Pouches and stomas

Neil Mortensen

Abstract

Colectomy for ulcerative colitis can be followed by ileal pouch formation to enable restoration of bowel continuity. Patients with familial adenomatous polyposis can also undergo pouch formation. The most common long-term problem with pouches is pouchitis, although this can often be treated with antibiotics. Stomas come in many forms, the most common types being ileostomy and colostomy, both of which can be permanent or temporary. The indications and complications of each are discussed. The expertise of a stoma nurse is vital to the management of these patients.

Keywords Adenomatous polyposis coli; colostomy; ileal pouches; ileo-anal pouches; ileostomy; J pouch; MRCP; pouchitis; restorative proctocolectomy; ulcerative colitis

Key points

- Ileoanal pouch surgery is now the most frequent restorative operation for ulcerative colitis and familial adenomatous polyposis
- Pouch surgery is becoming more minimally invasive
- The most common complication is pouchitis
- Pouch surgery is durable but needs to be carried out by experts and there are some major potential problems
- Ileostomy and colostomy remain important alternatives and rescue procedures.
- Professional stoma support teams are essential

Pouches

A pouch, or more correctly an ileal pouch anal anastomosis (IPAA), is formed during a restorative proctocolectomy. In this operation, the entire colon, plus rectum from the ileocaecal valve to 2 cm above the dentate line, is removed. An ileal pouch is constructed from the terminal ileum, which is then anastomosed to the anorectal remnant. This operation was first described in 1978,[1] since which time it is estimated that over 30,000 pouches have been formed worldwide.

Indications for pouch formation

Pouch formation is offered to suitable patients who require a proctocolectomy and would prefer to have bowel continuity rather than a permanent ileostomy. The decision to have a pouch rather than a stoma is entirely a matter of patient preference.

The most common underlying pathologies that may lead to formation of a pouch are ulcerative colitis (UC) and familial adenomatous polyposis (FAP). Although pouches have been performed for patients with Crohn's disease (CD) colitis and indeterminate colitis, they are much less commonly used in patients with these conditions.

Ulcerative colitis

Up to 20% of patients with UC eventually require colectomy, which may be undertaken in the acute or elective setting depending on the circumstances. Acute severe colitis with failure to respond to medical therapy usually requires urgent colectomy. Patients with chronic colitis refractory to medical management, or patients with dysplastic or malignant transformation, may require an elective colectomy. The risk of malignant transformation is related to the degree and extent of inflammation in the colon, and is increased by the presence of post-inflammatory polyps or colonic strictures, primary sclerosing cholangitis or a family history of colorectal cancer. It has been estimated that 18% of patients found to have UC will develop cancer within 30 years of diagnosis.

Familial adenomatous polyposis

FAP is an autosomal dominant condition in which a defect in the adenomatous polyposis gene leads to at least 100 colonic polyps forming in the colon. This can occur as early as the teenage years, with the potential for cancer change by the mid-20s. As it is not possible to remove all the polyps endoscopically, a prophylactic colectomy has to be performed, usually before the age of 25 years.

Crohn's disease

CD used to be an absolute contraindication to pouch formation because it has been associated with high pouch failure rates of up to 50%. However, it may be successful in patients who have disease confined to the colon.

Indeterminate colitis

Indeterminate colitis or inflammatory bowel disease unclassified (IBDU) is the pathological description given to the 5–10% of patients in whom histopathology cannot distinguish CD from UC. If there is no radiological or histological evidence of CD, IBDU tends to behave like UC, with pouch failure rates of 10% at 10 years. However, with careful preoperative assessment to exclude features linked to CD, a good outcome can be achieved.

Pouch surgery

Surgery is usually undertaken in stages because of the concern about complications with a single-stage procedure, particularly in the urgent setting with acute severe colitis. Although some centres have demonstrated that it is possible to perform a single-stage procedure on selected patients, most undergo a staged procedure to mitigate against the complication of anastomotic

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leak, which can subsequently lead to pouch dysfunction and failure.

Two-stage surgery: if the patient is having the pouch for chronic UC refractory to medical treatment, or for FAP, surgery is performed in two stages. The first stage involves a panproctocolectomy, ileal pouch formation and defunctioning loop ileostomy. The second stage – closure of the loop ileostomy – is performed around 3 months later, after a pouchogram has shown no leak at the anastomosis.

Three-stage surgery: if the colectomy is being performed for acute severe colitis, the procedure is performed in three stages. The first stage involves subtotal colectomy and end-ileostomy, the rectum being left untouched. Several months later, when the patient no longer requires corticosteroids, the inflammatory response has resolved and nutritional status has returned to normal, the second stage is performed; this involves a completion proctectomy, pouch formation and defunctioning loop ileostomy. Finally, as with the two-stage approach, the loop ileostomy is subsequently closed.

Rectal division versus mucosectomy: the rectum is usually divided a few centimetres proximal to the dentate line, leaving a cuff of rectal mucosa to enable a stapled anastomosis. Maintaining a short segment of rectum also results in better sensation and causes less damage to the sphincter, leading to a better functional outcome.[2] However, some patients experience symptoms related to recurrence of UC in the retained rectal cuff, known as cuffitis, and there has been concern that this residual segment of rectal mucosa might retain the potential for malignant transformation. The alternative is to perform a mucosectomy (stripping the mucosa off the underlying bowel muscle) and form a hand-sewn ileal pouch–anal anastomosis, but this procedure has been associated with increased septic complications in some studies.

A meta-analysis has shown no difference between the two anastomotic techniques in terms of short-term complications; the stapled technique leads to a better functional outcome, whereas the hand-sewn technique leads to fewer symptoms associated with a residual rectal cuff. Moreover, in the Cleveland series of pouches, mucosectomy was not protective against pouch neoplasia in patients with inflammatory bowel disease.

Pouch configuration

J pouch – this is now the most common type of pouch formed.[3] The end of the ileum is stapled closed and the small bowel looped back on itself to create a 'J' that is 20 cm long. An opening is made in the apex of the 'J' to allow the passage of a 10 cm long linear stapler. This is fired twice, converting the parallel lumens into one large lumen. The apex is then anastomosed to the rectal remnant (Figure 1).

W pouch – here, the small bowel is looped three times so that four lengths of small bowel lie next to each other. These are then joined together to form a pouch. The intention of this design is a large reservoir size, allowing less frequent pouch emptying, but in our practice we have found a J pouch to be quite adequate in this respect.

A randomized study comparing the J pouch with the W pouch configuration demonstrated no functional advantage to the W pouch and concluded that the J pouch, which is easier to construct, is the optimum design.

S pouch – this was the first pouch to be described. Here, the most distal part of the small bowel is anastomosed to the anus, the pouch being just proximal. This pouch frequently led to problems with pouch emptying and has fallen out of favour.

Laparoscopic versus open surgery: laparoscopic surgery has been shown to have short- and long-term benefits over open colorectal surgery, and this approach is increasingly being used during initial colectomy in the acute setting. A consequent increase in use of the laparoscopic approach for pouch surgery has confirmed its feasibility, and has led to a reduction in the complications of open surgery, such as adhesion formation and incisional herniation. However, if difficulties are encountered using this approach, it is important to convert to an open operation, as leaving a long rectal stump is associated with a poorer long-term outcome. The use of access techniques from below such as in the trans anal single port procedures with an precisely placed hand sewn anastomosis may make this less relevant.

Normal pouch function and quality of life: a mature well-functioning pouch (Figure 2) will empty 5–6 times per 24 hours. The contents are liquid, although the effluent may

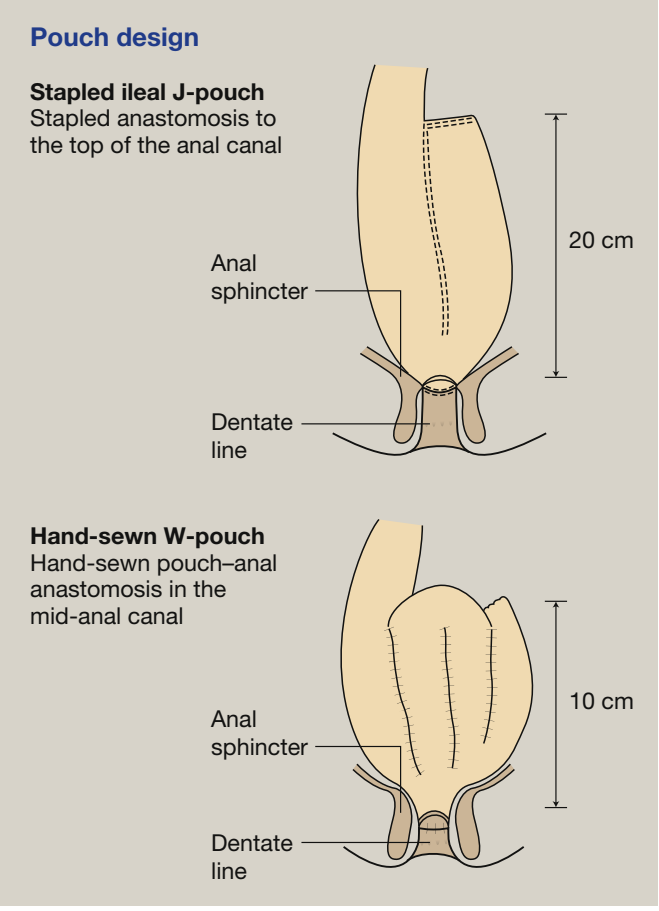

Figure 1

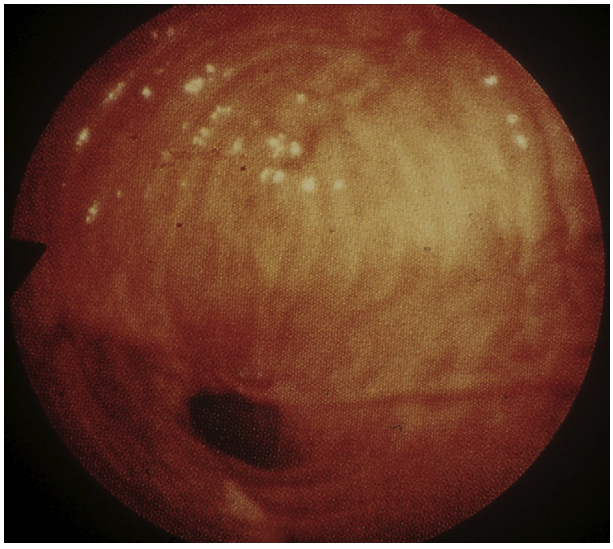

Figure 2 Endoscopic view inside a normal, healthy pouch. The seam of one of the vertical stricture lines in this J pouch can be seen (lower left).

thicken after the pouch has been in place for some years. Nocturnal pouch emptying is common. Most patients need to be careful with their diet (Table 1), and often have to take loperamide to slow pouch emptying, adjusting the dosage as necessary; however, in the majority the urgency of colitis is abolished.

Pouch leakage can be problematic; as a routine in our centre, all patients have the anal sphincter assessed before undergoing pouch surgery. This is especially important in women who have suffered obstetric trauma, as weak sphincter function can result in problems with pouch continence. The UK National Pouch Registry reported nocturnal seepage occurring in 8% of patients at 1 year, rising to 15.4% at 20 years. Quality of life in patients with pouches is comparable to that found in a healthy reference population.

Complications: Early complications such as pelvic sepsis, which can have long-term effects on function, and late complications such as pouchitis or stricturing, occur in about a third of patients undergoing surgery, with pouch failure in 4–15%. Mortality in a study of >3000 patients was very low (0.1%).Pouch complications usually require clinical assessment with pouchoscopy to assess the mucosa, size of pouch, length of rectal stump and presence of anastomotic stricturing. This can be followed by stool culture, magnetic resonance imaging of the pelvis to check for small abscesses, pouchography to look for sinuses or fistulae, and examination under anaesthetic to assess the pouch more fully.

Pelvic sepsis – although the majority of patients have a temporary defunctioning loop ileostomy, the complication of anastomotic leak still has serious consequences, with pelvic sepsis contributing to early morbidity, compromising pouch function and leading to pouch failure. The UK National Pouch Registry has reported failure rates of 9.3% at 5 years after primary pouch formation, sepsis being the major cause.[4]

Pouchitis – the most common complication,[5] pouchitis presents with bleeding (Figure 3), pain, increased pouch frequency and urgency. It is believed to result from a combination of bacterial factors and reactivation of the immune abnormality that led to the UC, as it occurs in up to 50% of individuals with underlying UC but only 10% of those with FAP. It generally settles after a 2-week course of ciprofloxacin and/or metronidazole. Chronic pouchitis, which affects 5–10% of patients, is difficult to manage; options include maintenance treatment with ciprofloxacin, although use of the probiotic VSL#3® has produced good results in some centres. Metronidazole cannot be used for maintenance owing to the risk of peripheral neuropathy.

Other pouch problems such as CD, bacterial overgrowth and small pouch size are occasionally misdiagnosed as chronic

Foods that may affect pouch and stoma output

Increase and loosen output	Beans, beer, caffeinated beverages, chocolate, leafy green vegetables, raw fruits and vegetables, spicy food, wholemeal food, cereal, alcohol, citrus fruits and juice
Decrease and thicken output	Apple sauce, bananas, boiled rice, cheese, smooth peanut butter, tapioca, white bread, potatoes, suet pudding, pasta
Increase flatus	Beer, carbonated beverages, dried beans and peas, milk and milk products, onions, cabbage, broccoli, sprouts
Can obstruct ileostomy, pouch inlet or pouch outlet	Mushrooms, sweetcorn, potato skins, nuts, tomato skins, raw fruit skins, celery strings
Can cause anal irritation	Citrus fruits, popcorn, oriental vegetables, bran, coconut

Table 1

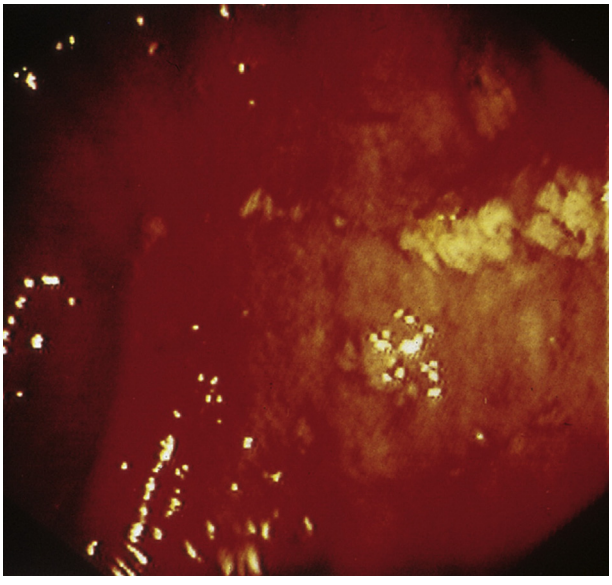

Figure 3 Acute inflammation of a pouch.

pouchitis, so it is important that patients are properly assessed (see above).

Fistula – the most common causes of pouch fistulation postoperatively are anastomotic leak and underlying CD. Most fistulae are initially managed with seton placement, but surgical options include advancement flaps, defunctioning ileostomy or, in the most difficult cases, revision pouch surgery. If the patient has multiple fistulae, the ultimate result is often pouch excision with end-ileostomy formation, but tumour necrosis factor-α antagonists can be tried. Vaginal fistulae have a poorer outcome than other fistulae, with only 47% of patients achieving resolution in one reported series.

Difficulties with emptying – stenosis of the pouch–anal anastomosis can result in problems with emptying; this usually results from the pouch having been placed in the pelvis under too much tension, damage to its blood supply or pelvic sepsis. Another cause of emptying difficulties is a rectal stump that is too long. Both stenosis and an overlong stump can be managed with intermittent catheterization of the pouch or pouch revision surgery.

Fertility and sexual function – all men undergoing pouch surgery should be warned of the possibility of erectile dysfunction following damage to rectal nerves during the rectal dissection. This risk has been reported to be small, but all men at our centre are routinely offered sperm storage.

Pouch surgery has an adverse impact on female fertility, a recent meta-analysis reporting a 3-fold increased risk of infertility. The underlying cause may be pelvic adhesions; a recent study demonstrated a lower rate of infertility in patients undergoing a totally laparoscopic approach to pouch surgery, possibly because this was associated with fewer adhesions.

Mode of childbirth is also controversial. Several studies have concluded that vaginal delivery is safe after pouch formation. However, a third of vaginal deliveries can be associated with occult sphincter injury, and we recommend a planned caesarean section to minimize problems in the long term.

Anaemia and vitamin deficiency – vitamin B_{12} absorption in the terminal ileum can be disrupted by pouch formation, and bleeding secondary to pouchitis can contribute to iron deficiency anaemia. Patients with UC are also prone to vitamin D deficiency, leading to a reduction in bone mineral density, which persists even after colectomy and pouch formation.

Pouch cancer – the cancer risk is small, with only around 30 cancers reported worldwide. Previous colorectal dysplasia or carcinoma in UC patients is associated with a 4–25-fold increase in developing pouch cancer. Guidelines advise annual pouchoscopy for patients with FAP or UC patients with a history of colorectal dysplasia or carcinoma, and 3-yearly for UC patients with more than a 10-year history of UC.

Alternative procedures

Proctocolectomy or colectomy and end-ileostomy: although pouch surgery is viewed as the gold standard in individuals requiring colectomy, there is no need to form a pouch if the patient is happy to accept a permanent end-ileostomy. If a patient has a rectal remnant *in situ*, surveillance for dysplasia and malignant transformation is required, along with symptomatic treatment of the rectum or completion proctectomy at a later date.

Colectomy and ileorectal anastomosis: before the introduction of the ileal pouch, ileorectal anastomosis was the most common procedure to restore bowel continuity in patients who required a colectomy. The advantages are that a pelvic dissection to remove the rectum is not required and the ileorectal anastomosis is technically less demanding, leading to less short-term morbidity. However, because both UC and FAP affect the rectum, long-term surveillance of the rectal remnant is required; in addition, patients may experience significant symptoms from the retained rectum, so ileorectal anastomosis is less commonly used in current practice.

Kock pouch: in those who do not want, or cannot cope with, an ileostomy but are prevented from having an IPAA by poor sphincter function, an alternative is a continent ileostomy known as a Kock pouch. This is a flat ileostomy with a valve and reservoir created from the terminal ileum. The valve prevents the stoma contents discharging unless a catheter is passed. This form of pouch was first described in 1969 but went out of favour following the introduction of the IPAA, as it still requires a stoma, and because technical difficulties with the valve led to its slippage and consequent leakage of stoma effluent. It is still formed in selected patients in a few specialist centres.

Despite the multiple problems that can be associated with pouches, most patients have good function and would recommend them to others.

Stomas

A stoma, from the Greek word meaning 'mouth', is the exteriorization of the bowel through the abdominal wall. Stomas are classified according to the part of the bowel from which they are formed, whether they are permanent or temporary, and whether they are formed from an end or a loop of bowel. The most common types of bowel stoma are an ileostomy and a colostomy, but it is possible to have a stoma from any part of the gastrointestinal tract (e.g. jejunostomy, gastrostomy, caecostomy).

Loop or end: loop stomas are formed when a loop of bowel in continuity is brought to the surface and opened, and both the proximal and distal bowel ends are sutured to the skin edge, resulting in two openings into the stoma. With an end-stoma, the proximal end of the divided bowel is sutured to the skin, resulting in only one opening.

Temporary or permanent: temporary stomas are formed when it is anticipated that bowel continuity may be restored at a later date. Permanent stomas are irreversible and are usually formed when the distal bowel has been excised.

Ileostomy: this type of stoma is constructed from ileum and passes liquid effluent. Ileostomies are usually spouted (originally known as a Brooke ileostomy) to avoid the alkaline effluent and associated enzymes having contact with the skin as this causes skin excoriation.

Colostomy: a colostomy is formed from colon and is usually flush with the skin as the colonic contents do not irritate the skin.

Indications for stoma formation

To divert the faecal stream: diversion is often required temporarily, to reduce the likelihood of an anastomotic leak or to enable a distal fistula to heal. A loop stoma is usually formed and may be either an ileostomy or a colostomy, depending on the indication. In a low anterior resection for rectal cancer, a diverting loop ileostomy is usually constructed because the anastomosis is low in the pelvis and a leak can have significant consequences if the faecal stream is not diverted.

Following resection of distal bowel: resection of distal bowel for neoplasia or inflammatory conditions such as UC, CD or diverticulitis is associated with formation of an end-stoma that is often permanent. Patients undergoing an abdominoperineal resection for rectal cancer will have their anorectum removed and a permanent end-colostomy formed. During a Hartmann's operation for acute diverticulitis, in which the sigmoid colon is removed, there is often gross faecal contamination that may compromise the healing of an anastomosis. In this situation, the rectum is stapled closed but left intact, and an end-colostomy is formed, which will be temporary if the patient is fit enough to undergo further surgery to restore bowel continuity at a later date.

To manage poorly functioning distal bowel: patients with anal sphincter damage, CD involving the anorectum, paraplegia or bowel obstruction, or who require down-staging chemo-radiotherapy for rectal cancer in anticipation of poor bowel function, may require a permanent or a temporary stoma to manage their bowel function or improve their quality of life.

As a conduit: conduits are sections of bowel that are used to transport alternative contents, for example urine. Following a cystectomy, the ureters can be connected to a segment of bowel, either ileum or colon, which is known as an ileal or colonic conduit. If cystectomy and distal bowel resection are performed simultaneously, a colostomy may serve as both a stoma for stool and a conduit for urine, known as a 'wet colostomy'.

Normal function

As, with a stoma, there is no sphincter mechanism or rectum to store stool, there is no control over the passage of effluent. An ileostomy tends to pass its effluent continuously as the small bowel shows constant peristalsis and the content is liquid. By contrast, colonic clearance is intermittent, so a colostomy passes its effluent only a few times a day.

Diet: certain foods are recognized as causing looser motions, and patients should be advised of them (Table 1). If patients find their ileostomy effluent is too large or frequent, loperamide can be used, with the dose adjusted as required.

Flatus: flatus passed from an ileostomy results from swallowed air or carbonated drinks. With colostomies, the flatus is mainly generated by bacterial fermentation in the colon. If flatus is problematic, root vegetables can be excluded from the diet or oral charcoal taken.

Stoma nurses

All centres routinely creating stomas should have specialist stoma nurses, who have taken on a significant part of the workload associated with the preoperative and postoperative management of stomas. Before surgery involving possible stoma formation, a stoma nurse should counsel the patient and mark the site of an appropriate place for the stoma, to avoid the stoma being sited in an area that is difficult for the patient to access. Following surgery, stoma nurses help to educate the patient about stomas and the changing of stoma appliances, and often provide advice for patients who have difficulty managing a stoma.

Long-term complications

High output: this is usually a problem only with ileostomies, as they are proximal to the absorptive function of the colon. It can lead to marked and rapid fluid and electrolyte imbalance, particularly during bouts of infective gastroenteritis. High-output stomas can result from a short proximal length of small bowel or diseased proximal small bowel, for example in CD.

Psychological morbidity: stomas can be associated with significant psychological morbidity and problems with body image, which can be helped by giving appropriate information and counselling before and after their formation.

Parastomal hernia: this results from protrusion of bowel alongside the stoma through the opening in the muscular abdominal wall. It occurs in up to 50% of patients. The presence of a hernia can make fitting of a stoma appliance difficult, increasing the chances of a leak, and can cause pain from stretching of the mesentery or pressure effects on the abdominal wall. Hernias can be difficult to fix as they have a high rate of recurrence.

Stenosis/retraction (Figure 4)**:** this can occur if there is a poor blood supply to the stoma or if the stoma was formed under too

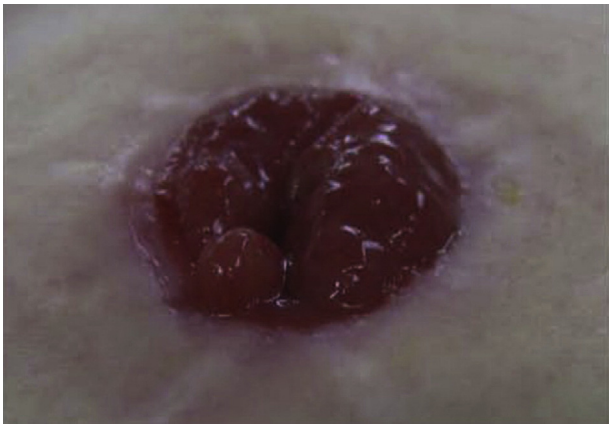

Figure 4 Retracted ileostomy.

much tension. It is managed conservatively, with dilatation, or by surgical revision.

Prolapse: this is mainly seen with ileostomies, where the spout elongates. If problematic, it requires surgical repair.

Skin irritation: the solid stool from colostomies rarely causes problems, but ileostomy effluent can cause marked skin excoriation. Barrier creams and films can help in mild cases. Stoma nurses can assist with stoma bag fitting, but a poorly spouted stoma requires surgical revision.

Bleeding: granulation tissue, which readily bleeds, can develop at the mucocutaneous junction. It can be managed with silver nitrate cauterization. If no external tissue can be seen, bleeding should be investigated by endoscopy via the stoma.

Bowel obstruction: adhesional obstruction is the most common cause and is usually treated expectantly with nasogastric decompression and intravenous fluids to rest the bowel. If the obstruction fails to resolve, surgery can be performed but carries the risk of forming new adhesions. Infrequent causes include internal hernia and food bolus, the latter causing obstruction where the stoma passes through the abdominal wall. ◆

KEY REFERENCES

1 Parks AG, Nicholls RJ. Proctocolectomy without ileostomy for ulcerative colitis. *Br Med J* 1978; **2:** 85–8.

2 Kirat HT, Remzi FH, Kiran RP, Fazio VW. Comparison of outcomes after hand-sewn versus stapled ileal pouch-anal anastomosis in 3,109 patients. *Surgery* 2009; **146:** 723–30.

3 Simillis C, Afxentiou T, Pellino G, et al. A systematic review and meta-analysis comparing adverse events and functional outcomes of different pouch designs after restorative proctocolectomy. *Colorectal Dis* 2018; **20:** 664–75. https://doi.org/10.1111/codi.14104. Epub 2018 Apr 19. Review.

4 Worley GHT, Fearnhead NS, Brown SR, Acheson AG, Lee MJ, Faiz OD. Review of current practice and outcomes following ileoanal pouch surgery: lessons learned from the ileoanal pouch Registry and the 2017 ileoanal pouch report.; association of coloproctology of great britain and Ireland (ACPGBI) inflammatory bowel disease clinical advisory group, commentators in the 2017 ACPGBI ileoanal pouch report, and ileoanal pouch Registry contributors. *Colorectal Dis* 2018; **20:** 913–22. https://doi.org/10.1111/codi.14316. Epub 2018 Aug 27.

5 Holubar SD, Cima RR, Sandborn WJ, Pardi DS. Treatment and prevention of pouchitis after ileal pouch-anal anastomosis for chronic ulcerative colitis. *Cochrane Database Syst Rev* 2010; **6:** CD001176.