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SOME UNUSUAL FEATURES OF APPENDICITIS AND THEIR TREATMENT.*

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The protean character of various forms of pathological conditions, grouped under the head of appendicitis, offers the surgeon an unusual and often unforeseen group of clinical, as well as pathological, manifestations. The varying size and anatomic appearance of the appendix, the various movements through which it passes in peristaltic action, the various directions in which it might permanently locate itself, from the adhesions it is likely to make during the course of a surrounding inflammation, make the possible resulting pathological lesions almost numberless. Should a case be submitted to operation a very short time after the initial symptoms present themselves, the purpose of this paper would be eliminated, for nothing would be found but a displaced appendix adherent to the colon, ileum or retroperitoneum. Possibly when an anomaly takes place, an adhesion to surrounding organs might be found, and the operation or cure of the condition would consist simply in a careful dissection of the adherent and inflamed appendix. Not until the profession and the laity are convinced of this fact will there disappear from clinical surgery the complicated and distressing cases, which, unfortunately, form the subject of these lines. As on a former occasion, I repeat the following proposition: "In every case of fatal appendicitis, there was a time when, had the operation been performed, the patient would have survived." This is true no matter what complications or unusual phases the peculiar anatomic conditions of the case would likely produce in the eventual course of the disease. Granting, as we know, that the first symptoms of appendicitis are persistent pain, even after evacuation of the bowel, and that, therefore, at that stage, nothing more than a mere adhesive peritonitis or perityphlitis ought to be as yet the pathological lesion. Neither the profession at large nor the laity have yet realized the truth of this proposition, and it follows and possibly will continue to follow, that various anomalies in a case will result from certain unusual complications, some few of which I desire to draw your attention to at present.

CASE 1.—A young man, aged 26, complained of constant pain in the left iliac region, the character of which seemed almost like that in acute intestinal obstruction. A differentiation was made by the attending surgeon, who promptly obtained an evacuation by the administra-

tion of salines. After slight relief of the condition, the pain returned with redoubled intensity. Rigidity, however, existed in the right iliac region, the pain being distinctly in the left. This made the diagnosis uncertain, and hence a medical treatment was persisted in, with only an increase of the pain, elevation of temperature and increase of pulse. Three days after the appearance of the pain the patient was taken to the Medico-Chirurgical Hospital, and was immediately submitted to operation. A mass was found adherent to the anterior parietal peritoneum, and, with difficulty, separated. Evidences of radiating peritonitis existed, and, as yet, no pus had formed, although the end of the appendix presented a gangrenous appearance while fastened to the peritoneum. The appendix was dissected away, cut at its base flush with the colon, and the edges inverted, treating the opening as a gunshot wound of the abdomen. The surrounding adhesions were scraped and disinfected with a gauze sponge, dipped in a 1 to 1000 bichlorid of mercury solution, and the surrounding parts carefully packed with iodoform gauze. The patient made an uninterrupted recovery.

The lesson learned in this particular case was the reflex character of the pain, which the patient insisted he felt on the left side, tending to deceive the surgeon. The persistent induration of the abdominal walls on the right side, showing a local reflex contraction, together with a return of the pain after copious evacuation, eliminated any direct intestinal obstruction, and pointed out the existence of a local intraperitoneal irritation directly under the indurated muscle. In this connection we should remember that the law of reflexes is varying and deceptive, whereas, the law by which a muscle that is irritated, contracts and becomes indurated, is positive, constant and unchanging. Hence, rather than be led to the operative procedure by the uncertain character of the pain, it is wiser to base our opinion upon the positive evidence of the induration of the muscle in a certain locality, though the pain be felt at a distance.

CASE 2.—A man, aged 42, was taken to the Medico-Chirurgical Hospital, suffering with what his attending physician supposed was an abdominal tumor on the right side, encroaching upon the right inguinal region. There had been no acute manifestations, though the patient had long complained of obscure pains in that region. The temperature ranged between 99 and 100, while the pulse was about 90, the patient being somewhat emaciated. Physical examination revealed an indurated mass, immovable and not circumscribed. There was a tendency to diarrhea in the case. The blood count was taken, 20,000 white blood corpuscles were found to a cubic millimeter, thereby not giving us much information so far as the relation of leucocytosis to the formation of pus was concerned. The peritoneum was opened by a line of incision, extending from the cos-

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tal cartilage to the crest of the ilium. No adhesions were found and a hard mass, simulating a retroperitoneal sarcoma, was felt. Prolonging the incision to the iliac region, the appendix was found sloughed off at the end and penetrating this large mass. It seemed then that the diagnosis of a retroperitoneal sarcoma was correct. Knowing the uselessness of attempting to remove such a tumor on the one hand, and the advisability of establishing a positive diagnosis on the other, it was determined to explore the nature of the tumor. An incision revealed a wall, thickened to the extent of three-quarters of an inch, leading to a large abscess cavity. The introduction of the finger within the cavity led to a point where the appendix was adherent to the abscess, having caused a retroperitoneal abscess, which grew to an enormous size, developing thickened walls, and subsequently simulating a retroperitoneal sarcoma. The pus was examined and was found to be free from living organisms, though still containing streptococci and staphylococci that had not undergone disintegration. This would explain the comparative freedom from inflammatory symptoms in the patient. The abscess was thoroughly drained, scraped, washed and packed with iodoform gauze. From this case we should be reminded of the uncertainties of a positive diagnosis in abdominal tumors, and should, whenever practicable, give the patient the benefit of a positive opinion, which can only be gotten, without disadvantage, by exploratory incision under modern aseptic precautions.

CASE 3.—A young man, Italian laborer, aged 25, had been convalescent from typhoid fever, and suffered obscure pains in the right hypochondriac region, slight jaundice, but no elevation of temperature. He had often heard of appendicitis, and was convinced, though he spoke very little English, that he was suffering with this condition, explaining that he was assured of this fact. His symptoms were decidedly limited to the region of the gall-bladder. There was slight induration in the right iliac region and constipation. Owing to the persistent jaundice and the pain, a diagnosis of possible gallstones was made, and an exploratory incision was resorted to, over the gall-bladder. This was found somewhat enlarged and containing pus, a cholecystostomy having been performed. While we had made a diagnosis of cholecystitis, and had said nothing about removing the appendix, the patient made us promise that we would explore the region of his appendix. To this we consented. We accordingly made an exploratory incision in this region, and to my great surprise the real seat of his disease was found. The appendix was gangrenous and pus had formed about it. Considerable peritonitis existed, which, if not checked, would have ended fatally. The parts were carefully cleansed, the appendix resected, and both cholecystitis and appendicitis were removed at the same operation. It has often been suggested of late that there may be an intimate connection between the etiology of some forms of these conditions. This case presented a history of typhoid fever, as well as grippe, leaving the system in a reduced condition, unresistant to the invasion of certain organisms and predisposed to the development of metastatic abscesses. There is no wonder that two organs so similarly constructed, histologically, as the gall-bladder and the appendix, should become a prey to the development of organisms from similar causes. Both are connected directly with the intestinal tract, by continuity, only the gall-bladder connecting with the gut from a greater

distance and at a point where ferments and organisms have not yet attained great virulence, while the appendix connecting with the gut at a point where practically the intestinal contents have fully served their nutrient purposes, and have become foul refuse matter, ready to enter into the colon as a reservoir. This would explain, in a measure, the greater frequency of the infection of the appendix from the gut than the gall-bladder, but if we presuppose a very much depressed condition of the system where phagocytes are weak and insufficient in number, it does not matter so much whether the organ invaded be the gall-bladder or the appendix, whether the organism of infection be from the duodenum or the ileo-cecal region, both gall-bladder and appendix are weak and receptive, the whole system being also depressed, germs may be of uniform virulence the whole length of the intestinal tract, and would tend, therefore, to produce an inflammation of the same character in the gall-bladder at the origin and in the appendix at the end of the small intestine.

CASE 4.—A man, Italian, aged 40, was admitted to the Medico-Chirurgical Hospital, suffering with symptoms of chronic intestinal obstruction. There had been gradually more and more difficulty in obtaining evacuations in spite of purgation. A distinct tumor was felt, movable, within an area of 3 inches radius around the umbilicus. There was no fever and pulse was rapid, though strong. The gastro-intestinal irritation and symptoms of dyspepsia suggested the possibility of a floating kidney, though it was impossible to return the tumor to the region of the kidney. An exploratory incision was determined upon, and I must acknowledge that I scarcely had any other condition in mind, as a possible explanation of the symptoms, than carcinoma of omentum or intestine, or floating kidney. On opening the abdominal cavity a large kidney-shaped tumor was found, directly under the umbilicus, consisting of omentum, ileum, colon and mesentery. This mass had formed no adhesions with the peritoneum, but was freely movable, as had been discovered on clinical examination. As the tumor was unraveled and dissected out, a foul abscess was opened, the omentum was resected, the ileum separated from the colon, and an appendix about the size of a thumb was found, having become gangrenous from a perforating fecal concretion. There had been a loosening of the caput coli from the ileo-cecal region, an adhesion to the omentum, which probably drew the parts up to the umbilicus, and a chronic appendicitis had developed away from the normal location of the organ. The appendix was resected, the gut scraped thoroughly with a curette, washed with a bichlorid solution of 1 to 1000 and a gauze sponge introduced so as not to allow the rest of the abnormal cavity to become irritated. The ileo-cecal portion of the intestine was pulled back to its normal position and fastened there to the abdominal wall, while the seat of the inflammation was thoroughly packed with iodoform gauze. Here again, owing to the limitation of the infection, granulations immediately set in and the patient recovered without any further complication. This was another instance of the difficulty of making a positive diagnosis. As I can now retrace the course of the affection, I would venture to say that the adhesion of the omentum to the cecum took place first as a result of the inflammation, there being no other adhesions, the violent contraction and thickening of the omentum gradually lifted up the ileum and cecum to its new position near the umbilicus. In this instance, owing to

a lack of adhesions between the inflamed parts and the parietal peritoneum, there was no induration of the abdominal wall, which would lead us to locate an inflammatory condition immediately under it, showing a marked contrast from Case 1, where the inflamed parts were found directly under the indurated portion of the abdominal wall.

It is generally agreed that appendicitis, as such, does not kill, but the peritonitis, incident to the appendicitis, is what proves fatal. The dreaded complication of this widespread affection, therefore, is peritonitis, and he who successfully meets the complicating peritonitis would prove most successful in the treatment of this condition. It behooves us, therefore, to thoroughly understand what we are attempting to achieve before saying that we have succeeded or we have failed in arresting the peritonitis, incident to appendicitis. Therefore, in every case of appendicitis, three different periods should be established:

1. The period of appendicitis, properly so-called; by that I mean such pathological conditions and symptoms resulting therefrom, as are limited to disease, as yet existing in the appendix proper.

2. The stage of peritonitis, resulting therefrom, is limited to a primarily acute or primarily chronic inflammation of the peritoneum, starting from the region of the appendix and spreading thereafter.

3. The stage of septicemia, which means a septic condition of the blood, resulting from poison developing therein, which poison was absorbed from an infectious appendiceal peritonitis.

These three propositions being clearly established, we will say, that for the first, that is, when the inflammation is strictly limited to the appendix proper, the curative measures are medical, when at first successful; operative, when the first medical attempts at relief have failed.

The second condition is the one generally found in its mildest expression, when small adhesions are found about the appendix, and in its most marked expression when an acute abscess, circumscribed or very lately perforated, exists. In this class of cases, while there is a peritonitis, chronic or acute, according to the particular conditions present, the peritonitis is a peritonitis, no more or less, that is, an inflammation of the peritoneum, a condition corresponding to a circumscribed abscess when the condition is chronic, or else if the abscess has broken and has started a general peritonitis, a condition corresponding to a recent perforating gunshot wound of the intestine or a recent perforating ulcer of the stomach or a recent perforating Peyer's patch in typhoid fever. Just as these varying conditions warrant an early operative course to be of a successful issue, so also in these forms of peritonitis from a chronic appendiceal abscess that has perforated or an acute peritonitis set up by the appendicitis, we may hope for success by applying the same principles of rapid operative procedure before the infection becomes generalized and rises from a mere peritonitis to one of septicemia. Upon the treatment of this stage of the condition little need be said. Carefully cleansing the operative field, flushing the abdominal cavity, or if the abscess has partaken of a chronic character, carefully packing with iodoform gauze, so as to isolate the rest of the abdominal cavity, meet the indication and give success.

Not so, however, when we consider the third and most important division of our subject. When the spread of the peritonitis has been such as to have

started a septicemia, and both peritonitis and septicemia have joined hands to destroy the patient, what is best to be done? Usually, we simply wash out the abdominal cavity, close to the abdomen, drain with gauze and tube from the most dependent portion and let the infectious elements of the abdomen still develop, furnishing more food for the septicemia that has already started. Shall we continue for a period our attempts at utter destruction of the local peritonitis or local peritoneal infection, preventing further toxins from being absorbed into the general economy, and hoping thereby that the septicemia already set up will be taken care of and destroyed by the still powerful phagocytes? It strikes me that the indication is clear that we must take it for granted that the phagocytes will compete more successfully with a slight amount of septicemia, the sources of which will be shut off, than with a septicemia which is continually increasing by constantly forming toxins taken up from the peritonitis. It would be vain to hope that any form of local peritoneal treatment should destroy the septicemia existing to an utmost degree in the general economy, but it is not vain to hope that local treatment may stop a peritonitis, which, though it be accompanied by the beginning of a septicemia, would ultimately produce a septicemia beyond the control of phagocytic action. Therefore, in the treatment of peritonitis, the two elements to consider are the peritonitis as such and the accompanying amount of septicemia that it has already caused.

This local treatment of peritonitis, whereby the arrest of a progressive septicemia may be hoped for, should consist, I believe, in a constant and persistent flushing of the peritoneal cavity, for at least a few hours after the operation. This should be done, as I described nearly two years ago, by continuous irrigation of the peritoneal cavity with a normal saline solution. It should be applied during the operation at the temperature of 100 Fahrenheit, and maintained after the operation by a system of irrigation, as follows: A glass tube is introduced to the bottom of the pelvis, which is connected with a rubber tube, leading to a basin under the bed. A small tube is introduced at the superior extremity of the wound and is placed in connection with the irrigating apparatus, which latter should be only a few inches higher than the patient. The wound is closed tightly between the two tubes. A continuous irrigation will follow and should be kept up according to the necessities of the case. The immediate effects will be stimulation of the heart action, a general irritation of the peritoneum, promoting phagocytosis, a restraining effect upon the development of local organisms, and a dissolving of the toxins, and draining them away from the abdominal cavity. This, I say, is the direct application of the peritoneum to the principle we have found in general surgery so effective. The indications are the same, just as in general surgery, these local irrigations, though indicated, can not cure the septicemia that has already resulted from an infected limb; so also in a peritonitis, this irrigation can not cure the marked septicemia that has already started, but, just as in an infected limb, this continuous irrigation will restrain the development of organisms, which might otherwise result in a general septicemia; so also the general peritonitis, the continuous irrigation will restrain the development of micro-organisms, which otherwise would intensify the septicemia, rendering it beyond the

control of the body. While this method is strictly based on surgical principles, it must not be expected to exert directly more than a local action upon the peritoneum, destroying the source of infection therefrom. Latterly, saline venous transfusions have been strongly advocated in the treatment of general septicemia. Inasmuch as absorption is very free from the peritoneal cavity, we would be warranted to expect even some general benefit from the continuous peritoneal irrigation. However, the important point to remember is not to discredit the beneficial action of irrigations, on account of its failure to destroy septicemia when it has already invaded the general economy. It would be uninteresting to relate the several cases that I have successfully treated by this method. We are justified, I believe, in concluding that, owing to the general acute nature of the peritonitis, the cases would have progressed otherwise to a fatal termination. In one instance the irrigations were kept up for three days; this, however, is not absolutely necessary, as the formation of fibrin from the irritation of the salt solution may impede the dissemination of the irrigating fluid before this time. At all events, the irrigation should be kept up as long as the fluid freely drains from the abdominal cavity. The essential precaution to be taken is that the flow of fluid be free and continuous, otherwise a hydrostatic pressure is produced within the abdominal cavity, tending to impair, mechanically, the function of the diaphragm in respiration. The hopelessness of many of these cases surely warrants a faithful trial of the above method.

THE KNOT WITHIN THE LUMEN IN INTESTINAL SURGERY;

WITH REPORT OF NINETEEN CASES.*

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The history of the location of the knot in intestinal surgery might be said to be the history of that branch of surgery itself, for, it would appear, that everything has hinged on the knot and its location. When this was outside of the abdominal wall intestinal surgery was in its infancy. The methods were crude, and the mortality high. As the knot began to make its way inward this branch of surgery advanced as a science. Crudity was replaced by a more perfect technic, and, as a result, the mortality rate was greatly reduced. Literally, the involution of the knot might be looked upon as the evolution of enterorrhaphy.

A brief glance at the various steps may not be out of order. It confirms the above and shows that the trend of surgical thought from the earliest times to the present has been a search for the best location for the knot.

In this quest there was a gradual progression from without inward. This may be divided into five stages, as follows:

1. outside of abdominal wall, artificial anus; 2, outside of the intestinal wall, anchored to the abdominal wall; 3, outside of the intestinal wall, in the free peritoneal cavity; 4, outside the intestinal wall, buried between the opposed serous surfaces, and 5, inside of the intestinal wall, on the mucosa.

Attempts to place the knot within the lumen have been made by Vesein, Bishop, Maunsell, Ullman, Cheate and Hartigan. Breidenbach's suture has been

described as "tying the knot on the inside of the lumen of the bowel." Correctly speaking, the knot is not in the lumen, but between the two inverted and coapted margins. It, therefore, cannot be properly included in this list. Czerny and Wölfler merely add a mucous stitch to the ordinary Lembert.

Maunsell was the first to introduce a suture in such a manner that the knots of all the stitches employed in the enterorrhaphy proper, were within the lumen. But this he accomplished by making a secondary longitudinal incision, which he closed with Lembert stitches.

The method here presented, where the knots of all the stitches are within the lumen, was first employed by the author in October, 1898. The possibility of placing all the knots within the lumen in enterorrhaphy is no longer in doubt, but the advisability of such a procedure is still a disputed question with those who never used it.

The chief objection raised to such a location of the knot, is that it necessitates the perforation of all coats of the bowel wall. But the perforation of all coats when the knot is placed within the lumen, and the perforation of all coats when the knot is in the peritoneal cavity, are not the same. These two conditions differ so widely in practice that they cannot be placed in the same class.

It may be admitted that in both cases a communication is established between the lumen and the serous coat of the bowel wall, with the resultant possible danger of leakage followed by peritonitis, either general or local, depending upon the virulence or quantity of the infective material and the natural resistant power of the peritoneum. However, we are led to believe that even with the knot on the serosa, this danger must be small, as the instances where the needle penetrates into the lumen while endeavoring to take a Lembert stitch must be numerous. The fact that the danger is not great can be seen from the results by T. H. Manley following the method of M. E. Connell.

Yet this danger, no matter how small, can and should be reduced materially by reversing the stitch. Then it will be inserted so that the knot is within the lumen, leaving but little, if any, of the loop on the peritoneal surface. By this simple reversal, the danger of infecting the peritoneum by using a stitch that perforates all coats, is reduced to a minimum and is practically removed.

In support of this position we point to the results obtained by original experimentation, and the nineteen cases on the human being herewith reported, as well as the cases of Maunsell and his followers.

With the knot on the serosa, there are present the following conditions: 1. The major portion of the stitch, the knot and ends, is in the free peritoneal cavity. 2. The size of this portion, the knot and ends, prevents perfect apposition of the serous surfaces external to the knot. 3. The drain, the suture material, is broken on the serous coat at the cut ends, so that if capillary action does convey infective material through the wall, it may siphon from the cut ends on to the peritoneum.

On the other hand, with the knot and ends in the lumen, and the loop perforating the serous coats, the conditions are exactly the opposite. They are in this case as follows: 1. The major portion of the stitch, the knot and ends, is on the mucosa, not in the free peritoneal cavity. 2. A small portion only of the loop can be in the free peritoneal cavity, and, if the square stitch is used, a much smaller portion is there than if the cir-

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