REMARKS

ON

THE TREATMENT OF GUNSHOT-WOUNDS
OF THE ABDOMEN IN RELATION TO
MODERN PERITONEAL SURGERY.

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[Concluded from page 262 of last number.]

Gastrorrhaphy.—There have been a few recoveries following suture of incised and lacerated wounds of the stomach; but never a successful gastrorrhaphy after shot-wound of this viscus.

Enterorrhaphy.—Otis says: "There are thirty-two American instances of enterorrhaphy of the small intestines, of which twenty-five were successful." In all of them the wounded bowel had prolapsed through punctured or incised wounds, and was sutured, and returned to the peritoneal cavity. They occurred between 1807 and 1869. If the bowel had not prolapsed in all these cases, there would have been no enterorrhaphy; fecal effusion would therefore have followed, and produced certain death in a few days. This proves the importance of enlarging the external wound in all cases, whether shot or punctured, and searching for the injured bowel, and entering the lesions. Many cases are recorded where the prolapsed wounded bowel had been neatly sutured and returned, and yet the patients died in a few days, just as if there had been no sutures applied. In these, necropsies revealed the fact that there were other lesions which were not prolapsed, and therefore were not sutured. In all cases, then, it would be wise to enlarge the wound so as to examine all viscera lying in its range. For penetrating wounds of the intestinal canal, whether by shot or puncture, are often multiple. The war records contain numerous cases where the same missile made two, three, and even five lesions. Deputy-Inspector Alexander reported a case at the Crimea, in which the ball entered near the umbilicus, and passed out near the sacrum, wounding the small intestines not less than sixteen times in its passage. These multiple lesions show the importance, the absolute necessity, of enlarging external wounds sufficiently for thorough exploration. The records of our civil war teem with reports of shot-wounds of intestines where patients have lived and suffered, not only for days, but in some cases for very many days, and even for weeks, eventually dying of exhaustion and blood-poisoning. With the knowledge of to-day, it would have been as easy to save them as to let them die. I may be permitted to give an example of the do-nothing surgery of former days.

X. was accidentally wounded by a Remington revolver; the ball entered to the right of the lower lumbar vertebra, and was removed by incision about an inch above the right internal abdominal ring an hour afterwards. Opium was given; simple dressings were applied. Forty-eight hours afterwards, fecal matter was discharging freely from the wound in front. The patient died four weeks after the accident.

At the necropsy, three hours after death: "Rigor mortis was well marked; there was great emaciation; the abdomen was much contracted; the intestines were bound together by strong adhesions; upon separating these adhesions, numerous small collections of clear pus were disclosed, none of them exceeding in quantities a teaspoonful. The small intestine was found completely divided about ten feet below the duodenum. The portion of the small intestine below the division was contracted almost to the size of a goose-quill. This portion of the gut communicated with the wound in the groin, and also with that in the loin. Surrounding the right psoas muscle was a cavity of sufficient size to hold a quart, separated by adhesions from the remainder of the abdominal cavity. The upper portion of the intestine opened into this cavity, which was half full of fecal matter." How the poor fellow lived a whole month in such a condition is marvellous. And how easy it would be now to enlarge the inguinal wound in such a case, excise the injured portion of bowel, and unite the divided ends, and save life.

I do not reproach my brethren for the treatment of that day and time. They did all that was justifiable; all that the greatest military surgeons of the day would have advised or dared to do. But the man who would now stand by and do nothing in perforating shot or other wounds of the abdomen, would fall far short of his duty to himself and to his patient.

Otis says (p. 73): "So far, the annals of military surgery seem to be

barren of instances of successful suture of the small intestines after shot-injuries, though recoveries have ensued with temporary fecal fistulæ when sutures were employed."

We have already seen that of thirty-two punctured and incised wounds of the small intestines, twenty-five were cured by suture. There is no reason why the same success should not attend the suturing of shot-wounds of the small intestine, if we would only convert the latter into the same favourable condition for suture that exists in the former, simply by excising the bruised edges of the shot-wound. But Otis, speaking of shot-wounds, says: "I regard the refreshing of the bruised edges in gastrorrhaphy and enterorrhaphy as unnecessary. In the modern methods of applying sutures to the alimentary canal, inversion and approximation of the serous surfaces is universally sought. Now, in all shot-wounds of the digestive tube that I have examined, the loss of substance is mainly confined to the muscular, connective, and mucous tissues, the serous membrane remaining sufficiently organised to hold stitches. It will be sufficient to unite these surfaces; and what sloughing of the inner tunics there may be can discharge into the digestive cavity."

The directions here given may answer if the sutures be passed far enough from the bruised edges of the perforation to insure their firm co-adaptation. If there should be the least doubt about the course to pursue, then it would be better to excise the wounded part of the intestine, and bring together its smoothly divided ends. For we are sure of perfect union of neatly adjusted clean cuts in this canal. A great deal of useless and ingenious mechanism has been devised for suturing wounds of the intestines; but they must all give way to simpler means, those based on common sense, and of easy and universal application.

The question of the best method of repairing lesions of the intestines was settled definitely, forty years ago, by Professor Gross, by a series of beautiful philosophical experiments on the lower animals. (*An Experimental and Critical Inquiry into the Nature and Treatment of Wounds of the Intestines.* By Samuel D. Gross, M.D., etc. 1843. Louisville, Kentucky.) His experiments are so satisfactory and conclusive that there will never be any need of repeating them; they must be accepted as final. Dr. Gross advocates the continued suture in all intestinal wounds, no matter what may be their situation, direction, or extent. He used a straight round needle (a Kirby's No. 7 or 8 answers admirably), armed with a single fine silk thread. Interrupted or continued sutures, when the threads are cut short, always pass into the intestinal canal, and are evacuated with its contents twelve or fifteen days after their application. This is the rule; there is no exception to it when the sutures are cut close. Professor Gross's experiments fully confirmed those previously made by Smith, Thomson, Travers, and Sir Astley Cooper. Benjamin Bell had suggested this as the probable disposition of the sutures; but it was reserved for Thomson and Travers to prove it by experiment on inferior animals. If the ends of the sutures should be left long, and brought out at the external wound, they escape by the external wound. The stitches should be passed about a quarter of an inch from the edges of the wound, including only peritoneal and muscular coats; and when drawn closely they invert the edges, and thus bring the serous surfaces into apposition. This is Lembert's method. He used interrupted sutures thus applied; but, as every suture requires a separate tying, of course it takes a little longer. The continued suture is easier and quicker in application.

When the intestinal wound is extensive, that is, more than two inches long, whether longitudinal or oblique, Dr. Gross advises to "excise the wounded part entirely, and then to unite the divided ends." He further says: "My conviction is that there are but two sutures which should ever be thought of in the management of this class of injuries, namely, the continued and the interrupted, with the modification of the latter proposed by Lembert;" that is, the inversion of the edges of the wound so as to bring its serous surfaces into contact. The mode of reparation is the same, whatever the form of suture, viz., effusion of lymph and adhesion of the injured part to the neighbouring structures. Sometimes the part throughout the line of suture is coated with a layer of plastic exudation, which conceals the threads from view; and, in a great majority of cases, there is attachment of omentum to the surface and edges of the wound, which gives support and assists the process of restoration.

Baron Larrey records but one recovery from a shot-wound of the small intestine, and that one was treated by Palfyn's method. Palfyn's method consists simply in passing a ligature through the edge of the intestinal lesion, and pulling it to the level of the external wound, and there securing it to make an artificial anus. Otis expresses surprise that this was never done during our war; but how could it have been done, when it is well known that wounded intestine seldom prolapses through a simple bullet perforation; and when no surgeon was ex-

pected, at that time, to enlarge the external wound to search for intestinal lesions?

Bandens practised enterorrhaphy in two cases of shot-wounds of the intestine during the Algerian war, and one of them was completely successful. Pirogoff advocated the suture in the Caucasus, but had no time to put it in practice. Lohmeyer, in the Danish war, boldly advocated enterorrhaphy, but had not performed the operation. Legouest proclaimed similar doctrines in the Crimean war. And in our own country, since the experience of our civil war has proved how utterly futile our efforts were in this direction, many leading surgeons have given free utterance to sentiments that presage an inevitable revolution in the treatment of shot and other wounds of the abdominal cavity.

The latest expression of opinion on this subject comes from Surgeon-General Longmore, who says: "As to gun-shot wounds of the abdomen, I have little doubt that it will be found, whenever another great war gives the opportunity, that the revolution which has taken place in abdominal surgery in civil practice, especially with the additional advantages of the antiseptic mode of treatment, will equally show itself in military practice in penetrating gun-shot wounds of the same bodily region. In any such war as occurred in France in 1870-71, where in numerous instances there were opportunities of speedily treating the wounded in regular hospitals or permanent buildings in towns or villages, I feel assured that lives will be occasionally saved after complicated penetrating abdominal wounds, including cases of wounds of intestines, of lodgement of projectiles in the peritoneal cavity, and of hæmorrhage from mesenteric or other vessels, which hitherto have been left to die unaided by operative proceedings." (Letter to Sir William Mac Cormac, January 15th, 1882.)

Otis says of shot-wounds of the small intestines: "I have shown that in wounds of the small intestines of any magnitude, the pathological evidence of recoveries achieved by the unaided effort of nature, even through the establishment of a preternatural anus, is limited to a very few instances, of which none are absolutely unequivocal. Therefore, in wounds of this viscus, unattended by protrusion, when there is danger of extravasation, the external wound should be enlarged, and the wound in the intestine closed by suture."

Dr. J. S. Billings says, in a letter to Otis: "In regard to penetrating wounds of the abdomen, where there is reason to suspect intestinal injury, it appears to me to be proper to enlarge the opening, if necessary to ascertain the nature and amount of injury, to remove foreign bodies and extravasated matter, to employ sutures or ligatures where needed, and to cut these short and return the injured viscera. Especial care should be taken to prevent even the smallest particle of fecal matter from escaping into the peritoneal cavity, and to remove such as may escape. Ordinary fecal matter contains immense numbers of microzymes, or minute organisms known as bacteria, monads, micrococci, etc., which, if not the direct cause of putrefaction, as seems probable, are at all events closely connected with that process."

Professor Hunter McGuire expresses himself thus: "Penetrating wounds of the belly are nearly all fatal, and we must look for some other means of saving life than we now have. If the shock, thermometer, etc., indicate wound of the bowel, cut down and sew it up. You say this is desperate. I answer, the cases justify it. We must do something more than give opium and use ice-poultices."

Dr. H. S. Hewitt says: "It is next to an impossibility, when a soldier is wounded in the abdomen, with lesion of the intestines, that their contents should not escape into the peritoneal cavity. I think it admits of question, whether greater effort should not be made to seek out the wound, to close it by silver wire, and to endeavour to obtain primary union, while peritonitis and constitutional disturbance are treated on general principles."

Professor N. S. Lincoln declares that, "in punctured and incised wounds, when there is adequately strong presumptive evidence of intestinal lesion, though there may be no protrusion, it is the surgeon's duty to enlarge the parietal wound to seek for the wounded intestine, and to close the orifice, if it exceeds three lines, by suture. That, in shot-wounds of the intestine, unattended by protrusion, unless the perforation may be in the iliac region, with a reasonable likelihood of implicating the part of the large intestine uncovered by peritoneum, and thereby avoiding the risk of intraperitoneal extravasation, it is the safest course to enlarge the track of the ball, and to close the intestinal wound by suture."

[These letters from Drs. Billings, McGuire, Hewitt, and Lincoln, were written to Otis ten or twelve years ago, and are to be found in the *Medical and Surgical History of the Civil War*.]

Professor Samuel D. Gross, the highest surgical authority in our country, says, in the last edition of his *System of Surgery* (1872, vol. iii, p. 667): "It is still a mooted question as to what should be done when the wounded bowel does not protrude at the opening in the wall of the

abdomen. When we reflect on the fact, that in all lesions of this kind the great danger is from fecal effusion, and that such effusion is almost inevitable, even when the opening of the intestine is of very small extent, the duty of the surgeon, I think, plainly is to enlarge the abdominal orifice, to seek for the wounded tube, and to sew up the cut in the usual manner." Our great master in surgery, Professor Gross, here in a few words lays down the rule which should invariably guide our action hereafter in all wounds of the alimentary canal however made.

Thus we see that there were mutterings of discontent amongst surgeons long before our great war, which, since the war, have become more out-spoken and positive in demands for reform in the treatment of intestinal wounds. Look at the history of military surgery from its earliest days to the present moment; and what has it ever done for lesions of the abdominal viscera? Absolutely nothing, if we except a few cases of punctured and incised knuckles of intestine, which, having protruded through the outer wound, were sutured and returned to the cavity of the abdomen. But if we profit by the teachings of ovariotomy and ovariologists, we shall soon wipe out this reproach. Heretofore, when a man was shot or stabbed in the abdomen, we laid him down, gave opium to arrest pain and peristalsis, and applied "simple dressings", waiting and hoping for it to result in a fecal fistula. And how rarely did nature gratify our wishes, except when the lower ends of the colon and rectum were wounded! But all this must be changed. In the treatment of perforating shot and other wounds of the abdomen, we should strictly observe the following rules.

1. The external wound or wounds should be enlarged as soon as possible, and sufficiently to ascertain the whole extent of the injuries inflicted.

2. These should be remedied by suturing wounded intestines and ligaturing bleeding vessels.

3. Diligent search should be made for extravasated matter, and the peritoneal cavity should be thoroughly cleared of all foreign substances, whether fecal or bloody, before closing the external opening.

4. The surgeon must judge whether the case requires drainage or not. Generally it will not, if these rules be strictly carried out. We must not forget that fecal effusion has taken place after intestinal wounds have been sutured, simply because the surgeon failed to find and suture all the lesions. And we must not forget that fatal results have followed enterorrhaphy when thoroughly done, simply because fecal effusion had taken place before the intestine was sutured, and had been left in the peritoneal cavity, producing death as speedily and as certainly as if the lesion had not been found and closed. Therefore, it is essential not only to find all lesions and remedy them, but to be sure that we leave the whole cavity of the peritoneum perfectly clean.

These principles are the foundation of success in all other operations involving the peritoneum, and they must be equally successful when applied to shot and other wounds of the intestinal canal.

Dr. N. S. Lincoln advises to enlarge the external wound and search for the injured bowel, and suture it, "unless the perforation may be in the iliac region", where it may possibly be followed by fecal fistula, and spontaneous cure. But it would be unwise to make exceptions of this sort. We should trust nothing to chance. For we must remember that, of eighty-nine shot-wounds of the large intestines, thirty, or 33 per cent., died; of one hundred and eighty-three of the bladder, ninety-six, or 52.5 per cent., died; and of one hundred and three of the rectum, forty-four, or 42.7 per cent., died. Now, if we should not interfere with pelvic and iliac wounds, the above figures prove conclusively that we would jeopardise from 33 to 52 per cent. of all lives with such wounds. I would therefore insist on leaving nothing to luck, but to explore and suture all intestinal and bladder wounds alike, under all circumstances.

There is a time for all things; and a fitness of time for all new departures from old customs. From preceding quotations, it is seen that there has been a latent, but growing, sentiment amongst surgeons for many years, that, sooner or later, a new system would be adopted in the treatment of intestinal wounds. But there has never been a time, till now, when such a course could be wholly justified; and now it can be done alone by showing the positive success that invariably attends all operations in peritoneal surgery. Besides this, there has never been a more opportune moment for pressing this question on the attention of the profession. For we have all suddenly become intensely interested in the subject of gun-shot wounds. The death of the beloved President Garfield by the assassin's bullet sent a thrill of horror through the whole country and throughout the civilised world, and excited such sympathy in every grade of life, as to make us all of one family and one feeling. Soon after the shooting, I was often called on in Paris for an opinion as to the probabilities of the President's recovery; and as he did not die in three days, I knew that the ball had not penetrated the peritoneal cavity, and I gave my friends assurances of his ultimate

recovery. In the early days, when despair pervaded all minds, I was interviewed, and my statements were telegraphed home. A few weeks afterwards, I was informed that they produced amongst medical men great surprise, and severely adverse criticism. When I heard of this, I determined at once to lay the subject broadly before the whole profession, leaving them to decide the question at issue.

Feeling that I have now done my duty, I seize this occasion to repeat what I said in Paris to the friend who sent the telegram to New York. I said: "If the President had recovered from shock, and if there was undoubted evidence that the ball had traversed the peritoneal cavity, his only safety was in opening the abdomen, clearing out the peritoneal cavity, tying bleeding vessels, suturing wounded intestines, and treating case as we would after ovariectomy, using drainage or not, as circumstances required." This is what I said then; this is what I say now, and what I am able to defend on the broad principles already so well established in peritoneal surgery.

Do we not now every day, fearlessly and with the utmost safety, open the peritoneal cavity, and remove ovarian tumours and uterine fibroids, cut out kidneys and spleens, attack the liver in its fastnesses, unroll the convoluted obstructed intestine, exsect the pylorus, incise the stomach for foreign bodies and for nutrition, search out and evacuate hidden receptacles of pus, and remove Fallopian pregnancies, bringing back to life individuals who, but for these brilliant and successful achievements, would all have found early graves? And shall we stand idly by, and see any man, whether he be president or peasant, certainly die with a shot through his intestines, without an effort to save life, when it is so certain and so easy to do it on the principles now well understood and successfully practised every day? Fortunately for the President, the ball did not traverse the peritoneal cavity, and hence his escape from a rapid death, and hence the uselessness of my telegram.

Finally, I have the deepest conviction that there is no more danger of a man's dying of a gun-shot or other wound of the peritoneal cavity, properly treated, than there is of a woman's dying of an ovariectomy properly performed. Ovarian tumours were invariably fatal till McDowell demonstrated the manner of cure, which has now reached such perfection that we cure from 90 to 97 per cent. of all cases. And by the application of the same principles that guide us in ovariectomy to the treatment of shot-wounds penetrating the abdominal cavity, there is every certainty of attaining the same success in these that we boast of in ovariectomy.

If the facts now presented to you on this question be accepted as such, then I think we may logically draw the following conclusions.

1. Wounds of the peritoneal cavity, however made, have a common course to run.
2. They have a common termination, that is, in death by septicæmia.
3. This is the general law in death from ovariectomy.
4. It is the general law in death from gun-shot and other wounds of the peritoneal cavity.
5. Septicæmia in these cases is the result of the absorption of a bloody serum and other effusions found in the peritoneal cavity after wounds or operations.
6. Gun-shot wounds of the pelvic cavity recover, because of natural drainage by the track of the ball carrying off poisonous effusions and bloody serum.
7. Gun-shot wounds of the abdominal cavity die, because there is no natural drainage, and the poisonous effusions and bloody fluid fall into the pelvic cavity, and are there absorbed, producing septicæmia and death.
8. To evacuate this bloody fluid and other foreign effusions, it is necessary to enlarge the abdominal wound, to clear out the peritoneal cavity, to suture wounded intestines, and tie bleeding vessels, using drainage or not, according to circumstances.
9. If this operation be well done, there will hardly be need of drainage.

TOXICOLOGICAL MEMORANDA.

CASE OF POISONING BY NITRATE OF POTASH: RECOVERY.

I was called to see G. S., a farm-labourer, about 1.30 P.M. on the 8th of January last. I found him walking about the room in evident distress. He complained of intense pain in the stomach. It was constant, and of a burning character. The eructations were like "flame". On inquiry, he told me that, not feeling well the last few days, he had taken an ounce (avoirdupois) of salts about 7 A.M. that morning. He had often taken as much before. The salts did not taste quite the same as usual, but they were not "sour". He had nothing in the

house for which he could have mistaken them. They were bought at the village grocer's, and his little girl had previously taken half-a-teaspoonful, with the usual effect. As soon as he had taken the salts, he felt the intense pain in his stomach. The perspiration "poured" out of him. He felt sick, but did not vomit till 11 A.M. (four hours afterwards), in the meantime having taken his breakfast and a glass of brandy and water. He vomited very freely, and described it as being "black, like coffee", and tasting very "bitter". It was not preserved, but a little that had remained on the pavement at his door had the appearance of hæmatemesis.

On examination, I found his pulse 56, regular, full, and strong. His pupils were normal. His tongue was moist, with a white fur down the centre, and was tremulous. There were no excoriations about the lips or pharynx, or other signs of an irritant. As it was six and a half hours since taking the "salts", and he had vomited freely, I merely gave him an opiate to be taken every hour, and ordered hot applications to the epigastrium. At 5 P.M., he sent again for me, still complaining of the severe pain. The first two doses of the opiate had relieved the pain somewhat, but he had vomited after taking the third dose. The vomit had all the characters of hæmatemesis. He now told me that he thought it was "saltpetre" and not "salts" that he had taken. On inquiry, I learned that he had had calls to micturate every half-hour for the first three hours after taking the salts. I procured some "salts", and also some powdered "saltpetre", from the shopman, and the patient at once selected the saltpetre as what he had taken, as also did his daughter. The vomit also gave distinct evidence of the presence of a nitrate.

My principal, Dr. Adams, now saw the case with me; and it was determined to give him a free emetic and a copious warm water enema; to let him drink freely of thin milk-gruel; and to give a fourth of a grain of morphia in a pill every three hours.

At 11 P.M., he had taken freely of his gruel, and had not been sick since the action of the emetic ceased. The pain was a trifle easier. His pulse was 88, regular, and full. He was slightly under the influence of the morphia.

At 9 A.M., on the 9th, the patient felt easier. The pain was not quite so severe nor so constant. He had slept about an hour during the night, and had passed about half a pint of urine. It was dark orange in colour, of specific gravity 1020, very acid in reaction, and did not contain albumen. At 3 P.M., the patient had had the free use of his bowels after taking a full dose of castor-oil, and felt much better. The stool was liquid, tarry in appearance, and very offensive. The pain in the stomach was less, and the patient had had three hours' sleep; and from this time made a gradual recovery.

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CLINICAL MEMORANDA.

CASE OF DIFFUSED SUPERPIGMENTED MOLE OF ABDOMEN, SIDE AND BACK.

L. C. was born on August 4th, 1880. Her parents are both strong, robust, and healthy-looking people, with good family history. The husband, twenty-four years of age, is employed as a mechanic in some large works. The mother, twenty-one years of age, had been married three years, and had one male child perfectly developed. While pregnant two months and a half with this, her second child, the mother states that she was frightened by a large black dog, which lay on the road while a cart passed by; and she, thinking it was a child about to be run over, screamed out, when the dog rose suddenly. There is no other history of a fright. The mother is reported to have always been passionately fond of dogs, and would nurse them for hours on her lap.

On August 4th, 1880, she was attended by a midwife; and, after an ordinary labour, was delivered of this female child. The case was brought to me at the hospital when a fortnight old. I found the greater part of the skin of the abdomen, right side, and the whole of the back, from a line drawn between the axilla above down to the anus below, and extending down the right thigh, as far as the junction of the upper with the middle third, hypertrophied, superpigmented, and covered with hair one inch in length. The right labium was greatly enlarged, forming quite a flap, which almost completely covered the vaginal orifice. On every part of the body, from the crown of the head to the soles of the feet, there were a number of minute patches of pigment, varying in size from the point of a pin to a very small split-pea. The skin over these parts was perfectly smooth, and free from hairs. In all other respects, the child was well-developed.