STATED MEETING, APRIL 3, 1905

The President, HENRY R. WHARTON, M.D., in the Chair.

SCREW FIXATION IN CASES OF INTRACAPSULAR FRACTURE OF FEMUR.

DR. GWILYM G. DAVIS presented a man, forty-seven years of age, who, one year before, had fallen a distance of eight feet, striking on his right hip. The femur on the injured side had been fractured once before, when he was fourteen years old.

On examination, the right lower extremity was found to be shortened about 2.5 centimetres (1 inch). Pain on movement of the hip was very severe. The foot was everted, the fascia lata lax, and the greater trochanter moved with rotation of the leg. It was found to lie above Nélaton's line, and the base of Bryant's triangle on the injured side was shorter than that of the sound side. In short, there were present all the classical signs of a fracture of the neck of the femur. A skiagraph showed a line of fracture beginning above high up on the neck near the articular cartilage and running down almost vertically. The outer fragment was pushed up and was above the inner fragment.

On the sixth day after the injury an incision about 7.5 centimetres (3 inches) long was made over the greater trochanter, and an ordinary steel wood screw 7.5 centimetres (3 inches) long inserted up through the trochanter and neck into the detached head, traction in the meantime being made by an assistant. A plaster-of-Paris dressing was then applied, embracing the pelvis and down to the knee, and later the leg was placed on a sliding foot-piece to keep the foot from everting. The wound healed without trouble, but a sinus formed later at the site of the screw, and it was removed after having been in eight weeks. Two or three weeks later the patient was discharged, and now, a year after, he has apparently bony, or at least firm, union, very little shortening, almost normal movements, a slight loss of abduction,

and walks comfortably without any support, and only a slight limp due to the uncorrected small amount of shortening.

Dr. Davis further remarked that the results obtained by the various methods of treatment of fractures of the neck of the femur in those other than children and the aged are as yet so unknown that it is impossible to say which is best. That the methods usually pursued and the results obtained by the mass of the profession are unsatisfactory is evident from the frequency with which ununited fractures of this part are seen. In children, conservative treatment by splints and apparatus has been demonstrated to be efficient. In the aged, say, those over sixty years, bad results are accepted with a certain amount of resignation; but when an otherwise healthy man, from twenty to fifty odd years of age, is left with an ununited fracture of the neck of the femur, the distress and disability are so marked as to justify radical measures in order to avoid it. Many of these patients have more or less pain, a marked hobbling gait, and are often compelled to use a support, such as a cane or crutch. They are debarred from all active occupations, and perhaps relegated to the ranks of useless cripples. The most usual way of treating the injury is probably by weight extension, the same as if the fracture was lower down. The uselessness of this method is seen from the resulting ununited fractures. Of the value of other methods we have as yet too little data to judge. The treatment of this fracture in the aged by the method of combined weight extension and lateral traction has in his hands been far more satisfactory than by weight extension alone. The method of placing the limb in an abducted position in plaster-of-Paris is likewise better than using weight extension alone. He had recently had one good result from this method, but, to offset this, he recently saw a case in which the method had been equally faithfully applied without union occurring.

Having previously operated on several cases of ununited fracture, he decided to apply a modified form of the same method to recent fractures of the neck of the femur, and the good result obtained in the case shown had encouraged him to resort to the same plan in future cases.

DR. W. W. KEEN briefly detailed a case in which he had employed a device similar to that of Dr. Davis. The lesion dif-

fered, however, in being an old, ununited fracture which required an anterior incision to freshen the bone in addition to the lateral one for inserting the screw. The patient can now walk without the aid of crutches or a cane. Two screws were employed to unite the fragments in this instance, and they are still *in situ* after more than a year. The case will be reported in full later.

Dr. Robert G. Le Conte said that the proposition advanced by Dr. Davis, of immediate operation in intracapsular fracture of the thigh, was a very broad one. In these days of modern asepsis the ideal treatment of fracture of the femur is perhaps the open method, whether the break is intracapsular or of the upper portion of the shaft; and yet no one is quite bold enough to carry out this method in every case. In Dr. Le Conte's experience in patients whose ages range from forty years to extreme old age, the non-operative methods of treatment in intracapsular fractures result in giving useful and valuable legs in perhaps 80 per cent. of the cases; in about 20 per cent. this favorable result is not obtained. These statistics are not exact and are given from memory only. Granting that good results are obtained without operation in four out of five cases, why should we not continue the expectant method of treatment as opposed to the operative. If union fails to occur, operation can be later performed with little, if any, radical risk. It should be remembered that some of the cases of useless limbs following the expectant or non-operative treatment are due to osteophytes forming about the seat of the fracture and mechanically interfering with the motion of the joint, and not to ununited fractures. Dr. Le Conte would be very loath to indorse the statement of Dr. Davis that the majority of recent intracapsular fractures of the femur should be treated by the open method.

Dr. John B. Roberts did not believe the ideal method of treating fractures of the femur is by incision; in certain cases only is it advisable. In fact, the ideal method is treatment without incision, especially in fractures of the shaft. Unless the break is in the upper third, we expect good results from treatment by traction, elevation of the bed to secure counter-traction, and lateral support. He approaches such cases with utmost confidence that good results will follow this treatment, and in but few cases is there disappointment. Contrary to Dr. Le Conte, he would not call this expectant treatment. In the case of fracture of the neck of the femur we are not always sure that it is intracapsular; in the case exhibited, the skiagraph seems to indicate that it is partly outside the capsule, which is often the true condition present. In Dr. Roberts's experience, in a man of the age of Dr. Davis's patient with a fracture not entirely intracapsular, good results may be expected from treatment by weights, counter-traction, and lateral support. This he would not call the expectant, but the non-operative method of treatment. It is interesting to hear Dr. Davis speak of the sinus following the use of the screw, as that has been Dr. Roberts's experience with the use of nails. Suppuration nearly always occurs, and there is delay in closure of the sinus after the nail is withdrawn. Dr. Roberts has been surprised to find good results without operation in a few patients seventy or eighty years of age, with what were at least supposed to be intracapsular fractures. When the fracture lines are apparently through the base of the neck outside of the capsule, a good leg should be expected without operation.

Dr. Davis, in closing, said that an interesting point in these cases is the correctness of the diagnosis; it is often difficult to demonstrate whether the break is intra- or extracapsular. Anteriorly, the capsule extends downward to the anterior intertrochanteric line, and nearly every fracture is bound to be intracapsular at this point. Posteriorly, the capsule extends half-way to the intertrochanteric line, and in some instances even more. Hence many fractures are partly intra- and partly extracapsular. It is not possible to make a differential diagnosis with any degree of certainty. He supposes that Dr. Le Conte's statements refer to fractures of the neck alone, as it is well known that extracapsular fractures involving the trochanters unite readily and with an abundance of callus. As to fractures of the neck they are not so satisfactory. If Dr. Le Conte's figures embrace all the fractures of the aged, 80 per cent. of good results is a trifle high; he is not willing to admit this. Dr. Roberts' statements regarding the good results in fractures partly intra- and partly extracapsular are not capable of verification; as such diagnosis cannot be made, the absolute condition is unknown. As to the results of intracapsular fractures, it was held years ago that they almost never unite by bony union. When they are partly intracapsular and partly extracapsular, good results might be expected in young adults. Notwithstanding this, the experience of Dr. Davis is that

results in general are bad in fractures of the neck of the femur in young and middle-aged adults; this opinion is based on eight or ten cases seen during the past four years, all in individuals between twenty-five and fifty years of age. Ununited fractures during this period are not uncommon. Dr. Davis does not advise operative treatment in children nor in the aged. In the latter class, reparative efforts are slight; in children, conservative methods give good results. In certain other cases, as in the patient exhibited, disability from failure of conservative treatment is so great, and the occurrence of this result so frequent, that a more positive method of treatment is desirable. Dr. Davis does not, however, positively advise open operation in all cases, but would not hesitate to employ it in comparatively young adults, under sixty, otherwise healthy, who have intracapsular fracture. For treating these fractures there are now recognized two methods that are still largely untried. They are, 1, placing the thigh in abduction, and, 2, applying longitudinal traction and lateral traction combined. The use of these methods has as yet not been so extensively reported as to determine their true value. As a competitor of the two, to be tried out with them, Dr. Davis adds a third, the open incision and insertion of a screw as detailed in the reported case. The operation is simple, being little more than a straight incision with insertion of the screw while extension is made. Healing always readily occurs. When the screw loosens, an inflammatory focus forms beneath the scar and this tissue soon gives way, producing a sinus through which the screw may be removed. Operation does not appreciably add to the danger of the treatment and gives improved results.

ANTHRAX.

Drs. G. J. Schwartz and B. Franklin Royer presented, jointly, a man, aged twenty-four years; white; single; occupation, farmer, who was admitted to the Jefferson College Hospital, in the service of Dr. W. W. Keen, February 21, 1905, suffering from anthrax, and with the following history:

The farm on which he labored was situated at the head of a small stream, along the borders of which a number of cases of bovine anthrax occurred in 1899. Some of them were in the immediate vicinity of the farm. Since then this meadow land has been "out of the tide," so that it has been impossible to pasture cattle or cut hay. The farm being at the head of this stream has made the meadows drier and admitted of some pasturage, and last season considerable rough hay was cut upon it. Unknown to the health authorities, two apparently healthy mules belonging to the patient's father became suddenly sick, and died within two days of each other. The supposition was then that they were poisoned. Their carcasses were buried in this field. Later in the season, a crop of hay was harvested from the field. This hay comprised a portion of the fodder of the stock farm.

On February 12, 1905, two apparently healthy cows, which had been eating the hay harvested from the above mentioned field, were turned out in the morning and died during the day. The patient skinned the last cow which died and sold the hide to a dealer, who expressed it to this city. The patient noticed while skinning the cow that a bloody serum exuded from several sores on the hind quarters of the cow.

On February 14, 1905, two days later, the patient noticed a small red spot, which resembled a flea-bite, situated about one inch above the left wrist-joint on the posterior external surface on a line passing through the first metacarpal bone. The next day two papules appeared on flexor surface of the same wrist. These papules gradually became larger and were accompanied by slight itching and burning. During the next day a small blister containing a yellow serum streaked with blood and surrounded by an inflammatory band, œdematous, with overlying skin of livid hue, appeared.

On February 18, six days after skinning the cow and four days after the lesion appeared, the patient complained of slight headache and cough; by this time œdema had involved the hand, wrist, and was rapidly extending up the forearm; blisters had become blebs, were tense, and contained a distinctly blood-tinged, yellowish serum.

The following day, February 19, he became alarmed about his condition and went to bed. The headache became very severe. Cough became productive, pain in arm throbbing, swelling extended rapidly to the arm. Now, for the first time, the patient sent for his family physician. Local applications were made.

During the night the patient was restless, could not sleep, and felt much weaker.

On February 20, condition was much worse, and his physician decided to send him to the Jefferson Hospital, where he arrived February 21.

His condition on arrival was as follows: Facial expression was that of a person suffering considerable pain and mental anxiety; face was flushed, and there was slight sweating about the forehead; pupils dilated, tongue slightly coated and dry, slight nausea with no vomiting; temperature, 100.4° F.; pulse, 82, soft, compressible; respiration, 24. A brief physical examination of chest showed heart and lungs apparently normal with the exception of a few râles posteriorly on both sides. The left hand, forearm, and arm to within 10 centimetres of the shoulder-joint were immensely swollen. The swelling pitted on pressure, and there was an entire absence of emphysematous crackling. The overlying skin was of a slightly dusky red color, and pressure caused the redness to slowly disappear, but it returned slowly when pressure was removed. The axillary lymph glands were not palpably enlarged, but on palpation the spleen seemed to be enlarged. Situated along the forearm on the flexor surface were several medium-sized blisters containing a cloudy, yellowish serum, and just above the wrist-joint over the line of the artery was a large bleb the size of a half-dollar, filled with blood-stained serum.

Smear preparations, cultures, and a blood examination for the anthrax bacillus made, and within one hour's time a verbal bacteriological report confirmed the clinical diagnosis.

The report, from a later more exhaustive examination, was that the bacilli obtained in spreads from the blebs of the left forearm possessed the morphological and tinctorial characters of the Bacillus anthracis. In cultures, a bacillus, possessing the morphology, tinctorial, and biological characters of the Bacillus anthracis in pure culture. The blood taken from the right arm developed no growth, indicating in all probability that the infection at the time of examination was local in nature.

The following treatment was carried out: The patient was etherized and five drachms of a 3 per cent. solution of carbolic acid was injected into the skin and superficial fascia, so it would completely encircle the arm one and one-half inches above the

infiltrated tissues. The bullæ over wrist and back of forearm and a ring of healthy tissue around each of these were excised down to the deep fascia. The infection did not seem to go below the deep fascia except over the radial artery just above the wrist. This suspicious tissue was removed, and in doing so the radial artery was wounded. After tying both ends of the artery, several syringefuls of a 3 per cent. solution of carbolic acid were deeply injected into the tissues around the areas removed. After this was completed, long multiple longitudinal incisions were made into the œdematous tissues, allowing a large quantity of clear yellow serum to exude.

The tissues, on incision, presented a yellowish color, gelatinous and very friable. At no point was any pus found. The limb was then wrapped in hot antiseptic fomentations, placed on a pillow, and surrounded by hot-water bags.

At the end of the operation the patient was severely shocked and intravenous infusion of salt solution was then given by Dr. Anderson.

The patient received free stimulation-strychnia and atropine, and every three hours, while he remained in the hospital, received a hypodermic injection of 30 minims of 3 per cent. carbolic acid.

The patient was transferred to the Municipal Hospital the following morning after the operation. His condition on removal was fair.

On February 23, 1905, was received a report from the State Board of Veterinary Medical Examiners, stating that the body of the cow skinned by the patient showed lesions of anthrax.

Dr. Schwartz said that most authorities advise excision[1] of the malignant pustule and cauterization with pure carbolic acid.[2] Tillmans, of Leipsic, holds that anthrax remains local longer in man than in animals; hence, excision and cauterization should be employed in human anthrax. He excises the area of infection, going well into healthy tissues, and cauterizes it, then injects in and about it a 1 to 1000 solution of bichloride of mercury and a 5 per cent. solution of carbolic acid. By this treatment,[3] Lenoyel and Koranyi lost but thirteen cases out of 142. Müller,[4] in opposition to the above treatment, says that it is impossible to destroy the disease by excision of the seat of inoculation. In guinea-pigs, amputation of a limb performed a few hours after inoculation fails to prevent the disease. His belief is that treat-

ment should aim to make the cells about the inoculated area prevent dissemination of the bacteria and protect the body. The products are injurious, if absorbed, but they also tend to destroy the bacteria, hence excision is harmful.

Müller's treatment is as follows: Immobilize the parts, and elevate, if an extremity, apply mercurial ointment and give alcohol internally in large doses. He describes thirteen cases successfully treated by the above method. Notwithstanding the above, the majority of reports lean towards excision with cauterization of the infected area.

Cauterization with cautery, pure carbolic acid, caustic potash, hydrochloric acid, acid nitrate of mercury, and, in fact, every caustic substance known, has been either tried or suggested.

Medical Treatment.—Muskett [5] notes the treatment of fifty cases by simple applications of ipecac to the area of infection without excision, and without a fatal result in any case.

Laboratory experiments have shown that powdered ipecac will destroy the anthrax bacillus, but has no effect on the spores, and in the body sporulation does not take place.

Injection Method: Scharnowski [6] reports the treatment of fifty cases by carbolic acid injections, with a mortality of 2 per cent.

Graef [7] reports the treatment of 384 cases by cauterization with caustic potash, with a mortality of 5 per cent.

The treatment by caustics is, however, very painful, and, after all, it seems impossible to say which treatment is best for all cases, for each individual case must necessarily be considered as standing absolutely alone.

Dr. B. F. Royer stated that on admission of the man to the Municipal Hospital, smears made from scrapings from the floor of the extirpated areas, and smears of blood made from a finger prick, failed to show anthrax organisms. The blood count at this time showed: Leucocytes, 19,400; erythrocytes, 3,210,000.

Hæmoglobin not estimated.

Differential count (600 cells count); polynuclear leucocytes, 87.68; large lymphocytes, 7.66; small lymphocytes, 2.66; eosinophiles, 2.00.

Urine Analysis.—Chemical Examination. Amber, acid, 10.12, no sugar, albumen.? Microscopic Examination. Leucocytes. Numerous hyaline, epithelial, and granular casts. Urine

centrifuged, and the sediment examined for anthrax organisms with negative result.

Smears and cultures made at this time from the nasal secretions from the saliva and from the fæces failed to show anthrax germs.

Second day after admission, tenth day of the disease, physical condition improved; pleuritic pain less marked; pulse of better volume; temperature normal; urine loaded with hyaline and granular casts.

Eleventh day of disease, third after operation, abdominal distress and frequent desire for stool suggests mercurial poisoning. Salt solution substituted for the arm. Blood culture made second day after admission negative.

From this time on nothing of very great interest resulted. Leucocyte count, sixth day after admission, fourteenth day of disease, is 20,400. Erythrocyte count, 3,400,000. Urine still filled with hyaline and epithelial casts. Anæmia probably due to nephritis. For the next few days the kidneys were somewhat erratic, 111 ounces being voided on the seventh day after operation and 128 ounces the ninth day after operation. General condition seems to be good.

Blood culture made nine days ago still showed no growth.

From this time until the forty-fourth day of his disease nothing worthy of special consideration occurred. He was detained at the Municipal Hospital thirty-five days, while the wounds from operation were healing. On being discharged, he returned to Professor Keen's clinic, where he was shown to the students.

Dr. Royer remarked, further, that the most marked advance in the treatment of anthrax has been made in Italy. In America, where the disease but infrequently occurs, we are apt to lose interest in the disease, or we may fail to keep in touch with the most recent advances in its treatment. This disease has long been considered a surgical affection. The day seems to have dawned, however, when a more scientific treatment is available. This newer method of serum treatment was introduced by Professor A. Sclavo, of the University of Siena, in 1897. The underlying principle with this therapy, and in fact with nearly all serum therapy, is to get from a susceptible animal the substance manufactured by that animal in acquiring a tolerance to many times its fatal dose of toxin.

Sclavo's [8] method of producing this serum is based on vaccination and upon immunization by toxin injection. He first vaccinates an ass with an attenuated anthrax culture, and in ten or twelve days with a more virulent culture. So far, then, the process is like vaccination in principle. The object is to protect against a dangerous disease by deliberately inoculating with a harmless disease. This is the method practised by veterinarians in immunizing herds. The next steps are to use virulent cultures of anthrax in increasing quantities until enormous doses can be tolerated. This is comparable to the process in making diphtheria antitoxin, but differs from it as follows: In inoculating horses, to make antidiphtheritic serum the toxin only is used. This germ can readily be separated from its toxin. Not so, however, with anthrax. Here we have an intracellular toxin. (At least it appears to be intracellular in artificial media.) For this reason it is necessary to inject the entire culture. The process and results, however, are very similar to that of making diphtheria antitoxin. After a period of several months of such treatment, the ass is bled, and the serum separated from clot is preserved by adding ether to the extent of 3 per cent. of its bulk. The serum is now tested on rabbits by first inoculating a series for controls and an equal number for treatment with 5 cubic centimetres of a suspension of a culture of anthrax grown on agar for two days. The test rabbits are given at the same time 10 cubic centimetres of the prepared serum, usually by injection in an auricular vein. This testing, you see, is similar to the test for diphtheria antitoxin. If the controls all die and the treated ones are all protected, the serum is regarded as high grade. As yet, Sclavo seems to have no method of standardizing as we have in the production of diphtheria antitoxin.

Sclavo's [8] present contentions are as follows: (1) The serum is innocuous even in large doses; (2) it can be well borne, even when introduced into the veins; (3) no case taken in an early stage and of moderate severity will be fatal if treated with the serum; (4) by its means some cases may be saved when the condition is most critical (he narrates one case in which a woman recovered after bacilli were found both in the blood and urine, and another in which they were present in the urine); (5) when injected into the veins it quickly arrests the extension of the œdematous process, so as to reduce notably the danger of suffocation which is present in many cases when the pustule is situated on the face or neck; (6) if used early enough, it reduces to a minimum destruction of the tissues when the pustule is localized, and thus diminishes risk of deformity; (7) persons attacked appear to become convalescent almost at once. The dose of serum recommended in ordinary cases is 30 to 40 cubic centimetres subdivided into three or four injections, subcutaneously into different parts of the abdomen, and followed in twenty-four hours, if there has been no improvement, by further injection of 20 to 30 cubic centimetres. In very grave cases he recommends intravenous injection, preferably into one of the superficial veins on the back of the hand, of 10 cubic centimetres, followed in an hour or two, where no improvement is shown, by another similar dose.

Bandi [9] reports two cures. In one cauterization had failed. There was œdema of the entire arm, the glands in the axilla were as large as a hen's egg. Fever, 104° F.; pulse rapid and intermittent and patient in coma. Anthrax organisms were found in blebs surrounding the cauterized areas and in the blood by culture. In this case 150 cubic centimetres of a serum, prepared by using a sheep and Sclavo's methods, were given intravenously, and followed later on the same day by 50 cubic centimetres intravenously.

In his second case, with temperature 103° F., rapid, irregular pulse, swelling and œdema of the arm, and with a positive blood culture, cauterization, and 80 cubic centimetres intravenously and later 30 cubic centimetres subcutaneously, promptly cured the patient.

Recently, Lockwood [10] and Andrews treated a case of malignant pustule of the cheek with 40 cubic centimetres. Sclavo's serum injected subcutaneously. No other treatment was given; the œdema increased, the enlarged glands subsided. Recovery most satisfactory.

Bowlby and Andrews [11] report a case of malignant pustule of the forehead treated with Sclavo's serum and recovery. In this case the glands at the angle of the jaw were much swollen. They rapidly subsided. The œdema extended for a time after treatment was begun. Recovery was satisfactory in every particular. No other treatment was given.

Legge [12] has studied a series of cases treated by Sclavo and others in Italy, and those treated in England since July, 1904.

His study, reported in his Milroy Lecture, would encourage one to recommend anti-anthrax serum as almost a specific against this dreaded disease if given early. If given late, it may be necessary to practise excision or free drainage in addition to serum therapy.

From the data presented by Legge, Bandi, Soberheim, and Sclavo it would appear that the time had come when we in this country should have a supply of anti-anthrax serum kept by health boards or research laboratories where it might be gotten in a few hours by those called upon to treat anthrax.

When this case was sent to the Municipal Hospital, he communicated with Parke, Davis & Co., H. K. Mulford & Co., the Marine Hospital Laboratory, and through Dr. Cairns, of our health office, with the Bureau of Health of New York, but could find no serum in this country. This patient's treatment consisted of stimulation with whiskey, strychnine, and quinine, carefully looking after the emunctories and diet, and flushing him with large quantities of water. When evidence of mercurialism developed, the bichloride dressing was omitted. Salt solution was used for twenty-four hours, and then potassium permanganate, 1 to 5000, as a wet dressing. Later, a 1 to 8000 bichloride dressing was used until the arm was nearly healed. Where the indurated areas were dissected out, curettement was required, and, later, stimulation with silver nitrate brought granulations to the surface.*

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Dr. W. W. Keen said that when the resident physician notified him by telephone of the patient's admission, he at once suspected some animal disease, as anthrax or actinomycosis, and directed that a bacteriological diagnosis should be made at once. The subsequent history shows that we now possess a thorough means of prompt diagnosis, as within one hour the examination had been made and anthrax bacilli found. Dr. Keen saw the man one and one-half hours after admission. A slight pimple had been present on the wrist, but no pustule. The most conspicuous features were a number of large blebs and an enormous œdema of the arm. At the deltoid insertion the arm was fully one and one-half times as large as immediately above that point. The case then was one of anthrax œdema. The communicability of the disease to others demands attention. This patient was isolated, and the operation performed in the same room rather than in the operating-room. Afterwards the bacilli were repeatedly recovered from the room, five separated disinfections being required to remove them; removal of the floor was at one time seriously contemplated. This shows the great importance of investigating rooms where fluids have fallen during operation, as otherwise subsequent patients might very easily obtain anthrax infection. Dr. Keen has communicated with Dr. Abbott, of the Philadelphia Bureau of Health, who has taken steps to secure from Professor Sclavo, of Italy, some of the serum which has been used with such good results. It is hoped that the serum may be kept on hand to use in future cases.

Dr. De Forest Willard believed that even when serum treatment is employed, the original point of infection in anthrax should be excised in order to get rid of all the infection possible. He detailed a very severe case that occurred in a wool-sorter. There was a pustule with blebs and an ulcer of the cheek; anthrax bacilli were present in great numbers. Immediate diagnosis was followed by immediate removal of the pustule and by cauterization. Though there was great local œdema, speedy amelioration of the local symptoms followed. The patient, however, apparently infected his food, and in two or three days there was enormous distention of the abdomen with tormina and tenesmus, twenty or thirty stools occurring daily. Suppuration followed, and three quarts of pus were removed from the abdomen and several ounces from the scrotum. For weeks the patient was

almost at the point of death, but he finally recovered. Antistreptococcic serum was employed during a week or two, but incision appeared to do the most good. The patient was isolated and none of the attendants became infected. The room was thoroughly disinfected, and no other case developed.

Dr. John H. Jopson spoke of the frequency of anthrax in Philadelphia; he regards it as more common than most physicians suppose. He saw and reported a case some years ago from the Episcopal Hospital dispensary, it being the first of a small series of cases occurring among the morocco workers in that neighborhood. Mutchler, Miller, Willard, and Given have also reported cases, at least eight, occurring during the past ten years. Three were treated in their own homes by hypodermic injections of carbolic acid and recovered.

Dr. Royer, in closing, said the precautions taken with the patient at the Municipal Hospital consisted in keeping him in a tent and disinfecting the discharges with 3 per cent. solution of carbolic acid for one-half day. The nasal secretions and sputum were collected on gauze and immediately burned. The linen was soaked one-half day in 3 per cent. carbolic acid, then steam sterilized, boiled, and washed. The question of disinfecting the outfit when the patient left the hospital was solved by placing the tent, bedding, and other contents in the large steam sterilizing apparatus used in disinfecting clothing for the city and subjecting them to live steam, under five pounds pressure, for one hour on each of three days. Three test objects containing anthrax bacilli were also exposed, one being removed at the end of each sterilization; the bacteria were all destroyed. The bedding has since been used with no untoward result.

FILLING DEFECTS IN THE SKULL BY BONE CHIPS FROM THE OUTER TABLE OF THE NEIGHBORING BONE.

Dr. W. W. Keen reported the case of a man, aged twenty-four years, first seen by him September 15, 1903.

Three years previously he had received a violent blow from a golf-stick on the forehead just below the border of the hair and about 1 centimetre to the right of the median line. The golf-stick was broken and a portion of it was left sticking in the wound. He was knocked down by the blow and stunned. With assistance, in a few minutes he got up and walked to the house.

He was never unconscious, was never sick enough to be in bed. A local doctor who was called seized the bit of golf-stick, pulled it out, and sewed up the wound. Healing took place by first intention, and the wound never gave him the slightest trouble in the way of headache, pain, or other disturbance until about a month ago, when a small abscess formed at the site of the accident and discharged a little pus. The day after the accident he went with a party of young people on a "hay ride." Neither he nor his doctor or friends had the least idea that his skull had been fractured.

Examination revealed, just below the border of the hair, a scar about 3 centimetres long and at its middle a sinus, the result of the old abscess. A probe discovered some bare bone.

An incision was made in the line of the old scar, which disclosed an unsuspected triangular bit of wood 1.5 centimetres long, 8 millimetres broad, and 4 millimetres in thickness. As soon as this was removed, it was apparent that it had filled up a depression which was 1 centimetre deep. At the time he received the blow, the skull had been fractured with depression of the fragment, and implantation of two pieces of the golf-stick in the wound. One piece had been removed, and this second piece of wood, together with the tissues about it, filled up the depression, so that no irregularity existed on the surface.

Inasmuch as Dr. Keen had seen two cases of fibroma and sarcoma result from such a depression of the skull, and epilepsy in many other instances, he deemed it essential that the depressed portion of bone should be removed. Accordingly, he carefully chiselled the depressed portion through until he reached the dura, and then by means of the rongeur forceps removed all of the depressed bone. The depressed portion exercised considerable pressure on the dura. In removing it he had to uncover the superior longitudinal sinus. The opening that he made was 3 by 2 centimetres.

The patient made a prompt recovery without any rise of temperature whatever.

A second operation to fill in the aperture in the skull was done February 23, 1904. He first made a flap, including the old scar and the scalp on each side of it, by a semicircular incision with its convexity posterior, the ends of which barely reached the border of the hair; the rest of it being therefore covered by the

hair. From this first incision he made a second directly backward. Dissecting these flaps away, he was able finally to lay bare the dura and the healed margins of the opening. By the rongeur forceps he made the margin raw all around the opening. He then chiselled a number of pieces from the outer table of the skull under the flap that he had turned back and filled in the opening in the skull entirely. The flaps were then replaced and sewed together, a small bit of folded rubber dam serving as a drain for twenty-four hours.

The man made a perfectly smooth recovery without any rise of temperature. On the ninth day he went home. The ugly depression on his forehead which had existed prior to this operation had entirely disappeared, and, with the exception of one point where there was a very slight prominence of one of the bone chips, his forehead was entirely normal.

In the autumn of 1904, six or seven months after the last operation, he was seen, and it was found that the inequality in the surface of the skull had entirely disappeared.

Dr. Keen remarked that this case was worth reporting on account of the entirely unsuspected nature of the injury, for no one examining his skull would have supposed that there was a depressed fracture. In addition to this, the mode of filling up the aperture is one which he first proposed probably eight or ten years ago. He had now practised it in fully a score of cases. This is the smallest opening he had filled by these bone chips chiselled from the neighboring outer table. In other cases he had filled in areas 6 to 7 centimetres by 3 to 5 centimetres, in other words, large openings. The skull becomes in time very solid and strong, reproducing practically a normal skull so far as both outline and protection are concerned. The margins of the opening, of course, should always be made raw by the rongeur forceps, and the pieces of bone which fill in the opening should not be too large. He had found the best instruments for procuring them are a gouge and mallet. Never in a single instance had he had any of the pieces of bone undergo necrosis, and so to require removal.

EXCISION OF THE TIBIA.

Dr. Francis T. Stewart said that he was indebted to Dr. Le Conte for the privilege of operating upon and reporting the following case:

The patient is a Polish boy, aged ten years, from whom it was difficult to obtain any definite history. About seven months ago the right knee and leg suddenly swelled and became excessively painful. The patient was confined to bed for several weeks with marked constitutional symptoms, and has not been able to use the leg since. There is no history of injury. At the time of operation, the entire tibia and the lower end of the femur were markedly thickened, and the knee was ankylosed at an angle of about 40 degrees. Along the course of the tibia were numerous sinuses leading down to necrotic bone. Under ether a feeble attempt to straighten the knee resulted in a fracture of the femur just above the condyles, thus allowing the limb to be fully extended. An incision was made down to the tibia from the knee to the ankle and the entire diaphysis excised subperiosteally, leaving the lower epiphysis and a shell of the upper. In curetting the upper epiphysis the instrument at one point entered the knee-joint, which was found to be filled with hard, fibrous tissue. The entire wound was packed with sterile gauze and the limb placed in a fracture-box. Bacteriological examination of the specimen showed the infection to be that of the Staphylococcus pyogenes aureus.

Dr. Stewart said that he had had two other similar cases, one concerning the tibia and the other the fibula. The tibial case was a boy of twelve years who developed an acute osteomyelitis following a trivial injury. The limb was treated for four weeks with poultices, at the end of which time he saw him and excised the bone subperiosteally, saving the upper and lower epiphyses. At the end of six months the tibia had regenerated and was much thicker than normal. There was a little flexion of the knee and a slight varus of the leg, but withal a useful limb. In the fibular case, a boy of nineteen years, a contusion of the outer side of the leg was followed within a few days by marked constitutional disturbance, which was diagnosticated typhoid fever. Four months later he saw the patient, and removed the bone subperiosteally, excepting a small portion of the upper and lower ends. The infection in this case proved to be the Staphylococcus pyogenes aureus. The bone regenerated promptly, and the patient returned to his work as a laborer at the end of six months.

At the 1904 meeting of the American Surgical Association, Dr. Johnson read a paper on this subject, and among other points

emphasized the following: Regeneration in all his cases, six in number, was rapid and complete. Deformity never results where a disc of bone is left between the shaft and the epiphysis. The companion bone invariably takes on compensatory hypertrophy. During the operation the periosteum should be spared as much as possible, and the curette should be used very cautiously. The leg should be immobilized in a fracture-box and frequent and rough dressings avoided. The part should be moulded with bandages or adhesive strips as bone tissue develops, and the young bone should be protected by means of plaster of Paris.

Nichols (*Journal of American Medical Association*, February 13, 1904) states that the reason the regenerated bone is at first much larger than the original shaft is that the bone is not completely ossified. In time the size decreases almost to normal, and, judging from skiagrams, a new medullary canal develops. He thinks the best time for operation is about two months after complete drainage of the acute infection.

In regions, such as the thigh or the arm, where there is no companion bone to act as a splint and maintain the length of the part, one should wait until the periosteal shell of regenerating bone is sufficiently advanced to preserve the contour and bear the weight of the limb. Roughly, this stage is reached when the periosteal shell, as determined by the X-ray, is equal to one-fourth of the diameter of the original shaft.

Dr. Robert G. Le Conte said that he had operated upon six cases of osteomyelitis where the whole shaft of the tibia was involved in the disease. These cases varied from the very acute to the very chronic stages of necrosis, the duration of the disease being from five days to seven or eight months. He believes that the deposition of bone from the unremoved periosteum depends upon the length of time the disease has lasted. In the chronic cases, months after the onset of the acute symptoms, the regeneration of bone is reduced to a minimum, while in the acute stages, say two or three weeks after the onset of the disease, the periosteum is in an active state for bone regeneration. In the personal cases mentioned, more or less good bone was formed in four of the patients with useful limbs; partial deposit occurred in one, and in the other no bone whatever was formed.

Dr. De Forest Willard said his experience had not been so favorable, since regeneration of bone is slow and imperfect in old

cases. Osteomyelitis should be treated as is appendicitis, by early diagnosis and early operation within forty-eight hours if possible, not waiting until the case has been treated for months for other diseases, as rheumatism, typhoid fever, etc.

Dr. John H. Gibbon referred to the report of a case by Dr. Huntington, of San Francisco (Annals of Surgery, February, 1905), in which the entire shaft of the tibia had been removed and the shaft of the fibula substituted. After the removal of the tibia the result was not completely satisfactory, and the author divided the fibula near one of its extremities and attached it to the corresponding epiphysis of the tibia. A few months later the other end of the fibula was also divided and attached to the other epiphysis of the tibia. The result of this transference was most satisfactory.

Dr. Stewart, in closing, said that several cases of bone grafting had been reported. The bone is obtained from the same individual or from animals. Morton used in one case bone from a dog, and Senn has employed a similar expedient, using bone from the same individual.

TRANSMESENTERIC HERNIA OF THE APPENDIX VERMIFORMIS.

BY ALFRED C. WOOD, M.D.,

OF PHILADELPHIA.

Assistant Professor of Surgery in the University of Pennsylvania; Surgeon to the University, Philadelphia, and St. Timothy's Hospitals.

A MALE, aged twenty-two years, student, was admitted to the University Hospital, January 7, 1904. He had always enjoyed good health, with the exception of two occasions, viz., the first, four years ago, when he had an acute attack of obstinate constipation and generalized abdominal pain, lasting several days and causing him to remain in bed; the second was a similar attack, nine months before admission to the hospital, associated with influenza and lasting ten days.

About two weeks before the present illness the patient was writing almost all day, and he found, while sitting at the table, that he was comfortable only when the right side was "kinked up," as he expressed it. In this position he did not feel any unusual sensation, but as soon as he assumed a normal posture he was conscious of a distress in the abdomen. Without any other premonitory symptoms he became distinctly ill on the afternoon of January 1, about a week, therefore, after the attack just mentioned. He had headache, nausea, vomiting, and moderate pain in the epigastrium. After retiring in the evening he had a pain in the back and felt chilly, but had no distinct rigor. On the following day there were three bowel movements; the pain in the abdomen continued. There was no definite change on the third day; the bowels moved once. On the fourth day the pain was distinctly in the right lower quadrant of the abdomen. It had been continuous with occasional attacks of general abdominal pain. There was no change on the fifth and sixth days. On the seventh day, after saline purges, there were six watery stools.

The notes made on January 8 are as follows: Pulse, 88; respiration, 20; temperature range 100° to $102^{2}/_{5}$° F. The abdomen is not distended, and there is no rigidity. A rounded tender

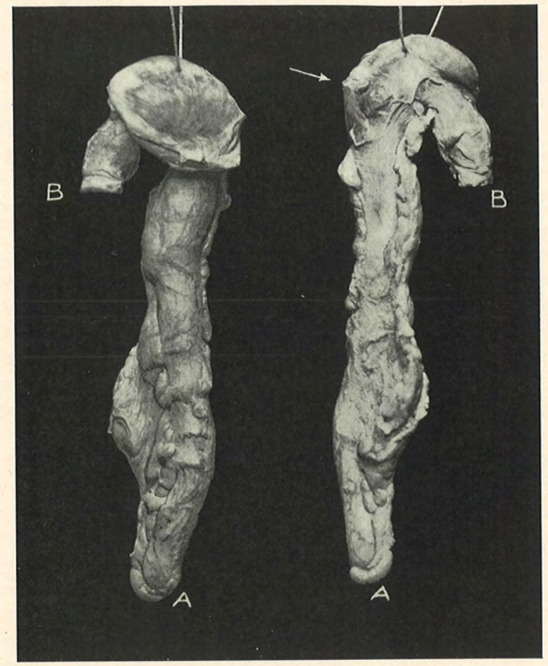

FIG. 1.—Hernia of appendix vermiformis through abnormal opening in mesentery, with strangulation. *A*, The free extremity of the appendix; *B*, the cæcal extremity; the arrow points to the perforation indicated by the small dark spot. The crown, composed of lymph, covers the portion that had protruded through the mesenteric opening.

mass is felt in the abdomen, approximately two inches wide and four inches long, in the line of the ascending colon; the lower border of the mass corresponding with McBurney's point. The leucocyte count is as follows: January 8, 2 P.M., 14,640; 9 P.M., 17,920; midnight, 17,000; January 9, 9 A.M., 16,080. The urine is normal.

Although some of the features were unusual, the condition was thought to be appendicitis, with an abscess. An operation was performed, the peritoneal cavity being opened by an incision over the mass. The latter occupied the normal position of the ascending colon and had the general shape and size of this structure. It was firm to the touch and had a very deep red color. At three or four points areas of softening were seen, suggesting the beginning of breaking down in the mass. While no anatomical structure could be recognized through the incision, the mass was thought to be the colon, altered by inflammatory action and lymph formation. As the appendix could not be found, it was supposed to be in the mass described, but a careful search failed to disclose a trace of this structure. The areas of softening were found to be suppurating, epiploic appendages. By enlarging the incision the survey was extended, and finally the cæcum recognized firmly fixed in its position. The longitudinal bands could be seen here, but were obscured above. The anterior band led backward and upward, and seemed to be lost beneath the mesentery. On inspecting the opposite surface of the latter, after displacing a portion of adherent omentum, a small rounded structure was seen projecting from it. The condition at once became clear; the appendix had slipped through a hole in the mesentery and had become strangulated. It was reduced with some difficulty, owing to adhesions and the firm constriction of the ring. As soon as the appendix was liberated the unusual fixation of the cæcum was relieved. The process was removed. The opening in the mesentery, which comfortably admitted the tip of the little finger, was closed by sutures. A Mikulicz drain was inserted and the wound closed. The patient made an uncomplicated recovery.

As will be seen by consulting the illustration, the appendix was strangulated at its base, the organ having doubled upon itself and slipped into the hole in the mesentery. It had ruptured at the point of constriction. The meso-appendix was unusually large and fleshy.

In addition to the rarity of the condition, the case was interesting on account of the presence of an inflammatory mass quite two inches from the affected portion of the appendix, and an apparently healthy area between. This misleading evidence prolonged and complicated the operation. The minute perforation of the appendix permitted very slow leakage, which, owing to the position of the patient, or other causes, collected on the anterior and outer aspect of the colon, and caused an inflammation of the structures with which it came in contact.

I have not been able to find any reference to similar cases, although instances of strangulation of the intestine in the same manner are recorded.

APPENDICULAR FEMORAL HERNIA, WITH NOTES OF ONE HUNDRED CASES.

BY ALFRED C. WOOD, M.D.,

OF PHILADELPHIA.

In the summer of 1900 the writer operated upon a woman, about 70 years of age, for a painful, fluctuating swelling in the right groin which was supposed to be a suppurating inguinal adenitis. (See Case 99.)

The incision revealed a cavity, containing a small, offensive, gangrenous mass, which proved to be the vermiform appendix. The cavity was found to be the sac of a femoral hernia. The distal half of the appendix was gangrenous; the proximal portion was nearly normal. This was a case of gangrenous appendicitis occurring in the sac of a femoral hernia. Although this case excited a deep interest, no investigation of the subject was undertaken at the time.

In August, 1904, I saw, in consultation, a woman who had a lump in the right groin, which had been present for three weeks. The diagnosis of femoral hernia had been made by her physicians, an opinion in which I fully concurred. (See Case 100.)

At the operation, the swelling was found to consist chiefly of serum, but the sac also contained the entire appendix vermiformis, the base of which was so tightly grasped at the neck of the sac that reduction was impossible until the constriction had been divided.

Although this is a rare condition, I have been able to collect 100 cases, including these two personal experiences, in which the appendix alone occupied the sac of a femoral hernia. All those in which any other portion of the intestine was reported as being present, have been excluded. While an

effort was made to include every case, some, undoubtedly, have been overlooked.

It would be a difficult task to determine who first noted the presence of the vermiform process in the sac of an external hernia. Such observations, however, are not confined to recent times, having been recorded by Garengot (Traité des operations de Chir., 1731, i, 237), and by Sandifort towards the end of the eighteenth century. Tritschler wrote on hernia of the cæcum and appendix in 1806. Rust described (Handbuch der Chir., 1832) hernia appendicularis. Among other contributors to this subject are Klein (1886); Brieger (1893); Bajardi (1895); Spurrier and Corner (1902); Vesignie (1903), and Wassiljew (1904).

In addition to the papers devoted to a more or less formal discussion of the subject, there are a large number of individual cases recorded. This is especially true with reference to "cæcal" hernia, in connection with which the appendix is often found. Hernia of the appendix occurs in both the inguinal and femoral varieties, and either alone or in conjunction with other portions of the abdominal viscera.

The following figures show the relative frequency of the appendix in abdominal hernias: Of 250 cases of radical cure of hernia by the Bassini method, reported by Hoffman, from the Albert Clinic, Vienna, the appendix was found in the sac 9 times. Of 1586 hernias operated upon in the clinic of Professor Colzi, Florence, the appendix was present in 27. Wassiljew reports 106 Bassini operations, in which the appendix was found 3 times. Coley met with the appendix, alone or with other viscera, 16 times in 1003 operations for the radical cure of hernia. Bundschuh (Heidelberg clinic) met with the appendix 3 times in 109 consecutive operations for strangulated femoral hernia. Combining these figures, the appendix was found 58 times in 3054 hernias,—once in about 53 cases. No figures are at hand to show the proportion of hernias in which the appendix alone is found in hernial sacs.

The relative frequency of pure appendicular inguinal and femoral hernias might be expected to preserve about the same

ratio as that which exists between the usual forms of these two varieties, but the few figures at hand lead to a rather different conclusion. In Brieger's collection of 35 cases of hernia of the appendix, 20 were inguinal (19 right and 1 left), and 15 were femoral. In 98 cases, Bajardi found 54 inguinal and 44 femoral. Of 145 hernias containing the appendix alone and with other viscera collected by Spurrier and Corner, 71 were inguinal and 69 femoral.

In Gibbon's collection of 63 "cæcal hernias," 56 were inguinal and 7 were femoral. Of the latter, 4 (3 right and 1 left) contained in addition to the appendix, other portions of the bowel, while 3 (all right) contained the appendix only. Of the 56 inguinal hernias, 32 (28 right and 4 left) contained intestine in addition to the appendix, and in 9 (8 right and 1 left) the appendix alone was found. It will be observed that the appendix was present in all the femoral hernias, but was absent in 15 of the inguinal hernias. In this collection of "cæcal" hernias the ratio of the femoral to the inguinal variety is as 1 to 8; of pure "appendicular" hernia it is 1 to 3; in Spurrier and Corner's, it is about equal. In Brieger's collection (appendicular) it is 3 to 4; in Bajardi's (also appendicular) it is 4 to 5. It must be borne in mind that different collections of cases do not always lead to the same deductions, but as far as these limited figures may be accepted, they show that cæcal hernia is about 8 times as frequent in the inguinal variety as in the femoral, while in pure appendicular hernia, the proportion is nearly equal.

Another interesting point concerns the relative frequency of cæcal and appendicular hernia in the two sexes. Of Gibbon's 56 cases of inguinal hernia, but one occurred in a woman, and that was a pure appendicular hernia; therefore the table does not contain a single example of inguinal "cæcal" hernia in the female. The seven cases of femoral hernia all occurred in women. Spurrier and Corner's cases include only those in which the appendix in a hernial sac gave rise to at least a part of the symptoms. Including both the inguinal and the femoral varieties, there were 52 males and 61 females.

Of the 100 cases of appendicular femoral hernia appended to this paper, 81 were in women, and 7 in men; the sex not being given in 12.

An important difference between cæcal and pure appendicular hernia concerns the age of the patients. Gibbon quotes the combined experience of Coley and Halsted (1898), a total of 642 herniotomies, in which the cæcum or appendix was found in the sac 21 times, and in but 3 of these was the patient over 15 years of age. It should be stated that 16 (but 1 being over 15 years of age) of these were reported by Coley, whose work has been largely among children. Of Gibbon's 63 cases, 36 were under 15 years of age, 5 between 15 and 40, 7 between 40 and 50, and 15 past 50 years. Over one-half, therefore, were less than 15 years of age, and 60 per cent. were under 40.

In marked contrast are the cases of appendicular hernia here reported. The age is given in 77 instances. The youngest patient was 19 years of age, five were in the third decade, five in the fourth, twenty-five in the fifth, eighteen in the sixth, thirteen in the seventh, nine in the eighth, and one in the ninth; the latter patient being aged 87 years. More than one-half of the patients were over 50 years of age, and over 85 per cent. were past 40 years. This varies slightly from the statement made by Spurrier and Corner, that the maximum frequency occurs in the sixth decade, although this refers to cases accompanied by intestine in the hernia.

Any consideration of the etiology of appendicular hernia must first admit a low position and a definite degree of mobility of the cæcum and appendix. Given these conditions, the subsequent steps will probably be determined by the attending circumstances. It is certain that all do not develop in the same way. From a study of the appended cases, it seems permissible to assume the following types:

1. The hernia (probably cæcum and appendix) develops in the usual manner,—*i.e.*, it is either congenital, or a freely movable cæcum and appendix is situated low down, in contact with a weak internal abdominal ring, when some severe strain or jar, or a series of such accidents, develops the rupture. The hernia is at first reducible, and usually returns to the abdomen when the patient is in the recumbent position. If the hernia is not kept up by a truss, sooner or later the appendix becomes adherent to the sac. In this condition the hernia is but partially reducible, the bowel escaping from the abdomen to the hernial sac and returning, according to the position of the individual, while the appendix remains fixed. In these cases the patient frequently notes that "the lump gets smaller on lying down, but does not entirely disappear." Either as a result of wearing a truss, or of contraction of the neck of the sac from natural causes, the cæcum may cease to descend, leaving the appendix as the sole structure involved in the protrusion. The neck of the sac may continue to contract, causing incarceration or strangulation of the appendix, or the latter may become the seat of inflammation. In either of these conditions, acute symptoms develop promptly.

2. It is conceivable that a congenital hernia, or one occurring early in life, may appear to have cured,—that is, may cease to come down, but yet leave a sac and small, but patulous canal in which the appendix could engage under favorable circumstances. In some of the cases the abdominal symptoms,—pain, constipation, and vomiting,—indicating incarceration or strangulation of the appendix, occurred before the hernia was observed; in others the lump appeared some days or even weeks before the onset of acute symptoms. In either event, it would appear that there must have been a hernial sac present, or the appendix could not have escaped so freely and suddenly from the abdomen.

3. One is led to ask if a hernia is ever appendiceal primarily? The history of some of the cases appears to justify an affirmative reply (*vide* Cases 4 and 82.) Whether an incomplete hernia exists, which suddenly becomes complete; or whether the appendix, lying either in the inguinal or femoral fossa, is suddenly and forcibly protruded through the respective canal, carrying the adjacent parietal peritoneum before it, must probably remain a matter of conjecture. The writer believes the former is the more reasonable explanation.

The symptoms of appendicular femoral hernia as noted in the following cases, vary greatly: A lump was present in the groin in every instance. In some it had existed previously; in others, it first appeared with the onset of acute symptoms for which the operation was performed. An impulse on coughing was rarely noted at the time of onset of the acute symptoms. In a number of cases the lump was the only symptom, but the majority exhibited in addition one or more of the following: Fever, loss of appetite, nausea, vomiting, in some cases stercoraceous, constipation, colicky pains, violent hypogastric pain, distention, frequent and difficult micturition, drawing sensation in lower part of the abdomen, pain in the right hip joint, restricted movement of the thigh, and flexion of the thigh.

It seems worthy of mention that involvement of the appendix alone, in some instances, gave rise to symptoms characteristic of strangulated intestinal hernia,—*e.g.*, nausea, vomiting (even stercoraceous), constipation, and distention. This is evidently the result of reflex nerve action, as it is improbable that any organic obstruction is caused by the incarceration of the appendix. An unexpected manifestation was flexion, and restricted movement of the thigh. This condition is probably due to contraction of the appendix after it has become adherent to the sac, so that full extension of the thigh would make undue traction on the cæcum.

The duration of the acute symptoms was stated in 50 of the cases. It varied from a few hours to five weeks. The majority was less than three days; and three-fourths, five days or under. Of the more frequent symptoms, nausea is noted eleven times, vomiting twenty-five times, and constipation fifteen times.

The condition of the appendix was said to be normal, or nearly so (mere congestions included) in eleven, inflamed in four, adherent in seventeen, incarcerated in twenty-two, strangulated in eighteen, perforated in sixteen, ulcerated in five, gangrenous in twenty. It will be understood that two or more of these conditions were sometimes noted in the same case.

In 52 instances the appendix was removed; of these, three died. In 17, the appendix was reduced; all recovered but one. There were 8 other fatal cases, but in these the disposition of the appendix is not given.

In his work on appendicitis, page 186, Sonnenburg says he does not accept the view that a "normal" appendix becomes strangulated. The latter condition, in his opinion, is always due to inflammation. Wulff takes the opposite view, claiming, in his case, that the appendix was perfectly normal except for the constriction and its results. I believe the weight of the argument is against Sonnenburg. Some difference of opinion may arise from the rather confusing and sometimes indiscriminate manner in which the terms "incarceration" and "strangulation" are employed. But as the second condition is simply an advanced stage of the first, no sharp distinction need be drawn in the present discussion.

One may well imagine a small hernial orifice barely large enough to admit the appendix into which the latter may become engaged during some violent effort of the individual. Owing to the dependent position and perhaps the pressure of organs above, the circulation of the appendix is somewhat embarrassed, and slight swelling ensues. This causes a little constriction at the neck of the sac, and still greater swelling results, each condition aggravating the other. In the presence of marked congestions, as is well known, inflammation of the appendix is easily established. In this way the inflammatory cases are explained. It is equally obvious that an appendix in the sac of a hernia may become inflamed from other causes, resulting in swelling and subsequent strangulation.

That it is unsafe to assume that every case of incarcerated or strangulated appendix is inflamed, appears from a reference to the cases. In 17 instances the appendix was returned to the abdomen, and but one death followed. This was reported by Dieffenbach in 1848. In this case the appendix was clearly not in a condition suitable for reduction. If the naked-eye appearances may be trusted, the appendix was normal in a number of instances; it is also significant that no trouble resulted in

the 16 cases in which reduction was performed. Surely some of them would have given symptoms if they had been returned to the abdomen in an inflamed condition.

There appears to be no signs by which appendicular hernias may be recognized. In my first case the conditions suggested an abscess: in the second, the sac was so tense that no information as to its contents could be obtained. Coley has been able to recognize the appendix in the hernial sac by palpation, but this would manifestly be possible in but a few of the cases. Usually tension, fluid or inflammation would interfere with this test. Both Koelliker and Muus are of the opinion that the presence of the appendix in the hernial sac causes the patient to walk with the body inclined forward, and that this posture is an important aid in making the diagnosis. This symptom can be explained only by assuming that the appendix is adherent to the sac and that when the patient attempts to take the full, erect attitude, traction is transmitted from the mesocolon, through the cæcum, to the appendix. This condition was noted in a few instances, but so infrequently that it cannot be looked upon as a symptom, except in those cases in which adhesions, incarceration, or strangulation exists. It is not probable, therefore, that many of these cases will be recognized before operation.

The treatment of hernias in general is divided into the palliative and the radical, and the appendicular hernia if recognized would be treated upon the same lines as the other forms.

The proper disposition of the appendix, when found at operation in the sac of a hernia, must be decided by a consideration of both the general and local conditions.

In discussing treatment, the cases may roughly be divided into three classes:

First.—Those in which the appendix is normal or but slightly congested from mild constriction. In this class, removal of the appendix is to be preferred, if the attending conditions are favorable; that is, if the entire process and its attachment to the cæcum can be exposed in the wound, rendering the operation easy, and free from risk to the patient. This

is much more apt to be the case in inguinal than in femoral hernias. When the base of the appendix cannot be exposed, the hernial canal may be enlarged by a small incision, if the patient's general condition justifies prolonging the operation. (See Case 99.) Cases will be met with in which this additional interference will be contraindicated, as in Case 99. In such instances, the appendix may safely be returned, if in a normal condition, as pointed out above. In older subjects the danger of subsequent appendicitis is much less than it is before middle life. A radical cure should be attempted whether the appendix be returned to the abdomen or removed.

Second.—Cases in which the appendix is firmly adherent to the sac, or is the seat of distinct inflammation. In these instances the organ must be removed, as the danger of returning it would be greater than the risk attending its removal. Great care is necessary, in the highly inflammatory cases, to avoid infecting the peritoneal cavity. A radical cure should conclude the operation, unless the amount of infection present demands free drainage.

Third.—Cases in which the appendix has perforated and fecal mater has escaped into the sac, or in which an abscess has formed. In this class the greatest nicety of judgment and precision of operative technique will be required to deal effectively with the conditions and yet avoid infecting the peritoneum. When the distal portion only is involved, it may be possible to ligate at the base and remove the affected part. In the particularly bad cases the sac should be laid open widely and sponged out carefully; the appendix should then be drawn out as far as possible and held in this position by sutures. In this way, the abdominal cavity is shut off. Of course, this presupposes that the peritoneum has not already become infected. In these cases the external wound must not be sutured, but should be allowed to heal by granulation. In many instances the wound will heal leaving the cæcum adherent at the internal hernial orifice, which, as a rule, will cause no inconvenience; or a fecal fistula may remain, which can be closed by operation at an appropriate time subsequently.

A study of the cases that follow will show that:

1. Appendicular hernia is more frequent than has been supposed.

2. When occurring in conjunction with the cæcum, no special considerations may be involved; but when occupying the sac alone new problems of treatment are introduced.

3. The appendix is more apt to be found in femoral than inguinal hernias. It has occasionally been observed on the left side.

4. A herniated appendix is apt to become adherent and inflamed, and, as a matter of clinical experience, this danger appears to be greater when it occupies the sac alone than when it is accompanied by other portions of the intestine.

5. The diagnosis of appendicular hernia has not been made, as a rule, before operation.

6. In all cases operated upon it is desirable to remove the appendix unless the patient's general condition or safety contraindicates this course.

REFERENCES.

1. Aly (Münch. Med. Woch., 1898, 45, 1656) reports a case in which the vermiform appendix had a perforation at its apex. The entire appendix was found in the sac of a femoral hernia. Result not stated.

2. Annandale (Lancet, London, March 30, 1889, page 627). Mrs. M., aged 60 years, noticed a swelling in right groin twenty years before, but it gave no trouble. Thirteen days ago the swelling increased in size, became tender, and caused a little fever. Soothing applications were applied. A diffuse inflammatory swelling was present in right groin and all signs of diffuse suppuration; some nausea, but no obstruction. Operation: Free incision, keeping in view history of hernia. Cavity, not markedly circumscribed, contained pus and blood. Well-defined round tumor, size of a mandarin orange, exposed. This proved to be sac of a femoral hernia; walls much thickened by inflammation. Sac opened; pus and blood flowed out. Only other object was appendix, thickened and congested. Base firmly adherent to inner aspect of neck of sac, and thoroughly plugged it. Base of sac and appendix firmly ligatured with catgut and cut away. Base of stump sutured by two or three subcutaneous sutures as in radical cure. Wound soundly healed January 19.

Appendix removed measured three and a-half inches. Small perforation about one inch from tip.

3. Bajardi (Lo Sperimentale, 1895, 330) reports the case of a woman of 42, with a right femoral hernia and the phenomena of incarceration and inflammation. Herniotomy was performed; the sac was found to be one mass of exudate, in the midst of which was an adherent appendix. This was excised, the sac sutured, and drainage inserted. The patient recovered.

4. Barth (Deut. Zeit. f. Chir. 1902, 149) reports the case of a woman of 80, who had been suddenly taken with pain in the upper part of the right thigh while lifting a heavy load. There were neausea, loss of appetite, vomiting, absolute constipation, and inability to pass flatus; also colicky pains, especially in the lower part of the abdomen. Eight days after the appearance of these symptoms, a diagnosis of incarcerated femoral hernia was made. At that time the mass was the size of a pigeon's egg. The skin was slightly movable and not reddened. The tumor was hard, and swollen lymph-glands surrounded it. Palpation was painful. There was some distention of the abdomen. The patient had never suffered with a rupture before. The operation was performed on the eighth day, under Schleich's anæsthesia, and some swollen lymph-glands were removed. Upon opening the hernial sac, turbid fluid escaped. The only structure in the sac was a loop of the vermiform appendix, 10 cm. long, gangrenous, and much distended. The incarceration was so tight that it was difficult to pass a probe alongside of the appendix. There were no adhesions except in the neighborhood of the internal ring. By breaking these up, a small abscess, containing foul-smelling green pus, was opened. The appendix was amputated. The resected appendix was 16 cm. long, 10 of which were incarcerated. The patient died some weeks later, of senility.

5. Battle (Lancet, 1899, 1, 1223). Woman, aged 59; swelling in right groin for five years. It caused some difficulty at one time, which subsided in three weeks. Ten days ago it reappeared without apparent reason. Pain, no vomiting, no constipation, mass irreducible, pressure in right iliac fossa caused sensation of dragging on swelling, no fluctuation. Operation: Some inflamed glands; appendix in sac. Appendix and adherent sac removed. Recovery.

6. Bayer (Centralbl. f. Chir., 1876, vol. xxxi, page 689). Appendix strangulated in right femoral sac. Local pain and swelling. (Quoted by Eccles.)

7. Bayer (Prag. med. Woch., 1886, xi, 221) reports the case of a woman of 27 years, who complained of having had a small mass in the right groin for several weeks. Its origin was unknown. There was pain radiating along the right limb and the right side of the abdomen. The patient was able to pass gas and stools. She could not move the right leg as freely as usual; the mass enlarged gradually. A diagnosis of hernia was made. The hernia was irreducible and inflamed. An incision was made over the mass, and the hernial sac was found to contain bloody, serous fluid. The hernial contents consisted of fibrin and a small piece of intestine, circularly constricted at the hernial neck. The loop was the size of the little finger, and not movable. The crural ring was split, the adhesions severed, and the loop of intestine found to be a

small portion of the vermiform appendix. This was reduced, and the patient recovered. The wound was permitted to granulate.

8. Bender (Bull. et Mem. de la Soc. Anatom. de Paris, 1900, vol. lxxv, 756). The patient was a woman, with a tumor the size of a nut on the inner side of the right thigh. It was hard, painful, and dull on percussion. There was no impulse on coughing. A diagnosis of inguinal adenitis was made; hernia being excluded by the absence of impulse.

Suddenly, violent abdominal pain was felt, followed by distention and absolute constipation. The diagnosis of strangulated femoral hernia was then made, and operation performed. The sac contained a quantity of yellowish fluid and the appendix. The latter, which was ligated and removed, measured 12 cm. In the tip a little pus was found. The patient recovered.

9. Bennet (Med. and Surg. Reporter, Phila., 1882, vol. 47, 396). Man, aged 64 years; lump in right groin for three years. On February 9, 1881, violent pains in hypogastrium. Called physician, who found lump size of hen's egg in right groin. Not painful; felt like large glands. Supposed to be hernia.

Taxis. laxatives, enema, etc., all ineffectual, but latter caused pain. Vomiting set in and became stercoraceous on 11th. Operation on 12th: Free end of appendix in *gangrenous* condition in femoral hernia. Patient recovered.

10. Bidwell (Trans. Clin. Soc. 1897, xxx, 186). Woman, aged 50; reducible right femoral hernia for seven years; for past fourteen days it was irreducible; no symptoms of strangulation. The hernia was tense, the size of a hen's egg, and slightly tender. Hernial sac contained clear fluid, one and a half inches of normal appendix in the sac; reduction, radical operation. Recovery.

11. Ibid. Woman, aged 60; right femoral hernia for five weeks; came down suddenly; irreducible, tense, hernial sac size of hen's egg; contained clear fluid. One inch of normal vermiform in sac; reduction; radical operation. Recovery.

12. Briancon (Thèse de Paris, 1897). Woman, aged 42; an irreducible, incarcerated, painful right femoral hernia, developed suddenly. At operation the sac was found to contain an ulcerated appendix. The patient recovered.

13. Ibid. Woman, aged 45 years; had a right femoral hernia for two years, which suddenly became incarcerated. At operation the hernial sac was found to contain an incarcerated appendix, 15 cm. long. It was obliterated below the point of incarceration. The appendix was removed. The patient recovered.

14. Ibid. A woman had had a right femoral hernia for a few years. Symptoms of strangulation developed suddenly. At operation the inflamed appendix was found in the hernial sac. Appendectomy. The patient recovered.

15. Brieger (Archiv. f. klin. Chir., 1893, xlv, 892) reports the following case: A woman had pain, with frequent and difficult micturition. In the right groin there was a mass the size of a walnut. The skin

was not changed. The operation showed within the hernial sac a cord 2½ cm. long. When pulled out, this was found to be the vermiform appendix. It was removed, and the patient recovered. It was somewhat thickened and pale-red. The amount of constriction was very slight.

16. Brohle (Münch. med. Woch., 1887, xxxiv, 506) reports the case of a woman of 72 years, who had had a small hernia of the right femoral region for several years. It had always been irreducible. It was as large as a hen's egg and painful to touch. Incision over the mass evacuated ill-smelling pus. The pus came from glands that had broken down. One of the glands was attached to a string, which passed through the femoral canal and seemed to be continuous into the peritoneal cavity. The hernial sac was opened and the string was found to be the vermiform appendix. It was adherent to a gland. It could be torn, and from its interior, foul-smelling pus was evacuated. The appendix was removed and the stump reduced. The patient died 23 days later.

17. Brunner (Beitr. z. klin. Chir., 1889, iv, 18) reports the case of a woman of 59, who complained of having had colicky pains for six years. The cause of these was not known. They came, as a rule, suddenly, remained several hours, and disappeared after she had vomited a quantity of bile. She had had for the same length of time a tumor of the size of a walnut over the upper part of the right thigh. It was not completely reducible. When seen by the author, she had had for two days intense pain associated with bilious vomiting. The small mass was swollen and not very tender. The skin over it was red and infiltrated. Through the skin there could be felt a cord passing upward into the abdomen. A diagnosis of suppurating, incarcerated femoral hernia was made. Incision over the mass revealed, after cutting through some strictures, a space lined with a greenish membrane. A fecal odor arose from it. Along the mass the finger entered the abdominal cavity. The mass was found to have an opening the size of a pea, through which fecal masses were escaping. Close examination showed it to be the vermiform appendix. It was removed and the hernial opening was packed. The patient died.

18. Bundschuh (Beitr. z. klin. Chir., 1901, xxxi, 425) reports the case of a woman of 53, who had had a right femoral rupture since childhood. While lifting a heavy tub, she experienced pain in the groin. The hernia was incarcerated for eight days. She vomited once, and there was inability to reduce the hernia. Herniotomy and a radical operation were performed. The hernial sac was thickened; the vermiform appendix was adherent to the upper part of the hernial sac; the lymph-glands were adherent; and there was some omentum, which was replaced. The patient recovered.

19. Ibid. In the second case, the patient was a woman of 60, who had had a right femoral hernia for two years. She had suffered much from coughing. While carrying a heavy bucket, incarceration took place. There was violent pain and nausea, and a mass the size of a nut appeared. The incarceration lasted three days. Herniotomy and resection of the adherent vermiform appendix, which was 6 cm. long, were per-

formed; also a radical operation. The hernial fluid was turbid. Some hemorrhagic omentum was resected, and the patient recovered.

20. Cabaret (Jour. des connaissances medico-chirurgicales, 1842, x, 54) reports the case of a woman of 60, who, without any known cause, began to vomit and had colic. There was no history of any hernia. The abdomen was tender and tense, and the next day a right-sided femoral hernia suddenly appeared and could not be reduced. It was the size of a pigeon's egg, and very sensitive. The hernia sac was opened, and in it was found the appendix, which was three fingers' breadth long, swollen, reddish-brown, and strangulated. The strangulation was produced by the femoral ring. Gimbernat's ligament was cut through, and the appendix was reduced. The patient recovered.

21. Cruveilhier (Anat. pathologique, 1835, Liv., xxxvii, Planché 6) reports the case of a woman, 50 years of age, who had a fluctuating phlegmonous tumor of the right groin, the size of an orange. The skin over it was inflamed. An incision over the tumor evacuated a large quantity of very offensive pus. The intestine [appendix] was gangrenous. Improvement followed the operation, but the patient died two months later. Autopsy revealed the cæcum to be attached to the crural ring, in which the appendix was engaged. The latter was adherent to the posterior wall of the sac and was perforated near its apex.

22. Danzel (Zeit. der Aerzte zu Wien., 1859, 209) reports the case of a woman of 61, who, for three days, had had symptoms of strangulation. The abdomen was distended; there was absolute constipation, and vomiting. Taxis had been performed for some time. The author found a large, right-sided femoral hernia, tensely distended and painful. The skin was reddened. An incision over the region of the hernia revealed fetid pus. The cavity was drained and the patient put to bed. An improvement was noticeable within a few days. On the twelfth day, a grayish-black mass was removed from the wound in the course of dressing, and was found to be the vermiform appendix. In addition to this, small masses of fæces were discharged. The patient recovered with a small fecal fistula.

23. Davies-Colley (Guy's Hospital Rep., 3d Series, vol. 27, 1884). Woman, aged 38 years, admitted to Guy's Hospital October 2, 1883; married; eight children, youngest two and a-half years. Twelve months ago while lifting a heavy basket she felt a sudden pain in right groin, followed by vomiting. Symptoms soon subsided, but recurred from time to time. On a second occasion she felt a small lump in groin; always able to return lump, and pain never lasted over one hour. Sometimes the hernia would not come down for two or three months. September 30, in chapel, 6 P.M., sudden attack of pain, and felt lump in groin; on arriving home unable to return lump as before. Vomiting at 9 P.M., and continued next day. Taxis, evening of October 1, unsuccessful. Taxis applied unsuccessfully a second time. Bowels moved on 30th, twice October 1, and once (slightly) on 2d.

Swelling over right femoral ring, globular, one to one and a quarter inches in each direction. Rather movable; no impulse on coughing.

Thought to be gland, or strangulation of omentum, or part of calibre of bowel.

Sac was incised. Appendix found, coiled up, three inches long, normal thickness, and little altered in appearance, except that there was a blood-clot under the peritoneal coat, one inch from tip. Internal border of femoral ring was notched, and the appendix returned. Sides of sac brought together with catgut and wire sutures in skin. No fluid or omentum in sac. Recovery.

24. Ibid (page 436). Woman, aged 47 years, admitted to hospital, May 14, 1884. Married; fourteen children. Lately had a sensation of weakness over abdomen and chest.

December 24, 1883, after day's hard work, noticed a swelling in right groin which came down suddenly and caused great pain. Swelling reduced by doctor. No more trouble until May 9, when lump again appeared while she was walking and coughing; 11th, bowels opened and taxis applied twice; 13th, taxis again applied. Vomiting began. In the right groin below Poupart's ligament an ovoid swelling two inches in circumference. No impulse on coughing; abdomen tender. On opening what was thought to be sac, two ounces of serous fluid escaped. A knuckle appeared, and on scratching surface a second flow of fluid having fetor, but no color. In the sac was an object covered with gray lymph which proved to be the appendix. Appendix ligated at base and the swelling caused by inflammation. Recovery.

25. Dieffenbach (Die operative Chir., 1848, ii, 600) reports the case of a man about 60 years of age, with no history of ever having had a rupture. He suddenly became ill. There was nausea, belching, and a drawing sensation in the lower part of the abdomen. The bowels were regular. The hernial region was free. By pressing over the right femoral ring, dull pain was elicited. Laxatives, leeches, and applications were used without improving the condition. Operation disclosed at the femoral ring a very small mass, the size of a small bean, protruding from the ring, and resembling peritoneum. The membrane was opened and was found to be connected with a blackish-gray, folded body. When loosened, this was seen to be the end of the vermiform appendix. It was adherent. Gimbernat's ligament was cut through, and the appendix was reduced. The patient died.

26. Eccles (St. Bartholomew's Hospital Reports, vol. xxxii, 1896), Woman, aged 48, hernia, right femoral, for eleven years. Admitted to hospital for an irreducible swelling in the right groin. No impulse on coughing, but fluctuation was present. Skin tender and inflamed. Patient never had vomiting, but was constipated.

Herniotomy: One inch of appendix, dark and thickened, was adherent to mouth of sac. Ligated and removed. The strangulation was due to the swelling caused by inflammation. Recovery.

27. Ibid (Trans. Path. Soc., London, 1896–97) reports Gee's case. Man, aged 41 years, died from carcinoma of stomach. At postmortem the appendix was found to be five inches long; four inches within abdomen, and the distal inch in sac of right femoral hernia, adherent

at its mouth, and the free extremity somewhat dilated. No previous history in the case.

28. Floel (Deut. Zeitschr. f. Chir., 1891, xxxii, 587) reports the case of a woman of 50, who was suddenly seized with violent pain in the upper part of the right thigh. The pain continued, and a small mass appeared. There was no vomiting. The mass was found to be a hernia, which was irreducible and incarcerated. It was tender to touch and the size of a pigeon's egg. The skin over it was not changed. An incarcerated crural hernia containing omentum was diagnosed. A longitudinal incision was made, and the mass rendered free on all sides. It was found to be continuous with a pedicle through the femoral canal. This pedicle entered the mass, the centre of which was found to be a hernial sac. The pedicle was found to be the vermiform appendix. It was incarcerated, was brownish-black, and had a fetid odor. No fluid escaped. The femoral canal was dilated; the appendix was removed. It was 6 cm. long and not perforated. The patient recovered.

29. Good (British Med. Journal, 1898, ii, 876). Woman, aged 39; tense swelling in right groin; existed for 24 hours; pain and vomiting. Diagnosis: Irreducible, strangulated, femoral hernia. Operation: Hernial sac opened; it continued the vermiform appendix, strangulated and congested; five inches of the process were in the sac and two inches in the abdominal cavity; one inch was gangrenous; this was resected. Patient recovered.

30. Guinard (Bull. de la Soc. Anat. de Paris, 1896, lxxi, p. 451). Woman, aged 45 years, who had had a small femoral hernia, was suddenly seized with abdominal pain, and the hernia became irreducible. There were no symptoms of intestinal obstruction. Celiotomy was performed, and the appendix doubled upon itself was found to occupy the femoral canal and hernial sac. The proximal and distal extremities of the appendix remained in the abdominal cavity. The patient recovered.

31. Heusinger (Mag. f. d. Gesammte Heilk., 1820; quoted by Bajardi) reports the case of a man complaining of colicky pain that had come on suddenly. The patient died four days later. At the autopsy, a suppurative peritonitis was found in the crural canal; the vermiform appendix was discovered, adherent and surrounded with a mass of pus.

32. Hevin (Cours de Path. et de Therap. chirurgicale, 1785, p. 407) reports a case of right femoral hernia with symptoms of incarceration. The femoral sac opened and pus with a fecal odor escaped. In the sac was a gangrenous piece of intestine. The patient died, and the autopsy showed the intestine to be the vermiform appendix.

33. Honsell (Beiträge zur klin. Chir., 1903, xxxvii, 208) reports the case of a woman of 46 years, who had had a small hernia in the upper part of the right thigh, which had been reducible until two days before. There had been violent pain since that time, but no vomiting. The mass was the size of a walnut, and it was painful, tender, and irreducible. An operation was performed under local anæsthesia. A vertical incision was made, and the hernial sac isolated and opened. It contained a clear yellowish fluid. In the sac, the bluish-red, slightly swollen vermiform

appendix was found. Poupart's ligament was severed, relieving the constriction. Reduction was then accomplished. The cyanotic discoloration of the peripheral portion disappeared after the reduction. Radical operation for the cure of the hernia was performed, and the patient recovered.

34. The second patient was a woman of 53 years, who had a hernia that had developed suddenly in the right side of the thigh while she was loading hay. There was violent pain, and a small, tender mass appeared. There was repeated vomiting, and flatus, but no stool could be passed for some days. An incision was made over the mass, the hernial sac was opened, and the constricting ring divided. The opening of the sac disclosed bloody fluid. Within the sac was the appendix, together with its mesentery. The strangulation was from 1½ to 2 cm. from the cæcum. A distinct constriction of the appendix and of the mesentery was present. The strangulated part was brownish-red and covered with hemorrhagic spots. The appendix was resected and a radical operation for the hernia was performed. The patient recovered.

35. In the third case, the patient was a woman of 54, who had had a right-sided femoral hernia for many years. It could be easily replaced until four days before, when, while ploughing, the hernia became irreducible. There was violent pain about the thigh; no stool or flatus was passed for several days; no vomiting. The mass was the size of a walnut, fluctuating and tender. It could be traced beneath Poupart's ligament. The skin over it was perfectly normal. Under local anæsthesia an incision was made, and the tumor freed. The hernial sac was only about the size of a cherry. It contained several drops of serous fluid, and a folded black structure, which passed through the narrow hernial opening. Poupart's ligament was incised and also the hernial neck. The structure mentioned was found to be the vermiform appendix with its end twisted on itself; 5 cm. of the appendix was gangrenous, 2 cm. normal. Between these two parts was a deep constriction-ring. The appendix was resected; a radical operation for the hernia was performed, and the patient recovered.

36. The fourth patient was a woman of 55, who had had a right-sided femoral hernia for several years. It had been easily reducible. For eight days it had been painful and could not be reduced; and neither stool nor flatus had been passed since. There was a tumor the size of a hen's egg, tense, elastic, and painful. The skin over it was slightly edematous. Resistance could be traced below, beneath, and above Poupart's ligament. Under local anæsthesia the hernial sac was isolated and opened. A tablespoonful of turbid, foul-smelling fluid was found. A tough incarcerated piece of tissue, the size of a bean, lay on the floor of the hernial sac. Poupart's ligament and the abdominal covering were severed, and the peritoneal cavity entered. The insertion of the appendix lay above the hernial ring, as did also its tip; but the central portion was within the femoral canal. The mesentery acted as the constricting element. The constricted portion was from 2 to 3 cm. long, and showed two deep furrows. It was blackish and looked gangrenous. No per-

foration could be found. The appendix was resected, and a radical operation performed. The patient recovered.

37, 38, 39. HUETER (Chir., 1882, ii, 559) says he has seen three cases of right-sided femoral hernia containing the vermiform appendix.

40. JACKLE (Diss. Marburg, 1888) describes the case of a woman of 37 years, with a small strangulated and gangrenous-appearing hernia of the right femoral region. There was no fecal vomiting. The skin over the hernia was reddened. An incision was made, and brown, ill-smelling fluid escaped. A small perforated intestinal loop was found. It was partly adherent to its surroundings and covered with pseudo-membrane. The femoral ring was narrow. A close examination revealed the fact that the incarcerated portion of the intestine was the beginning of the appendix. The point of strangulation was 2 cm. from the apex. The appendix was ligated and removed, and the patient recovered.

41. JACOBSON (The Operations of Surgery, 1897, 637). Woman, aged 43; irreducible femoral hernia; radical cure. Hernial sac contained much fluid; in sac a thick fleshy body, tubular at end; constricted near Gimbernat's ligament. Incision of ligament; reduction of appendix. Recovery.

42. KASINOWSKI (Diss. Greifswald, 1871). Woman, 35 years of age, awoke two days previously with vomiting, pain in the right side, and obstruction of the bowels. A right-sided incarcerated femoral hernia the size of a walnut was found. It was tender on pressure. At operation a small amount of fluid and a healthy appendix was found in the sac. The appendix was reduced. The patient recovered.

43. A second case reported by the same author, and quoted by Bajardi, is that of a woman of 44 years, with a right femoral hernia, which had been incarcerated for two days. There was a right-sided vaginal hydrocele, and vomiting occurred. Herniotomy was done. The sac was found to contain a quantity of turbid fluid having a fecal odor. The appendix was reddish, long, and partly within the peritoneal cavity and partly within the sac. The sac and a part of the appendix were removed. The patient recovered.

44. KEETLEY (Med. Press and Circ., 1890, vol. i, page 85). Woman, aged 53 years. Appendix strangulated in right femoral sac. Patient vomited three times. Herniotomy four days later. No definite peritoneal sac found. Appendix thickened, white, and contained much pus. Ligated and removed. Good recovery.

45. KOELLIKER (Cent. f. Chir., 1901, xxviii, 792) reports the case of a woman of 69, with the right limb flexed at the hip-joint, resembling a patient with coxitis. She could walk only with the aid of a cane; and all attempts to straighten the limb, even while lying on her back, produced violent pain in the lower part of the abdomen on the right side. Her femoral hernia could not be reduced. Operation showed the sac to contain a thickened omentum, adherent to the neck of the sac. In the base of the sac was a very long appendix, adherent at its free end. The appendix was very tense during narcosis, as the limb was straightened. No other intestine was found in the sac. The appendix and the omentum

were resected and a radical operation for the hernia was performed. Recovery (not stated, but apparent).

46. KOERTE (Deut. med. Woch., 1901, xxvii, 176, v.) remarks that twice within a year he has operated on incarcerated appendices in small, narrow, crural herniæ. He has no doubt whatever that in each case an incarceration existed, without inflammation. In each case the appendix had a distinct furrow, and the mesentery was hemorrhagically infarcted. There was no suppuration; neither was there a foreign body, a fecal, stone, or anything else of that sort. In one case, the patient was an old woman, who had had an adherent omental hernia for some time. An acute incarceration forced operation three days after the beginning of the symptoms, and in the hernial sac the appendix markedly altered, was found.

47. The second patient was a young woman, who did not know anything concerning the existence of a femoral hernia. Suddenly, one morning, she had an incarceration. She was operated on twelve hours after the incarceration, and from the signs, it was evidently a very recent condition. The author is therefore convinced that these cases were pure incarcerations of appendices, and not inflammations of appendices situated within the hernial sac. Result not stated in either case.

48. KOERTE also reports the case of a woman who had had a rupture for some time. It had not been replaceable for several days. She came to the hospital complaining that she had some belching, but no pain. Distinct symptoms of strangulation were missing; but at the operation the author found an appendix sharply strangulated, with its apex on the point of becoming gangrenous.

49. In another case operated on by him, a gangrenous appendix was found in the hernia. Result not stated in either case.

50. LANGDON (St. Bartholomew's Hospital Reports, 1891, page 179). Woman, aged 46 years; appendix in right femoral sac; sudden onset of symptoms twelve hours before operation; vomiting, but loose motions. Herniotomy; sac much thickened. Appendix ulcerated and perforated; removed. Patient recovered.

51. LANGENBECK (quoted by Israel, Deut. med. Woch., 1901, xxvii, v. 177) operated upon a femoral hernia on account of symptoms of incarceration, and found in it, to his astonishment, a strangulated incarcerated appendix. Result not stated.

52. LEVY (Arch. provinciales de Chir., 1903, xii, 393) reports the case of a woman of 63 years, who had had a small, right-sided femoral hernia for thirteen years. A short time before, after a violent attack of coughing, the hernia had become painful, the pain not permitting the patient to sleep during the night. The mass grew and was found to be irreducible. It was the size of a hen's egg. The skin was tense and very tender, but there was no œdema. An incision was made, and the sac was opened. Serous liquid of a reddish color escaped. The contents of the hernial sac were found to be the appendix, which was very long, swollen, congested, and curved upon itself. It was found to be strangulated at the femoral ring. The appendix was resected and the patient recovered.

53. The second case was that of a woman of 73 years, who had had a small mass in the right groin for two months. It had been gradually increasing in volume, and was the size of a large chestnut. It was not reducible. There had been pain until the last four days. The mass was hard and tender, and the patient had been vomiting several times a day. There was no constipation. Fluctuation was noted and also mobility. A longitudinal incision was made; upon opening the sac a yellowish liquid escaped. The hernial contents were a small piece of intestine, which was gangrenous. The crural ring was stretched, and the piece of intestine escaped into the abdominal cavity. Celiotomy was performed. The gangrenous piece of intestine was found to be the appendix. It was removed and the wound was drained. The patient recovered.

54. LINDNER (Deut. Med. Woch., 1900, xxvi, 259 v.) reports a right femoral hernia that, upon opening, was found to contain a small piece of intestine, which was discovered to be the appendix. It was easily liberated and replaced. On sewing up the femoral canal, fæces suddenly entered it from the abdominal cavity. A laparotomy was performed, and the appendix was discovered to contain two perforations. It was distinctly necrosed and had evidently perforated only a few moments before. The patient died. It was evident that, as the result of the incarceration, a nutritional disturbance developed, and that this produced the ulceration.

55. LOEBKER (Griefswald, 1884, quoted by Bajardi) reports the case of a woman of 41 years, with an old, right femoral hernia that had been incarcerated for two days. Herniotomy revealed a partially gangrenous appendix in the lower angle of the sac. The appendix was ligated and removed, and the patient recovered.

56. LUCAS (Guy's Hospital Reports, 1884, p. 436) reports the case of a woman of 47, who for the last five months had had a right-sided femoral hernia the size of a walnut. Repeated attempts at reduction were futile, and vomiting began soon afterward. She had had no movement of the bowels for several days when seen; the tumor was egg-shaped, having a circumference of two inches. On opening, it was found to contain two ounces of serous fluid, and in the sac was the perforated appendix, which was as thick as the little finger. It was ligated and removed; the patient recovered.

57. LUSCHKA (Virchow's Archiv., 1854, vi, 409) examined the body of a woman of 50 years, who had died of pneumonia, and found that she had had femoral hernia on the right side. Within it was found the appendix, twisted on its axis and constricted at its cæcal end.

58. MICHAILOW (Russki Chirurgitscheski, 1895, No. 2) reports the case of a man of 48 years, who had developed sudden pain three weeks before, while lifting a heavy weight. A tumor appeared below Poupart's ligament. At first there was vomiting, and no stool was passed for seven days, after which time the bowels acted. The tumor was the size of a walnut, and extending upward from it an oval mass could be sharply defined. An operation was performed. The hernial sac was opened, and a black body resembling intestines was found. When separated from the hernial walls, this ruptured; and from it came pus smelling like fæces. An incision 10 cm. into the abdomen was made, and the body was found to be the inflamed and perforated appendix. It was resected, and the patient recovered.

59. MORSE (Wien. med. Woch., 1882, xxxii, 431) reports the case of a woman of 42 years, who had had a right-sided femoral hernia for three days. There was violent pain and a tumor, which gradually increased in size and was irreducible. Symptoms of incarceration occurred. The skin was not reddened. The mass was quite tender. An incision over it was made, and the femoral sac exposed. The femoral canal and sac were opened and inside was found the reddened appendix, which was gangrenous. This was resected. The patient recovered.

60. MOTTA (Ital. med., 1882, xvi, 57; quoted by Bajardi) describes the case of a woman of 76 years, with a right femoral hernia that had been incarcerated for three days. There was vomiting; the bowels were moved by means of enemata. In the femoral region there was an elastic tumor, painful and tense. Along the horizontal ramus of the pubis was a tight cord, prolonged upward into the abdominal cavity. Herniotomy was performed. The sac contained a resistant cord, grayish, about the size of the thumb, and terminating in an expansion the size of a nut. The constriction was relieved by incision. The dilated part was excised. The peduncle was found to extend up into the abdomen. The patient died seven days later, of general peritonitis. The autopsy showed the cord to have a central canal, which communicated with the intestine.

61. MUELLER (Diss. Muenchen, 1891). Woman, 75 years of age, three days ago developed a right femoral hernia, at stool. There was violent pain, and a tender elastic swelling in the groin. Diagnosis: Incarcerated femoral hernia. At operation the hernial sac was found to contain the appendix, which was of a bluish color. The appendix was returned to the abdomen. The patient recovered.

62. MUENCH (Korrespondenzblatt f. schweizer Aerzte, 1902, xxxii, 237) reports the case of a woman of 73 years, who had had a right-sided femoral hernia for many years. It had always been irreducible. There had been no disturbance, however, until a few days before the author saw her. Since then it had become larger and painful; there was no vomiting; flatus, stools, and urine, were evacuated regularly. A round, hard mass was noted in the upper part of the right thigh; it was tender to touch; the skin was almost adherent; there was no fluctuation. Local anæsthesia with eucaine was administered. While trying to liberate the hernial sac, ill-smelling pus was evacuated from the posterior surface of the mass. After opening the hernial sac it was found that its only contents were a 12-cm.-long appendix, which passed through the femoral canal. This was resected at a point as high as possible. The patient recovered. A pathological examination showed the appendix to have been perforated.

63. MUUS (Cent. f. Chir., 1901, xxviii, 1037) reports the case of a woman of 64 years, who for years had had a right femoral hernia, which was always easily replaced. A small tumor was always present, prevent-

ing the wearing of a truss. During the last month, the hernia had become more painful, forcing the patient to walk in a bent position. When lying on her back the right limb was flexed about 30°; and, on account of pain, she could not stretch it any more. There was very little pain on direct pressure. Operation showed a small lipoma in front of the hernial sac, which contained a healthy, adherent appendix. This was resected; radical operation was performed, and the patient recovered. From this time on she could stretch her limb perfectly.

64. Newbolt (British Med. Journ., 1867, i, 781). Woman, aged 21, painful swelling in right groin; had a femoral hernia for two years; always easily reduced. Incarceration for 48 hours; swelling size of hen's egg, hard, tense, tender, irreducible. No bowel movement for three days. Operation: Hernial sac contained vermiform, thickened, congested. Resection of congested part. Reduction of stump. Radical operation. Recovery.

65. Nicoll (Glasgow Med. Journal, 1903, lx, 432). Woman; right femoral hernia for many years; for past three days strangulated; painful, tense; constipation, vomiting, abdominal distention, bowels moved with enema. Sac contained feculent pus; the perforated appendix was adherent to neck. Resection. Recovery. Inflammation apparently occurred in appendix which had previously been in sac.

66. Owen (Lancet, 1899, i, 1222). Woman, aged 65; painful swelling existed in right groin for two weeks, increasing in size; bowels regular; no vomiting. The swelling was as large as the fist, hard, but fluctuating in lower part. Abscess opened and contents cleared out; at the bottom the vermiform was found, strangulated at femoral ring; adhesions at that point. Ligation of appendix. Recovery.

67. Pollosson (Lyon med., 1893, lxxiii, 75) reports the case of a woman of 71 years, in a condition of cachexia and delirium. No history was available. In the right iliac fossa above Poupart's ligament was a fluctuating mass, which could be traced down the thigh into the triangle of Scarpa, in front of the femoral vessels. An incision was made above Poupart's ligament. The patient died a few days afterward. The autopsy revealed a purulent collection situated within the peritoneum above Poupart's ligament and a counter opening made on the thigh. Fetid pus was evacuated. It was limited by adhesions to a point about the cæcum and the appendix. The later was gangrenous and perforated. The purulent collection was traceable into the triangle of Scarpa, and was surrounded by a peritoneal diverticulum forming a sac for a crural hernia.

68. Ibid. In a second case, the patient was a woman 37 years old, who had had a small tumor in the crural region for five years, but had never worn a truss. During the last two days, without any effort on her part, the tumor had become larger and painful. She had had colic and vomiting. During the last twenty-four hours she had not been able to pass either gas or stool. A diagnosis of strangulated hernia was made, and an operation performed. The patient was anæsthetized, and the operation was conducted as for an ordinary hernia. The sac was incised. It contained an abundance of reddish liquid; but in the interior, instead

of intestine or omentum, there was found a reddish cord, 5 cm. long, and of the thickness of the little finger. The neck of the hernia was cut through, and the strangulated portion pulled out. It was found to be the appendix. This was resected, and the patient recovered. A distinct ring of strangulation could be seen below the colon.

69. In a third case, the patient was a woman of 32 years, who had had a right femoral hernia for two years. She had had strangulation once before but recovered. Since that time she had worn a truss. For the last eight days, the hernia had been down, painful, and gradually increasing in size. There was some nausea and constipation. A diagnosis of strangulation was made, and an operation performed. The sac was dissected out and opened, and serous fluid escaped. Within the sac was to be found a small, hard tumor, the size of a terminal phalanx. This was reddish, and was found to be the appendix. The strangulated portion of it was resected and a radical operation was performed. The patient recovered.

70. Puchelt (quoted by Merling; Diss. Heidelberg, 1836; L'Experience, 1837, i, 337) reports the case of a woman of thirty years of age, with a right femoral hernia that had never before given her trouble. Suddenly, and without external cause, the hernia became strangulated. There was slight pain on mere touch, some vomiting, and fecal retention. An operation was performed, and the vermiform appendix slipped back in the abdomen spontaneously. Patient recovered.

71. Quenu (Bull. et Mem. d. l. Soc. de Chir., 1903, xxix, 801). Woman, aged 42; right-sided irreducible femoral hernia for nine days; pain, swelling; no vomiting; no obstruction; fluctuation. Hernial sac contained appendix, which was congested and red and strangulated about its centre.

72. Riese (Deut. med. Woch., 1900, xxvi, 259 v.) reports the case of a woman of 51, who for several years had had a right-sided femoral hernia, easily reducible. While lifting a heavy kettle, the hernia came down, and with this was noticeable a drawing sensation of the navel. The mass became larger and the patient had nausea and belching. When she entered the hospital she had had no movement for 24 hours. In the right femoral region there was a tense mass. The abdomen was distended and tympanitic. The skin over the mass was red. An incision was made, and the hernial sac was opened. A turbid fluid ran off, and in the sac was a bluish-black mass, the size of a thumb, which was recognized to be the appendix. It was not adherent to the hernial sac. It was impossible to reduce the appendix, because of the thickness of its mesentery. The abdominal muscles were split for a short distance. The process was then reduced and amputated, and the patient recovered. The appendix showed a furrow 3 cm. below its base, being bluish-black on the other side. The mesentery was swollen. The author believes that during the effort made the appendix entered the sac and became incarcerated.

73. Romm (Deut. Zeit. f. Chir., 1895, xli, p. 249). Man, 48 years of age; had a small reducible swelling in the left groin. Four days ago it became irreducible and painful. The overlying skin was red and œdema-

tous. There was no vomiting or other obstructive symptoms. At operation a small amount of foul pus was found in a gangrenous hernial sac. The appendix was also in the sac in a gangrenous condition. It contained a small fecal concretion. The appendix was removed. The presence of the appendix on the left side was due to a long mesocolon, and the mobility of the appendix. The patient recovered.

74. Rose (Deut. Zeit. f. Chir., 1892, xxxv, 51) reports the case of a woman of 54, that had had a femoral hernia the size of a hazel-nut, which, however, gave her no trouble. She wore no truss. Suddenly she developed pain in the hernial sac and began to vomit. She traced this condition to the lifting of a heavy tub. During the next two days she vomited from three to four times a day. The pains became more violent and colicky, and both stools and flatus ceased to pass. The hernia was on the right side. It was tense and tender. Fifty-five hours after the beginning of incarceration an operation was performed. The hernial contents were found to consist of a blackish-red piece of intestine no greater than the size of a pea. It was firmly incarcerated. The operation was very difficult. Upon closer examination, it was found that the incarcerated portion of bowel was a part of an appendix that was itself five inches long. The non-incarcerated portion was very pale; the incarcerated, blackish-red, and probably twice as large as the other part. The patient recovered. The appendix was not removed.

75. Rotter (über Perityphlitis, 1896, p. 57) reports the following three cases:

The first patient was a woman of 68 years, who had had an irreducible hernia the size of a hazel-nut for four years. It was occasionally painful. Five days before operation, she had experienced violent pain over the hernia, which became larger, and finally grew to be as large as a hen's egg. There was no vomiting. The bowels were moved regularly. The hernial sac was opened and brownish hernial fluid was discovered. The remaining contents consisted of a dark red node, the size of a hazel-nut, entering through the crural ring. There was a tight constriction. The incision was elongated, Poupart's ligament was divided, and the incarcerated portion of bowel was found to be a knee-shaped part of the vermiform appendix. The tip lay free in the abdominal cavity. The appendix contained pus, but there was no perforation. The cæcum was adherent to the apex of the appendix. The appendix was resected, and distinct constriction was found. The patient recovered.

76. The second case was in the person of a woman of 25 years, who did not know that she had a hernia; suddenly became nauseated, vomited, and had violent pelvic pain. The next day there appeared in the upper part of the thigh a mass the size of a pigeon's egg. It was painful. The bowels were moved regularly, and there was no sign of incarceration. The opening of the hernial sac revealed pus and an appendix that was bent on itself. It was dark-brown, its serous coat was smooth, and there was no perforation. Poupart's ligament was severed, the appendix was removed, and the patient recovered.

77. The third patient was a woman of 60 years, who, shortly after slipping, felt violent pain in the right femoral region. She had never had a hernia before, but she then noticed a distinct swelling. This was followed by vomiting, and the pain continued. The mass grew to be the size of a pigeon's egg. The skin was inflamed, but there were no signs of incarceration. At the operation the hernial sac was made free; Poupart's ligament cut through, and the abdominal cavity opened. The hernial mass had a central constriction, this being due to Poupart's ligament. Within the hernial sac was found some darkly discolored intestine, reaching into the abdominal cavity. This was discovered to be the gangrenous appendix. There was no perforation. The appendix was removed, and the patient recovered.

78. Sauvage (Thèse de Paris, 1893) reports the case of a woman with a strangulated right femoral hernia. Its contents were found to be the vermiform appendix, which was reduced after dilating the hernial orifice. The patient recovered.

79. Schede (Deut. med. Woch., 1893, xix, 451) reports the case of a woman of 60 years, with a right-sided femoral hernia. Herniotomy was performed. The hernia contained a gangrenous appendix, which was resected. The hernial sac was sutured, and the patient recovered.

80. Shands (Annals of Surgery, September, 1904) reports the case of a woman 29 years of age, who first noticed a swelling in her right groin in 1899. It developed very gradually, gave no pain or inconvenience, and always disappeared when the patient assumed the recumbent position. In October, 1903, the lump increased rapidly in size, became very painful on pressure, and did not disappear on lying down. There were no symptoms of strangulation of the bowel. A diagnosis of incarcerated femoral hernia was made, and an operation performed on November 3. Upon opening the sac there was a gush of peritoneal fluid; there was neither intestine nor omentum in the sac, but firmly adherent on the side was the appendix ceci, with the distal end ulcerated and much enlarged. The appendix was amputated in the usual way, and the wound closed as for a radical cure for femoral hernia. The patient made an excellent recovery.

81. Sonnenburg (Deut. Zeit. f. Chir., 1894, 38, 269) reports the case of a woman of 65 years, who had never had a rupture until eight days before operation. While lifting a weight, she had suddenly experienced pain in the right groin, which became swollen and painful. She had had no bowel movement for four days; there had been no vomiting. The patient was very fat. The swelling in the groin was tender to pressure and infiltrated. At operation, pus with a fecal odor was evacuated. The pus-cavity continued upward into a long channel, which corresponded to the crural canal. The patient improved. The pus was plentiful and always had a feculent odor. The pus cavity contained a long cord, dark-gray, with a narrow lumen. This was evidently the vermiform process. After this cord was cast off the secretion became less and the fecal odor disappeared. The patient died some years later, and the autopsy showed the vermiform process to be only 3 cm. long, its free end being adherent

to the peritoneum. This showed that a portion of the appendix must have been cast off, after the opening of the hernia. The portion cast off was 8 cm. long. The hernial sac closed within four weeks. The case was evidently one of acquired (not congenital) incarcerated, gangrenous, pure hernia of the vermiform appendix.

82. Ibid (Path. u. Therap. d. Perityphlitis, 1900, p. 184). The second case was that of a woman of 74 years, who had had a hernia on the right side of the thigh for two years. It had gradually become larger, and during the last two weeks had been irreducible. There was vomiting, but no fecal obstruction; and violent pain in the lower part of the abdomen was felt. The mass was the size of a goose-egg; the skin over it was infiltrated and inflamed. Fluctuation was present. As soon as the skin was incised, pus with the odor of fæces and containing gas poured out. The hernial sac was found to be thickened and gangrenous, and within it was the black appendix, which was perforated. This was resected, and the patient recovered.

83. Spanton (British Med. Journal, 1889, p. 126). Single woman, aged 62 years; in October, 1888, had a painful abscess in right groin. Two years before, while carrying a basket, felt something give way in the right groin. It caused pain and a small swelling soon developed, but caused only slight inconvenience. No further notice was taken of the swelling.

August, 1888, surface of swelling became red and inflamed, and skin shortly after broke down, followed by discharge of thin, dark pus.

At examination, erysipelatous blush over upper part of thigh; two sinuses; dirty looking discharge.

Operation: Carefully proceeding, some enlarged glands were removed and appendix exposed; the latter had come down behind the peritoneum; it had no peritoneal covering,—*i.e.*, a retroperitoneal hernia of the appendix. The patient recovered.

84. Spurrier and Corner (St. Thomas's Hospital Reports, N. S., Vol. xxxi, 371) relate the following case:

Woman, aged 70 years; one week before coming to the hospital had a bilious attack, accompanied with retching and straining, which caused the appearance of a lump in the right groin. This lump caused very little inconvenience at first, but it gradually increased in size and gave rise to great pain. The patient was well otherwise, and the bowels acted regularly. The diagnosis of strangulated epiplocele was made.

When the sac was opened, it was found to contain the distal inch of the appendix. Gimbernat's ligament was incised, the appendix brought down, amputated, and the stump invaginated with cæcum. Prompt healing followed. The specimen showed a well-marked ring dividing the injured from the healthy parts. The distal portion was blackish-brown, with thickened œdematous walls.

The authors make the following comment: As there was no pain at the time of the formation of the hernia, and not for some hours after, it seems improbable that the appendix was strangulated at once. Again, at the operation the appendix was easily pulled down, though it was

swollen far too big to be returned to the abdomen without a "herniotomy." Consequently it seems reasonable to assume that the apparent strangulation was the result and not the cause of the appendicitis.

85. Staatsman (Münch. med. Woch., 1904, li, 603) reports the case of a woman of 42 years, who had never noticed that she had a hernia until five days previously, when, without special cause, she had developed sudden pain in the right femoral region. She continued to work; and the next day she noticed a tumor, which gradually increased. There was violent pain in the region of the navel, and the mass could not be reduced. The tumor was the size of a walnut, hard, and elastic. The skin was not reddened. The region was painful to pressure. At operation the lymphatic glands were removed and the hernial sac opened. Within the sac was found a greenish discolored piece of intestine, folded on itself. It passed through the femoral canal, and was found to be the appendix, already gangrenous. Drainage was inserted and the treatment with opium continued. The appendix gradually broke down and sloughed off, and the patient recovered.

86. The second case was that of a woman of 74 years, who had never known that she had a hernia until she had suddenly developed a painful tumor in the right groin three days previously, while carrying a heavy weight. It gradually enlarged, but there was no vomiting, and the bowels were regular; the tumor became more painful. A diagnosis of incarcerated right femoral hernia was made. At operation there was found lying in the femoral canal the incarcerated appendix. There was no hernial fluid. The femoral ring was divided, and the appendix resected. The patient recovered. The appendix was 5½ cm. long.

87. Swasey (Med. Record, N. Y., 1881, p. 706). Woman, aged 67 years, spare; while lifting, six years before, felt a peculiar sensation in right Scarpa's space; and later, while bathing, found a compressible tumor, size of a walnut, at saphenous opening. Has worn a truss, but hernia never completely reduced.

January 28, tumor size of hen's egg, painful and irreducible; some abdominal pain and nausea. This sudden trouble followed heavy lift. Operation thirty-six hours after: Sac exposed and clear fluid seen. This was withdrawn by hypodermic needle, and appendix could be seen and felt within sac. It was returned to abdomen by manipulation. Sac not opened. Patient recovered.

88. Tacke (Beiträge z. klin. Chir., 1901, xxix, 72) reports the case of a woman of 54 years, who developed pain in the lower part of the abdomen suddenly. This pain gradually increased, and a mass developed below Poupart's ligament on the right side. It turned out to be a hernia, which could not be replaced. There was constant nausea, but no vomiting. The mass was about half the size of a hen's egg, and somewhat painful. It could be traced upward above Poupart's ligament into the abdominal cavity, where it was more tender than further down. An operation was performed on the third day. The hernial sac was found to be the size of a small walnut, and, when opened, was found to contain a grayish tumor of considerable length, which closed the hernial neck

completely and continued upward into the tumor of the abdomen. A large opening of the peritoneum was made. The tumor was found to be the vermiform appendix with a swollen mesentery. It was but 10 cm. long. The peritoneum was inflamed. The peripheral end of the vermiform appendix was bent on itself and above the bend a black discolored constriction-ring was found. The lower part was necrotic. The appendix was ligated and the patient recovered.

89. Tape (Arch. provinciales de Chir., 1904, xiii, 479) reports the case of a woman of 67 years, who had had a strangulated right-sided femoral hernia fifteen years before. At the time of its first appearance, she was operated upon, and some intestines were found in the hernia. This was reduced and the hernial sac was closed. Six years later the hernia recurred; but, as it was easily reducible, she wore a truss. During the last two years the truss was not worn, and the hernia soon became irreducible. It had been gradually increasing in volume. Suddenly it became very painful, and colicky attacks occurred. The patient began to vomit and was soon in the state associated with intestinal obstruction. Examination showed a hernial tumor, very hard, painful, and tender. It was irreducible. An incision over the crural arch was made, and the adhesions were dissected. An incision was made into the hernial sac, in which was seen a strangulated cylindroid mass. This was found to be the appendix. It was from 12 to 15 cm. long, and very much swollen. The constriction-ring was liberated and the appendix reduced. The patient recovered.

90. Tilanus (Nederl. Tigdschr. f. Geneeskunde, 1855, Sept.) reports the case of a woman of 65 years, with a tumor of the right thigh, which had been present for nine days. The cause was unknown. The mass gradually increased in size; it was painful, and walking was almost impossible. There was constipation, but no nausea or vomiting, and no abdominal pain. The skin was red and tense. The right labium was hard, and fluctuation was present. An incision revealed a gelatinous exudate. Beneath this was a cavity containing foul pus and fibrin. In the femoral canal was found a piece of intestine 2½ inches long, with the blind end dark blue. It was not perforated and was filled with gas. The femoral ring was incised and the constriction was overcome, but the hernia was not reduced. Exudate was found within the labium. Drainage was inserted. The piece of intestine was found to be the appendix. Peritonitis subsequently developed and the patient died. Half an inch of the appendix was found still within the abdominal cavity, and the cæcum was gangrenous.

91. The second case was that of a woman of advanced age, with a femoral hernia containing the appendix. The patient died of general peritonitis.

92. Thoren (Hygiea, 1887, p. 762) reports a case of incarceration of a vermiform appendix in a femoral hernia. The patient recovered after herniotomy.

93. Carrez (Lyon med., 1900, xciv, 493) reports the case of a woman, 70 years of age, who had an easily reducible right femoral hernia. She

was seized with sudden pain during sleep, when the hernia was found to be hard, painful, and irreducible. There was bilious vomiting.

At operation the sac was found to contain the appendix which was strangulated in the crural ring. The tip was gangrenous, the base was normal.

94. Vulliet (Revue Médicale de la Suisse Romande, 1900, vol. xx, p. 336). Woman, 54 years of age; hernia for fourteen years. She had never worn a truss as the hernia did not cause any inconvenience, and was always easily reducible. One month ago, for the second time recently, violent abdominal pains were felt, the hernia became irreducible and increased in size. There was some nausea but no vomiting; tongue dry, bowels regular. The lump was aspirated and a glass and a-half of clear fluid withdrawn, after which the hernia was reduced. Three weeks later there was a relapse, the same symptoms being repeated. Diagnosis: Strangulated omental crural hernia. Under local anæsthesia the sac was opened; a large quantity of yellowish fluid escaped. The hernial sac was hemorrhagic. The appendix, rigid and turgid, was seen projecting from the crural canal. It was incarcerated, but was reduced after the ring had been dilated. The sac was resected and radical cure performed. The patient recovered.

95. Waring and Eccles (St. Bartholomew's Hospital Reports, vol. 27, 1891, page 179). Woman, aged 46 years; first observed a right femoral hernia in 1879. It was easily reducible. She never wore a truss. Confined in 1887. Swelling did not reappear until January, 1890, when it was irreducible and painful. Replaced by a doctor, and truss worn since. In usual health until evening of January 18, 1891, at 7 o'clock. Had severe griping pains, loose motions, and passed flatus by mouth. Later vomiting. Next day taxis under chloroform; unsuccessful. Operated: Sac contained only appendix. Stricture divided; appendix pulled down, and ulceration and perforation at site of constriction. Appendix ligated with silk above, and cut away. The patient recovered.

96. Wette (Inaug. Diss., 1889, Aachen; quoted by Bajardi; also by Brieger; Arch. f. klin. Chir., 1893, xlv, 892) reports the case of a woman of 87 years, with a right incarcerated femoral hernia. Herniotomy was done. The sac contained clear liquid, and an appendix with a relatively long mesentery. The appendix was reduced and radical operation was performed. The patient recovered.

97. Wölfer (Arch. f. klin. Chir., vol. xxi, p. 432). Man, aged 19 years; appendix strangulated in right femoral hernia; constipation, nausea and vomiting. Herniotomy. The adherent appendix was left in the sac. The patient recovered.

98. Alfred C. Wood. (Author's case.) In the summer of 1900, a woman about 70 years of age was admitted to St. Agnes's Hospital at the request of her physician on account of what was thought to be a suppurating inguinal bubo.

Upon examination a swelling about as large as an egg was

found beneath Poupart's ligament on the right side. It was somewhat irregular in outline, painful on pressure and soft to the touch. The surface was of a dark red, almost livid color. According to the history, the swelling developed suddenly, ten days to two weeks before, without any cause that could be assigned. If a hernia existed previously it had not been observed. The temperature was between 101° and 102° and the pulse correspondingly accelerated. The tongue was furred and dry. The whole picture resembled quite accurately a late stage of suppuration of the vertical chain of inguinal lymph-nodes, although no lesion was found on the foot or leg to account for such a condition. The very soft character of the swelling noted was accounted for by the fact that hot flaxseed poultices had been applied for several days.

When the skin was divided a necrotic mass was exposed in which there was but very little fluid, and that was turbid and watery rather than purulent. After the necrotic structures had been removed as far as possible, the appendix was found in the bottom of the wound, the distal half being gangrenous. After cleansing the cavity the incision was extended upward until the base of the appendix was exposed. The tissues being healthy at this point a ligature was applied and the diseased part was removed. The incision was only partially closed by sutures, free drainage being provided, as there was great probability of peritonitis following. The wound did not do well; the inflammation, which was already present, spread, and took on an erysipelatous character. The patient's tongue became more dry and coated, the bowels moved only with the greatest difficulty, the temperature and pulse gradually rose, and the patient died about a week after the operation, from sepsis.

99. (Author's second case.) Mrs. B., aged 65 years, was seen by the writer in consultation with Drs. Bellows and Reckefus, August 10, 1904, on account of a lump in the right groin. Her attention was first drawn to this condition after retiring on the evening of July 19, 1904, during a stay at the seaside. She discovered, quite by accident, during full extension of her thigh, a lump about the size of an egg, in the right groin. There was a very slight diffused pain about the front of the thigh, but otherwise no inconvenience was felt. On the following morning she consulted a physician, who told her the swelling was a femora.

hernia. Nothing was done for the condition until she returned to her home on 3rd of August, when she called upon her family physicians, who arranged for the consultation, which was held on the date mentioned.

Upon examination, a swelling about as large as half an orange was observed in the right groin, below the inner half of Poupart's ligament. It was almost painless, presented an elastic sensation to the touch and gave a flat note on percussion. There was an indistinct suspicion of an impulse on coughing. The mass could not be reduced. It was the unanimous opinion that the condition was an irreducible femoral hernia. That the sac did not contain intestine was evident by the entire absence of obstructive symptoms, as well as the dull note on percussion. It was, therefore, supposed that the hernia consisted of omentum,—an incarcerated femoral epiplocele.

About two years ago the patient had an illness which was thought to be "grip." Since this time she had not been well. She was unable to exercise as usual on account of feeling weak and short of breath, although previously strong, and still of robust appearance.

In the general physical survey, the condition of the heart at once attracted attention. The action was very irregular; some beats were very feeble and imperfect, while others were loud and tumultuous. The rhythm was entirely upset, the intervals between the impulses varying greatly. The pulse could not be counted at the wrist, as only the stronger contractions of the heart were registered, nor could the heart-beats be definitely counted by auscultation over the precordia, owing to the extreme irregularity spoken of, but as nearly as could be estimated they were about 120 per minute.

The urine was scanty in amount, but otherwise normal. The other organs appeared sound.

An operation was advised in spite of the condition of the heart, as it was manifestly unsafe to permit an irreducible hernia to remain in that condition, even if composed of omentum only. The patient entered the University Hospital August 15. There had been no change noted in the meantime.

The operation was performed on the following day, the patient having been prepared in the usual manner. As the chief cause of anxiety was the anæsthetic, specific instructions were

given as to the administration of the ether, and arrangements were made in advance to carry out each step of the operation with the least possible delay in order to shorten the time of operation.

A vertical incision, three inches in length, was made over the swelling and the mass fully isolated. The sac was thickened and opaque and under such extreme tension that it was impossible to distinguish the nature of its contents. It was therefore carefully opened, when a considerable quantity, estimated at between two and three ounces, of slightly turbid straw-colored fluid was forcibly discharged. The sac then seemed to be empty, but on enlarging the opening and inspecting its interior the vermiform appendix was observed protruding from the neck of the sac, probably one-half of its length being external to the latter. There was not a trace of omentum or other structure in the sac. The appendix appeared perfectly normal in color, but was slightly swollen and œdematous. It did not show any evidences of acute inflammatory change, but either from constriction or adhesions, was held firmly in its new position. The problem of the proper disposition of the appendix at once came up. Its removal would have necessitated extending the original incision into the abdominal cavity, or the making of a second incision at the usual site for reaching the appendix. Both of these procedures were highly objectionable on account of the patient's physical condition, already referred to. On the other hand was the appendix so damaged that its return to the abdomen would subject the patient to the risk of peritonitis, or the inconvenience of a second operation? While this problem was being weighed and discussed, the appendix which was held by the constriction of the neck of the sac, and also by the adhesions, was being liberated by the finger. A final examination of the process led me to decide to accept what I considered to be the remote risks mentioned, rather than prolong the anæsthesia and thus add to the danger of the present operation, an opinion which was shared by both of the patient's physicians. The appendix having been returned, the sac of the hernia was ligated as high as possible and excised. The operation was concluded by performing a radical cure according to Bassini's method.

The patient made a satisfactory recovery in every particular, the wound healing by primary union, and the general condition

was quite as good as before the operation. She was discharged from the hospital on the 3rd of September. The patient has constantly improved in health since leaving the Hospital.

100. WULFF (Deut. med. Woch., 1901, xxvii, 175, v.) reports the case of a woman who had had an easily reducible femoral hernia for a year. Four days before admission, while bending forward, she suddenly experienced violent pain in the region of the hernia. Two days after this, there was nausea and the hernia could not be replaced. At the time of admission, she showed a rounded mass below Poupart's ligament, covered with normal skin, and somewhat tender. There was a slight rise of temperature; no peritoneal irritation; but a slight drawing at the umbilicus. Operation showed the hernial sac to contain a clear, slightly bloody fluid, in which was the hemorrhagic free appendix. Its mesentery was rich in fat, and discolored. At the hernial ring there was a distinct furrow; and on the other side of it the appendix was perfectly normal. Resection of the process and closure of the wound were followed by the recovery of the patient. The appendix was 12 cm. long. There was no pus, fecal mass, or mucus in its lumen; and no stenosis. The appendix was not gangrenous below the constriction, even though there was a hemorrhagic infarct. The condition was due to a pure incarceration.

OBTURATOR APPENDICULAR HERNIA.

Although the subject of obturator appendicular hernia is foreign to this paper, I have included the report of a single example. It is introduced here because it is nearly or quite unique, none of the writers quoted having mentioned the subject except Spurrier and Corner, but their collection did not include any illustration.

The case is described by Bary (Dissertation, Greifswald, 1893) and is as follows:

A woman, 42 years of age, had a painful mass in the region of the pectineus and adductor muscles. It gradually became larger and fluctuating. Operation was refused and the patient died. At the autopsy, an abscess was found beneath the pectineus and between the adductor muscles. The pelvic cavity behind the obturator foramen was filled with pus. The foramen was sufficiently open to permit the index-finger to pass through. Within it and adherent to it lay the perforated apex of an appendix four and a-half inches long. There were no symptoms of incarceration. The peritoneum was free from signs of inflammation.

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