

Keen (W. W.)

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LIGATION OF FEMORAL ARTERY FOR POPLITEAL ANEURISM;
CURE.

FECAL FISTULA CAUSED BY APPENDICITIS;
OPERATION; CURE.

*A Clinical Lecture Delivered at the Jefferson Medical College Hospital,
April 6, 1892.*

BY

W. W. KEEN, M.D.,

PROFESSOR OF THE PRINCIPLES OF SURGERY AND OF CLINICAL SURGERY.



FROM

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CASE I. *Umbilical hernia.*—The first case that I shall have the pleasure of showing you is one of umbilical hernia. A woman, Mrs. M. D., thirty-seven years of age, entered Jefferson Hospital March 28, 1892, with an umbilical hernia nearly the size of two fists. She is the mother of six children. At the sixth month of her fourth pregnancy, in 1882, an umbilical hernia appeared, and soon reached the size of a fist. From that time to the present she has suffered great discomfort, to such an extent as to prevent her from earning her living by labor, and hence she seeks relief by an operation.

You must remember, in regard to hernia, that it only indirectly threatens life. It is, of course, a positive danger, but strangulation may be remote or may never come. Hence, I think that we have no right to operate, even with the slight danger attending such operations, without a full knowledge of the facts on the part of the patient and his full consent. I have explained the facts of the



case to this woman and told her that, while there is no great risk, yet there is some. This risk she willingly accepts, in view of her present disability and her future danger.

The woman is now before you. The abdomen has been thoroughly disinfected. This is especially important, as the operation involves the umbilicus, where dirt readily accumulates and is removed with difficulty. We have used here a 1 : 500 instead of a 1 : 1000 sublimate solution. You observe the tumor. I find that the ends of two fingers can be readily passed through the wide umbilical ring. The parts are so flabby that it is difficult to make the incision quickly or neatly. I enter the sac and find that the bowel is not adherent. Having opened the sac, I find that the ring readily admits three fingers. The belly wall is so thin that the best result will be attained by freshening the edges of the ring, sewing them together, and then applying a ligature around the sac. I shall not cut out the umbilicus (omphalectomy). When I commenced the operation I had intended to do an omphalectomy, but you must remember that no surgeon, before he opens an abdomen, can tell exactly what he is going to do, and you must never be so wedded to a preconceived purpose that you will not change it if you see good reason to do so.

Having removed a strip of tissue from the entire edge of the ring, I wash out the abdominal cavity, to remove the blood that has got in. When I was a student, and for a long time afterward in fact, the peritoneum was the great surgical bug-bear. To-day you see it invaded with impunity. In fact, I believe it to be even more tolerant than most other tissues, but on one condition only, viz., that your aseptic and antiseptic technique is rigidly carried out. It is one vast lymph-sac and will absorb a good deal of blood without trouble, but at the same time I believe in giving the peritoneum

as little to do as possible. I use the water quite warm, and this is an advantage, as the shock is thus lessened.

A large flat pad of gauze being placed under the opening, I am now ready to introduce the stitches. In doing so great care must be exercised that the intestine is not injured; the gauze pad is here a great help, while at the same time it absorbs the blood caused by the punctures. I have now closed the peritoneal cavity and shall next dissect out and remove most of the sac. You see how corded its internal surface is from the presence of connective-tissue fibers. I also remove a large piece of redundant skin and am now ready to close the wound. In doing so, I include in the sutures the borders of what is left of the sac, which will tend to fix it more firmly and so prevent any recurrence of the hernia.

As you will note, the patient has a flabby belly. When I remove the sutures, and possibly before, I shall support the abdomen by adhesive straps, and certainly by a firm binder, and when she gets up at the end of three weeks or a longer period, I shall make her wear an elastic belt for months or a year or two, so as to support the abdominal wall.

[NOTE.—Her highest subsequent temperature was 99° , and she made a speedy recovery. Since leaving the hospital she has returned on account of the discharge of three of the silk ligatures. The hernia remains cured.]

CASE II. *Ligation of the superficial femoral artery for popliteal aneurism.*—The next patient is one that you have already seen. It is the case of popliteal aneurism which I have already twice attempted to cure, but failed each time. I brought the patient before you four weeks ago and tried forced flexion, flexing the heel to the buttock, securing it there by a bandage around the bent leg and thigh, and also by attaching the heel of a slipper on the foot to a bandage around the waist. In this way I

kept the artery closed for one week, but failed to effect a cure. It took ten days to overcome the contraction of the limb which followed this treatment. Next I tried the effect of instrumental compression. This also resulted in absolute failure, as the man could not bear the pressure. He is very anxious for a radical operation and a cure as speedily as possible. We could try one other method, namely, Esmarch's bandage, but he is so anxious for operation that I shall ligate the femoral artery at once. You have once before seen this operation done during the present session, by my colleague, Professor Brinton, in the case of the man on whom Mr. Bryant, of London, lectured, who in that case advised the adoption of other than operative measures before resorting to ligature, and rightly so, for they are less dangerous and often effect a cure. You will notice, however, that in both cases those measures have failed, and we must come to the cutting operation.

The patient, J. B., is a man fifty-four years of age, who entered Jefferson Hospital March 7, 1892. In 1864 he contracted syphilis, but has never had any violent secondary symptoms. He is a night watchman in a chemical works, and has to make eleven rounds, aggregating 1584 steps every night! Six months ago he noticed a small tumor in the left popliteal space, which has progressively increased in size and has caused increased pain. On examination a distinct swelling is found filling most of the popliteal space, pulsating synchronously with the pulse and ceasing upon pressure on the femoral artery. The case illustrates well two of the most frequent causes of aneurism—syphilis and the wear and tear on the arterial walls caused by the constant bending of the artery at the knee by reason of his occupation.

This chart will serve to recall to your minds the position of the femoral artery. Under the middle of Poupert's ligament runs the common femoral artery. I like this method of designation—the *common* femoral—

much better than *the* femoral. Then the common femoral divides into the *superficial femoral* and the *deep femoral* or profunda femoris arteries. Important as it is anatomically to distinguish between the common, the superficial, and the deep femoral, it is still more important surgically. Ligation of the common femoral—that is, the portion extending from Poupart's ligament down to the bifurcation—is an exceedingly dangerous operation. As a general rule, I should prefer to ligate the external iliac, as it is a safer operation. You will remember that the profunda femoris, or deep femoral, comes off from the common femoral, an inch and a half below Poupart's ligament. About an inch and a half further down, that is three inches below Poupart's ligament, is the apex of Scarpa's triangle, which is formed by the sartorius muscle on the outside, the adductor longus on the inside, and Poupart's ligament above. I shall fix the position of the artery by touch, and draw a line from that point to the internal condyle of the femur. This will give the line of the artery, and I shall make a point three inches below Poupart's ligament, the center of an incision three inches long. I shall then dissect down through the skin, superficial and deep fasciæ until I reach the sartorius muscle. Pushing the muscle to the outside, I expect to readily find the superficial femoral artery in its sheath.

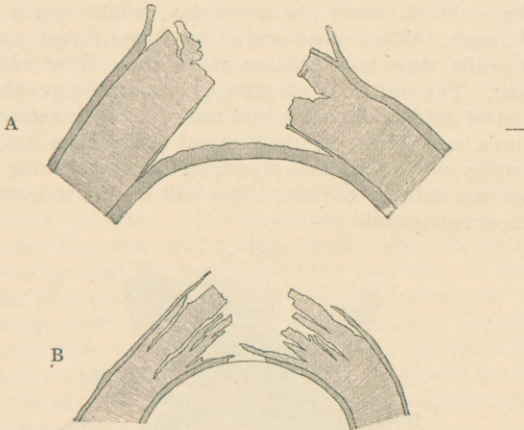
Having found the artery, I shall separate it from the vein with scrupulous care. The femoral vein is very large. At the groin it lies immediately inside the artery, but it very quickly takes a quarter of a turn, so that at the apex of Scarpa's triangle, the vein is already behind the artery. It is of the utmost importance that the vein be not wounded.

Having separated the artery from the vein, then came the questions: What material shall we tie with? what force shall we employ? and what knot shall we use? The material that I shall use is the floss silk of the den-

tists. I use it because it is soft and spreads out into a flatter band than twisted or braided silk, and so brings larger surfaces of the inner coat of the artery into contact, and also because its fluffiness favors the entanglement of its threads, and so prevents any slipping of the first knot while the second is being made. Each of these is an important factor in securing occlusion of the artery. I also use it because it has been so strongly recommended by Ballance and Edmunds in their recent magnificent work on the *Ligation of Arteries in Continuity*. This work is the result of years of research, experiment, and investigation, and is entitled to profound respect. Mr. Ballance, especially, has already shown himself to be such a thoroughly good surgeon in other matters, that I have the greatest respect for his views.

In tying the artery I shall use only sufficient force to approximate the surfaces of the intima, but not enough to rupture the internal or middle tunics. Following the teaching of Mr. Jones, a century ago, it has been the almost universal practice among surgeons to tie with such force as to cut through the middle and the internal coats. In fact, you will generally see the surgeon, or his assistant, tie with all the force he can use short of breaking his thread. If you look in the work to which I have alluded, you will be surprised to find how thin a layer there is between the ligature and eternity, when the artery is tied in this way. (See Fig. 1). You should also note the fact pointed out by these authors, that Listerian practice has diminished the dangers of ligation of the arteries very little, for the very reason that we have been applying too much force to the ligatures. The researches of Ballance and Edmunds have settled this point, and settled it in favor of such force as will approximate the intima, but will not rupture the two inner coats. This approximation should be by *surfaces* and not be a mere *linear occlusion*. Surface adhesion

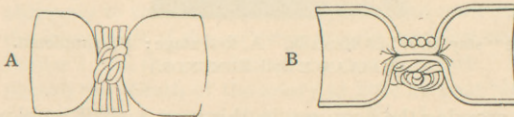
FIG. 1.



Injuries inflicted upon human arteries by a ligature. A, common femoral; B, subclavian (third part) showing how little even of the external coat was unruptured. (BALLANCE and EDMUNDS.)

of the intima is even more important than the subsequent formation of occluding thrombi. (Fig. 2.) They very properly appeal to Nature, as Dr. J. Collins Warren, of Boston, has also done in his admirable book on the

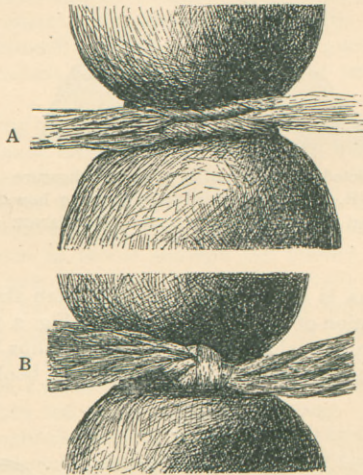
FIG. 2.



The application of four ligatures. A, external view; B, appearance on section, showing the approximation of a long portion of the surfaces of the tunica intima. (BALLANCE and EDMUNDS.)

Healing of Arteries. When, for instance, Nature closes the umbilical artery, the internal or middle coat is not ruptured. When other arterial canals are closed pathologically, there is no rupture of the internal or middle coat. The intima is simply approximated, a proliferation of cells takes place, and the vessel is transformed into a cord. In tying the femoral artery, then, I shall employ only a force that is sufficient to simply bring the internal walls in contact. This will require a force of about two pounds.

FIG. 3.



The "stay knot" of floss silk. A, first stage; B, completed.
(BALLANCE and EDMUNDS.)

In securing the ligatures in this case, I shall employ what Ballance and Edmunds term the "stay knot," (Fig. 3.) In this knot two or more ligatures are applied side by side. On each one of them an ordinary single

knot, with two turns, is made and the ends laid down. A similar knot is then tied on the other ligatures. The ends of both ligatures are then taken together and drawn upon equally, and the second knot is tied as though they were but one thread. If there are multiple ligatures they are tied in pairs. The double ligature of floss silk thus brings in contact a large surface of the intima.

Last evening, in Bridgeport, Conn., I made an address at the Centennial Celebration of the Fairfield County Medical Society. It is interesting to note that this Society has seen every artery in the body tied for the first time, with the exception of the femoral. In 1785, John Hunter tied the femoral artery, but there was not another artery tied in its continuity until 1803, when the carotid artery was ligated by Abernethy, and the other arteries were tied at later periods. Therefore, in the life of this one Society, there has been seen an enormous progress in this one department of surgery.

We shall now proceed to ligate the artery. You must be careful to locate Poupart's ligament accurately. Do not depend upon the eye, but place one finger on the anterior superior spinous process of the ilium and another on the symphysis (not the spine) of the pubes, and midway between these two points will be found the artery. I next measure downward three inches, and here you should be careful to measure exactly, for if you depend upon the eye you will probably get far too low—into Hunter's canal, instead of at the apex of Scarpa's triangle. Having determined this point, I make an incision a little obliquely to the line of the artery, and I at once come to the inner edge of the sartorius muscle, and just under its border I find the vessels in the common sheath. I shall disturb the sheath of the artery as little as possible, and I do not want to see the vein at all. I approach the artery from the inside rather than from the outside, because the vein lies to the inner side and behind. I now pass the double floss silk ligature and tie in the manner

described, without having even seen the vein, and with very little mechanical disturbance of the sheath.

The operation is done, but the case is not yet cured. These are two very different things. For at least ten days after I have tied the femoral artery I am anxious. At the end of this time the parts have become so consolidated that there is little risk of secondary hemorrhage. There is also a possibility that gangrene may follow the cutting off of so large a portion of the blood-supply of the leg. The limb will be enveloped in cotton, and surrounded by hot-water bags, in order to keep up the heat of the part, and so tend to prevent gangrene.

[NOTE.—Recovery was immediate and complete. On the sixth day after ligation pulsation was detected in the dorsalis pedis artery, through the collateral circulation. In October, 1892, the aneurism was still cured, and he was at work.]

CASE III. *Fecal fistula following an abscess from appendicitis; operation; cure.*—The next case is one of unusual interest and probably of unusual difficulty. It is that of the young man whom I showed you a week ago with a fecal fistula in the right loin. I propose to make an incision and trace the fistula to its source, but after we get a large wound with possibly a small opening at the mouth of the fistula, the question arises in my mind, If I cannot easily *see* this fistula, how shall I follow it? In order to overcome this difficulty, I have provided a bag filled with hydrogen, and if I find difficulty in following the sinus I shall inflate the colon through the rectum and note where the gas bubbles into the wound. Air would answer just as well, but hydrogen being lighter, will escape more readily.

The patient states that on March 20, 1891, he had an attack of appendicitis. A large swelling formed in the right iliac region and rapidly extended upward and backward into the lumbar region. Ten days later it was opened to the right of the first lumbar spine, when

pus, gas, and feces escaped, and have continued to discharge ever since. By the way, one of our English friends recently remarked at a meeting of a medical society that this word appendicitis "might be American, but it was not English." It may not be English, but for all that it is a very good word and is rapidly being adopted both in England and on the Continent. It applies to a distinct condition and it will live, especially as it gives greater precision to our language, and, therefore, to our thinking.

What I propose to do is to follow the sinus to its source, and then do whatever may seem to be necessary. I first slit up the sinuses from the four openings and find that they all unite in one rather wide track, which is so evident that the hydrogen will not be needed. On extending the cut in the line of this sinus and exploring it, I find that my finger readily enters the colon and thus discloses the source of the fecal discharge.

This formation of a fecal fistula, is a rather unusual termination of appendicitis, and yet, curiously enough, we have in the wards, at this moment, a second case in an old woman whose general health forbids interference, in whom exactly the same condition exists. It should be to you another lesson in favor of early rather than delayed operation in those cases in which an abscess forms. Not only may the abscess burst into the general peritoneal cavity, but it may evacuate itself through the rectum, the bladder, the vagina, or, as in this case, externally, and may, at the same time, burst into the colon. Even as to life itself, spontaneous external evacuation is the most dangerous, and as it carries with it, even if the patient recovers, the danger of a fecal fistula, it is to be avoided. Sometimes such an abscess, if the abscess runs upward, may even perforate the diaphragm and the pus may be discharged through the bronchial tubes.

Besides this sinus leading to the colon, I find an off-

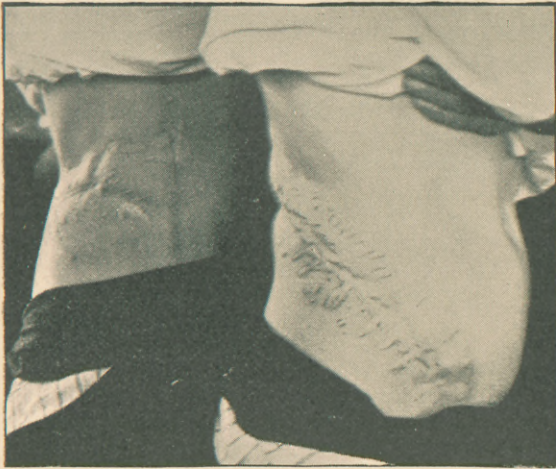
shoot which goes down, parallel with the crest of the ilium and then with Poupart's ligament to the site of the appendix. Laying this open widely, I make a search for the appendix, but cannot find it, as it is covered in at some unknown point by a mass of adhesions and new tissue. In following the sinus toward the appendix you notice that the peritoneal cavity has been opened, and this adds a serious complication to the case, in view of the difficulty we may have to keep such a wound free from infection in case the attempt to close the fistula in the colon is unsuccessful. The opening in the peritoneum was unavoidable, and I shall close it at once with some stitches in order to diminish the danger as much as possible. The search for the appendix being fruitless, and it being fairly evident that there is no escape of fecal matter through the appendix, I curette liberally the surface of the sinus and then turn my attention to the colon.

The opening in the colon is large enough to admit my forefinger. It is bound to the surrounding tissues by rigid adhesions which are very difficult to break up, and even when this is done I find difficulty in approximating the edges. However, the attempt must be made if the fistula is to be cured. All the margins of the opening are freshened, and then I introduce six Lembert stitches of silk and draw the edges together, invaginating their borders. Considerable force has to be used in order to approximate the edges, on account of the widespread and dense adhesions, and I am very much afraid that they will ulcerate before sufficient adhesions form to close the opening.

Now that this stage of the operation is finished, you can appreciate what an immense wound this is. It stretches from near the spinal column, all the way around to the middle of Poupart's ligament, and is thirteen inches in length.

[NOTE.—The entire wound healed by first intention, except posteriorly, where, on the fourth day, feces reappeared in small quantities in the wound. After a few days, however, this discharge ceased and the wound healed. It reopened later for a brief period, but now (November 20, 1892) has been healed for some months, and apparently permanently.]

FIG. 4.



Photograph of the wound when healed. The figure to the right shows the front view; that to the left is the reflection of his back in a looking-glass. The two show the entire length of the wound. (Photographed by Dr. C. A. Weaver, Jefferson College Hospital.)

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