

Ileal J-Pouch Construction

Léon Maggiori · Fabrizio Michelassi

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Abstract

Introduction Several configurations and techniques have been described to fashion an ileal pouch during the performance of a restorative proctectomy or proctocolectomy with ileo-anal anastomosis.

Methods In this article, we describe a simplified J-pouch construction technique which is designed to avoid unnecessary enterotomies, facilitate the subsequent ileo-anal anastomosis and reduce potential contamination to the pelvis.

Keywords Ileal pouch–anal anastomosis · J-pouch · Ulcerative colitis · Familial adenomatous polyposis

Introduction

Ravitch and Sabitson described a hand-sewn end-to-end ileoanal anastomosis after total proctocolectomy in 1947.¹ Although this technique spared patients the inconvenience of a permanent stoma, the lack of a reservoir condemned them to a very high number of daily bowel movements and poor function. In 1978, Parks and Nicholls² proposed enhancing the ileo-anal anastomosis with an ileal reservoir in order to increase capacity and improve the functional results. They described a technique to create a pouch by double-folding the terminal ileum on itself in an “S” configuration. Since then, several pouch configurations have been described and studied: J (single-folding), W (triple-folding) and H (side-to-side isoperistaltic).

The J configuration is now widely accepted as the standard technique because of ease of construction and comparable long-term functional outcomes.³ The senior author described a simplified technique for J-pouch construction in 1993.⁴ This technique is designed to avoid unnecessary enterotomies and facilitate the subsequent ileo-anal anastomosis.

Surgical Procedure

Indications and Contra-indications

The ileal pouch–anal anastomosis (IPAA) is indicated after a total proctocolectomy, or a second-stage proctectomy in order to avoid a permanent ileostomy. The most common indications for IPAA are ulcerative colitis (UC) and familial adenomatous polyposis (FAP).⁵ IPAA has also been proposed for young patients with Lynch syndrome complicated by rectal cancer and for patients with severe colonic and rectal inertia.⁶

Crohn’s disease (CD) is generally considered a contra-indication for IPAA since it may be associated with disease recurrence in the pouch. However, in 1996, a study reported the results of 41 IPAA for CD without perineal complications and small bowel disease: postoperative morbidity and functional results were satisfactory and, after a 10-year follow-up, only 10 % of the patients required pouch excision and permanent end-ileostomy.^{7,8} The Cleveland clinic reported that the 10-year pouch-loss rate was 15 % if the diagnosis of CD was established before the procedure.⁹ Nowadays, IPAA for CD is still not advocated in established practice guidelines,¹⁰ but specialized centers for inflammatory bowel disease have adopted this procedure for highly selected and motivated CD patients, without history of perineal lesions or small bowel involvement, as a temporary alternative to a proctocolectomy with end-ileostomy.

As one of the consequences of an ileal-pouch anastomosis is a decrease in the consistency of the stools, IPAA

L. Maggiori · F. Michelassi (✉)
Department of Surgery, New York Presbyterian Hospital,
Weill Cornell Medical College,
525 East 68th Street, Box 129, New York, NY 10065, USA
e-mail: fam2006@med.cornell.edu

should only be performed in patients with good anal continence. Hence, preoperative anal incontinence is a contraindication to IPAA. On the other hand, age is not, by itself, an absolute contraindication to pouch surgery. However, in consideration of the high frequency of additional comorbidities and the occasional desire of a patient to avoid multiple surgical procedures, the percentage of patients undergoing a restorative proctocolectomy with ileal-pouch anastomosis decreases in the seventh and eight decade in our experience and the experience of others.^{11,12}

Surgical Technique

Mesenteric Lengthening

The reach of the terminal ileum must be maximized when a total mucosectomy with hand-sewn technique is planned (see below) to allow for an IPAA without tension. We routinely perform a descent trial to ensure that the length of the mesentery is sufficient for a tension-free anastomosis. The length is considered adequate when the antimesenteric border of the small bowel at the presumptive anastomotic site reaches beyond the pubic symphysis when stretched along the axis of the superior mesenteric vessels.

If mesenteric length is a concern, several maneuvers can be performed to achieve a better reach. Firstly, the ileal mesentery can be dissected posteriorly until it is completely free from the duodenum and the pancreas. Secondly, the peritoneum can be opened with small transverse incisions made in a perpendicular direction over the superior mesenteric artery (Fig. 1).

When these simple maneuvers fail to achieve the desired mobilization, the penultimate branch of the superior mesenteric pedicle to the small bowel may be ligated to lengthen the most distal arcade of the ileal mesentery (Fig. 2). If this maneuver is performed, extreme caution must be exercised when descending the pouch into the pelvis to avoid tearing of the mesentery and compromise of the vascular supply. Alternatively, an S-shaped pouch should be considered,

since the efferent limb of this pouch offers an additional 1–2 cm of distal reach.

Pouch Construction

Whether the pouch is constructed as part of a restorative proctocolectomy or after an initial colectomy with end ileostomy, the end of the ileum is initially clamped with a non-crushing intestinal clamp or it is stapled across with a linear stapler. The apex of the pouch is appropriately selected by positioning the ileum over the pubis to identify the longest section of mesentery and a stay suture is inserted on the antimesenteric side (apical stitch). The pouch should have a length ranging from 15 to 18 cm: shorter pouches have lesser capacity, resulting in a higher frequency of bowel movements during the first 6–12 months after the procedure; larger pouches might induce fecal stasis which can result in bacterial overgrowth. The proximal and distal limb of the J-pouch are then approximated to each other with sutures placed at the ileal mesenteric junction to facilitate subsequent pouch formation and help avoid inadvertent inclusion of the ileal mesentery between the forks of the stapler. A non-crushing bowel clamp is applied on the small bowel proximal to the pouch to avoid spillage of intestinal contents during the construction of the pouch.

A longitudinal enterotomy is performed on the proximal limb, opposite to the stapled end of the distal limb, for a length that approximately equals one half the circumference of the intestine. The distal clamp occluding the terminal ileum is then removed; if the distal ileum was occluded with a mechanical stapler, the staple line is resected. The lubricated forks of an 80-mm linear stapler are inserted through the common enterotomy and are placed one in the afferent loop and one in the efferent loop of the future pouch (Fig. 3). The instrument is closed and locked (Fig. 4). Before firing the stapler, the mesentery of the terminal ileum is checked,

Fig. 1 If mesenteric length is a concern, the peritoneum can be opened with small transverse incisions made in a perpendicular direction over the superior mesenteric artery

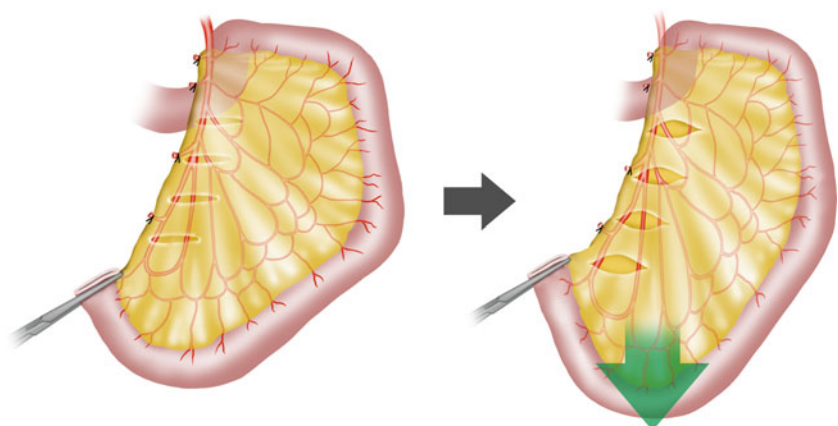
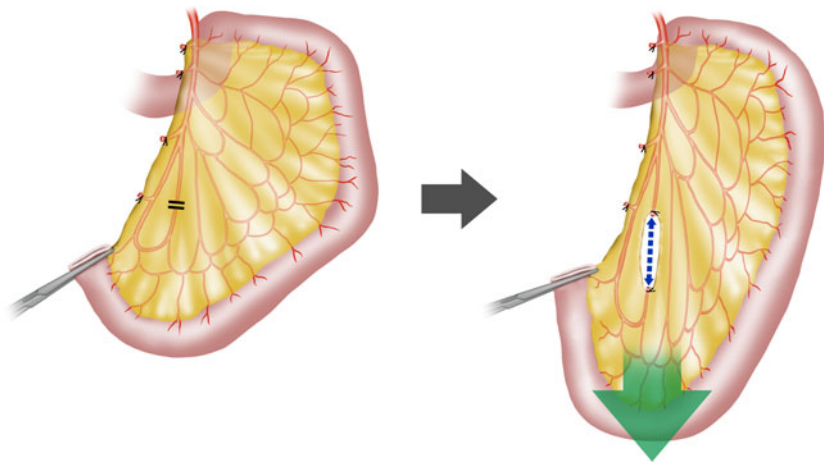


Fig. 2 If mesenteric length is a concern, the penultimate branch of the superior mesenteric pedicle to the small bowel may be ligated to lengthen the most distal arcade of the ileal mesentery



to make sure that it has not been included in the stapler (Fig. 5).

The pouch is then everted using delicate Babcock clamps applied on the suture lines until reaching the remaining intact septum, and a new 80-mm linear stapler is inserted (Fig. 6). This maneuver is repeated until the entire septum between the two loops is stapled and transected. Usually, three 80-mm linear staplers are needed to construct a satisfactory pouch. Eversion is helped by pulling the edge of the original enterotomy over the tip of the pouch. It is common to require an additional 60-mm linear stapler to suture and divide the most distal portion of the septum (Fig. 7).

Once the pouch is totally everted, the two staple lines are inspected for hemostasis, which can easily be achieved with the use of electrocoagulation. The pouch is then reduced by gentle traction on the apical stitch and counter-traction on the edge of the original enterotomy (Fig. 8). If a stapled ileo-anal anastomosis is

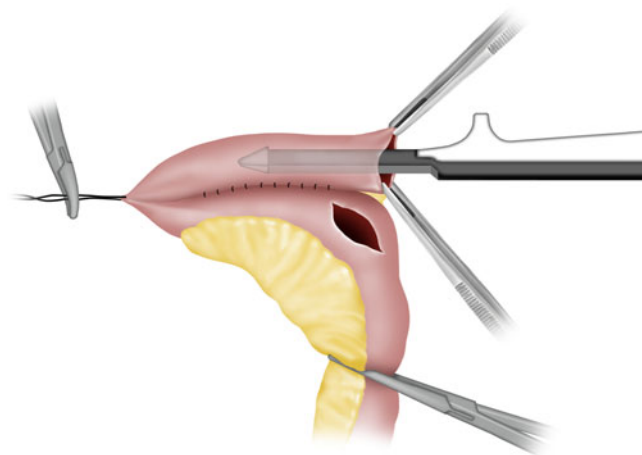


Fig. 3 The lubricated forks of an 80-mm linear stapler are inserted through the common enterotomy and are placed one in the afferent loop and one in the efferent loop (shown) of the future pouch (not shown)

planned, the apical stitch is removed, the anvil of a circular EEA is inserted through the common enterotomy and the stem is pushed through the tip of the pouch where the antimesenteric linear staple line ends. A 3–0 silk pursestring is applied on the intestinal wall around the stem of the anvil and it is tied.

Stay sutures are then applied on the orad end of the linear suture lines to help in the closure of the orad access enterotomy. This closure is performed in two layers, using a running full-thickness 3–0 absorbable suture for the inner layer reinforced by interrupted Lemberst stitches with non-absorbable 3–0 sutures for outer layer. And it is incorporated with the closure of the transected end of the terminal ileum, resulting in a single double-layer suture line. Although such closure can be performed with a linear stapler, the asymmetry of the defect can be better compensated by a hand-sewn closure (Fig. 9). As soon as the enterotomy is closed, the intestinal clamp proximal to the pouch is removed.

If a hand-sewn anastomosis is planned, three silk traction sutures are placed at the apex of the pouch at the angles of a virtual triangle encompassing the area of the future anastomosis. These sutures will eventually be passed through the anus to help in the descent of the pouch without losing spatial orientation.

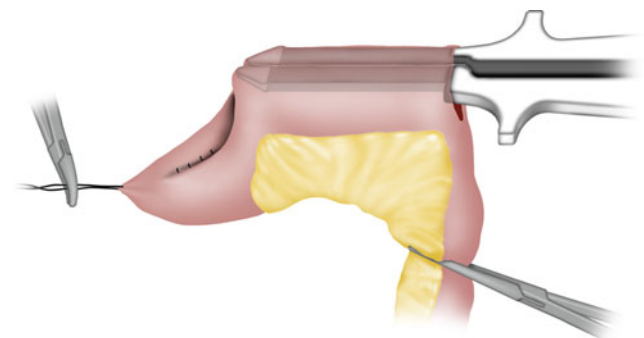


Fig. 4 The 80-mm linear stapler is closed and locked

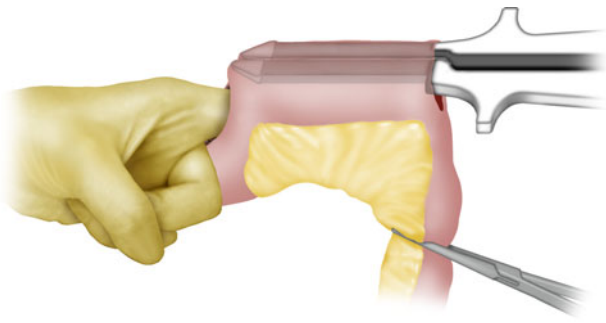


Fig. 5 Before firing, the mesentery of the terminal ileum is checked, to make sure that it has not been included in the linear stapler

Anastomotic Technique

The choice between hand-sewn and stapling techniques to perform the ileo-anal anastomosis has been the subject of considerable debate.¹³ In the original description by Parks and Nicholls,² the anastomosis was fashioned with a hand-sewn technique. With patient in lithotomy position and after complete mobilization of the rectum down to the pelvic floor, the rectum is transected at the level of the levator ani using the electrocautery. The mucosectomy is started at the level of the dentate line using a needle-tip cautery or fine scissors all the way to the cut edge of the anorectal stump. The pouch is passed through the denuded anorectal stump and its tip is opened. The IPAA is then performed using one layer of interrupted absorbable 4-0 stitches.

The stapled technique was introduced in the early 1990s. Many surgeons continued to advocate in favor of the hand-sewn technique because it was believed that the associated mucosectomy provides the advantage of entirely removing the affected mucosa. Conversely, the criticism for the stapled technique was that it does not remove the transitional mucosa, leaving affected lining at potential risk of neoplastic transformation. Yet, this has turned out to be more of a theoretical than an actual advantage.

If a stapled anastomosis is performed, the double-stapling technique is used. Care should be taken to staple the rectal

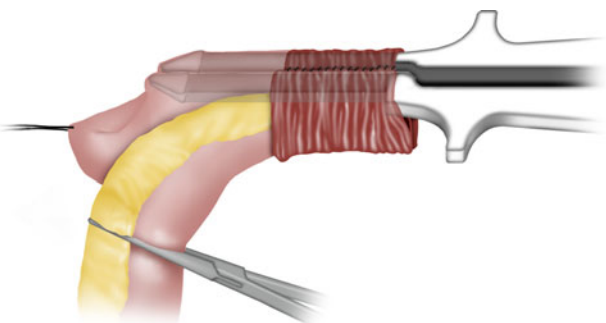


Fig. 6 The pouch is everted using delicate Babcock clamps (not shown) applied on the suture lines until reaching the remaining intact septum, and a new 80-mm linear stapler is inserted

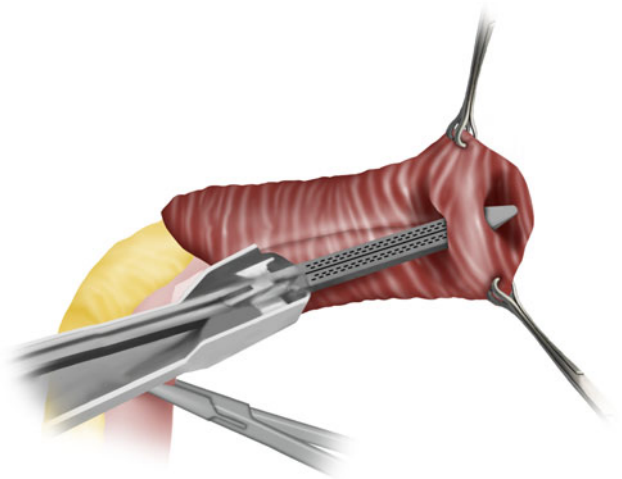


Fig. 7 A 60-mm linear stapler is commonly used to suture and divide the most distal portion of the septum

stump as close as possible to the levator ani level, in order to remove most of the transitional mucosa. The anvil of the mechanical stapler is inserted in the pouch prior to closing the apical enterotomy. With the patient in the extended, modified lithotomy position, the EEA is inserted in the anorectal stump and the stem is fully deployed allowing it to pierce the wall of the anorectal stump. The stem of the anvil on the pouch side is then inserted over the stem of the EEA. The EEA is closed, paying careful attention to avoid incorporating other structures (posterior wall of the vagina, other small bowel loops) between the closing parts of the EEA. The instrument is fired, open and removed from the anus. The retrieved doughnuts are inspected for completeness and the new ileo-anal anastomosis is checked for

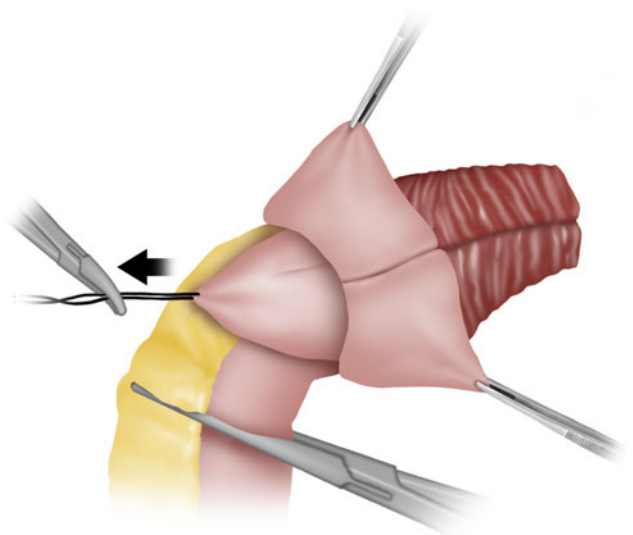


Fig. 8 The pouch is reduced by gentle traction on the apical stitch and counter-traction on the edge of the original enterotomy

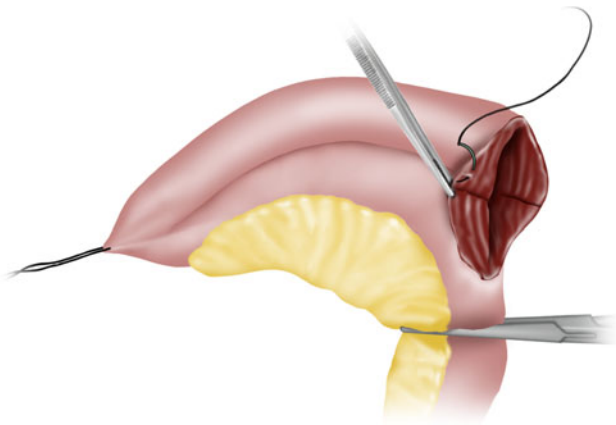


Fig. 9 The enterotomy is closed using hand-sewn stitches

integrity with a digital rectal exam. The authors do not routinely perform an “air leak” test.

Several studies have reported long-term follow-up after stapled IPAA for UC and have shown that the risk of dysplasia in the retained transitional mucosa is very low (4 % after an 11-year follow-up) and that the risk of cancer was nearly nil, provided that the patient had no rectal dysplasia or cancer.¹⁴ Furthermore, nearly half of the reported cases of adenocarcinoma on the transitional mucosa have occurred after hand-sewn IPAA, pointing to the fact that a mucosectomy does not protect against the development of a cancer due to the difficulty of excising the mucosa of the transitional zone completely. It is now appreciated that incomplete mucosectomies occur in as many as 20 % of the cases.¹⁵

Similarly, for FAP, several studies have demonstrated that the risk of adenoma formation in the transitional mucosa is higher after stapled IPAA, as compared to the hand-sewn technique, but the risk of neoplastic transformation is not abolished after mucosectomy.¹⁶

In addition, the long-term functional results of a stapled IPAA are better than those obtained after a hand-sewn technique.¹¹ Hence, based on these data, which appear to suggest that the benefits of stapled technique outweigh the benefits of the mucosectomy, the majority of surgeons are nowadays performing stapled IPAA. We routinely perform stapled IPAA, except for patients with FAP and patients with rectal dysplasia or cancer complicating UC.

Use of Temporary Stoma

Some studies have reported that a diverting stoma might be omitted after an IPAA in highly selected patients.^{17,18} However, outcome data on the subject remain scarce. We advocate to routinely protect the IPAA with a temporary diverting stoma in the belief that the long term adverse effects on functional results in the event of pelvic sepsis from an

anastomotic dehiscence in a patient without a diverting ileostomy outweigh the inconvenience and the complications associated with a temporary ileostomy.

Multi-staged Proctocolectomy

In case of UC requiring an urgent surgical procedure or in case of poor generalized conditions after a prolonged disease course, the patient may be better served by an initial abdominal colectomy with ileostomy and closure of the rectal stump. This initial step allows the patient to recover from the ravages of the disease prior to undergoing a completion restorative proctectomy with ileo-anal anastomosis usually 3 months later.

A recent German publication,¹⁹ including more than 700 pouch procedures, has highlighted preoperative steroids therapy of more than 40 mg/day as an independent risk factor for postoperative pelvic sepsis. Similar concerns have been raised from the Mayo Clinic if patients have received biological therapy (Infliximab) within 60 days before IPAA.²⁰ In these patients, both American²¹ and European guidelines²² recommend performing an initial abdominal colectomy with ileostomy and closure of the rectal stump to allow weaning of medical therapy and recovery of satisfactory general conditions prior to the definitive procedure.

Laparoscopic vs. Open Approach

Laparoscopic approach for pouch surgery has been shown to be feasible and safe. A meta-analysis from the Cochrane collaboration, published in 2009, included 11 studies and a total of 329 patients.²³ In this meta-analysis, there were no significant differences in mortality, complications, or recovery parameters between the two groups. The operative time was however longer in the laparoscopic group, as compared to the open approach.

The laparoscopic approach for IPAA might also be associated with a lower rate of postoperative small bowel obstruction in both genders and with a better rate of postoperative fertility in women, as it is associated with fewer postoperative intra-abdominal adhesions than the open approach.^{24,25}

Results

Postoperative Complications

In tertiary care centers, postoperative mortality after pouch surgery is nearly nil,^{26,27} but early postoperative morbidity remains high.²⁶ The most concerning morbidity relates to postoperative anastomotic leakage and pelvic sepsis, which may have a negative impact on long-term functional results.^{26,27}

Small bowel obstruction is another frequent postoperative complication after IPAA.²⁷ During the first 10 years after the procedure, 30 % of the patients suffer at least one episode of obstruction. Among those, approximately a quarter needs to be surgically managed.²⁷

Pouchitis occurs in up to 60 % of UC patients in the 10 years following surgery.²⁸ Its incidence is much lower in FAP patients, ranging from 3 % to 14 %.²⁸ Additional long-term complications include anastomotic stenosis, fistula-in-ano, rectovaginal fistula and the development of CD in the pouch.²⁹

Sexual Dysfunction

Sexual dysfunction after pouch procedure is a well-described complication. In men, the postoperative risk of erectile dysfunction and/or retrograde ejaculation is low, ranging from 2 % to 3 %, ³⁰ and is mainly due to injury to the sympathetic and parasympathetic nerve chains, respectively, during the proctectomy. In women, pouch surgery increases the incidence of dyspareunia from 8 % preoperatively to 25 % postoperatively.³¹

Pouch surgery has a significant impact on postoperative female fertility. Several anatomical changes associated with IPAA surgery might account for this impact. Firstly, following removal of the rectum, the posterior vaginal wall might lack anatomic support and retroflex in the pelvis. In addition to causing some women dyspareunia, uterine retroflexion might cause dilation and retention of fluid in the vagina. Secondly, postoperative adhesions in the pelvis might complicate the normal passage of ova from the ovary through the fallopian tubes, as the tubes might adhere to the dorsal pelvic wall postoperatively in a large percentage of women who have undergone IPAA.

A first study, published in 2002, reported that the probability of becoming pregnant during 1 year with unprotected intercourse dropped from 90 % before surgery to 35 % postoperatively.³² These alarming results should however be considered with caution, as the primary endpoint in the study was the cumulative pregnancy rate, which is a highly multifactorial criteria. More recently, Lepistö et al.³³ used a more specific endpoint, the ability to fulfill a pregnancy, and included both natural and medically assisted pregnancies. In this second study, 72 % of women wishing for pregnancy had at least one child after pouch procedure, as compared to 88 % in the control group (post-appendectomy), suggesting a 20 % diminution of fertility after IPAA.³³ On the basis of these data, female patients who desire postoperative pregnancy might elect to delay IPAA when possible.

Pregnancy has an impact on pouch functional results. Increased bowel movement frequency and possible fecal incontinence are typical changes during the third trimester of pregnancy and are related to the compression of the pouch by the gravid uterus. The pre-pregnancy functional

results are usually fully recovered after delivery in the majority of the cases.³³

In terms of type of delivery (natural vs. caesarean section), one study has suggested jeopardized long term functional results after vaginal delivery.³⁴ The European Crohn's and Colitis Organization (ECCO) guidelines recommend a caesarean section delivery for women with IPAA.²²

Pouch Failure

The main long-term risk of pouch surgery is pouch failure, leading to pouch removal in favor of a permanent end ileostomy. In a meta-analysis including more than 40 studies and 9,000 patients, this risk was evaluated at 8.5 % after a median follow-up of 36 months.³⁵ Reasons for pouch failure include poor function secondary to chronic pelvic sepsis, anal incontinence and severe chronic pouchitis.³⁵

Functional Results

In 2003, the senior author reported the long-term functional results of 391 consecutive J-pouch procedures performed for UC.¹¹ After a median follow-up of 34 months, the mean number of bowel movements was 6 per 24 h, including at least 1 nighttime bowel movement in two thirds of patients. At 5 years after the procedure, more than 80 % of the patients were able to postpone a bowel movement until convenient (>30 minutes), 72 % enjoyed complete continence (67 % after hand-sewn anastomosis vs. 95 % after stapled anastomosis), and fewer than 25 % took anti-motility drugs to alter stool frequency. Finally, more than 80 % of the patients judged their quality of life better when compared to the preoperative status, and overall satisfaction was excellent or good in 96 % of the cases.

Conclusion

IPAA complementing a proctocolectomy is nowadays the standard of care for UC, FAP and several additional colorectal conditions. The J configuration of the pouch is the most widely performed because of ease of construction and similar long-term functional results to other more capacious configurations. We have described here an elegant and effective technique to facilitate the subsequent ileo-anal anastomosis and reduce the number of necessary enterotomies.

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