TRANSACTIONS OF THE PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, May 1, 1899.

The President, J. EWING MEARS, M.D., in the Chair.

ACUTE CHOLECYSTITIS; CŒLIOTOMY.

DR. ALFRED C. WOOD remarked that acute inflammation of the gall-bladder, as a complication or sequel of the infectious diseases, has been recognized for a long time. There is, however, another class of cases to which his attention had been called but recently, in which the disease develops suddenly, in a person in good health, and in many instances in whom there has been no previous symptom referable to the biliary system. It is to this class that the case reported belongs.

Miss E. R., single, aged twenty-seven years. For a year prior to the present illness there had been some pain, at times, in the right iliac fossa, which was thought to be ovarian in origin, and to be the result of using a sewing-machine a great deal.

On August 31, last, she left home in her usual health to visit friends; during the night she was awakened with a chill, which she said was a very hard one, and lasted for a considerable time. After the chill had passed she fell asleep, and woke later with a high fever and severe pain in the head and back. A physician was summoned, who administered an hypodermic injection of morphine for the severe pain in the back. During the day (September 1) nausea and vomiting supervened. The matter vomited was principally bile. Severe general abdominal pain was next noted. There was no bowel disturbance. During the following ten days the same conditions prevailed, sometimes better and other times worse. The temperature ranged between 102° and 105° F.; the pulse at times being as high as 150. The abdomen was very tender to the touch, and gradually became more and

more distended until, on the tenth day, it was said to have been extreme. During this time the treatment had consisted in the administration of morphine to relieve the pain, and calomel, when necessary, to secure an action of the bowels. The diet had been limited to liquids, and turpentine and hot fomentations were applied to relieve the abdominal pain and distention.

She was first seen by Dr. Wood on the eleventh day of her illness. At the time of his examination the patient's expression was that of a person extremely ill, being that commonly observed in cases of peritonitis. The temperature was $103^{3}/_{5}°$ F., the pulse 130, and the respiration 34. The abdomen was uniformly distended and everywhere exquisitely tender to the touch. In fact, the jarring of the bed, caused by a person walking across the room, gave rise to acute pain. The patient lay on her back with the knees drawn up; the abdomen was everywhere tympanitic. Palpation yielded no information, save that the tenderness seemed slightly more acute at some points than at others. This sign was of no value, however, inasmuch as the points of greatest tenderness changed at successive examinations. It was never sufficiently constant at McBurney's point or over the gall-bladder to point conclusively to either of these regions as the origin of the trouble; in fact, the left iliac region, the right lumbar region, and the left hypochondriac regions were successively found to be the most sensitive points to pressure.

Being unable to decide whether the patient's condition had its origin in the appendix or in the gall-bladder, he advised an abdominal section, intending to first explore the right iliac fossa, and if this were found normal to examine the gall-bladder. The patient was, however, in a remote district of the country, where the necessary appliances for carrying out a modern operation were not obtainable, and where it would have been impossible to have given her the proper attention after operation. She was therefore removed to the University Hospital, in this city, a distance of 500 miles, where the case was further studied. During the two days that elapsed between her arrival at the hospital and the time for operation, the symptoms seemed to point more and more towards appendicitis. There seemed to be slightly more resistance in the right iliac region than elsewhere over the abdomen, and that there was a gradually developing dulness.

When the common incision for reaching the appendix was

made, the contents of the right iliac fossa were found to be absolutely normal, but on passing his hand up towards the gall-bladder a large mass was discovered which led him to prolong his incision upward to that point, where he found the viscera adherent to each other and to the anterior abdominal wall. On separating the adhesions a considerable quantity of purulent bile was evacuated. The patient's condition was such that he was then obliged to provide for drainage, to pack off the general peritoneal cavity with gauze, and to close the wound as rapidly as possible.

The convalescence was slow but uninterrupted. The temperature reached the normal point on the sixth day. Bile flowed freely from the opening for several weeks, but the sinus finally closed and remains healed at the time of this writing (June, 1899).

He reported this case thus fully because he believed, with Dr. Maurice H. Richardson, who, in his excellent article in the *American Journal of the Medical Sciences*, Vol. cxv, 1898, p. 629, states that "this subject seems worthy of discussion in connection with that of acute abdominal lesions demanding immediate interference; for acute cholecystis,—acute accidental cholecystitis, if I may thus designate this lesion,—though comparatively rare, is more frequent than such well-recognized lesions as intussusception, volvulus, or other forms of acute intestinal obstructions."

Acute phlegmonous inflammation of the gall-bladder is eminently a surgical affection and demands early operative intervention. Although healthy bile is said to be sterile, and to be tolerated by the peritoneum, the condition is quite different when the gall-bladder is the seat of an infectious inflammation. In the class of cases to which the one just reported belongs, it would seem, in the present state of our knowledge, that the diagnosis must not infrequently be made at the time of operation. In the case described there had been no illness for nine years; there had never been a single symptom of the presence of gall-stones. He did not know whether in the beginning of the attack careful palpation would have revealed the presence of a distended gall-bladder or not, but by the eleventh day the abdominal distention was so great that it was impossible to determine this point. There are cases in which the localization of the pain and the distention of the gall-bladder will lead to an immediate recognition of the trouble, but there are others in which, as in this one, it is abso-

lutely impossible to distinguish it from appendicitis or a local peritonitis due to rupture of an intestinal or a gastric ulcer or other similar cause.

The operative treatment of acute cholecystitis should be as successful as that of appendicitis, if an early diagnosis be made. The technique need not be described, as this is familiar to every surgeon.

Dr. Richardson reports (*loc. cit.*) ten cases of acute cholecystitis without known pre-existing disease, in a total of fifty-nine operations upon the gall-bladder, a most interesting series and well worthy of careful study. In some of these the histories are very similar to the one detailed, although the temperature in the latter was rather higher than in the series referred to.

THE CHOICE OF OPERATIONS UPON THE MALE BLADDER.

DR. JOHN H. BRINTON said that when this subject was brought before the academy on a recent occasion (ANNALS OF SURGERY, July, 1899, p. 103), it seemed to him that book directions were too closely adhered to; that there was a somewhat vague impression of individual opinion, and that sufficient prominence was hardly given to every-day, real practice.

The procedures or operations on the male bladder, to which he particularly referred, were, first, litholapaxy; secondly, the different methods of perineal lithotomy; and, lastly, the suprapubic or high operation of cystotomy. First, however, he recalled, for a moment, the old method of lithotrity, now practically obsolete. It had, he thought, its advantages, at all events for a time, and it had great disadvantages. In the early days the stone was usually crushed with the fenestrated instrument. This, from its then faulty construction, sometimes nipped the vesical walls; indeed, he had seen a strip of mucous membrane come away hanging from between the blades. Then, too, the fragments were simply broken, of rather large size, and often angular; although finer and better work was later done by the use of the duck-bill lithotrite.

A complication attending the use of all of these instruments was the liability of the blades to become clogged with imperfectly crushed fragments. When this occurred, the withdrawal of

the instrument was sometimes difficult; and he had known serious injury to be inflicted on the walls of the deep urethra.

He remembered operating on a case in a large hospital in this city, a great many years ago, using a crusher, which at that time was considered a very satisfactory instrument. It did its work apparently well, and yet, when he came to withdraw it, he found great difficulty in bringing it through the urethra. It had clogged, allowing a large piece of stone to become thoroughly and firmly impacted. He worked very carefully for a long time, —the patient was an old man,—and succeeded, finally, in extracting the instrument. At the same time, so much injury was done to the urethra that, from shock of the operation and injury to the walls of the urethra, death took place after several days, and on post-mortem examination, the walls of the urethra were found to be severely bruised and were on the point of sloughing.

Then, he knew of another case, in the practice of a prominent surgeon, in which the urethra was absolutely torn off, the result of a clogged lithotrite, and that patient died.

In connection with lithotrity, he recalled to memory the operation of a great surgeon, one who was in fact a surgeon to the very ends of his fingers, the late Professor Joseph Pancoast. Any one who had seen him operate would recall the wonderful facility and certainty with which he would find and catch the stone, and the skill with which he would crush it into fine pieces. He never would explain exactly how he found the stone. His directions were simply these: "You put the instrument into the bladder, turn it around, and pick up the stone." That was all; and in this respect he spoke much as Civiale did. Dr. Brinton had often closely watched Dr. Pancoast in this operation, and he was quite sure that he always followed a carefully considered plan of procedure to detect and grasp the stone. His technique, to use our modern term, was always the same: it was one from which he never deviated. Dr. Pancoast, having introduced his instrument into the partially dilated bladder, would push it right back until it reached the posterior wall of the bladder, then, turning the instrument eight or ninety degrees, he would gently draw it forward along the left side of the vesical walls, until the hooked blade would be arrested by the posterior portion of the prostate. He then depressed the handle between the thighs of the patient, so that the elevated curved beak could sweep closely and accu-

rately behind the prostate, and this manœuvre he would repeat to insure an exhaustive search of the vesical neck and post-prostatic region. This done the instrument was pushed backward, along the right side, to the posterior wall of the bladder, drawn forward, and the right side searched in like manner. Then with beak upturned, the anterior wall was swept, to discover any possible encysted calculus. When any calculus was detected loose in the bladder, he would with the curve of the instrument make slight pressure, so as to form a sort of cup in the mucous membrane, and then gently separating the blades, tapping them with some small metallic object, would receive the calculus, between the open blades slightly rotated to receive it. This was his manipulation for the detection and grasping of the stone; simple enough in practice, but almost magical to the eyes of a by-stander. The rest, to use Dr. Pancoast's words, the getting rid of the stone, was best accomplished by crushing it moderately fine, and letting the patient "piddle it out." This operation of lithotrity, a good one in its time, has, however, passed away, and is now superseded by litholapaxy. The latter has its advantages,—advantages in rapidity,—in the fact that the operation is done at a single sitting, and that, when done well, it is a very thorough operation. Now as to litholapaxy.

What are the difficulties of this procedure, and has it any dangers? The difficulties of too small a urethra, or contracted meatus, may usually be easily overcome. With a delicate hand and gentle touch, manipulation may possibly be carried on despite an enlarged and tender prostate. There is no great difficulty in catching a stone, and in properly breaking it. The fenestrated lithotrite has given way to safer treatments, and we have the powerful and lipped crushers of Bigelow; the varieties of Thompson's instrument, and the powerful one of Forbes, possibly the best yet devised.

The crusher which he preferred is a Thompson instrument, changed and modified. It has the exact curve of Bigelow's instrument, with a shorter female blade, and a strong, indented male blade, with teeth sloping outward. These blades are so fashioned that impaction under any circumstances is impossible, and the instrument can always be readily inserted and withdrawn. Its size is No. 27 of the French scale.

As to the dangers of litholapaxy, for dangers there are, and

patients do die often after this operation. Every surgeon of to-day, who has had much to do with crushing stone, has seen or known of death following litholapaxy. Professor Bigelow, in his early paper, in 1878, gives one death occurring in seven cases, and remarks, " It must pass for what it is worth." Immediately after the announcement of the method of litholapaxy the speaker was greatly attracted by the description given, and he determined to make trial of the operation. He did so, and in two days lost his patient, the only one he had ever lost after this procedure. This set him to thinking, and he tried experimentally to determine in what the danger lay. He took bladders, human and from the pig., placed them on the table, and injected into them varying measured amounts of water, having first inserted fragments of crushed calculi. He then made use of Bigelow's evacuating bag and tube, carefully noting the degree of digital pressure on the bag, just sufficient to agitate the fragments, the amount of water thrown in, and the distending effect upon the bladder. With a stiff rubber bulb, the amount thrown in by moderate pressure was about one and a half to two ounces; with a softer and more easily compressed rubber, from two to three ounces. The distending effects upon a bladder already nearly filled was very great, and he could understand how in a living bladder, especially if diseased, unlooked-for injury might be produced.

From experiments made upon bladders of varying capacity he was convinced that, unless the surgeon is practised and careful, he may by too rapid and over-distention unwittingly inflict damage upon a bladder to a disastrous and even fatal extent. To avoid such results he had, to his own mind, laid down the rules to be rigidly observed in the performance of the operation of litholapaxy.

(1) Draw off all accumulated urine, and carefully determine the full painless capacity of the bladder, two or three days before operation.

(2) In like manner determine the capacity of the bladder when patient is etherized for operation.

(3) Before using the evacuating instrument throw into the bladder borated or other proper antisepsic solution, to the extent of not more than three-fourths its capacity under ether. Thus, if the bladder will easily hold eight ounces, inject not more than six ounces.

(4) Use only moderate efforts with the evacuating instrument, making short, quick, squeezing pressure-movements with the fingers.

This matter of the over-distention of the bladder he believed to be one of the greatest dangers of litholapaxy. It can, however, be avoided, if the operator will only bear in mind the natural capacity of the bladder, and at all stages of his procedure refrain from throwing into the organ more than it can bear without undue strain. He should always keep one-fourth at least of the bladder empty. Clinically he had observed that a disregard of these precautions had been followed by disastrous results; and this is only what one might expect, when it is remembered that, in this operation, one has often to proceed in the face of, possibly, associate affections of the prostate, ureters, and kidney.

There is one clinical symptom which has not attracted attention,—viz., the groaning of the patient under ether, coincident with distention of the bladder. He thought that this is produced by over-distention, most apt to occur at the beginning of the evacuation, before leakage by the urethra to any extent has occurred, or just after the bladder has been refilled. He looked upon this groaning under ether, the result of pressure from the evacuating bulb, as a prophetic symptom of the gravest nature.

From what he had said it would be inferred that he regarded the operation of litholapaxy as a dangerous one in the hands of the general surgeon, and so he did. He looked upon it as very dangerous, save at the hands of a skilled few. He was sure that he was not alone in this view.

Passing now to the suprapubic operation,—is there not much to be said in its favor? It can be done with the greatest ease, and when the bladder is opened, a thorough examination of that organ can be made. Any calculus present can be detected absolutely and at once, whether loose, or encysted, or hidden behind a projecting lip of the prostate. Not only can the finger be used in the examination, but by the employment of proper electric illumination the interior of the bladder may be thoroughly inspected. Any foreign substance can be detected and removed, and, if the operator so wishes, protruding portions of the prostate may readily be taken away. The entire cavity of the bladder is under view; any necessary operative manipulation can be rapidly and efficiently performed; and when finished, the

surgeon has that comfortable certainty of mind that he has seen everything, inside the bladder; that nothing has been concealed or omitted; and that he has done for his patient all that he believed to be right. This certainly is a great matter in exact procedures, and cannot be arrived at by any other process than suprapubic cystotomy. The radical treatment of stone and its complications is thus made easy.

As for the dangers of the suprapubic operation, done in accordance with modern precautions, and with a full antiseptic technique, they are not great. The speaker had done a good many high operations for stone and for drainage, and had been so fortunate as never to lose a case. He had seen a great many more suprapubic cuts done by his friends, and had heard of but two deaths. It is sometimes said that this operation is a dangerous one. He thought, however, this statement to be based upon inherited opinions and prejudices. It usually was not the case in his personal experience and observations.

Drainage.—Many cases occur in which it is advisable to preserve a permanent drainage from the bladder. This may be demanded, *inter alia*, for chronic diseases of the mucous membrane, or for obstructive enlargement of the prostate gland. The problem of the preservation of a permanent fistula, practically the formation of a new urethra by the method of Dr. Hunter Maguire of Virginia, had greatly interested him. He had in many instances resorted to this drainage through a suprapubic fistula, which had in time become a satisfactory permanent new urethra. This he had successfully brought about by the daily insertion of short, flexible, block-tin, female catheters, of sizes proportioned to the calibre of the fistula, and bent or curved according to its direction. These he left in for a few hours, for a day or two at a time, until the new channel becomes callous, and accustomed to the passage of urine. Then a silver tube, of the size and curve arrived at, may be substituted and worn if necessary, closed with some sort of obturator, which can be loosed and withdrawn when necessary. In this manner leakage of urine in many cases may be practically overcome. Left to itself, the urine in the bladder accumulates, until the level of the artificial vesical opening is reached. Then escape of urine (leakage) will happen. Very often, however, the patient will first experience some strange, undefined desire to get rid of the contents of the bladder, which

may be accomplished by the insertion of a short catheter, or by opening the vent of the one already worn in position.

By these means, the patient can obtain a fairly good urethra, and in cases of prostatic hypertrophy, one is able to discard, as it were, the enlarged prostate, leaving the patient to draw off his own urine through this short, artificial urethra, comfortably and at his pleasure.

He had a patient, seventy-eight years of age, on whom he established, five or six years ago, an artificial urethra, after removing two stones by the suprapubic method. He has since passed all his water through the artificial canal, none by the natural urethra. He does not wear any permanent tube, but draws off his water as required; when he goes to bed at night, in the morning, again about his time of luncheon, and when he goes home for late dinner. He wears a small pad for safety's sake, but there is no leakage.

Dr. Brinton performed, years ago, a like operation, with equally good results, on a man fifty odd years of age, who still farms himself a tract of land of 160 rather barren acres, near the North Carolina coast. He has never, since the operation, passed a drop of water through the natural channel, and has not been troubled, in any way, with his enlarged prostate.

He had sometimes asked himself, What would I have done, if I were so unfortunate as to have, beyond peradventure, a calculus in my bladder? His answer to such a self-directed question would be briefly this, If the stone were a small one, and a soft one, he would have it thoroughly crushed, and try and pass it, *per urethram,* or possibly, if he could command the services of a skilful surgeon, whom he could trust, he would, perhaps, have it washed out. If, however, he had reason to believe that the stone was large or hard, or both, he would unquestionably have the high operation performed, since by the choice of this operation he firmly believes that less risk of life would be incurred, and that the operation, if successful, would be more apt to be final and happy in its results.

In conclusion, Dr. Brinton inquired whether any member present had ever observed evil consequences follow the X-ray examination of the bladder. He asked this question for this reason: Some time since he was present at such an examination, made on the person of a man suspected of stone, which repeated

previous searchings with the sound had failed to realize. The examiner was an expert, and the exposure about twenty-three minutes, with a negative result. Later the calculus was detected by the sound, and extracted by the suprapubic method. Several days afterwards a slough occurred around the wound, which involved the subcutaneous tissue and skin and travelled down in front of the bladder. The patient recovered, but the complication was an annoying one, although he could not speak positively as to its cause; which may have been some subtle influence of the rays, or slight urinary infiltration, or both causes acting together. He should say, however, that the drainage from the bladder was at all times good.

DR. W. W. KEEN said that he thought the choice of operation depends much on the age and the general health of the patient, as well as the size and character of the stone. If he were to choose between litholapaxy and suprapubic systotomy, and the patient were an old man and in feeble health, he would not do a litholapaxy. As a rule, in these cases the kidneys are not sound, —indeed, they may be very much diseased,—and the prolonged use of any anæsthetic, and the necessary shock that follows it, make suprapubic cystotomy very much preferable to litholapaxy. In a man with a moderate-sized stone, in vigorous health and relatively young, he would choose litholapaxy.

As to the rules laid down by Dr. Brinton with reference to the size and character of the stone, he agreed with him, but the question of age he did not touch upon. He thought his remarks as to the quantity of water with which the bladder should be distended are very much in point, and it would be well for all to heed them. The normal capacity of the bladder, of course, should be ascertained, and before applying suction to the bladder a fixed amount of water should be allowed to escape, in order to avoid the possibility of over-distention or rupture of the bladder.

For distending the bladder, however, he thought air to be much safer, especially in older persons, air being more elastic and less likely to damage the walls of the bladder. He had not found any difficulty in reaching the bladder when it was distended with air. It makes a very firm support. He liked the rectal bag, at least where one has to deal with the posterior wall of the bladder. He had found one advantage, that when an incision was made into the bladder the wound was not flooded with

water, but one can very quickly catch the walls of the bladder, and further manipulations can be carried on as desired. He did not think it necessary to suture the walls of the bladder to the abdominal wound. He had never done so, but had found that the wound is very quickly soldered together, and establishes a thorough protection against sepsis.

The drainage he had usually employed had been that which was devised by Cathcart, and he had found it, not only in the bladder, but in abdominal, thoracic, and other cases, to be very useful. It was more effective in his hands than any other method.

In reference to the question of the X-rays, he thought surgeons should be very careful as to their use, as there had been so many cases of burn reported,—in other words, he was very much inclined not to be willing to use the X-rays, at least in any case where a prolonged exposure was demanded, as in cases where the thickness of the parts is very great, without having a paper signed by the patient himself, assuming all liability if any injury should follow. In the very best hands such accidents have occurred, and there is now pending in this city a suit for such a burn. It is not the surgeon, it is not the X-ray operator who is responsible,—it is one of the things that no one can foresee. If the patient would not be willing to assume the responsibility, he would decline to use the X-ray.

The method which has been adopted recently by Cordier in skiagraphing stone in the bladder deserves mention. By inserting a narrow plate like an ordinary microscopic slide, suitably protected, into the rectum, in a man, or the vagina, in a woman, so that no poisonous effects would be produced, and by placing the tube above the abdomen, he has obtained most satisfactory results. It is not only suitable for cases of stone, but also applicable to foreign bodies in the bladder.

DR. DEAVER said that, in cases of stone in the bladder, he favored litholapaxy with very few exceptions. He had done a number of operations for litholapaxy, and had lost but one patient. That was an old gentleman, about seventy-six years of age. He made an autopsy in the case, and found a hydronephrosis of the right kidney and a contracted left kidney, with a very large cyst involving the ureter. That man would have died, litholapaxy or any other operation.

There are certain cases where litholapaxy is out of the ques-

tion, but in the majority of cases it is the operation. He would not cut for a stone when it could be crushed and he could go to business in a few days thereafter.

Of all operations, in that of litholapaxy the patients should be profoundly anæsthetized, to make the parts amenable to manipulation. It is only necessary to have two or three ounces of water in the bladder. He always went short of distention. With regard to evacuation, he used very little motion,—very little pressure. He was governed by the force necessary to bring the fragments into the bulb of the evacuator.

In regard to the question of death, there is no doubt but that prolonged etherization is a factor, but if one examines the statistics of the two operations the cutting operations are attended by higher mortality than the crushing operation.

Another strong point in favor of the crushing operation is that the patient will agreeably submit to crushing, where he would not submit to cutting, and while there are very few cases of fistulæ following the suprapubic or perineal operations, it does occasionally occur. He had often thought of the remark of Dr. Agnew, that he could not see the philosophy of going to the top of a house and breaking through the roof, while he could enter through the cellar door, and he believed that perineal drainage is best, except in the presence of a very large prostate gland.

INTERSCAPULO-THORACIC AMPUTATION.

DR. ROBERT G. LE CONTE read a paper with the above title.

INTERSCAPULO-THORACIC AMPUTATION.

By ROBERT G. Le CONTE, M.D.,

SURGEON TO THE METHODIST HOSPITAL, AND TO THE OUT-PATIENT DEPARTMENTS OF THE PENNSYLVANIA AND THE CHILDREN'S HOSPITALS.

In this note upon the interscapulo-thoracic amputation of the French, I desire to discuss the various procedures that have been resorted to in this amputation, and to give in detail a new method, at the same time limiting my remarks to pathological cases,—*i.e.*, morbid growths. Of traumatic cases requiring this operation I have had no experience.

Berger ("L'Amputation du Membre supérieur," etc., Paris, 1887) has clearly pointed out that the key of the situation is in the control of hæmorrhage; therefore the best method will be one which speedily and clearly exposes the subclavian artery and vein, and at the same time gives a wide field for the necessary ligation. In examining the records of between forty and fifty of the reported cases, I find nine different ways of dealing with the hæmorrhage.

(1) Simple compression of the subclavian vessels. This must always be dangerous and uncertain, as you can never be sure of completely controlling the hæmorrhage; also, there is considerable danger of air being drawn into the vein before that vessel is secured with a ligature. Air has entered the vein on several occasions, although it has not always proved fatal.

(2) Resection of a portion of the clavicle with compression of the vessels. This is also objectionable for the reasons already stated.

(3) Formal ligation of the subclavian artery as the preliminary step of the amputation. This ligation is often difficult and tedious, owing to the smallness and depth of the field in which the vessels are exposed, and there is considerable danger of wounding them before they can be secured.

(4) Formal ligation of the vessels at some time prior to beginning the amputation. This was done once by Wyeth (personal communication) under cocaine, before the ether was administered for the amputation. The same objections will hold here as in number 3, with the added one that, if much time elapses between the ligation and the amputation, gangrene of the arm may follow.

(5) Resection of the middle portion of the clavicle with ligation of the artery, the vein remaining unsecured until just previous to the time of cutting it. This leaves a very vulnerable vessel needlessly exposed.

(6) Ligation of the artery, and proceeding with the amputation, leaving the vein and brachial nerves as the last tissues to be divided. This seems also needlessly dangerous, as the vein could so readily be injured or torn.

(7) Beginning with a T-shaped incision over the scapula and working forward, leaving the great vessels alone until nearly the close of the operation. This must always lead to a maximum of hæmorrhage, as the source of the blood-supply is not dealt with until the end of the operation.

(8) Resection of the middle portion of the clavicle with ligation of both the artery and vein. This is recommended by nearly all authorities, and is at present considered the operation of choice. And yet it is not free from difficulties and dangers. Macnamara (*Lancet*, 1878, Vol. i, p. 669) resected the clavicle, but could not find the artery, owing to the large venous trunks exposed. Nevertheless, the operation was persisted in, the hæmorrhage was enormous, and the patient died the following day. Lund (*British Medical Journal*, 1880, Vol. ii, p. 617), while resecting the clavicle, wounded the subscapular artery, and experienced great difficulty with the hæmorrhage. Von Langenbeck (*Archiv für klinische Chirurgie*, 1862, Vol. iii, p. 340) experienced considerable difficulty in ligating the vessels after resecting the clavicle. Ollier (*Lyon Médical*, February, 1885, Vol. xviii, p. 158) resected the clavicle and had to ligate the vein first, and then experienced considerable trouble in getting the artery. Morisani (*Il Mor-*

gagni, 1885, tome xxvii, p. 505) had great difficulty in finding the vessels after resecting the clavicle. Keen (*American Journal of the Medical Sciences,* June, 1894) also found the ligation of the vessels extremely difficult, and ruptured a large vein under the inner sawn end of the clavicle, which produced a very annoying hæmorrhage. He states that most of the time spent on the operation was consumed in securing the vessels. It is therefore evident that this procedure is not always simple and devoid of risk, owing to the narrowness of the field and the depth at which the vessels are exposed, and it leaves the sawn end of the clavicle as a constant menace to the adjacent veins while the operation is being completed. Again, you are advised to resect the clavicle within the periosteum whenever possible, leaving to the patient the inner third of the bone and two-thirds of the periosteum. Such a procedure, when any portion of the clavicle is involved in a malignant growth, must of necessity defeat all hope of a radical cure, and, to my mind, nothing short of the removal of the whole bone with its periosteum should be attempted.

(9) Disarticulation of the sternal end of the clavicle with compression of the vessels. This has been done by one man only, Mussy (*American Journal of the Medical Sciences,* 1837, Vol. xxi, p. 390), in 1837, and has since been condemned by all authorities who refer to the case. The compression of the vessels was of course faulty, and resulted in air entering the vein prior to its ligation, but after the amputation had been completed. Berger says that (*Ibid.* p. 294) "the disarticulation of the internal end of the clavicle must be formally rejected; it exposes the subclavian vein to being wounded: the single surgeon who has practised it, Mussy, saw air enter the vein in question." Air entered the vein after the amputation proper was completed, and only as a fault of the compression prior to the securing of the vessel. That the disarticulation of the clavicle had anything to do with it I cannot see; nor can I understand why a resection of the clavicle over the site of the vessels is less dangerous than a disarticulation three inches or

more away from them. [This reference was found after my patient had been operated upon.]

(10) Disarticulation of the sternal end of the clavicle, with ligation of the artery and vein. This method was used in the case about to be reported; and I give the full details of the procedure, dividing it, for convenience, into seven steps.

(1) The incision is begun over the sternal end of the clavicle, carried along that bone to about its middle, and then curved downward to the anterior axillary fold. The skin and superficial fascia are dissected up, exposing well the inner two-thirds of the clavicle.

(2) The clavicle is disarticulated by severing its attachments to the sternum and the rhomboid ligament, the clavicular attachment of the sterno-cleido-mastoid muscle is cut close to the bone, and the clavicular portion of the pectoralis major is separated with the finger from the costal portion of the muscle up to the anterior axillary fold.

(3) The clavicle is now pulled upward and outward, and if the subclavius muscle does not readily strip off, its attachment to the first rib is divided. The pectoralis minor will now be well exposed, and it is divided, and the coracoid portion reflected upward with the clavicle. This exposes the axilla fully, and the vessels are seen traversing it from the anterior scalenus muscle down.

(4) The sheath of the vessels is opened and the vein dissected away from the underlying artery. Two ligatures are passed around the artery and tied. The arm is then held up to empty it of blood, while two ligatures are passed around the vein, but these are not tied until the arm is blanched. This renders the use of an Esmarch bandage unnecessary. It must be noted that the cephalic vein has joined the axillary below these ligatures, or else separate ligature of that vessel is required.

(5) The vessels are now severed, together with the brachial plexus of nerves, and the costal portion of the pectoralis major. This completes the division of the anterior attachments of the arm.

(*6*) A posterior incision is now carried from some point on the anterior incision (as near the tumor as it is deemed advisable to go) directly backward and downward to the inferior angle of the scapula, and up again to the posterior axillary fold. The skin and superficial fascia are dissected up for a short distance (half an inch to an inch).

(*7*) The trapezius is now severed and the transversalis colli or posterior scapular artery secured; the omo-hyoid muscle is cut and the suprascapular artery secured, and the muscles attached to the inner border of the scapula are rapidly divided close to the bone; then the serratus magnus and latissimus dorsi are cut, the latter at the posterior axillary fold. The arm is now held to the body by the skin of the axilla alone. If there is sufficient flap to cover the wound, the anterior and posterior incisions are joined through the axilla, but if more skin is needed, a flap may be raised from the under surface of the arm. The wound is then closed with suitable provision for drainage.

The procedure just detailed seems to have the following advantage:

(*a*) It gives the widest and fullest possible exposure of the vessels, and decreases the accidents of ligation to a minimum.

(*b*) The disarticulation of the clavicle is simpler, quicker, and easier than a resection of the bone, and the danger of wounding important vessels is less, because these structures are well protected by the sterno-hyoid and sterno-thyroid muscles.

(*c*) The elevation of the arm, after securing the artery and before the vein is tied, makes a practically bloodless amputation.

(*d*) The suprascapular and posterior scapular arteries (the only other vessels that can bleed) are easily picked up before being cut.

(*e*) In malignant growths, where the outer end of the clavicle is involved, there is less risk of a return if the entire bone with its periosteum is removed.

(*f*) It removes everything in one piece, a more surgical procedure when dealing with malignant growths.

A. E. T., white, aged forty-nine years, born in England.

Family History.—Father living and well, aged seventy-nine; mother healthy and strong; died at seventy-six from influenza. Three brothers and one sister alive and well.

Personal History.—Always strong and healthy. Rheumatism, twelve years ago, in knee. Gonorrhœa five years ago. No history of syphilis. For past thirty years has drunk freely of whiskey. Occupations: Served nine years in the British navy, followed by eight years in the merchant marine; since then he has been almost constantly a driver of wagons and trucks, which frequently necessitated his carrying heavy weights on his shoulder. Three and a half years ago, while placing a heavy box on his left shoulder, he felt a sharp pain as though a nail had pierced the skin. An immediate examination revealed a small bluish lump, the size of a five-cent piece, on the upper edge of the scapula, hard and tender to the touch. Since then he has not carried parcels on that shoulder. In six months the tumor had grown to the size and shape of a hen's egg, and was frequently painful, even when not pressed upon. This pain sent him to the Polyclinic Hospital, where the growth was excised. Almost immediately it returned again, and at the end of a year was the size of an orange, and at intervals painful. He was admitted to the Pennsylvania Hospital in May, 1897, and Dr. Ashhurst excised the growth, including the outer one-fifth of the clavicle and the acromion process of the scapula. Shortly afterwards the growth again returned, with periodical attacks of severe pain. Three months ago the skin ulcerated over a nodule on the anterior portion of the shoulder. This rapidly became fungoid in character, and oozed blood constantly, and occasionally was subject to more pronounced hæmorrhage. Since the ulceration of the skin appeared the patient has had but little pain. He was again admitted to the Pennsylvania Hospital on April 3, 1899, after a severe hæmorrhage from the fungoid mass.

General condition good, but anæmic. Soft, anæmic murmur heard best over pulmonary area; radials slightly sclerosed, left more so than right. Urine, first examination, negative, but a second specimen showed a trace of albumen with a few narrow, pale, hyaline casts. Other organs negative to examination. The tumor

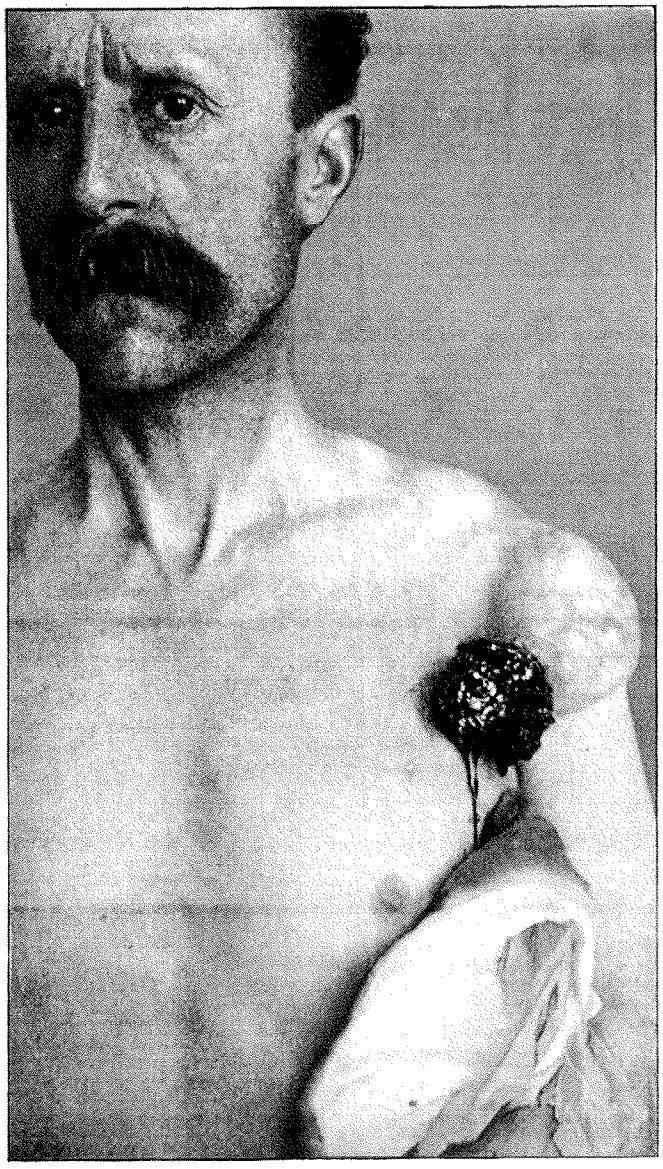

FIG. 1.—Sarcoma of shoulder submitted to interscapulo-thoracic amputation (anterior view).

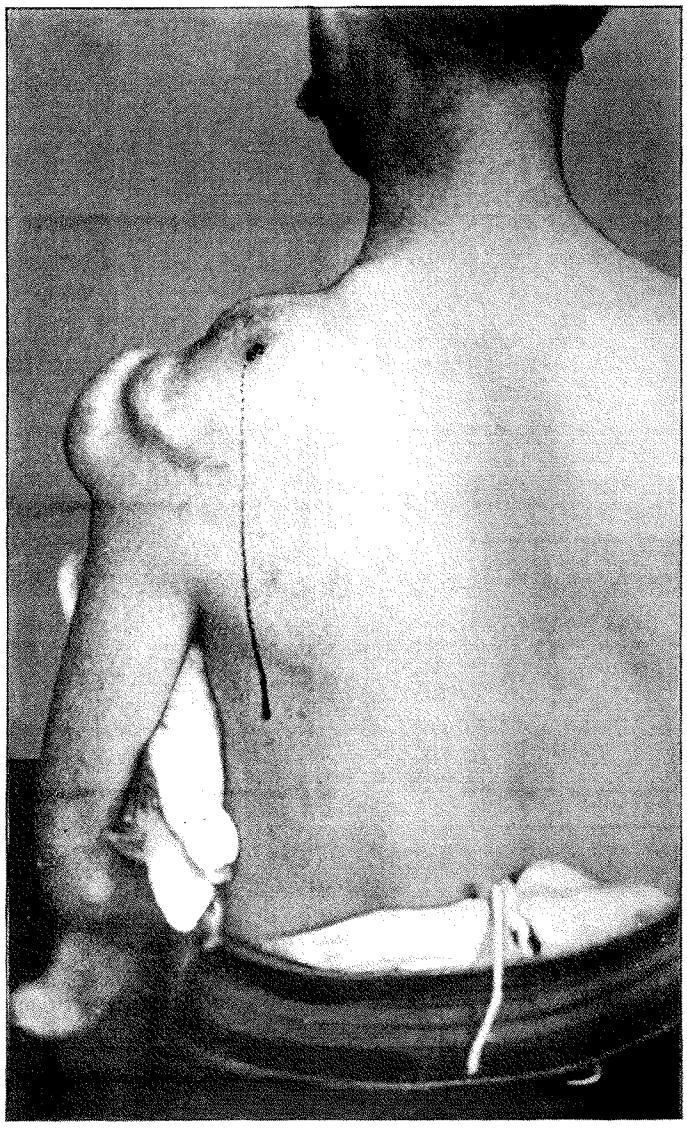

FIG. 2.—Sarcoma of shoulder (posterior view).

extends from the top of the anterior axillary fold to the outer third of the clavicle, to the middle of the outer margin of the trapezius, to the middle of the scapula, involving parts of the deltoid, trapezius, and supra- and infraspinatus muscles. It is nodular, firm, and intimately connected to bone, and for the most part hard, except in two places, where the skin has ulcerated. One of these ulcers has developed a fungous mass one and a half inches in diameter. The skin over the remainder of the growth is brawny and tense.

The patient was placed on a tonic treatment for a few days, to build him up, and on April 12 he was etherized, and the operation performed as detailed above. At no time was any difficulty encountered. The exposure of the vessels was extensive and free, and their dissection very easy. The cephalic vein was found emptying into the main trunk at the first rib, and in a small exposure of the parts it would have been impossible to ligate the artery until after the veins had been dealt with. Three silk ligatures were required for the vein, one to the subclavian, one to the axillary, and one to the cephalic, and the portions between divided. By ligating the artery and then elevating the limb before the vein was tied, a minimum of blood remained in the arm, and practically none was lost to the patient. The only ligatures required were those on the artery and vein, the suprascapular and transversalis colli being twisted. The time of operation was one hour and six minutes, which includes the dressing and removal of the patient from the room. The operation was slowly and cautiously done, as it was my first effort, and I feel sure that, in a similar case, I could now shorten this time from ten to twelve minutes, bringing it well within an hour. This would be a distinct gain of one hour, as the average time for this operation is in the neighborhood of two hours, and on some occasions it has lasted as long as three and four hours. The patient was out of bed on the ninth day, and his recovery has been uneventful, except that a small portion of the outer posterior flap necrosed (probably from lack of blood-supply, as there was no infection or rise of temperature). This is now healing by granulation. The shape of the remaining scar is almost like three radiating lines drawn 120 degrees apart.

I desire to thank Dr. Charles D. Hart for the careful notes of the case, and Dr. Francis J. Stewart for the excellent photographs here reproduced.