The Morbidity and Cost of the Temporary Colostomy*

RENE SMIT, M.D., ALEXANDER J. WALT, M.D.

From the Department of Surgery, Wayne State University School of Medicine, Detroit, Michigan

THE DECISION to divert the fecal stream is influenced by many factors. Ideally, a temporary colostomy should: 1) help to preserve life; 2) reduce morbidity; 3) cause no complication; 4) be closed as soon as possible; 5) be closed without complication. Whenever we fail in any of these five areas, a price is paid in human suffering and in expenditures by the public.

In 1973, Pelok and Nigro[11] published a prospective study of complications related to construction of a temporary colostomy in the patient with colonic injury. The following year, Kirkpatrick[9] published a prospective randomized study of the alternatives in management of injury to the colon, with emphasis on primary closure and exteriorization of the injured segment.

We have examined the clinical courses of patients in whom temporary diverting colostomies were established. Our objectives were threefold: 1) to determine the combined morbidity associated with construction and closure of a colostomy; 2) to determine the economic cost to the patient and society, expressed as a function of the duration of hospitalization for construction and closure, the interval from construction to closure, and the time spent in the operating room for closure; 3) to identify the means by which we may reduce the morbidity associated with a temporary colostomy and its cost to the individual patient.

Method

We reviewed the charts of 167 patients who underwent construction and closure of a temporary colostomy at the hospitals affiliated with the Wayne State University Department of Surgery between January 1, 1972, and December 31, 1976. The overall group was broken down into subsets determined by the basic lesions for which the colostomies were constructed: trauma (103), carcinoma (15), diverticular disease (23), and miscellaneous (26). The group was also divided according to type of colostomy—end versus loop, location, and method of closure. The male-to-female ratio was 132:35. The ages of the patients ranged from 14 to 85 years. The mean age was 41 years and the median 33 years.

The data were analyzed using chi-square and Student's t-test methods.

Results

By definition, all patients in this study had survived the construction of a temporary colostomy and had proceeded to colostomy closure. The complication rate associated with colostomy construction was 63/156 (40.4 per cent). Fifteen of the complications (9.6 per cent) were directly related to the colostomy itself. Six of 156 (3.8 per cent) patients needed reoperation in the immediate post-construction period for complications related directly to the colostomy.

No death occurred with colostomy closure. Complications developed in 50 of 167 patients (29.9 per cent). The most frequent complication was wound infection, which occurred in 18 of 103 (17.5 per cent) wounds closed primarily. All patients had received mechanical bowel preparation. Wound infections developed in five of nine patients who did not receive an antibiotic. In comparison, 13 infections developed in the remaining 94 patients, who had primary wound closure and received antibiotics (of any sort by any route). The difference was significant ($P < 0.01$). When oral administration of antibiotics and mechanical bowel preparation were combined, wound infection developed in eight of 47 patients. This again differed significantly from the

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Address reprint requests to Dr. Walt: Gordon H. Scott Hall of Basic Medical Sciences, Wayne State University School of Medicine, 540 East Canfield Avenue, Detroit, Michigan 48201.

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rate in those receiving no antibiotic ($P < 0.02$). Of 35 patients receiving mechanical bowel preparation, and oral or intravenous administration of antibiotics, only three had wound infections. The difference was again significant ($P < 0.001$). There was, however, no significant difference between the group treated by oral antibiotic administration alone and the group receiving both orally and intravenously administered antibiotics.

Fecal fistulas developed in six of 167 (3.6 per cent) patients following colostomy closure. Two fistulas occurred in 13 patients who did not receive any antibiotic. The remaining four occurred in 154 patients who had received various antibiotics by various routes. The difference was signifcant ($P < 0.05$). Two (2/40) fistulas occurred after simple closure of a loop colostomy and four (4/127), after resection of the colostomy and primary anastomosis. The difference was not statistically significant. No association was found between the incidence of fecal fistulas and: 1) the basic lesion for which the colostomy was constructed, 2) the site of the colostomy, or 3) the interval from construction to closure of the colostomy. Of the six patients in whom fecal fistulas developed, three needed new colostomies. Two fistulas closed spontaneously and one remained open.

In five of 167 patients, obstruction of the colon developed at the sites of colostomy closure. Four of these patients needed reoperation (three had new colostomies constructed). There was no correlation between obstruction of the colostomy closure and: 1) the basic lesion for which the colostomy was constructed; 2) simple closure of a loop versus resection and closure; 3) the site of the colostomy; 4) the interval from construction to closure of the colostomy.

Thirteen of 167 (7.8 per cent) patients needed reoperation in the early postoperative period for complications related to colostomy closure. Six patients needed new colostomies. This group of 13 patients subsequently underwent 19 operations. One patient still has a colostomy and one patient, an ileostomy.

No significant correlation was found between the overall incidence of complications and: 1) the basic lesion for which the colostomy was constructed; 2) the age of the patient; 3) the sex of the patient; 4) the location of the colostomy; 5) the type of colostomy (loop versus end); 6) the interval from construction to closure of the colostomy; 7) the use of a laparotomy incision to facilitate closure.

The mean hospital stay of all patients undergoing operations with concomitant colostomy construction was 22.2 days. This period was not significantly different when the group was broken down according to: 1) the basic lesion for which the colostomy was constructed; 2) the site of the colostomy; 3) the type of the colostomy (end versus loop).

The median interval from construction to closure of all colostomies was 101 days. The range was 14 days to eight years. In comparing loop colostomies with end colostomies, the medians were 90 and 120 days, respectively. The difference was significant ($P < 0.02$). No correlation was identified between the time from construction to closure and: 1) the basic lesion for which the colostomy was constructed; 2) the site of the colostomy.

The mean duration of hospitalization for closure of all colostomies was 17.2 days. The mean interval from admission to operation was 6.2 days. When the postoperative period was uncomplicated, the mean stay after operation was 6.3 days. By contrast, the patients who sustained complications were hospitalized for a mean period of 19.4 days after their operation. Again, there was no correlation between the duration of hospital stay for colostomy closure and: 1) the basic lesion for which the colostomy was constructed; 2) the site of the colostomy; 3) the type of colostomy (end versus loop).

The mean time from entry into the operating room to incision of the skin was 20 minutes. The mean time spent in the operating room (anesthesia) for all colostomy closures was 165 minutes. For loop colostomies with end colostomies, the mean times were 142 and 189 minutes, respectively. The corresponding median times were 135 and 190 minutes. These differences were significant ($P < 0.001$). In examining the subset of loop colostomies, there was no significant time difference between the colostomy that was closed as a simple loop and resection of the colostomy and primary anastomosis. The addition of a laparotomy incision for closure of a colostomy increased the mean anesthesia time to 236 minutes. The patients who did not have a laparotomy incision had a mean anesthesia time of 145 minutes. The difference was significant ($P < 0.001$). There was no correlation of operating time with: 1) the basic lesion for which the colostomy was constructed; 2) the site of the colostomy.

Discussion

The mortality rate for colostomy construction is about 1 per cent.[8] The high incidence of complications following construction of a colostomy has been well documented.[3, 6, 11, 12] Mortality rates associated with colostomy closure have been reported to be 0 to 4.5 per cent,[1, 2, 5, 8, 10, 13, 15] with the mean national mortality rate being about 1.5 per cent. Reported incidences of complications of colostomy closure have

been as high as 44 per cent.[5] The incidences of fecal fistulas range from 2.9 per cent, reported by Thomson and Hawley,[13] to 23 per cent, reported by Knox *et al.*[10] The 29.9 per cent incidence of morbidity in our series is comparable to those reported elsewhere.[1,2,5,8,10,13,15] The patient's age and sex, and the basic lesion for which the colostomy is constructed, appear to have no effect on the incidence of complications associated with colostomy closure.[3,4,7,14,16] There is controversy about the benefit of administering antibiotics with bowel preparation for colostomy closure. Finch[5] found that antibiotic bowel preparation reduced the incidence of fecal fistulas but it did not reduce the incidence of wound infections. Barnett *et al.*[1] reported that antibiotics significantly reduced the incidence of wound infection. Yajko *et al.*[15] found no advantage in the use of antibiotic bowel preparation for the prevention of wound infection. In our series, antibiotics significantly reduced the incidences of wound infections ($P < 0.01$) and fecal fistulas ($P < 0.05$).

Thomson and Hawley[13] reported an increased incidence of fistula formation when colostomy closure was performed less than a month after construction. An optimal time for colostomy closure could not be identified from the present study, but it did seem that a protracted period of waiting offered no advantage. We agree with Knox *et al.*[10] and Finch[5] that, for most patients, the optimal period for closure of a temporary colostomy is two to three months after its construction. Opinions vary greatly as to the effects of site and type of the colostomy and the development of complications related to closure. We found no statistically significant difference.

The mean hospital stay of patients with uncomplicated colostomy closure was 12.5 days. This is comparable to that reported by Yakimets[16] (10.4 days) and Barnett *et al.*[1] (13.8 days). We agree with Beck and Conklin[2] that a loop colostomy can be closed more quickly. In this study, the mean times for closure of a loop colostomy and closure of an end colostomy were 142 and 189 minutes, respectively. We prefer to construct a loop colostomy rather than an end colostomy. When, by necessity, an end colostomy is constructed, the divided ends of the colon should be brought out in proximity to each other, thus facilitating subsequent closure.

The second objective of this study was to assess the cost of a temporary colostomy. The mean cost of a hospital bed within our medical center is $200.00 per day. The ancillary services increase this figure by $95.00. The charge for the first half hour in the operating room is $270.00. Each subsequent half hour costs $100.00. The cost of anesthesia for the first half hour is $95.00. Each additional half hour is $40.00. In this study the mean stay associated with construction of a temporary colostomy was 22.2 days. The mean hospital stay for colostomy closure was 17.2 days. The mean anesthesia time was 165 minutes. The average computed cost for the bed, operating room and anesthesia for colostomy closure is $5,750.00. This is figured from a base cost of $4,370.00, which rises to $7,910.00 when complications develop. In this study, the mean interval from admission to operation was 6.2 days. We believe this delay is excessive and that it represents one area in which hospital costs could be easily reduced by performing preoperative sigmoidoscopic and barium-enema examinations and a portion of the bowel preparation on an outpatient rather than an inpatient basis.

The median interval from construction to closure was 101 days. One can extrapolate that, allowing a month for recuperation from closure of the colostomy, the patient is at least partially incapacitated for five months. This results in a substantial loss of income to the patient. In addition, the social costs attendant on colostomy are considerable and should be taken into account by the surgeon, but this aspect has been deliberately excluded from this study.

Summary

The charts of 167 patients undergoing colostomy construction and closure have been reviewed. The incidence of complications related to the construction of the colostomy was 9.6 per cent. No death occurred with closure of the 167 colostomies, but 50 patients (29.9 per cent) sustained complications. Fecal fistulas occurred in six patients (3.6 per cent). The combined reoperation rate for colostomy construction and closure for problems related to the colostomy was 11.6 per cent.

The mean period of hospitalization for combined construction and closure of a temporary colostomy was 39.4 days. The median interval from construction to closure was 101 days. Mean anesthesia time for colostomy closure was 165 minutes.

The mean cost of hospitalization for colostomy closure was $5,750.00. For patients sustaining complications, this increased to $7,910.00. The median period of disability was approximately five months.

The identifiable means to reduce the high morbidity and cost of the temporary colostomy are: 1) meticulousness in planning and construction of the colostomy stoma; 2) where possible and appropriate, construction of a loop colostomy in preference to an

end colostomy. When, by necessity, an end colostomy is constructed, it is important to approximate the two divided ends of the colon at the time of colostomy construction and thereby facilitate its subsequent closure; 3) early closure of the colostomy (two-to-three months); 4) minimizing the period of hospitalization prior to closure of the colostomy; 5) the use of antibiotics with bowel preparation for colostomy closure; 6) where appropriate, the selective use of alternatives to colostomy, such as exteriorization or primary repair of colonic injury.

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Memoir

CHEWNING, Clarence Conway, Jr., Richmond, Virginia; born March 15, 1911, Chilesburg, Virginia; Medical College of Virginia, 1934; internship, Stuart Circle Hospital and Medical College of Virginia Hospital, Richmond 1935–1936; served with U.S. Armed Forces during World War II.

Dr. Chewning joined the American Society of Colon and Rectal Surgeons in 1949 and was elected to Fellowship in 1954. He was a Diplomate of the American Board of Colon and Rectal Surgery, member of the American Medical Association, Virginia Academy of Medicine, Richmond Academy of Medicine, Southern Medical Association, and Past Secretary-Treasurer of the Piedmont Society of Colon and Rectal Surgeons.

He was on the staff of Richmond Memorial, Stuart Circle, St. Mary's and Retreat for the Sick Hospitals, and a member of the faculty of the Medical College of Virginia. He died February 15, 1978.