ABBE (R.)

THE PROGNOSIS AND TREATMENT OF ACUTE GENERAL PERITONITIS.

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FROM
THE MEDICAL NEWS,
May 29, 1897.

[Reprinted from THE MEDICAL NEWS, May 29, 1897.]

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TWENTY years ago, the dread of peritonitis after operations within the abdominal cavity where previous inflammation did not exist, was still the bugbear of surgery. It has gradually occupied a lessening position of seriousness in the calculations of the operator, until to-day the surgeon, who is properly cognizant of the powers of the peritoneum to aid him when respectfully treated, completes his work (no matter what immediate soiling has occurred, be it extravasation of bile, urine, feces, or pus), with slight apprehension that post-operative peritonitis will occur. The once-dreaded invasion of the peritoneal cavity has become a matter of safe conduct when the operator is the invader. Nevertheless, this same cavity has become a battleground of great interest in the surgical field to-day, when not the surgeon, but germ-laden matter, is the invader, and precedes the surgeon by many hours. Here the race becomes unequal. A death-dealing blow has been dealt to the human body in one of its most vital parts, a blow from which it is possible to rally, under some circumstances, by intrinsic powers of resistance, but which, under most conditions, is followed by an encounter, the outcome of

[1] A contribution to the discussion upon "Peritonitis" at the the Fourth Triennial Congress of American Physicians and Surgeons, Washington, D. C., May 4, 5, and 6, 1897.

which will often depend on extrinsic aid from the physician and surgeon.

It is to the study of this most important and narrowing field that our attention is turned.

That the peritoneal cavity is not equally impregnable in all its parts is a well-established fact. Not that the same susceptibility does not exist in all anatomically similar portions of its surface, but from varying contour, or proximity to actively moving viscera, it transpires that the greater part of those invasions which originate in the pelvis, or in the fossæ outside the colon, or in a less measure in the area anterior to the stomach and liver and above the colon, become localized within a few hours, and are under the control of Nature's reparative processes in the confines of quickly built up lymph walls; while a discharge of offending secretions into the more central part among the small intestines becomes a grave menace, from causes the principal of which seems to be the difficulty encountered in throwing up barriers in the presence of quick-moving intestinal coils, which rapidly distribute the infection.

Hence, we will see that the location of the invasion, independent of the quantity and virulence of the material spread about, has much to do with determining the gravity of the case and the need of action. The scholarly treatment of the subject of general peritonitis, in all its minor and major phases, by Treves and other writers, and the graphic delineation by Dr. Senn of the varieties and classification, impress upon our minds the value of thorough understanding of the nature of peritonitis and the methods adopted by Nature to save life. They prepare us to

accept the dictum that all peritoneal invasions by infectious processes, of which we shall speak, are essentially fraught with the greatest peril. Although general peritonitis may originate in any portion of the cavity, we must exclude from our thoughts in this discussion all limited forms, no matter how grave their concomitant symptoms. We know that an intra-abdominal abscess or slight infection may be accompanied by so grave symptoms that, to the clinician, it may seem to be a case of general peritonitis, and a surgeon may even wrongly report operation on general peritonitis, because he has opened an enormous abdominal abscess which had crowded the uninflamed intestines into the upper part of the abdomen.

The grave form of acute general peritonitis which we are to consider is one which is caused almost universally by the rupture of some one of the hollow viscera (stomach, intestines, appendix, or bladder), and for the practical surgeon need not be classified on any but a clinical basis. We must accept the universal bacterial origin of peritonitis, and regard the victim as poisoned by the septicemic infection. Apart from all other considerations we must say that acute general peritonitis shall include only those cases in which the infection is not confined by any lymph barriers. The stage at which it is seen will determine the area of the peritoneum invaded. The affection is the same whether it include half or all of the entire peritoneum—for who can say when the last few inches are affected? The case which we operate on to-day and find universal had spread to only half the abdomen yesterday and six hours

earlier to one-quarter of its area. The surgeon has to form an estimate of each particular case at the time of operation by the naked-eye appearances and thus classify it as to gravity. If he has been fortunate enough to inspect it by early operation he will find most various appearances all illustrating an early stage of a disease inevitably advancing to a fatal issue. The one essential feature that allows a case to be classed as acute general peritonitis is that there are no boundary limits. Given a turbid, semi-purulent or purulent effusion about inflamed small intestines arising from perforated stomach or gangrenous appendix, with no effort of Nature to wall it in, and the fatal end of the case is not far off unless arrested by the surgeon. Septic infection has already occurred and Nature has failed to wall it in.

The only subclassification of this form of peritonitis is into the early and late stage. Both are equally grave if left to Nature.

Opinion has been growing skeptical as to the value of operation in this form of peritonitis in any stage. Speaking of general diffused non-tuberculous peritonitis, Treves says: "I am doubtful if a single human life has been saved by surgical interference in a genuine case of peritoneal toxemia." Richardson says: "In a large number of cases of general peritonitis, verified by bacteriologic examination, the result with hardly an exception has been fatal in my hands under any method of treatment." Weir says that he had never been able to save a patient nor had he seen one saved. Von Winivarter, after a large experience, writes: "In not a single case where the exudate had a fecal odor have I succeeded

in saving my patients, all have succumbed to the septic intoxication. . . . We possess no means of checking a peritonitis of septic character." Regnier says: "Laparotomy and lavage are unavailing for the cure of a true general peritonitis. The various cases we hear of are cases of large encysted purulent collections." Delorme says: "I have operated on many cases of general peritonitis and I have lost all my patients."

Facing this pessimistic opinion, which is echoed from many sources, it seems evident that the optimism of those who report from thirty to sixty per cent. of cures, is born of a misunderstanding of the variety of the disease discussed. Let us then make no mistake in appreciating the character of the disease.

As I have already stated the only warrant for classing cases under this head is the presence of reasonably extensive involvement of some part of the small intestine from foul contamination, which is absolutely not limited by any boundary adhesions. As far as septicemia goes, they are all septic, and under the above conditions practically guarantee an ultimately fatal issue under expectant treatment. Demonstration of the presence of noxious bacteria in the exudation has been so constantly shown that it may be admitted to be universal. Acute general peritonitis is an *a priori* argument of their existence.

The variety of the bacterial flora corresponds with that found within the intestines. Elaborate research has already demonstrated the streptococcus and bacillus coli commune as most uniformly present. Therefore, we are prepared to study the prognosis of *unlimited peritonitis* from an operative point of view,

regarding it, if fairly widely developed, as being on the high road to a fatal issue.

The effort made by the system of the patient to protect and rid itself of the parasitic assault, is a complicated and beautiful one. The power of the peritoneum to rapidly remove large quantities of fluid, introduced experimentally in animals, as studied by Wegner and others, demonstrates that from three to eight per cent. of the animal's weight of fluid can be taken up in an hour—equivalent to the entire weight in one day. Murcatello demonstrated, also (*Virchow's Archives*, 1895), that the current of absorption is toward the diaphragm, which fact is of practical import. Carmine particles suspended in fluid are quickly carried through the intercellular openings in the peritoneum covering the diaphragm into lymph spaces beneath, where direct communication is had with the mediastinal glands. Here the parasites can be found arrested in five to seven-minutes' time if the animal is held head downward.

Before the visceral peritoneum begins absorption into the lymphatic system of the mesentery that which lines the diaphragm has given exit to bacterial infection and leucocytes, which are speedily taken into the blood current and sent to the large abdominal organs—the liver, spleen, and kidneys.

Experimental research shows that when a small amount of infectious culture of intestinal bacteria is injected (a cloudy emulsion of 5 or 10 c.c.) it can be disposed of without fatal effect. A small quanity produces diarrhea; more, a local peritonitis; still more, a fatal fibropurulent peritonitis—and a larger dose, acute fatal sepsis, without peritonitis. Exam-

ination of the survivors show no streptococci in the peritoneum 5½ hours after injection of small quantities. The experiments of Barron and others, however, show that a very minute quantity of fluid from an inflamed part (such as fluid from puerperal peritonitis) produces much graver symptoms than a larger quantity of a culture from the same germ. The destruction of bacteria by phagocytosis, and the unexplained bactericidal action of blood-serum, are coincident methods called into action in the emergency and need no description here. When the injection is severe they are inadequate and every organ teems with bacteria soon after pronounced septicemic symptoms appear.

With such recognition of the power of the peritoneum to rid itself of small toxic doses, we turn to the demands made upon it by disease and accident. Taking the experience of hospital surgery as representing an average we find that acute general peritonitis results in the majority of cases from infection starting from the appendix. Second to that, perforating gastric ulcers, intestinal traumatisms, ruptured pelvic abscesses. Ruptured urinary and gall-bladders occupy a relatively smaller place.

With the nature of the invading medium, it is evident, the virulence of the attack must vary. A discharge of stomach secretion into the peritoneum seems not to be so quickly toxic as a minute quantity of active poison pent up in an already inflamed appendix, yet by its eroding action on the endothelium paves the way for absorption soon after. So also with normal urine or intestinal contents not in a state of inflammatory ferment at the time of invasion.

In such cases septicemic symptoms supervene some hours after the accident. Perforating gastric ulcer, if it has time to leak slowly into the peritoneum, will almost surely be controlled by adhesions, and the alert operator may save general invasion by incising the epigastric abscess.

Most perforations, however, occur after a meal, and general peritonitis is set up simultaneously from the stomach to the pelvis. The degree of inflammation found will be in exact ratio to the lapse of time before operation.

Recent statistics show that, up to five years since, no operative case for perforating gastric or duodenal ulcer had recovered. Weir has recently collected 97 operations, with 22 recoveries, and to his statistics I am able to add a summary of twenty reported later, three of these being my own. In these additional 20 general peritoneal extravasation occurred in 18, and of this number 12 recovered and 6 died. Out of the 12 recoveries operation was performed within ten hours in 7 and after twenty-four hours in 5, showing the value of prompt action. Of the six fatal cases in all but one operation had been delayed until after the first day. In two fatal cases the peritonitis was practically cured, but the patients succumbed to septic pneumonia as late as the seventeenth and twentieth days. Weir says, in reviewing his statistics: "More than half of all the patients operated on in the first twelve hours recovered, the mortality being 39 per cent.; while of those operated upon from twelve to twenty-four hours after perforation, 70 per cent. died, and of those who came to operation after the first day, 87 per cent. suc-

cumbed." In conclusion, he says: "The happy result of operation is dependent more upon its early performance than upon any other factor." My own feeling is most hopeful that future contributions to this subject will show that the earlier we can operate on these cases, the more surely will we be able to combat the disastrous accident.

In gunshot or stab or penetrating wounds of the abdomen there is a universal consensus of opinion that operation at the earliest possible moment is the only justifiable attitude. The surgeon can never be absolutely positive some organ is not injured or that there exists concealed extravasation until he has seen the invaded part. If it be a slight stab wound, or if shock is greater than will warrant anesthesia, it is incumbent on the surgeon to make an incision or an extension of the wound under cocain anesthesia, and if nothing be discovered he may then be justified, and only then, in awaiting symptoms. If he finds perforation or hemorrhage, a temporary arrest of the flow will be conservative until two or three hours have given the patient time to recover from shock. The statistics of gunshot wounds corroborate the value of promptness, as seen in every other phase of abdominal work. Of 39 cases operated on within twelve hours, 18 recovered, while of 22 after twelve hours, only 5 recovered. Likewise in rupture of the urinary bladder, which was uniformly a fatal accident until recently, the mortality has been reduced from 90 to 50 per cent. during fifteen years. Sieur's paper reports 34 cases and 14 recoveries. Schlanger notes 22 operations and 10 recoveries. The evidence is accumulating that early cleansing and draining will

insure a prompt recovery, unless cystitis be previously present when the chance of grave peritonitis is enhanced. So also if the gall-bladder be inflamed at the time of injury, the bile is swarming with bacteria, notably the coli commune, which have worked back from the duodenum, and septic peritonitis is imminent unless quick and thorough precaution be taken. Normal bile, however, will be fairly well borne and disposed of by the uninflamed peritoneum.

The phase of acute general peritonitis from perforating typhoid ulcer has seemed to me to differ but little in its course and treatment from that following ulceration of other parts of the alimentary canal. The patient's lower vitality does not militate so greatly against recovery as one would imagine. The peritoneum is able to throw reparative lymph about a slow perforation, though usually it is overwhelmed by a sudden liquid extravasation. The beneficial results of interference are shown by the case of Van Hook, which, as yet, stands unequalled. He operated at two in the afternoon in a case where rupture occurred at five in the morning (nine hours before). Extravasation had taken place wide of the ulcer. The opening was sutured, the abdominal cavity thoroughly washed out, and the patient rescued from collapse, and saved. Excluding all doubtful cases, Finney finds 11 recoveries after 45 operations, showing a success in 26 per cent.—certainly a very admirable showing in the face of practically certain death. The evidence, as he shows, is clearly in favor of early operation. The most striking recoveries were among those operated upon twelve hours after the accident.

It is well recognized that in this trouble there is a marked signal symptom of the beginning perforation. The patient has "sharp continued abdominal pain coupled with nausea." As in gastric perforation the patient feels as I have had them express it either a "tearing pain" or as if something had given way. Hence, the attending physician has in most cases every reason to suspect the nature of the disaster, and little excuse for masking the symptom by morphin while waiting for peritonitis to set in before seeking surgical aid.

After the foregoing considerations we are now able more intelligently to consider the prognosis in that disastrous condition seemingly more common every day, *viz.*, acute general peritonitis of appendical origin. Granted that ninety per cent. or ninety-five per cent. of mild attacks of appendicitis pass over without grave results, there still falls to the lot of the surgeon that unhappy group of septic cases which are presented to him for cure by the too often delinquent practitioner after from two to five days of hopeless expectancy. Of this type, with non-limited inflammation, all are in various stages of septicemia, and the dullest observer must admit that, be it early or late, the patient is on the highway to more profound infection and inevitable death. The literature of the last two or three years teems with references to individual cases and opinions, showing confusion of classification and reporting oftentimes doubtful cases.

I have chosen therefore to ask you to consider a very few reported consecutive cases representative of this class.

Two years since McBurney chose a group of twenty-

four cases distinctively of this type operated on by himself during the previous five years and gave brief details of each, sufficient to identify it as justly classified. He also regards general peritonitis as including those not only which are seemingly universal but such as involve half or a quarter of the intestinal surface and are spreading without barrier at the time of operation. Of his twenty-four cases he saved fourteen. One reads though that in some cases limiting barriers had been thrown up but had subsequently burst and scattered the pus far in advance among the coils of intestine. McCosh, also, in a paper recently read before the Surgical Society chose, among his hospital cases, eight during the past two years and forty-three during the previous seven, which he had submitted to radical operation. Of the forty-three in the earlier group thirty-seven died (86 per cent). Of the eight during the past two years two died. Of all the fifty-one cases thirty-nine died (or 76 per cent). He has carefully confined his choice to cases of distinctly generalized peritonitis.

In my own practice I have chosen with the same point in view thirty-three cases, all that I have operated on during the past five years from among several hundred laparotomies. I would also add ten well-observed cases ably reported by Lockwood (*L. Clin. Jour.*, April 1, 1896) and nineteen consecutive cases during two years by Koerte (*Berlin. Kl. Woch.*, Aug., 1892). It would be unnecessary to enlarge this list for present discussion, and we may fairly say that this group of 137 cases are representative, and would be duplicated in consecutive work by most operating surgeons. As already remarked it is only fair to the

discussion to divide these into two groups, representing an early stage and a late stage as nearly as possible. A picture of the two types would be represented by what may be presumed to be the condition of the same patient operated on at the end of twelve hours or neglected until the third day.

From the milder class are excluded all those where clear serous effusion is found free, and from the second cases those where pus is scattered from an abscess at operation, or just prior to it, even though it be found smearing the intestine beyond confines.

In the first picture, the early stages, a day or two after a sharp onset of symptoms, operation will release turbid or semipurulent fluid, which will flow from between presenting coils of intestine before the appendix is reached, and will uniformly be found in considerable quantity in the lower pelvic pouch. When the operator has dried all presenting parts, he draws the dusky, inflamed intestines toward him, and finds no barriers of lymph adhesion; but as he sponges between the coils and advances into the center of the small intestine area, there is less and less appearance of inflammation. When the visible evidences are less, he thrusts sterile gauze pads still further into the interintestinal spaces, and later, on withdrawing them, finds them wet with clearer effusion than that already removed. He rests satisfied. The appendix in these cases may be either slightly perforated or gangrenous, free among the intestinal coils, or hanging loosely in the pelvis. It is bathed in foul-looking fluid, more turbid than appears elsewhere, and usually has a slimy, virulent-looking coating of non-adhesive exudation. If not thinned by

gangrene of its coats, it is highly inflamed and hard.

If treated expectantly it will represent the second class in from one to three days, and on incision thin pus (usually offensive) will stream out of the operative wound—will be found floating the bowels out of the pelvis, and come equally from the opposite side of the abdomen, or in the median line above the navel. The intestines are thickened or even granular, and reddened lymph patches are loosely and irregularly adherent. It is no wonder that surgeons stand appalled before this class and are skeptical as to their ever being cured.

Taking the class mentioned as the most fair that I can find for study we have the following showing:

McBurney, 24 cases, 16 recoveries; McCosh, 50 cases, 12 recoveries; Abbe, 33 cases, 9 recoveries; Lockwood, 10 cases, 3 recoveries; Koerte, 19 cases, 6 recoveries. Total—137 cases; 46 recoveries. It is possible in many of these to divide them into the two classes previously mentioned.

In my own, of which I have clear records, I can assert that of the 33 cases, 6 were of the milder type but progressing rapidly when operated upon, and 27 were of the grave type. Of the mild type 5 were operated on early, and 1 on the fifth day—all recovered. Of the grave 11 were operated on within two days, 3 recovered, 8 died; 16 were operated on from two to five days after the attack—all died.

Of the reported cases of McBurney and McCosh it is not easy to thus classify many of them, but choosing 28 cases, in which the time of operation is indicated, there were 18 of the grave type, and 10 of the milder. Of 6 grave cases taken within 1½

days, 4 recovered, 2 died; of 8 grave cases taken within 2½ days, 4 recovered, 4 died; of 4 grave cases taken within 2½ days, all died. Of 10 cases of milder type, 3 cases taken within 1½ days, all recovered; two cases within 2½ days, all recovered; 5 cases after 2½ days, 1 died. Of 19 cases of Koerte, 16 operated within 4 days, 6 recoveries; 3 over 4 days, all died.

For a summary then we may say that choosing only those 16 which are certainly of the milder type, judging from personal knowledge or the records, only 1 died. Of the graver type, 64, where the time is noted, the 17 recoveries were all obtained inside of 2½ days. There is but one logical deduction from this review—and that corresponds with the same, drawn with regard to perforations of the stomach and intestines—namely, that the element of time is the one of greatest importance. The earlier the operation the greater the hope. Only 1 death occurred in 16 slighter forms of advancing general infection, and almost no case of the graver type recovered after 2½ days from the hour of attack, the earlier periods showing most recoveries.

There is one point I have discovered in the review, that, of numerous cases where recovery takes place, albumin or casts are not found in the urine. I ask careful consideration of this by future reporters because it would seem that where the kidneys are choked up by the bacteria of septicemia it is practically useless to operate.

If time permitted, I would gladly give some thought to the evidences which distinguish a true case of beginning dangerous peritonitis from the milder local

troubles which often begin with seemingly the same violence.

Are there any entirely characteristic symptoms?

A study of the initial signs in cases which have come to operation and been proved has shown me that uniformity of symptoms is entirely wanting. A persistent diffused tenderness spreading to the opposite side of the abdomen is very grave. A board-like stiffness of both sides of the abdomen is suggestive. Tenderness at a point in the rectum as high as the finger can reach in the median line is a sure index of either an inflamed appendix hanging over the pelvic brim, or an acute peritonitis. A pulse that is rapid and quick, or "snappy," is almost a sure index of septic toxemia, and, if it persists more than twelve hours, calls for interference.

Vomiting will usually occur once with most mild attacks, but, if persistent, indicates mischief. The tongue may be clean and moist and the eye bright in one-third of the cases of grave peritonitis, even after two or three days.

The facies of abdominal inflammation is more often a late symptom.

Thoracic respiration is very often seen when spreading peritonitis prevails.

The temperature is frequently but little elevated during the first day or two, while the pulse may be showing great agitation.

These danger signals may serve to aid diagnosis before profound toxemia sets in; when the surgeon can do nothing.

Regarding treatment, substantial progress has been made in determining the lines of action.

There is but one opinion regarding the cleansing of the abdominal cavity when only the lower segment has as yet been invaded. The moment the surgeon sees septic fluid, he sponges it away before it can be scattered. He mops the presenting bowels with sponges in clamps, dripping wet with hot salt solution (℥ iss to a quart), and dries them again before drawing other coils into the field of inspection. As soon as parts are found not much inflamed, he pushes a sterilized gauze tamponade, properly folded, among the bowels far away from the field of work. This has a tape sewed to it, to which a clamp is fixed and left outside the wound. One or two such tamponades may be thrust upward and across the abdomen before the pelvis is cleansed, to which much attention is *always* to be given. This being thoroughly mopped out, a light packing of mild iodoform gauze is to be placed in the pelvis, and a short way among intestinal coils elsewhere, especially if the gauze tamponades now removed prove to have come out wet, absorbing the thin effusion from a distance. The abdominal wound should never be closed in any septic case. It wastes time, confines infection, and prevents drainage.

In the grave cases, a long median incision, or two lateral ones, will always be needed. The lumbar drainage incision will only be necessary when the median cut is used.

The question of drainage has been thoroughly settled in favor of ample gauze packing as against rubber or glass tubes.

The lymph barrier quickly thrown out by the peritoneum wherever the gauze is in contact at once

forms a boundary line, beyond which one process is going on, namely, absorption, destruction, and elimination of the marginal infection, already entrapped, while at the site of packing the current is reversed and everything is sucked into the gauze and removed.

When infection has been widespread there is but one alternative—irrigation. By flushing the interintestinal spaces systematically with hot salt water, as hot as the operator's hand can bear (which will be over 105°, usually), these effects are produced. The water cleanses and stimulates the patient amazingly. One sees the pulse respond at once and remain steady long after the operation, and the absorbing power of the washed endothelium is diminished. This has been shown by experiments of Kinscherf on animals where doses of strychnin or bichlorid of mercury left after irrigation were not absorbed, while the same put into the peritoneum of dogs not irrigated were fatal. Thus the toxin absorption is temporarily arrested, while the patient fights for time to discharge the burden already taken up.

In the large abdominal incisions in bad cases, it is wise to leave the wound widely open, the gauze will hold back the intestines, and abdominal straps and binder will support the abdominal walls.

If the intestines are distended with gas and fluid feces it is well to let them come out of the abdomen, receive them in hot towels in charge of an assistant, and prick one or two prominent places with a knife to evacuate gas and noxious excreta, which is washed away with a constant hot stream. Through one opening there should then be injected a syringe full of

saturated solution of Epsom salts and the puncture closed. I have done this on three occasions during the past three years, but only in the very worst cases.

McCosh, however, advises in all bad cases to pass such a dose of salts through an aspirating needle into the bowel, and close the aperature with one suture, which I heartily endorse as a routine procedure. It cannot be vomited, it excites downward peristalsis, and as it aids to carry off impurities, it proves of the greatest value.

In regurgitation lavage of the stomach should be done before and after operation, and repeated as soon as regurgitation is renewed.

The rectal tube to relieve distention by gas is of inestimable value, and its use not infrequently marks the turning point in the disease by promoting downward peristalsis.

Some of the most brilliant recoveries I have had have been where the attending doctor has been ineffectually plying the patient with calomel or physic, which acted only after operation, or where a good dose of calomel taken after operation has rid the body of all noxious excretions on the second or third day.

The value of an ice coil, or light broad ice bags after a general peritonitis, cannot be overlooked. I have great faith in cold thus used to retard the inflammatory action and bacterial growth either before or after operation. Moreover, it is almost uniformly grateful to the patient.

I will not detail other restorative measures which must be plied on general principles. Strychnia 1-40 gr. every two hours is sometimes necessary, and

in cases of severe pain when the patient is well out of ether, morphine, hypodermically, is rather helpful than otherwise.

In conclusion, I would say that close study of the bad cases of general peritonitis shows it to be one of the most absolutely fatal maladies with which we have to deal. It has also been demonstrated that logically and statistically the earlier the operation on the lines delineated the better the prognosis. It has been further shown that even in the bad form if operation be done and a masterly irrigation carried out there still remains a chance for life if the period elapsing be not more than two and one-half days. In cases where albumen and casts show in the urine it is proof enough that the system is already overwhelmed and the kidneys and other glands are choked and the operation hopeless.

The burden of responsibility then for fatal issues in so many cases lies not with the surgeon so much as with those who withhold from him the opportunity to render the prompt aid which we have shown is the only chance. The ideal success may be accomplished in the future not more by new methods than by new opportunities. The ideal operation may be the old method under ideal circumstances as to time.