

THE TREATMENT OF GENERAL SEPTIC PERITONITIS.¹

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THE object of this paper is not to give an account of the various methods which have been employed in the treatment of septic peritonitis, neither is it to dwell on the results of treatment as recorded in the statistics of different surgeons, but simply to state the conclusions which have been derived from my own experience in the treatment of these cases. My remarks will apply solely to that form commonly known as diffuse or general septic or suppurative peritonitis, where the infection, unlimited by adhesions, has extended to all parts of the peritoneal cavity. Intraperitoneal collections of pus, if walled in by adhesions, no matter how numerous or how extensive they may be, are not considered, neither are cases of tubercular peritonitis.

It is useless to discuss the medical treatment of this disease except, perhaps, to condemn in the strongest terms the inexcusable delay which is sometimes practised before the patient is handed over to the surgeon. Such delay will generally deprive the patient of the slight chance which may exist for recovery.

A connection for the past nine years with a public hospital, whose ambulance service covers a large territory, has given me the opportunity to observe many cases of general septic peritonitis. Most of these patients have been, on admission to the hospital, in a very critical shape, and a considerable number have been moribund and beyond all hope of recovery. Between the

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years 1888 and 1895, inclusive, I have operated in forty-three cases of general septic peritonitis. Of these thirty-seven have died and six have recovered, a mortality rate of about 86 per cent. It is, perhaps, true that at the present time some of these cases would not be subjected to operation on account of their hopeless character, but prior to 1890 the limits of laparotomy for the cure of this condition were not as clearly defined as they are at present. I will not weary you with the history of these cases, but will merely state that many different operative procedures have been employed. A free abdominal incision was made in all, and with a few exceptions irrigation was employed. It was omitted in a few cases where death on the operating-table seemed imminent, and any further procedure, beyond the introduction of a large, glass drainage-tube, was unjustifiable. Various irrigating fluids have been employed, solutions of bichloride of mercury, carbolic acid of different strengths, and of boric acid, Thiersch's solution, peroxide of hydrogen, and sterile water. In some cases the intestines were removed from the abdominal cavity for more thorough cleansing, in others, this was considered inadvisable. In a few cases the intestine was opened by a small incision to allow of the escape of gas and fæces in order to facilitate the return of the coils into the abdominal cavity. It was noted that such an incision did not relieve the distention for a distance of more than ten or twelve inches.

Various methods of drainage have been employed, a large, glass tube passing down into the pelvis, several rubber tubes passing in various directions, in a few cases leading out at counter-openings in the loins, strips of gauze, and various combinations of these methods.

As a rule, if a fibrinous deposit was found on the intestinal walls as much of it as possible was removed. I do not feel convinced of the wisdom of this procedure, and am in doubt as to which is the most judicious, to expose a raw surface for the absorption of sepsis or to shut up among the intestinal coils septic masses which may later break down into abscesses?

I will briefly mention two cases which serve to illustrate some of the methods employed.

Female, aged nineteen years; on March 14, 1889, she was seized with severe abdominal pain which increased until March 20, when she was brought to the hospital by ambulance. Bowels, in spite of cathartics, had not moved since the 17th; abdomen tremendously distended and tympanitic; constant vomiting; temperature (rectal) 97° F.; pulse 136. Fluctuating tumor in right iliac fossa; chloroform; laparotomy, median incision five inches long. On opening peritoneum purulent serum gushed out. This fluid permeated all parts of the peritoneal cavity and scattered through it were flakes of lymph. No adhesions found except around the right Fallopian tube, which was distended to the size of a cocoa-nut, and in its wall was an opening through which fetid pus was escaping into the general peritoneal cavity. The distended intestines were partially removed, the abdominal cavity thoroughly irrigated with gallons of hot, sterile water, and a large, glass drainage-tube inserted into the pelvis. The patient needed stimulation during the operation and was nearly pulseless at its close. She rallied and was out of bed on April 26, and discharged, cured, on May 6.

Male, aged twenty-seven years; gave a history of subacute appendicitis for several weeks before admission to the hospital, on April 23, 1890. Twenty-four hours before admission he was seized with sudden severe pain, vomiting, and signs of collapse. Vomiting and hiccough had been constant. On admission abdomen much distended and tympanitic; skin cold and clammy; temperature (rectal) 98° F.; pulse 120. There was a right inguinal hernia, very tense; chloroform; incision over hernial sac which contained a loop of intestine, purplish in color, almost gangrenous. Peritoneal cavity contained several pints of purulent serum; incision enlarged upward and the intestines congested, distended, and covered in spots with layers of fibrin were removed from the abdominal cavity and wrapped in hot towels. Appendix found to be partially gangrenous, and it apparently was the source of the general septic infection. Intestines and peritoneal cavity were thoroughly irrigated with hot, sterile water. As the intestines could not be returned, an incision was made into the ileum and a quart or more of fluid fæces and much gas escaped. This opening was closed by Lembert sutures and the intestines replaced. Abdominal wall sutured except where it admitted a large, rubber drainage-tube eight inches long, which was directed towards the left loin where a counter-opening was made and a similar tube inserted. Severe collapse followed, but he rallied under stimu-

lation. During the first day irrigation of hot water through the anterior tube was employed at intervals of two hours. At each irrigation several quarts were used and the abdominal cavity distended till respiration was affected. It caused considerable distress and some shock, and after the expiration of twenty-four hours it was discontinued with the exception of two irrigations administered on the second day. On April 29, five days later, his general condition was fairly good. No vomiting, bowels had moved freely, temperature 100.5° F.; pulse, 120. There was gradual improvement until May 5; on May 6 the heart's action became weak and the temperature rose, and on May 8 he died (fifteen days after operation). At the autopsy several small abscesses were found between the intestinal coils, the largest being the size of a walnut. Cause of death, sepsis. It is possible that the patient's life might have been saved had the abdomen been reopened and irrigated on the twelfth day, when he began to show signs of sepsis.

The question as to the respective advantages and disadvantages of opium and of cathartics in the treatment of those cases is as yet unsettled, and discussion on this subject seems endless.

I must confess that I have been surprised that in certain recent articles the administration of opium is preferred to the use of catharsis, as, for example, in the excellent article on peritonitis in the recent volume of the "Twentieth Century Practice," the author favors the use of opium. My own experience is exactly opposed to this view. I feel that the safety of these patients depends in a large measure on our ability to restore to the paralyzed intestines their peristaltic action, thus increasing intestinal drainage and diminishing the danger of emigration of colon bacilli through the walls of the intestine. Of course, in certain hopeless cases or for the relief of very acute pain opium should be administered, but I am entirely opposed to its employment as a routine measure of treatment; indeed, I am apt to feel that every hypodermic which a patient receives diminishes his chance for recovery.

I feel that the hopelessness of these cases is often due to inability to retain cathartics when administered by the mouth on account of incessant vomiting. Their administration by rectum,

as, for example, sulphate of magnesia, seems to me almost valueless.

For these reasons I began, some years ago, to employ the intractant injection of sulphate of magnesia and of other cathartics. At first I was doubtful of the beneficial results of this plan of treatment, and it is only within the past eighteen months that I have been convinced of the great value of this procedure, which I now employ in almost all my operations on cases of general septic peritonitis.

Since the adoption of this procedure as a routine measure the results of operation have been so much more favorable than those of former years that I cannot but believe that, in a measure at least, this improvement is due to the injection into the small intestine of a saline cathartic. It is true that in other respects, especially in the cleansing of the peritoneal cavity, the treatment may have been more thorough and systematic, but not sufficiently so, I think, to have produced such a difference in the results. More than once, within the past year, I have been astonished to observe cases which, judging from former experience, I considered almost hopeless, begin to improve before twenty-four hours had elapsed, flatus being expelled and a movement of the bowels following soon afterwards. Former experience led me to expect in these cases, where the distention was very great and the vomiting constant, that intestinal paralysis would continue; that vomiting would persist; that constipation would be absolute, and that death would result on the second or third day. During the past year such an outcome has been exceptional, as shown in the records of my operations from January 1, 1896, to March, 1897, during which time I have operated at the Presbyterian Hospital on eight cases of general septic peritonitis, one of these died as the direct result of the peritonitis, one died from lung complications five weeks after operation, five recovered and have remained well, and one is still in the hospital convalescing, and will probably recover (fifty days since operation).

This record is so much better than that of former years that one naturally endeavors to ascertain the reason for this improve-

ment. Is it due to the coincidence that many favorable cases have been encountered, or is it due to the treatment employed? It may be that the patients have been of unusual vigor, or have been brought to the hospital at an earlier stage of the disease, or that the poison has been less virulent in character, and while I am willing to grant all this, yet, on looking over the histories of these patients, their average condition at the time of operation does not seem to have been less severe than that of those encountered in former years. With two exceptions, every case that has been brought into my service has been subjected to operation. Each of these two was moribund on admission, one dying within an hour and the other being unable to bear an anæsthetic. With two exceptions (Cases III and V) the condition of all the other patients seemed desperate, but laparotomy was performed as offering the one chance for recovery. The condition of three (Cases I, VI, and VIII) was such that the prognosis at the time of operation seemed absolutely bad, and I do not think that any of the spectators, who saw the interior of the peritoneal cavity, had any idea that recovery was possible. In six of these patients the cause of the peritonitis was a gangrenous appendix, in one a perforating gastric ulcer, and in one a septic uterus. In two cases streptococci were found in cultures and in two colon bacilli. While granting an element of chance in encountering so many favorable cases almost in succession, yet I feel convinced that these results are due in large measure to more thorough and systematic treatment, and I am inclined to attribute a large share of this success to the intestinal injection of sulphate of magnesia.

CASE I.—Cause, appendicitis. W. P., male; aged forty-four years; admitted January 20, 1896, at 4 P.M. For three days abdominal pain; for two days vomiting almost constant; last movement of bowels on January 16. On admission temperature 101° F.; pulse 150; respiration 50; great abdominal distention; vomiting almost constant. Operation at 9 P.M. Chloroform; median incision; large amount of purulent serum in general peritoneal cavity; much fibrin on intestines; no adhesions; appendix gangrenous, removed; irrigation; drainage, by glass tube and gauze strips; wound partly closed. Died January 21.

CASE II.—Cause, ovarian abscess. M. W., aged thirty-two years; admitted June 24. History of pelvic inflammation for past two months. Insertion of uterine sound and intrauterine medication forty-eight hours before admission, followed by signs of shock and severe pain; abdomen distended and tender; muscular rigidity; vomiting constant; pulse 112; temperature 99° F. (rectal). Chloroform; median laparotomy. A pint or more of thin brownish purulent serum in general peritoneal cavity; no adhesions except around ovaries and tubes; small abscess in left side of pelvis opened and several small abscesses found in left ovary; evidence of rupture of an abscess in neighborhood of right broad ligament and an abscess in right ovary; intestines removed, irrigated, and replaced; injection of one ounce of sulphate of magnesia; drainage by gauze strips and glass tube in pelvis; wound partially closed; calomel; bowels moved in twenty-six hours. Discharged cured August 2.

CASE III.—Due to appendicitis. C. L., male, aged nineteen years; admitted October 18. History of fourteen previous attacks. Thirty-six hours before admission sudden and severe abdominal pain, great tenderness, and vomiting. On admission, temperature 100.2° F.; pulse 110; abdomen flat and intensely rigid. Operation at 10 P.M. Chloroform; right lateral incision; general peritoneal cavity filled with turbid serum of thin consistency; no adhesions; appendix gangrenous; irrigation with salt solution, intestines being removed; injection of one ounce of sulphate of magnesia; drainage by gauze strips; wound partially closed; ten grains of calomel; first movement of bowels in twenty hours. Discharged cured in six weeks.

CASE IV.—Due to perforating gastric ulcer. A. B., female, aged twenty-one years; admitted November 8 at 5 P.M. Epigastric pain and occasional vomiting since October 28. On November 7 severe abdominal pain and tenderness with signs of collapse. On admission, temperature 103.5° F.; pulse 125; respiration 36; abdomen moderately distended, very tender, muscles rigid; heart displaced; general bronchitis (pneumonia?). Operation 8 P.M. Chloroform; localized abscess between stomach and liver; below stomach general peritoneal cavity containing thin pus; no adhesions; no fibrin; intestines injected and distended; opening in stomach sutured; irrigation salt solution; gauze drainage. For ten days slow improvement. Bowels moved freely at end of twenty-four hours. From November 20 to December 15 signs of sepsis; abscess

of spleen opened; empyema and pneumonia. Death thirty-eight days after operation.

CASE V.—Due to appendicitis. J. C., male, aged ten years; admitted November 14. Thirty hours previous to admission sudden severe abdominal pain and vomiting, which continued; constipation. On admission, temperature 102° F.; pulse 110; moderate abdominal distention and tenderness, acute over appendix; rigidity marked. Operation 10 P.M. Chloroform; lateral incision; peritoneal cavity contained about a quart of thin, dirty-looking pus; no adhesions; few flakes of lymph; appendix gangrenous; irrigation salt solution; injection of one ounce of sulphate of magnesia; drainage by four strips of gauze; wound not sutured; five grains of calomel; bowels moved at end of twenty-four hours; rapid convalescence; secondary suture. Discharged cured December 12.

CASE VI.—Due to appendicitis. M. M., female, aged twenty-six years; admitted November 10 at 4 P.M. Twenty hours previous abdominal pain and vomiting. On admission, temperature 101.8° F.; pulse 126; respiration 34; moderate abdominal distention and general tenderness; constant hiccough and vomiting. Operation at 5 P.M. Chloroform; median incision; a quart or more of free pus in general peritoneal cavity; appendix adherent, gangrenous; intestines distended injected; some flakes of lymph; no adhesions; intestines removed; irrigation, salt solution; injection, one ounce of sulphate of magnesia; silk drainage; wound partially closed; calomel; bowels moved at end of thirty hours; slow convalescence. Discharged cured December 23.

CASE VII.—Due to appendicitis. L. H., female, aged thirty years; admitted January 10, 1897, at 1 P.M. History of pain over appendix for eighteen months. Twenty-four hours before admission severe pain and tenderness; vomiting and fever. On admission, temperature 102° F.; pulse 115; moderate distention and tenderness, but marked over appendix. Operation at 4 P.M. Chloroform; lateral incision; peritoneal cavity contained a quart or more of thin, brownish pus; no fibrin; no adhesions; intestines injected and distended; appendix gangrenous, not adherent; intestines removed; irrigation, salt solution; injection, one and a half ounces of sulphate of magnesia; wound partially closed; calomel; flatus expelled at end of twenty-four hours; bowels moved at end of forty-eight hours; casts and albumen in urine; slow convalescence. Discharged cured February 22.

CASE VIII.—Due to appendicitis. F. S., female, aged twenty years; admitted February 9, 1897, at 2 P.M. One previous attack; on February 3 abdominal pain and vomited; pain, vomiting, and tenderness continued; no food retained. On admission, condition desperate; temperature 100° F.; pulse 130; marked distention and tenderness; vomiting constant. Operation at 5 P.M. Chloroform; median incision; peritoneal cavity contained several quarts of very fetid, thick pus; much fibrin; appendix gangrenous; intestines removed; irrigation; injection of one and a half ounces of sulphate of magnesia; drainage with strips of silk; wound partially approximated; calomel; three movements of bowels on second day. On fifth day three openings in small intestine appeared through which all intestinal contents passed till March 20, when two are closed and fæces passing by rectum. Abscess of parotid opened; gradual improvement.

While the details of operation must necessarily vary somewhat according to the conditions found in each case, the plan of treatment employed was in general as follows:

- (1) Chloroform is employed as the anæsthetic.
- (2) A free incision is made generally five or six inches in length. Its situation varies according to the organ which has excited the peritonitis. The purulent fluid is allowed to flow out, its escape being often aided by turning the patient on the side.
- (3) As a rule, the intestines are allowed to escape from the abdominal cavity into hot towels held in the hands of assistants (the patient generally being turned on the side). In certain cases, where the distention is enormous and where the heart's action is very weak, any considerable escape of the intestinal coils is prevented. Where possible, however, even at a great risk, the intestines are removed, and if well protected by hot towels I have not found that this evisceration increases to any great extent the shock of the operation. If the distention is such that their return is impossible, I do not hesitate to open the ileum and allow gas and fæces to escape. These openings are closed by Lembert sutures. I have never seen any reason for establishing a temporary artificial anus by suturing the gut to the abdominal wall as has been recommended.
- (4) The cause of the peritonitis is removed. If it be an

appendix or tumor, it is extirpated; if it be a perforation, it is sutured.

(5) The intestines and the cavity of the peritoneum are thoroughly irrigated with hot, normal salt solution. If the intestines have been removed, they are thoroughly but gently washed with the contents of several two-litre flasks, as is also the abdominal cavity, at the same time a stream from a three-gallon irrigating jar is steadily flowing into every corner and crevice of the cavity through the soft rubber tube which is moved about in different directions. The temperature of the solution is 110° to 112° F. If the removal of the intestines has been considered unwise the edges of the incision in the abdominal wall are grasped by the assistant, held well up and separated to their full extent, and the cavity flooded by flaskful after flaskful of the solution at the same time that the irrigating tube is pouring a steady stream into all pouches and recesses opened up by the hands of the operator, which are gently moved about among the intestinal coils. I have not found that much shock is caused by irrigation carried out in this manner, indeed, on the contrary, the heart's action will often be stimulated by the hot water. It is of the utmost importance that the temperature of the water should not be below 110° F., indeed 112° F. or even 114° F. is probably safer. Irrigation is preferred to the swabbing of the intestines and peritoneum by means of gauze pads or sponges. I doubt if the cleansing by this latter method is as effectual, and it seems reasonable to suppose that the mechanical friction must damage to a certain extent the peritoneal endothelium and so diminish the vitality of this serous coat and its power of resistance against infection. Of course, I do not mean to claim that perfect cleansing can be accomplished by any method. A considerable amount of the salt solution is allowed to remain in the abdominal cavity for the purpose both of stimulating the heart and of favoring intestinal drainage.

(6) Sulphate of magnesia is injected, through a hollow needle attached to a large aspirating syringe, into the small intestine, a point in the jejunum or in the ileum, as high up as possible being selected. A saturated solution containing between

one and two ounces of the salt is used. The needle puncture is closed by a Lembert suture.

(7) The peritoneal cavity is drained generally by four or more strips of sterile gauze thrust in different directions among the intestines. At times a large glass tube is also inserted into the pelvis. In other cases strips of rubber tissue are used, and recently I have employed strips of pure silk sponges instead of gauze. These appear to drain well and are easily removed, but are not so well suited for walling off septic areas from the general peritoneal cavity. The strips of rubber tissue are most easily removed of all, but I do not feel sure that their drainage is as efficient. Each gauze strip is often surrounded for two or three inches at its point of exit by a cuff of rubber tissue which facilitates its removal.

(8) The abdominal wound is but partially closed by sutures. The edges are not closely approximated but are generally partially drawn together by two or three silkworm-gut sutures between which and the intestines is placed a compress of gauze. A wound which gaps somewhat affords freer exit for the escape of the peritoneal secretions.

(9) After the return of the patient to bed, if the condition of the stomach will permit, a ten-grain dose of calomel is given. If chloroform has been used this will generally be retained.

Rectal stimulation is employed during the first twenty-four or thirty-six hours. If there be persistent vomiting lavage is sometimes useful.

In conclusion, I will again express the conviction that success in the treatment of septic peritonitis depends largely on thorough irrigation and restoration of intestinal peristalsis.