

curative surgical procedures available today, that which comes closest to the norm is ileal pouch-anal anastomosis. Based on these long-term results, ileal pouch-anal anastomosis can be recommended to the majority of patients who require operation for chronic ulcerative colitis.

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## DISCUSSION

DR. ARNOLD G. CORAN (Ann Arbor, Michigan): I would like to congratulate the authors on an excellent series, probably the largest series of endorectal pullthroughs reported thus far in the literature.

I would also like to thank them for asking me to discuss their paper. I do so with great humility since our experience at the University of Michigan is far less than theirs.

Since 1977, we have done 80 straight endorectal pullthroughs without a reservoir on patients with ulcerative colitis and familial polyposis who range in age from 4 to 48 years. Six of these patients were converted to a Brook ileostomy of which three were done because of dissatisfaction with stool frequency.

Daytime continence was achieved in all of these patients within 1 month after closing the temporary ileostomy and nocturnal incontinence occurred in the first year in six of these patients and then finally disappeared.

(Slide) The mean stool frequency in this group declined progressively over the first 3 years to 8 per 24 hours, which compares favorably with the six reported in the current series.

We have also analyzed the stool frequency by age groups above and below 18 years of age and above and below 30 years of age and could find no statistical difference. We also analyzed them by gender and again found no differences. This is consistent with our finding as you will see in the next slide (Slide) that the neorectum progressively dilates over this 3-year period, finally achieving what appears to be a normal rectal reservoir capacity 2-3 years after the endorectal pullthrough.

I would like to ask the authors three questions: how did they specifically obtain their follow-up data on stool frequency and continence? We found that frequent and close follow-up of our patients is necessary to determine what the actual frequency is. For example, we find sometimes that a stool frequency can vary by 100% if, in the case of a college student, they are getting ready for final exams, if there is marital strife, etc. I have seen patients with an average frequency of three stools a day increase their frequency to 10 or 12 under emotional stress.

Second, how exactly was the endorectal dissection done? Was any of it done from above or below or both ways, and in those cases, was the intact mucosal-submucosal tube removed so that they feel assured that all the potential disease has been removed?

Third, were there times when the "J" pouch could not be performed because of significant tension at the anastomosis?

I have occasionally had to do a "J" pouch because the tension at the anastomosis with a straight pullthrough was too great and *vice versa*. I am wondering that the authors did in the cases where there was too much tension.

Essentially, it appears that the results with the straight endorectal pullthrough in our much smaller series and the results with the ileal pouch anal anastomosis are similar in terms of continence, frequency, and complications. I do believe that the straight pullthrough is somewhat easier to do and takes less time. In general, the operation takes us about 3.5-4 hours and we seldom use blood.

Probably, as has been the experience with Hirschsprung's disease, the most important factor in the results of this operation is the experience of the surgeon.

DR. ERIC W. FONKALSRUD (Los Angeles, California): I would like to congratulate Drs. Pemberton, Kelly, and their colleagues at the Mayo Clinic for providing us with a very carefully performed detailed analysis of the long-term excellent results after the endorectal ileal pullthrough procedure with a "J" reservoir for ulcerative colitis excluding the polyposis patients.

Although the operative technique used by each of the five surgeons from their hospital was similar in this series with little variation during the 5-year period of study, the optimal technique for the pullthrough procedure for colitis may not as yet have been determined as was mentioned by Dr. Coran.

In a recent review of 1771 patients compiled from reports from 17 different hospitals using various types of reservoir, the failure rate was remarkably similar in this large group, with 7.2% failures when no reservoir was used, 5.6% with the "J", 6.4% with the "S", and 4.2% with the lateral reservoir. Nonetheless, the incidence of complications varied considerably, and the average follow-up was less than that reported today.

The authors report only slightly better results in the last 195 patients compared with the first 195 in their manuscript; a somewhat different observation than that for most other hospitals where there has been a steep learning curve with improvement in results as modifications in technique have been made. In our experience with 165 patients at the UCLA Medical Center in which the lateral ileal reservoir was used in 141, 6 patients (4%) were failures and returned to permanent ileostomy and 14 (10%) were given a temporary ileostomy, eight of which have subsequently been closed. Over 60% of the reoperations performed in our series were performed in the first 50 patients. Only two of the last 100 patients were failures and the incidence of reoperation was greatly reduced.

The authors indicate essentially stable results after the first year as determined by return to the ileostomy, stool frequency, and daytime continence, but note an increase in pouchitis at 16–18 months after operation. In our experience, pouchitis also was noted in over 35% of our early cases and was heralded by an increase in stool frequency, gas, and diarrhea more than 1 year after operation. In all but one of these patients the reservoir had elongated or enlarged causing reservoir stasis and increase in bacterial growth, poor emptying, and a decrease in absorption of bile acids. Reoperation to shorten the reservoir to a length of 12–15 cm and repair of any outlet obstruction has relieved the symptoms in almost all patients. We now rarely construct a reservoir longer than 12–15 cm at the initial operation. It appears that the initial results are good with a big reservoir but become worse as the reservoir enlarges with time.

My first question to the author is: have they observed a direct relationship between the size of their reservoir and the development of pouchitis in later years since some of their reservoirs were 20 cm or longer? It would appear that the more complex pouches such as the "S" and more recently the "W" may be even more prone to late distention with stasis and may also be technically difficult to revise in subsequent years.

The authors report a somewhat higher incidence of sexual and bladder dysfunction than that reported in many other series. The second question is: do you believe that removing the rectal muscle down to within 3–4 cm of the dentate line is necessary since a slightly longer muscle cuff in males may be a bit safer and not alter the long-term results?

The authors have used the same technical operation for all patients with colitis. It appears that obese patients, those with severe anal sphincter spasm, and children, will do better with a short reservoir of 10–12 cm in length or no reservoir at all as Dr. Coran just mentioned and as was used in 15 of our patients during the past 2 years. Question number three: from your large clinical experience, have you considered tailoring the operation to the anatomic and physiologic differences between your patients? With this in mind should we not refer to this operation as the endorectal ileal pullthrough rather than the pouch procedure?

Again I compliment the authors on their pioneering work in this field and for providing us with an excellent detailed analysis of their long-term results with a very large series of patients.

DR. MALCOLM C. VEIDENHEIMER (Burlington, Massachusetts): It was with great pleasure that I received the manuscript from the Mayo Clinic. The Mayo experience so closely parallels our own that I have little to add in the way of criticism or critique for this paper.

We have now performed this operation for more than 200 patients. We have 23 who had an "S" pouch, and the surgeon in our group who used the "S" pouch abandoned it about 1.5 years ago and joined the others in our group in using the "J" pouch. The "J" pouch, we believe, is more easily fashioned.

I would like to ask the Mayo people who I know have had experience with straight end-on anastomoses and with the "S" pouch, why they have chosen to use the "J" pouch? Has there been something they have learned that has put them into the "J" pouch field?

The results of our work have been very similar to the results reported today from Mayo. We have a 15% incidence of pouchitis. One incidentally was in a patient with familial polyposis whose ileostomy had not yet been closed. I certainly do not have an understanding as to why people get pouchitis.

Pelvic sepsis occurred in 4% of our patients, all of whom had inflammatory bowel disease. The other problems with the pouch, which include leak at the staple line, leak at the ileoanal anastomosis and anal stricturing, resulted in the occurrence of some type of pouch problem in nearly one quarter of our patients. Fortunately, most of these problems have been resolved.

As with the Mayo experience, our patients have been functionally satisfactory. They average five bowel movements in 24 hours and less than one of these movements occurs at night.

The sexual function of our patients has been somewhat better than that reported by Mayo, but on the other hand, we, the doctors, were doing the questioning, and patients go out of their way to try to please the doctor. Perhaps the impartial observer approach used by Mayo Clinic would be a better test of true function.

Twelve per cent of our patients, whether males or females, have ended up having a pregnancy after our operation.

The operation, we believe, is a great operation. It is now the operation of choice. In 1980 and 1981, we did three cases each of those years. This past year we did in excess of 70.

I would like to ask the authors some questions. Despite a large experience with inflammatory bowel disease, we frequently make the mistake of operating on a patient with ulcerative colitis only to find that clinically and histologically they have Crohn's disease. Did they have a problem with this in their patients reported today? And was there a relationship between complications and Crohn's disease?

Is there a difference in the results of your patients reported today with ulcerative colitis from those who you have treated for familial polyposis, especially in respect to complications?

I know that you have removed some pouches, and I wonder in your removal of these, what have you found histologically about regeneration of mucus membrane? Dr. Ravitch a few years ago reported that Dr. Snyder had noted a case of carcinoma in a person having this procedure done. In investigating this further, Dr. Ravitch, I have found that that patient had an anal canal cancer and not an adenocarcinoma. Nevertheless, the risk of regenerating mucosa and its neoplastic tendency is something that needs our constant concern.

DR. HEBER H. NEWSOME, JR. (Richmond, Virginia): Our series is smaller than that of the Mayo Clinic, as is every other series, but an important question has been addressed that I believe is the age factor.

You mentioned that the stool frequency was higher in the age over 50. We are surprised that the soilage rate is not higher because the sphincter, in our experience, tends to relax slightly as age progresses.

The direct question is have you measured sphincter function in older people? Could you give us a little more detailed breakdown of your data in the older population? Is there an age limit that you might use to exclude patients?

DR. KEITH A. KELLY (Closing discussion): First of all, I would like to thank the discussants for their thoughtful comments on our paper.

To start with Dr. Coran's questions, we obtained our follow-up data using an independent observer, a nurse practitioner. She contacted all

the patients at periodic intervals and elicited, we believe, a more objective follow-up than we, the patients' physicians, could have done.

The endorectal dissections were all accomplished *via* the perineal approach. None were done *via* the abdominal approach. The anus was dilated slightly, and a small Gelpe retractor was used in the anal canal to provide access to the rectal lumen. We resected the mucosa from the dentate line to a point about 4 or 5 cm proximal to the line. The rectum was transected at that point, and more orad portions removed entirely.

Dr. Coran wonders whether there were times when the "J" pouch could not be used. In answer to that there were. In about 4% of patients, a "J" pouch would not have reached the dentate line. In these patients an "S" pouch was used. Another 2 or 3 cm in length is possible with the "S" pouch.

The disadvantage of the "S" pouch, is that its efferent limb may obstruct outflow from the pouch. Some of our "S" pouch patients have had to use a catheter to empty the pouch. In contrast, all of our patients with a "J" pouch can empty the pouch voluntarily and spontaneously.

Eric Fonkalsrud raises a number of good points. I certainly agree with him that this operation is not perfect as yet. We need to continue to explore methods of improving it. He wonders whether "pouchitis" might be due to a mechanical problem either at the ileal pouch-anal anastomosis or within the pouch itself. Our data suggest, however, that this may not be the case. We have seen terminal ileal inflammation in individuals with a straight ileoanal anastomosis (no pouch) and with no mechanical obstruction. Also, the incidence of pouchitis is much less in patients with familial polyposis, and yet such patients would be subject to the same mechanical problems as those with ulcerative colitis. Lastly, we have studied the emptying of the "J" pouch using scintigraphic techniques, and found that those patients with pouchitis emptied their pouches just as well as patients who had no pouchitis. Therefore, it seems unlikely that pouchitis is solely a mechanical problem. My own hunch is that pouchitis may arise in some way from an interaction between the luminal bacterial or their products and the intestinal wall.

Dr. Fonkalsrud wonders whether we are making our rectal mucosal cuff too short and, therefore, predisposing our patients to sexual problems. We stay close to the rectal wall during the pelvic dissection and away from the sympathetic and parasympathetic nerves innervating the bladder and genitalia. We make our cuff 4–5 cm in length. Perhaps by making it longer, we would preserve sexual function better.

We have not as yet tailored the operation to specific anatomic differences among the patients. Our goal was to create a pouch with a capacity similar to that of the normal rectum, which is around 350–400 mL. The "J" pouch does this quite well. Perhaps as we study our subjects further, we can identify patients in whom special tailoring should be done.

Dr. Veidenheimer asked why we make the "J" pouch rather than other types of pouch. We believe the "J" pouch is the easiest pouch to make. It can be constructed using sutures in about 15 minutes or using staples in about 10 minutes. The "J" pouch has an adequate size. It empties well without the need for a catheter.

He raises the difficult question about what do we do with patients who have Crohn's disease or in whom we cannot clearly rule it out. It is not always easy to separate Crohn's and ulcerative colitis, even when all the data are in. We discuss the possibility of "indeterminant colitis" with the patients before operation, and explore their opinion on what they want to do if their colitis cannot be clearly separated from Crohn's colitis. Nearly all patients want to proceed with the ileal pouch-anal operation and take their chances. That is usually what we end up doing.

We have observed patients with indeterminant colitis who have had the operation. They generally have done well. Thus, it is interesting to speculate as to whether or not we should explore the use of this operation in patients with Crohn's disease limited to the large intestine.

Are there differences between the responses of colitis patients to operation and the responses of patients with familial polyposis? Yes, there are. Fewer postoperative complications occur in familial polyposis patients. For example, no cases of pelvic sepsis occurred in our series of polyposis patients. Interestingly enough, the stool frequency is nearly identical as we observe both groups for several years after operation.

Have we left rectal mucosal behind, that could possibly predispose patients to long-term problems with carcinoma? We have removed the pouches of 24 patients who had a poor result from the operation. We looked at the specimens carefully for evidence of residual rectal mucosa. In about 15% we found small nests of residual rectal mucosa between the ileal pouch and the rectal tunica muscularis. Whether or not these nests would turn into cancer over the long term is unknown. The nests are not exposed to the luminal flora or to luminal carcinogens. Also, the amount of mucosa left is extremely small, making the chance of developing a cancer also small.

A question on age limit was asked. We started out saying nobody over 50 years, but then we had a healthy 55-year-old who asked, "What about me? I would like the operation." Therefore, we operated on this patient, and then we operated on a 60-year-old and then a 62-year-old. Our oldest patient is 64 years old. If older patients have a strong anal sphincter and healthy digestion and absorption, they should be considered. We have not operated on anyone over age 65 as yet.

I would like to close by thanking the members of the Association who have done so much to bring this operation forward; especially, Dr. M. Ravitch, Dr. D. Sabiston, Dr. L. Martin, and Dr. O. Beahrs, who did the first of these operations in adults at the Mayo Clinic.