MASSIVE RESECTION OF THE SMALL INTESTINE*

REPORT OF TWO CASES

WM. H. PRIOLEAU, M.D.

CHARLESTON, S. C.

FROM THE DEPARTMENT OF SURGERY, MEDICAL COLLEGE OF THE STATE OF SOUTH CAROLINA, CHARLESTON, S. C.

THE PURPOSE of this paper is to discuss briefly massive resection of the small intestine and to report two cases, one of which survived the resection of 260 cm. of small intestine, with 31 cm. of sigmoid colon, and two subsequent major operations for reestablishing the continuity of the large intestine, who, finally, regained an excellent state of health; and the other case who survived the resection of 354 cm. of small intestine, with 40 cm. of sigmoid colon, but pursued a generally downhill course, and died four months later of nutritional disturbances and postoperative complications.

Massive resection of the small intestine is of interest both from the immediate survival of a critically ill patient from an extensive emergency operation with, not infrequently, secondary operations for establishing intestinal continuity, and later from the standpoint of nutritional disturbances following the loss of a large section of the bowel. The term is applied to those cases in which 200 cm., or more, of small intestine have been resected. This is generally estimated at one third the total length, though there must be considerable variation with individuals, and in children it is relatively a greater proportion of the whole. The most complete review is that of Haymond,[1] in 1935, in which he analyzed a series of 257 carefully selected cases. In this series the mortality was 33 per cent, but this is considered as unduly low due to the greater tendency to report the successful cases. In some cases a portion of sigmoid colon is involved and requires resection. This adds greatly to the operative risk but has no significant bearing upon the nutritional status. In this group the mortality is highest, being 65 per cent. The two cases herewith reported are of this type. Volvulus is the most common condition necessitating such an extensive resection. Among others are strangulated hernia, mesenteric thrombosis, adhesions and abdominal injuries.

Besides the length of the intestine resected, the immediate outcome is determined by the disease condition which necessitates the resection and the general health of the patient. While there appear to be some exceptions, the nutritional status is definitely affected by the relative amount of bowel removed. Discounting the operative risk and postoperative complications, a patient may be expected to regain a normal nutritional status following the removal of 33 per cent of the small intestine. Fifty per cent is given as the

* Read before the Southern Surgical Association, New Orleans, La., December 7–9, 1943.

upper limit which may be borne, with a possibly satisfactory outcome. A loss greater than this is almost invariably followed by serious nutritional disturbances of varying degree.

Inadequate compensatory changes following massive resection of the small intestine result in loss of weight, anemia and diarrhea, and at times, edema. There is excessive loss of fat and protein in the stools. The blood calcium and serum proteins are low. In a remarkable case reported by West, *et al.*,[2, 3] in which only three feet of jejunum remained, there was noted at a subsequent operation considerable dilatation and hypertrophy of the remaining bowel. Extensive metabolic studies led to the conclusions that carbohydrate is well assimilated, protein less well, and fat only poorly. The large amount of fatty acid in the stool apparently carries with it calcium in the form of calcium soap, leading to a negative balance of this mineral. Their patient did best on a high carbohydrate, adequate protein, low fat diet with additional calcium and vitamin D. Observations of others are along the same lines.[1, 4]

CASE REPORTS

Case 1.—Hosp. No. R 110430-4511: W. A., Negro, male, age 31, was admitted to the Roper Hospital May 7, 1940, at 10:30 A.M., complaining of severe pain in the abdomen, which had begun in the epigastrium at 5 A.M. There was vomiting at the onset but none subsequently. The pain was rhythmic in character and varied in severity, but was always present in some degree. His general health had been good and there was no history of indigestion or of any previous attack. He was well-developed, well-nourished, and had an ashen grey complexion. He was obviously acutely and critically ill. He was writhing with pain. Temperature 96° F., pulse 70, and B.P. 120/80. His abdomen was moderately distended and tympanitic. There was a general tenderness and rigidity. There was no visible or audible peristalsis. Rectal examination revealed some fullness in the rectovesical pouch. W.B.C. 15,500, with 91 per cent polymorphonuclear cells. A specimen of urine could not be obtained. Roentgenologic examination revealed some fluid levels in the small intestine and gaseous distention of the large bowel up to the splenic flexure. *Clinical Diagnosis.*—Intestinal obstruction, with strangulation.

Operation.—5 P.M. Spinal anesthesia with pontocaine 20 mg. was given. A few minutes after the subarachnoid injection the patient had generalized severe convulsions, respiration ceased, and the pulse became imperceptible. He reacted somewhat to artificial respiration, inhalation of oxygen and carbon dioxide, and injections of coramine and ephedrine, though he remained in shock throughout the operation. A right paramedian incision was made. All of the small intestine in view was of a dark, blue color, likewise its mesentery. The gangrenous portion was resected with its mesentery. A section of the gangrenous large bowel was twisted with the small intestine in such a manner that it had to be divided before it could be sufficiently mobilized to permit of resection. An end-to-end open anastomosis was made between the proximal end of the small intestine and the distal end, which was 6 cm. from the cecum. A Witzel enterostomy was made proximal to the anastomosis, bringing the tube out through a stab wound on the right. The appendix was removed. The distal end of the large bowel would not reach the abdominal wall so it was closed by inversion and dropped into the pelvis. The proximal end of the large bowel was brought out through a stab wound to the left of the umbilicus to act as a colostomy. The incision was closed with catgut for the peritoneum and fine alloy steel wire for the aponeurosis. The operation took one hour and forty-seven minutes.

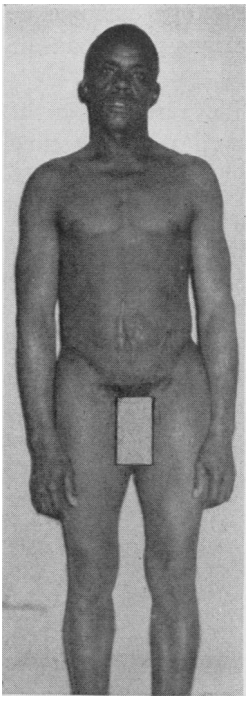

FIG. 1.—Case 1: Appearance of patient 18 months after operation.

The patient was returned to the ward in fair condition. The specimen removed, as measured 15 hours later, consisted of 260 cm. of gangrenous small intestine, with its mesentery, and two segments of gangrenous colon, measuring 19 and 12.5 cm., respectively. The appendix had a thick serosa and a scarred wall.

Postoperatively the patient was given continuous stomach suction and lavage through a Wangensteen tube. Sodium sulfapyridine was administered intravenously. The abdomen remained flat and the convalescence was remarkably smooth. On May 10 the enterostomy began discharging freely, and on May 13 the colostomy did likewise. The enterostomy spontaneously closed following removal of the tube on May 17. On May 20 there was noted some purulent discharge and slough at the upper end of the incision. On June 19 roentgenologic examination with a barium enema revealed the distal end of the colon to be 20 cm. from the anal orifice.

On June 25, under spinal anesthesia, in preparation for anastomosing the ends of the sigmoid colon, numerous dense adhesions were severed from around the proximal end, and a double barrel transverse colostomy was made. On July 16, under spinal anesthesia, through a low left rectus incision dense adhesions were freed, and with difficulty the ends of the colon were mobilized for anastomosis. This was accomplished by attaching a stout ligature to the proximal end and telescoping it into the distal segment by a forceps passed through the anal orifice. No other method of anastomosis was possible due to the fixation and induration of the distal end, which had to be split to permit passage of the proximal end. Following this operation there were several brief periods of diarrhea, which were readily controlled by dietary regimen.

Until August 15, a period of one month, when dye instilled into the distal loop appeared at the anal orifice, there was complete obstruction at the site of anastomosis. Later a Levine tube was passed from above, and subsequently dilatation was effected by passing bougies from below. From October 1 to November 17, the colostomy spur was crushed in stages. On November 22, the colostomy was closed under local anesthesia. On November 24, four months after the anastomosis, there was a bowel movement by the rectum. On November 30 the patient was discharged from the hospital. His general condition was good. He was eating the ward diet. He was passing several poorly-formed stools a day. The abdominal incisions were firmly healed. Laboratory examinations were as follows: W.B.C. 8,075; Hb. 10.5 Gm. Urine: Albumin one plus; blood serum protein 8.20 Gm.—albumin 4.7 Gm.—globulin 3.43 Gm.—chlorides 495 mg.—blood Wassermann—positive.—Stools: Yellow and putty-like, muscle poorly digested.

On December 29, 1941, he returned to the hospital for observation at our request. He had been enjoying good health and working at his former occupation as a laborer in a fertilizer factory. He paid no particular attention to diet. He preferred carbohydrates and proteins, but ate fat without ill effect. He had no digestive disturbance or abdominal pain. His weight was 138 lbs., a very good average for him. He had one bowel movement a day. Roentgenologic examination revealed no abnormality other than a shortening of the small intestine and a correspondingly short emptying time. Examination of the urine was negative. W.B.C. was 7,700, hemoglobin 12 Gm.

Blood sugar 81 mg.—calcium 12 mg.—phosphorous 8.25 mg.—total serum proteins 8.25 Gm., albumin 4.3 Gm., and globulin 3.9 Gm. The stools were yellow and mushy.

He was last examined on October 10, 1943. He was working as a laborer for a railroad. His general health was good. He was having two or three bowel movements a day. He paid no attention to dietary restrictions. The stools were well-formed and normal microscopically. Blood calcium 10 mg.,—phosphorus 3.5 mg.,—total serum protein 7.61 Gm.,—albumin 4.88 Gm.,—globulin 2.73 Gm.; and hemoglobin 12 Gm. per 100 cc.

Case 2.—(Reported by courtesy of Dr. Frederick E. Kredel): (Hosp. No. R 8382): J. S., Negro, male, age 56, was admitted to the Roper Hospital at 11 A.M. May 16, 1942, complaining of abdominal pain. He had been awakened at 1 A.M. by a sudden, sharp pain in the region of the umbilicus. The pain became steady but varied in intensity in rhythm, each cycle lasting 15 minutes. He had vomited continually since the onset. He had no passage by rectum. He had been losing weight the past few months and had noticed an increasing tendency to constipation. He appeared acutely ill and had an anxious expression. Pulse 70, temperature 97.4° F.,—B. P. 60/40. The abdomen was considerably distended and tympanitic, no bowel pattern was visible. Rectal examination was negative. In view of a questionable pericardial friction rub, an electrocardiogram was made. It showed changes best explained by anoxemia incident to peripheral circulatory collapse. W.B.C. 15,400, with 88 per cent polymorphonuclear cells. *Clinical Diagnosis:* Intestinal obstruction from mesenteric thrombosis. For the purpose of investigating the cardiac condition and of treating the shock, operation was deferred until 10 P.M.

Operation.—Under nitrous oxide-oxygen-ether vapor anesthesia, a left lower paramedian incision was made. Two quarts of foul-smelling bloody fluid was aspirated. All but the proximal seven feet of small intestine and the terminal ileum was gangrenous, also two feet of sigmoid. The condition was apparently due to a volvulus. The gangrenous bowel was resected. A side-to-side anastomosis of the small intestine was made. The distal end was closed and a tube was inserted through the proximal end to act as an enterostomy. The ends of the large bowel were sutured side-by-side and brought out as a double barrel colostomy. Eight grams of sulfanilamide powder were sprinkled in the abdominal cavity. The wound was closed with chromic catgut and through-and-through silkworm gut sutures. The operation lasted one hour and eighteen minutes. At the end, the condition of the patient was very poor.

The specimen removed at operation consisted of 354 cm. of gangrenous small intestine, and 40 cm. of large intestine, with vascular engorgement, hemorrhage and edema.

For several days the general condition of the patient was very poor. He was disoriented, excited and resistive. His abdomen remained scaphoid. The ileostomy tube drained freely. On May 24 a crushing clamp was applied to the colostomy spur. On May 25 the enterostomy tube was removed. On June 4 it was noted that there was profuse discharge through the fistula at the ileostomy site. The general course was downhill. For the next six weeks the intestinal drainage was profuse and caused excoriation of the surrounding skin. The patient was oriented but persisted in being resistive and uncooperative. On August 6 the fistula was much smaller and the patient was discharged to the Out-patient Department. He was eating well but his state of nutrition was poor. He had four or five soft, yellow, foamy bowel movements a day. Total serum protein was 6.99 Gm.,—serum albumin 4.91 Gm.,—serum globulin 2.08 Gm.,—chlorides 539 mg.,—urea nitrogen 16 mg.,—blood Wassermann positive. W.B.C. 7,600, polymorphonuclear cells 66 per cent. Hb. 8.5 Gm. Urine: Albumin three plus, W.B.C. 15, R.B.C. 3 per h.p.f.

On September 4, 1942, he was again admitted to the hospital with a diagnosis of intestinal obstruction. He had noticed increasing abdominal distention during the past week, though his bowels continued to move and the intestinal fistula continued to drain.

He was irritable, emaciated and anemic, but in no acute distress. The abdomen was drum-tight. He did not improve under treatment by continuous stomach suction. The blood chemistry findings were the same as on discharge August 6. On September 11, under spinal anesthesia, operation was performed for the purpose of relieving the obstruction and closing the fistula. A right rectus incision was made in line with the fistula. About five liters of ascitic fluid was found. The intestines were edematous but not discolored or much distended. The terminal ileum was kinked by dense adhesions. The fistulous tract was complicated involving the colostomy and terminal ileum. After considerable dissection the openings in the intestines were closed. On September 12 distention reappeared. The patient developed peritonitis, and died September 15, 1942.

COMMENT.—Case 1 is of interest from the standpoint of the patient's regaining good health following the resection of approximately 40 per cent of the small intestine, with a section of sigmoid colon, and two subsequent major operations for reestablishing intestinal continuity. No hernia resulted, though three longitudinal incisions were made in a contaminated field. This is partly attributed to the use of alloy steel wire. The telescoping anastomosis of the rectosigmoid resulted in stricture formation, which was dilated only with difficulty but showed no tendency to recur. Examination three years later indicated that he had regained a state of normal health.

In Case 2 the patient survived removal of approximately 53 per cent of the small intestinal and a section of large bowel. Though he lived for four months his course was generally downhill. His nutritional disturbance was increased by a small intestinal fistula which drained more or less profusely for six weeks after operation, but it did not improve following diminution of the drainage. Edema appeared early. That the blood serum proteins were not lower is probably accounted for by the state of dehydration. The nutritional changes were those to be expected. The development of partial intestinal obstruction necessitated operation four months later. Of particular interest was the finding of a large amount of ascitic fluid and edema of the intestines.

SUMMARY

1. The subject of massive resection of the small intestine has been reviewed.

2. Two cases are reported, one regained a normal state of health, the other died of nutritional disturbances and postoperative complications after four months.

REFERENCES

1 Haymond, H. E.: Massive Resection of the Small Intestine. Surg., Gynec., and Obstet., **61**, 693, 1935.

2 West, Edward S., Montague, John R., and Judy, Frederick R.: Digestion and Absorption in a Man with Three Feet of Small Intestines. Am. Jour. of Digest. Dis., **5**, 690, 1938–39.

3 Todd, Wilbert R., Dittebrandt, Marlowe, Montague, John R., and West, Edward S.: Digestion and Absorption in a Man with All but Three Feet of the Small Intestine Removed Surgically. Am. Jour. of Digest. Dis., **7**, 295, 1940.

4 Greeley, Paul W., and Greeley, Paul E. N.: Extensive Resections of Small Intestine. Illinois Med. Jour., **67**, 451, May, 1935.