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PART I.

ORIGINAL COMMUNICATIONS.

ART. I.—*Intestinal Perforation Occurring in Enteric Fever, and its Treatment, with Notes of Two Cases.* By WILLIAM TAYLOR, F.R.C.S.I.; Surgeon to the Meath Hospital and to Cork-street Fever Hospital, Dublin.

IN no region of the domain of surgery have more brilliant results been achieved within recent years than in the surgery of the alimentary tract. These results are due mainly to a more perfect knowledge of antiseptic and aseptic principles, combined with greater improvements in the *technique* of abdominal surgery in general. In 1884 Leyden, at Berlin, was the first to advocate laparotomy for perforation in typhoid fever. From that till 1892 only 19 cases were recorded, with four recoveries, but as two of these were doubtful the results did not augur well for the new procedure. It is thus only since 1892 that more cases so treated, and with better results, have been recorded. As the subject has received but scant notice in this country compared with its importance, the notes of the following two cases, though both ended fatally, with some remarks on the diagnosis, and the results of operative interference, so far as can be ascertained, may not be out of place:—

CASE I.—Mrs. C. was admitted into Cork-street Fever Hospital in the beginning of July, 1899, suffering from an attack of typhoid

fever. Between two and three weeks prior to admission she had an abortion, consequently her condition from admission was extremely serious; however, she convalesced sufficiently to be allowed up on August 13th, and was apparently doing well until the 19th inst., when she complained of a sudden pain in the abdomen, and, becoming faint, was put to bed. Some sedative was given, and hot stupes applied, but without much effect until the 21st, when she began vomiting, and as the bowels could not be got to act, the diagnosis of obstruction (probably produced by a band) was made. I was then telephoned for to go and see the patient for the first time with a view to operating. On arrival I certainly found the patient very ill with vomiting, fast, thready pulse, and a greatly distended and tender abdomen. Deeming it injudicious to waste time trying to make an accurate diagnosis, we at once prepared for operation, and I opened the abdomen in the middle line. The intestines were a good deal distended, and evidence of peritonitis was here and there very obvious. No band was detected, but three small collections of pus were found in the mesentery, due to softening of the mesenteric lymph glands. These were easily cleaned up with sponges wrung out of corrosive sublimate 1 in 1,000. On passing the hand into the pelvis a large quantity of pus came welling up, which on closer examination was seen to be coming from a suppurating right ovary. I thereupon intended to remove the diseased ovary, but being told by the resident medical officer, Dr. Day, who was watching the patient, that she was practically pulseless, I merely enlarged the opening from which the pus was issuing, passed a sponge into it, and dried up any pus therein, and then washed out the abdomen with saline solution at a temperature of 106° F., which had the effect of at once increasing the force of the pulse. The abdomen was then quickly closed, a gauze drain being passed through its lower angle into the pelvis in contact with the diseased ovary. The patient was then placed in bed, and strychnin and brandy were freely administered. That evening her temperature was 102° F., and her pulse 128, and fairly strong. The bowels acted twice. From this the surgical aspect of the case presented nothing of importance, but the patient seemed to have got a relapse of the typhoid, all the prominent features of the disease being present again.

On the 4th September, that is on the 15th day after this operation, when everything seemed to be going on satisfactorily, the patient again complained of pain in the abdomen, and began to vomit almost immediately. Pulse increased in rapidity from 110 to 132, and as there had been no discharge from the wound for

over a week it was thought that the opening in the diseased ovary had closed up while the pus accumulated, and that this had suddenly ruptured again into the pelvic cavity. Consequently the lower portion of the wound was opened again, but instead of finding what we expected, we discovered a perforation about half an inch long extending along the floor of the ulcer, from which about 3 or 4 drachms of fæces had escaped. The walls of the intestine in the neighbourhood of the ulcer were so thin that the fingers could easily be seen through them. The condition of the patient precluding excision of the loop, the edges of the perforation were inverted, and a continuous suture of fine silk passed through the entire thickness of the walls of the gut, which, indeed, were too thin to attempt anything else. One actually cut through on being tightened. The extravasated fæces were sponged up, and abdomen washed out with hot saline solution. On account of the doubt felt as to whether the sutures would hold, a gauze drain was again inserted at the lower angle of wound. No hope was entertained, but, strange to say, the patient did well till the morning of the 19th September (again 15 days after suture), when some fæces were seen coming from the wound on removing the dressings. Collapse quickly supervened, and she died a few hours later, fæces continuing to come freely from the wound. It should be mentioned that for several days before the first perforation occurred until the time the second perforation killed her, the patient had from 7 to 11 and 12 copious motions every day. Nothing seemed to be able to check the diarrhœa.

The *post-mortem* showed a perforation situated almost one inch from the site of the one I had sutured up, and which seemed perfectly healed. The walls of the intestines for some three or four feet resembled tissue paper, and seemed to be quite stripped of their mucous membrane. The remarkable point is that union followed suture of so diseased an intestine in a patient so exhausted by fever and suppuration, and that at so advanced a stage as the 64th day after her enteric fever first began.

CASE II. was that of a young lady, twenty-eight years of age, who was admitted into a private ward in the Meath Hospital under the care of my colleague, Dr. Craig, and who perforated in the fifth week of a severe attack of enteric fever. Dr. Craig, having diagnosticated the condition on seeing the patient, recommended operation, which was performed by the late Mr. R. Glasgow Patteson,

and at which I assisted. The perforation, which was quickly found, was extremely small. The edges, having been sponged, were drawn together by a continuous suture passed through all the coats, after which he applied a row of interrupted "Lembert" sutures so as to completely enfold the first row. The perforation was situated about 12 inches from the ileo-cæcal valve. No other perforation being found, the extravasated fæces were mopped up, and the abdomen flushed out with hot saline solution, and the wound completely closed. Patient was put to bed, and strychnin and brandy were given. She never rallied, but died about six hours after. Perforation was reckoned to have taken place between five and six hours prior to operation.

Post-mortem showed sutures intact, and site covered by a piece of lymph. I mention this case because I know Mr. Patteson, had he lived, would have reported it himself.

Considering the comparative frequency with which this complication is met, one sees very few cases recorded as having been treated surgically, probably for two reasons—first, that few come under the surgeon's notice, and, secondly, that many surgeons are loath to publish unsuccessful cases, which is unfortunate, for how can correct statistics of the results of operative interference be compiled unless by the publication of every case operated upon, whether success follows the procedure or not?

The frequency with which this complication is said to occur in enteric fever is generally taken to be about once in every 33 cases, and it is to be noted that its occurrence has no relation to the severity of the symptoms, perforation being often met with in mild cases—those known as "Ambulatory Typhoid."

Finucane reports a case of a man who, because of cardiac dropsy, was admitted into St. Thomas's Hospital. He was purged and allowed to eat heartily. Two weeks later he began to suffer from abdominal pain and died next day, the *post-mortem* showing perforation from a typhoid ulcer.

Another case is reported of a woman who, till 48 hours before death, was at business, and who was suddenly stricken and died from this cause.

One of the first points of importance in connection with this condition is that of early diagnosis. In many cases

nothing can be more difficult than to state definitely at an early stage—that is, before general septic peritonitis supervenes—whether the intestine is actually the seat of perforation, while in others all the features of perforation are so well marked that the diagnosis is comparatively easy. These differences in the symptoms and signs are due mainly to the form of perforation present. The typical evidences as described by Murchison are—“Sudden supervention of collapse with or without rigors, but with acute pain and tenderness of the abdomen, which is at same time tense and tympanitic; vomiting is common and often precedes the other symptoms for days, and is then often accompanied by an increase of diarrhœa, with or without intestinal hæmorrhage. The decubitus is dorsal, with the legs drawn up; the temperature rises; the pulse is rapid, thready and imperceptible; the breathing is thoracic; the countenance pale, pinched and expressive of suffering; there is thirst and suppression of urine; soon the prostration becomes extreme, the extremities cold, the face covered with large drops of perspiration, and the patient gradually sinks, the mind remaining clear till the last.” This is a beautiful picture of two of the forms of perforation met with—viz., where the sloughing process extends outwards and produces a large irregular opening in the wall of the gut; and, secondly, that form in which, from some unwonted movement or indiscretion in diet, setting up irregular and violent peristalsis, or over-distension of the gut with gas, a tear along the whole length of the floor of the ulcer takes place. This second form seems to me the variety one is most likely to meet with in the so-called “ambulatory” forms of typhoid; but the evidences met with in the third form of perforation, described by the late Dr. Graves as the “Pin-hole Perforation,” bear very little analogy to those above mentioned. In this form collapse is entirely absent; patient may only complain of sudden pain, which, like the pain in all abdominal lesions, in an early stage at least, is generally referred to a point immediately above the umbilicus, and which may or may not be severe—generally it is not severe. Sometimes pain is absent; the breathing gets quicker, face becomes drawn and anxious, but, as a rule, vomiting does not supervene for some time, it

may not be for some hours; the pulse gradually gets faster and becomes thready. The legs at this stage may not be drawn up, but the patient gets restless. Liver dulness, if previously noticed to have been normal, may now be found to gradually diminish, but unless previously well marked this sign may be fallacious—indeed normal liver dulness may be present while a perforation exists. Its absence, on the other hand, may be due to a distended coil of intestine, and not to the presence of free gas in the abdominal cavity. The abdominal walls now become rigid and hard. The temperature remains up, or may be but little affected, until peritonitis supervenes, when a slight rise may take place. It is not till the end that collapse supervenes, due to septic absorption. A chilliness or slight fall of fever alone may be present in some cases, *but the pulse will always be found to be gradually increasing in rapidity and becoming more thready and compressible.*

The absence of pain at the onset of some of these cases of perforation is due to loss of nerve tone or blunted sensibility.

It must be remembered that peritonitis causing pain, distension, hardness, and rigidity of the abdomen, with rise of temperature, vomiting, anxious drawn face, and quick superior thoracic breathing, may be present without any perforation.

Perforation may also be simulated by rupture of the peritoneum over a swollen and softened mesenteric gland.

Diagnosis is comparatively easy in mild cases, as the onset is more likely to be acute and sudden, whereas in the severe ataxic cases the symptoms progress slowly, and perforation is unsuspected in many cases until sudden fulminating symptoms, often due to a general septic peritonitis, appear. Intestinal hæmorrhage, coming as it often does from deep ulceration, should demand a close watch for evidences of perforation.

The next important point in connection with this subject, which is the object with which this paper is written, is the line of treatment to be adopted.

Who is there at present who would hesitate to have a surgeon open an abdomen in case of perforation of a gastric ulcer, duodenal ulcer, or appendix? yet, unfortunately, there must be many physicians who do not recommend this pro-

cedure in cases of typhoid perforation. The results in the former cases from surgical interference have been brilliant, and while recognising that the circumstances are different, still, comparatively speaking, the results are no less brilliant in the latter. A glance at the following statistics may help us to recognise this fact.

The proportion of recoveries after the expectant treatment—which merely consists in giving opium or morphin in large doses—as given by Murchison, is small. He, in his large experience, found only six cases of recovery, two of which were his own, while Todd and Jenner collected only one each. Murchison, notwithstanding, places the mortality after perforation at 90–95 per cent. It would be more correct, I think, to place it at 98–99 per cent., for if left untreated (surgically), recovery can take place only by the formation of an abscess, which must subsequently burst externally, open into the gut again, or be opened by the surgeon. Those cases which recovered without the formation and subsequent evacuation of an abscess either spontaneously or by the assistance of the surgeon were, I hesitate not to say it, cases of mistaken diagnosis. Two Russian authorities collected and reported 71 cases operated upon, with 17 recoveries = almost 24 per cent. Professor Keen, in his book on the surgical complications of typhoid fever, appends a table of 83 authenticated cases with 16 recoveries, or 19·36 per cent. of cures, and 80·64 per cent. deaths (1898). Hare, in his work on Typhoid Complications, published in 1899, noted altogether 103 cases with 21 recoveries = 20·3 per cent. Dr. H. M. Taylor, of Richmond, Virginia, reported a case on March 24th, 1899, of a boy who was perforated and was operated on 15 hours subsequently with recovery.

In England, up to July, 1899, only 13 cases of operation were recorded with 3 recoveries = 23·07 per cent. Allowing for the fact that there are probably as many more unsuccessful cases not recorded, still the mortality will be far from being as appalling as after the expectant treatment. Of these cases of recovery, as analysed by Keen according to age, the result is surprising. Under 15 years of age, 5 cases with 2 recoveries = 40 per cent. In one of these cases resection of the gut was done; if to these one case of perforation of the

gall-bladder with recovery after operation is added, we have 6 cases with 3 recoveries = 50 per cent.

From 15 to 25 years of age 23 cases and 3 recoveries = 13·0 %

„ 26 „ 35 „ 24 „ 5 „ = 20·8 %

Over 35 years of age 11 „ 5 „ = 45·5 %

This shows that, so far as the above figures go, operations for perforation of the intestine in enteric fever are more fatal between 16 and 35 years of age than under 15 or over 35 years of age.

Cases in which interval was noted from time perforation took place until operation was performed:—

Within 12 hours,	15 cases, 4 recoveries = 26·7 %
From 12 to 24 hours,	20 „ 6 „ = 30·0 %
„ 24 to 48 „	13 „ 1 „ = 7·5 %
„ 2 to 3 days,	6 „ 2 „ = 33·0 %
„ 3 to 4 „	4 „ 0 „ = 0
„ 5 „	1 „ 0 „ = 0
„ 38 „	1 „ 0 „ = 0

On looking at this table the best results seem to be met with in those cases in which operation was done during the second twelve hours after perforation. The two cases in which recovery followed after operation performed during the second and third days must be exceptional. Notwithstanding the above statistics I should deem it unwise to wait for twelve hours after the diagnosis of perforation was made before operating. It does not take many hours for the production of septic peritonitis, and the longer we leave an open gut inside the abdominal cavity, the greater will be the extravasation in the majority of cases, and the greater the risks of peritonitis, which everyone knows is always grave in itself at the best of times, but which must be rendered particularly so by the unfavourable conditions existing in the third or fourth week, or even later, as my own case exemplifies, of typhoid fever. It seems to me that, considering what the end must be if left alone, and what these tables above show, the operation should always be done where the condition of the patient was sufficiently good to warrant any operative procedure. Great collapse then would seem to me the only contra-indication to operation in these cases; but even this

should be overcome by free administration of strychnin and brandy hypodermically, while other preparations are being made for operation, so that should reaction come on there might be no undue delay. Rapidity of operation, which is always necessary, so as to diminish the shock of all abdominal operations, is especially essential here. The temperature of the room or operation theatre should be above that generally employed, the legs and chest of the patient well wrapped up in warm flannels. The skin should be as quickly cleansed as possible, and the abdomen opened in the middle line. While the peritoneum is being incised notice whether gas escapes. Generally speaking some fæculent-stained fluid will be noticed at once, and should the perforation not immediately present itself, start at the cæcum, and run the lower two or three feet of the ileum through the hands, removing any flakes of lymph which may be seen on its walls, and which may be sealing up a minute perforation. Failing to find the perforation in this amount of the ileum, turn to the cæcum and examine it and the vermiform appendix, after which, if still unsuccessful, try the sigmoid flexure.

The following table gives site of perforation in 130 noted cases:—

In ileum	-	-	106 cases	} Liebermeister.
In colon	-	-	12 „	
In vermiform appendix	12	„		

Hoffman, out of 20 cases, gives the following table:—

Near ileo-cæcal valve	-	1 case
4 to 6 inches above	-	4 cases
8 to 12 „ „	-	9 „
4½ to 6 feet „	-	2 „
10 feet above	-	1 case

This will leave three cases to be found in other sites—such as the cæcum, appendix, or sigmoid flexure. It has been stated that as many as 25 to 30 perforations have been found in the jejunum, but such statements should be taken with caution.

Fitz found that—

81·4 per cent. of perforations were found in the ileum,
 12·9 „ „ „ „ „ colon,
 while only a few were found in the appendix, jejunum, or Meckel's diverticulum.

In 19 cases there were 2 perforations.

„ 3	„ 5	„
„ 4	„ 4	„

It will thus be noted that the majority of perforations are found within 2 feet of the ileo-cæcal valve. Having found the perforation, cleanse wall of gut and edges of opening with sponges wrung out of 1 in 1,000 corrosive sublimate solution, and with a continuous suture of fine silk run through all the coats, draw the edges together, then enfold these with a second row of continuous “Lembert” sutures, and wash again with sterilised water. If there be much extravasation wash out abdomen with sterilised salt solution at a temperature of 105° to 108° F., moving intestines gently with the hand until every part of abdomen is quite clean, paying special attention to the loins and pelvis. A pint or so of the solution may then be left in, and the wound completely sewn up. Should there be only a very limited extravasation, it may be quite sufficient to mop it up well with sponges wrung out of 1 in 1,000 corrosive sublimate solution. Unless evidences of septic peritonitis are present, drainage should not be necessary; but if this condition be well marked, drainage through each loin as well as through the abdominal wound will be necessary. A second perforation should always be looked for in the neighbourhood of the one found. The above line of treatment is that applicable in the majority of cases, but if many ulcers whose floors seem very thinned and likely to perforate are in close proximity, while the pulse is good and the strength of the patient well maintained, possibly excision might, in such a case, be undertaken with advantage, the ends of the intestine being united by some rapid method—such as Mayo Robson’s bone bobbin—which will become absorbed. A Murphy’s button would scarcely be suitable in such a case, as after being cast off into the lumen of the gut it might tend to produce perforation of some ulcer lower down; still, if nothing else were at hand and rapidity of operation imperative, I would have no hesitation in using it.

Patient should then be returned to a well-warmed bed, strychnin and brandy given according to the condition of the pulse, and morphin given to induce rest (by allaying peristalsis) and sleep.

Should a second perforation take place at a later date it would, I think, be unwise to operate again; but that is a question which will be decided by the condition of the patient.

I cannot do better than conclude by quoting the following opinions advanced by Dr. Weller Van Hook, of Chicago, and reprinted in Sir John William Moore's *Treatise on "The Continued and Eruptive Fevers,"* published in 1892:—

"1. There is no rational treatment for perforation in the course of typhoid fever except laparotomy.

"2. The indication for laparotomy when perforation occurs in typhoid fever is imperative.

"3. The only contra-indication is a moribund condition of the patient.

"4. The stage of the fever is not to be considered as an indication or as a contra-indication for laparotomy.

"5. The severity of the typhoid fever alone is not a contra-indication.

"6. Early laparotomy offers the most hope.

"7. The symptoms of peritonitis should not be awaited before operating.

"8. In taking charge of all typhoid fever patients, it is the physician's duty to be ready, in case of perforation, to perform laparotomy.

"9. The published statistics of laparotomy for this condition are strongly in favour of operation."

While looking over the proof-sheets of the above, I received a copy of the "*Transactions of the American Surgical Association*," Vol. XVIII., in which appears a Report, presented by J. Collins Warren, M.D., of the Committee of the Boston Society for Medical Improvement, of 24 cases of laparotomy for peritoneal infection in typhoid fever. Probably some of these cases are included in the statistics of Keen and Hare. However, of the 24 cases operated on—21 with abdominal infection, and 3 without abdominal infection at time of operation—6 cases recovered, or 25 per cent. Three cases have just been reported as having been operated on in the Imperial Yeomanry Hospital in South Africa, but all ended fatally.—(*British Medical Journal*, Dec. 15, 1900.)