asepsis in treating wounds, as well as diseases, would have, no doubt, been somewhat deferred. His success over the old time practice induced men of brains to commence thinking, which is the only way great reformations can be brought about. But unfortunately great discoveries are, in their application, many times carried to excess, which, doubtless was the case with the Lister antiseptics, as it respects their use in obstetrics. The conservative views entertained heretofore as it regards parturition were soon exchanged by many for those of a radical character. Instead of regarding parturition as a natural and physiological process, it was deemed to be pathological, and the puerperal was looked upon in the same light as a case of amputation, and of course must be treated accordingly. This view led to the use of injections of irritating and poisonous drugs to prevent septicæmia.

I only wish to put in a plea of conservatism, by which the medical pendulum will be prevented from swinging too far to one side.

GUNSHOT WOUNDS OF THE ABDOMEN; WITH CASES.

Read in the Section of Surgery and Anatomy at the Forty-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.

BY DAVID BARROW, M.D.,

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J. G., æt. 15, was shot in the abdomen at 7 p. m. on February 8, 1890. The wound was one inch and a half to the left of and on line with the umbilicus, and was made by a 32-calibre ball. The pistol was discharged at close range. I saw him at ten p. m. He was then in bed with the lower extremities flexed; vomiting was frequent, and he complained of great abdominal pain; the facial expression was anxious, and the abdomen was hard and retracted; pulse was over a hundred and rather weak; shock was evident but not extreme. The wound was not probed, but it was plain that the cavity had been entered and all the symptoms pointed to visceral wounds. Laparotomy was indicated, and at eleven o'clock, by lamp light, I operated, assisted by Drs. Bryan, Keller and Scott. Chloroform was administered and several times during the operation the patient's condition was alarming. An incision of four inches was made in the linea alba, between the umbilicus and pubis. A loop of the intestine presented, but owing to the extreme rigidity and retraction of the abdominal walls, manipulations were unsatisfactory, so I enlarged the incision to six inches. Passing two fingers into the cavity the wound of entrance was felt; the ball had passed backward and upward. Tracing the intestines I found six perforations, four in the small and two in the large bowel. These were closed by the Czerny-Lembert suture, using fine intestinal silk,

and in one of the perforations of the large bowel, on account of the great bruising and ecchymosis, I reinforced the stitches and bruised tissue with omentum. There was not much hæmorrhage and no feces were seen. Irrigation was copious and thorough, and considerable water was left in the cavity. A glass drainage tube was inserted, with one end between the bladder and rectum; the incision was closed with silk. The duration of the operation was an hour and fifteen minutes. Chloroform was taken badly, and a great part of the time, all intra-peritoneal manipulations were resisted by the forcible contraction of the abdominal muscles, and the operation was thus greatly prolonged. Boiled cistern water was used. Antiseptic dressings were applied, and the patient was greatly shocked when placed in bed; the heart's action was rapid and weak, and the respiration was shallow. Reaction was slow and he vomited occasionally for eight hours. On account of some pain and great restlessness morphine was given in small doses for ten days. The drainage tube was emptied frequently and was removed on the sixth day. Convalescence was uneventful. The bowels were moved on the seventh day, and stitches taken out on the eighth. There were several stitch abscesses and a small superficial part of the incision healed by granulation. Three weeks after the operation, on account of imprudence in diet, he had a severe attack of indigestion, with much vomiting, and was greatly exhausted. He is now perfectly well.

C. D., æt. 13, was wounded by a 32-calibre ball at four p. m., July 1889. I saw him a few minutes later and had him taken to his home several squares away on a stretcher. I operated at 8 p. m., assisted by Drs. Brown, Molloy, Colman and Evans. At the time of operation there was no symptoms indicating serious injury; there had been no vomiting; the pulse was eighty and regular; and the boy was comparatively comfortable. The ball had entered two inches to the right of and one inch below the level of the umbilicus, and a probe passed directly into the peritoneal cavity. Chloroform was administered, and I made a four inch vertical incision, and included in the incision the bullet wound. The ball had passed downward and to the right. Tracing the intestines five perforations were found, two in the ilium and three in the cæcum. These were sutured with fine silk by the Czerny-Lembert method; the cavity was irrigated with boiled distilled water; the abdomen was closed and antiseptic dressings applied. Duration of operation a half hour. There was no shock when put to bed and he rallied promptly from the anæsthesia. For two days he did well when the temperature went up to 101° and he began to vomit. The abdomen was reopened, and irrigated with boiled distilled water and a rubber drainage tube in-

sented. He died at the end of the third day of septic peritonitis. *Post mortem* demonstrated all perforations securely closed; there was no leak when the gut was distended with water; some loops of the intestines were adherent, and there were several ounces of bloody fluid in the peritoneal cavity. The boy should have recovered, and, I believe, would have, had I inserted a glass drainage tube at the time of the operation. The operation was done in a negro's cabin, and the hygienic surroundings were most unfavorable.

In a paper read at the last meeting of the Kentucky State Medical Society on "Four Cases of Gunshot Wound of the Abdomen Treated by Laparotomy, With Remarks," and published in *THE JOURNAL*, June 15, 1889, I reported all of my cases up to that time. Since then, I have had the two just reported, making six laparotomies I have done for gunshot wounds of the abdomen. Of the first four, three died and one recovered, and of the last two one died and one recovered.

Dr. T. S. K. Morton, of Philadelphia, read in the Surgical Section, at the last meeting of this Association, an instructive paper on "Abdominal Section for Traumatism," and in it gave a complete table, containing nearly all the reported cases of gunshot wounds of the abdomen treated by laparotomy. From a study of this table, and my own cases, I am enabled, I think, to demonstrate much that is still apparently unsettled in the minds of some surgeons relative to the management of these wounds. The table contains one hundred and ten cases, and these should be sufficient to establish many facts in the management of such wounds. That laparotomy should be done when called to one of these patients is no longer debatable, for with the "let alone" plan of treatment nearly all die, and with laparotomy a third recover. This mortality will certainly decrease, and I hope before many meetings of this Association shall have passed by, and when surgeons learn to act promptly, that half or even more of these cases will be saved. The necessity for prompt action is well shown—of the thirty operated upon fifteen, or more, hours after the wounds were received, six recovered and twenty-four died, giving a mortality in these delayed operations of eighty per cent. The great danger is septic peritonitis, and that will often appear very quickly; frequently in a few hours there is evidence of its presence. We should operate to prevent this septic condition that is so certain to follow wounds of the peritoneum, and to procrastinate until this septic inflammation is inaugurated, is a timid and disastrous method of dealing with these wounds, and will necessarily be followed by a very large mortality. Of the seventy-four deaths recorded, thirteen were due to septic peritonitis, directly dependent upon delayed operations. When the operation has been delayed

and there is septic infection and shock, the patient can stand but little manipulation, and if the operation be prolonged from any cause, he may die on the table or may never rally from the shock. An ideal operation cannot be done when this is the condition, so we must "operate strictly to save life." No good will be accomplished by closing the wounds neatly, if the patient dies from the prolonged effort necessary. In these desperate cases, I believe more can be saved by opening the abdomen, inserting multiple drainage tubes, irrigating frequently, and adopting the open peritoneal treatment.

In only nine of the cases is the duration of the operation given, and in every instance where it was much prolonged, the patient died. Dogs and other animals will die of shock, if kept under the influence of an anæsthetic for a long time, and the viscera manipulated, and it will be disastrous to anticipate a favorable termination in gunshot wounds, when from two to four hours is often spent in doing the laparotomy. As to the evidence the surgeon should have to justify his opening the abdomen, I think the facts will bear me out in this very positive statement: When there is proof of the ball having entered the peritoneal cavity, it is the duty of the surgeon to open the abdomen and remedy, as best he can, the abnormal conditions there found. Eight times the abdomen was opened and no viscus found wounded. Six of the operations were done promptly and all of the patients recovered; but in two, the operations were delayed, in one to the fourth and in the other to the sixth days, and both resulted fatally. *Post mortem* examinations proved the absence of visceral wounds, and that septic peritonitis had been the cause of the deaths. Had these two patients been operated upon promptly, as were the other six, and the peritoneal cavities thoroughly cleansed, they too, I believe would have been saved. If the six had not been treated promptly, the probabilities are, that some of them would have died of septic peritonitis. Believing, when the bullet has penetrated the peritoneal cavity, that the abdomen must be opened and the cavity cleansed, even should the alimentary canal escape injury, I can see but little use of the hydrogen gas test. There are twenty-one cases where the alimentary canal was not wounded, eleven recovered and ten died. Of course the test would have given negative results, but I venture none of us will doubt but what the operations should have been performed. The test has been applied to nine cases and failed but once to indicate the true condition of the alimentary canal, and then there were five perforations of the small intestines. In another the result was negative, the operation was delayed six days, and then done for septic inflammation, and the *post mortem* examination demonstrated the absence of visceral wounds.

The hydrogen gas test can only be of use to prove the thoroughness of an operation just before closing the abdominal incision. Seven times perforations were overlooked, and had the gas been used, they might have been found and closed. Dr. Senn detected an overlooked perforation with the gas before closing the incision, and succeeded in saving his patient. In wounds of the liver the hæmorrhage must be controlled. Nine of the fifteen cases reported died. To stay the hæmorrhage we may suture the wound, pack it with gauze, or apply the cautery. A glass tube inserted through the track of the ball, as has been suggested, might be of benefit in controlling the hæmorrhage, and by carrying off all septic materials. Styptics might be applied to the bleeding surface through the tube with good results. Of the five kidney wounds all of the patients died except one, and she was saved by removing the wounded kidney.

In abdominal operations there is nothing more essential to success than thorough irrigation, and in laparotomy for gunshot wounds, this is, if possible, more important than in laparotomy for other causes, for here the peritoneal cavity often has thrown into it septic material from the digestive track. It is most difficult indeed to wash the peritoneal cavity clean, and I have no doubt that, in many of the cases where irrigation is noted, the cleaning process was imperfectly done and practically useless. The table can throw no light on this subject, but to every one who has operated in the abdomen, no argument will be necessary to convince him of the importance of thorough irrigation. The best and simplest irrigator I have ever seen is one used by Dr. Joseph Price, of Philadelphia, consisting of a funnel, a rubber tube and a large perforated nozzle. The force of the current can be regulated by elevating or depressing the funnel, and if the nozzle be properly directed amongst the intestines, all loose materials will be floated through the incision. The effect of drainage is forcibly shown, and though out of the one hundred and ten operations, the use or non-use of the drainage tube is mentioned in but twenty-nine, these are sufficient to justify the strongest conclusions. Of the twenty-nine cases drainage was used in twenty-one, and in eight there was no drainage employed; of the drainage cases six recovered and fifteen died, and of the non-drainage cases two recovered and six died, in the former a mortality of 71½ per cent., and in the latter of 75 per cent. This is a stronger argument than at first appears, for the use of the drainage tube for the cases usually regarded by surgeons as requiring drainage, are the more desperate ones, and those where it is usually dispensed with are considered favorable. So necessary is drainage, that I will, even at the risk of being tedious, refer in detail to some of the cases where

drainage was employed and others where it was not. Of the six recoveries where drainage tubes were used, five were desperate cases and could not have been saved without the drains. In one case there was "intense peritonitis" at the time of operation, and the tube was kept in place for ten days; in another the operation was delayed for 108 hours, and besides the perforations, there was in the peritoneal cavity, bloody serum and pus; a third was Dr. M. Price's case, the liver and right kidney were wounded, and the latter organ was removed, and during convalescence several small hepatic abscesses formed and were discharged; and in two of the three remaining cases, the wounds were extensive, and blood, food and feces were found in the peritoneal cavities. In the fifteen fatal drainage cases the conditions were extreme and the drains in none of them could have accomplished much. In two of the cases perforations were overlooked; the operations were delayed in four; and in four others the deaths were due directly to hæmorrhage and shock; in one a divided ureter was undetected; another died from opium; and in one the "drain had not worked." The traumatism in the other two cases were extensive and it would have been exceptional for either one of them to have recovered. Of the eight non-drainage cases two recovered and six died; of the two recoveries there were no wounds in the alimentary canal in one, and in the other, only one perforation of the small intestine. Of the six that died septic peritonitis caused death in five, and in the other there was profuse hæmorrhage from the renal artery. Had drainage been employed in these cases, I believe more of them would have lived, for if there is any one thing, next to irrigation, that can guard against septic infection, it certainly is the drainage tube.

In one of my patients I believe the omission of the drainage tube was directly responsible for death, and shall always feel that had I used drainage my patient would have recovered. The operation was, with that exception, the most satisfactory I ever did, it was done promptly and quickly; there was no shock before or after the operation; and the perforations were all found and demonstrated at *post mortem* to have been securely closed. Everything went along well until the peritonitis set in, and then death came rapidly, notwithstanding the wound was reopened, the cavity irrigated, and a drainage tube inserted.

In wounds of the intestines so extensive as to materially diminish the bowel lumen, should the Lembert suture be used, intestinal anastomosis promises better results than exsection of the wounded intestine. All of the eleven patients died where exsection was resorted to.

To reinforce a perforated or bruised intestine with omentum is of great importance. Fre-

quently around a perforation there is some bruised tissue, and this may slough if the perforation is simply sutured. In one of my cases I stitched the omentum over the perforation and bruised tissue, and my patient recovered.

The following are the causes of death in the seventy-four fatal cases: Septic peritonitis, 29; hæmorrhage, 15; delayed operations, 13; shock, 9; overlooked perforations, 3; and from other causes, 5. I believe the study of these fatalities, with the other facts presented, will make it apparent that the suggestions made, should be considered as established rules in the management of gunshot wounds of the abdomen. I hope in future that such causes of death will be eliminated as septic peritonitis, due to omissions of irrigation or drainage, delayed operations, shock from prolonged operations, and overlooked perforations.

From a careful analysis of 112 laparotomies for gunshot wounds of the abdomen, I feel warranted in drawing the following conclusions:

First. Gunshot wounds of the abdominal cavity should invariably be treated by laparotomy. With the operation the mortality is 66.27 per cent; without the operation more than ninety per cent. die.

Second. It will be safer to always open promptly and cleanse the peritoneal cavity, even should the viscera escape injury. Two patients died of septic peritonitis, without visceral wound, because this was not done; the six exploratory operations terminated favorably.

Third. Symptoms are unreliable, and the surgeon should never wait for them, if the ball has penetrated the cavity. This must always be ascertained, either by the use of an aseptic probe, or by enlarging the bullet wound and following its track through the abdominal wall. In delayed operations the mortality is eighty per cent.

Fourth. In every instance mentioned, where the operation has been greatly prolonged, the patient died. Shock from the anæsthesia and manipulation is always considerable, and all possible haste should be made.

Fifth. In extreme shock, rather than occupy too much time in suturing the perforations, adopt the open peritoneal treatment, and trust to irrigation and drains to save the patient. Nine deaths were due to shock.

Sixth. In destructive wounds of the intestines, lateral anastomosis promises better results than exsection. All of the eleven died where exsection was done.

Seventh. By utilizing omentum we can sometimes close destructive wounds, without diminishing the intestinal lumen too much, and can reinforce bruised intestinal tissue that would otherwise be dangerous to leave. In one of my successful cases the latter procedure was adopted.

Eighth. In liver wounds the hæmorrhage must

be controlled and the peritoneal cavity cleansed. In some cases it may be well to drain the liver wound separately, by inserting a glass tube, as suggested by Dr. M. Price. A fatal case of mine, with bile duct cut, might have recovered had I used the tube.

Ninth. The kidney must be removed if wounded and bleeding. This was done in the only successful case; and in the other four cases, all fatal, the kidney was removed in two and left in two.

Tenth. The hydrogen gas test is only of use in demonstrating the closure of all the perforations, and should be used just before closing the abdominal incision. Dr. Senn detected an overlooked perforation by this means and saved his patient.

Eleventh. Irrigation should always be copious and thorough, and never omitted when the digestive track is perforated. It is the best treatment we have for shock; diminishes the thirst that is so often annoying; and is the best means of guarding against septic peritonitis. Twenty-nine of the seventy-four deaths were due to this septic infection.

Twelfth. The drainage tube should rarely be left out. I have never known it to do harm, and certainly some of the recorded cases would have done better had the tubes been inserted. The omission of the drainage tube was the cause of death in one of my patients. In drainage cases the mortality was less than in non-drainage cases, notwithstanding the former were in a far more desperate condition at the time of operation than the latter.

FRACTURES OF THE BASE OF THE SKULL, AND THEIR TREATMENT.

Read by Title in the Section of Surgery and Anatomy, at the Fort-first Annual Meeting of the American Medical Association, Nashville, Tenn., May, 1890.

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Benjamin Bell, of Edinburgh, writing about 100 years ago, said: "A great variety of symptoms are enumerated by authors as indicating a compressed state of the brain from external injuries, but the most frequent, as well as the most remarkable, are the following: giddiness, dimness of sight, stupefaction, loss of voluntary motion, vomiting, apoplectic stertor in the breathing, convulsive tremors in different muscles, a dilated state of the pupils even when the eyes are exposed to a clear light, paralysis of different parts, especially of the side of the body opposite to the injured part of the head, involuntary evacuation of the urine and fæces, an oppressed and in many cases an irregular pulse, and when the violence done to the head has been considerable, it is commonly attended with a discharge of blood from the