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TREATMENT OF STRANGULATED HERNIA.

Read in the Section on Surgery and Anatomy at the Forty-fifth Annual
Meeting of the American Medical Association, held at San
Francisco, June 5-8, 1894.

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TREATMENT OF STRANGULATED HERNIA.

"If you see a strangulated hernia in the day, reduce it before the fall of night; if in the night, let not the rising sun witness its presence."—*Stromeyer*.

It is almost a truism that a strangulated hernia, if unrelieved, means death. In an experience of seventeen years, I have seen, with Dr. Richards, one case of umbilical hernia recover without operation after the formation of an artificial anus. It is almost equally true that if the strangulation is relieved early, recovery is the rule that ought to admit of few if any exceptions. The fatal cases of to-day are those of septic peritonitis, of gangrene, of contusion, paresis, and in the aged, pneumonia. With the possible exception of the last named, these fatal conditions are directly ascribable to delay in interference. Fortunately this must be oftenest charged to the neglect of the patient, but the cases are not a few in which, from insufficient examination or a doubtful diagnosis, the limit of safety is permitted to pass. The salient feature in the treatment of strangulation is the diagnosis. With that established the course is reasonably clear. I may be pardoned, therefore, for briefly touching on some of the points which seem of special importance. Given the following complex of symptoms, an irreducible tumor, hard and free of impulse in the site of an hernial aperture, accompanied by abdominal pain, obstipation, nausea and continuous vomiting, the diagnosis is indisputable. It is in the absence of or ill-pronounced development of one or many of these phenomena that the cause for doubt must be sought. The physical evidences of the hernia are often defective. The tumor may be small, too small to make a

perceptible tumor, and palpable only in the depth of its canal. In the presence of a loose or irreducible hernia on the opposite side, the real seat of the strangulation is easily overlooked. Where a large and a smaller tumor are present, the probabilities of strangulation are *ceteris paribus*, greater in the smaller one. Furthermore it may be said that, inversely to the size of the hernia, are the acuteness of development and the severity of the symptoms.

The absence of communication between hernial sac and peritoneal cavity, as shown by the suppression of impulse and irreducibility, is an infallible evidence of strangulation if the constriction is at the neck of the sac. In large hernias, strangulation by bands within the sac is common, in which cases there will be an impulse and the hernia may be partly reducible. In a specimen presented to the ASSOCIATION two years ago—which I was enabled to present through misinterpretation of these data, perforation within the sac had taken place by pressure from a Meckel's diverticulum.

Torsion of a loop within the sac, occlusion within a diverticulum of the sac, acute inflammation as of the appendix may occur without the suppression of abdominal impulse, and without increase of tension in the totality of the hernial protrusion. To an experienced surgeon, increased tension is a most important evidence of strangulation. Through gaseous distension of the intestine and serous transudation within the sac, a hernia after two days strangulation may resemble a cystic tumor in its hardness and elasticity. The detection of a pedicle deep in an abdominal orifice, may avert an error. A subperitoneal lipoma or a cyst may conceal the hernia and complicate the diagnosis. Inflamed and retained testicles, and deep-seated lymphatic glands have been mistaken for strangulated hernia. The error is trivial. To err in the other direction has often proved fatal.

The symptom which in my judgment is most cal-

culated to deceive is that of pain. Until adhesions form about the neck of the sac or within it, or unless manual efforts at reduction have been made, a strangulated hernia produces little or no pain at the site of the tumor. If present, it is overshadowed by the colicky pains of obstruction and the dragging pain of a fixed omentum or intestinal loop. It is felt chiefly in the umbilical region. Until the extra-peritoneal soft parts are involved in the inflammatory processes, a strangulated hernia is not very tender, except over the line of constriction. Within a year I have seen a patient treated for intestinal colic for three days. A small femoral hernia was overlooked. Three days later, an operation revealed a gangrenous hernia and septic peritonitis.

Nearly every strangulated hernia is obstructed. Therefore vomiting and constipation are capital symptoms. They are not pathognomonic. In acute cases, vomiting is an initial symptom. It is copious, recurs at short intervals, and may in *foudroyante* cases, within twenty-four hours change to regurgitation of feculoid or fecal matter, with persistent hic-cough. Such vomiting can not be mistaken. But even in acute cases the vomiting may be limited to one or two seizures in the twenty-four hours. Such vomiting, associated with diminished renal secretion and albuminuria, may readily be mistaken for that of uremia. Quite recently I saw a case of this nature with Dr. Hoppe. The diagnosis was further obscured by pregnancy. Vomiting did not supervene until the fourth day. The operation revealed a small knuckle of intestine concealed behind an adherent omentum. Opposite Gimbernot's ligament it had become gangrenous.

Obstipation is the rule in strangulated hernia. Lavage may remove the contents of the lower bowel. Cases are very rare in which strangulation involves the omentum alone. Such a case I reported two years ago. In the beginning the intestinal current may not be interfered with. With continued fixation of

the gut, it soon becomes impermeable. This applies to strangulation of the appendix caught in a hernia, of which a number of cases have been recently reported, and to that form of hernia in which only a part of the circumference of the gut is involved.

There are yet other cases of hernial obstruction in which the diagnosis can not be made in one or two days. They occur in the large irreducible scrotal hernias of the aged. There are present retardation only of the onflow of the intestinal contents, slight colicky pain, little or no vomiting, recurrent constipation. Gradually the bowel is distended to a point beyond which the rings can not be made to yield. Then ensues the strangulation as in the acute cases. One or two weeks may pass before the latter makes itself manifest.

Notwithstanding all that has preceded, cases will occur in which doubt can not be dissipated. The prudent and wise surgeon will deal with all these as cases of strangulation.

In a brief paper on the treatment of strangulated hernia, only two methods can claim consideration; 1, taxis; 2, operative interference.

TAXIS.

As surgery has progressively sought the light for its manipulations, and learned the value of large open wounds, the usefulness of taxis has become restricted. The indications for taxis are few; the contra-indications many. I have long believed that the future of hernia patients would be bettered, if taxis could be altogether stricken from surgical technique. This statement is made with the full understanding that the mortality of reduction by taxis has been placed at from 4 to 8 per cent. (Bryant-Tscherning.) No statistics can be obtained of cases in which an unsuccessful taxis was followed by kelotomy. Taxis should be restricted to the subacute obstructions of old hernias. The smaller the hernia and the acuter the symptoms, the less is taxis indicated; never in

these cases after the first twenty-four hours of strangulation.

The bowel may be irreparably damaged before this, but not often. Gangrene may be present without the usual evidences thereof, such as local edema, redness, great tympanites, rapid and feeble pulse, albuminuria. To consider the absence of any or all of these symptoms as indication for taxis, means enlarging the mortality from strangulated hernia.

Should the effort at taxis be successful which, perhaps fortunately, in the class of cases under consideration it rarely can be, it is so at the risk of returning to the abdominal cavity a loop of intestine doubtful as to viability, or with adherent limbs, and a hernial fluid ready to infect the peritoneum. Every effort at taxis is a contusion of the strangulated intestine. The blood-tinged hernial fluid is an evidence thereof. In intra-abdominal strangulation it is never encountered. Rents of the peritoneal coat of the distended intestine, the dread of the surgeon in laparotomy for obstruction, are none the less likely to occur because the bowel is manipulated under the soft parts and through the medium of a water-pad.

When reduction by taxis is indicated, it should be done under full anesthesia. The absolute relaxation thereby obtained is doubtless responsible for many of the successes of taxis. A time limit to the manipulation has been given by many. Two unskilled hands can do more harm with taxis in twenty seconds than a careful operator will do in twenty minutes. Forced taxis is an abomination which has been expunged from surgical practice. It has been my fortune to see but one case of reduction *en masse*. The efforts of taxis should be gentle, continuous, and gradually increasing in force. Lateral pressure and gentle traction upon the neck of the sac may, by straightening the bend of the gut at the point of constriction, open a passage for the escape of its contents and thus be the immediate precursor of a reduction.

Taxis should be resorted to but once. When it

fails, herniotomy can not be too soon performed.

KELOTOMY.

An operation for strangulation is *per se*, not dangerous. The measure of its gravity is formulated by the condition of the parts and of the patient at the time of operation. I have had thirty-seven operations for strangulated hernia. Of these, six ended in death, two from gangrene and peritonitis, one from pneumonia in a man of 70, one from heart failure in a woman with aortic regurgitation, and one through an error in judgment in adding the radical to the relief operation in a large scrotal hernia. In the sixth case, laparotomy was performed for reduction *en masse*. The intestine, which seemed viable at the time of the operation by lamplight, gave way on the fifth day. With my present knowledge the deaths from heart failure and pneumonia might have been averted, by substituting cocain for general anesthesia, since in neither patient could it have been a question of radical operation. In a case recently seen with Dr. Topmiller, I made the relief operation, removing a mass of omentum the size of a walnut, and returned the intestine without inflicting enough suffering to elicit a moan. The patient was 68 years of age and the subject of cardiac asthma.

From the foregoing limited experience, the conclusion is justified that in an otherwise healthy individual, death does not follow herniotomy, except as a consequence of grave changes in the hernial contents or within the abdominal cavity. The full statistics of Hagedorn of 170 operations fully bears out this view. It includes cases treated between 1883 and 1890. The general mortality was 14 per cent. The death rate was *nil* in cases in which the large intestine was involved; 48 per cent. in cases where the small intestine and omentum were unchanged; from 22 to 38 per cent. in cases where it was ecchymotic or suspected of gangrene. These results are a vast improvement on those given by Benno Schmidt, Rose

and authorities of Great Britain a few years before, according to which the mortality varied from 25 to 48 per cent. Thus is negatived the view that the modern methods of wound treatment have not influenced the mortality of operations for strangulated hernia. As operations are performed earlier, and larger experience improves the methods of dealing with the grave complications, the mortality will be doubtless still further reduced.

OPERATION.

Except in the hernias of infants and in the large hernias of the aged, and then only when the constriction is known to be at the neck of the sac, the incision should be ample. An utter disregard of the anatomic tunics will facilitate procedures. There must be no enucleation until the sac proper has been reached. To recognize this will sometimes embarrass an experienced operator. When thickened and covered by pendulous masses of fat it may greatly resemble a part of the colon. In acute hernias containing considerable sanguinolent fluid, the resemblance to a discolored intestine is very great. The presence of ramifying vessels in the sac is distinguishing. So long as there is a doubt, it is quite certain that it is *not* the bowel which is exposed. In very rare cases there may be no sac under the line of incision, an uncovered portion of the large bowel or of the bladder presenting. An exploratory opening such as would naturally be made into the sac as ordinarily found, would while elucidating the relations, be far from being a serious mishap, if it involved the bowel.

Is the sac to be opened? This question has been affirmatively settled for all times, if not for all cases. In every case in which the radical operation is to be performed, in which there is the least doubt as to the site of the constriction or the condition of the hernial contents, and always before the constriction is relieved, the sac must be opened; the constricting ring to be divided from within. In the hernias of

very young children, where the surroundings might make the aseptic course uncertain, and in the large obstructed hernias of subacute course as seen in the aged in whom a confinement of two weeks might be serious, an external herniotomy is doubtless justifiable. Although I have seen a number of cases in which it seemed applicable, I have never performed one, nor is it probable that I shall. An irrepressible anxiety to see the condition of the hernial contents impels me to what was known as the greater procedure of internal herniotomy. The division of the stricture is always a most delicate operation, in which the hernia knife of Cooper is almost indispensable, the finger serving as a guide. Save in the very tightest strangulations, the intestines are readily displaced to permit the nicking at one or several points of the constricting band. To avert the danger of wounding the intestine, the constriction can be divided from without. In inguinal hernia it is feasible. In femoral hernia it ought not to be practiced, since it entails the division of the crural arch.

The constriction relieved, the hernial contents often have a tendency at once to slip into the abdominal cavity. This is to be prevented, for no intestine is to be returned until it has been thoroughly inspected below, at, and for some distance beyond the line of constriction. In hernias which have been irreducible from adherent omentum, it may be difficult to find the strangulated intestine. Often it is small. In a case seen with Dr. Marcus, only a part of the circumference of the gut was found beneath the constriction. In not a few cases the intestine can not be properly exposed until the adherent and thickened omentum has been excised. Since, as a rule, it can not be returned, it might as well be radically treated first as last. In dealing with the omentum, too much tissue should not be included in the ligature; this should be tightly drawn, care being taken that in the necessary manipulation the thin-walled veins are not torn. After thorough disinfect-

tion, the omental stump should always be returned into the abdominal cavity and not be permitted to remain near or within the hernial ring. I have seen, with Dr. Forchheimer, one internal strangulation consequent on the fixation of an omentum to the internal ring, after a radical cure had been effected by truss. Personal experiences I have not had with complications produced by the omental pedicle returned to the abdomen. Those interested in the subject will find them ably set forth in a recent paper by Dr. Bull.

Hernias in which there is obstruction without strangulation are generally dry. The coils of intestine are reddened, covered often with fibrinous flakes, and often adherent to each other and to the sac wall. Such adhesions should always be severed, lest after reduction the obstruction continue. The greatest care is necessary in severing the adhesions which have formed within the neck of the sac. They must be looked upon as the barrier to peritoneal invasion from an ulcerated bowel. Even with the greatest care, a rent may be made here as the bowel is drawn into the wound. This accident happened to me during the winter, before my class.

There are few things more beautiful to the surgical eye than the fast changing colors of a tightly strangulated intestine, relieved of its constriction. Within a few minutes, dark brown or even black, in turn becomes chocolate, purple, dark red, and pink before the intestine is normal. The contained gases pass on, the constriction groove becomes shallower and while you observe, peristalsis may be reëstablished. Such an intestine can be returned with safety. Here are two things to be remembered: 1, it is as unsafe to return a distended gut to the abdomen after herniotomy as after abdominal section; and 2, that false reductions can be made after an operation quite as easily as after taxis. The absence of the gut from diverticula of the sac, which may be present between the musculo-fascial planes or in front

of the peritoneum, must be established by the finger within the belly cavity before the reduction of the hernia can be said to be assured. With a free severance of adhesions about the neck of the sac, a mass reduction is not possible after herniotomy. When complications such as these follow herniotomy or taxis, the opening of the abdomen is justifiable. In no ordinary strangulated hernia, however, is hernioceiotomy a proper procedure.

Introduced as early as 1590 by Rosset and in 1723 by Cheselden, this chimera was almost forgotten until Mr. Tait made an effort to revive it in a paper before the British Medical Association, in 1891. Possibly of service for the radical relief, for reasons almost obvious it can have no place among procedures for strangulated hernia.

The most important question entering into the treatment of this subject is what to do with gangrenous hernia. Shall the constricting ring be divided? The theory was long advocated, and recently again promoted by Banks, that the constriction ring should ordinarily not be divided in gangrenous hernia, on the ground that it bars the development of general peritonitis. By the constriction the septic products of a hernia may be isolated for a time. But the peritonitis develops from within, and that without the direct implication of the intestine. In a case of gangrenous hernia which contained only omentum, seen with Dr. Tilton, of Kentucky, death resulted from general peritonitis. Just beyond the neck of the sac was the colon fixed by the adherent omentum, and its wall rendered paretic through traction, was unable to resist the passage through it of organisms fatal to the peritoneum.

Gangrene of the omentum is rare. Its safety is found in the ease with which it forms adhesions to the sac wall, through which it then receives its nutrition. The case alluded to is the only one I have seen. Benno Schmidt questions altogether the existence of primary strangulation of the omentum.

Of Hagedorn's 170 cases, gangrenous omentum was only once the sole occupant of the sac. I have found reports of two other cases; one from Heidelberg; the other of W. H. Bennett, of St. George's Hospital. There is but one opinion as to the management of gangrenous omentum. Excision after ligation in healthy tissue, and return to the abdomen, generally ends in recovery unless peritonitis already exists. The three cases quoted all recovered, although in each the radical operation followed that for strangulation.

When gangrene involves the intestine, the solution of the problem is far less easy. Since Ramdohr first successfully resected the gut for hernia in 1727, the possible success of primary excision has been conceded.

Of recoveries there have been many. But the measure, however ideal, has never gained firm footing among surgical procedures. This in face of the fact that the results from the alternative measure, that of the formation of an artificial anus, have been most deplorable. Recently Poulsen reports twenty-nine cases, with but four recoveries. Of thirty-five cases as treated at St. Bartholomew's, four were saved (*British Medical Journal*, June, 1891, vol. i., p. 701). Certain it is that all cases should not be treated alike, and that every case ought to be considered with reference, first to the condition of the intestine and its environments, and second, the ability of the patient to bear the shock of a prolonged operation.

A strangulation affects the gut either along the line of constriction, or at some or all points of the coil involved, or in the course of the intestine for a varying distance above the point of constriction. Where the constriction band binds the gut, a well-marked groove is made by direct pressure. The constriction, tight enough to occlude the caliber of the bowel, may not interfere with its vascular supply. If gangrene results it will be from pressure at the bottom of the groove and limited in extent. Except

for the usually small ulcer in the constriction groove, the gut above and below may be normal in appearance. In the fruitless effort of nature to protect the general peritoneum, adhesions are quickly formed between bowel and neck of sac. In the attempt to sever these, the fragile wall of the bowel tears along the line of constriction. Doubtless many cases of this kind occur, the fecal outpour taking place at the time of the operation. To avoid this it might be wise to follow the practice of Mikulicz, who in every case of suspected gangrene opens the rings from within the belly cavity, thus making a laparokelotomy which permits, as he thinks, thorough isolation by gauze of the infected area. The difficulty appears in the fact that pressure gangrene limited to the furrow and made by the constricting band is not always easily recognized. Fortunately the tissues about it, whether torn by manipulation or not, are in a fair condition for partial excision and lateral suture, by which the patient may be saved the perils and annoyance of an artificial anus. Krumm reports such a case successfully treated, and Barette three, of pressure gangrene successfully managed in the same manner. In such a case the gangrenous area may profitably be inverted and the contiguous parts sutured in a horizontal fold. In the case of rupture appended, the aperture was treated as a gunshot wound, sutured, and the coil returned to the abdomen, but anchored for forty-eight hours to the wound by a catgut suture through its mesentery.

In some cases the force of the strangulation, although influencing the circulation of the whole knuckle, appears to affect most seriously its central part and at a point farthest removed from the mesentery. It is clear that if in such a case excision were to be done, it could only be beyond the limits of constriction. The cyanotic gut about the really gangrenous center would ill support a suture. Let alone it will recover. The handling incident to suture might easily prevent it. Furthermore, in cases of

this nature the gangrene is often more extensive than is apparent. Beginning generally in the mucosa, the serous tissue is the last, and therefore least affected. The fixation of the gangrenous area in the bottom of the wound, relying on nature to make the anus preternaturalis, appears to me sound judgment. The data on which this view is based differ from those which militate against the formation of a fecal fistula when the gut is gangrenous in its entirety.

First and foremost, the caliber of the gut remains patent, and death from inanition is rendered impossible. Again, the fistula which results will probably be small, and close in a few weeks or months without operative interference.

When gangrene involves the entire strangulated knuckle the appearances are sufficiently characteristic. Chocolate, or dark slate-colored, denuded in patches of its peritoneum, covered with flakes of lymph and in a collapsed condition, it fails to react to mechanical or chemical irritation. The odor is fetid before perforation has taken place. When the strangulation has been very acute, the changes in and about the hernial sac need not be very marked. After the escape of a varying amount of turbid bloody fluid from the sac, the latter appears of a bright or dusky red, minus the glistening appearance of the normal serosa. When it is of older date, one after another of the hernial coverings is involved in the inflammation. They are welded together, in turn to break down. A fecal abscess is the result.

The most serious and far-reaching changes in gangrenous hernia are often found in the afferent portion. They may be said to involve its caliber, its nutrition, its contents and the peritoneum, singly or together. Although long recognized, the dangers inherent in this part of the intestine have recently been strongly brought forward by Beneke. Above the constriction there is always some dilatation with more or less paresis and congestion of the intestinal wall. It may be dark in color and edematous from

venous stasis. Possibly from the same cause its mucous lining secretes abnormally, and as a result, at times, enormous accumulations of fluid are found—according to Mikulicz from one to three quarts. This forms an excellent culture medium for bacteria and in the process of putrescence, toxins are formed, the absorption of which doubtless accounts for many deaths under the mask of acute sepsis from strangulated hernia before peritonitis has developed. The disintegration of this fluid gives rise to a fecal odor irrespective of the site of the constriction, and it is this fluid forced into the stomach and thence regurgitated that is so often mistaken for fecal vomit.—(Mikulicz.) Furthermore the wall of a paretic and congested gut has no power to resist the pathogenic organisms which it incloses. Far above the constriction, hemorrhagic infiltrations, diphtheritic-like deposits on, or ulceration of the mucous membrane may ensue. This is far more liable to such necrotic changes than the outer tunics and there is no way of knowing how far the process has extended. In one of Kocher's cases the gangrene extended four inches, and in one of Taendler's six inches above the suture line. In a case not submitted to operation, the diphtheritic deposits were found six feet above the constriction.

When death follows hernia, the symptoms of peritonitis are rarely absent. In the majority of cases, even of gangrene, there is no perforation within the abdomen, and the course of the peritoneal infection must have been through the microscopically intact gut. That it may occur where the gut does not enter into the hernia has already been seen. It has long been known through Nepveu's investigations that the fluid transudate in a hernial sac is rich in pathogenic organisms before gangrene has developed. Benneke has recently shown that the bacteria readily pass through the wall of the paretic bowel and produce diffuse peritoneal infection. On microscopic sections he was enabled to trace their progress

through the intestinal wall. (Before the French Surgical Congress, Clado has recently made similar demonstrations.) From these sources metastatic infection in remote organs may ensue. The process is like that seen in other morbid conditions of the intestine; notably in typhoid fever and appendicitis, where peritonitis develops without actual perforation.

Equally important with the local, is the general condition of the subject of a gangrenous hernia in determining the plan of procedure. When delay has brought the patient to the verge of collapse, when even the shock from prolonged anesthesia can not be ventured, *that* must be done which most readily gives relief to the strangulation. It may be the opening of a fecal abscess, the division of the stricture, or the rapid fixation of the gut in the wound. Whatever the procedure adopted in the condition indicated, the result will probably be the same—death within a few hours or days.

In most cases, however, the condition is less deplorable and evidently tolerant of a somewhat prolonged operation. It is in this class that choice must be made between the establishment of an artificial anus and resection of the bowel with immediate suture of the divided ends.

Authorities are at variance as to the value of the two procedures. In England, Baker, MacCormac, Banks and Treves decidedly oppose the greater operation of resection. In this country the same opinions have been held, unless they have been recently influenced by the reports of successful cases of excision by McCosh, Richardson, Dawbarn and others. In Germany, Kocher's and Czerny's first successes were followed by many failures which frustrated the natural desire of surgeons to make primary excision the normal procedure in gangrenous hernia. Finally Reidel's critical review of the statistics in 1883 made it appear that the preferable primary operation was enterostomy, to be followed by a second operation for the closure of the preternatural opening. From

the first, Kocher has remained steadfast to the ideal operation, and in Mikulicz he has recently found a most able supporter.

The advantages and disadvantages of the two procedures are almost apparent. If primary resection is successful, the patient is well in from four to six weeks. If an artificial anus is successfully established, a second operation of a very serious nature must follow. The artificial orifice is as large as the bowel, and the mucous membrane is prone to prolapse. Such an opening never closes spontaneously.

While in a considerable number of cases the enterotome of Dupuytren might be successfully applied with the low mortality of 5 per cent. (Korte), it will fail in many cases and be absolutely inapplicable in others. Again, according to Dupuytren, it should not be used for two or three months after the primary operation. It is during this interval that the greatest danger from artificial anus is encountered, that from progressive inanition. Recently Poulsen has used it twelve and even nine days after the first operation.

It has not yet been established how much of the intestinal canal is essential to the maintenance of nutrition, but where the fistula is above the mid-part of the ileum, rapid emaciation and death follow before any secondary procedure for closing it can be practiced. McCosh does not overrate the argument of statistics in the statement that the death rate of all cases in which an artificial anus is made, including the operations for its relief, is 50 per cent. The danger from secondary resection and enterorrhaphy is very considerable. Haenel mentions forty-three cases, with sixteen deaths and two failures.

To be successful, the artificial anus must be established in healthy bowel, else the dangers inherent in the afferent portion will not be removed nor will a free outflow from the intestine be secured. The only advantages therefore which can be claimed for this method are the rapidity with which it can be per-

formed and the slight technical skill required in its performance. A further advantage is supposed to exist in the lesser danger connected with this, as compared with the major procedure of immediate resection.

There is hardly a subject in surgery concerning which statistics are so much at variance as are those relating to gangrenous hernia. According to Korte, of 111 cases treated by enterostomy, eleven ended fatally. Herman (quoted by Haenel) mentions eighty-three cases with seven deaths. On the other hand, Weil reports fifteen cases with thirteen deaths. Benno Schmidt places the mortality at 85.5 per cent. for the formation of an artificial anus, as against 71.1 per cent. for primary resection.

F. A. Southern, Surgeon to the Manchester Royal Infirmary, recently reports eighty-five cases of herniotomy with nine cases of gangrene. All of the latter died. In six, an artificial anus was made; in three, primary excision.

If statistics are of any value in solving the relative merits of enterostomy and primary excision, it is evident that the reports of scattered cases are far less weighty than such from a few skilled operators, and from hospital records where nothing is concealed. Such a tabulation has recently been made by Mikulicz from seven large clinics of Germany and Switzerland. Of 168 cases of gangrenous hernia, 109 died. Of ninety-four in which an artificial anus was made, seventy-two died; mortality, 76 per cent. Of sixty-eight primary excisions, thirty-two, or 47.1 per cent. died. Of six intermediary resections, five died. It would appear from this that the mortality of primary excision is very much less than that of the lesser operation. But this can be accounted for by the certainty that the latter was often used as a last measure in conditions approaching collapse, and therefore precluding the major operation.

These statistics practically coincide with the very

extensive and recent tabulation of H. P. Zeidler, of St. Petersburg. Of 289 cases in which primary excision was performed, 142, or 49.13 per cent. died. Of 287 cases in which an artificial anus was established, 213, or 74.22 per cent. died. This is an increase in the mortality, of 25 per cent. In the group of cases of artificial anus there were 5.55 per cent. more of cases hopeless from the beginning than in the group of primary resections. This still leaves 17 per cent. of cases which might probably have been saved by primary excision.—(*Cent. f. Chir.*, 1893, p. 62.)

The advantages of primary resection are patent. Its disadvantages are, the time required for its performance and the danger of peritonitis from imperfect technique. In a measure both can be overcome. The first of these is probably grossly exaggerated. With separation of the mesentery and its closure by suture, to be followed by the continuous Lembert-Czerny suture, by lateral anastomosis, or by the use of button or potato plates, not more than half an hour at most should be required for the enterorrhaphy. Complicated clamps, a separate row of stitches for mucous and serous tunics, interrupted sutures unnecessarily waste time. When the continuous suture is used and appears weak at points, a few supplementary stitches can easily be taken. Suturing the mesentery brings the intestinal ends naturally together and gives assurance that the most treacherous part of the suture, that near the mesentery, can be properly applied. The second danger is from injudicious selection of the lines for suture. As elsewhere in gangrenous processes, the danger lies rather in removing too little than too much. If Kocher excised five and Koeberle six feet of intestine, a few inches more or less can not be important. In acute cases, where the caliber of the gut has not been long occluded, and koprostasis is little, if at all developed, an inch or two on each side of the constriction groove will probably bring the suture line in healthy

tissue. Where the mesentery has not been included in the strangulation, the same favorable conditions may be expected. Where, however, much dilatation of the afferent gut exists, its thorough evacuation should precede the enterorrhaphy. After hernia, as after laparotomy for obstruction, it is fatal to return a distended gut to the abdomen. The further danger, that of septic infection of the peritoneum, can in a large measure be reduced by thorough irrigation of the sac before suturing; by careful handling of the gangrenous gut without the wound, meanwhile protecting the peritoneum by gauze packing. Finally, the sutured intestine should be left just within the abdominal cavity and a radical cure should not be attempted. Mikulicz, whose success surpasses that of any other operator—twenty-one cases with fourteen recoveries—insists on the open treatment of these cases. Should fecal extravasation ensue from defective suture or other cause, it would naturally turn towards the wound, whereby the danger of general peritonitis would be largely averted. For from two to five days after the operation the sutured intestine remains where it is placed within the abdomen, and after that length of time the development of peritonitis is not probable. To hasten the process of wound repair, deep and superficial sutures might be drawn through the wound margins and kept over the gauze packing, to be tightened without anesthesia after the danger line has been passed.

Between the extreme measures considered, others looking toward a compromise have recently been brought forward by a number of surgeons. Among these are the intermediary, excision and suture of Riedel. The artificial anus is established in the usual way. After twenty-four or forty-eight hours the edges of the intestine are vivified and united by suture. In 1882 Bouilly suggested excision and suture, the latter being purposely made imperfect at one point to guide the fecal extravasation. To avert the danger from imperfect suture, Hahn follows the

kelotomy with a median laparotomy. Through this wound he brings the divided ends of the bowel, thoroughly protecting the abdomen against infection by packing them in gauze. When the suture is completed, the closed knuckle is kept in the wound between gauze splints until union is assured. The competency of the suture is certain after twenty-four hours, when the bowel is returned to the abdomen and the external wound closed. It is difficult to understand why the same procedure should not be carried out in the inguinal herniotomy wound. Nevertheless, Hahn has had two successes with it, and in a third, reported by Kutschera, the result was equally satisfactory.

To overcome the danger from death from inanition, Helferich has recently combined enterostomy with an intestinal anastomosis above the constriction furrows. By this method two courses are open to the intestinal circulation, and the closure of the artificial anus is greatly facilitated. The operation was done in two cases, one of which was successful, the fecal fistula closing spontaneously.

There is yet another class of cases in which the condition of the bowel is such that whereas gangrene is not yet present, it might through subsequent necrosis cause death if returned to the abdomen. Such a knuckle is a menace. Who has not seen it? Especially if operating by light, both artificial and bad. A bowel that is not at all doubtful in appearance will at times repay the trust placed in it by a perforation. Among ninety-six deaths after herniotomy, it was in twenty-six cases the result of returning to the abdomen intestine which subsequently perforated. In Hagedorn's clinic three deaths out of fifteen resulted in the same way. To return doubtful intestine is unnecessarily jeopardizing life. To treat such intestine as radically as bowel already gangrenous is an extreme measure, not to be advocated. Fortunately the intestine can be retained in the wound for a number of days in gauze packing or by sutures. When its viability has been established, it is an easy

matter to return it to the abdomen. Graefe recently reported a successful case in which the intestine was so retained for five days before replacing it. Should the dread of adhesions be feared, the intestine might be retained just within the abdomen by fixation sutures or by gauze. In the event of gangrene, the fecal extravasation would course toward the external wound.

When in 1880 Czerny reported his first case of primary excision for gangrene, he believed that the operation would not displace the older operation of enterotomy. Although the last four years have brought forward success after success from primary resection, the dictum of Czerny still holds good. Each operation has its proper field. The boundary lines are becoming more clearly defined. Nevertheless, it must always remain for the judgment and tact of the surgeon, as individual cases arise, to determine the proper procedure to be adopted. In operative surgery, as elsewhere, the ideal should be sought. This would make primary excision the normal procedure in gangrenous hernia, and only cogent reasons should cause the operator to refrain from striving for the ideal.

Case 1.—Male, aged 60 years; Germantown, Ohio; left inguinal hernia; reduction by taxis; obstruction unrelieved. Two days later, laparotomy by lamplight. Bowel apparently viable. Perforation, peritonitis on fifth day. Death.

Case 2.—W. P., male, aged 29 years; Carlisle, Ky. Rupture of several years standing. Taxis attempted on second day. Operation in the night of the fifth; one-half pint of foul smelling bloody serum in the sac. Omental mass large as a fist, gangrenous; no intestine in sac. Death in twenty-four hours from peritonitis.

Case 3.—Miss D., aged 30 years; seen with Dr. Jenkins, of Newport. Recent rupture of four days; strangulation. Sac contained several ounces of bloody serum; coil of small intestine four inches long; in its center, opposite mesenteric pudic, gangrenous patch large as a silver quarter. Constriction divided; intestine anchored by catgut suture through mesentery; gauze packing; perforation on the fourth day; profuse discharge during two weeks. Gradual contraction of fistula and permanent closure in one month.

Case 4.—Mrs. K., age 56 years; seen with Dr. Harff. Large intestinal inguino-labial hernia. Strangulation by band;

operation twenty-four hours after inception; gangrene of intestine; excision of fourteen inches and end-to-end suture by Czerny-Lembert method. Recovery.

Case 5.—Mrs. P., age 48 years; seen with Dr. Potter, Carthage, Ohio. Small femoral hernia right side; strangulated six days; refused earlier operation. Great abdominal distension; vomiting fecal. Pulse 110, temperature 101. Fetid and bloody fluid in sac; loop of small intestine six inches long, gangrenous, afferent gut normal. Relief of constriction, excision of seven inches of gut. End-to-end suture by Czerny-Lembert method. Fixation of gut near wound, gauze drainage, death in twenty-four hours from peritonitis.

Case 6.—I. F., male, age 54 years: Good Samaritan Hospital. Irreducible femoral hernia; right side; strangulated four days; fecal regurgitation; general condition good. Few ounces of purplish fluid in sac. Knuckle of intestine and adherent omentum in sac. Constriction at Gimbernaut's ligament divided. Intestine gives. When brought into wound there is a perforation in the constriction groove one-third inch wide and one-half inch long. Edges normal. Inversion and closure by suture as in gun-shot wound. Slight anchoring of intestine; gauze packing; uneventful recovery.

Case 7.—Mrs. H., age 35 years; seen with Dr. Hoppe; four months pregnant. Right irreducible femoral hernia of many years standing. Absolute constipation five days, vomiting twenty-four hours; sac contained several ounces of bloody fluid and adherent omentum and a knuckle of small intestine, eight inches long. Gangrenous in constriction groove but not perforated. Anchored to wound. Fistula established on fourth day; closed permanently in a month. Recovery.