Staff Meeting Bulletin
Hospitals of the » » »
University of Minnesota

Primary Resection for Lesions of the Colon, Rectosigmoid and Rectal Ampulla

Volume XIV | Friday, May 28, 1943 | Number 27

STAFF MEETING BULLETIN
HOSPITALS OF THE . . .
UNIVERSITY OF MINNESOTA

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INDEX

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William A. O'Brien, M.D.

I. LAST WEEK

Date: May 21, 1943

Place: Recreation Room, Powell Hall

Time: 12:15 to 1:10 p.m.

Program: "Analysis of Prolonged Anesthesia"
Scott M. Smith

Discussion
Ralph Knight
W. T. Peyton
Fred Hoffbauer

Attendance: 82

Gertrude Gunn,
Record Librarian

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II. MEETINGS

1. ANATOMY SEMINAR

Saturday, May 29, at 11:30 a.m., in room 226 Institute of Anatomy.

"Some morphological aspects of the secretory process"
Richard N. Winger

"Diet and leukemia in mice"
Frederic Lawrason

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2. CENTER FOR CONTINUATION STUDY

Tuberculosis for Public Health Nurses
June 1 - 3

Kenny Technique for Physicians
June 1 - 5

Dermatology and Syphilology
June 28 to July 3

Kenny Technique for Technicians
June 7 (nine weeks)

Kenny Technique for Technicians
June 28 (nine weeks)

Kenny Technique for Physicians
July 12 - 17

Kenny Technique for Physicians
August 2 - 7

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III. NECROPSY PERFORMANCE IN APPROVED HOSPITALS - 1942

Minnesota hospitals employing interns only had 1,658 deaths and 659 necropsies. Employing both interns and residence, 2,281 deaths, 1,549 necropsies. Employing residence only 1,576 deaths, 748 necropsies. The University of Minnesota Hospitals were 13th on the list. The St. Mary's of Duluth was in 10th place.

Highest Necropsy Rates* in Approved Internship Hospitals - 1942

	Percentage
1. Research and Educational Hospitals, Chicago	97.7
2. Hospital of University of Pennzylvania, Philadelphia	88.6
3. Trinity Hospital, Minot, N.D.	86.3
4. University of Nebraska Hospital, Omaha	84.6
5. Beverly Hospital, Beverly, Mass.	82.8
6. Evanston Hospital, Evanston, Ill.	81.0
7. University of Chicago Clinics, Chicago	80.8
8. Mary Hitchcock Memorial Hospital, Hanover, N. H.	79.5
9. Colorado General Hospital, Denver	77.8
10. St. Mary's Hospital, Duluth, Minn.	76.9
11. Santa Barbara General Hospital, Santa Barbara, Calif.	76.5
12. University of California Hospital, San Francisco	74.5
13. University of Minnesota Hosps.	74.2
14. Iowa Meth. Hosp., Des Moines	73.3
15. Presbyterian Hospital, Philadelphia	73.2
16. Ancker Hospital, St. Paul	71.5
17. Massachusetts Memorial Hospitals, Boston	71.3
18. St. Luke's Hospital, Chicago	71.1
19. Strong Memorial and Rochester Municipal Hospitals, Rochester, N. Y.	70.6
20. Jewish Hospital, Philadelphia	70.6
21. St. Luke's Hospital, Duluth, Minn.	70.2

*Thirteen of the federal hospitals approved for intern training had rates above 70 per cent.

IV. PRIMARY RESECTION FOR LESIONS OF THE COLON, RECTOSIGMOID AND RECTAL AMPULLA

Owen H. Wangensteen

Procedures Under Discussion

Current practice in the University of Minnesota Surgical Clinic is to try to resect all unobstructed lesions of the colon in one stage, establishing intestinal continuity by oblique end to end closed (aseptic) anastomosis, without antecedent or complemental colostomy or decompressive vents, other than in indwelling tube. Lesions in the rectosigmoid, whose lower limits are within 10 to 13 centimeters from the anal opening, as determined by proctoscopic examination, are treated similarly. In addition, for suitable carcinomas of the rectal ampulla between 5 and 10 centimeters from the pectinate line, I am endeavoring to do a one-stage abdomino-anal protectomy with preservation of the sphincters, establishing continuity by variants of methods described by others previously. The attainment of good to excellent continence in the majority of the few patients who have been operated upon, suggests that a restudy of the Kraske and Hochenegg sacro-perineal methods (or variants of them), with special attention to an abdomino-anal method of dissection and restoration of intestinal continuity with preservation of the sphincters, is in order. Furthermore, the emphasis which has been given to the upward spread of cancer of the rectum by the studies of Westhues (1930), Wood and Wilkie (1933), Gilchrist and David (1938) and Coller, Kay and MacIntyre (1940) suggests definitely that operations of this type are legitimate procedures, as long as one does not compromise on the extent of the removal, or invoke the procedure in instances in which proximal lymph node blockage may have permitted retrograde or downward migration of metastases. Obviously, in lesions in juxta-position to the sphincters, and in ampullary lesions with local extension beyond the bowel wall, the orthodox abdomino-perineal operation, in which a liberal portion of the levator and muscle and the sphincter muscle are sacrificed, is to be preferred to the abdomino-anal operation described herein.

The colonic resections reported herein have been done by five surgeons; the larger number, however, were done by two surgical residents and the writer. The rectosigmoid resections and the abdomino-anal operations for ampullary carcinoma were done by the writer.

The Rise and Decline of the Exteriorization Operation

The adoption of the exteriorization operation for carcinoma of the colon by Mikulicz (1903) was, in its time, a definite forward step in the surgical management of colonic cancer. Bryant (1882), Block (1892) and Paul (1895, 1912) had previously reported instances in which the exteriorization principle had permitted extirpation of colonic lesions at lesser risks. It was the advocacy of the procedure by Mikulicz and his report of a favorable experience with its use, in a large series of cases, that gave this method of dealing with colonic malignancy an important impetus. Prior thereto, the method in general use for lesions in both the right and left colon was primary resection employing the open anastomosis. In his initial report, Mikulicz (1903) reported a group of 24 cases, in which exteriorization, accompanied by immediate removal of the lesion in some of them was done, followed by secondary closure of the colonic stoma with a mortality of 16.6 per cent. Mikulicz favored a one or two-stage resection for lesions of the right half of the colon and reserved the exteriorization procedure for lesions of the left colon. Up until quite recently, the precepts of Mikulicz, with reference to choice of procedure in dealing with colonic malignancy, have been followed quite generally. Lahey (1932) extended the exteriorization plan to lesions of the right colon, a suggestion which has not met with wide adoption or favor.

It was the prevalent high mortality from peritonitis, that persuaded the surgeons of a generation and more ago to

abandon primary colonic resection in favor of the exteriorization principle. Surgery of that time was not ready for primary resection. Oblique section of the bowel, with reestablishment of intestinal continuity by the closed method of anastomosis, has changed all this. Surgeons who have schooled themselves in the precepts of Halsted with reference to intestinal suture technique, find that a satisfactory one-stage, oblique, end to end anastomosis can be made anywhere in the intestinal canal.

Schoemaker (1921, 1927), Wilkie (1939), Campbell (1940) and Whipple (1940) have been ardent advocates of the one-stage closed anastomosis. Wilkie and Whipple favor an auxiliary cecostomy or other external drainage vent for lesions of the left colon. Campbell felt no necessity for establishment of an external safety vent. Shoemaker (1927) advised a preliminary cecostomy for obstructive lesions in the descending colon. In the cases herein reported, it was employed only 3 times - all in resections of the pelvic colon. Appendicostomy was done twice and in the one patient in this series of resections in which an open anastomosis was made, a complemental colostomy was done. In one of the appendicostomies, infection of the wound occurred. Therewith, external decompressive vents, as an accompaniment of colectomy was given up altogether. Cheever (1931) was able to report a series of 35 cases of primary resection in the colon for malignancy in which anastomoses were made by the new method with a mortality of only 8.5 per cent. Cheever felt the employment of an external decompressive vent important; when it was omitted, the mortality increased considerably (24 per cent). The routine employment of suction applied to an indwelling duodenal tube probably has rendered unnecessary the use of such external drainage vents. Stone and McLanahan (1942) report a mortality of 10.6 per cent employing the closed anastomosis in colonic resections, whereas when the open anastomosis was employed the mortality was 20.6 per cent.

An important advantage of primary closed resection over the exteriorization operation is in the amount of mesentery constituting the lymphatic drainage area which can be sacrificed. Rarely, if ever, need the surgeon compromise on the extent of excision of mesentery in primary resection; whereas, obviously, in the exteriorization operation, there are practical limits to the amount of mesentery that can be excised without risking the viability of the bowel brought through the abdominal wall.

The Operation

The material embraced in this report covers a two-year period (April 1, 1941 to April 1, 1943) during which time 60 primary resections were done for carcinoma of the colon and recto-sigmoid. The closed or aseptic method has been in use in this clinic for a longer period of time. Only within the period of the study, however, has the policy been consistently followed of attacking adherent growths by removing the tissue in juxta position to it. In other words, studied attempts have been made to avoid contamination during operative procedures occasioned by coming unexpectedly upon a perforated lesion. In instances in which preliminary dissection disclosed probable perforation of the lesion against the abdominal wall, mesentery, ureter, uterus or bladder, a part of that structure would be sacrificed rather than accept the risk of spillage and bacterial contamination. The hope lent that sulfonamides, such as sulfaguanidine and succinyl sulfathiazole, would sterilize the intestinal content of the colon and render spillage through contamination of perforated lesions innocuous, has not been borne out in the writer's experience. The only reliable safeguard against the contingency of opening such perforated lesions is to adopt the arbitrary policy of sacrificing even such important structures as a ureter or an additional loop of bowel. This principle of operation envisages the performance of more radical procedures but with a greater economy of life. Economy of the surgeon's time becomes a relatively unimportant consideration when weighing the element of hazard to the patient presented by two alternative schemes of procedure. Also, only during the two-year period under consideration have the surgeons in this clinic

become familiar enough with the nutritional needs of the debilitated patient to eliminate largely the losses sustained on this score in earlier years. The item of preparing patients satisfactorily for operation, who have lost considerable weight, and the problem of meeting caloric and nitrogen requirements of such patients are matters of major importance in dealing with poor risk patients who frequently require formidable operative procedures.

Meeting Caloric and Nitrogen Requirements

Patients who have been supported by their own fat stores for fairly long periods and whose existence might be described as having been autocannibalistic, frequently, at operation, are found to have fatty livers. And patients with fatty livers tolerate strenuous operative procedures very poorly. A systematic and careful inquiry into the character of food ingestion and the extent of weight loss are, therefore, extraordinarily important. The greater the percentile loss in body weight, the longer must be the period of preoperative preparation. Weight losses in excess of 25 per cent of the initial body weight demand a long period of preoperative feeding of a high protein, high carbohydrate, low fat diet. Patients with acute obstruction, obviously, must have an antecedent decompressive operation. Patients with mild obstruction, who exhibit large weight losses and who require a long period of preoperative feeding, also should have an antecedent colostomy; occasionally, however, if the weight loss is not large, intravenous feeding of a 20 per cent glucose solution, amino acids and plasma will suffice and make a temporary colostomy unnecessary in patients with mild obstructive symptoms. The precepts of Madden and Whipple (1940) and Ravdin (1940) and their associates have guided us in meeting the caloric and nitrogen requirements of patients who have sustained large weight losses. My associate, Dr. R. L. Varco (1942), has compounded two diets which in our experience have met the requirements of preparing hospital patients, who have lost considerable weight, for operation. In gastric cases with obstruction, the problem is even more difficult; in patients who have lost 30 to 35 per cent of their body weight, a minimum of three weeks usually has been employed in replacing depleted body stores with a high protein and carbohydrate and low fat diet. Successful gastric resection has been carried out latterly on two patients exhibiting recent weight losses, constituting 35 to 37 per cent respectively of the body weight.

Improving the Operative Mortality Score

Reduction of operative mortality is essentially the same problem as stopping the leaks in an expense account. No surgeon probably will learn to keep all the leaks sealed. However, it is very reassuring to note, as competence in a Clinic improves in one item after another in the many problems involved in the care of surgical patients, how those increments of gain are reflected directly in an improved mortality. The best surgeons of the past generation were content with a mortality of 10 per cent in formidable operations for malignancy in the gastrointestinal canal. However, small gains in knowledge here and there, such as improved anesthesia, effectual schemes of preventing intestinal distention, and a better understanding of the importance and the technique of preparing patients for operation and caring for them after, should begin to tell. Avoidance of deaths from pneumonia and peritonitis, attending operations of election is almost within the surgeon's grasp, if he will only be alert and responsive to the available means of thwarting these disasters, which have pursued the surgeon stealthily and too effectively since the very beginnings of abdominal surgery. Yet, when one contemplates the infirmities of age as well as the debility frequently attending gastrointestinal neoplasms, the goal of a low mortality appears difficult of consistent achievement. As the surgeon's confidence in methods of preparing poor risk patients for operation increases, he is persuaded to accept risks of a strictly borderline character. With advantages of management, unknown to our surgical predecessors of a generation ago, we should be able to improve upon their re-

cord of accomplishment and still extend the benefits of operation to a larger group of patients. A greater salvage of life is to be achieved obviously through urging patients with symptoms suggestive of a colonic malignancy to report for painstaking examinations at an early date. Yet, the surgeon's responsibility is to deal with the problem as he finds it. Perhaps in no malignant neoplasm in the body are determined efforts, directed at excising widely an adherent growth, more commendable than in the colon. As contrasted with the stomach, the number of long survivals or apparent cures attending the grubbing out of difficult adherent neoplasms, in colonic malignancies is large, as the experience of many surgeons attests. Long periods of palliation attending resection, in the presence of hepatic metastases, in the experience of the writer is not unusual. Survival beyond 6 months, when gastric resection is carried out in the presence of hepatic metastases, appears to be distinctly unusual. Survival beyond a year, under similar circumstances when the primary lesion is colonic is not unusual, in this writer's experience.

I. Colon

Plan of Operation

Preoperative preparation of the colon: We have tried most of the expedients which have been suggested for preparing the colon for operation. None are wholly satisfactory. In this series of cases, there have been a fairly large number in which the preparation was poor - usually in patients with low grade obstruction, frequently unrecognized preoperatively. Yet, employing a closed or aseptic mode of suture, the surgeon need not change his plan of operation because feces are present in the bowel. It is the writer's impression that, the preoperative administration of a liberal amount of mineral oil by mouth and the giving of colon flushes just prior to operation are the best schemes of insuring an empty colon. Sulfaguanidine and succinyl sulfathiazole have been employed and each has been given up in favor of the preoperative administration of enemas. No sulfonamide is given prior to operation.

Indwelling tube: Over a period of more than 12 years in this clinic, patients having abdominal operations of election, have gone to the operating room with an indwelling duodenal tube in place. To this practice, patients with colonic or rectal malignancy are no exception. Suction is employed prior to, during and after operation. After gastric resection, the duodenal tube is left in place three full days after operation; after partial colectomy, the tube is allowed to remain for five days. Whipple (1940) has come to put considerable reliance on the Miller-Abbott tube in colonic surgery. In this clinic, too, we have learned to appreciate many of the advantages of the Miller-Abbott tube; however, as a prophylaxis of intestinal distention, the ordinary nine-hole indwelling duodenal tube meets the situation admirably in most patients. Moreover, if the Miller-Abbott tube, placed well down in the reaches of the small intestine is used as a prophylaxis against postoperative distention, often it is found necessary to put an additional tube down through the patient's other nostril into his stomach, a circumstance which is trying to the patient, his relatives and his surgeon.

Anesthesia: Cyclopropane has been the basal anesthetic agent for abdominal surgery in this clinic for years. During the past year, a combination of cyclopropane and spinal anesthesia has been employed. The anesthetist's technique of reducing the patient's respiratory movements to a minimum by artificial inflation of the lungs is a scheme particularly acceptable to the surgeon, for it insures a quiet abdomen. Improved anesthetic methods have been a great boon to the surgeon, permitting him to be more deliberate and painstaking in his operative procedures.

Incisions: The vertical incision has been used largely; in right hemicolectomies, however, an oblique incision beginning beneath the left costal margin and coursing downward and to the right above the umbilicus is employed frequently. It affords good exposure and gives ready access to the midtransverse colon, where the anastomosis will be made.

This incision is not a physiologic one with respect to innervation and blood supply as is the Hoag incision which courses obliquely downward in the other direction, paralleling nerve and blood supply. The oblique incision herein described, however, is superior to the Hoag incision in affording exposure where it is needed most, a consideration which outweighs any other. Surgeons have come to have far more trust in the transverse or the oblique, as contrasted with the vertical incision in that evisceration with the latter is more likely to occur. Unfortunately for low lesions in the left colon, only the vertical incision affords optimal exposure - and good exposure is so important that it becomes a dominant consideration.

The anastomosis: An end to end oblique closed (aseptic) anastomosis has been employed to the exclusion of all other methods of anastomosis in this Clinic, save in subtotal colectomy in which an abastomosis is effected between the terminal end of the pelvic colon and the side of the cecum. For multiple lesions of the colon, leaving the cecum and the ascending colon free, the writer has become very partial to this scheme of anastomosis. For idiopathic dilatation of the colon, so-called Hirschsprung's disease it is, I believe, a quite satisfactory operative procedure.

The Italian surgeon Parlavecchio (1898, 1900), the innovator of the closed method of making intestinal anastomoses noted the importance of making an oblique section of the bowel, leaving the mesenteric edge longer. On consulting the original writings of Parlavecchio during the past year, I was struck with the great similarity between the clamps employed by Parlavecchio and those made for me in 1938 by Mr. John A. Phelan of the Scientific Apparatus Shop on the University campus. Parlavecchio described the use of an instrument with well tempered, flexible and thin blades with biting grooves. Parlavecchio employed a locking device over the shank of the handles not unlike that in my instrument. The only things missing in the older instrument are the single and double ferrules which prevent spread or separation of the thin blades of the clamp as it is closed om the bowel. Interestingly enough, Parlavecchio incorporated in his anastomosis clamp a refinement which Mr. Phelan and I discussed but decided to omit, viz; a curve in the handles to permit easier rotation of the instrument for the anterior suture, after completion of the two posterior rows of suture. Experience has shown that the straight handled clamp, which is easier to manipulate, meets the requirements of the situation very satisfactorily.

The mesenteric angle in end to end anastomoses and the problem of the inturn: The problem of the mesenteric angle in oblique end to end anastomoses throughout the intestinal canal undoubtedly has occasioned many surgeons to adopt the less physiologic procedure of side to side anastomoses. The mesentery is not to be relied upon to close the mesenteric border of the bowel; nor should the mesenteric border present any special problem if the scheme is followed of denuding the bowel of its mesentery 7.5 millimeters beyond the site selected for section of the bowel. Furthermore, every stitch is to be placed in the gut wall. Two rows of sutures, in which the extent of the inverted bowel does not exceed 7.5 millimeters, constitutes a satisfactory inturn. No matter where, in the intestinal canal the anastomosis is made, the surgeon should set himself the task of employing only 5 to 7.5 millimeters of the adjacent walls of the tubular viscera to be approximated.

The epiploic appendages: Despite the apparent importance of the epiploic appendages in the blood supply of the colon, in the interests of placing each and every stitch in the bowel wall, this writer has sacrificed these appendages. Grasping a fatty epiploic appendage, overlying the bowel wall in a suture, is not an acceptable substitute for careful placement of the stitches into the submucous coat of the bowel.

Antecedent or complemental colostomy unnecessary: If each and every stitch grasps the submucous coat of the bowel and the sutures are otherwise well placed and the blood supply of the anastomosed segments is preserved, there does not appear

to be any necessity for a preliminary colostomy or little if any justification for the so-called "defunctioning colostomy" of Devine. A well made anastomosis will not leak. Only in the presence of obstruction is an antecedent decompressive vent necessary. For acute obstructions of the pelvic colon with great distention, it has long been the practice of this clinic to establish a transverse colostomy - a procedure which can be accomplished with little hazard.

Implantation of sulfathiazole: On completion of the anastomosis, a small amount of sulfathiazole is implanted about the anastomosis. Inasmuch as most anastomoses in colonic resections remain in contact with the small intestine, it is undesirable to leave a large quantity of sulfathiazole in the peritoneal cavity because of the known adhesive stimulating quality of the drug. When the anastomoses can be extraperitonealized completely, as in resections of the rectosigmoid, a larger implantation of sulfathiazole can be made with no misgivings on the score of adhesion formation. Our usual plan is to implant not more than a total of 3 grams in the ordinary adult patient, the larger fraction being implanted in the abdominal wall. No sulfonamide is given prior to operation; no additional sulfonamide is given after operation, until after the elapse of 48 hours, when a total of one to two grams of sulfadiazine is given subcutaneously in divided doses for two or three days if an indwelling urethral catheter still remains in place.

Intraperitoneal vaccination: We have never employed preoperative intraperitoneal schemes of vaccination in this clinic. On theoretical grounds alone, the plan does not appear to have real merit. Why subject the patient to this ordeal? It would appear that the neoplasm and operation are tribulations enough for the patient. Why provoke fever and make the patient ill unnecessarily just prior to the trials of operation?

Table I

Nature of Lesions

	No. of Cases	Hosp. Deaths	Mortality
Carcinoma	46	1	2.1%
Regional ileitis and colitis	4	0	
Ulcerative colitis	2	0	
Diverticulitis	4*	0	
Hirschsprung's disease	3	0	
Tuberculosis	1	0	
Multiple intestinal fistulas	1	0	
Total	61	1	1.6%

*One patient also had regional ileitis (see text).

Division of Cases

The location of the lesions appear in the tables. The majority of the operations were undertaken for carcinoma. In the cecal group of resections, there were four instances of regional ileitis or ileo-cecitis, necessitating removal of the terminal segments of the ileum and the right half of the colon. Amongst the 18 patients with lesions in the pelvic colon, one had tuberculosis and 4 had diverticulitis. One of these also had a regional enteritis involving the terminal ileum and cecum, necessitating a simultaneous ileo-colic resection and a resection of the pelvic colon. The patient was dismissed from hospital 10 days later with the wound healed. The patient with tuberculosis of the pelvic colon also had two simultaneous colon resections - one in the right half of the colon and the other in the pelvic colon. As indicated in the footnote to Table II, of the 7 patients for whom a one-stage subtotal colectomy was done, 6 had noncancerous lesions. Of the 60 patients for whom colonic resection was done, 15 had lesions other than malignancy. There were no deaths in this group.

Table II

Location of Lesions

	No. of Cases	Hospital Deaths
Cecum	14	0
Ascending colon	3	1
Descending colon	5	0
Pelvic colon (exclusive of rectosigmoid)	18	0
Multiple lesions necessitating subtotal colectomy (1 stage) anastomosing terminal ileum or cecum to terminal pelvic colon.*	7*	0
Rectosigmoid	10	0
Total	61	1

*This group includes: One patient with polyposis and multiple carcinomas; 1 patient with diffuse diverticulitis and diverticulosis; 2 patients with ulcerative colitis; 3 patients with Hirschsprung's disease. In 3 of the 7, an end to side anastomosis was made; in the other 4, the terminal ileum was anastomosed to the colon pelvinum end to end.

1.6% mortality

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Table III

Types of Operative Procedures

	No. of Cases	Hospital Deaths	Mortality	Researches
Exploratory only	0	0	0	
Colostomy only	0	0	0	
Enteroanastomosis only	1	0	0	Perforated lesion with abscess and metastases.
Two-stage resection (preliminary enteroanastomosis)	1	0	0	Perforated lesion with abscess.
Exteriorization (3 stages)	1	0	0	Severe cirrhosis
Open anastomosis	1	0	0	Closed anastomosis in ileum and open anastomosis between rectum and pelvic colon with resection of bladder for multiple intestinal fistulas (Dr. Dennis), also complemental colostomy.
Primary resection	57	1	1.7%	Antecedent transverse colostomy for acute obstruction 6; complemental appendicostomy 2; complemental colostomy 1.
Total	61	1	1.6%	

Mortality and Resectability

The total hospital mortality for resections of the colon and rectosigmoid during this 2-year period was 1.6 per cent. Of the 61 operations, a closed primary anastomosis was done in 57 patients. (Table III) In 60 of the 61 patients, excision of the lesion was effected by one method or another.

Amongst the 61 patients, 46 had malignant lesions in the colon; 45 were carcinoma. There was one lymphosarcoma of the cecum. Of the 46 patients with colonic malignancy, 42 had a primary closed resection. Entero-anastomosis alone was done in one patient; a two-stage resection in one; an open anastomosis in one and a three-stage exteriorization was done once (Table III). A primary resection of some type was done in 43 of the 46 patients with malignancy (93.4 per cent). In all but one of the 46 patients, however, removal of the growth actually was accomplished (97.8 per cent). This is probably a higher resection rate than can be justified by more experience. Five of these patients had hepatic metastases; in 2 of them the hepatic metastases were extensive, but the lesions in the colon were stenotic enough to necessitate either resection or its only alternative colostomy. Coincidental total hysterectomy was performed once because of intimate adherence to a rectosigmoidal lesion. Removal of a portion of parietal peritoneum overlying an adherent lesion is not an unusual circumstance and must be done if entry into a perforated lesion is to be avoided. Partial excision of the urinary bladder was undertaken twice. The right kidney was removed twice for adherent, perforated lesions of the ascending colon and hepatic flexure.

In one of these Mr. F.G., aged 49, it became necessary also to remove a strip of the inferior vena cava in addition to the kidney and ureter and finally, to my great embarrassment, to remove a section of the retroperitoneal duodenum. In the appraisal of the operability of the lesion, it was believed that a resection of the anterior face of the duodenum would suffice. The presence of an unrecognized duodeno-colic fistula made it mandatory to sacrifice a fairly long segment of the duodenum ligating the pancreatic ducts. I was not certain whether the ampullary termination of the common bile duct was removed with the duodenum - consequently, I established external tube drainage of the gall bladder. Later, when the duodenal specimen was studied carefully by the pathologist, it was observed that the ampulla of the common bile duct was on the specimen. This patient died from massive hemorrhage from an actively bleeding artery in the wall of the antrum of the stomach 16 days after operation. In other words, a Mann-Williamson operation had been done on the patient. At autopsy, both intestinal anastomoses were intact. Transplantation of the bile duct into the stomach or duodenum might have averted this disaster. In his monograph on "The Surgery of Pancreatic Tumors," Brunschwig (1942) gives no indication that this complication has been observed in the Whipple operation for carcinoma of the ampulla or carcinoma of the head of the pancreas. It would appear, therefore, that return of bile to the intestinal canal is mandatory when the pancreatic ducts are to be ligated.

Postoperative Hospital Stay

Complications: The mean postoperative hospital stay following resection for the 60 of the 61 patients who recovered from operation was 12 days; the average length of hospital stay was 14.3 days. Within 14 days of operation, 36 patients were dismissed. More patients were dismissed on the eleventh postoperative day than on any other, viz.; 15 patients. Ten patients were dismissed on the 12th postoperative day; the largest number of patients dismissed on any other one postoperative hospital day was 4 dismissals on the 10th, 15th and 17th postoperative days. Three patients were dismissed on each of the following postoperative days: the 13th, 14th, 15th and 18th. The other dismissals were dispersed over a wide interval. The largest postoperative stay was 35 days occasioned by a postoperative adhesive obstruction which remained refractory to suction and the use of the

Miller-Abbott tube - secondary operation being necessary for the relief of the obstruction. In the main, the chief causes for lengthening of the postoperative hospital stay beyond the conventional 11 or 12 days were: the infirmities of age and the debilitated status of a poorly nourished patient. The one patient for whom the exteriorization operation was done had a total postoperative hospital stay of 33 days - 13 days following the initial exteriorization and excision; 10 days after cutting the spur and again 10 days following closure of the colostomy. The one-stage closed aseptic anastomosis is the operative procedure of choice from the standpoint of the patient's economy of time and hospital expense. A convalescence without complication assures prompt wound healing, minimal mortality and early recovery.

The Occurrence of Diarrhea After Right Hemi-colectomy

Transient diarrhea after excision of the right colon together with 2 or 3 feet of the terminal ileum has not been an unusual circumstance. Perhaps this is as it should be, for water absorption is largely a function of the ileum; in addition, a further drying process of the intestinal content takes place normally in the right half of the colon. Whenever sacrifice of this segment of the colon is accompanied by loss of 2 or 3 feet of the terminal ileum, as becomes necessary to remove adequately the lymphatic drainage area for a cecal carcinoma, temporary diarrhea may follow. I have never observed diarrhea following sacrifice of a good portion of the left colon; nor have I seen it in the cases of subtotal colectomy in which the cecum is anastomosed to the colon pelvinum or rectum. As a matter of fact, there are 2 patients in the present group for whom right hemi-colectomy with sacrifice of a short segment of the ileum was done more than a year ago, who continue to have, without other apparent cause, 4 to 5 stools a day - a diarrhea which has remained refractory to all the usual measures of dealing with such situations.

II. Primary Closed Resection for Lesions at the Recto-sigmoidal Juncture.

As early as 1910, Balfour had reported excising lesions in the pelvic colon as a one-stage procedure, establishing intestinal continuity over a rubber tube. In 1920 Balfour made a second report upon the utility of this procedure. In 1908, Lockhart-Mummery described excision in the pelvic colon through a perineal incision, making the anastomosis over a glass tube. In the main, however, it appears that most surgeons have settled upon a one-stage abdomino-perineal operation as the only operative procedure which meets satisfactorily the problem presented by lesions of the lower pelvic colon or upper rectum. There have been only a few dissenting voices. Horsley (1937), Dixon (1939) and Dunphy (1941) have each reaffirmed their belief in the thesis that lesions in the recto-sigmoid can be excised in accordance with the principles of good cancer surgery with restitution of intestinal continuity. To Dixon, in particular, great credit is owing for indicating that this procedure can be accomplished with a reasonable risk. Dixon performed the operation usually in three stages, performing first colostomy, then excising the lesion, establishing continuity by an open anastomosis. The final procedure was closure of the colostomy. Arnold (1939) and Arnold and O'Shea (1940) have employed an abdomino-sacral three-stage procedure for carcinoma at the recto-sigmoid, an operation not unlike the sacral exteriorization of Küttner (1910).

My interest in trying to restore continuity by primary resection for lesions in the terminal pelvic colon and at the recto-sigmoidal juncture was provoked by a patient for whom a colostomy had been established elsewhere for an ulcerative lesion in the pelvic colon. This patient was determined to have intestinal continuity restored. He had twice previously been subjected to exploration, at his own persistent insistence, in vain attempts to accomplish restoration of continuity. No vestige of a colon had been

found in the peritoneal cavity beneath the level of an inguinal colostomy when Dr. Charles E. Rea of this clinic performed the last exploration. Proctoscopic examination disclosed a rectum patulous to the proctoscope to 12 centimeters. It was my intention to dissect beneath the pelvic peritoneum for the blind rectal pouch, to remove the colostomy, and to establish continuity by end to end suture between the rectum and the pelvic colon. The colon was so full of impacted fecal material, from cecum to the colostomy outlet that an anastomosis with the colon did not appear feasible. The contracted colostomy outlet apparently precluded ready evacuation of the colonic content despite preoperative administration of enemas. Recourse was had, therefore, to the expedient described by Stone (1927), in which a loop of ileum was interposed, an end to end anastomosis being effected between the rectal ampulla, resurrected from the sacral concavity and the ileum. Because of the extraordinary fecal impaction of the entire colon, the proximal end of the ileum was led out to the exterior. During convalescence, the colostomy opening was enlarged and vigorous catharsis readily remedied the disquieting colonic impaction noted at operation. At a subsequent procedure, end to end union was effected between the transverse colon and the ileum, the colostomy and the intervening colon being excised.

As an aside, it may be interesting to record the character of the fluid drained out through the temporary ileal fistula. This was the first time that an anastomosis had been made at so low a level in this clinic. At that time (6-9-41), the operation seemed technically very difficult. Apparently a few sutures engaged the opposite bowel wall, causing a temporary obstruction, an occurrence which permitted us to collect daily from the 20 centimeter ileal segment, through a catheter in its proximal end, an opalescent, white, somewhat milky fluid. The fluid looked not unlike a rich admixture of mucus with fluid from anywhere in the intestinal canal. The surprising thing, however, was the odor of this innocent-looking fluid. Quite uniformly a startled look lighted the faces of all who sampled the aroma of the bottle. It was a pungent unpleasant odor, which permeated the patient's room. Presumably this is the normal ileal secretion. No such odor was perceptible on the patient's breath at this time, initially on admission to hospital or after complete restoration of intestinal continuity.

This patient, Mr. R. P., aged 46, has been very pleased with the reestablishment of intestinal continuity, and the operation of the new channel apparently has duplicated normal colonic behavior in every way.

This procedure suggested the feasibility of excising carcinomatous lesions at the recto-sigmoidal juncture, with primary reestablishment of intestinal continuity. During the period covered by this study, primary resection has been done for recto-sigmoidal lesion in a group of 10 cases (Table II). The same technique of establishing intestinal continuity is employed as has been found practical in aseptic or closed resections of the stomach and the small intestine or colon. The clamps employed are the same. The broad attachment of the mesentery to the rectum obviates the necessity of making an oblique section of the rectum, as is mandatory in primary anastomoses in the colon. In consequence, a transverse section on the lower rectal segment can be made with salvage of rectal wall for the anastomosis - an item which makes the operation easier. Apparently, the middle and lower hemorrhoidal arteries are quite adequate to support a normal blood flow to the residual rectum, for in each such operation, obviously it becomes necessary to sacrifice the superior hemorrhoidal artery.

Antecedent colostomy, save in the presence of acute obstruction, appears to be unnecessary; similarly, a complemental external decompressive vent appears unnecessary. As in the colonic anastomoses, each and every suture is placed in the gut wall, great care being observed to secure satisfactory approximation with an inturn, not exceeding 7.5 millimeters. Moreover, it is surprisingly easy to extraperitonealize the entire anastomosis. It is also a simple procedure to push a rectal tube beyond the anastomosis after completion of the suture. I employ a

Number 24 tube and have an assistant push it up from below, threading the tube about 10 centimeters above the anastomosis. Every third day, the tube is withdrawn 2 to 3 centimeters, to preclude tension effects of the tip of the tube upon the pelvic colon. No intestinal fistulas occurred in the group. Four of the ten patients in the series were dismissed from the hospital with a healed wound in 11 days and 2 on the 12th postoperative day. One patient remained 24 days; the others left the hospital on the 17th postoperative day with healed wounds.

Arbitrary Surgical Definition of the Lower Proctoscopic Limits of Lesions of the Recto-sigmoid.

The rectum begins where the colon ceases to have a mesentery. Prior to the B.N.A. reclassification of the constituent parts of the pelvic colon and rectum, the colon pelvinum was counted as a portion of the rectum. In designating lesions of the recto-sigmoid, I have employed rather arbitrary distinctions, including only those lesions whose lower extent as observed through the proctoscope, is not less than 10 nor more than 13 centimeters from the pectinate line. The rectum is not straight as its name would imply; it has a deep antero-posterior curve and lesser lateral curves. Lesions whose lower proctoscopic limit is more than 13 centimeters from the anal opening, in the main, can be resected easily without mobilizing the rectum. Even for lesions within the arbitrary limits described, there is some variation in the ease or difficulty with which the operation is done, depending on the depth of the peritoneal cul de sac, and the adiposity of the patient. In lean patients with a deep peritoneal cul de sac and a large pelvis, resection for lesions at the recto-sigmoid juncture may be easy and necessitate little mobilization of the rectum as contrasted with the adipose patient, especially if the cul de sac is not deep. Interestingly enough, when patients who have had resections at this level are submitted to proctoscopy after operation, the suture line often is described as being at about the same distance from the anal opening as was the lower extent of the lesion initially, despite the excision of 2 to 3 centimeters of normal appearing bowel below the lesion. Obviously, this seeming paradox can be explained only by the surgeon's mobilization of the rectum at operation.*

It is unlikely that the resection rate will be as high for recto-sigmoidal lesions as in the colon proper. I have not hesitated to perform partial colectomy in both the right and left colon, in the presence of rather extensive hepatic metastases. In a similar circumstance, the lesion being at the recto-sigmoidal juncture the surgeon radily could justify to himself performance of the easier alternative operation of colostomy.

Concomitant presence of rectal polyps with lesion in pelvic colon or recto-sigmoid contraindicates resection:

It is perhaps not out of place to sound a note of warning over enthusiasm for primary resection with restoration of intestinal continuity in a patient presenting a carcinoma on the basis of a polyp, exhibiting at the same time polyps in the rectum which appear benign on proctoscopic examination. Just recently in this clinic, a patient from the present series, Mr. W.D., aged 60, has been submitted to abdomino-perineal excision approximately 16 months after segmental resection had been done in the pelvic colon. It was believed that the polyps in the rectum could be kept in check by fulguration. Despite repeated fulguration carcinoma developed. In another patient, Mrs. H.L., aged 49, two lesions were observed proctoscopically,

*My colleague, Dr. William C. Bernstein, of the Division of Proctology kindly checked the inferior limits of all lesions within the range of the proctoscope before operation and the site of suture line after operation. This information is very helpful to the surgeon and affords him an opportunity of becoming better oriented in the anatomico-surgical aspects of the problem.

one was a carcinoma at 12 centimeters from the anal opening, the other was described as a benign polyp at a distance of 10 centimeters from the anus. Microscopic study of the resected segment showed that the polyp was malignant, even though there was yet no demonstrable invasion of the circular muscle. To trust to fulguration for control of rectal polyps, when a similar polyp at the rectosigmoidal juncture or in the pelvic colon already has become malignant, does not appear to be a wise course.

Preservation of Normal Sexual Function: That impotence is a frequent accompaniment of the abdomino-perineal operation of removal of the pelvic colon and rectum is the common experience of surgeons. Jones (1942) indicates that the incidence of impotence following the operation in male patients is approximately 95 percent. In rectosigmoidal resection, with immediate restoration of intestinal continuity, this unfortunate side effect of the abdomino-perineal operation is avoided.

III. Abdomino-anal Methods for Excision of Carcinoma of the Rectal Ampulla with Restoration of Continuity and Preservation of the Rectal Sphincters.

The Kraske and Hochenegg methods of perineal or sacral resection of the rectum with preservation of the rectal sphincters are well known. Kraske (1885) described excision of a segment of the sacrum with resection of the rectum, restoring continuity by circular suture. Hochenegg (1888) described two methods, known respectively as the "pull through" and the "invagination" methods. The former has enjoyed the widest use in the hands of Hochenegg and his pupils as well as by others. The Küttner (1910) plan of sacral exteriorization already has been alluded to in the section on primary resection for rectosigmoidal lesions.

A rather general and increasing enthusiasm for the abdomino-perineal method of operation for carcinoma of the rectum, together with pathological studies, which suggest definitely a centripetal spread of lymphogenous metastases from rectal cancer, sometimes at a rather great distance from the local lesion - these factors have led to a general abandonment of the perineal or sacral methods of excision of cancer of the rectum, save on special indication. Even though the one-stage abdomino-perineal operation appears to be a more formidable operation than colostomy followed by posterior excision, in practical hands the hazards of these procedures in standard risk patients should be approximately the same. The gain in more complete excision of the lymph drainage area in the abdomino-perineal operation definitely suggests it to be the better procedure.

Limitation of Resection Methods:

In addition to the shortcomings of the perineal or sacral methods of amputation of the rectum just described, when the rectum is resected by either of these routes with preservation of the sphincters, the incidence of fistula formation is high, no matter whether the methods of Hochenegg or Kraske are employed. A perusal of the papers of Körbl (1913) and Goldschmied (1914) and other pertinent literature suggests that the incidence of primary wound healing is not high by any of these methods. Rotter (1912) has devised a pedicled skin flap procedure to deal with the item of fistula formation, following the Kraske circular suture method of rectal resection. Furthermore, even with preservation of the sphincters, the recovery of complete continence by either method has not been too promising. Mandl (1940), a pupil of Hochenegg and an ardent advocate of the pull-through method of Hochenegg, states that satisfactory ultimate continence is obtained in 50 per cent of instances by the Kraske circular suture method, and in 60 to 65 per cent by the Hochenegg method. Körbl (1913) of the Eiselsberg Clinic stated that primary healing occurred in only 20 per cent (total of 27 cases) with employment of the Hochenegg "pull-through" method; recovery of complete continence was observed in 36 per cent. Employing the Kraske suture method, Körbl states that primary healing

occurred in 39 per cent (total of 34 cases) and eventual complete continence occurred in 66 per cent. Wilensky (1942) recently reported preservation of the sphincters in the abdomino-perineal operation, a suggestion made several years ago by Kraske (1905) and practiced by Perthes (1927).

The Abdomino-Anal Scheme of Operation Employing the Pull-through or Suture Methods.

My own thought on the matter was to combine the advantages of the abdominal removal of the lymphatic drainage area, and eliminate the troublesome problem of perineal fistula by either (1) pulling the pelvic colon through the anal opening, or (2) by suturing the pelvic colon to the rectal wall, at the lower level of resection.

A recent search of the literature discloses that these methods, too, have had their advocates. As long ago as 1892, Maunsell, a surgeon in New Zealand, described a method very similar to that employed by the writer. Maunsell intended his operation for lesions of the rectal ampulla and lower pelvic colon. Through an abdominal incision, he divided the rectum below the lesion and pulled the upper segment with tumor attached through the lower rectal segment after excision of the lesion, anastomosis was effected between the segments. The author remarks that "a tailor always pulls a sleeve inside out to sew it." In 1901, Weir described an almost identical procedure, with this difference, that the rectal segment containing the neoplasm was removed through the abdominal incision before the pelvic colon was pulled through the lower rectal segment. Like in Maunsell's method, the anastomosis was described as being effected in the "cold outside." Weir reported 3 cases in which this type of operation was performed for carcinoma located in each instance at 4, $3\frac{1}{2}$ and $2\frac{1}{2}$ inches from the anus. Bergeret and Livory (1940) describe an abdomino-anal procedure for lesions of the rectosigmoid employing the principle of the Hochenegg invagination scheme on the lower rectal segment.

The Experience of this Clinic with the Abdomino-Anal Method.

During the past year, 7 abdomino-anal operations for carcinoma of the rectal ampulla have been done in this clinic.* There have been essentially two plans of operation. The patient is placed in the lithotomy position with knees only moderately flexed. Whereas this position handicaps the surgeon a little in the abdominal dissection, it possesses this advantage that the patient's position need not be changed for the final stages of the operation. My first plan was to dilate the rectal sphincter and to dissect up the normal rectal mucosa, just above the pectinate line, much in the manner of the Whitehead operation for hemorrhoids. This short mobilized tube of mucosa is then closed by suture and a gauze pack impregnated with 2 grams of sulfanilamide is left in the supra-anal muscular cylinder. Following a change of gown and gloves, excision of the carcinoma of the rectum is completed by the usual abdominal method. The preliminary Whitehead maneuver from below facilitates the abdominal dissection. Whereas, in primary resection for carcinoma of the rectosigmoid, Sudeck's (1907) critical point apparently has no great significance for the surgeon; in this procedure, on the contrary, in which the pelvic colon is to be pulled down to or through the anal canal, the maintenance of viability to the very tip of the pelvic colon becomes a problem of real concern to the surgeon. Four patients have been operated upon by the abdomino-anal pull-through method. One of these Mr. N.F., aged 45, a large muscular man died of pyelonephritis and oliguria 12 days after operation. The day following operation, the patient's external sphincter was divided posteriorly because of gan-

*It is a pleasant task to acknowledge here the enthusiastic help and encouragement I have received from my associate, Dr. Richard L. Varco, in carrying out the latter type of operative procedure.

grene of the segment protruding through the external sphincter.

The remaining three patients having the abdomino-anal procedure, were operated upon in the following manner: in one, the preliminary Whitehead dissection was carried out, but following the abdominal dissection excision of the neoplasm and mobilization of the pelvic colon, the operation was completed by suturing the pelvic colon to the remnants of the rectal wall just above the pectinate line. In the other two, the preliminary Whitehead maneuver was omitted, the removal of the carcinoma was completed from within the abdomen. In one of these, the operation was completed by the abdomino-anal pull-through maneuver; in the other, my associate, Dr. Clarence Dennis, sutured the pelvic colon to the lower level of rectal resection through a large Fansler proctoscope, while the writer completed the operation from within the abdomen.

For a patient of 16 years, C.E., with chronic ulcerative colitis involving the rectum, I did a one-stage proctectomy and colectomy, pulling the ileum through the anal canal. It was necessary to elongate the ileocolic artery much in the manner with which one deals with the inferior mesenteric artery, in the abdominl-anal pull-through maneuver for carcinoma of the rectal ampulla. The procedure was not a complete technical success, and a few weeks later the boy was readmitted, at which time ileostomy was performed. A well-functioning ileostomy or colostomy, obviously, is preferable to a perineal anus, in which the sphinteric function is poor. Babcock (1932) is one of the few American surgeons who recommends a sacral anus to his patients in preference to a colostomy. I have had the privilege of talking with surgeons who have had personal experience with an abdominal colostomy and count it no great handicap in the ordinary activities of life.

Dissatisfaction with these Methods

Primary healing did not occur in a single instance. It may prove that a preliminary colostomy should be done in these procedures to divert the fecal stream during the healing phase. Nevertheless, the ultimate recovery of something approximating normal continence in the majority of the patients operated upon suggests that efforts directed at preserving the rectal sphincters have some merit. I have the impression that the suture method is superior to the pull-through maneuver; further, preservation of the entire thickness of the rectal wall in the lower segment is desirable; in other words, whereas the preliminary Whitehead maneuver facilitates the abdominal dissection, this step in the procedure should be eliminated in the interest of preserving the lower rectal segment intact. In the Whitehead dissection, the submucosa apparently is removed with the mucosa; there is also real hazard of inflicting injury upon the internal sphincter muscle.

All these factors suggest that the abdomino-anal suture method is the most effective way of dealing with carcinoma of the rectal ampulla, if one is to attempt preservation of the sphincters. The experience of this clinic with these methods has not been extensive enough to warrant any conclusions. These preliminary skirmishes with the problem are recorded here only to suggest that these initial trials indicate that a satisfactory technique of dealing with certain cases of ampullary carcinoma with full restoration of sphincteric function probably can be worked out.

Importance of internal sphincter:

Whereas this experience has been inadequate to enable formulation of the best plan of procedure in the preservation of normal continence, it has demonstrated to the writer the great importance of the internal sphincter in the maintenance of perfect control of gas and feces. One thinks ordinarily of the external sphincter as a strong muscle. It is, however, a voluntary muscle and subject to the fatigue of ordinary voluntary muscle. The internal sphincter, on the contrary, is a less dense sheet of muscle fibers, but being an involuntary muscle, it is not subject to the action of the will,

nor does it exhibit the fatigue of voluntary muscle. A patient, having had the Whitehead dissection, probably with trauma to the internal sphincter as a preliminary to one of the abdomino-anal operations described above, may fine, when he attempts to walk from his bed to the toilet, early in convalescence, that his external sphincter tires, permitting the escape of gas or feces. This circumstance was particularly noticeable in the boy with ulcerative colitis, in whom the ileum was pulled through the external sphincter following proctectomy and colectomy.

Hospital stay: Two patients in this group left the hospital at 17 and 18 days after operation respectively. The average hospital stay for the 6 patients who survived operation was 26.3 days. Furthermore, whereas the patients with colonic and rectosigmoidal resections left the hospital with wounds healed and, usually, with complete restoration of normal intestinal function, the patients in which the abdomino-anal resection was done for ampullary carcinoma had to endure a long healing period beyond the long hospital stay.

Summary and Conclusions

The experience of this clinic suggests that primary resection employing the closed anastomosis, can be made with relative safety for carcinoma and other lesions anywhere in the colon as well as for rectosigmoidal carcinoma. Antecedent colostomy is necessary only in the presence of obstruction; complemental external decompressive vents are unnecessary. Amongst 60 resections performed for lesions of the colon and rectosigmoid juncture over a two-year period, there was one death, a mortality of 1.6 per cent. A high resection rate is compatible with a low mortality in colonic resections. A short hospital stay and healing period attends primary resection for lesions in the colon and rectosigmoid quite regularly.

In addition, a preliminary report is made of the experience of this clinic with abdomino-anal methods of dealing with carcinoma of the rectal ampulla, preserving the rectal sphincters. Whereas the healing period has been long in these patients, the ultimate return of function, approaching the normal, suggests that efforts directed at preserving the rectal sphincters are worthwhile.

References

I. Colon

1. Bloch, O.
   Om extra-abdominal Behandling of cancer intestinalis (rectum derfra untaget) med en Fremstilling af de for denne sygdom foretagne operationer og deres Resultater.
   Nord. med. Arkiv. 2:1, 1892.

2. Brunschwig, A.
   The Surgery of Pancreatic Tumors.
   C. V. Mosby Co., St. Louis, Mo., '42.

3. Bryant, T.
   A case of Excision of a Stricture of the Descending Colon through an Incision made for a Left Lumbar Colostomy: with remarks.
   Proc. Roy. Soc. Med. 9:149, 1882.

4. Campbell, O. J.
   Surgery of the Carcinoma of the Colon
   Minn. Med. 23:215, '40.

5. Cheever, D.
   The Choice of Operation in Carcinoma of the Colon.
   Ann. Surg. 94:705, '31.

6. Devine, H.
   Operation on a Defunctioned Distal Colon.
   Surg. 3:165, '38.

7. Gibbon, J. H. Jr. and Hodge, C. C.
   Aseptic Immediate Anastomosis following Resection of the Colon for Carcinoma.
   Surg. 59:395, '41 (Lit.)

8. Lahey, F. H.
   Resection of the Right Colon and Anastomosis of the Ileum to the Transverse Colon after the Plan of Mikulicz.
   Surg., Gyn. & Obst., 54:923, '32.

9. Madden, S. C. and Whipple, G. H.
Plasma Proteins: Their Source, Production and Utilization.
Physiol. Rev. 20:194, '40 (Lit.)

10. Parlavecchio, G.
Nuovo metodo per le enteroanastomosi nell' asse e laterali e per le gastro-e le colecisto-enterostomi.
Il Poleclinico (surgione chirurgica). 5:376-393 and 429-437, 1898.

11. Parlavecchio, G.
Di Una utile Modificaszione all 'enterostomo.
La Clinica Chirurgica. 8:193, 1900.

12. Paul, F. T.
Colectomy. Brit. Med. J. 1:1139,'95.

13. Paul, F. T.
Personal Experiences in the Surgery of the Large Bowel.
Brit. Med. J. 2:172, '12.

14. Ravdin, I. S.
Hypoproteinemia and Its Relation to Surgical Problems.
Ann. Surg. 112:576, '40.

15. Schoemaker, J.
Some Technical Points in Abdominal Surgery.
Surg., Gyn. & Obst. 33:591, '21.

16. Schoemaker, J.
Operative Treatment of Obstruction Due to a Growth in the Descending Colon.
Surg., Gyn. & Obst., 45:359, '27.

17. Stone, H. B. and McLanahan, S.
Resection and Immediate Anastomosis for Carcinoma of the Colon.
J.A.M.A. 120:1362, '42.

18. Sudeck, P.
Über die Gefässversorgung des Mastdarnes in Hinsicht auf die Operative Gangran.
Munch. Med. Woch., 54:1314, '07.

19. Varco, R. L.
Unpublished data, '42.

20. Wangensteen, O. H.
Some of the Advantages of Closed Anastomosis in Gastro-intestinal Resections.
Proc. of Interstate Postgraduate Med. Assembly of N.A., Oct. '41.

21. Wangensteen, O. H.
Intestinal Obstructions.
Charles C. Thomas Company, Springfield, Ill., '42.

22. Wangensteen, O. H.
The Controlled Administration of Fluid to Surgical Patients; including description of gravimetric methods of determining status of hydration and blood loss during operation.
Minn. Med. 25:783, '42.

23. Wangensteen, O. H.
The Surgical Problem in Gastric Malignancy; with special reference to (1) the closed method of gastric resection, (2) coincidental hepatic resection, and (3) pre- and post-operative treatment.
Arch. Surg. In Press.

24. Whipple, A. O.
The Use of the Miller-Abbott Tube in the Surgery of the Large Bowel.
Surg. 8:289, '40.

25. Wilkie, D. P. D.
Surgery of Malignant Disease of the Colon.
Edin. Med. J. 46:1, '39.

II. Rectosigmoid

1. Arnold, H. R.
Resections of the Carcinomatous Rectosigmoid Juncture, with Establishment of Intestinal Continuity; preliminary report.
Arch. Surg., 38:1004, '39.

2. Arnold, H. R. and Shea, J. F.
Resection of the Carcinomatous Rectosigmoid Juncture with Reestablishment of Intestinal Continuity: Subsequent Report.
Arch. Surg. 41:110, '40.

3. Balfour, D. C.
A Method of Anastomosis Between Sigmoid and Rectum.
Ann. Surg. 51:239, '10.

4. Balfour, D. C.
The Utility of the Rubber Tube in Intestinal Surgery.
Surg. Gyn. & Obst., 31:184, '20.

5. Dixon, C. F.
Surgical Removal of Lesions Occurring in Sigmoid and Rectosigmoid.
Am. J. Surg., 46:12, '39.

6. Dixon, C. F.
Resection without Permanent Colostomy for Carcinoma of the Rectosigmoid and Lower Portion of the Pelvic Colon.
In Vol. II, Page 1414 of Treatment of Cancer and Allied Diseases. Edited by G. I. Pack and E. H. Livingston.
P.B.Hoeber, New York, '40.

7. Dunphy, J. E.
Anterior Resection for Cancer of the Rectosigmoid.
Arch. Surg. 43:1076, '40.

8. Horsley, J. S.
Resection of the Rectosigmoid and Upper Rectum for Cancer with End to End Union.
Surg. Gyn. & Obst., 64:313, '37.

9. Jones, T. E.
Complications of One Stage Abdomino-perineal Resection of the Rectum.
J.A.M.A. 120:104, '42.

10. Lockhart-Mummery, J. P.
A New Method of Restoring the Continuity of the Bowel in Cases of Excision of a Growth Low Down in the Sigmoid Flexure.
Lancet 1:1402, '08. (See also letter to editor, page 1512).

11. Stone, H. B.
The Interposition of Small Bowel Segments Between Divided Ends of the Colon.
Ann. Surg. 86:401, '27.

12. Stone, H. B.
Interposition of a Loop of Ileus to Repair Defects in the Colon.
Ann. Surg. 88:593, '28.

III. Resection of Rectal Ampulla

1. Babcock, W. W.
The Operative Treatment of Carcinoma of the Rectosigmoid with Methods for the Elimination of Colostomy.
Surg., Gyn. & Obst., 55:627, '32.

2. Bergeret et Livory
La resection recto-sigmoidïenne avec intubation colorectale.
Jour. de Chir. 56:209, '40.

3. Coller, F. A., Kay, E. B. and MacIntyre, R. S.
Regional Lymphatic Metastases of Carcinoma of the Rectum.
Surg. 8:294, '40.

4. Gilchrist, R. K. and David, V. C.
Lymphatic Spread of Carcinoma of the Rectum.
Ann. Surg. 108:621, '38.

5. Goldschmied, K.
Resultate der Radikalen Operationen des Mastdarmkrebsen bezüglich der Erhaltung der Kontinenz.
Wien.klin.Woch., 27:412, '14.

6. Hochenegg, J.
Die Sakrale Methode des Exstirpation von Darmkrebsen nach Prof. Kraske
Wien. klin. Woch., 1:254, '88 (article continued through weekly installments 11 to 16 inclusive).

7. Hochenegg, J.
Beiträge zur Chirurgie des Rectum und der Beckenorgane.
Wien.klin.Woch., 2:515, '89 (continued article Numbers 26-30 inclusive).

8. Hochenegg, J.
Zur Therapie des Rectum Carcinoma.
Wien.klin.Woch., 10:729, '97.

9. Körbl, H.
Die Continenz Verhältnisse nach dem radicalen Operationen des Mastdarmkrebses.
Arch. f. klin. Chir. 101:499, '13.

10. Kraske, P.
Zur Exstirpation hochzitzenden Mastdarmkrebse.
Verhandl. d. Deutsch. Geselloch. f. Chir. 14:464, '85.

11. Kraske, P.
Erfahrungen über den Mastdarmkrebs.
Sammlung Klinischer Vorträge, '97.
Chirurgie Numbers 52 and 53, p. 771.

12. Kraske, P.
Die Erhaltung des Schlieszmuskels bei der Exstirpation des Mastdarmkrebse und seine spatere Funktion.
Deutsch. Med. Woch. 31:1098, '05.

13. Kraske, P.
Über die weitere Enwickelung der Operation Hochsitzende Mastdarmkrebse.
Arch. f. klin. Chir. 80:634, '06.

14. Küttner, H.
Die Sakrale Vorlagerungsmethode beim Hochsitzenden Rectum Carcinom.
Deutsch. Med. Woch. 36:606, '10.

15. Küttner, H.
Zur Technik meinen sakralen Vorlagerungsmethode beim hochsitzenden Rektum Carzinom.
Zentralbl. f. Chir. 43:905, '16.

16. Küttner, H.
Bericht über 800 Rektum Carzinome.
Munch. Med. Woch. 67:799, '20.

17. Mandl, F.
Maintenance of Continence in Operations for Carcinoma of the Rectum.
Jour. of Internat. College of Surgeons, 3:11, '40.

18. Maunsell, H. W.
A New Method of Excising the Two Upper Portions of the Rectum and the Lower Segment of the Sigmoid Flexure of the Colon.
Lancet, 2:473, '92.

19. Perthes, G.
Abdominosakrale Operation hochsitzenden Rektumcarzinome mit Erhaltung des Schlieszmuskels.
Arch. f. klin. Chir. 148:605, '27.

20. Rotter, J.
Die Wiedherstellung der Continenz nach der Excisio recti carzinomatosi.
Arch. f. klin. Chir. 98:38, '12.

21. Weir, R. F.
An Improved Method of Treating High-seated Cancers of the Rectum.
J.A.M.A. 37:801, '01.

22. Westhues, H.
Über die Entstehung und Vermeidung des lokalen Rectum-Carcinom-Residiv.
Arch. f. klin. Chir. 161:582, '30.

23. Westhues, H.
Im Kampfe um die Prophylaxe des Rectum Carcinoms.
Arch. f. klin. Chir. 178:408, '34.

24. Wood, W. Z. and Wilkie, D.P.D.
Carcinoma of the Rectum. An Anatomico-Pathological Study.
Edin. Med. J. 40:321, '33.

25. Wilensky, A. O.
Retention of the Sphincter in the Radical Operation for Carcinoma of the Rectum and Rectosigmoid.
New York State J. of Med., 42:1151, '42.

V. GOSSIP

Standard Nomenclature of Disease and Standard Nomenclature of Operations published by the American Medical Association, 1942, is a development of far-reaching significance. It is a classification of disease which one day will be international. This may be not too far off for the League of Nations Health Section was making good progress in international correlations when the war broke out. This approach to disease classification will be incorporated in medical school teaching and in all hospitals. It is so practical that physicians will employ it in their offices so that office and hospital records can be interchangeable. I quote: "The Standard Nomenclature aims to include every disease which is clinically recognizable and to avoid repetition and overlapping. English terms in good usage are employed whenever possible. This Nomenclature attempts to make clear the distinction between a disease and its manifestations. It has been designed primarily for clinicians since the clinical diagnosis is the source of all information on the prevalence and distribution of disease.

The method of classification followed is based simply on two primary factors: the portion of the body concerned (topographic) and the cause of the disorder (etiologic). These two elements are designated by numerical digits separated from each other by a hyphen. The first three digits in the disease code describe the topographic site; the last three, following the hyphen, describe the etiologic agent.

Topographic Classification

The main topographic divisions are:

000- Diseases of the body as a whole (including diseases of the psyche and of the body generally) and those not affecting a particular system exclusively.
100- Diseases of the integumentary system (including subcutaneous areolar tissue, mucous membranes of orifices and the breast).
200- Diseases of the musculoskeletal system.
300- Diseases of the respiratory system.
400- Diseases of the cardiovascular system.
500- Diseases of the hemic and lymphatic systems.
600- Diseases of the digestive system.
700- Diseases of the urogenital system.
800- Diseases of the endocrine system.
900- Diseases of the nervous system.
x00- Diseases of the organs of special sense.

These major groups are further divided in order to specify a definite organ or part of an organ. Thus, for example, the digestive system being designated by 600-, and the fourth organ listed in the system being the stomach, the digits for the stomach are 640-. The pylorus, which according to arrangement is the fifth structure under stomach, receives the code number 645-. If a lesion involves the whole digestive tract, it will receive the topographic classification 600-; if the disease involves all of the stomach, it will receive the number 640-, and if it can be positively identified as involving the pylorus, it receives the number 645-.

Etiologic Classification

A similar system of numbering the causes of disease constitutes the second portion of the classification. Thirteen major classifications of etiology are included:

-000 Diseases due to prenatal influence
-100 Diseases due to a lower plant or animal parasite
-200 Diseases due to a higher plant or animal parasite
-300 Diseases due to intoxication
-400 Diseases due to trauma or physical agent
-500 Diseases secondary to circulatory disturbance
-550 Diseases secondary to disturbance of innervation or of psychic control
-600 Diseases due to or consisting of static mechanical abnormality (obstruction, calculus, displacement or gross change in form) due to unknown cause
-700 Diseases due to disorder of metabolism, growth or nutrition
-800 New growths
-900 Diseases due to unknown or uncertain cause with the structural reaction (degenerative, infiltrative, inflammatory, proliferative, sclerotic or reparative) alone manifest; heredi-

ditary and familial diseases of this nature

-x00 Diseases due to unknown or uncertain cause with the functional reaction alone manifest; hereditary and familial diseases of this nature

-y00 Diseases of undetermined cause.

As in the topographic classification, these major groups are further subdivided to specify particular etiologic agents. For example, a causative agent identified as poison, but with its exact nature undetermined or unspecified, receives the number -300. If identified as a metallic poison, but the exact metal undetermined, it will receive the number -310. If the metal can be identified as bismuth, for example, it will receive the number -319, thus indicating the specific etiologic nature. In certain of the etiologic groups it is necessary to insert a fourth digit to indicate the anatomic or functional disturbance produced by the etiologic agent. If one wishes to indicate that bismuth has produced degeneration, the code number assigned will be -319.9, the digit following the decimal point indicating the resultant degeneration. Similarly, ankylosis of knee due to infection would receive the number 248-100.4, the last digit representing the ankylosis. The 248- is the topographic number for knee, while -100 indicates infection, generally. More specifically, if the ankylosis was due to tuberculosis, the digits would be 248-123.4.

Secondary Diagnoses and Symptoms.-- If an institution wishes to attempt a distinction between primary and secondary diagnoses, this may be done as follows: The secondary diagnoses may be entered with a different colored ink or may be placed, if desired, on different colored cards.

For the indication of symptoms and syndromes the Standard Nomenclature includes nondiagnostic code numbers for the nervous system, the heart, the obstetric conditions and certain general manifestations of disease, for each of which special cards may be employed if desired.

Incomplete Diagnoses - the use of Y.- If information for an accurate diagnosis is insufficient that fact may be indicated at whatever point in the diagnosis the information is lacking. Thus it is possible to code "undiagnosed disease of the heart." This would receive the topographic designation for heart, generally 410-, and the etiologic diagnosis of -y00, signifying an unknown cause. A lesion known merely to involve an unidentified portion of the digestive tract would receive the topographic code number 6y0-. Similarly, the lesion in an unidentified portion of the stomach but not involving all of the stomach would be designated 64y-. Therefore y00-y00 would indicate complete ignorance of the nature of a disease both as to location and as to cause.

Suspected Diagnoses. - There is one other purpose of employing a y and that is to designate diagnoses which the physician wishes to show are merely suspected. The name and digits of the diagnosis are to be entered as usual, but a y may be added at the end of the code.

The demand for a terminology of operations which would parallel the Standard Nomenclature of Disease both in its educational features and in its arrangement has prompted the development of this section.

Topographic numbers, i.e., those digits appearing before the dash, correspond exactly with those used in the Standard Nomenclature of Disease. The operative procedure completes the code and is expressed by the digits following the dash. The key, or meaning of the digits, is given on page 871. The main operative procedures are:

-0 Incision
-1 Excision
-2 Amputation
-3 Introduction
-4 Endoscopy
-5 Repair
-6 Destruction
-7 Suture
-8 Manipulation

For the use of certain types of institutions and in various surgical specialties it may be desirable to carry out further subdivisions and refinements. This can be done readily within the present framework of the text. Hospitals are encouraged to carry out the maximum degree of refinement in classification of operative procedures which their facilities will permit."