of many persons afflicted with acute shigellosis or salmonellosis. Groups 3 and 4 represent findings from cases of chronic diarrhea among poor and better situated patients, respectively. When the number of specimens examined and the technics employed are considered, the differences in percentage of cases between the two groups is not as great as might be expected. The last group studied were physicians after overseas service, who were suffering from chronic diarrhea. A high proportion (30.6 per cent) had an amebic infection.

SUMMARY

The paper presents a complication of extensive studies made on methods used for the detection of Endamoeba histolytica, and the application of those methods to the examination of more than 13,000 fecal specimens from 5,048 persons during the past 7 years in Chicago and Cook County, Illinois. Combined fecal and proctosigmoidoscopic specimens examined within 30 minutes after collection, employing hematoxylin-stained slides and zinc sulfate flotation, gave optimal results. The irregular behavior of E. histolytica at different temperatures is presented, necessitating their preservation if examination is not carried out within 30 minutes. Advantages of polyvinyl alcohol and Schaudinn's fixative for hematoxylin stained slides and those of formalin and D'Antoni's iodine for flotation were pointed out. Results of stool examinations for other components than parasites and bacteria were compiled and their lack of value for etiological, but usefulness in guidance of symptomatic treatment were shown. The approximate proportion of E. histolytica infestations in patients suffering from chronic intestinal disturbances in the Chicago area is estimated as 20 ± 3 per cent.

REFERENCES

1. Sodeman, W. A.: General Discussion on Amebiasis Panel. Am. J. Trop. Med., *30*:167, 1950.
2. Bargen, J.: Amebiasis (Amebic Colitis): Present Day Management. Illinois Med. J., *97*:129-137, 1950.
3. Craig, C. F.: Laboratory Diagnosis of Protozoan Diseases. 2nd ed., Lea & Febiger, Philadelphia, 1948.
4. Gradwohl, R. B. H.: Clinical Laboratory Methods and Diagnosis. 4th ed., C. V. Mosby, St. Louis, 1948.
5. Mackie, T. F., Hunter, G. W. and Worth, C. B.: A Manual of Tropical Medicine. W. B. Saunders Co., Philadelphia, 1945.
6. Dobell, C. and Laidlaw, P. P.: On the Cultivation of E. histolytica and Other Entozoic Amoebae. Parasitology, *18*:283-291, 1926.
7. Ratcliffe, H. L. and Parkins, P. V.: On the Use of Mallory's Phosphotungstic Acid Hematoxylin for Staining Intestinal Protozoa. J. Lab. & Clin. M., *29*:534-535, 1944.
8. Felsenfeld, O. and Young, V. M.: An Improved Method for the Examination of Intestinal Protozoa. Am. J. Clin. Path., *15*:47-49, 1945.
9. Felsenfeld, O. and Young, V. M.: Comments on the Laboratory Diagnosis of Enteric Infections. Am. J. Digest. Dis., *14*:392-397, 1947.
10. Craig, C. F. and Faust, E. C.: Clinical Parasitology. 4th ed., Lea and Febiger, Philadelphia, 1945.
11. Faust, E. C., Sawitz, W., Tobi, J., Odom, V., Peres, C. and Lincicome, D. R.: Comparative Efficiency of Various Technics for the Diagnosis of Protozoa and Helminths in Feces. J. Parasitology, *25*:241-262, 1939.
12. Weinrich, D. H., Stabler, R. M., and Arnett, J. H.: E. histolytica and Other Intestinal Protozoa in 1060 College Freshmen. Am. J. Trop. M., *15*:331-345, 1935.
13. McMullen, P. B. and Gray, J. K.: The Incidence of Intestinal Parasites in Fecal Samples Collected in Eastern Oklahoma. Southern M. J., *34*:177-180, 1941.
14. Goldman, M.: Use of Polyvinyl Alcohol to Preserve Fecal Smears for Subsequent Staining. Science, *106*:42, 1947.
15. Goldman, M.: Polyvinyl-Alcohol-Fixative Method for Shipping Fecal Smears. Publ. Health Lab., *6*:38-39, 1948.
16. Magath, E. B. and Meleney, H. E.: The Complement Fixation Reaction for Amebiasis. Am. J. Trop. M., *20*:211-238, 1940.
17. Felsenfeld, O. and Young, V. M.: A Quantitative Method for the Determination of the Amebicidal Activity of Drugs in Vitro. Trans. Am. Microscop. Soc., *64*:286-288, 1945.
18. Shlaes, W. H.: Amebiasis in the Temperate Zone. Chicago M. School Quart., *11*:41-49, 1950.
19. Felsenfeld, O.: Comparison of Methods Used for the Detection of Endamoeba histolytica. J. Parasitol., *31*:Dec. Suppl., 7. 1945.
20. Felsenfeld, O. and Young, V. M.: Correlation of Intestinal Protozoa and Enteric Microorganisms of Known and Doubtful Pathogenicity. Am. J. Digest Dis., *13*:233-234, 1946.
21. Young, V. M. and Felsenfeld, O.: The Incidence of Embadomonas Intestinalis Wenyon and O'Conner in Food Handlers and Diarrheic Patients of Mental Hospitals. J. Parasitol., *30*:34-35, 1944.
22. Young, V. M.: The Incidence of Intestinal Protozoa in Mental Patients and in Cases Showing Symptoms of Amebic Dysentery. J. Parasitol., *30*: Aug. Suppl., 8, 1944.
23. Felsenfeld, O.: Amebiasis in Children. Proc. Am. Fed. Clin. Res., *3*:74-75, 1947.

THE SURGICAL TREATMENT OF REGIONAL ENTERITIS

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NOWHERE IN THE VOLUMINOUS literature that has appeared on the subject of regional enteritis since the definition of the disease as a pathologic entity by Crohn, Ginzburg and Oppenheimer in 1932 (1) can there be found agreement as to the most successful method of treatment in those cases where surgery is indicated. Despite the note of pessimism sounded in many reports because of the high rate of recurrence of the disease only a few authors such as Cutler (2) have come out squarely against surgery as a form of therapy for this condition. It is now assumed by the majority that in the chronic stage of the disease, particularly where intestinal obstruction or fistula formation is present, that surgery is the treatment of choice. The bone of contention is the type of operative procedure which should be carried out.

Since the greatest number of cases recognized for the first time as regional enteritis appear in an acute exacerbation of the chronic form, it must be recognized that the principal therapeutic approach is now surgical, and that other measures are employed only to prepare the patient for surgery or for palliation of the inoperable or hopeless patient.

HISTORY OF SURGICAL TREATMENT

In his monograph entitled "Regional Ileitis," Crohn (3) discusses the historical development of surgical

treatment for this disease and attitudes arising from the results obtained. He points out that resection in one stage was the initial procedure of choice. To this period belong the reports of Meyer and Rosi (4) in 1936, Koster, Kasman and Sheinfeld (5) in 1936, Mixter and Starr (6) in 1938, Clark and Dixon (7) in 1939, and Shapiro (8) in 1939. These authors find in their own or in collected series of cases a great predominance of resected cases. It is instructive to examine these reports in a little detail in the light of subsequent events.

Meyer (4) reported on 8 cases, of which 7 involved the ileum alone and 1 the jejunum. Three patients had appendectomies and were well for 1 year. Five patients were subjected to one-stage resections, and 4 were well from 1 to 4 years. Koster (5) reported 17 cases on which he had operated. Seven were treated by one-stage resection with no deaths and no recurrences. Four of these patients had been followed over 2 years. Three were treated by two-stage resection with one death. The remainder had appendectomies with no mortality. He also reported on 100 cases out of 126 collected from the literature where the type of surgery and the result were clearly recorded. The general mortality of the bigger series was 14 per cent. There were 65 resections with 10 recurrences, a rate of 15 per cent. In 6 cases a second operation was successful and in 3, death resulted. There were 15 side-tracking procedures with 1 recurrence and 1 death. Fourteen cases were explored and 8 of these were well. The remaining 6 were later resected with 4 cures, 1 recurrence and 1 death.

Mixter (6) reported 19 cases operated on with 4 appendectomies and no mortalities, 8 one-stage ileocecal resections and one death (13 per cent), and 7 multiple-stage procedures with 3 deaths (43 per cent). The resected cases were followed from 6 months to 6 years with only one recurrence, which took place after 8 months. Clark (7) cites 44 cases operated on with a total mortality of 11.5 per cent. Twenty-seven of these patients had been previously operated upon including 6 with ileocolostomies and 4 with resections. Among 14 ileocolostomies performed by the authors there were 4 postoperative deaths with 5 patients later well and 5 unimproved. Exclusion of the terminal ileum was carried out in only three. Among 14 wide one-stage resections there were no postoperative deaths and 12 patients were well up to two years later. Among 15 two-stage resections there was one postoperative death and 12 patients were well also up to two years later.

Shapiro (8) in a review of 448 surgical procedures collected from the literature up to 1939, found 290 resections with a mortality of only 7.2 per cent and 68 per cent of the patients listed as completely recovered. The recurrence rate was only 10 per cent, counting those in which there was no improvement. He found 88 short-circuiting procedures with a mortality of 8 per cent, only 30 per cent complete recoveries and 34 per cent recurrences. There were 70 appendectomies in acute cases with 56 per cent recoveries, 20 per cent recurrence and 4 per cent operative mortality.

Resection had been strongly advocated by Ginzburg and Oppenheimer (9) who stated in 1933 that, while a short-circuiting procedure might cause the acute process to subside, the disease remained active in the terminal ileum, and that acute peritonitis with perforation and a fatal outcome might occur. Clark and Dixon (7) showed in a small series that the mortality and rate of recurrence were high in cases treated by short-circuiting alone.

Gradually there began to appear more reports in which two-stage resections predominated. This second phase of the attack was led by the Lahey Clinic group, whose figures were published by Marshall (10, 11), and by the Mayo Clinic, whose results have been reported variously by Brown and Donald (12), Mayo and Judd (13), and Pemberton and Brown (14). A third paper by Mixter (15) reviewed the experience of many different surgeons. In general this tendency represented a reaction to what was considered an excessively high mortality rate for the one-stage procedure. It also reflected the fact that many of the cases coming to these centers had recurrence of disease following a previous operation elsewhere. A brief consideration of the results is pertinent to later discussion.

Marshall (11) reported on a series of 55 patients who had operations with a gross mortality of 5.5 per cent. Thirty-nine of these patients had a two-stage resection, of which 34 were of the Mikulicz variety with one death. Seven patients had a primary resection and anastomosis without mortality, and five ileostomy only with one death. Follow-up data were obtained on 42 patients in this series over periods of one to five years. There were only five recurrences, a rate of 9.6 per cent. It is not specified in which group of operations the recurrences were found. The Mikulicz operation, however, is only a slightly modified one-stage procedure since the resection is almost entirely carried out in the first stage.

Mayo (13), summarizing the work of the Mayo group, listed 100 resections for non-specific ileocolitis. Of these, 32 were performed in one stage with a mortality of 22 per cent, and 64 in two stages with a mortality of 3 per cent. The average interval between the first and second stages was 14 months. Four patients had more than one-stage procedures, and one died. Following the one-stage resection, 24 patients were followed from one to five years. Thirteen were cured, seven improved, two had recurrences of whom one died, and two more died later at home. The percentage of poor results was 16 per cent. Fifty-seven patients were followed one to five years after the two-stage resection. Of these, 26 were cured, 18 improved, nine worse and three died. This indicates a failure rate of 21 per cent.

Mixter (15) sent out a questionnaire designed to evaluate the results obtained by various forms of treatment to those individuals and clinics where he thought the widest experience with this disease had been obtained. He received replies from 31 individuals and clinics concerning 363 cases of regional enteritis. These indicated that 278 major surgical procedures had been performed in this group with a mortality of 14 per cent. There was a 20 per cent recurrence rate for all operative cases in follow-up periods varying from six months to six years, the majority having been followed more than one year.

Twenty-five out of 27 surgeons responding favored radical resection as the treatment of choice. The author declared himself in favor of this method, preferring multiple-stage procedures where possible.

At the same time a third type of surgical approach came into prominence, chiefly through the very strong recommendations made for it by the group of surgeons from the Mt. Sinai Hospital in New York. This was the ileocolostomy with transection of the ileum above the site of disease so that exclusion of the involved area from the passage of the fecal stream was accomplished. The principal papers of importance in influencing this trend were those by Lewisohn (16), Ginzburg, Colp and Sussman (17), Colp and Ginzburg (18), Ginzburg and Garlock (19), Garlock and Crohn (20), and finally, in 1949, the monograph by Crohn (3). The evidence presented is impressive and should be carefully reviewed.

Lewisohn (16) in reporting nine cases of short-circuiting or two-stage procedures cautioned that transection of the ileum above the location of the disease was essential to cure. It was his opinion that the bowel would heal itself if put at rest. Colp and Ginzbug (18) presented 22 cases of ileocolostomy with transection, a further report on the 14 cases previously published with Sussman (17). There were only three recurrences during the follow-up period, a rate of 14 per cent. Four patients were subjected to reoperation because of persistence of diarrhea, and in each instance the original site of disease in the ileum appeared to be completely healed. There were no surgical deaths. The series was extended to include 54 cases treated in this manner in the report of Ginzburg and Garlock (19), and finally, 65 cases in the paper of Garlock and Crohn (20). There was still no surgical mortality for this type of procedure, and only 14 per cent recurrences. Persistence of the disease in the excluded loop was noted in five cases. Three of these patients were resected and were well. The remaining two died without a second operation. This was contrasted in the final paper with 55 one-stage resections accompanied by nine deaths (16 per cent) and nine recurrences (20 per cent), and 25 two-stage resections accompanied by three deaths (12 per cent) and eight recurrences (36 per cent), all performed at the same hospital. The follow-up period varied from two to 14 years.

Crohn (3) divides those of his 222 cases which have been subjected to surgical treatment into four groups: chronic regional ileitis, acute ileitis, ileojejunitis, and ileocolitis. There were 108 cases in the first group, including 57 treated by ileocolostomy with transection, 36 treated by primary resection and ten by two-stage resection. In the whole group there were 28 postoperative recurrences of which 14 occurred within one year, but two occurred after 12 and 16 years. There were 16 cases in the second group of acute ileitis, of which four were not operated upon and two are well. There were no primary short-circuiting procedures in this group. In the third group of 38 cases of ileojejunitis there were less than five short-circuiting procedures and the results are not given separately. In the last group of 22 cases of ileocolitis there were only four ileocolostomies with transection. One patient is well and there are three recurrences.

Throughout the development of these three phases of the surgical attack on regional enteritis there have also been isolated papers by individuals or groups reporting small numbers of cases. There are many reports of single cases with varied treatment which it would serve no purpose to list here. There are several papers worthy of mention, however, which demonstrate what confusion exists in determining the indications for the different types of surgical procedures.

Sneiersen and Ryan (21) report on 22 cases which they have treated in a small general hospital. Eight were explored without resection and all recovered and were well up to four years later. Fourteen had radical resections with a total mortality of 21 per cent. There were no deaths in the four cases who had Mikulicz or two-stage resection. There were four recurrences in the surviving cases. Eckel and Ogilvie (22) discuss 21 patients in whom 24 operations were performed without immediate mortality. There were two simple explorations, 11 appendectomies, six resections in the ileum only, two one-stage resections, two two-stage resections and one secondary enterostomy. One of those explored only, two of the appendectomies, and two of the resections in the ileum did poorly and the secondary enterostomy died six months later. The periods of follow-up were not given. Svec and Mahle (23) presented nine cases treated by various surgical methods of whom four were well three to five years and the remainder lost to follow-up or too recent to evaluate. Blackburn (24) reports 22 cases treated by the three different surgical procedures with follow-ups of one to four years. The majority were treated by one-stage resection and all are considered to be cured.

Fallis (25) lists 28 radical resections with an operative mortality of 3.6 per cent. Seven were done for recurrence following previous resections by other surgeons. Two side-tracking procedures were done; one died in the hospital and the other at home a year later. Follow-up on the resected cases is not given. Halloway (26) discusses 13 operative cases. There were five appendectomies followed for an average of five years without recurrence. Six resections were followed for an average of six years with two poor results, one after six and the other after eight years. The only lateral anastomosis had to have a resection after two years. Rossmiller (27, 28) treated 55 patients surgically. Forty-seven survived the postoperative period, an overall mortality rate of 15 per cent. Forty of these were followed from one to 15 years. Twenty-one patients had side-tracking procedures of which all but two were without transection of the ileum. One of these died as did five others, and the other did poorly, as did nine others of the 12 that were followed. Thirty-five patients had resections, of which 15 were in two stages with no mortality in this group. Only two patients had a satisfactory result following a one-stage resection. Six died and three were not followed. Seven had a subsequent resection and five were improved. Thirty-one patients were followed altogether of which 23 had a satisfactory result, a recurrence rate of 26 per cent.

Finally there is a group of reports, including two of recent origin, that express disillusionment with results of all types of surgical treatment. Cutler (2)

presented the results of 11 cases operated on at the Peter Bent Brigham hospital. There were two in which exploration only was carried out of whom one was alive nine years and the other eight months and both fairly well. There was one appendectomy with a good follow-up report after six months. There were eight resections with one death, a mortality of 12.5 per cent. Five of these patients were well but still had some symptoms, notably diarrhea. Two had no evidence of disease. He drew the rather surprising conclusion that surgery should be performed only for obstruction or fistula and in those cases, a permanent ileostomy should be made. Felger and Schenk (29) reported 13 cases of recurrence of the disease collected from the literature and including two of their own. The time of recurrence varied up to nine years. Two cases represented second recurrences in the same patient.

Warren and Miller (30) report 26 cases in which resections were done, and five in which side-tracking only was carried out. There was only one postoperative death, a gross mortality of only 4 per cent. Nevertheless only six patients were symptom-free on follow-up and only two more were not so sick as to be incapacitated. In the five patients with side-tracking procedures, the ileum was transected in four and yet only one recovered; the patient whose ileum was not transected also recovered. In 16 one-stage resections, only two recovered and two later died of the disease. In ten two-stage resections, four recovered and one later died. Twelve cases seen by these authors were treated without surgery, of which five recovered and two later died. The recurrence rate in this series following surgery is therefore 69 per cent. Starr (31) cites a recurrence after 15 years. He does not think resection of the involved mesenteric lymph nodes is necessary. He points out the severe psychic disturbances which seem to accompany many of these cases and suggests that this may be a psychosomatic rather than a surgical problem. Hawthorne and Frobese (32) report 24 radical resections with only two operative deaths (8.3 per cent). Seven patients were followed less than one year. Fifteen were followed from one to 14 years and there were recurrences in 11 (73 per cent). They have now done six short-circuiting procedures with four patients symptom-free after only two years.

REPORT OF CASES

Six cases operated upon at the Meriden Hospital between 1928 and 1945 are presented. These were winnowed from a larger group in which the diagnosis had been made on the record but where sufficient clinical or histological evidence of regional enteritis was lacking, or where, as in two cases, the diagnosis of tuberculous enteritis was finally demonstrated. There may have been other cases since 1932 in which the diagnosis was suspected or made in retrospect but does not appear as the final one on the chart. To these six cases are added two personal ones.

Case 1. A 24 year old white male was admitted on October 25, 1928 with a complaint of peri-umbilical pain for two weeks. He had a similar previous attack two years before. On physical examination he appeared acutely ill. His temperature was 100.0° and his pulse 92. Tenderness was present around the umbilicus and there an ill-defined abdominal mass was felt. The white blood count was 9,400 with 64 per cent polymorphonuclears. Operation the same day revealed a typical appearance of regional enteritis localized to the region of the ileocecal valve. Appendectomy was carried out and the histological examination showed a normal appendix.

The patient made a good immediate recovery but returned to the hospital on January 27, 1929 complaining of recurrent abdominal pains since shortly after the first operation. This time he did not appear acutely ill but his temperature was again 100.0° and his pulse 88. There was diffuse abdominal tenderness and a mass in the right lower quadrant. The impression was of intestinal obstruction. At operation more extensive involvement of the terminal ileum and apparently of the cecum was seen. A one-stage resection of four inches of cecum and eight inches of terminal ileum was carried out.

The patient again made a good immediate recovery but had a recurrence 1½ years after the second operation. A colostomy was performed at another hospital for symptoms of obstruction. Attempts to close this subsequently were unsuccessful and a fistula developed. There were repeated admissions at this and other hospitals for abdominal pain, vomiting and diarrhea. X-ray examination showed chronic obstruction in the ileum. The patient finally died of his disease on November 18, 1949.

Case 2. A 38 year old white man was admitted September 11, 1935 because of cramping abdominal pains for nine months. There had been no vomiting, diarrhea or weight loss. Physical examination showed a well-nourished young white male who did not appear acutely ill. His temperature was 99.0° and pulse 72. The abdomen was distended and a mass was palpated directly beneath McBurney's point. At operation a typical appearance of regional enteritis was seen involving the terminal ileum and apparently the cecum. A Mikulicz resection in one stage was carried out, removing the terminal ileum, cecum and part of the ascending colon. The patient died five days postoperatively. No post-mortem examination was obtained.

Case 3. A 45 year old white male was admitted March 28, 1936 because of acute lower abdominal pain for one week accompanied by vomiting. For the previous six months he had experienced chronic indigestion and weight loss. The diagnosis of acute appendicitis had been made before admission and operation at first refused. Physical examination showed an emaciated middle-aged man appearing chronically ill. His temperature was 100.0° and his pulse 90. Hemoglobin was 80 per cent and the white blood count 11,800 with 82 per cent polymorphonuclears. At operation a typical appearance of regional enteritis was found involving the terminal ileum and apparently the cecum. A Mikulicz resection of the terminal ileum and cecum was carried out in two stages. The patient died three days postoperatively. Postmortem examination showed gangrene in the terminal ileum.

Case 4. A 52 year old white male was admitted January 18, 1942 because of acute abdominal pain for 12 hours. There was no vomiting or diarrhea. On physical examination he appeared acutely ill. His temperature was 99.4° and pulse 80. The abdominal examination showed tenderness in the right lower quadrant but no mass was palpable. Hemoglobin was 80 per cent and the white blood count was 12,600 with 86 per cent polymorphonuclears. At operation an acute inflammatory process, typical of the acute stage of terminal ileitis, was found. The appendix was removed and histologic section showed it to be normal. The patient made a good immediate recovery from the operation. The patient died at home in 1944, presumably of cancer. It is not known whether he had any further recurrence of symptoms, which could be attributed to his acute ileitis.

Case 5. A 4 year old white boy was admitted March 16, 1943 because of acute abdominal pain for 18 hours with vomiting but no diarrhea. The child appeared pale and acutely ill. His temperature was 99.6° and his pulse 82. There was spasm and tenderness in the right lower quadrant of the abdomen but no mass was palpated. Hemoglobin was 61 per cent and white blood count 9,900 with 83 per cent polymorphonuclears. At operation acute terminal ileitis was found and the appendix was removed. A large lymph node was removed for biopsy. Histologic examination showed a normal appendix and non-specific inflammatory reaction in the lymph node. The boy made a good immediate recovery from the operation. Seven years later the child is reported to be

well and has had no symptoms of recurrence since the operation.

Case 6. A 21 year old married white female was admitted June 1, 1945 with a complaint of pain in the right side for eleven days. Fever and vomiting had occurred on the night before admission. There was no diarrhea. Her temperature was 102.4° and her pulse 110. There was spasm and tenderness in the right lower quadrant of the abdomen but no mass was felt. On pelvic examination there was tenderness on the right side and a feeling of a mass. There was some vaginal discharge. Hemoglobin was 60 per cent and the white blood count was 32,000 with 91 per cent polymorphonuclears. A diagnosis of appendicitis or tubo-ovarian abscess was made. At operation dark red fluid was found in the peritoneal cavity. The mesentery of the ileum contained many enlarged lymph nodes. The principal mass, which was about four inches in diameter, appeared to involve the cecum primarily in the region of the ileocecal valve. A Mikulicz resection of the terminal 12 inches of ileum, cecum, ascending colon and right half of the transverse colon was performed in two stages on successive days. Examination of the specimen removed in operation showed a typical appearance of regional enteritis with edema of the terminal ileum, cecum and appendix and the presence of a small abscess in the mesentery near the ileocecal junction. The patient made a good recovery from operation and was discharged after two weeks, only to be readmitted in six days with cramping abdominal pain but no vomiting or diarrhea. She was discharged after three days of conservative management. Since then she has carried through a normal pregnancy and is, at the present writing, free of symptoms.

Case 7. A 25 year old white male was admitted to the hospital August 15, 1945 because of recurrent crampy abdominal pains, vomiting and diarrhea. Abdominal drainage for peritonitis followed by appendectomy later had been performed three years previously and no evidence of regional ileitis noted. The patient complained that he had been unable to maintain his weight because for many months the taking of any food caused cramping abdominal pain and diarrhea. On physical examination he appeared younger than his stated age and generally underdeveloped, although of average stature. He was acutely and chronically ill. The abdomen was distended and tympanitic. There was a right lower rectus incision. Peristalsis was high-pitched and hyperactive. An ill-defined mass could be made out in the right lower quadrant. Tenderness was diffuse throughout the abdomen. Hemoglobin was 60 per cent and the white blood count 18,000 with 82 per cent polymorphonuclears. The total serum protein was 5.8 gm. per cent.

Plain x-ray examination of the abdomen and with barium through a Miller-Abbott tube passed down into the ileum demonstrated the extreme narrowing of the terminal ileum characteristic of terminal ileitis. The patient was kept on intestinal suction and prepared for operation with blood transfusion and sulfasuxidine.

At operation on August 25, 1945 a shaggy-looking loop of small bowel was seen lying adjacent to the cecum in the position occupied in the x-ray studies of the small bowel by a doughnut-shaped loop of barium. This bowel was almost covered by an overgrowth of fat from the mesentery which had a rainbow-colored appearance. The mesentery itself was greatly thickened and quite friable, and it contained many enlarged lymph nodes. The cecum was scarred, thickened and fairly well fixed to the posterior abdominal wall. The terminal ileum was involved in a similar process extending eight inches from the ileocecal junction. It was extremely narrow and did not manifest any active peristalsis. Between this terminal ileum and the portion first seen when the abdomen was opened was a distance of approximately three feet. In this space there were three portions of bowel varying in length from four to eight inches, which were involved in the same type of pathological process. The remainder of the small bowel was explored and was apparently uninvolved. Because of the extensive involvement of the ileum with skip areas and the extreme fixation of terminal ileum and cecum, it was decided to do a by-passing procedure rather than a resection. The ileum was transected six inches proximal to the highest involved area. A side-to-side anastomosis was performed between the ileum and the transverse colon.

The patient made a good recovery from the operation but continued to have four to five watery bowel movements daily. He gained some weight and was eventually able to return to work with only one episode of diarrhea weekly. He was readmitted to the hospital September 5, 1946 because of fever, abdominal pain and diarrhea for 36 hours. On physical examination the patient appeared acutely ill. His abdomen was slightly distended and there was minimal tenderness in both upper quadrants. There was acute tenderness in both lower quadrants. In the right lower quadrant a tender, movable, lobulated, cylindrical mass, 10 cm. in diameter, was palpated. Hemoglobin was 15.5 gm. and the white blood count 18,500 with 87 per cent polymorphonuclears. The patient was started on sulfasuxidine and penicillin. Within 24 hours the mass had almost disappeared and the abdomen was soft and non-tender. Barium studies of the colon and small bowel showed the presence of the anastomosis between what appeared to be lower jejunum and the transverse colon but no obstruction. The patient was discharged in 12 days as recovered.

Subsequently the patient was treated for a year and a half as an outpatient in the psychiatric clinic of the hospital. His chief complaint was diarrhea. He was unable to maintain his weight in spite of a good appetite. Because of weakness and of the necessity of moving his bowels frequently, he was unable to hold a job. X-rays of the small intestine and colon in 1947 and 1949 revealed no evidence of recurrence except for some irritability of the small bowel near the stoma. The following quotations from letters written to the author by the patient this year are indicative of the troubled mental state which is so characteristic of many of these patients:

"Most of my problem stems from an unhappy home atmosphere. . . . I have been living in a home where dissention, suspicion and envy have existed for a long time. I have always been in the middle and I guess a person who was very healthy could eventually develop some ailment like ulcers. I have often thought of leaving home and trying to make a go of it. . . . I feel depressed and mostly alone at all times. . . . I hate to burden you with my troubles but it's because I feel alone and have no one to turn to. . . . The most important task is adjusting myself to whatever capacity my physical being can endure. My feelings, emotions are natural and being without social life, a job, self-respect and independence is hard. The days are long and dreary sometimes. . . . It is not necessary for me to explain that medication can do so much for a patient, especially in cases like mine. . . . Where spiritual and emotional factors are present, the medication has far less chance of being potent. So it is in my case. The food I consume has very little chance of doing me any good, if spiritually and emotionally my heart hangs heavy and hard."

On examination in January, 1950, the patient weighed 106 pounds. He did not appear ill. The abdomen was soft with slight to moderate general tenderness. Peristalsis was hypoactive. No mass was palpated. A small hemorrhoid and a scarred anal fistula were seen. Ankle edema was present. The patient was placed on a high-protein, low residue diet, Cellothyl and a combination of phenobarbital and belladonna. His ankle edema has now disappeared but he is still having watery movements.

Case 8. A 16 year old white boy was admitted to the hospital September 28, 1949 because of recurrent crampy abdominal pain for three years. An appendectomy had been performed five years ago and a "chronic appendix" removed. During the last three years the patient had suffered from intermittent diarrhea as well as crampy pain. He ate very little because taking food induced pain and, consequently, did not gain weight. The constant abdominal distress had caused him to avoid the company of other boys his age and to become very seclusive. A recent x-ray examination in another hospital had shown calcification in some mesenteric lymph nodes which led to a diagnosis of intestinal tuberculosis.

The patient appeared as an apprehensive, withdrawn young white male who was undersize and underweight for his age. He was acutely and chronically ill. There was a Battle incision on his abdomen which was moderately distended and tympanitic. It was diffusely tender, more so in the right lower quadrant. No mass could be palpated. On rectal examination, there was no mass or tenderness and no fissure or fistula. Hemoglobin was 77 per cent and the white blood count 29,500 with 98 per cent polymorphonuclears. The total serum protein was 6.62 gm. per cent with 4.52 gm. per cent

albumin and 2.10 gm. per cent globulin. Other blood chemistry was within the normal range.

X-ray examination of the abdomen on admission showed gaseous distention of a few loops of small bowel suggesting early small bowel obstruction. Injection of barium into the terminal ileum after a Miller-Abbott tube was passed showed obstructive changes in the terminal ileum due to narrowing of its lumen with associated involvement of the cecum, probably due to regional enteritis. Sigmoidoscopy showed only a glistening appearance of the mucous membrane and the presence of considerable mucus. The patient was prepared for operation with blood transfusion and with dihydrostreptomycin.

At operation on October 5, 1949, there was a small amount of free fluid in the peritoneal cavity. The distal segment of ileum adjacent to the cecum was distended for a distance of about 1½ feet. The mesentery of the small intestine was filled with enlarged lymph nodes, some of which were as large as 2 cm. in diameter. The mesentery showed the characteristic fatty infiltration and color-play of regional ileitis. Near the ileocecal junction folds of fat extending up over the intestine were seen. The cecum itself was bound down by most dense adhesions to the posterior parietal peritoneum. There appeared to be direct extension of the inflammatory process into the posterior parietal peritoneum at one point. The small intestine was searched for other areas of inflammatory process but none were seen. The terminal 1½ feet of ileum, cecum and ascending colon were resected together with a considerable portion of the posterior parietal peritoneum and the mesentery containing the majority of the enlarged lymph nodes. An end-to-side anastomosis was made between the ileum and the transverse colon. Gross and microscopic examination of the specimen showed that the disease process terminated sharply at the ileocecal valve, although there was edema of the serosa of the cecum, probably due to involvement of its small lymphatics.

The patient made an uneventful postoperative recovery. He was discharged on the twelfth postoperative day eating a modified high protein diet and having normal bowel movements once or twice daily. Since discharge he has returned to school and has gained 40 pounds. At the present time (June 1, 1950) he has no abdominal complaints and is moving his bowels one to three times daily.

DISCUSSION

These eight patients almost represent a microcosm of this disease: the young boy and the middle-aged man with acute terminal ileitis who were treated by appendectomy with no further manifestations; the young man with recurrent pain who has first an appendectomy and then a resection with recurrence followed by poorly planned later operative procedures, a permanent invalidism and then death; two relatively young men with subacute symptoms, relatively localized disease, but dying after resection; a young woman with acute enterocolitis making a good recovery following a two-stage resection and free of recurrence after five years; a young man with recurrent disease following an episode of peritonitis showing extensive disease, cured of obstruction by a side-tracking operation but still chronically disabled by diarrhea; and finally a young man with recurrent symptoms following appendectomy, having localized disease and with an excellent immediate result following resection but an uncertain future. The only things missing are a case of fistula formation, and a case of jejunitis.

The experience with treatment of these cases varies hardly at all from that presented in the typical report of a small series in the literature. The net impression is one of discouragement. It is difficult for any individual or group except those in the large medical centers to find enough cases of this disease so that any plan of surgical management can be adequately evaluated from the local experience. It has also been clearly demonstrated that a long follow-up period is necessary before the results can be judged fairly. Consequently the surgeon must rely upon what he can find out from the literature. How is he to derive a clear guide from the confusing mass of evidence which is now available?

At first, the conception of collecting a number of cases from the expanding literature and dividing them into categories seems attractive. By this method at the present time the reports of close to 1,000 cases could be catalogued, the types of treatment and results noted and perhaps some conclusion drawn as to which management produced the greatest number of cures. There are five objections to this plan of analysis, however. Primarily, the multiphasic nature of the disease, which still remains of unknown etiology, defies accurate comparison of the cases.

Secondly, the possible variations in the surgical approach are so many that it is impossible to compare methods exactly. One man does a wide resection and carefully removes all the involved nodes he can see; the next does a wide resection but disregards the nodes. The complications, particularly fistula, which often ensue following an earlier operative procedure, create a great variance in the scope of subsequent procedures. It has been demonstrated that with careful modern methods of pre- and postoperative management that the mortality, even for resections in extensive cases, can be kept below 5 per cent. This makes a comparison with older series difficult, since patients with more extensive disease are surviving the first surgical attack to become recurrences later on.

Thirdly, the period of follow-up must be a long one if we are to know the eventual result in these patients. Recurrences have been reported as late as 15 years following the primary procedure. In too many of the reports found in the literature the period of follow-up is not mentioned or is too short to be of any significance. This unfortunately applies to some of the largest series. In comparing the side-tracking operation which includes transection of the ileum with the classical two-stage resection, of which the former is the first stage, too many patients are included who represent failures of the first stage operation. Perhaps there are also some whose second-stage is not done because of the amelioration produced by the first stage and who are later recurrences because of this.

This leads to the fourth objection, which is that undoubtedly too many patients are included under different headings in more than one series. If all the duplications could be weeded out, perhaps the total number of cases would be smaller than is now indicated. It has been pointed out by several authors that one man's success may be in a few years another man's failure. As is the case with all patients suffering from chronic debilitating disease, these patients are great "shoppers" and tend to gravitate eventually to the large clinics which are known for their experience in treating these difficult problems.

Fifth, and lastly, is the fact that too much emphasis has been laid upon the techniques of surgical management in these patients to the exclusion of equally important considerations. There is an extremely pressing necessity for physical, mental, social and economic rehabilitation of the great majority of patients with this disease. Certainly there are many things which tend

to support Starr's (31) suggestion that this is a so-called psychosomatic condition. The emotional readjustments necessitated by such a potentially chronic and disabling entity may be severe, if not partially or completely irreversible. The financial drain may be unsupportable. The diarrhea associated with the pathologic process, or resulting from extensive resection, may make ordinary social contacts undesirable or not feasible for the patient. There is no discussion in any of the articles which includes reports of cases surgically treated that the writer has been able to find, including many which are not listed in this paper, which indicates how the principle of rehabilitation has been applied to the patients in the postoperative series. Not even the recent and otherwise complete monograph by Crohn (3) includes a discussion of this phase of management.

CONCLUSIONS

What then can be derived from this amorphous mass of material culled from the literature regarding the particular type of surgical management which should be applied to the particular case of regional enteritis?

First let us dispose of the question of simple exploration and/or appendectomy. In the case of acute regional ileitis, the diagnosis will seldom be made preoperatively; therefore, many cases will be explored who do not have obstructive symptoms. With a careful technique and the avoidance of drainage in the peritoneal cavity no harm appears to result from this procedure. If appendectomy is performed there is an immediate, though not very large, danger of establishment of a fistula. This is due to the finding that the principal, and usually sole, involvement of the cecum is represented by edema and lymphatic engorgement in the serosa, which may lead to break down at the suture line. The most experienced writers are now agreed that since histologic examination of such appendices reveals only edema that unless there is unmistakable evidence of acute appendicitis, that appendectomy in the acute stage of the disease offers nothing but a hazard. The great number of cases with previous appendectomies for the same or similar symptoms appearing in all series is a sufficient answer in justification of this viewpoint. Where suppuration and local peritonitis have already occurred a careful toilet of the area accompanied by the systemic administration of the appropriate antibiotics and without drainage of the peritoneal cavity is the procedure of choice.

With regard to the choice between ileo-transverse colostomy with and without transection of the ileum, there appears to be very little question that the latter group produce the greatest number of cases of persistence and recurrence of the disease of any of the operative procedures. The original fears that the excluded loop of ileum might become dangerously dilated (Holm, 32) have not been borne out by experience.

It appears likely that the indications for performing a one- or two-stage procedure if resection is contemplated depend principally on the patient's general condition. With proper timing and the judicious use of the presently available adjuvants to surgery the mortality for extirpation of the diseased bowel should be very low. There may be a disposition on the part of some to elect a waiting period following the first stage and to select only those with persistence of symptoms for the second stage procedure. In complicated cases, such as those with fistulas, the necessity for staging is obvious. The use of the Mikulicz procedure in resection seems to contradict the principles which are so generally agreed upon with regard to exploration: that is, that the establishment of direct communication between the skin and peritoneal cavity may lead to fistula formation. It does not seem logical to advocate wide resections of mesenteric nodes where other channels of lymphatic spread through the serosa of the large bowel are left intact.

Finally, the choice between resection and sidetracking alone cannot be decided on the basis of the figures that have been presented for all of the reasons given above. The experience is too diverse, the surgery too varied, the follow-up period in most instances too short, the duplication of cases too great, and the emphasis on rehabilitation as the final phase of the treatment almost totally lacking. It can probably be fairly stated that too many cases which have been subjected to resection have been adjudged failures due to the persistence of the one symptom of diarrhea. It is now a common experience for long segments of small and large bowel to be resected for other types of disease with diarrhea resulting. This can often be controlled by careful dietary and medical management.

Individualization of management must remain the rule in the treatment of diseases of uncertain etiology. Any attempt to standardize the treatment of regional enteritis on the basis of the incomplete information now available may only serve to halt progress toward the eventual solution of this problem.

SUMMARY

A review of the significant contributions to the literature on the surgical management of regional enteritis has been made.

Eight cases from the experience with this disease at the Meriden Hospital and from the author's experience have been presented from the standpoint of their surgical management and the results.

An analysis of the claims made for the greater efficacy of any particular surgical procedure in the treatment of this disease over any other does not show them to be fully justified by the results presented.

The burden of opinion is against appendectomy and/or drainage of the peritoneal cavity in acute regional enteritis.

The procedure yielding the poorest results appears to be ileocolostomy without transection of the ileum.

Sufficient emphasis has not been placed on the psychosomatic aspects of this disease and the necessity for mental, physical, social and economic rehabilitation of the patient following surgery.

The author wishes to express his appreciation to Drs. M. J. Conroy, E. W. Foster and D. P. Smith for their permission to report several cases.

REFERENCES

1. Crohn, B. B., Ginzburg, L., and Oppenheimer, G. D.: Regional enteritis. A pathologic and clinical entity. J. A. M. A., 99:1323, 1932.
2. Cutler, E. C.: A neglected entity in abdominal pain and a common disease — cicatrizing enteritis. N. Y. State J. Med., 39:328, Feb. 15, 1939.
3. Crohn, B. B.: Regional ileitis. Greene and Stratton, New York, 1949.

4. Meyer, K. A., and Rosi, P. A.: Regional enteritis (non-specific). Surg., Gyn. & Obs., 62:977-988, June, 1936.
5. Koster, H., Kasman, L. P., and Sheinfeld, W.: Regional ileitis. Arch. Surg., 32:789, 1936.
6. Mixter, C. G., and Starr, A.: Further experience with regional enteritis. N. A. J. M., 219:37-40, July 14, 1938.
7. Clark, R. L., Jr., and Dixon, C. F.: Regional enteritis. Surgery, 5:277, 1939.
8. Shapiro, R.: Regional ileitis. A summary of the literature. Am. J. M. Sc., 198:269-292, Aug. 1939.
9. Ginzburg, L., and Oppenheimer, G. D.: Non-specific granulomata of the intestines. Ann. Surg., 98:1046, Dec. 1933.
10. Marshall, S. F.: Regional ileitis. N. A. J. M., 222:375-382, 1940.
11. Marshall, S. F.: Regional ileitis: Surgical management and results of operation. S. Clin. N. A., 23:873-880, 1943.
12. Brown, P. W., and Donald, C. J.: Prognosis of regional enteritis. Am. J. Dig. Dis., 9:87-91, March 1942.
13. Mayo, C. W., and Judd, E. S.: Surgical resection in non-specific ileocolitis. J. A. M. A., 117:836, 1941.
14. Pemberton, J. de J., and Brown, P. W.: Regional ileitis. Ann. Surg., 105:855-870, 1937.
15. Mixter, C. G.: Regional enteritis. Surg., Gynec. & Obst., 68:322-326, 1939.
16. Lewisohn, R.: Segmental enteritis. Surg., Gynec. & Obst., 66:215-222, 1938.
17. Ginzburg, L., Colp, R., and Sussman, M.: Ileocolostomy with exclusion. Ann. Surg., 110:648-655, 1939.
18. Colp, R., and Ginzburg, L.: Ileocolostomy with exclusion in the treatment of regional ileitis. N. Y. State J. Med., 41:982-990, 1941.
19. Ginzburg, L., and Garlock, J. H.: Regional ileitis. Ann. Surg., 116:906-912, 1942.
20. Garlock, J. H., and Crohn, B. B.: An appraisal of the results of surgery in the treatment of regional ileitis. J. A. M. A., 127:205-208, 1945.
21. Sneiersen, H., and Ryan, J.: Regional ileitis; resume of present knowledge and the addition of 22 cases from Broome County, New York. Am. J. Surg., 52:424-432, June 1941.
22. Eckel, J. H., and Ogilvie, J. B.: Regional enteritis, 21 cases. Am. J. Surg., 53:345-348, 1941.
23. Svec, F. A., and Mahle, A. E.: Regional ileitis. Quart. Bull. Northwestern Univ. Med. School, 23:124-129, 1949.
24. Blackburn, G., Hadfield, G., and Hunt, A. H.: Regional ileitis. St. Barth. Hosp. Rep., 72:181-224, 1939.
25. Fallis, L. S.: Regional enteritis. J. Mich. State Med. Soc., 48:864-868, 1949.
26. Halloway, J. W.: Regional ileitis. Ann. Surg., 118:329, 1943.
27. Rossmiller, H. R., and Crile, G.: Surgical treatment of regional enteritis. S. Clin. N. Amer., 28:1139-1147, 1948.
28. Rossmiller, H. R., and Messenger, H. M.: Regional enteritis; diagnosis and treatment. Med. Clin. N. Amer., 32:419, 1948.
29. Felger, L., and Schenk, H. L.: Recurrence in segmental enteritis following radical resection. Am. J. Surg., 49:307-315, 1940.
30. Warren, R., and Miller, R. H.: Regional enteritis. New England J. Med., 226:589-593, 1942.
31. Starr, A.: Is there an adequate therapy for regional enteritis? Surg., Gynec. & Obst., 87:351-352, 1948.
32. Hawthorne, H. R., and Frobese, A. S.: Chronic stenosing regional enteritis. Surgical pathology and experience in surgical treatment. Ann. Surg., 120:233-240, 1949.
33. Holm, C. E.: The fate of the side-tracked loop of ileum following lateral anastomosis for complete benign obstruction. Surg., Gynec. & Obst., 56:746, 1933.

NON-PSYCHOGENIC FUNCTIONAL DISORDERS OF THE GASTROINTESTINAL TRACT

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ALL TOO OFTEN the busy practitioner of medicine is inclined to apply a few select laboratory and roentgenologic studies to his patients presenting gastrointestinal complaints, and on finding no organic disease manifested tends to catalogue the patients as having a psychogenic disorder with gastroenterological manifestations. Certainly a respectable percentage of such patients have a purely psychogenic basis for their complaints, but the thorough diagnostician must never forget that a goodly number of these patients have functional disorders which are non-psychogenic in nature. In all fairness it should be stated that the dividing line between psychogenic and non-psychogenic functional disorders in certain given patients is rather indefinite. This is best exemplified by the modified motor function of the gastrointestinal tract during emotional disturbances. In other cases, the dividing line between organic and non-psychogenic functional disorders is equally indefinite. This paper is concerned primarily with the middle-zone or non-psychogenic disorders.

Perhaps it would be well to attempt to define a non-psychogenic functional gastrointestinal disorder. This is a condition in which a patient has gastrointestinal symptoms, and frequently gastrointestinal signs, due to impaired motor and/or secretory function and on whom tissue studies by the pathologist are negative for definite evidence of organic disease of the gastrointestinal tract. An appreciable percentage of these disorders represents gastrointestinal manifestations of organic disease elsewhere in the body.

Certain prolonged or excessively acute non-psychogenic functional disorders may result eventually in demonstrable organic disease in the gastrointestinal tract.

For the purpose of discussion these non-psychogenic functional disorders are divided into three groups: (1) Neurogenic, (2) Metabolic and (3) Miscellaneous.

NEUROGENIC

Non-psychogenic functional disorders of the gastrointestinal tract may be secondary to a number of neurological diseases. Probably the most frequently recognized of these includes epilepsy, migraine and the abdominal manifestations of the tabetic crises. The general condition of epilepsy may have protean manifestations and the gastrointestinal tract may be the system with a predominance of symptoms (1, 2, 3, 4). The history is probably the most important factor in making the diagnosis of abdominal epilepsy. The

Submitted Sept. 13, 1950.

Read before the annual meeting of the Texas Society of Gastroenterologists and Proctologists, Fort Worth, Texas, May 1, 1950.