THE AUTHOR'S ALEXANDER OPERATION.

With my method of doing Alexander operation some of you are already familiar, as I published it over a year ago. It is unique only in the method of fixation of the ligaments. As in my ventral fixation operation, in fixing the shortened round ligament I do not cumber my wound with any permanent or temporary buried sutures. I make the ordinary incision from the spines of the pubes, two inches in length, in the direction of the anterior superior spine of the ilium, exposing the external rings (Fig. 8). I separate the rings and draw out the strong round ligament. I then pass the closed blades of an artery forcep from the lower end of one wound beneath the skin, fat and superficial fascia over the pubes to the lower end of the wound of the opposite side. I then open the closed blades of the forceps and grasp the freed end of the ligament of the farthest wound and draw it through to the other wound (Fig. 8). The two ligaments are then drawn taut and tied tightly together over the pubes in a strong hard knot. The free ends of the ligaments are tacked by means of antiseptic cat-gut to the ligament on either side in such a way as to prevent the knot slipping until adhesions have occurred (Fig. 9.) This method of tying effectually and evenly shortens the ligaments and the knot thoroughly fixes them without the necessity of resorting to any kind of objectionable permanent suture. The wound is then closed over the ligaments in the ordinary way with temporary silkworm gut sutures.

SUMMARY.

1. Continuous retroversion of the uterus is a condition which frequently leads to serious pathologic consequences.

2. Retroversion without adhesions can be cured without operative interference in about 20 per cent. of the cases in which it occurs.

3. A small percentage of retroversion with adhesions can be cured by massage, electricity and depletion.

4. Retroversion with unyielding adhesions should be freed through the Douglas *cul de sac* and the round ligaments shortened at the same operation.

5. Retroversion with diseased appendages should be treated through an abdominal incision and the uterus brought forward and suspended on the urachus or a ligament constructed of peritoneum.

6. When the Alexander operation is performed the ligaments should be secured without resort to a permanent buried suture, and this can best be accomplished by tying the two ligaments together in a hard knot over the pubes beneath the integument.

ORIGINAL ARTICLES.

THE TECHNIQUE OF OPERATIONS FOR ACUTE APPENDICITIS.

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The technique of operations for acute appendicitis has been studied and discussed by a splendid array of the world's best surgeons. Nevertheless opinions continue to differ not only as to the immediate objects of operative interference but also as to the technical methods by which these objects are to be accomplished.

Some of the operators whose lists are longest and whose statistics make the best showing are extremely vague when it comes to a working description of their methods. The incision which each writer affects is carefully described; the statement made that the intestines are carefully protected by gauze; the appendix carefully removed or carefully left in and a few sutures inserted. But in my opinion the most important part of the operation consists in the protection of the normal serosa from infectious matter and the application of the gauze drain. These points are not carefully dwelt upon as a rule and one prominent writer says he fears he can not give an accurate idea of the method he employs.

This paper is not intended to exhaustively treat of technique in all the multitudinous forms and anatomic varieties of appendicitis, but rather to discuss the common forms, if possible, in a way to suggest the principles upon which the infinite variety of morbid anatomic conditions may be dealt with.

The minds of those who have not operated at all, or of those who have only operated "occasionally," should first be disabused of the notion that operations for appendicitis are easy or simple affairs and a wholesome conviction should be entertained that they are not unassociated with danger. It is impossible for me to withhold an expression of surprise and almost of horror that most writers either leave an opposite impression or like Sonnenburg¹ state boldly that the operation is a simple one. It is my firm belief that a hundred cases of acute perforative appendicitis will show a much higher percentage of recoveries under a uniform "medical" treatment of rest and hot applications with "lancing" of pointing abscesses than will be the case with a hundred patients similarly affected and operated upon by a hundred or even twenty surgeons gaining their first experience. I am confident that the loss of life from weak or faulty operations for appendicitis is proportionately much greater than is the case with operations in pelvic abdominal work. The reason for this greater danger is that a surgical operation in the course of appendicitis is an act of supreme violence—supreme because inflicted just at the critical point, the seat of virulent infection with the deadly inhabitants of the intestine. No surgical calamity can be more appalling than the uncontrolled distribution of pus from appendicitis to previously uninfected peritoneum. When this accident has occurred the fear of the patient's death is before us, no matter what surgical technique or detail of subsequent medical management be resorted to. It is the prevention of this accident, the unnecessary distribution of pus to normal serous membrane, that in these operations marks the man of surgical skill.

No medical man objects to the acquisition of experience by the tyro; he must make a beginning at some time. But ethics demand that except in cases of the utmost urgency the inexperienced operator abstain from drawing blood. Experience can be gained without much loss of life by assisting an older surgeon. A second proposition of equal importance is that none should begin operating on these cases who has not the inclination and opportunity to follow up his work and to so perfect himself in the beneficent art that his later cases may fare better than his earlier ones.

¹ "Die Operation bei der Appendicitis perforativa ist eine einfache, und jeder, der mit den anatomischen Verhältnissen bekannt ist, wird sie leicht erlernen koennen." Deutsche Zeitschrift fuer Chirurgie, Bd. xxxviii, Hefte 2 und 3.

The *objects to be accomplished* in these operations should be clearly defined and borne in mind at the bedside and at the operation. None will deny that the first great goal to be reached is the saving of life. It is the cry of danger to life that has aroused the profession to the importance of operating at all and it is this which gains for us the consent of the patient to submit to a procedure which *is in itself dangerous*, although if indicated and properly done not so dangerous as the disease itself.

We can not conscientiously permit any departure from those technical details which most strongly promise the saving of life. In consequence we must subordinate to *this prime object* considerations of future comfort and convenience.

The *secondary objects* are, first the prevention of fistulæ; second the avoidance of recurrent appendicitis, and third the diminution of the risks of hernia.

The *preparation* for the operation by the surgeon, if the patient be not in hospital, involves in the first place obtaining the best nurse to be had, since her services will not only be required during the operation but will accordingly be of the greater importance in the after-treatment. A trustworthy assistant to stand opposite the operator is essential to the best work, to aid in preventing escape of pus into the uninfected abdominal cavity, to arrange sponges and keep them warm, to prevent breaks in the chain of antisepsis, to place and hold retractors, etc. An operating table must be provided suitable for the application of the Trendelenburg principle, if conditions are present before or arise during the operation to make it desirable. An ordinary kitchen or dining table will do in an emergency if the patient's feet are fastened to the end in such a way as to prevent his slipping toward the head of the table. A box or chair placed under the end of the table will raise its feet sufficiently. Elaborate preparation of the patient is usually impossible for lack of time. The cleansing and disinfecting of the skin should not be done in such a way as to jeopardize the integrity of the abscess wall if adhesions have taken place. Transportation of the patient even to a neighboring hospital is an extremely hazardous procedure. Every jolt and jar causes the patient to suddenly contract the abdominal muscles, menacing the normal peritoneum with a flood of infectious matter from perforated bowel or abscess.

The *position of the patient* should be subject to the varying demands of the operator as modified by the pathologic conditions encountered. Should pus be met with at the pelvic brim it may be necessary to prevent its flowing into the pelvis by quickly tipping the patient into the Trendelenburg posture. If the pus tends to flow toward the median line the patient may be rolled upon the right side. These two maneuvers may be practiced simultaneously if desired. The site of the incision must depend largely on the site of the appendix and the morbid anatomic conditions present. It must be so located as to give the most free and direct access to the seat of disease, except where we desire to avoid opening the free peritoneum. The median incision has been discarded except for the rare cases in which the cecum and appendix lie behind the linea alba.

The most rational *method of opening the abdomen* when the appendix lies in one of its more usual positions, is that of McArthur and McBurney. McBurney recommends that the skin incision, about 4 inches

long, should cross a line drawn from the anterior iliac spine to the umbilicus nearly at right angles, about 1 inch from the iliac spine, and so situated that its upper third lies above that line. The aponeurotic structures are divided with the knife, but the muscular fibers are separated by blunt dissection. In this way a wound is produced at whose edges are muscular fibers running in different directions. These fibers, held apart by retractors during the operation, close the wound almost perfectly when the operation is finished, by overlapping. Unfortunately this method can not be applied except where an abundance of good assistance is at hand and where the wound need only be a small one. The general principle involved should be respected in all incisions involving the lateral regions of the abdomen, *i. e.*, the direction of the incision should follow the general trend of the fibers of the external oblique muscle and the fibers of muscles should be cut as rarely as may be possible. In this way nerve trunks may be avoided. It is to avoid nerve injuries that Kocher recommends our making only transverse or slightly oblique incisions except in the median line. Hence the old Langenbuch incision at the side of the rectus muscle, and the various longitudinal incisions over the colon must be given up. With Kocher's recommendation we must heartily agree, partly because the nerves supplying the rectus muscle should be held sacred, for fear of weakening that part of the abdominal wall by paralysis, but chiefly because the oblique incision gives perfect access to all ordinary foci of appendical inflammation and at the same time making the wound parallel with the general traction lines of the abdominal muscles prevents yawning of the wound and diminishes the tendency to hernia at the seat of operation.

The *length of the incision* must be adequate for all the manipulations required in the abdominal cavity. The wound should always be long enough to facilitate and not to retard intra-abdominal work. There is no essential advantage in operating through openings of especial shortness. On the other hand, making the wound unnecessarily long conduces to prolapsus of intestines and increases the liability to hernia.

Before going further a few *diagnostic points* demand brief consideration, since they concern most intimately the manipulations to be undertaken later. They are as to the site and the morbid anatomy of the appendix and of the adjacent structures. No diagnostic study of a case of appendicitis can be considered complete until these points are if possible determined. The *site of the chief pathologic activity* can be determined in the majority of instances, especially when a tumefaction exists or when tenderness is found. To discover these signs a *rectal or vaginal examination should never be committed* since a pelvic location or extension of the inflammation is by no means rare.

[I can not agree with Fowler, who says, "Generally speaking, it is not possible to demonstrate by means of a rectal examination in these cases anything which can not be made out much more satisfactorily by external examination; if the examining surgeon is to be the operator in the case he will do well to keep his finger out of the rectum." In several instances I have been able to make or to strongly confirm the diagnosis by this mode of examination; while in other cases the exact site of the primary or secondary focus has been made out.]

Pain at the end of urination is a sign of much value

in the diagnosis of inflammation of the vesical peritoneum.

In the cases of the gangrenous appendicitis, or in the perforative cases in which diffuse peritonitis takes place, the absence of a tumefaction and the presence of widespread tenderness makes a *diagnostic localization of the appendix* impossible.

A preliminary determination of the *relation of the inflammatory focus to the ascending colon* and to the ileum is also of great import. These structures, ileum and colon, act as barriers, water sheds so to say, tending to limit or retard the spread of inflammatory fluids. Abscesses to the outside of the ascending colon generally occupy a position well toward the flank and tend to extend as they grow larger toward the renal and hepatic regions. Moreover the tympanitic colon can often be detected by percussion, nearer the median line.

Inflammatory activity *below the mesentery of the ileum* tends to extend into the lesser pelvis and can often be located by rectal or vaginal touch. Our gravest apprehensions are excited for the patient's recovery when the site of inflammation is *mesial to*

Fig. 1.—A B, Poupart's ligament; A, anterior superior spine of ilium; A C, line joining umbilicus and anterior superior spine; D E, line of incision recommended by McBurney, parallel with the course of the fibres of the external oblique muscle and its aponeurosis.

the ascending colon and above the mesentery of the ileum. The percussion relations of the colon are here of some value, but our chief dependence must be upon the situation of the tumefaction and tenderness well toward the median line.

The abnormal positions of the appendix are usually not determinable before operation unless the focus of inflammation can at once be located at a point remote from the usual site of the caput coli and be recognized as appendical.

The *Morbid Anatomic Conditions* to be encountered can be determined before operation only to a limited extent. It is partly on account of this very uncertainty that appendicitis operations may prove far more difficult after the abdomen is opened than they appeared beforehand.

The duration of the inflammation and the size of the tumefaction are points which often, not always, give a suspicion of the morbid changes to be encountered. Obviously a suppurative process of long standing (one to three weeks) can be considered to have

brought about much adhesive proliferation. On the other hand, acute and violent symptoms lead us to suspect no such delimitation of the process by adhesions. And combining these general propositions, an inflammation which has existed for some time, but which has at the last advanced by sudden exacerbations, may be suspected to have become limited at first, but to have extended later by successive fresh invasions of previously normal serous membrane. Uncertainty in respect to the state of these new-formed barriers to the spread of inflammation is greatest between the third day and the end of the first week. No reliable diagnostic signs are as yet at our disposal to aid in deciding this important clinical question. Our efforts result only in a prediction of probabilities. From signs of violent activity of the disease, we assume the local extension of the inflammatory process. A tumefaction not apparently enlarging, in the presence of mild general symptoms, would of course suggest the limitation of the process by adhesions.

Fig. 2.—To show the appearance of the gauze strips before they are turned over to the right side of the patient's body.

Edema of the skin is usually an indication of the adhesion of the abscess to the abdominal wall and the operator in that case has the opportunity of simply draining the abscess without even seeing the free peritoneum. In one case I was able to push about in the abdominal cavity the caput coli with the abscess mass for a distance of three-quarters of an inch in each direction. The operation disclosed the fact that the omentum covered the coils of adherent intestines enclosing the perforated appendix. And as the omentum was not inflamed upon its anterior surface, the whole mass could be slipped about by external pressure.

An additional subject upon which to exercise our diagnostic acumen in future is as to the *amount of tension* present in the abscess-cavity. Much prognostic importance would attach to this knowledge if we could in any way gain it. Unfortunately we can only draw from our clinical study the vaguest inferences on the subject.

Having decided, as nearly as possible, these pre-

liminary diagnostic points we have to ask ourselves, *what is the technical task before us* when we undertake an operation for acute appendicitis. It is, we may say briefly in answer, to expose and drain an area of serous membrane surrounding the appendix, which is infected, usually with enormous quantities of bacteria of many species and often of the utmost virulence acting with the aid of most irritating fluids. If this were all—if the damaged tissues and the invading microorganisms lay beneath the skin or even immediately below and in contact with the abdominal wall, the case would be surgically simple. But this drainage has to be effected over a membrane the progressive infection of which means death to the victim of the disease.

Of what properties of this delicate serous membrane can we take advantage in attempting a practical solution of the difficulties to be met? First, our most important aid, our ever present help in time of need, is the enormous resisting power of infection presented by the peritoneum. No other tissue in the human body can so powerfully annul the pathogenic power of bacteria or so quickly and effectually remove disease producers as can the peritoneum. One-tenth the filth often cast into the peritoneal cavity without

tear the intestines from contact with this material by means of large compresses. When the infected cavity has been evacuated as well as possible, the compresses were removed and pieces of gauze applied in their place to be left as drains, with the purpose of opposing the capillary action between serous surfaces and the action of gravity with the capillarity of the cotton fibers. I wish to urge the *preventive* application of this capillary drain. Before defilement has taken place in that part of the peritoneal cavity lying between the anterior parietal serous layer and the *dépôt* of infection, the operator should apply gauze sterilized and, if not required in too great quantity, iodoformized, in such a way that it will attract fluids away from the intestinal interstices and not into them. This gauze, instead of the peritoneum beneath it, must henceforth be the surface to be protected by gauze compresses. The ends of the pieces of gauze are to be inserted into various spaces, as will be dwelt upon later in order to prevent by occlusion as well as by capillarity the dissemination of poisonous fluid. The strips of drainage gauze are not to be replaced by fresh gauze at the close of the operation for three reasons, to wit: 1. The repeated manipula-

Fig. 3.—To show the relation of gauze strips to the cecum (A) and the stump of the appendix (B), when the appendix lies between the cecum and the outer abdominal wall.

harmful results would cause fatal infection in the cranial cavity. In operating for appendicitis under the conditions assumed, we take advantage of this resisting power of the peritoneum and *deliberately inoculate a portion of the serous membrane*. Inoculation, however, is fortunately not always tantamount to progressive infection. But traumatism, such as mechanical and chemical irritation, drying and cooling of the serous surface, tend to diminish resistance. These things can not be wholly avoided, and for that reason it is strongly urged that these operations are not, as is so often maintained, devoid of danger or even only slightly dangerous.

Our main surgical resource is found in *drainage by capillarity*. In the unopened abdomen the normal serous surfaces are not separated from one another by layers of gas or ordinary air. They lie in contact with one another, lubricated by a thin layer of serous fluid. A foreign fluid poured out between these surfaces is disseminated with extreme rapidity, partly by the action of gravity, but chiefly by capillary action. This force, which lifts the sap to the tops of the highest forest trees, is aided also by the vermicular action of the intestines. When about to open a *dépôt* of infectious matter it has been the usual custom to pro-

Fig. 4.—To show the application of the gauze when the appendix (B) lies in the midst of the small intestines, to the left of the cecum (A). This and the preceding drawing were made from photographs of frozen sections made by the writer after having performed the operation described in the text upon the cadaver.

tions of the intestinal serosa favor the ingress of the bacteria into the tissues. 2. The handling of the parts transports bacteria to previously clean areas. 3. The gauze, if properly applied, will carry outward, through the very long strips employed, the infectious matter contaminating their surfaces, which has escaped the carefully applied gauze compresses, that of course have been replaced as often as desired by the operator.

It is maintained by Gubaroff that the beneficent action of the absorbent gauze extends a distance of two and one-half inches on each side of its margin. This must be at least approximately true, since by no other assumption can we explain why capillary drainage enables us continuously to withdraw infectious fluids across the serous membrane without wide-spread inflammation. A recent autopsy by Dr. Fuetterer upon a case of my own, operated upon after general peritonitis had set in, confirms Gubaroff's opinion. Dr. Fuetterer says that for at least a distance of two and one half inches on either side of the gauze the peritoneum presented all the evidences of recovery from the violent inflammation.

For practical purposes it is of the first importance for the operator to decide before operation whether he has to deal with: 1, a morbid process not mechan-

ically limited. 2, a pus dépôt shut off from the uninfected peritoneum by delicate adhesions; or 3, a well marked abscess-cavity without strong adhesions.

Once a positive diagnosis of appendicitis has been made a probable determination of these morbid anatomic points must be reached by consideration of the points already mentioned, the most important of which is the duration of the disease. In a first attack of moderately severe perforative appendicitis effective adhesions may be considered absent up to the fourth day. Between the fourth and tenth days the bands of new connective tissue are becoming resistant and may be utilized in the operative treatment. After the tenth day the abscess (if it has not enlarged by successive ruptures) may be expected to have strong walls, requiring distinct pressure to break them down.

TECHNIQUE.

In the absence of adhesions, the proper preparations having been attended to, an incision is to be so made as to place the operator in full command of the region involved. It is important that the incision be made long enough before manipulations are begun within the abdomen. This having been accomplished, the first thing to be done is to apply a gauze barrier about the

Fig. 5.—Lembert sutures applied before the appendix is cut off.

wound, so that exudate and feces may not soil the normal peritoneum. For this purpose, strips of plain sterilized gauze and of iodoform gauze will have been prepared by the nurse, two and a half inches wide, fifteen to eighteen inches long and four layers in thickness. The iodoform gauze will be used for all packing if the quantity required is not so great as to threaten iodoform intoxication. If this is feared plain gauze will be used for preventive packing and the iodoformized material reserved for the immediate drainage of the disease focus. An assistant now places a large dull-edged retractor under the abdominal wall at the edge of the wound and by strong traction perpendicularly to the abdominal parietes lifts the wall upward and away from the intestines. The operator then pushes the end of a ribbon of gauze under the abdominal wall between the parietal peritoneum and the intestines for a distance of one to three inches, in a direction at right angles to the line of incision. This piece of gauze is to be flattened out rather neatly. The retractor is now moved aside in either direction for a short distance and another piece of gauze inserted by the side of the first one, with whose edge it lies in contact. This process is repeated if free peritoneal surface surrounds the wound, in every direction, so that as the operator looks into the

wound, the edges of the incision are seen to be covered by gauze extending out into the abdominal cavity. If the inflammatory focus lies in contact with the lateral parietes, the gauze barrier must be applied with great care to prevent infection of the pelvic cavity below or the hepatic region above. For this purpose the incision must be low enough to enable the operator to get well below the appendix. Strips of gauze are then passed down toward the pelvic brim until the surgeon is sure that this avenue of infection is reasonably well closed. This maneuver may be facilitated by the temporary use of the Trendelenburg position. Equal care must be taken to guard the hepatic fossa by a similar method. For, while a patient may escape with his life, if this large area be infected, since it is in a sense isolated from the rest of the peritoneum, the extent of the surface is so great that even the primary intoxication due to flooding with feces and pus is of most serious import, especially as the chief resorption area of the peritoneum, the centrum tendineum of the diaphragm, is located here.

The object of this packing is, 1, to prevent as far as possible infection of the peritoneum when the disease focus is disturbed; 2, to set up enough peritoneal irritation to determine a serous discharge, so that outward capillarity along the strips of gauze may conduct infectious matter away from the free peritoneum²; and 3, to favor the formation of adhesions

Fig. 6.—Lembert sutures tied after removal of the appendix.

about the tract through which drainage is to be effected.

The second step has for its purpose the finding of the inflammatory focus and its immediate treatment. The operator carefully covers the visible parts of the gauze strips with gauze compresses wrung out of warm (105 degrees F.) salt solution, and with the edges of these compresses he presses aside loose coils of bowel until he reaches the seat of most active disease. If the location of the offending part has not been determined by palpation before operation and if a real search is necessary the longitudinal muscular band of the colon is an infallible guide, leading the surgeon at once to the seat of trouble. The appendix having been found, a quantity of feces, pus or sero-pus will gush upward almost invariably and must be caught on compresses, which, as fast as they are replaced by fresh ones, must be carefully discarded to prevent their being used again. The cecum is not to be lifted from its original site, if by so doing the least additional danger of infection is to be incurred. Before removing the appendix the operator carries his strip of gauze packing well down to the infected region surrounding the dangerous area, thus completing the well of gauze through which the work is done. Far

² See paper by the writer, Amer. Obstet. and Gyn. Jour.

better would the surgeon leave the base of the appendix closed by a strong catgut ligature at the bottom of such a well protected cavity, than by lifting out the cecum from the wound, spread the virulent bacteria often present over uncontaminated serous membrane. But if the cecum can be thus lifted up without risk of infection, *i. e.*, without risk of pouring infectious matter into parts of the peritoneal cavity unprotected by adhesions, a piece of gauze is slipped under it, the appendix is amputated by incision between a thin but strong temporary ligature on the proximal side and a compression forceps on the other. The projecting mucosa is then touched with a drop of carbolic acid and a row of Lembert sutures passed from side to side over the stump of the appendix. These sutures are not tied until the temporary ligature has been removed. But when this has been done the stump is inverted into the cecum and the Lembert sutures knotted. A second row of sutures may be placed if desired. This elaborate technique is rarely practicable in acute appendicitis.

Hemorrhage from the arteries of the mesenterium is controlled, if need be, by ligatures or suture ligatures. If the cecum has not been lifted, drainage of the deeper cavity is effected by some additional strips of iodoform gauze and, if the operator chooses, by a tubular drain. If it is found that the infectious fluid has already traveled between the intestines in any direction or to any extent, it is carefully followed with sponges, cleansed away by gentle pressure with gauze sponges and gauze drains left in contact with the infected serous membrane. The practice of lifting extensive masses of intestine from the abdominal cavity to clean them seems to me illusory. They are much better treated by surrounding them with gauze drains which can be subsequently removed, if necessary under anesthesia. The ends of the gauze strips are to be left very long so that they may hang over into hydrophilic dressings at the side of the patient, since the writer has shown that the dependent part of the gauze strip delivers fluid partly by gravity and partly by capillarity at an exceedingly rapid rate, thus enabling the intra-abdominal portion of the strip to lift fluid against gravity without the embarrassment of imperfect delivery upon the surface of the abdomen. This method of placing the gauze drains almost all the fluid to the patient's side. I have often found the gauze and cotton dry at a distance of two inches from the wound on the left side, while on the right side of the body toward which the strips were directed, not only the dressings but the bedding and mattress were soaked with exudate.

The last step consists in the partial closure of the wound. The point at which the drains are to project is determined, the gauze being made to emerge in as short a line as possible from the site of inflammation. Silkworm gut or silver sutures are inserted above and below the drainage opening and tied. The same material is to be used for secondary sutures, the threads being introduced at the sides of the gauze mass but not tied until the drain is removed.

It is *when adhesions exist* in easily recognizable degree and mass but while they are still easily broken down by the finger-tip that the technique is as yet farthest from being settled. All are agreed that the appendix is to be removed if it be near at hand on exposing the focus of inflammation. Others say it may be removed if in the operator's opinion this can be done without breaking down the abscess wall; some say

if the appendix do not constitute a part of that wall.

Shall we remove the inflamed appendix at all hazards, as advised by still another set of clinicians? There is at present no more popular clinical problem in all surgery or one, perhaps, better worth consideration. Some bold operators say it is always to be removed; that operations without its extirpation are "incomplete;" that undiscovered abscesses may be left undrained; that recovery is slow; that fistulae and sinuses remain and recurrences are to be expected. Unfortunately statistics can not help us at present, for our clinical classification of cases is so poor that a reported death rate of 15 per cent. by one operator may be an index of no better work than would be indicated by a mortality rate of 20 per cent. by another man whose run of cases is different. Of course the man who operates on all cases, even the mildest, will make a better showing than will he who chooses for the knife only those of well marked severity. He who gets his cases on the third day will have a brighter list than will the man whose patrons call him in council on the fourth. Statistics of appendicitis operations indiscriminately gathered furnish no trustworthy information.

The question that arises in our minds when we approach our cases of appendicitis for operation is, How can we operate to save life? All other questions are secondary. All considerations of surgical nicety and personal satisfaction must give way. What is the main anatomic object to be accomplished by operation *when adhesions have formed*? You will agree that it is to relieve by outward drainage the tension in the abscess cavity—to make a safety-valve. When this has been properly done our chief excuse for interference is exhausted. Further work in the abdomen is dangerous. To what extent is it justified by securing to the patient immunity from other ills? The "aggressive" surgeon says, if we do not find the appendix we may leave a secondary abscess unopened. The "conservative" operator replies that secondary abscesses do not very frequently occur; that he does not consider removal of the appendix necessary to the discovery or drainage of the secondary abscess; and that the manipulations necessary to effect extirpation necessarily disseminate pus and, by injuring the peritoneal surface, invite infection. The aggressive man urges that recovery is prolonged if the offending member is not plucked out, that fistula or sinuses may remain, and that the patient is exposed to recurrences. His opponent argues that even if the first statement is correct, a few more days spent in bed can not be so serious a matter as the additional operative risk; that fistulae and sinuses do not often occur, and can be cured with comparative safety by an operation instituted when virulent pus has well nigh disappeared; that tenderness and occasional pain over the appendix region will usually warn the patient after the acute attack is over, if a chronic inflammation exists which is capable of being lighted up into a new acute attack, so that the part may be removed during the quiet stage. The percentage of recorded recurrences after drainage seems to be small. Fitz placed it at 11 per cent. No one should underestimate the value and satisfaction of leaving the patient freed of the dreaded appendix; but it seems to me we should not too strongly urge the operator, especially if inexperienced, to go too far toward this ideal. The conservative ground is here the safest to advise. Remove the appendix when you feel confident that by so doing

you will not scatter pus or destroy the wall of adhesions which encloses the *dépôt* of infection. Success in these operations depends largely on the use of a proper system of gauze packing. On opening the abdomen the wound is first carefully surrounded with gauze strips, as already described, passing between the abdominal parietes and the superficial layer of intestines wherever they are not adherent. The next step consists in the application of the gauze about the coils of intestine which are matted together to retain the infectious material. The operator should palpate with the utmost gentleness to ascertain what portions of bowel are non-adherent and therefore to be isolated from those nearest the appendix by the protective packing. These deeply seated strips of packing material are to be carried well back to the posterior parietal layer of peritoneum. They must touch one another from side to side and must be spread out evenly. All knots and coils of gauze must be avoided with great care. This can be accomplished most easily where the end of each gauze strip can be carried to its destination on the tip of the finger. No strip is to be folded longitudinally upon itself in order to fill up cavities. When spaces are to be filled in, additional pieces of gauze are to be used, each one coming to the surface of the abdomen by as a direct a route as possible. The infected area is not to be encroached upon for any purpose, diagnostic or therapeutic, until the peritoneum is protected by gauze. Once the operator is sure of his protective gauze the infected area is to be opened and drained. This is done deliberately by working the finger gently between the adherent coils of intestine until the exudate is reached. Direct drainage to the cavity is then affected by a strip of gauze which may enclose a tubular drain if the operator desires. If removal is not practicable, the intestines are carefully retracted with gauze compresses or strips and the drains inserted deeply enough in the track of the pus to assure the operator with reasonable certainty that no pockets of pus are without a vent. It is much safer to carry the drainage down to the appendix itself, even if it is not removed.

The location of the inflammatory focus with reference to the great barriers to the spread of infection is of the first consequence in estimating the safety and justifiability of these manipulations.

Foci situated between the ascending colon and the right lateral abdominal wall offer conditions relatively very favorable to manipulation, since the colon acts as a watershed to turn the course of infection from the main part of the abdominal cavity. Before opening such a focus the surgeon takes care that the space between the anterior surface of the colon and the abdominal wall, if not obliterated by adhesions, is protected by gauze strips and that the upper and lower boundaries of the infected area are well protected by packing to prevent the infectious matter from traveling upward toward the liver or downward toward the pelvis. This technique needs but slight variation when the appendix lies farther down *i. e.*, in the internal iliac fossa.

It is when the inflammatory disturbance lies mesially to the colon and above the ilial mesentery that the greatest difficulty exists in protecting the peritoneum during the operation and in draining adequately afterward. In the language of Harris, "However well we may pack around with gauze, it is often impossible to prevent pus escaping into the general

cavity with a resulting fatal peritonitis."³ Presupposing that adhesions are slight or altogether absent, it is absolutely essential that the patient be placed upon a table which can be adjusted to the Trendelenburg position. The pelvis being elevated, the abdomen is opened, the gauze strips having been adjusted as usual about the wound, aseptic compresses are so placed as to receive any infectious matter emanating from the appendical region, and if any adhesions are present at all, the most delicate manipulations must be made in order to leave them intact and a drain of gauze, with perhaps also a tubular one, is to be passed down to the appendix. Should delicate adhesions be disturbed peristaltic action may carry the liberated small intestines to a distant part of the abdomen in a few hours together with the actively infectious matter adherent to their walls.

It should be mentioned that transperitoneal drainage has often seemed to various surgeons more hazardous than direct drainage of pelvic accumulations through the vagina or rectum. One of these routes may occasionally be used with advantage. If the inflammation has existed for a length of time sufficiently great to allow strong adhesions to form, binding an abscess wall to the abdominal parietes, it is the surgeon's duty to seek the most direct route to the abscess interior, the incision through the abdominal wall being made in such a way that the free peritoneum will not be injured. When abscesses are situated in the right iliac fossa adhesions will oftentimes be firm between the walls of the abscess and the outer abdominal parietes, even though the anterior wall be free. The incision in such a case should be made well to the outside of the focus of inflammation or even in the lumbar region.

The gauze drain should not be removed until five to eight days have elapsed, giving ample time for adhesions to have walled off the infected area.

AN IDEAL SUTURE FOR THE CLOSING OF ABDOMINAL INCISIONS, CUTS ON THE HANDS, FACE AND BODY GENERALLY.

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The ideal suture is one that, first, can be most readily and easily introduced; second, that holds the parts in perfect apposition with the least possible interference to the circulation of or at the edges of the wound; third, that is the least apt to become septic; fourth, that requires the least possible amount of suture material; fifth, that leaves the least possible scar; sixth, that can be relied upon to fulfill these requirements and after fulfilling them, can be removed.

The old interrupted *en masse* suture, while fulfilling the first requirement of introduction well enough, utterly fails in all the rest except the last, *viz.*: removal, for by including the tissues from one-half to one inch on each side of the wound and tying them, the circulation is materially interfered with, thus preventing healing and promoting sepsis by reducing the blood supply and depriving nature of its best means of keeping the wound disinfected and promoting its rapid repair.

The buried animal suture is objectionable because

³ See the admirable paper of Harris, *Journal American Medical Association*, Dec. 1895.