

TWO CASES OF LAPAROTOMY FOR PENETRATING WOUNDS OF THE ABDOMEN, WITH REMARKS.¹

BY ARTHUR T. CABOT, A.M., M.D.

SINCE Dr. Bull's first case of pistol-shot wound of the intestines awakened interest in the treatment of these injuries, and in view of the constantly increasing list of patients successfully treated in the same manner, the duty of the surgeon to endeavor to repair intestinal injuries made by penetrating weapons or missiles has been almost universally accepted.

The following cases are presented as a contribution to the statistics of this class of injuries.

CASE 1. Stab wound of the abdomen: recovery.

Margaret K., who gave her age as about fifty, but who looked much older, entered the Massachusetts General Hospital August 18th, 1886. She was a spare, frail-looking woman. A little more than an hour before entrance she had been attacked by a man with a large pocket-knife. There was a long superficial cut on the right side of her neck, also a cut in the left labium. The abdominal injury was a punctured wound through the outer edge of the rectus muscle on the left side, about an inch below the level of the umbilicus. The patient was pale, as if she had lost considerable blood. She was not suffering much pain.

An immediate exploratory operation was undertaken to see whether the peritoneum was opened, and if so, whether any internal injury had been done. As it was found that the knife had entered the abdominal cavity, the opening was enlarged enough to examine the viscera. One or two ounces of clotted blood lay in front of the intestines; this was sponged out, and a careful examination made of all the coils of intestine lying near the point of puncture. No wound of the intestinal wall was found, and there was no further bleeding as from wounded viscera; the incision was therefore closed. The patient recovered well from the ether, and was reasonably comfortable, with moderate abdominal pain.

August 21st (the third day). The dressing stained through, and on investigation it was found that the stitches, which were of paraffined silk, had slipped their knots, and a little mass of omentum about the size of a child's fist had protruded. Ether was given, and after returning the omentum to the abdominal cavity the wound was firmly sutured. From this time recovery was uninterrupted, and the patient left the hospital well in the early part of September.

In this case the anæmic, feeble condition of the patient gave rise to the fear that hæmorrhage was going on inside the abdomen. In the absence of much blood in the peritoneum it is probable that there had been a greater loss of blood from the external wounds than was thought at the time.

CASE 2. Pistol-shot wound of the stomach: laparotomy and suture of the stomach wall; recovery.

Robert E., twenty-one years old, entered the Massachusetts General Hospital the evening of July 3rd, 1888.

Two hours previous to entrance, while standing

¹ Read at the meeting of the Surgical Section of the Suffolk District Medical Society, April 3rd, 1889.

beside a companion who was handling a revolver, he had been accidentally shot in the abdomen. The distance from the muzzle was about three feet. The ball, of 22 calibre, entered the body two inches above and one inch to the left of the umbilicus. The accident happened about an hour after he had taken a full supper. When seen he was suffering a moderate degree of pain about the wound, and this was increased somewhat by taking a long breath. On palpation there was some tenderness around and above the wound. He had not vomited nor felt any nausea. Laparotomy was advised and at once done.

A vertical incision three inches in length was made so that the bullet opening lay in the middle of it. The transverse colon at once presented in the wound, and was carefully examined for a considerable distance on either side; its mesentery was also inspected, but no wound found. The stomach was then drawn down into view, and at once the bullet hole was seen at about the middle of the anterior wall.

The wound was a simple puncture, which did not gape, and through which there had been no escape of the stomach contents, even though the patient had vomited quite freely while going under the influence of the ether. The hole was turned in, and closed by five interrupted Lembert sutures of fine silk.

The close condition of the wound in the anterior stomach wall, and the absence of extravasation of the stomach contents through it, made it seem wiser not to extensively separate the omental attachments of the organ in order to get at the posterior wall. This would have involved a much larger abdominal incision, and from the apparent line of the bullet it seemed likely that the wound of exit was close to the smaller curvature, where it would have been reached with difficulty, and at the expense of considerable violence of manipulation.

Further search was therefore not attempted, and the abdominal wound was closed.

The patient vomited much after the ether, but otherwise did well.

For three days he took nothing into his stomach but a little water; he then began to take milk and lime water cautiously, and gradually resumed ordinary food.

On the seventh day his bowels acted freely after a senna enema.

He was out of bed on the fifteenth day, and went home at the end of eighteen days.

Since then he has been seen several times, and although he has suffered somewhat from debility, and has not regained fully the flesh that he had before his accident, yet the most careful and thorough examination fails to reveal local trouble anywhere either in the abdomen or chest.

Shortly before the occurrence of my second case Dr. Senn, who has done so much excellent experimental work in the abdominal cavity, suggested a new way of determining whether a penetrating wound of the abdomen opened the alimentary canal or not. This was by the injection into the rectum of hydrogen gas, which, if it escaped through the wound in the abdominal wall, could be ignited, and thus demonstrate beyond doubt the existence of an

opening somewhere in the intestinal tube. He has shown, by experiment, that the hydrogen gas will thus make its way out; and I believe that until now it has escaped any admixture of oxygen which might form with it an explosive compound and make its ignition a dangerous matter.

Dr. Senn's experiments have shown that the gas finds its way upwards through the whole alimentary canal, and in one case he determined the existence of a perforation of the stomach by the escape of gas through a bullet wound in the lower part of the chest.²

Dr. Senn's other work in abdominal and other branches of surgery has been so full of practical suggestions, that a surgeon having a perforating wound of the abdomen, and neglecting to apply a test so highly praised by him, is open to the charge of a disregard of necessary precautions if he cannot show good reasons for his neglect. This must be my excuse for setting forth certain considerations which still deter me from the use of insufflation in these cases. Further experience may show the objections I shall state to be purely theoretical, but until this is demonstrated I shall prefer to treat wounds of the human abdominal cavity in a less experimental way.

Hesitation to use insufflation for the perfection of diagnosis may arise from two fears: one, that it may sometimes fail as a means of testing the condition of the intestines, whether injured or not; and the other, that it may introduce additional dangers into the case.

That it is possible in most cases to demonstrate the existence of a perforation of the intestine in this way has been abundantly shown. Whether the injection of hydrogen furnishes an infallible test may well be doubted. The abdominal wall being made up of separate layers of muscles and other tissues, which shift upon each other with every movement of the body, it must now and then happen that the opening through it is tightly closed, and will not permit the passage outward of gas that has escaped among the intestines. Errors from this cause may generally be avoided by the introduction through the wound of a pair of dressing forceps, a director, or a tube; but with a thick, fat, abdominal wall these measures may fail, especially if the omentum plugs the wound on the inside.

Again, suppose a bullet perforates a coil of intestine that is full of liquid feces. It is evident that the gas cannot escape through until it has pushed the liquid out before it.

If it is acknowledged that the gas will sometimes not escape even though the intestine is injured, what guidance does the surgeon get from its use in deciding the question whether in a given case to explore the abdomen? In the cases in which the hydrogen gas test succeeds in demonstrating a perforation, we shall certainly do laparotomy.

But what are we to do in the cases in which it does not succeed? Are we then justified in not doing an exploratory operation?

This is the question which the surgeon has to meet; and until it is shown that the fear that in a certain proportion of cases of perforation the test will fail is groundless, he must either do a lapar-

otomy, even in the cases in which hydrogen gas does not issue through the external wound, or he must expect to leave some cases of perforation not operated upon.

Furthermore, it should be remembered that perforation of the intestine is not the only injury wrought by penetrating wounds, which it is the surgeon's duty to rectify. Serious lacerations of the mesenteric or other vessels may exist even without a perforation of the intestine. In both of the cases of intestinal suture reported by Dr. Senn in the *Philadelphia Medical News* of November 10th, 1888, there was profuse bleeding from the mesenteric veins, and the ligation of these was one of the important benefits of the operation.

It is the strong chance of such accidents as this, and the feeling that there will be cases in which perforations of the intestines or stomach will escape the hydrogen gas test, that make the writer feel that in the cases where no hydrogen emerges from the outer wound the surgeon would still not be justified in foregoing an exploratory operation.

If this feeling is borne out by facts, and an exploration is called for whether the hydrogen test succeeds or not, it is obviously a waste of time to apply the test, even supposing the injection of the gas to be a harmless proceeding. But is this last supposition correct?

Dr. Senn says that the gas is aseptic and therefore innocuous. Does he mean by this that the gas, after passing through many feet of intestine, enters the peritoneal cavity in an aseptic condition? And what is to be said of the intestinal contents that the gas drives along with it? They are certainly not aseptic, and it is therefore evident that there is a strong possibility that the injection of gas may add to the dangers of a given case, and should not be lightly used.

What has been said up to this point applies only to the use of the gas for diagnostic purposes before an incision has been made.

There is another use of gaseous insufflation to which Dr. Senn calls attention in the paper already referred to, which may be of great service.

After closing all of the perforations that he could find, he again injected the hydrogen into the rectum and it at once began to bubble up from the pelvis. Following down the sigmoid flexure, and compressing it at different points, the gas still escaped until he reached the rectum, where he found and closed a last wound.

Continuing the injection, he saw the gas go up past the openings that he had closed, and, finally, stopping the injection to avoid the too great distention of the bowels, he pressed the gas already introduced upwards from coil to coil until he reached the duodenum and stomach, without finding any more perforations.

This application of the insufflation, after all of the openings that can be readily found have been closed, seems to be of undoubted value. It enables the surgeon to make a quick but thorough exploration of the bowels with the least possible amount of handling. The gas escapes at once into the air, and does not carry impurities throughout the abdominal cavity, and if it carries with it liquid feces their escape is at once perceived and they are quickly removed by irrigation.

² In this case the injection was made directly into the stomach.

For this exploration it would seem that air would be equally good with hydrogen gas.

The suggestion of this procedure adds one more to the capital points in abdominal surgery for which we are indebted to Dr. Senn.

To return now to the consideration of the cases reported. In both of them laparotomy was performed at once when they were first seen.

This practice of immediate laparotomy, without waiting for convincing symptoms of serious intra-abdominal lesion, seemed wise, for the following reasons:—

First: It was felt that the enlargement of the penetrating wound through the abdominal wall added little or nothing to the severity of the injury, and would give the opportunity to discover and repair any lesion of the intestines or other abdominal contents before the occurrence of peritoneal inflammation. The absence of danger in a simple incision into the abdomen is generally recognized.

Secondly: We know that symptoms are often very poor guides to an appreciation of the severity of intra-peritoneal injuries, and if we wait until the patient's condition demands an operation, we shall often find that a serious inflammatory condition has arisen, which we are powerless to stop, even though we may succeed in closing the intestinal wound that gave rise to it.

The cases are as yet too few to determine the ratio of the increased danger in delayed operations, but experiences are not wanting to show that it is very large.

Thirdly: In the event of any considerable vessel being injured it is, of course, important to stop the bleeding early before the patient is seriously exhausted. Here again, if we wait until the symptoms of internal hemorrhage are unmistakable, we shall run a serious risk of letting the patient slip into a condition from which he cannot be recovered.

In view of these considerations it seemed to the writer, and he still thinks it a good rule in practice, that—in a case of penetrating wound of the abdomen, made by a sharp weapon or by gun-shot—the wound should be followed carefully down until the operator is convinced that it enters the abdominal cavity. When this is established the peritoneum should be opened with enough freedom to allow of a sufficient inspection of the abdominal contents, and for the repair of any injury found.

It seems probable that by this immediate operation cases will be saved which would be lost if time were given for the peritoneum to inflame or for serious loss of blood to occur; whereas with proper care in making a clean, aseptic operation the surgeon will rarely, if ever, feel that he has added to his patient's risk by the exploration.

TWO CASES OF PENETRATING WOUND OF THE ABDOMEN.

TREATMENT BY LAPAROTOMY.¹

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CASE I. Knife wound of the abdomen with protrusion of the omentum: laparotomy; recovery.

¹ Read at meeting of Surgical Section of Suffolk District Medical Society, April 3rd, 1889.

A. D., thirteen years old, came to the Massachusetts General Hospital, September 10th, 1887. He was stabbed in the abdomen with a knife, about midway between the umbilicus and pubes, and two inches to the left of the median line. The wound was about one inch in length. Through this wound protruded a mass of omentum, completely plugging it. The wound was enlarged to about double its size. This allowed an easy reduction of the omentum, and gave an opportunity to inspect the intestines lying directly beneath the incision. The omentum, when returned to the abdominal cavity, began to bleed. The constriction made by the edge of the incision had controlled the bleeding until this constriction was removed. The bleeding points were tied. No injury to the intestines was found, and nothing pointing to such injury was seen. The patient was about the ward on the eighteenth day, the wound having entirely healed.

CASE II. Pistol wound of the abdomen: laparotomy; death.

W. G., a teamster, twenty-four years old, was brought to the Massachusetts General Hospital, August 6th, 1888, at about 6.30 p.m., pulse 80, temperature 100.8°, respiration 30. He had been shot one-half an hour before. Examination showed a strong, vigorous man. A bullet wound in left chest between first and second ribs, three fingers-breadth from the clavicle's sternal end. There was a bullet wound one inch below the umbilicus and two or three fingers-breadth from umbilicus in left side. There was also a bullet wound on the inner side of the femoral vessels in Scarpa's triangle. No bleeding of any account from either wound. Wounds not probed. The urine was drawn by catheter and found to be bloody, but there were no clots. Spit some blood from the throat. No cough. No pain in chest. Abdomen tender. Pain in small of back. The flanks are flat on percussion, otherwise the abdomen was tympanitic. Morphia and brandy were given.

At 8.30 the urine was more bloody. The pulse had become rapid. The patient seemed to be sinking from loss of blood. It seemed best to attempt a laparotomy. Two quarts of blood mixed with intestinal contents were evacuated. Blood and intestinal contents were flowing into the abdominal cavity freely. Three holes in the small intestine and two lacerated wounds of the intestine were sewed up with silk. The abdomen was washed out with warm water. The posterior course of the bullet was not determined. It was thought that it might have cut the ureter or have entered the kidney. The patient rallied slightly, but died at 12.20 in the morning. On autopsy it was found that the left kidney had been pierced by the bullet which had injured the intestines. There was considerable hemorrhage into the perinephritic tissues. The abdominal cavity, upon removing the intestines, was found to be perfectly clean, notwithstanding the large amount of blood and feces which it had contained before washing. No other intestinal wounds were found. The bullet wound of the chest passed through the apex of the lung. No wound of the intestines had been overlooked. Insufflation was not used.