doubt, operate. Advocates resection of pylorus with absolute closure of wound, then make a posterior gastro-enterostomy.

"If we do not prolong life by a single day, the operation is still justified, in my eyes." (Mikulicz.)

Rydygier (*Revue de Chirurgie Abdominale*, 1901) gives details of a case of pylorectomy in a woman of forty-nine, operated on nineteen years before for ulcer penetrating the pancreas, a part of which was excised. By removing a conical segment of the posterior wall of the duodenum, direct suture of the stomach and duodenum was possible without folds. The patient's digestion is very good, and she works hard. Five accouchements since operation.

The rapid gains in weight and the complete restoration in health in the non-malignant pylorectomies make one think seriously of pylorectomy in place of pyloroplasty, at least, as it has been performed. The permanent results of pyloroplasty have been anything but gratifying. If pyloroplasty is to become one of the standard operations, it must be so performed that no adhesion or fixation of the pylorus to the anterior abdominal wall follows it as a second pathologic condition.

The results of stomach operations in general are seen in the following statistics:

Guinard, of Paris (*Revue de Gynécologie*, 1896). Mortality has been steadily lessening, as shown by the following collected cases:

Author.	Year.	Cases Corrected.	Recovered.	Died.	Mortality. Per cent.
Hahn	1883	27	4	23	85.18
Kramer	1885	72	17	55	69.9
McArdle	1887	62	27	35	56.4
Guinard	1891	149	63	86	57.71
Zeller	1892	117	54	62	53.0
Haberkant	1894	207	114	93	54.4
Wölfler, 1896, experience of fifteen German surgeons:					
		92 cases before 1888			56.4
		173 cases, 1888–96			31.2

In 75 cases, Mikulicz found 29 inoperable; in 17 more, exploratory incision being made, they were found inoperable also; in 21 gastro-enterostomy was done; in 8, resection.

Doyen has made 146 operations for stomach diseases, with 22 deaths. In 66 cases of carcinoma, 20 died. Prefers Roux's method (gastro-enterostomy in Y).

Stendel. Stomach operations, Czerny's Clinic. Up to the end of 1897, 192 operations were performed (not including gastrostomies), with an average mortality of 29 per cent.

Years.	Pylorectomies.	Gastro-Enterostomies.	Pyloroplasties.	Exploratory Laparotomies.	Other Operations on Stomach.	Total.	Mortality. Per cent.
1881–89	13	14	0	11	4	49	4.5
1890–93	7	17	3	5	2	34	18.0
1894–95	2	23	7	8	4	44	27.0
1896	4	28	1	2	0	35	34.0
1897	3	28	0	4	2	37	16.0
1881–97	29	110	11	30	12	199	29.0

In feeble subjects, Czerny has tried to divide the operation into two stages,—gastro-enterostomy and then pylorectomy. Patients, however, nearly always refused to submit to the latter until too late.

No pyloroplasties since 1896 on account of bad results.

Since June, 1896, sutures have been abandoned in favor of the Murphy button. In 53 gastro-enterostomies with the button, the mortality was 24.5 per cent. In gastro-enterostomy with suture it was 36.8 per cent.

Stomach Operations.—Chlumsky. (Mikulicz's Clinic.) June, 1897–August, 1898. Seventy-eight gastro-enterostomies; 21 died in first 30 days (26.92 per cent.).

1884–1899. One hundred and fifty-five gastric operations; 45 died in first 30 days (29.60 per cent.). One hundred and fifteen malignant growths; 40 died (34.78 per cent.). Thirty-four ulcers; benign strictures; 2 died (5.87 per cent.). First 4 per cent. by Wölfler's method.

"1891–1896. Von Hacker's method alone used. In all 13 per cent. by Wölfler's method, 5 deaths. Forty-three per cent. by Von Hacker's method, 14 deaths.

STATED MEETING, JUNE 1, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair,

CASES ILLUSTRATING FRACTURE IN THE LOWER ANIMALS.

DR. W. BARTON HOPKINS exhibited for Dr. Charles B. Penrose and himself two specimens. The first was the femur of a deer which had been shot by Dr. Penrose, the bone showing the results of an old gunshot fracture.

Fractured Left Humerus of a Black-Tail Deer.—This animal was shot in the Sawtooth Mountains of Idaho during the last part of September, 1901. Horns had started, and the animal was therefore probably born in the spring of 1900, being at the time of death about fifteen or sixteen months of age. He was with two other deer, and appeared to get along as easily and as quickly as they did. There was no external mark on the skin to show the old wound. The skin was adherent over area about size of little finger-nail to the mass of callus. Tissues around seat of fracture were healthy, showed no signs of acute inflammation. A few drops of thick purulent material were found in a small pocket of fibrous tissue. Several small fragments of lead about size of No. 9 shot were found in fibrous tissue surrounding callus, and one free spicule of bone about one-half inch long by one-third inch wide, which was not united to humerus or to callus.

This animal had probably been shot the previous year in September, the open season, when a fawn. The uninjured right humerus was preserved for comparison. The animal was in as good condition as any of the eleven or twelve deer which were shot in that region.

The second specimen represents a gunshot fracture of the tibia of an apparently healthy duck, of perhaps two or three months' standing. When the bird was killed, the wounds of entrance and exit were still open, the limb was very much swollen,

and was shortened. There was no union of fragments. Preparation of the bones demonstrated excessive formation of callus about the seat of fracture.

Both of these specimens illustrate how motion at the seat of fracture produces excessive callus, the deposition at the latter being further increased if great deformity is present. In the one, the humerus of the deer, the mass of callus finally prevented motion and firm union resulted; in the other, the tibia of the duck, a like result would probably in time have occurred had the bird lived. Both specimens are interesting examples of gunshot fracture in the lower animals.

DR. W. BARTON HOPKINS said that the specimen showed very firm consolidation of the fracture. Compared with the corresponding bone of the opposite side, it is seen that practically no rotation of the fragments has occurred. There is shortening, angularity, and marked overlapping, but no rotation. This may be attributable to the position of the humerus in the deer, which is well up against the thorax and supported by it.

DR. JOHN H. BRINTON asked if any hypothesis could be hazarded as to the condition and possible position of the deer for the two or three weeks immediately following the injury. He then cited an instance of callus formation in a dog. Treatment was suggested a week after the animal had received a fracture of the leg. By that time an enormous amount of callus had been formed around the site of fracture. A plaster dressing was applied to immobilize the parts. In eight or nine days this became loose and a new one was supplied. It was then found that the excessive amount of callus had been almost entirely absorbed, this process taking place rapidly, as soon as the cast performed the work of the callus. This instance suggested that union in fractures of human bone may be more rapid than is usually thought. In replying to Dr. Brinton's question, Dr. Hopkins said that it must be assumed that an agile animal like the deer would do as a dog does under like circumstances,—go on three legs as long as there was pain in the injured limb. The probability in this case is that the deer kept his foot off the ground until healing of the fracture took place.

AN APPARATUS FOR MAKING TRACTION UPON THE KNEE FOR THE REDUCTION OF DISLOCATION OF THE HIP.

Dr. Oscar H. Allis exhibited an appliance which consists of two flanges that fit the thigh and a parallel bar on each side that can be pushed away from the inner flanged portion. The thigh is first bandaged, the apparatus applied, and several turns of bandage taken around the entire apparatus. By means of two thumb-screws on each side, the parallel bars are then pushed away from the flanges, and the bandages around them and the leg are made as tight as desired. If traction loosens the bandage, as it practically always does, a turn of the screws makes it tight again, this being the valuable feature of the apparatus. The bars carrying the flanges are prolonged in front and carry a transverse handle between their ends.

Dr. W. Barton Hopkins, on whose leg the apparatus had been applied for purposes of demonstration, said that after feeling it on his thigh he had one suggestion to offer regarding its improvement. He would prolong the handle about eight inches on each end and terminate it with knobs. This leverage would afford a powerful means of rotation when added to the purchase of the instrument on the leg.

Dr. Allis, in reply to the suggestion of Dr. Hopkins, said that the leverage exerted by one hand holding the ankle while the other made traction upon the instrument was sufficient, and was more safe than would be the powerful rotation afforded by the expedient suggested. The experience of many surgeons is that occasionally a case is found in which reduction of the dislocation is impossible. Bigelow has dealt with such cases by throwing the head of the femur in such a way as to tear the ligaments. With the apparatus exhibited, and the one hand manipulating the ankle, the bone can be teased back into its proper place in the same line in which it passed out and without the use of undue force and the risk of fracture.

AN ACCIDENTAL CURE OF A CASE OF PAPILLOMA OF THE BLADDER.

Dr. Orville Horwitz reported the case of a man who was first seen by him in consultation with Dr. Louis Breechman in September, 1897. He was then sixty-three years of age. He

stated that for two years he had occasionally noticed that he passed bloody urine, unaccompanied by any other symptom. The blood at first voided was small in quantity. As time went on the attacks of hæmaturia became very frequent, and the amount of blood lost was greater. Occasionally a good-sized clot would be passed. During the past three months there has been an increased frequency of micturition; the urine being voided about every three hours during the day and twice at night. This condition has never been attended with pain. The patient stated that at the outset of his complaint the blood was passed infrequently, that the urine was blood-stained, and had continued so for many weeks. He observed that the voidance of bloody urine was apt to follow over-exertion, constipation, or coition.

Examination of the urine showed it to be cloudy, alkaline, with a deposit of pus and phosphates, together with mucous threads accompanied by clots of blood. Albumen was present in large quantities. Examination by the microscope revealed pus and epithelial cells in large quantities together with crystals of hæmatobin. No casts were found.

The cystoscopic examination detected a large pedunculated papilloma in the vicinity of the left ureteral orifice. An operation was advised, which was positively declined. The hæmaturia abated under hygienic, local, and constitutional treatment. The cystitis decreased, and the individual enjoyed a period of three or four months of comparative comfort. Occasionally there would be a slight trace of blood in the urine, but the amount was so much lessened as to cause but little apprehension on the part of the individual, whose general health was excellent.

Whilst absent from the city during the summer, Dr. Horwitz's assistant was called to visit the patient, who was suffering with an attack of retention of urine caused by a blood-clot, the attack having followed a long walk in the country. Three similar attacks occurred within the next year, each having followed over-exertion. The first two were relieved with much difficulty; on the third occasion retention of urine had existed for fourteen hours. Every effort had been made to evacuate the contents of the bladder without success. The patient was in great pain, walking up and down the room, with the body bent well forward, so as to relieve the pressure on the bladder as much as possible. A well-marked pyriform tumor existed above the pubic bone ex-

tending nearly as far up as the umbilicus. A catheter could be readily inserted by way of the urethra into the bladder, but, owing to the presence of the blood-clot, no urine could be evacuated. The over-curved catheter of Brodie, the blood catheter of Gross, and the evacuating tube of the Bigelow apparatus were each employed without relief. The patient positively declined to permit the use of either aspiration or suprapubic cystotomy. As a last resort, a small sized Thomson's lithotrite was introduced and an effort made to crush and churn up the clots in the bladder, emptying the contents from time to time by means of the evacuating catheter of the Bigelow apparatus, and washing out the viscus with a 5 per cent. hot suprarenal solution. After a manipulation for the space of an hour and a half, the bladder was finally emptied; irrigation with a hot suprarenal solution and continuous drainage were instituted by means of a soft catheter. Large doses of ergot were administered. There was no future trouble from retention of urine, which continued to be streaked with blood for about a week.

Two days after the relief by this manipulation, he began to void what he described as "large pieces of stringy flesh," which followed each act of micturition. An examination of the material showed it to be a portion of the villous growth which had evidently been crushed or torn off whilst attempting to break up the blood-clot. The débris continued to pass for about one week after the attack of retention, and was accompanied by acute cystitis; from this the patient gradually recovered, the inflammatory symptoms subsiding, the urine becoming clear, and all signs of vesical irritability disappearing.

Up to the present time the patient has enjoyed excellent health. There has been no return of either hæmorrhage or vesical irritability.

Unfortunately, after convalescence, a cystoscopic examination was not permitted, so that it can only be surmised that in attempting to break up the clot by means of the stone-crusher the tumor was either torn from its attachment to the bladder-wall or so injured that decay of the foreign mass took place, when it sloughed and was discharged with the urine.

STATED MEETING, OCTOBER 5, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

THREE CASES OF PERFORATED GASTRIC ULCER AND ONE CASE OF PERFORATED DUODENAL ULCER.

DR. JOHN H. GIBBON reported these cases, all of them having been operated upon during the present year.

CASE I.—A healthy-looking young man, eighteen years of age, was sent into the Bryn Mawr Hospital, January 12, 1903, by Dr. T. F. Branson, of Rosemont, and operated upon on January 13, 1903. The patient had been well except for some gastric discomfort, until the day of admission, when he was suddenly seized with severe abdominal pain. The sudden onset of pain occurred at 5.30 P.M. Dr. Branson saw the patient at 9.30 P.M., and Dr. Gibbon operated at 9.30 the next morning. When the abdomen was opened considerable flocculent fluid was found and the pelvis filled with it. The appendix was long, slightly adherent, and considerably inflamed. There was, however, no lymph about it, and it was not in a sufficiently bad condition to have been the cause of the general inflammation. The ileum was examined and found normal. Exploration was then carried up the colon, and the hepatic flexure with the omentum in its neighborhood was found covered with lymph. The incision was extended to the costal border and the duodenum found to be covered with lymph. When a portion of this was removed, a perforation into which a duck-shot could have been placed was found in the first portion of the duodenum. The perforation was inverted with difficulty because of the friability of the tissue surrounding it. However, three sutures deeply placed inverted it. The cavity was thoroughly irrigated with salt solution. Iodoform gauze was packed about the duodenum and hepatic flexure of the colon. The body of the stomach appeared normal. A gauze drain was then introduced into the pelvic cavity and the wound closed in layers. The patient was in an extremely bad

condition during the latter part of the operation, requiring the administration of oxygen: he, however, recovered promptly, and seemed in good condition a short time after the operation. The wound became infected and necessitated the removal of a number of the sutures. The gauze packing was gradually removed and the wound ultimately closed. The patient was fed by the rectum for three weeks, receiving nothing by the mouth excepting small quantities of water. An exception to this diet, however, occurred about two weeks after the operation, when he obtained and ate two and a half sticks of peppermint candy. This, however, produced no trouble, and he was discharged on February 27, 1903. After the operation it was revealed that the patient had had attacks of pain in the abdomen, but never sufficient to require a medical attendant. He suffered from pneumonia one year before operation, had never had typhoid fever, and had never been burned. He has been seen a number of times since his operation and has been perfectly well. He eats everything and suffers no discomfort. He has no hernia.

The interesting points in this case are: the fact that there was nothing in the patient's previous history which could possibly indicate a duodenal ulcer; the attacks of pain which have been spoken of were believed to have been due to the appendix. He had never had attacks of vomiting nor had he ever passed blood by the bowel. His pain and rigidity were present to a marked degree over the lower half of the abdomen, but more especially on the right side, and therefore the diagnosis of a perforative appendicitis seemed the most likely one. Another interesting point in the case is the length of time which the patient was kept upon rectal feeding. The rectal enemata consisted entirely of malted milk, which was suggested by Dr. Walter Chrystie, who had found it to be well retained and non-irritative.

Case II.—A rather emaciated man of about fifty years, seen in consultation with Drs. Patrick and Sharpless, of West Chester, Pennsylvania. This patient had for several years been under the care of Dr. Patrick, who had treated him for gastric trouble. On Friday, April 6, 1903, at three o'clock, the patient, in lifting a buggy, was suddenly seized with excruciating pain in the upper part of the abdomen. Dr. Patrick did not see him until late the same evening, when he was somewhat more comfortable, the result of a hypodermic injection of morphia which had been

given. Dr. Sharpless saw the patient with Dr. Patrick, and agreed in the diagnosis of perforated gastric ulcer. The patient's family, however, would not consent to his removal to a hospital or to a surgeon seeing him until the afternoon following the perforation. He was seen by Dr. Gibbon first at ten o'clock on Saturday evening, thirty-three hours after the perforation had occurred. At this time he presented all the symptoms of a general peritonitis; the abdomen was distended, rigid, and painful, especially over the upper portion; the temperature had risen to about 101° F. and the pulse was 130 and weak. The patient was sweating and his facial expression was that of peritonitis. Two hours were consumed in obtaining consent for the operation from the patient's family and in removing him to the West Chester Hospital, which was but a short distance from his home. The operation was performed at midnight. When the abdomen was opened, a large quantity of yellowish fluid escaped with considerable gas. A large perforation was readily found in the anterior wall of the stomach at the greater curvature near the pylorus. The perforation was sufficiently large to admit the tip of the little finger. Because of its size the perforation was closed with considerable difficulty with catgut sutures. The stomach and the liver in its neighborhood were covered with thick lymph. After the closure of the perforation a second opening was made above the pubes and the pelvic cavity found to contain a large amount of fluid. The whole abdominal cavity was thoroughly irrigated with salt solution. In spite of stimulation, the patient's condition on the table became extremely bad. Gauze drainage was introduced into the pelvis and down to the site of perforation. Immediately after the operation a quart of salt solution was introduced into the patient's circulation. After the operation consciousness was promptly regained, and he was quite comfortable for several hours. In spite of stimulation, however, he died eleven hours after operation.

Case III.—An anæmic girl of seventeen years was sent into the Bryn Mawr Hospital by Dr. George MacLeod on the first of May, 1903, and was operated upon the same day four hours after admission, about seven hours after Dr. MacLeod saw her. She was taken ill with pain in the abdomen about thirty-six hours before admission, but this did not become severe until about eight hours before admission, when she was greatly collapsed. Upon

her admission the abdomen was slightly distended, and there was exquisite tenderness on the left side, and the left rectus muscle was absolutely rigid. It was stated that a mass could be felt in the pelvis by rectal examination. The patient's temperature was 100° F. and pulse 116. No history of previous gastric symptoms could be elicited; because, however, of the suddenness of the attack and the localized point of tenderness on the left side near the umbilicus the reporter concluded that he had probably to do with a perforated gastric ulcer. The abdomen was opened below the umbilicus and the pelvis found to contain a quantity of dark yellow fluid containing flakes of lymph. The omentum above this incision was found adherent to the abdominal wall, therefore a second opening was made in a median line above the umbilicus. A perforation was found in the anterior wall of the stomach near the pylorus and lesser curvature: it was about one-quarter of an inch wide and three-eighths of an inch long. It was closed without difficulty with catgut sutures. The extravasation of fluid had been so extensive in this case that all of the small intestine was removed from the abdominal cavity and a most thorough irrigation with hot solution performed. A plain gauze drain was introduced into the pelvis and several iodoform gauze drains placed in the upper part of the upper wound, one being put directly over the point of perforation. The patient's condition on the table was bad, but she responded promptly to stimulation. The after-treatment was the same as in the first case, and the patient did well for about two weeks, when she showed some symptoms of obstruction of the bowel, which were accompanied by a rise in temperature and considerable abdominal pain. These symptoms progressed until it was quite evident that to relieve them the abdomen must again be opened. At this time, the seventeenth day after the first operation, the upper wound had practically healed, but there was still some discharge of pus from the lower wound. The gauze drain at this time did not extend deeply. The patient was anæsthetized and the lower wound reopened. The small intestine was found matted together in a number of places, but in one place there was a distinct kink which might readily have produced all the symptoms of obstruction. In addition to this condition, however, it was found that the lower part of the pelvis was filled with foul pus. After liberating the adherent cavity and thoroughly irrigating the pelvic cavity drainage was introduced and

the patient returned to bed. After the operation she improved somewhat, but died from sepsis on the seventh day after the second operation and the twenty-fourth day after the first operation.

This case was one of subacute perforation with the discharge of the gastric contents into the pelvis, and, but for the complication which arose two weeks after the operation, the patient would have recovered, and this complication was the result solely of failure to reintroduce the pelvic packing sufficiently deep to keep up drainage. It is often difficult to reintroduce the packing as deep as it ought to go, and surgeons are too frequently content to get it simply within the peritoneal cavity.

Case IV.—This patient, a man forty-five years of age, was admitted to the Pennsylvania Hospital on October 1, 1903, and was operated upon immediately. He had suffered for five years from what was supposed to be a duodenal ulcer; he was under the care of several capable men who carried out a rigid treatment. Previous to his admission he had been in bed for a number of weeks on rectal feeding, but during the past week has been allowed soft diet. He had never vomited blood until recently, but had vomited dark material, and melæna had been marked. At six o'clock on the morning of the day of his admission to the hospital, after a comfortable night, he was suddenly seized with severe pain in the epigastrium, accompanied by marked rigidity but no vomiting. Between seven and eight o'clock he was given two one-quarter of a grain doses of morphia hypodermically and then brought to the Pennsylvania Hospital from his home in Moorestown, New Jersey. When first seen by Dr. Gibbon at 2 P.M., his pulse was 112, respiration 24 and entirely costal, and temperature about normal. Soon after the onset of pain in the early morning his temperature was subnormal. His facial expression was bad, though he was not sweating. The abdominal wall was rigid, especially on the right side, in spite of the morphia which he had received. He was unable to pass his urine, though he had no pain in the lower portion of his stomach. There was a point of tenderness in the epigastrium. When the abdomen was opened through the right rectus muscle a quantity of yellowish fluid containing small flakes of lymph escaped. The gastrocolic omentum was slightly adherent on the right side; the great omentum, however, was entirely free excepting over the right kidney, where it apparently had been adherent for a long time. The

duodenum was quite free, and there was no evidence of ulceration in it. On the anterior wall of the stomach, however, about one and a half inches or two inches from the pylorus, and just bordering on the lesser curvature, there was an area covered with lymph, which was removed and two points of perforation about the size of a head of a pin discovered. The lesser omentum was extensively adherent around the ulcer. Because of the situation of the ulcer exactly at the lesser curvature, it was difficult to close it, and in doing so the operator was obliged to utilize the lesser omentum, sewing it firmly to the gastric wall beyond the perforation. The abdominal cavity was then irrigated throughout, a small suprapubic opening being made and a glass drainage tube introduced to the depth of the pelvis. A large gauze drain was placed over the point of perforation and the upper wound partially closed. The lower wound was drained with a glass tube, into which was passed a gauze wick. The operation required thirty minutes, and the patient stood it very well. He was anæsthetized first with chloride of ethyl, which was followed by ether. At the end of the operation his pulse was 120, his temperature a little above the normal, and he was in fairly good general condition. It seemed evident, from the appearance of the adhesions about the ulcer, that an earlier perforation had been prevented by the adherence of omentum, and that with the progression of the ulceration the omentum proved an insufficient control. It seemed wise to do a thorough irrigation of the abdominal cavity because there was considerable free fluid, and the pelvis was drained because a number of pieces of lymph passed up through the tube during the irrigation.

October 10.—Tube has been removed from pelvis and gauze drain in upper wound changed twice. Temperature has been normal for a number of days, and there has not been a single bad symptom since operation. The rectal feeding continues satisfactory, and the patient bids fair to make a satisfactory recovery.

Dr. William L. Rodman said that gastro-enterostomy is hardly radical enough for the treatment of non-perforating gastric ulcer. It is not certain that it will relieve hæmorrhage; it does not remove the lesion; it does not enable the surgeon to determine if there be more than one ulcer; and it does not get rid of cicatrices which later on may undergo malignant degeneration. According to the best authorities at least 6 per cent. of gastric ulcers

terminate in carcinoma. The frequency of perforation, hæmorrhage, and other complications of ulcer, many of them occurring most unexpectedly, would make it seem wise in the future to excise the ulcer-bearing area before such complications occur. This can be done without great difficulty or risk of danger, as in probably 80 per cent. of all cases the ulcers are near the pylorus and the lesser curvature of the stomach, and can easily be excised at one time. The mortality from this operation should not be more than from 5 to 10 per cent., while the mortality from gastric ulcers treated by medical means is known to be much higher, some writers placing it as high as 50 per cent. Dr. Rodman closed by asserting his belief that the future treatment of gastric ulcer should be largely operative, and consists in excision of the ulcer-bearing area instead of simply the ulcer itself. In his advocacy of this method at recent meetings of national societies, he has found that similar views are held by many eminent surgeons.

Dr. Morris J. Lewis stated that he had seen in consultation with Dr. J. A. Scott, one year ago, the fourth case reported by Dr. Gibbon towards the close of the patient's fourth attack. At this time the symptoms, it was thought, pointed rather more to duodenal than to gastric ulcer. There had been epigastric distress coming on some time after eating, and blood in the evacuations, with some nausea, but without vomiting. During the summer the patient improved greatly and gained fifty pounds in weight. One month ago, symptoms of trouble reappeared; there was pain two or three hours after eating, and vomiting of blood. Under rectal feeding the symptoms ameliorated, but one week after recommencing very careful feeding by the stomach the patient awoke with excruciating pain in the left shoulder-blade, which soon transferred itself to the cardiac region and then to the epigastrium, when the diagnosis of perforation was made and the patient brought to the hospital.

Pain in the scapular region as a symptom of gastric perforation is unusual, and worth remembering.

Dr. J. Alison Scott said that the physical signs in the case referred to by Dr. Lewis presented some interesting points in diagnosis, it being distinctly an atypical case, if one is to believe text-book statements. It is stated that gastric ulcer is found in cases of extreme hyperacidity, and that the result of an old ulcer is usually puckering of the tissues, resulting in more or less

obstruction of the pylorus. Hence we should expect to find a dilated stomach and hyperacidity of its contents. In the case under consideration there was not only the absence of hyperacidity, but there was actually anacidity, and the patient's stomach was absolutely normal in size. These points, in conjunction with the facts that there was no vomiting, and that the blood in the stools was fully digested and recognized only by chemical tests, made the diagnosis of gastric ulcer in the early stages of the case extremely difficult. The history during the month preceding perforation, although he did not then see the case, was more that of the typical symptoms of gastric ulcer. Dr. Scott believes that cases of gastric ulcer are not so common in this country as in England. In a somewhat extensive hospital experience he has not seen more than ten to fifteen cases, and has never in his hospital or private practice been in charge of a case when perforation occurred.

Dr. Addinell Hewson said that the presence of fluid in the lower right portion of the abdomen, and the consequent rigidity of the abdominal wall in that region as found by Dr. Gibbon in his cases, can be explained by the anatomical relations of the involved structures. The attachment of the mesentery extends downward from left to right, and the omentum in its projection downward from the stomach extends more to the left than to the right. The mesentery is attached to the posterior abdominal wall, the intestines occupy the space forward, and the duodenum, under the greater curve of the stomach and the omentum, fills in the interval between. Hence fluid from the perforations in question will first pass downward on the right side. Later it may pass upward and towards the left, but not until the lower right portions of the abdomen are occupied by the fluid which follows the posterior attachment of the mesentery to the parietal peritoneum. When the perforation is on the posterior wall of the stomach, the course would not be the same were it not for the fact that the mesenteric attachment of the pyloric end is not so long as that of the cardiac end. Even when the fluid comes from a perforation on the ventral wall of the stomach, it is possible for it to take the same direction as when it comes from the duodenum or the pylorus or the posterior wall.

Dr. Francis T. Stewart reported two cases of perforation of the stomach operated upon with recovery of both. The first was that of an apparently healthy bar-tender aged twenty-four years,

who had never suffered from indigestion, and who had never vomited blood or passed blood from the bowel. Soon after taking a hearty dinner of lamb chops and peas the patient was seized with severe pain in the epigastric and umbilical regions, and later vomited the materials composing the dinner, but no blood. When seen soon after there was general tenderness and rigidity, but most marked over the right upper quadrant of the abdomen. Liver-dulness was present, and there was no dulness in the flanks. The leucocyte count was 18,000, and within an hour rose to 19,000. Blood-pressure was 235. A diagnosis of perforated gastric ulcer was made and operation performed five hours after its occurrence. A perforation one-eighth inch in diameter was found one-half inch from the pylorus near the greater curvature of the stomach. It was closed with a purse-string suture reinforced by Lembert sutures. A second abdominal incision for drainage was made below the umbilicus. Recovery followed.

The second case was that of a gunshot wound of the stomach in a boy of eleven years, the bullet having entered below the costal arch on the left side. When the patient was seen four hours after the injury there was abdominal rigidity, though neither this nor tenderness was marked; liver-dulness was present, and there was no dulness in the flanks. There was no vomiting. Operation was performed four hours after the injury was received. The bullet had passed through the stomach near the cardiac end. Both wounds were closed by purse-string, reinforced by Lembert, sutures; the abdomen closed without drainage, and the bullet removed from where it was lodged immediately beneath the skin of the back. Both patients made uneventful recoveries.

Dr. Gibbon, in closing, emphasized strongly a point mentioned in his paper, namely, the extensive induration of the stomach wall in his fourth case. He referred to the number of cases of supposed gastric cancer, reported as such, in which gastro-enterostomy has been followed by recovery and apparently by the disappearance of the cancer. These probably have been cases of ulcer with pronounced induration. In the case in question, Dr. Gibbon believes that if the induration present had been in the pylorus he would have pronounced it malignant. He recalled the case of a woman upon whom he had operated, and who had a clear history of gastric ulcer some ten or twelve years previous. When he saw the patient she was vomiting, and pre-

sented other symptoms of acute obstruction of the pylorus. Operation revealed a mass that was thought to be pyloric carcinoma. The patient was anæmic and in bad general condition, and gastro-enterostomy was performed with the idea of doing a subsequent pylorectomy if the patient's condition improved sufficiently to warrant that operation. She vomited a great deal after the operation, and did not do well for a time, but finally made a good recovery. Her condition now is satisfactory enough to support the hope that the pyloric mass was only an extensive infiltration around an old gastric ulcer.

TWO CASES OF PERFORATION DURING TYPHOID FEVER TREATED BY OPERATION ENDING IN RECOVERY.

Dr. Robert G. Le Conte said that in reporting these two cases, and referring to a third one, the three having been operated upon last month at the Pennsylvania Hospital, he did not wish to give the impression that the operative cases of that institution are always successful. Their statistics in this dreaded complication are just as bad as those of other hospitals, and it is simply a coincidence that two cases following each other should have been successful. The third case mentioned occurred in the service of Dr. Gibbon, which recovered from the primary operation, but died ten days later from a secondary perforation.

Case I.—J. S., hatmaker, Russian Jew, aged thirty-eight years, was admitted to the Pennsylvania Hospital July 21, 1903. Owing to his nationality, it could be learned only that the patient had been ill in bed four weeks with fever. He was evidently suffering from an attack of typhoid fever of moderate severity. On admission his temperature was $102^{2}/_{5}$° F.; respirations, 32; pulse 108, regular but weak. Tongue moist, slightly coated, very tremulous; lips covered with sordes; abdomen soft, rounded, no tenderness and no spots. Spleen easily palpable but not tender. Urine showed faint trace of albumen without casts. The day after admission a Widal test was made, and another five days later, both proving negative. The fever ran a moderate course, and twelve days after admission the temperature touched normal for the first time. The convalescence from this time on was uninterrupted, and the patient left the hospital August 17, fifty-six days after the onset of the attack.

He was readmitted to the medical wards under the care of

Dr. Stengel, September 8, 1903, twenty-two days after his discharge from the hospital, complaining that for the past few days he again had fever and felt badly. The temperature was $103^{3}/_{5}$° F.; pulse, 112; respirations, 28; tongue coated white, edges and tip red, very tremulous; a few râles posteriorly on the right side of the chest. Spleen enlarged, palpable, and tender; abdomen well rounded, soft, flabby, slightly tender, with a few suspicious rose spots. Urine, slight trace of albumen and a few hyaline and granular casts. A Widal test was suggestive but not positive. For a week the man went through a moderately severe relapse, with quite marked hebetude. He received thirteen baths and fourteen sponges, one alternating with the other when his temperature rose to 102° F. or over. On the evening of the 15th of September, the eighth day after admission, he informed the night nurse that he had had pain in the abdomen for the greater part of the day, but that it did not become severe until 7.30 P.M. At five o'clock that day his temperature was $101^{1}/_{5}$° F., and at 9 P.M. it had fallen to $97^{4}/_{5}$°; respirations, 24; pulse, 100. At 10.30 the patient broke into a profuse perspiration, with shallow respirations and anxious expression. At this time the temperature was $97^{3}/_{5}$° F.; pulse, 140; respirations, 40; abdomen tympanitic, rigid, and tender, especially on the right side. A diagnosis of perforation was made, but permission for operation was delayed until friends could be communicated with. At 2 A.M., September 16, ether was administered, and a three-inch incison made in the right semilunar line below the umbilicus. This was three hours and a half after the patient showed signs of collapse, six hours and a half after the onset of severe pain, and perhaps fifteen or eighteen hours from the first pain noticed. On opening the abdomen, some cloudy, non-odorous fluid escaped. The cæcum immediately presented. It was brought out of the abdomen and a search for perforation was begun at the ileocæcal valve. About eight inches from the cæcum a large inflamed Peyer's patch was found in the ileum, with a perforation in the centre about the size of the lead in a pencil. This was invaginated with a running Lembert suture of silk reinforced with three or four interrupted Lembert sutures. No other inflamed areas were discovered on the bowel. The pelvis contained some turbid fluid, but no lymph flakes. The operating table was tilted so that fluids would gravitate to the pelvis and to the right side of the

abdomen while the cavity was being irrigated with salt solution. The pelvis was then mopped dry, a rubber tube inserted to the bottom, and five wicks of gauze were run in various directions between the coils of intestine to a distance of two or three inches from the wound. One suture was then passed through the wound and tied to retain the intestines within the abdominal cavity, the remainder of the incision being filled with gauze. Time of operation, thirty minutes. The patient reacted well, and vomited once a small amount of dark brown liquid. Temperature immediately after operation, $98^{2}/_{5}$° F.; pulse, 128; respirations, 40. The convalescence was uninterrupted, but movements of the bowels had to be secured by enemata of soap and water. The gauze wicks were removed forty-eight hours after operation and the tube leading to the pelvis on the seventh day. The latter was replaced by a narrow wick of iodoform gauze. The temperature reached normal eight days after operation, and convalescence was uninterrupted. Cultures taken from the peritoneal fluid at the time of operation showed numerous streptococci pyogenes, and also a few streptococci pyogenes aureus.

It will be noted that in this case at the time of his first attack of fever the Widal reaction proved negative, and during the relapse the Widal was only suggestive, and not positive.

Case II.—A. G., Russian laborer, aged twenty-one years, was admitted to the Pennsylvania Hospital August 25, under the care of Dr. Stengel. He had been ill for ten days previously with fever, headache, slight cough, and hebetude. Examination revealed a well-built, well-nourished man; tongue coated, edges and tip red; a few râles in the upper lobe of the right lung, with slightly diminished resonance. Abdomen well-rounded, tympanitic, soft, with slight tenderness, and no pain. Spleen enlarged, palpable, and tender. Surface of abdomen and chest showed several rose spots. Urine contained trace of albumen and a few hyaline casts. Widal test positive. His temperature shortly after admission was $104^{4}/_{5}$° F.; pulse, 104; respirations, 24. Tubing was resorted to each time the temperature reached 102° or over, and in the next six days he received twenty-eight baths. At this time, estimated the sixteenth day of the disease, immediately after a bath at 6 P.M., he complained of sharp pain in the right side of the abdomen, with rigidity and tenderness. There was no vomiting. A blood-count an hour later showed 9600 leucocytes. Pain

and tenderness at this time had increased, and also the rigidity. Temperature was 100° F.; pulse, 110; respirations, 24. At 11 P.M., four and a half hours after the onset of pain, operation was undertaken by Dr. Mitchell in the absence of Dr. Le Conte. Ether was administered, and a three-inch incision made in the right semilunar line below the umbilicus. A slight amount of turbid fluid escaped. One foot from the cæcum a large necrotic ulcer was seen, with a small perforation about the size of the head of a pin, from which a small amount of gas was escaping. Very little lymph was present, and no attempt at walling off. The perforation was inverted with two rows of Lembert sutures, abdominal cavity washed out with salt solution, and a gauze wick inserted in the pelvis and another at the site of perforation; wound partially closed with through-and-through silkworm-gut sutures.

After operation reaction was good; no vomiting; temperature rose rather rapidly to 104° F. and then subsided gradually, so that by the seventh day it reached normal for the first time. The abdomen continued soft without distention. Bowels moved with enemata. Packing was finally removed on the eighth day after operation. After the temperature had been normal for ten days there was again a rise, with signs of a relapse of fever. This continued for sixteen days, during which time he received thirty-four spongings, when the temperature was 102° F. and over. Convalescence is now again established.

The successful results obtained in these two cases are unquestionably due to the fact that both patients had more or less classical symptoms of perforation. The diagnosis having been readily and quickly made, operation speedily followed.

In the first case the man said that for some hours he had had abdominal pain. This pain must have been slight, for it was not sufficient for one of his race and nationality to speak of it until several hours had passed; then the pain became severe, and shortly afterwards signs of collapse were present, with subnormal temperature, rapid, weak pulse, rapid respiration, profuse perspiration, and anxious facial expression. From the onset of the symptoms of collapse three hours and a half intervened before operation.

In the second case the first sign of perforation was sharp pain immediately after a tub bath, which was quickly followed by rigidity, tenderness, and a relatively high leucocyte count,

a fall in temperature, and a rise in the pulse-rate. From the onset of this pain four hours and a half elapsed before the operation was undertaken. In neither case was there any attempt on nature's part at walling off the perforation from the general peritoneal cavity. In both cases the perforated area seemed to be in contact with the parietal peritoneum. It is known that the parietal peritoneum is very much more sensitive and reacts more quickly to an irritant than the visceral peritoneum, and it may be that in this fact there is a reason why some of the cases immediately present classical symptoms of perforation, while in others the onset is so gradual that the diagnosis cannot be made until the patient is practically beyond operative relief. Given a perforation which is surrounded by coils of intestine or covered by omentum (the least sensitive portions of the peritoneal surface), it might be hours or even days before the inflammation extended to the parietal peritoneum, with the appearance of severe pain, rigidity, and marked tenderness. The reporter had observed—but on this point he was not entirely certain—greater pain, tenderness, and rigidity of the abdominal wall when an inflamed or perforated appendix is in contact with the parietal peritoneum, and that the symptoms are much less marked when such an appendix is surrounded or walled off by intestinal coils. This suggestion was made only as a possible explanation for the slow and gradual onset of symptoms sometimes observed in perforating cases. When a condition of profound toxæmia is present, one would naturally look to this for a masking of the abdominal symptoms.

Dr. J. Alison Scott confessed his inability to diagnose perforation on all occasions. He had made a careful study of many of these cases at the Pennsylvania Hospital, and finds that they do not show any one thing that is diagnostic of perforation. Neither temperature, pulse, nor respiration is constant. Rigidity, pain, and the symptom complex are most to be depended upon. Something in the appearance of the patient that can hardly be described is often suggestive. And yet all these points may be demonstrated in a patient and operation reveal no perforation. However, it is better to make this mistake occasionally than to let cases go unrecognized.

Dr. John H. Gibbon said that he was convinced that perforation of the large bowel is more insidious and presents more difficulty in diagnosis than does a like condition in the small intestine. He cited a case of perforation of the sigmoid in which adhesions had formed. When the abdomen was opened there was escape of gas, but only a small quantity of fluid was present. The perforation was exposed only when the sigmoid was separated from the abdominal wall to which it was adherent. Dr. Gibbon said that he felt that local anæsthesia was not so popular in Philadelphia as in some other cities, but it worked very satisfactorily in the above case. The man was very ill and delirious, and he decided to open the abdomen under cocaine and determine if perforation had occurred, and then employ ether if necessary. No pain was complained of until the sigmoid was dragged upon, and then ether was given. A series of seven cases of perforation operated on under local anæsthesia with three recoveries, which is reported by Hays, of Pittsburg, speaks well for this method of anæsthesia. One can trust to cocaine for exploratory incisions if one-fourth grain of morphine be given hypodermically fifteen minutes before operation. If prolonged operation is found necessary after the exploratory incision, ether can be given. Dr. Gibbon then discussed the treatment of threatened perforation in cases that are being operated upon. He has lost two patients from secondary perforation,—one on the second, the other on the tenth day after operation for the first perforation. In the first case the second perforation occurred promptly after the first, but in the second it was not suspected until shortly before death. At the operation only one ulcer seemed in imminent danger of perforation, and it was inverted. Autopsy showed that one had perforated which had shown no signs of it at the time of operation ten days before. In the second case an ulcer seemed on the point of perforating, but it was situated so near the ileocæcal valve and the surrounding tissue was so friable that attempts at inversion were unsuccessful. An expedient which will not be again used was then employed. It consisted in wrapping the omentum around the intestine in such a manner as to cover the weakened area, the enveloping structure being held in place by a gauze pad. Perforation, as stated, occurred on the second day, before sufficient adhesions had formed to prevent the escape of the intestinal contents. Better results would no doubt have been secured had the gauze been placed next to the intestine or had the omentum been sewed to the intestine. One of the latter plans will be adopted in any future similar case.

Dr. William J. Taylor believes that the mortality in operations for typhoid perforation is in direct proportion to the size of the opening in the bowel. In two cases which he operated upon early, within one and one-half hours after perforation was diagnosed, there were large openings in the intestines and profound infection of the peritoneal cavity. Cases ending in recovery generally have small openings and but a comparatively slight amount of fluid in the belly. This fact urges early operation in cases of perforation.

Dr. John H. Jopson cited a case corroborating Elsberg's statement that the symptoms of perforation in a child do not differ from those of an adult. He operated upon a child of six years, one of the youngest patients on record, who was admitted to the hospital twenty-four hours after perforation had occurred during the third week of the disease. The child had severe abdominal pain, vomiting, etc., in fact, being sent in as a case of peritonitis. When seen thirty-six hours after perforation the symptoms were typical, differing in no way from those seen in the adult. The child lived three days after operation.

Dr. William L. Rodman agreed with Dr. Scott that there was no one characteristic symptom or sign of perforation. He also believed that rigidity and pain, with the addition of a subnormal temperature, are the most reliable indications. Considering the present difficulty in diagnosing perforation itself, it does not seem that Cushing's suggestion of operating in the preperforative stage can be attempted. We must be further along in the matter of diagnosis before doing that, however desirable it may be. When in doubt regarding the presence of perforation, Dr. Rodman advises exploratory incision under cocaine. He has used this in two cases, one of which he was sure was hæmorrhage instead of perforation. He operated at the solicitation of two medical colleagues, and found blood in the bowel but no perforation. This finding was confirmed by autopsy, death occurring later from a second hæmorrhage. He recovered from the operation, and would have probably recovered but for the second hæmorrhage. An interesting feature in this case was that the medical men were misled by the leucocytosis present. Dr. Rodman emphasized the fact that the sooner we operate in these cases the better are the results. Statistics regarding the result of operation are becoming better because surgeons no longer wait for the

subsidence of shock. As in gunshot wounds of the intestine, we should operate at once and not wait too long. He has operated on but one case, and recovery followed, though thirty-seven hours had elapsed since perforation and general peritonitis were marked. As to Dr. Taylor's statement regarding the size of perforation, the end of a finger could be put in the opening in this case. It was true, however, that not a large amount of fluid had escaped, the presence of lymph and the adherent omentum preventing great extravasation into the peritoneal cavity. Regarding local anæsthesia, Dr. Rodman said that the abdomen can be opened without giving the patient much pain. The intestines can be handled quite freely without causing pain, pinching the parietal peritoneum with forceps causing the greatest discomfort. He has performed one laparotomy under anæsthesia induced by carbolic acid alone, cocaine not being employed.

Dr. R. P. McReynolds has operated upon five cases of typhoid perforation; in four the diagnosis was made too late and death resulted from general peritonitis. In two cases coming to autopsy the operative result was good; the perforation being entirely closed. In one case, when the perforation was closed, the omentum was stitched over the ulcer in order to reinforce, and at the same time to prevent adjacent ulcers from perforating. The leucocyte count in these cases was misleading; in the last case it was only 8900, and for this reason we were not urgent enough for immediate operation. If we depend upon the leucocyte count alone, we will lose our patients. We thought the question of consultation to be an important one. If medical men see the case first and then send for the surgeon much valuable time is lost. In hospitals it would be better to send for a surgeon as soon as a typhoid fever patient shows any sign of perforation, and if he thinks an operation is indicated go ahead at once without waiting for a consultation.

Dr. Francis T. Stewart gave a brief analysis of eight cases of perforation in typhoid fever operated upon by him with two recoveries. Six were males, two females; ages varied from nine to forty-two years; the period of the disease varied from the thirteenth day to the fifth week; the time of operation after perforation was three, twelve, twelve, fourteen, nineteen, and forty-eight hours respectively in six cases, the other two being unknown. The first and one of the last two recovered. Many of the follow-

ing statistics refer to six cases only, as but little was known of the other two. There was previous abdominal pain in two, none in the others; all had pain when perforation occurred; there was tenderness and rigidity in all; vomiting was absent in five; the temperature fell in one, rose in one, remained unchanged in four; pulse and respiration were accelerated in all; seven had distention and thoracic breathing; liver-dulness and dulness in the flanks were absent in six; the leucocyte count in four cases was respectively four, seven, ten, and eighteen thousand; the perforation in all was within three feet of the ileocæcal valve; the size of the opening varied from that of a pinhead to a quarter-dollar; free fluid was found in the abdomen of each, being clear in one; in only one was there any attempt at walling off the perforation by adhesions; two of the patients had been walking about until the occurrence of perforation; four were admitted as emergency cases, four were in the hospital when perforation occurred; ether was used in seven cases, cocaine in one. Dr. Stewart does not agree with Dr. Gibbon regarding the use of local anæsthesia in these cases, but prefers ether. Cocaine for exploratory incisions is of value, but for treatment is not satisfactory, as good work cannot be done upon a frightened, struggling patient. In addition to this point, the abdomen cannot be properly cleansed when only cocaine is employed. Drainage was employed in seven of the eight cases reported; in one the peritoneum seemed normal; drainage was not employed, and the patient recovered; none of the patients had a chill at the time of perforation; the Hippocratic facies was present in six, being absent in the two that recovered; auscultation was negative in seven, peristalsis being present in one of the patients that recovered; the diagnosis of perforation was made in five and the incision made in the right iliac region, the median incision being used in the others, in which a diagnosis of perforative peritonitis was made.

Dr. James P. Hutchinson has seen the diagnosis made and operation performed in twenty cases of perforation in typhoid fever. Generally speaking, physicians are not inclined to call a surgeon in these cases as early as the latter would like. In doubtful cases operation should be performed, as those patients not suffering from perforation are not harmed by the exploratory incision. Dr. Hutchinson does not agree with Dr. Taylor regarding the effect of the size of the opening in the intestine. The peritoneum is more tolerant in patients having typhoid fever than is generally supposed. He believes that there is in every case a small perforation first, and that the opening gradually becomes larger. In some of the cases seen there was reason to believe that as many as four days had elapsed before symptoms became pronounced. He believed that perforation had been present in many cases longer than usually supposed, and during the most of this time the presence of fæcal matter has been withstood. Ether is considered by Dr. Hutchinson to be the best anæsthetic. It does not do as much harm as the fright when local anæsthetics are employed. A large part of the time taken by these operations is employed in washing the abdomen, and during this period the ether can practically be dispensed with. In cases of perforation where there is not a large amount of fluid and the infection is distinctly limited, the area should simply be wiped with gauze and not flushed; flushing will carry the infection throughout and make the condition worse.

Dr. Le Conte, in closing, referred to the condition mentioned by Dr. Gibbon where a considerable area of inflamed bowel is present with a number of suspicious ulcers threatening perforation. In the presence of such a condition he did not believe it wise to invaginate with sutures these suspicious ulcers, or to cover them with omentum, as there was grave danger of their breaking down. He preferred to isolate such areas of the intestine from the general peritoneal cavity with walls of gauze, and to permit the ulcers to perforate if they would do so. A case was cited in which a dozen highly inflamed and thin areas were present in the last two feet of the ileum and in the cæcum, in which this entire area was isolated from the rest of the peritoneum by gauze. Within forty-eight hours some of these ulcers perforated with the formation of fæcal fistulæ. These fistulæ closed spontaneously in three weeks, and the patient recovered without further operative treatment.

HERNIA FOLLOWING OPERATION FOR APPENDICITIS.

Dr. William J. Taylor presented a man, aged twenty-six years, always healthy and strong, except for an attack of appendicitis six years before. From this he made a complete recovery, and had no symptoms of recurrence until October 2, 1901, when

he was seized with acute pain in the right side. Two days afterwards he was operated upon, and believes the appendix was removed and no pus was found, as the wound was closed without drainage. The sutures were removed on the fifth day, the wound apparently perfectly healed, and he remained in bed about five weeks to insure absolute closure of the wound. When he got up he wore a bandage with a pad over the site of the wound.

Towards the end of December, or nearly three months after this operation, he first noticed a little bulging at the lower angle of the wound; this gradually increased, in spite of wearing the bandage, until a very distinct and well-developed hernia resulted. He had a good deal of pain and discomfort, and for three or four weeks before he was seen by Dr. Taylor had almost constant pain. When he presented himself, there was a well-developed hernia about the size of the closed fist, which could not be entirely reduced. It was directly over the wound, and had dissected under the skin latterly towards the flank. An opening in the belly wall about an inch in diameter could be distinctly demonstrated.

On January 14, 1902, or fifteen months after the original operation, an incision was made to the outer side of the scar, and the hernial sac exposed. An opening was found about an inch in diameter in the belly wall; to this was adherent omentum and bowel, which were both anchored outside of the belly cavity. There was an immense number of adhesions everywhere, and the omentum had to be dissected away with great care. The hernial sac and its surrounding fibrous tissue were taken away also. The edges of the opening were freshened, the layers of the belly wall dissected loose, and three layers of suture were placed in the deeper tissues. The wound was then closed by interrupted silkworm-gut sutures, about six strands of silkworm gut introduced in the wound for drainage. The wound came together nicely, but there was a fair amount of tension on the stitches.

In the opinion of Dr. Taylor, undoubtedly at the time of his first operation a stitch had given way, or else the closure of the wound was not sufficiently accurate. The patient says that he vomited excessively after the operation, and a small portion of the omentum was forced out in the incision and caught. Along this path the hernia developed.

The reporter stated that he had seen quite a number of cases

of hernia following abdominal operations, and had operated upon a number of them. In all instances there has been a portion of omentum, and at times bowel anchored outside of the belly cavity and attached by adhesions to the hernial sac.

This explains the extreme difficulty of complete reduction in most of these cases, and also the discomfort produced by any form of truss or bandage. For this reason he would urge very strongly that operation be done and a definite closure of the opening in the belly wall made in all of these cases. A hernia through the belly wall which gives any discomfort ought not to be allowed to remain for any length of time without an attempt being made to close the opening by operation. The after results in this case were perfect. His recovery was uneventful and uninterrupted.

Dr. William L. Rodman cited a case which had been a source of surprise to him. He operated upon a clean case of appendicitis, using the gridiron incision, securing primary union; but the patient returned some time later with a large ventral hernia. Why it occurred is not understood, as the layers were sutured separately with kangaroo tendon and chromicized gut. The patient attributed the hernia to a fall which she received a few weeks after operation. It has been said that hernia cannot occur after the gridiron operation, hence this case is put on record. In many such operations it is the only hernia he has seen where primary union was secured.

Dr. Robert G. Le Conte said that in closing an abdominal wound without drainage he always used through-and-through sutures of silkworm gut, with catgut to unite the layers of the fascia, and had never had a hernia follow this method of closure. The approximation of the fascia is of much more importance than that of the peritoneum.

NECROSIS OF ENTIRE LOWER JAW.

Dr. Robert G. Le Conte exhibited a lower jaw which he had removed that day from a child four and a half years old. Two weeks previously the child was said to have been perfectly well. The trouble began with pain in one of the teeth on the right side of the lower jaw. This was speedily followed by swelling of the right side of the face, fetid breath, discharge from the mouth, and high fever. When seen the child was almost in a typhoid condition, with great swelling of the right side of the

face, temperature 104° F., a gangrenous condition of the alveolus, fetid breath, etc. On a hasty examination the case was thought to be one of noma, but after ether had been given it was found that the whole lower jaw was the seat of a fulminating, gangrenous osteitis. The mucous membrane covering the mental portion of the jaw was incised within the mouth, the jaw divided, and each half removed separately with sequestrum forceps by aid of very light traction. The cavity remaining was then curetted and the gangrenous tissue cut away with scissors, hæmorrhage being controlled by iodoform gauze packing. The patient's condition is most serious from systemic sepsis.

STATED MEETING, NOVEMBER 2, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

OSTEITIS DEFORMANS.

DR. JOHN B. ROBERTS said that he had reported a case of leontiasis ossium, or hypertrophy of the bones of the face, at a meeting of the Section on Surgery of the College of Physicians of Philadelphia, November 8, 1895 (ANNALS OF SURGERY, 1896, Vol. xxiii, p. 303). The woman, who was twenty-two years of age, had suffered from the time she was six years old with a slowly increasing enlargement of the upper and lower jaw-bones. Such cases are supposed by some writers to be an early stage of osteitis deformans. He had unsuccessfully endeavored to find the woman mentioned, in order to see whether there has been any change in her condition that would throw light on the possible relationship of these two disorders of the bones.

Leontiasis ossium, sometimes called Virchow's disease, and osteitis deformans, often called Paget's disease, are evidently, in his opinion, trophoneuroses. The two conditions are therefore probably related, even if the disease manifested by enlargement of the bones of the face is not actually osteitis deformans, beginning in the facial bones instead of in those of the extremities and cranium. He presented an illustration of the face of the young woman. ("Deformities of the Face." By John B. Roberts. Second Edition, 1901, p. 19.)

Now he reported a case of typical osteitis deformans occurring in a man. The patient, sent to him about a year ago by Dr. H. E. Schlemm, had applied to that physician because of his increasing loss of stature, which had attracted the attention of his friends; otherwise he had, in his own opinion, no special symptoms of illness, except that he had been of late somewhat below par in general health. The bony lesions, other than the diminution of height, had been unobserved.

The gentleman, who was aged forty-seven years, and un-

married, knew of no family history of gout or rheumatism, and had no definite knowledge of any condition similar to his in his ancestors or collateral relatives. His father's father had died at the age of eighty years of cystitis; his father's mother at the age of eighty years of dropsy; his mother's father at sixty of dropsy, and his mother's mother at eighty-two of dropsy. He knows of no instance of bandy-legs or bow-legs in the family, except that his father's father just mentioned is said to have become bow-legged as he increased in age. His father had died at the age of sixty-two years of what was called heart-failure, although there was also a history of some kidney disturbance. Some of the friends of the family say that his father before death walked like the patient. The latter, however, does not know that his father became shorter in stature, but says that he became very bent and stooped. His mother still lives at the age of seventy-two years and is in good health.

The patient has living at this time two sisters and three brothers in good health. One brother died of dropsy at the age of thirty-nine. Ten years previously he had received a shock by falling at a roller-skating rink and fracturing one arm. The patient does not know which arm, or whether the injury was above or below the elbow. Later he had suffered from an injury to the right hip, but there was no fracture at that region. During the ten years from the time of the receipt of the fracture of the arm and his death he gradually became weaker, and had to be rolled about in a chair for three or four years; but he was not paralyzed in the legs. The man was dropsical and swollen, and it gave pain to lift him, so that some sort of apparatus was made by which he could be lifted by the attendants.

The present patient does not know that this brother had any tendency to stiffness of the joints at this time, nor that there was any tendency for his bones to bend. The right side of the lower jaw was, however, swollen, and the patient thinks that this swelling of his brother's face was situated in the jaw-bone. He has no recollection of his brother complaining of pain in the jaw.

The patient is the eldest child of his parents. About fifteen years ago he fractured his left humerus about one inch above the elbow by being thrown from a street car. There was no cutaneous wound. The bone rapidly united, but he dates the beginning of his decline in health from the time of that accident. He

has never had any serious disease. There is no history of gonorrhœa or syphilis. He has never suffered from abscess and has never had scrofulous lesions, rickets, or typhoid fever. There is no history of ague, rheumatism, rheumatic pains, or jaundice.

About twenty years ago he had a boil upon his right thigh, but this lesion seems to have been unimportant. About ten years ago he weighed in the neighborhood of 160 pounds, and was about five feet nine and one-half inches in height. Now he measures five feet six and one-fourth inches with his shoes on, and weighs about 150 pounds. His physician says that the patient was very erect in his carriage.

Four or five years ago the patient's friends called attention to the fact that he was becoming shorter. He apparently paid very little attention to this symptom until recently. Since that time he has been taking a month's holiday each year, because he found that he was a little run down in health. His business has kept him a good deal confined to his office.

On examination the patient had a pallid, anæmic look, and gave the appearance of his arms and legs being too long for his body. He said that he had no digestive disturbance, was not constipated, and was temperate in eating and drinking. According to his own statement, the color of his skin was better than it had been for several years. Examination of the lungs was negative, as was that of the heart, except that there seemed to be a systolic murmur, possibly attributable to the excitement of the examination. He, however, said that he got easily out of breath from going upstairs, and that when he walked his knees felt weak. There had been no hæmoptysis. His urine was acid, had a specific gravity of 1026, and was free from albumen and sugar.

He used glasses for reading and had a slight degree of hyperopic astigmatism, his refraction being plus .75 sphere combined with plus .75 cylinder axis 90 in each eye. His hearing and teeth were good. He himself had no knowledge of his change in stature until his attention was called to it by his friends, though he had been feeling that he was not quite up to his general standard of health.

When the patient was stripped, the normal hollow of the back in the lumbar region was gone, and the spine in that location bulged backward just above the sacrum so as to change the normal lumbar concavity into a slight prominence backward.

This change was not at all like the angular deformity which occurs in tubercular spondylitis, but was a general bulging backward of the whole region. The femurs, especially the right one, were unnaturally convex forward and perhaps bowed a little outward. The right clavicle, which had never been fractured, was massive, being at least twice as thick as the left clavicle, which seemed to be of normal shape and size. The left humerus was very much thicker than the right, especially in the lower half of the shaft and the condyles. This was the bone which had been fractured years previously, but the enlargement is a general one, and not like that at the seat of an old fracture with displacement and callus. The enlargement of this bone existed in the upper portion to a less extent than in the lower portion. The left tibia had a distinct enlargement in the region of the tubercle, which extended downward in a promontory-like mass upon the front of the bone. The rest of the tibia was normal in size and shape.

There was no stiffness of the joints. There were no gouty deposits in the fingers, toes, or ears. There was no rhachitic rosary upon the ribs, and no rhachitic-like deposits at the wrists or ankles. Because of the bending of the lumbar region of the spine, the lower ribs and the crests of the two ilia were only about a finger's-breadth apart.

The head looked very big at the back, though he had not been aware of this peculiarity until asked whether he had recently been obliged to increase the size of his hat. He then said that about two years ago the number of his hat was 7¼, whereas now it was 7½. There was no enlargement of the jaws or facial bones nor of the hands or feet.

In an article by Dr. J. C. Wilson, in the *Philadelphia Medical Journal* of the early part of this year, it is stated that up to that time there had been but seventeen cases of osteitis deformans reported as observed in this country. Hence the report of the present case, which shows most of the typical symptoms, and differs from most of the cases reported only in the circumstance that the kyphosis, or bending backward of the spine, occurred in the lumbar rather than in the cervicodorsal region.

The pathology of the condition is interesting. Microscopical examination shows absorption of healthy bone and formation of new bone coincident with this absorption, but apparently not connected with the absorptive process. The new bone may show a failure of calcification, may itself become absorbed, or may finally become calcified. The condition appears to differ from osteomalacia, because synchronously with the absorption of the bone a process of regeneration takes place, and because, instead of fracture occurring, the bones have a tendency to bend as in rickets. The statement that leontiasis ossium affects the bones of the face only, and not those of the cranium or extremities, does not seem to be verified. On the other hand, some cases of osteitis deformans, it is said, show hypertrophy of the bones of the face as well as of those of the cranium, which is the region of the head that ordinarily is affected. It seems probable that there is some relation between these two conditions and the common disease called osteo-arthritis, rheumatoid arthritis, and rheumatic gout. Acromegaly differs from the conditions under discussion, at least in its clinical manifestations, because in it the enlargement occurs in the feet and hands as well as the head, and seems to involve the soft parts as well as the bones. From a study of the recent articles on the subject, Dr. Roberts was inclined to believe that osteitis deformans is a nutritive or trophic disorder, due, as suggested by Prince (*American Journal of the Medical Sciences,* 1902, Vol. cxxiv, p. 796), to a modification or perversion of the natural processes occurring in normal bones.

Dr. De Forest Willard said that, owing to the rarity of this condition, no one physician had the opportunity to make a clinical study of many cases. He has seen but two cases, both being aged women. The pathology of the affection is uncertain. Dr. Willard believes that rheumatoid arthritis, osteitis deformans, and leontiasis ossea are in some way related to each other. In all there is a tendency towards the deposit of extra bone and the production of deformities. When the pathology of the conditions in question is ultimately worked out, it will probably be found that, although dissimilar, they all belong to one general group.

Dr. William J. Taylor mentioned a case of leontiasis ossium that involved the frontal bone. A mass of the new formed bone varying from one to two inches in thickness was chiselled away by Dr. Keen. This bone was subjected to a very careful microscopic examination, which revealed no definite structure other than that of normal bone. The patient made a good recovery from the operation, but whether recurrence followed is not known.

Dr. Henry R. Wharton had seen two cases of osteitis deformans, one of which, occurring in a man, was under the observation of the late Professor Ashhurst and himself during more than ten years. The second case was in a woman forty years of age. Among the points of interest in these cases is the diagnostic importance of a gradually diminishing stature. This change is largely due to curvature of the bones of the thigh and leg, but changes in the spine also aid. This curvature also involves the bones of the upper extremity, including the clavicle. Another interesting point was the slight impairment of general health in both cases mentioned. The one under observation for ten years showed no failure of his general condition. The other patient was seen only for a short time, but her health was then good. As to treatment, nothing seems to be of avail. The man was for months given potassium iodide without producing any effect.

SUBACUTE INTESTINAL OBSTRUCTION.

Dr. W. J. Hearn said that many cases were brought to the Jefferson Hospital to be operated on for a supposed obstruction of the bowel which really does not exist. The history of such cases is usually as follows: The patient has probably had an attack of acute indigestion with pain, and, as happens too often in such cases, morphine has been administered to relieve the pain. Then follows the necessity of opening the bowels which the morphine has constipated. Frequent doses of purgatives cause the patient to vomit; enemas are given which only wash out the lower, but do not relieve the upper, bowels, and soon the patient is supposed to have obstruction of the bowel. But certain important symptoms that indicate genuine obstruction are wanting. There is no temperature; the pulse is almost normal; it may be somewhat rapid, but that will be due to the excitement and apprehension suffered by the patient on finding the bowels cannot be opened. There is but slight distention of the abdomen. There is no muscular tension of the abdominal walls. There are no points of tenderness nor general tenderness over the abdomen. In these cases Dr. Hearn usually recommends a cessation of attempts to evacuate the bowels. He simply permits the patient to rest without any medicine at all, and soon nature rights itself. Many cases of appendicitis or general peritonitis from any cause whatever are mistaken for obstruction, but the lack of abdominal

distention and the presence of the usual symptoms of appendicitis and peritonitis reveal the cause of the trouble. Persistent vomiting, great abdominal distention, and inability to pass any gas whatever through the intestines, and, later, great tenderness, a rapid pulse, and a significant facial expression indicate, as a rule, acute obstruction, and if there be fæcal vomiting, which is usual, the diagnosis is complete. But in the subacute and chronic obstruction the diagnosis is much more difficult. Then the surgeon confronts a question of great gravity and peril to the patient. In these cases the obstruction is not at first complete and the symptoms develop more slowly. The abdominal distention is later coming on, and the patient is able to pass some gas from the bowels. By the time the symptoms are those of complete obstruction, the patient suffers either from general peritonitis or local gangrene of the intestines, and the prognosis, as is well known, is much more unfavorable than in the acute cases. These facts are demonstrated in four cases now reported, as follows:

Intestinal Obstruction due to an Enterolith in the Small Intestine.—A patient of Dr. Kollock, of Newark, Delaware. A woman, aged sixty years, well nourished, abdomen very fat, without previous history of colic of any kind whatever. She was attacked with colicky pains in the lower portion of the abdomen. Up to the time of this attack the bowels had been opened as well as usual as far as she knew. The pains were at first accompanied by vomiting the contents of the stomach and afterwards bile and mucus. Then the vomiting would cease, and two days would elapse before it would occur again. On the seventh day after the first attack she vomited fæcal matter for the first time. She was able to pass flatus through the intestinal canal and with some relief to the pain, but no fæcal matter. On the tenth day, when seen by Dr. Hearn, she was suffering considerable abdominal pain, but there had been no vomiting at all on that day. There was moderate distention of the abdomen and a more rapid pulse than normal. The area of tenderness on pressure was in the right iliac region. Laparotomy was advised on the basis of the vomiting of fæcal matter which had occurred. No other symptoms were present to justify it, with the exception that her bowels had not been opened. An incision was made in the middle line and the parts were explored by the sense of touch. In doing so the hand accidentally came upon a mass in the ileum

about eighteen inches from the ileocæcal valve. This mass was delivered through the abdominal incision, and by palpation appeared to be the size of a hen's egg. It apparently filled the entire lumen of the bowel and was immovable. There were areas of gangrene in the peritoneal coat, also areas of gangrene in the mucous membrane of the bowels. As these areas were apparently in a straight line, an incision was made into the bowel through these areas of gangrene about two inches long and the concretion removed. The mucous membrane was closed first and then two rows of Lembert sutures through the peritoneal coat, thus inverting the gangrenous areas. The patient made an uneventful recovery. Nausea all ceased, and the bowels were opened on the second day voluntarily without any laxative. The enterolith has been examined chemically by Dr. Stellwagon, who gives the following report. "The concretion had for its base biliary calculus composed of cholesterin and fatty crystals surrounded by triple phosphates." While this stone has for its nucleus a biliary calculus, yet the patient gave no history of ever having had an attack of colic. Of fifty-one cases of intestinal obstruction caused by the impaction of gall-stones, collected by Wissing, thirty-eight died. In some of these cases the calculi were of great size. In the cases reported by Smith and Fagge they measured four and one-half by two and one-half inches in circumference. In all cases enterotomy should be performed at once, and no attempt should be made to crush the enterolith in the lumen of the bowel, as has been suggested by some. The method suggested by Tait, of passing a stout steel needle obliquely through the intestinal wall and attacking the calculus in order to break it up, is not worthy of approval.

RICHTER'S HERNIA; LOCAL GANGRENE; PERITONITIS AND DEATH AFTER OPERATION.

Miss P., aged forty-two years; well nourished, of rather large stature, previous health always good. Eight days before admission to the Jefferson Hospital she took an overdose of an expectorant mixture for a cold. It nauseated her and caused intense straining in the attempt to vomit. While straining in the effort to vomit, she suddenly felt a sharp colicky pain over the entire abdomen. She then vomited the contents of the stomach. On the following day there was no vomiting. Nausea was somewhat relieved, but there was no cessation of the pain, nor were her bowels open, notwithstanding she was given very active purgatives. On the fourth day the abdomen began to swell, and Dr. Hearn saw her then for the first time with Dr. Piper, her attending physician. Obstruction of the bowel was not then suspected, as the vomiting had apparently ceased. The groins were examined for hernia, but none was found, and she insisted she had never suffered from hernia. On the evening of the seventh day the vomiting commenced again, and was of a fæcal character. When Dr. Hearn saw her again, the next day, there was every evidence of general peritonitis; constant vomiting, rapid pulse, temperature 101° F.; a general tenderness over the entire abdomen, but no defined area of tenderness, with a facial expression that of general peritonitis. She was at once transferred to the Jefferson Hospital and operated the same day. An incision large enough to permit the entrance of the hand was made below the umbilicus. In carrying the hand down the side in the right iliac region, a portion of the intestine was found fixed in the right femoral canal. This was carefully detached from the point of adhesion and brought outside the abdomen. A portion of the bowel delivered presented the appearance of a large nipple and was gangrenous. Some of the contents of the bowel had escaped into the abdomen through the gangrenous tip of this nipple-like projection. About half of the lumen of the bowel had been drawn into the ring, and its width on the length of the bowel surface was about one inch and a half, culminating in a point. As the larger portion of this nipple was gangrenous, it was necessary to perform a resection of the bowel. Her condition was alarming, and, as it was necessary to terminate the operation quickly, a Murphy button was used. The abdomen was thoroughly washed out with a salt solution, and closed in the usual manner with a drainage in the lower angle of the wound. During and after the operation her pulse was 140 and her temperature rose to $103^{2}/_{5}$° F. The patient died the following day of general peritonitis.

SUBACUTE OBSTRUCTION CAUSED BY MECKEL'S DIVERTICULUM; OPERATION; DEATH.

Mrs. S. W., aged fifty-six years, for twelve years had suffered from occasional attacks of intestinal colic, accompanied by constipation and followed by diarrhœa, which would last for a week or ten days. On June 20, 1902, she was seized with pain in the abdomen, which was not localized to any particular region; during the following four days she had attacks of pain with intervals of complete freedom; the abdomen would become moderately distended and tender, and again these symptoms would disappear. Purgatives and enemas would bring away some fæcal matter and gas, but no free bowel movement was produced. Temperature between 98.6° and 100° F.; pulse between 80 and 90. Her family physician, Dr. Henry Lovett, of Langhorne, called Dr. Hearn to see her on the day after she was taken ill, but owing to his absence from the city his assistant, Dr. Roe, saw her on the second and third day, and they both saw her on the fourth day. Unfortunately, about the time of their visits, her symptoms had improved, and, as she was and had been a very delicate woman for many years, and as she had passed through very similar attacks previously, and more especially as her importunities not to operate if we could possibly avoid it were great, a waiting policy seemed justified. During the night of the fifth day her abdomen became distended and vomiting began, which soon became stercoraceous. The following morning the abdomen was opened by an incision through the median line; the intestines were found injected with some serous effusion in the peritoneal cavity. While exploring the posterior abdominal region, there came into view a short obliterated diverticulum, having a short mesentery, coming from the right side of the ileum about twenty inches from the ileocæcal valve and crossing over the free border and adherent to the posterior parietal peritoneum. The diverticulum was divided between a distal and proximal ligature which included its mesentery. The intestine was then liberated and showed the point of constriction, which, however, did not require any repair. Although the symptoms of obstruction were relieved, the patient died four days later of general peritonitis, following the usual course of chronic obstruction.

GANGRENOUS RICHTER'S HERNIA RESULTING IN INGUINAL ABSCESS; INCISION AND DRAINAGE; SUBSEQUENT RESECTION AND ANASTOMOSIS OF THE ILEUM; RECOVERY.

A man, aged sixty-eight years, consulted Dr. Hearn, July 26, 1896, for a large phlegmon of the right groin. Previous to the present illness he had an attack of enteric fever at the age of twenty-five years, and twelve years before he had an enlarged gland in the right groin, which disappeared under treatment, and very probably was a hernia. There was no history of injury or infection of the genitals. About four weeks before coming to Dr. Hearn he was seized with griping pains in the abdomen; in the meantime he observed an enlargement in the right groin; a week later it took on growth and steadily increased. The skin over the enlarged area in the groin was dusky, pain throbbing, tension marked and fluctuation. He was admitted to the hospital and prepared for immediate operation. Upon incising the abscess it was found to contain about ten ounces of an admixture of pus and bowel contents. At the site of the femoral canal there was a small opening which communicated with the bowel. The cavity was irrigated and tamponed with iodoform gauze. A fæcal fistula remained after the abscess healed, and six months later he re-entered the hospital. On the following day Dr. W. J. Roe opened the abdomen, and after freeing the bowel did a resection and end-to-end anastomosis, using Halstead's rubber bobbins. Recovery was uninterrupted and uneventful.

Dr. John B. Roberts referred to two specimens of intestinal calculus that he had placed in the Mütter Museum. One of them was passed by a physician after an attack of acute pain in the epigastric region which had not yielded to treatment. Surgical advice was contemplated, but before it was obtained something was felt to give away in the abdomen, and two days later a large calculus, together with a piece of sloughed tissue, was passed from the bowel. The second specimen referred to by Dr. Roberts was a calculus, one by three inches in size, which he removed from a woman who had had severe constipation during many years, and secured movements by rectal enemata. The calculus, which was located near the ileocæcal valve, was removed by enterotomy, and the patient soon afterwards died, al-

though there were many reasons to believe that she would recover. This case was interesting because of the history that many years before the patient had suffered from some affection that produced jaundice. At the time of operation the hepatic region was explored, with the result of finding adhesions about the liver, but no trace of the gall-bladder. The nucleus of the calculus, which has never been opened, is believed to be a gall-stone which ulcerated its way into the intestine years before.

Dr. Joseph M. Spellissy reported that in his service at St. Joseph's Hospital, and assisted by Dr. Davis, he had removed an enterolith having as its nucleus a common pin. The condition leading to interference existed for months, caused little distress, and consisted of an apparent thickening of the anterior and internal margin of the right iliac bone. While the density of the mass suggested it to be a new growth, its late characteristics pointed to a possible inflammatory origin. Incisions close to the iliac crest passed through an inch thick, apparently fibrous mass, into a small extraperitoneal abscess close to the bone, and containing the spindle-shaped enterolith. A persisting fæcal fistula marred an otherwise uneventful recovery. This fistula was later operated upon during the service of Dr. Davis and by him.

Dr. John H. Gibbon said that in the majority of cases of chronic obstruction of the bowels the large intestine was the site of the lesion, and that the cause of the obstruction producing subacute or chronic symptoms was usually a malignant growth. These patients, however, were generally admitted to the hospital for a complete obstruction following previous attacks of subacute obstruction. When operating on such cases where the obstruction is complete and the patient's condition is not good, it is thought to be better surgery to relieve the obstruction by performing colostomy rather than to do an immediate resection. Littlewood, in a recent article in the *Lancet,* has shown the great advantage to be derived from pursuing the former plan of treatment. Gibbon referred to a case of complete obstruction of the bowel due to a cancer of the sigmoid, in which he did an immediate resection and lost his patient. He believes that this patient might have been saved had he done a left inguinal colotomy and later resected the bowel.

EXCISION OF THE CONDYLE OF THE LOWER JAW FOR BONY ANKYLOSIS OF THE TEMPORO-MAXILLARY JOINT.

Dr. Francis T. Stewart presented a girl, aged six years, who twenty-two months ago was attacked by severe pain in the lower jaw and convulsions. The face swelled, pus escaped into the mouth, and five teeth were extracted without relief. Four months later some carious bone was removed from the lower jaw by an external incision. He first saw the child fifteen months ago at the Polyclinic Hospital. She then presented a complete ankylosis of the jaws and two sinuses on the right side, one near the chin and one near the angle of the lower jaw. An incision was made along the body of the jaw connecting these sinuses and a sequestrum the length of the body of the jaw removed. The wound resulting from this operation gradually contracted to a small sinus, but there was no improvement in the ankylosis, it being impossible to move the jaw in any direction. The region of the right temporomaxillary articulation was occupied by a swelling having the consistency of bone. September 28, 1903, the patient was etherized, a scab of collodion placed over the old sinus, and a small vertical incision made over the joint, the parotid gland and the temporofacial fibres being retracted towards the ear. The condyle could not be defined, a mass of bone continuous with the zygoma and glenoid fossa occupying the usual situation of the joint. The neck of the condyle was severed with a chisel, and as much condyle as possible was gouged from the joint cavity. Just at the completion of the operation, a large vessel was severed, and it became necessary to pack the wound. Two days later the wound was sutured except at the lower end, at which point a sinus still persists. Immediately after operation the patient was able to open her mouth to the normal limit. She now eats solid food with comfort and has a jaw as freely movable as a normal jaw. There is a slight palsy of the orbicularis palpebrarum, which will probably disappear, as the temporofacial fibres were simply stretched and not severed.

Dr. De Forest Willard gave a brief history of a case upon which he operated three weeks ago. The patient was a child who two or three years before had fallen while playing and

had run a pointed stick into its mouth. The result was the repeated formation of abscesses which opened in a number of places on the cheek and near the ear. After some months a piece of wood was discharged from the temporal region, and healing of the sinuses followed. For two years nothing had been done to restore motion to the jaw, and the incisor teeth could be separated only one-fourth inch. From the history it was believed that interference with motion came principally from cicatricial contraction of the masseter and temporal muscles, and that myotomy of at least the masseter would be necessary. After etherization of the patient, screw power was inserted between the teeth, and the yielding was so marked that cutting of the masseter was dispensed with. By steady pressure the jaws were separated one and three-fourths inches. Now, at the end of three weeks, the mouth can be fully opened and mastication is nearly normal.

RUPTURE OF THE BRANCHES OF THE MIDDLE MENINGEAL ARTERY BY CONTRECOUP.

Dr. Stewart related the history of a man, aged forty-five years, who was struck on the head by a weapon, and admitted to the Polyclinic Hospital in an unconscious condition September 19, 1903. There was a compound depressed fracture of the right parietal bone and a paralysis of the right arm and leg, but not of the face. The pupils were moderately dilated and reacted sluggishly to light. The depressed fragments of the right parietal bone were removed and a piece of gauze packed against a small opening in the longitudinal sinus. The left parietal bone was trephined and a clot of blood measuring about two inches in thickness and about four inches in length was found separating the dura from the skull and compressing the brain. The clot was evacuated and the cavity packed with gauze, the bleeding apparently coming from a number of small vessels. The paralysis entirely disappeared by the third day, but the unconsciousness continued for two weeks. One week after operation there were a number of severe general convulsions; after reopening the wound on the left side and evacuating a large clot which had reformed, the convulsions ceased. The patient is now perfectly well, both mentally and physically.

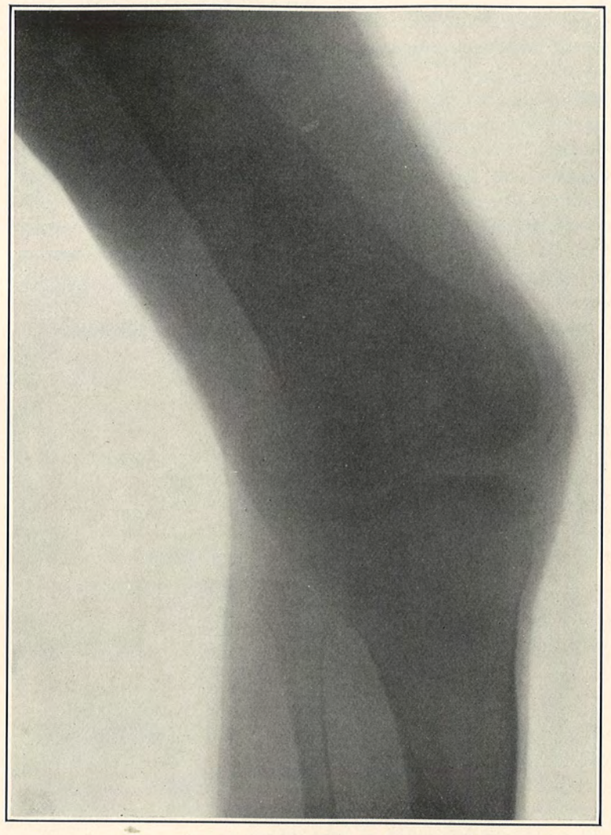


Fig. 1.—Congenital dislocation of patella.

Dr. G. G. Ross mentioned a case in which there was rupture of branches of the middle meningeal instead of the main trunk. He packed the area with gauze for three days, and there was no further trouble. He operated in three hours after the injury, though there were no symptoms, because of a depressed fracture. A clot of considerable size was found.

Dr. John H. Jopson cited a case of meningeal hæmorrhage under his care one year ago in which there was rupture of the middle meningeal artery, but no accompanying fracture. He explains the so-called rupture by contrecoup by the fact that adhesions of the dura mater are weak in the region of the middle meningeal artery. Tension on the branches of the vessel at the time of injury, especially after a blow, may be great enough to cause rupture. Fracture of the skull may not occur, the artery being ruptured by the springing back of the bone. This he is inclined to think was the cause in Dr. Stewart's case. This form of rupture is apt to involve the branches instead of the main trunk of the vessel, and hence might easily account for the hæmorrhage from several places.

Dr. Henry R. Wharton believes that, in packing to control hæmorrhage from the middle meningeal or the sinuses, the gauze is generally left in for too short a time. He has made it a rule to leave the packing in from five to six days or even a week if the wound remains sterile. The late removal of the packing is usually not followed by any considerable bleeding, as is the case where it is removed at an earlier period.

CONGENITAL DISLOCATION OF THE PATELLÆ BRACHYDACTYLIA.

Dr. Stewart presented a man, aged thirty-nine years, who came under observation at the Pennsylvania Hospital for fracture of the radius. His ancestors were German. His parents, two sisters, two brothers, and all his relatives are normally formed, excepting one first cousin, who has six toes on one foot. He is five feet high, of fair intelligence, is dolicocephalic, has a slight exophthalmos, brows slanting upward in Mongolian fashion, and a high arched palate. All the digits of both hands and of both feet are abnormally short, being about two-thirds the normal length. All the fingers of both hands except the

index and little, which each have two phalanges, have three bones, as shown by the skiagraph. By palpation only two bones can be distinguished in each finger. Each thumb exhibits three irregularly shaped bones and a sesamoid in place of the phalanges. The ring and middle fingers of the left hand are webbed to the end of the proximal phalanx. Each foot has six toes, all of which are webbed, and each toe has two phalanges. The accessory toe has two large phalanges and a small metatarsal bone which articulates with the internal cuneiform. The internal cuneiform bone is larger than normal and projects well below its usual level. The middle and external cuneiform bones cannot be seen in the skiagraph, the two middle metatarsal bones apparently articulating with the scaphoid. The patient has knock-knees, and when standing the patella rests on the external surface of the external condyle, the internal edge looking forward, the anterior surface facing outward. When the leg is flexed the patella passes farther outward and backward until it touches the head of the fibula. The skiagraphs were made by Dr. Francis Allen, of the Pennsylvania Hospital.

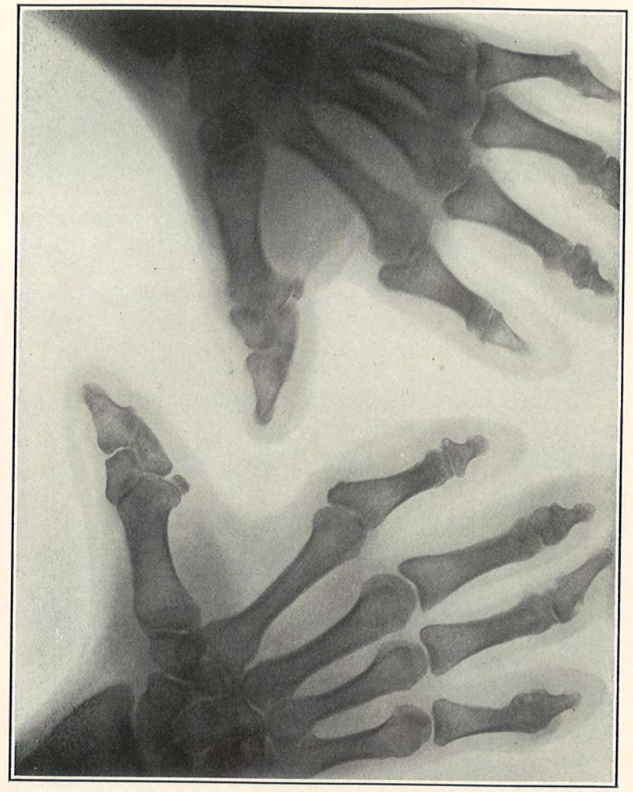


Fig. 2.—Malformation of hands. "Brachydactylia."

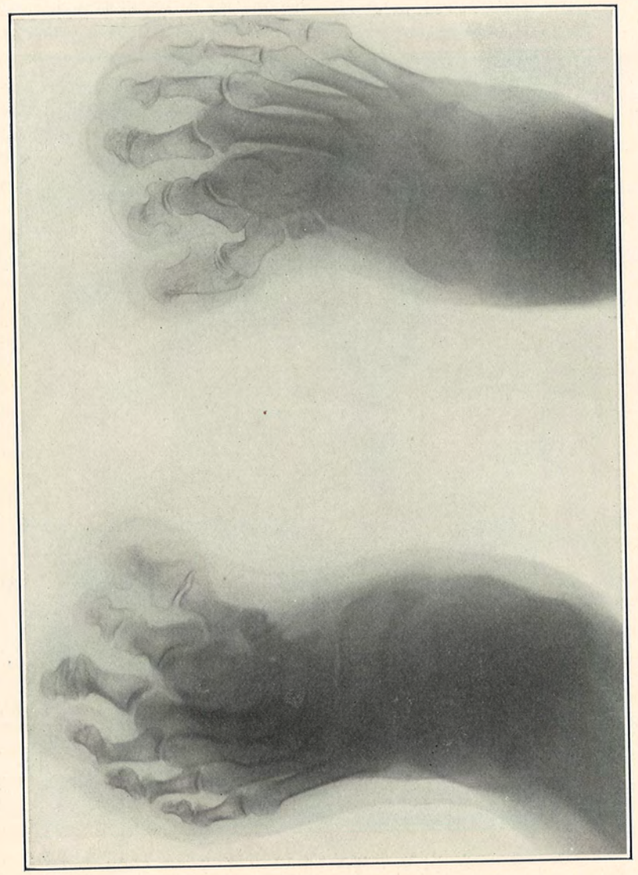


FIG. 3.—Malformation of feet. "Brachydactylia." Supernumerary Toes.

STATED MEETING, DECEMBER 7, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

CHOLECYSTOTOMY.

DR. LEWIS W. STEINBACH presented three patients who had been subjected to operation for cholelithiasis.

The first case was a woman, aged forty years, who was admitted to the Polyclinic Hospital, June 17, suffering since one o'clock in the morning with intense abdominal pain, which could not be relieved by hypodermic injections of morphine administered within the limits of safety. There was vomiting, tenderness over upper half of the abdomen, and a slight yellow discoloration of the sclerae. An immediate operation was decided upon. The patient was anæsthetized with ether. A long incision through the abdominal parietes exposed an enlarged, tense gall-bladder, in which no stones were felt until after evacuation of the fluid contents by means of a trocar. The fluid evacuated approximated eight ounces in quantity and resembled normal bile. The neck of the bladder contained three gall-stones, while a fourth was separated by a valve-like partition and was removed with some difficulty, the thumb and forefinger of the right hand steadying the cystic duct while the left hand manipulated forceps or scoop. The stones were globoid with facets, were of almost equal size, each one having about three-fourths of an inch in diameter. A sound was passed into two branches of the hepatic duct and into the common duct without detecting other calculi. In order to verify this condition, a colleague probed the biliary passages and perforated the common bile duct. An elongated gauze pad was placed in contact with the perforation in the common duct, a large rubber drainage tube was inserted into the distended cystic duct and stitched with the edges of the incision in the gall-bladder to the parietal peritoneum at the lip of the abdominal incision; the sutures were permitted to remain long. Three additional stitches secured the gall-bladder to the peritoneum.

The abdominal wall was closed with through-and-through silkworm-gut sutures, except where it was required to leave an open space for the removal of the gauze pad. On the day following the operation, healthy bile in large quantities saturated the dressings; the urine was free from bile pigment. On the ninth day the patient was allowed house diet, on the eleventh day the sutures were removed, and the drainage tube on the twelfth day. Patient was sitting up on July 7. Discharge of bile diminishing gradually, ceased entirely by July 8. Patient is well and comfortable and was discharged as cured on July 23. Observation continued until November. Patient remains free from pain, has no jaundice, gall-bladder cannot be palpated, enjoys excellent health.

The second patient was a woman, thirty-eight years of age, mother of nine living children, who, since the birth of her first child, twenty-one years ago, had suffered at intervals from attacks of pain in the region of the gall-bladder accompanied with jaundice. The attacks at first came at intervals of one or more years, gradually becoming more frequent. For the past three months the attacks came every week and had remained continuous for the past three weeks. Patient takes very little food, has lost much of body weight, and is said to have had obstinate constipation, for the relief of which various purgatives, including croton oil, have been administered by different practitioners. On admission, on August 13, to the Polyclinic Hospital, her temperature was 100.6° F.; pulse, 96; respirations, 24. Decidedly jaundiced. Systolic murmur at apex. Urine is dark reddish-brown, acid, specific gravity 1040, no albumen, no sugar. On August 14, operation under chloroform anæsthesia, the patient being prepared by thorough purging with magnesium sulphate enemata and lavage of the stomach immediately before the operation. Incision about six inches long was made over gall-bladder. Gall-bladder exposed and found adherent to the omentum. Adhesions were ligated and divided. The gall-bladder was aspirated and several ounces of greenish-brown, turbid fluid withdrawn. About twenty many-faceted stones were removed from the gall-bladder with forceps and scoop, after it had been opened by an incision one and one-half inches long. The gall-bladder was thoroughly washed out. With the finger in the abdomen, several stones were pressed into the gall-bladder from the common and

cystic ducts. Irrigator could then be passed into the common and hepatic ducts, which were flushed out, and on probing found free from calculi. In all eighteen large gall-stones one-third of an inch in diameter and nine small ones were removed. A large-sized drainage tube was passed into the gall-bladder and fastened to its edges by a silk suture whose ends were left long. The bladder was stitched to the peritoneum with catgut sutures, cut short, and with one silk suture whose ends were left long. Abdominal incision closed with through-and-through silkworm-gut sutures. Bile discharged freely through the tube into the bottle immediately after the operation, the amount gradually lessening day by day. On the ninth day the sutures were removed and the drainage tube on the tenth. Jaundice disappeared entirely and the urine was free from bile pigment. The patient was discharged on September 3, twenty days after operation, with moderate discharge of bile and mucus. The sinus did not close completely until three weeks later. In October and again in November patient has had an attack of colic accompanied by jaundice.

The third patient was a man, aged forty-four years, who had had during the past three years several attacks of colic, for the relief of which narcotics had to be administered; never marked jaundice. Operation under ether anæsthesia preceded by lavage of the stomach. Long abdominal incision exposed a contracted bladder containing numerous small calculi; the cystic, common, and hepatic ducts likewise filled with biliary gravel. Irrigation of gall-bladder and ducts. The case was treated like the preceding one. The discharge was moderate in amount, greenish mucus, never resembling healthy bile. Drainage tube was withdrawn and reinserted on the fourth day, sutures removed on the ninth day, patient sitting up on the tenth day. On September 8, the gall-bladder was irrigated and three small calculi washed out. Patient was discharged on the nineteenth day after operation, with one abdominal suture remaining and the sinus discharging small quantities of bile-stained mucus. After complete closure of the orifice, the gall-bladder became distended and palpable. Patient remains well.

It remains to be pointed out that ever so careful a probing and irrigation have failed in two out of three cases to remove all the calculi during the operation. In one instance they passed

subsequently through the drainage tube, whilst in the other case they are passing through the cystic or common duct.

RUPTURE OF THE LIGAMENTUM PATELLÆ.

Dr. George G. Ross reported the case of a man, forty years of age, who was admitted to the German Hospital, September 27, 1903, with an injury to the right knee. A wagon toppled over, striking him on the back; he was forced into a kneeling position, the legs being flexed on the thigh and the thigh on the body. He could stand on the right limb after being released from the very uncomfortable position, but could not extend the leg.

On admission there was moderate distention of the joint, pain, and tenderness. There was a separation of about two inches between what was thought to be a fracture of the lower half of the patella. An X-ray negative showed the separation and a deeper shadow at the position of the supposed lower fragment. It was accordingly diagnosed as fracture of the lower end of the patella, the fragment being very small.

On September 30, the joint was laid open by a longitudinal incision and the patella exposed. The patella was found to be intact and uninjured. The ligamentum patellæ was torn completely through about one-half inch below the lower border of the patella. The shadow on the X-ray plate, which was thought to be a fragment of patella, proved to be a small blood-clot.

The torn ends of the ligament, which were badly frayed, were trimmed up and united by kangaroo tendon, the upper loops of the continuous suture including the capsule of the patella. The superficial wound was closed and the limb placed in a plaster case. The patient made an uneventful recovery, and at the present time has a very fair functionating joint. Extension is good, and there seems to be a complete union between the ends of the torn ligament.

Dr. Francis T. Stewart, as illustrating the result that might be secured by sewing together the ends of a divided quadriceps extensor tendon, mentioned a sailor who had had the tensor severed by a knife thrust. Three months after the injury he was seen by Dr. Stewart, who found the joint distended with fluid and a distinct depression above the patella, the patient being unable to extend the leg. The diagnosis of severed tendon was made, and

by an anterior incision the depressed area was exposed. The severed ends of the tendon were found to be separated a distance of four inches in the middle line, this distance gradually diminishing as the muscles at either side were approached. With some difficulty the ends were approximated and sutured with kangaroo tendon. The knee was immobilized for three weeks. The functional result was practically perfect, as the patient was able to resume his occupation and work in the rigging as before the injury was received.

ACUTE INTUSSUSCEPTION OCCURRING AS A COMPLICATION OF TYPHOID FEVER.

Dr. George G. Ross reported the history of a lad, seventeen years of age, of good family and personal history, who was admitted to the German Hospital on the eighth day of an attack of typhoid fever. Temperature ran fairly regular course, although the daily range of temperature was considerable, the difference between highest and lowest for a day being as much as 3° F. The highest recorded temperature was 104 $^{3}/_{5}$° F.

On the twenty-first day he had a blood-stained, liquid stool. Tubbing stopped. On the twenty-fifth day the highest temperature was 102° F., the lowest 101° F. The tub baths had been resumed at patient's request. At 8 P.M., temperature, 101 $^{3}/_{5}$° F.; respiration, 24; pulse, 112. After bath, temperature, 99 $^{3}/_{5}$° F.; respiration, 24; pulse, 104. At 9.40 P.M., hæmorrhage, 120 cubic centimetres. At 11.35, another hæmorrhage, 650 cubic centimetres. Temperature, 99 $^{3}/_{5}$° F.; respiration, 24; pulse, 96.

At 1.30 A.M. of the twenty-sixth day patient awoke with a violent abdominal pain without any particular point of intensity; there was some rigidity of the right rectus muscle. The patient screamed with pain for fifteen minutes, and was only relieved by morphine .01. At 2 A.M., temperature, 98° F.; respiration, 20; pulse, 80. At 4.40 A.M. he had another hæmorrhage, 820 cubic centimetres. Between the time of onset of the pain and 3.30 A.M. there was a slight increase in the abdominal distention. There was a leucocytosis of 16,000. It was thought that the patient had had a perforation, and the abdomen was accordingly opened without further delay.

Immediately upon opening the peritoneal cavity it was evi-

dent that perforation had not occurred, as there was entire absence of gas or fæcal matter. There was no lymph or inflammatory exudate. It was thought wise to make a search of the small intestine. The terminal twenty inches of ileum was moderately distended, and showed the typhoid ulcers and the bleeding points very distinctly through the thin bowel wall. From this point to the duodenum the bowel was completely collapsed. About three feet from the junction of the duodenum and jejunum an intussusception about two and a half to three inches long was discovered; the invagination being from above downward. It was readily reduced and the bowel slowly distended. The sides of the invaginated portion were slightly sticky, and very soon would have become adherent. The peritoneal cavity was filled with salt solution and the abdominal wound closed without drainage. Intravenous transfusion of 1000 cubic centimetres salt solution was given. The patient's temperature remained at 98° F. after operation, rising gradually to 101° F.

On the twenty-seventh day the patient had two hæmorrhages, one of 120 cubic centimetres and one of 250 cubic centimetres.

Temperature normal on the twenty-eighth day.

Thirty-fourth day, temperature normal and the patient's general condition good. He has since made an uneventful recovery.

Dr. W. W. Keen said that the case of intussusception reported by Dr. Ross as occurring during the course of typhoid fever was extremely unusual. No case of the kind was recorded in his book on the "Surgical Complications and Sequels of Typhoid Fever," published in 1898, and covering the results in 1700 cases.

Dr. John B. Deaver said that the case of intussusception showed the importance of operating early in the presence of urgent abdominal symptoms during the course of typhoid fever. Had this case been allowed to continue, obstruction would undoubtedly have occurred, and perhaps made necessary an extensive operation, which in the enfeebled condition of the patient would have been exceedingly dangerous.

Dr. Ross rejoined that during a somewhat extensive search of the literature he had found intussusception during typhoid fever mentioned in three instances, one in an article on typhoid fever by Dr. J. C. Wilson, in Keating's "Encyclopædia of the Diseases of Children." There the condition was simply mentioned without reference to actual cases. Two cases are on record, one by Ash (*British Medical Journal* for May 3, 1903), in which operation was done and the patient recovered. The second case was reported by Watkins Pitchford in the *British Medical Journal* for September, 1902. In this case the condition occurred during convalescence from typhoid, and was only discovered at the post-mortem. Both of these reports were kindly furnished by Dr. John H. Gibbons.

GANGRENE OF THE SUPERFICIAL FAT OF THE ABDOMINAL WALL, FOLLOWING OPERATION FOR INCARCERATED UMBILICAL HERNIA.

Dr. Ross reported the history of a woman, aged sixty-seven years, and weighing 250 pounds, who had an umbilical hernia of twenty years' standing, which had been irreducible for twenty-four hours before her admission to the Germantown Hospital, October 23, 1903. The abdomen was pendulous and flabby. Bowels had not moved for forty-eight hours, severe crampy pains. Pulse, 104. Tongue moist, coated white. There was a large hernial protrusion about the size of a small melon extending halfway to the symphysis pubis. The covering of the hernia consisted of attenuated skin and peritoneum which had become adherent one to the other. The sac when opened contained a large knuckle of gut and omentum, which was tightly adherent to the inner side of the sac, but had not ulcerated through. The gut was not strangulated, although the fæcal circulation had been cut off. The gut was reduced and the adherent omentum loosened, tied off, and reduced. The sac was removed close to the peritoneal opening, which was closed with kangaroo tendon. The closure was reinforced by lateral flaps of aponeurosis. The wound was closed and rubber drainage introduced, coming out at the lower angle of the wound. The pressure of the sac and its contents had destroyed the fat in the superficial fascia for an area corresponding to the size of the tumor.

The patient was not shocked after operation. The pulse went down to 80 and the temperature to normal. The bowels moved on the second day, and she vomited but once after ether. Drainage tube was removed on the third day, at which time a foul odor was noticed. The superficial fat was gangrenous. The

gangrenous process spread until it involved the entire right side of the abdominal walls down to the loin space. The wound above the tube healed by first intention.

The urine was lost in bed, so that only an estimation of the amount could be arrived at. It was probably above normal. Several specimens examined on different days showed albumen, casts, but no sugar. The patient developed slow coma without delirium, and died in coma. Two days before death a patch of gangrene developed on the right thigh just below Poupart's ligament.

The operation wound had healed by primary union, and had not become involved in the gangrenous process, which had been confined to the superficial fat, not involving the aponeurosis below or the skin above.

In spite of the absence of sugar in the urine, he believed that diabetes was the determining factor in the patient's death.

JACKSONIAN EPILEPSY; TREPHINING; RECOVERY.

Dr. W. Barton Hopkins reported this case, stating that he did so for two reasons: First, because it added one more to the list of epilepsies cured, at least temporarily, by the operation of trephining alone, in which no discoverable lesion had been found to exist; and, second, because he had employed for the first time on a living subject the trephine which he had devised and previously demonstrated on the cadaver before the Academy.

T. T., a man, aged twenty-one years, born in Italy, came to the Pennsylvania Hospital, July 15, 1903, with the following history. Was naturally healthy until three years ago, when he became epileptic. The condition was attributed to fright; while being lowered into a well he was suddenly impressed with a dread that he would fall, and became very much alarmed. About one week afterwards he had his first convulsion. At first these were occasional, but gradually increased in frequency, until of late he has had three or four a day. On admission appears a healthy, well-nourished individual, of fair intelligence; examination of his urine, eye-grounds, chest, and abdomen are negative. On the day of his admission he had three seizures, and during the night two. One of the latter was described by the nurse as beginning in the left upper extremity and involving the upper part of the

body; was accompanied by unconsciousness, and during the attack the patient was very violent. During one of the seizures there was observed clonic movement at the elbow; then the head rotated to the left and the eyeballs turned upward and to the left. There were also some general bodily movements and apparently unconsciousness. There was no bleeding at the mouth. This seizure lasted about five minutes, at the end of which time the left arm was still twitching. Before recovering from the convulsion another similar one occurred, followed by still a third. The three seizures occupied about twenty minutes. The left arm was very painful afterwards. The nurse reported numerous convulsions up to midnight, when he was given a large dose of bromide of sodium, after which he slept.

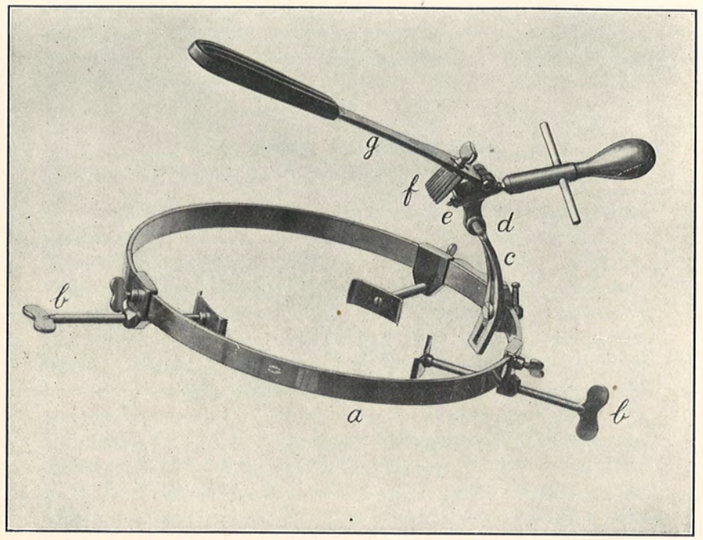
The following observations were made by Dr. Charles K. Mills, who kindly saw the patient: Left upper extremity, some weakness in grip of hand and in special movements, as of little finger and thumb. Awkwardness with movement of left hand and fingers, especially with eyes closed, but all movements retained, all forms of sensation retained, response to touch prompt, but to pain and temperature diminished and retarded. Asteriognosis of the left hand present, but not absolute; recognizes common objects, such as a knife, a coin or a key, by feeling them with his eyes closed, more promptly with the right hand and sometimes not at all with the left. Sensation similarly affected in the left lower extremity. There is no facial paralysis, no paralysis of the proximal portion of the arm and none of the lower extremities. Knee-jerk present on both sides; no plantar cutaneous reflex on the left except tarsal response at first. This latter may have been involuntary; tarsal and metatarsal responses on the right probably voluntary. No ankle clonus. Deep reflexes present in the upper extremities, probably more marked on the right.

July 23 the patient was anæsthetized with anæsthol. The topographical lines were carefully pencilled with aniline, and a point for the centre of a three-inch flap was located about three-quarters of an inch posterior to the middle of the right Rolandic fissure. The time required in cutting and reflecting back the osteoplastic flap, after adjustment of the instrument, was six minutes. A good exposure of the dura mater was thus obtained. The latter appeared perfectly healthy; pulsation was apparent

to view and touch, and there was no abnormal tension. The dura was freely opened by a crucial incision, and a probe was inserted at one point into the cortex. A flat probe was also carefully insinuated between the brain and dura beneath the peripheral opening in the skull. No diseased area nor tumor being detected, the flap was replaced and the scalp approximated with a continuous catgut suture. The patient's condition was good throughout. The next day he had a slight convulsion, but otherwise was in satisfactory condition, and the grip of the left hand was found to have become very much stronger. His recovery from the operation was uneventful. Three weeks later, August 14, 1903, he was discharged from the hospital cured, the final note being made that his general condition was excellent; that he still complained of curious feelings on the palmar surface of the left wrist; that there was no anæsthesia of the hand, no asteriognosis, as tested with a knife and watch, and the grip of the left hand, which before the operation was very feeble, was about as strong as on the opposite side. Has been quite free from convulsions since the day after the operation. The patient, seen a month after his discharge, appeared to be in perfect health.

The trephine used may be described as follows:

This instrument, through the firm fixation of its centre-pin and the powerful control of its cutter, renders the forming of large osteoplastic cranial flaps comparatively easy and very expeditious. It will cut a three-inch bone-flap in from three to five minutes, and it cuts so smoothly that the shock from cranial jar is, in this preliminary step to operations upon the brain, avoided. Its adjustment may be carefully and deliberately effected as follows: The circular frame (*a*) is clamped by set-screws (*b*) to the head in a position which will bring the adjustable bracket (*c*) approximately over the proposed site of operation, and in a plane beneath the greatest diameter of the head. The pressure of the pads of the set-screws need not be excessive; they can be brought to bear on points best able to stand pressure, and they are made to adhere closely to the integument by covering their surfaces with rubber adhesive plaster, adhesive side out. The curved bracket is next set by a binding-screw in a position which will bring the centre-pin (*e*) nearly in place, when a small incision is made into the scalp to receive it. The final and accurate adjustment is then completed by setting up the lock-joint



OSTEOPLASTIC TREPHINE. *a*, circular frame; *b b*, set screws, to which pads are applied; *c*, curved adjustable bracket; *d*, lock-joint; *e*, centre-pin with drill-point; *f*, cutter; *g*, lever.

(*d*) while the centre-pin is held absolutely perpendicular to the cranial dome. The drill-point of the centre-pin is then, by a few turns of its handle, made to engage in the bone. A circular incision of the integument may be made with a scalpel in a line indicated by a gentle impression of the teeth of the cutter (*f*), or a knife may be inserted in the notch of the lever corresponding to the size of the proposed flap. The notches 1, 2, 3, and 4 in the lever, in one of which the cutter is held by the binding-screw, cut flaps two, two-and-a-half, three, three-and-a-half inches in diameter.

PANCREATIC CARCINOMA; GASTRO-ENTEROSTOMY; PECULIAR COURSE OF THE DUODENUM AND JEJUNUM.

Dr. De Forest Willard reported the history of a woman, aged fifty-six years, who was admitted to the Medical Ward of the Presbyterian Hospital, October, 1903, under the care of Dr. Stryker, with a history of indigestion for two years. She presented marked emaciation and deep jaundice, with increasing loss of flesh for last two months; loss probably twenty-five pounds. Continuous pain at and below epigastrium for four months; vomiting persistent; bowels constipated; fæces contain fat.

Diagnosis.—Cancer, probably of pancreas; possibly involving stomach or gall-bladder. She was transferred to Surgical Ward for exploration and possible gastro-enterostomy, in order to drain the stomach. She was in exceedingly low condition, deeply jaundiced.

On examination, large, dense, nodulated masses were plainly palpable between the epigastrium and the umbilicus, extending along the spinal column nearly to the bifurcation of the aorta, and upward to the stomach; also extending across to the right in the direction of the gall-bladder. Aortic pulsations imparted to tumor. Left lobe of the liver not enlarged, but the liver is discoverable below the ribs. To the right was a smooth tumor of shape and feeling of an enlarged gall-bladder. Has vomited blood, dark in color. Has also sugar in the urine to the extent of 1.63 per cent.; also bile pigments, albumen, and granular casts; fæces contain fat. The temperature was subnormal. Pain was very severe and the exhaustion great. There was no history of

the violent attacks such as are found in cholelithiasis of the common duct.

Upon palpation the liver could be discovered below the ribs, but nodules could not be felt on its under surface. The gastric symptoms were not as positive as is usually the case in stomach cancer; there was less vomiting of blood. The absence of the pancreatic secretion from the intestines was not tested by giving salol and noting the absence or presence of its products carbolic and salicylic acids in the urine: salol under normal conditions should be decomposed into these two substances in the duodenum. Examination of the gastric contents showed free HCl present; total free HCl, 16; total acidity, 28; erythrodextrin present; microscopic examination, starch.

Operation, October, 1903. Patient's condition very unfavorable; within fifteen minutes from beginning of operation pulse became unrecognizable at wrist. Patient in collapse throughout nearly whole time; salt solution, hypodermoclysis, oxygen, stimulants, etc., freely used. Upon opening the abdomen, dense nodules occupying the site of the pancreas were reached. These nodules filled the curve of the duodenum, extended across to the left beyond the spinal column, and up and down the spine. Pylorus not involved. Liver free and normal. Gall-bladder greatly distended. The duodenum could be traced from the pylorus through the first three inches, then it disappeared behind the cancerous mass and could not be reached. On lifting the omentum, large dense masses were found adherent to the posterior part of the omentum, and, as the duodenum could not be reached nor the first part of the jejunum, a loop of bowel was caught and a posterior gastro-enterostomy done with a Murphy button, as the most rapid method. Patient's condition forebade any additional entero-enterostomy. The gall-bladder, the size of a small orange, was sutured to the abdominal wall and drained through a second opening. Several ounces of very dark green, thin bile were secured, with four small dark gall-stones. No stones found in ducts. In spite of saline injections and stimulation of all kinds, the patient only rallied slightly, and died the night after operation.

At autopsy the duodenum and the first part of the jejunum were entirely lost behind the cancerous pancreas. Upon reflecting the great omentum the under surface was found adherent to the upper surface of the mesentery, still further concealing the

course of the upper intestine. A probe could be passed through the cystic and common ducts into the duodenum, meeting no obstruction. The dilated gall-bladder and changes evidently had been due to pressure upon the duct. The infiltrated glands extended up the spinal column as far as the diaphragm. The left kidney showed secondary carcinoma deposits; liver and right kidney free.

Pathological Diagnosis.—Primary carcinoma of pancreas with metastases to the mesenteric, retroperitoneal, and peripancreatic lymphatic glands; also of the left kidney. Pressure on the duodenum and common bile duct; carcinomatous adhesions between the great omentum and mesentery enclosing transverse portion of the duodenum.

Dr. J. Dutton Steele, Pathologist, reports as follows: "Carcinoma of pancreas; the organ considerably sclerosed, with atrophy of the secreting glandular tissue; cancer nests infiltrating the newly formed connective tissue. Sclerosis does not affect the islands of Langerhans, and they are quite numerous in proportion to the glandular epithelium. Cancer evidently of glandular origin. The kidney shows secondary deposits; the acute parenchymatous degeneration or cloudy swelling as seen in cases of intoxication in poison and in malignant disease."

Dr. Willard remarked that these tumors of the pancreas may sometimes be reached by dividing the gastrocolic omentum below the greater curvature, where the tumor may be covered by the posterior layer of the lesser sac, or they may be reached by turning up the omentum and tearing through the transverse mesocolon into the lesser sac; as they usually push the transverse colon downward, it is sometimes necessary to pass through both layers of peritoneum forming the greater omentum, together with the posterior layer of the peritoneum of the lesser omentum.

A dozen or more cases of attempted removals of cancer of the pancreas have been reported by Robson and Moynihan in their work on "Diseases of the Pancreas." Portions of the gland have certainly been safely taken away in some cases, and in one or two instances it is said the whole gland; but this procedure seems doubtful, especially when one considers the close relations of the large splenic, superior pancreaticoduodenal branches from the hepatic, and the inferior pancreaticoduodenal branches of the mesenteric. The hæmorrhage from any one of these vessels in

the already weakened condition of these patients would be a serious matter. Directly behind the head also lies the inferior vena cava, the left renal vein and the aorta, to which vessels adhesions might have been contracted, while the tail of the organ is in intimate relation with the spleen and with the duodenojejunal flexure.

SPINA BIFIDA, WITH ANTERIOR OPENING, FORMING ABDOMINAL CYST.

Dr. De Forest Willard presented a female Italian child, who at his first examination, when the child was two months old, presented a dorsal tumor the size of a small orange, which occupied the whole lumbar region. It was covered by normal skin; was semifluctuating in character, but was too dense to permit accurate information as to an opening into the spinal column. The impression imparted to the hand was that of a lipoma, with an underlying spinal cyst. Pressure upon the mass did not give the child pain nor apparent cerebral distress. It was rendered somewhat tense in crying, but the child was apparently in no pain and did not cry out when handled. The right half of the abdomen and flank were filled with a large semiliquid tumor, giving the impression of a sarcoma of the kidney. The child does not use its lower limbs. The baby at present is four months old, and observation for the last two months does not reveal any perceptible increase in either tumor, and the child is thriving, thus rendering the diagnosis of sarcoma improbable.

The abdominal tumor bulges on coughing; is tympanitic in points, as though the colon was pushed forward, but with the possibility of it being an anterior spina bifida. Tapping it has not been resorted to, and the condition is so uncertain that he had preferred to delay operative measures upon either posterior or anterior tumors until the diagnosis was more sure, and until the child should be older.

The dense shadow in the tumor, as seen in the skiagraph, denser even than the bones of the spinal column or pelvis, renders the condition a puzzling one. The tumor might be a teratoma containing fœtal remains.[1]

[1] International Encyclopædia of Surgery, Ashhurst, Vol. iv, pp. 902–905.

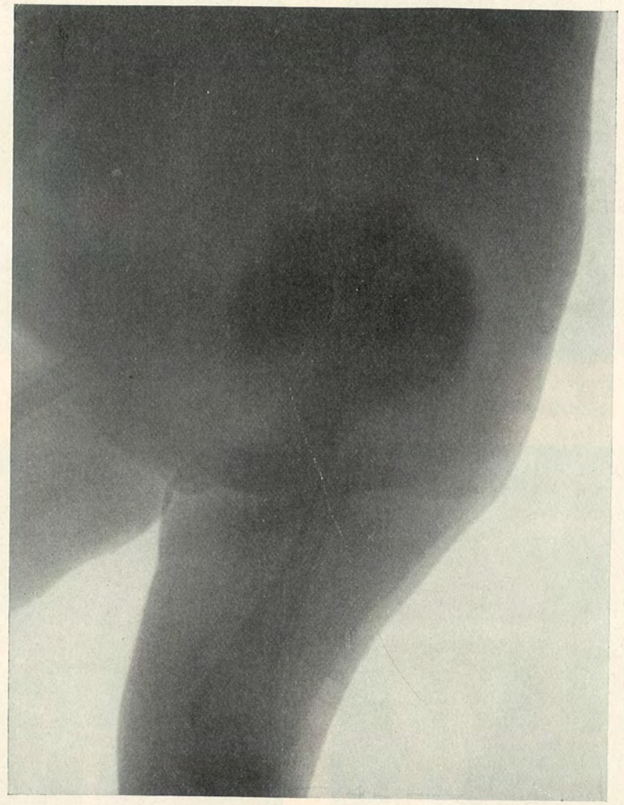


Fig. 1.—Skiagraph of case of spina bifida, posterior and anterior.

FIG. 2.

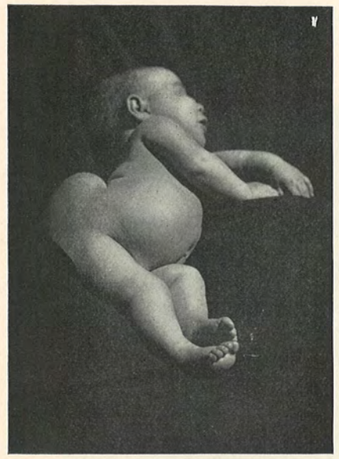


FIG. 3.

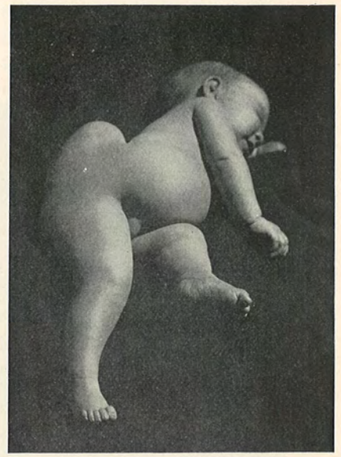


FIG. 4.

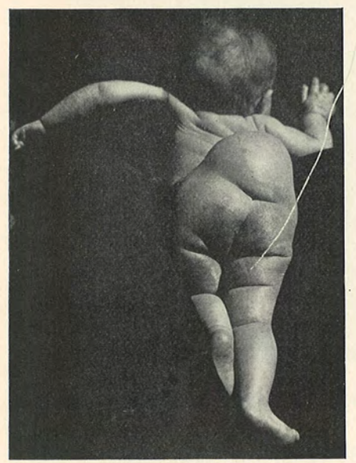
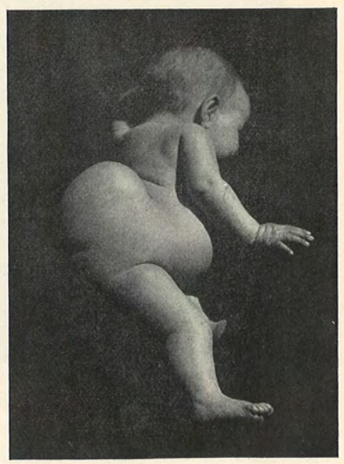


FIG. 5.



Spina bifida, posterior and anterior.

Spina bifida anterior is a very rare condition.[2] Robinson [3] states that there is no clinical record of a similar experience to his own; but Emmett [4] reports such a tumor diagnosed as an ovarian cyst in a woman of thirty-six years, which cyst extended into the pelvis, filled up the curve of the sacrum, and was aspirated through the rectum. The woman died on the seventh day. The cyst contained three quarts of fluid, and was found to be connected through the three lower sacral bones with the spinal canal.

In Robinson's case of a child of eleven months old with club-feet, there is no record of a posterior tumor; but the right side of the abdomen was occupied by a large tumor, which received an impulse on straining; the cutaneous veins were enlarged. The fingers could be dipped between the costal margin and the cyst. The diagnosis was that of a parovarian or broad ligament cyst, or some fœtal remnant. Celiotomy was done at the right of the median line. A pint of fluid was removed from a thin-walled cyst, and a finger inserted into the cyst passed into an opening into the spinal column. The sac was ligatured close to the spine with silk and cut away. No nerves were found in the sac. The fluid was colorless; specific gravity, 1002; alkaline reaction; contained a trace of proteid and some chlorides. The child lived ten days. Temperature persistently high. Five days after operation the anterior fontanelle was fuller. No tetanic contractions in hands or arms. At the post-mortem an extensive defect at the right side of the last dorsal and of the lumbar vertebræ was discovered. The pedicles of the transverse processes of these vertebræ were absent; the bodies of the vertebræ were irregular and fused. The two lumbar had a very poorly formed ossific nucleus on its right half; the third had no ossific nucleus on the right side. The spine was curved laterally, concavity to the left. There was a marked dilatation of the central canal of the cord.

One other case is found in the Royal College of Surgeons

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[2] Willard. International Encyclopædia of Surgery, Ashhurst, Vol. vii, Supplement, p. 653, 1895.

[3] Medical Press and Circular, London, p. 477, 1903. Transactions of Clinical Society, London, 1903.

[4] American Journal of Obstetrics, 1871, p. 623.

Museum,[5] but there is no clinical record attached. In this case there is a marked defect on the left side of the last lumbar vertebræ; but the case is probably one of posterior rather than anterior tumor.

Bryant [6] reports a case of a woman aged twenty-five years dying from an accident, who presented an anterior spina bifida.

Jacobi [7] reports operation upon a supposed lipoma in the lumbar region of a child four months old, which at birth presented a tumor the size of an English walnut. It grew rapidly, however, and at the operation, after cutting through one and three-quarter inches of fat, a spinal sac the size of a thimble was found connecting with the two lower lumbar vertebræ. The child died in convulsions in forty hours.

Johnson [8] reports a recovery from an excision of a fatty tumor overlying a spina bifida.

Dr. John B. Deaver said he believed the case to be one of spina bifida. Both tumors contain fluid, as fluctuation can be elicited in each. Both posterior and anterior are in connection with the spinal canal. The paraplegia as well as the anterior tumor especially increasing in size when child cries favor this diagnosis.

Dr. William L. Rodman believed the tumor on the sacrum to be a combination of lipoma and spina bifida. This is not a rare condition. Dr. Willard exhibited another such case to this Academy a year ago, and Dr. Rodman has seen several such cases. Bland-Sutton has particularly called attention to this condition. The anterior tumor is of doubtful nature. It is possible that the posterior one has become cut off from the spinal canal by closure of its communication and the fluid is going anteriorly. This seems to be a rational explanation of the situation, but the anterior tumor is tympanitic. The presence of coils of intestine might be in part responsible for this tympany, yet there seems more than would come from these and a moderately distended cyst. Another possibility in this case is that it may be one of

[5] Clinical Society, London, Spina Bifida Reports, Vol. xviii, pp. 358, 359.

[6] London Pathological Society Transactions, Vol. ii, 1860, p. 299.

[7] American Journal of Obstetrics, 1871, 631.

[8] Transactions of Pathological Society, London, Vol. viii, p. 16.

lumbar hernia presenting in Petit's triangle. Spina bifida is usually accompanied by other developmental faults, such as hernia, talipes, hydrocephalus, etc. Dr. Rodman was quite sure that the condition is not one of sarcoma of the kidney.

LIVER ABSCESS FOLLOWING AMŒBIC DYSENTERY; DRAINAGE THROUGH GASTROHEPATIC SPACE.

Dr. De Forest Willard reported the history of a woman, sixty years of age, who in August, 1903, in the midst of good health, and without having visited the tropics, was seized at Atlantic City, New Jersey, with pain, mucous stools without blood; passages eight or ten daily; temperature as high as 104° F. Soreness on pressure continually present. Amœba found in stools. She was seen in consultation with Dr. Musser late in September suffering with great pain over the region of the liver, with tenderness on pressure. Below and to the right of the epigastrium was a tender, semifluctuating tumor, visible to the eye. There was slight jaundice with continuous bowel pain and vomiting. Hæmoglobin, 60 per cent.; red blood-corpuscles, 2,745,000; leucocytes, 22,000.

On account of danger of rupture into the peritoneal cavity, immediate operation advised, which was done September 29, 1903. (At the operation he was fortunate enough to have the assistance and counsel of Dr. W. J. Mayo.)

Upon opening the peritoneum no adhesions were found between the two layers. The edge of the liver was plainly seen, but there were no signs of protruding abscess upon either upper or lower surfaces. Beneath the liver, in the gastrohepatic space, was a large elastic tumor, suggesting cyst of the pancreas. After circumferential packing had been introduced, a half-pint of greenish-yellow fluid was evacuated, thin in consistency at first, later thicker and more glutinous; finally, masses of dark, broken-down liver tissue and partially organized coagula were discharged. In the cavity was a large ragged mass of firm consistency, which it was deemed unwise to detach with the fingers lest hæmorrhage be started. The walls of the abscess were stitched with catgut to the aponeurosis, and a large rubber drainage tube inserted to the bottom of the cavity, together with a strip of gauze.

Laboratory examination. Fluid from amœbic patient. Spe-

cific gravity 1002; albumen, $4^{4}/_{10}$ per cent.; clear green fluid; no pancreatic ferments; no change in milk, and no production of peptone in alkaline media. Microscopical examination. No pus; few fat droplets and granular débris; no bacteria. Culture in agar (plate), sterile; no growth. Necrotic tissue, apparently old blood-clot, containing no amœba and no bacteria. The fluid proved to be sterile; did not respond to the tests for pancreatic juice, while it was also negative as regards bile tests. The hardened masses removed showed broken-down blood-corpusles, etc.

As the patient vomited on fourth day, the packing was removed, lest its pressure upon the stomach might act as an irritant. The drainage from the cavity was left undisturbed. The peritoneal cavity was quickly blocked off and never became infected. The masses within the sac separated and came away as slough. Drainage continued for weeks from the cavity, which was six inches deep from the surface, but which slowly granulated.

October 4, 1903. Agglutination test with bacillus of dysentery in dilution, 1 to 20; negative. In dilution, 1 to 50; negative. Gastric contents, total amount, 58 cubic centimetres. Total free HCl, 0.4 cubic centimetre. $^{n}/_{10}$ NaOH Sol. 0.014584 per cent. Lactic acid absent. Microscopic fat globules abundant; starch granules few; sarcinæ absent; Oppler Boas bacilli negative.

October 5, 1903. Hæmoglobin, 75 per cent.; red blood-corpuscles, 4,238,000; leucocytes, 14,900. Gauze dressings suggestive of biliary elements; staphylococcus pyogenes albus.

October 30, 1903. Amœba coli present in the abdominal discharge and in stools.

The varying conditions of the presence or absence of amœba agree with the statement of Kieffer (*Philadelphia Medical Journal*, February 21 and 28, 1903) in his excellent lectures on "Tropical Abscess of the Liver."

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