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REVIEW ARTICLE

Modern surgery for ulcerative colitis

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Abstract
Ulcerative colitis (UC) is a chronic inflammatory disorder of poorly understood aetiology. While medical treatment is first-line management, approximately 10% of patients with UC will require a colectomy either as an emergency or elective procedure. There are multiple surgical options available in the current era and the choice of operation(s) is highly dependent on the clinical presentation, patient preference and individual surgeon or institutional practice. We present a review of modern surgical practices in ulcerative colitis, addressing some current controversies and diversities.

Keywords Ulcerative colitis · UC · IPAA · Total colectomy · Panproctocolectomy · Subtotal colectomy

Introduction

Ulcerative colitis (UC) is an idiopathic chronic inflammatory disorder of the colon and rectum. It carries an incidence of 9–20 per 100,000 persons per year in developed countries including North America, Northern Europe, the United Kingdom and Ireland [1–4]. Although an exact causative factor or indeed factors remain elusive, it is believed to occur as a result of an exaggerated host immune response towards normal gut flora due to a combination of genetic and environmental influences.

While appropriate medical management is paramount in the treatment of both quiescent and active ulcerative colitis, the role of the surgeon in the multidisciplinary team remains an important one. Despite advancements in medical therapy for inflammatory bowel disease, the 10-year cumulative risk of undergoing a colectomy for UC is approximately 10% [5]. Furthermore, the rate of emergency colectomy for severe colitis remains unchanged; up to 10% of patients presenting with an acute episode of ulcerative colitis requiring hospital admission will have an emergency operation [6, 7].

The indications for surgical treatment of UC can be broadly classified as elective, urgent or emergency surgery. Typically, surgery will be offered electively for disease refractory to medical management, dysplasia, invasive malignancy or occasionally, to palliate symptoms of extraintestinal manifestations of UC. Urgent or emergency surgery may be required during a hospital admission for patients with severe colitis refractory to medication becoming increasingly systemically unwell, toxic megacolon, imminent/present perforation and major haemorrhage.

The operation of choice is dependent on numerous factors, i.e. those pertaining to the patient, the disease and the surgeon. First, the patient's current clinical condition and comorbidity must be taken into account. Second, and perhaps more relevant to the elective setting, the patients' own preferences must be considered following appropriate counselling regarding each option and its respective outcome. Lastly, the operating surgeon's personal training history, experience and institution of practice will inherently influence the procedure undertaken. Non-restorative surgical options include a subtotal colectomy with formation of an end ileostomy and rectal stump/mucous fistula remaining in situ or a panproctocolectomy with end ileostomy. Restorative options include (rarely) a subtotal colectomy with ileorectal anastomosis or, what is now considered gold standard in the modern era, a panproctocolectomy with an ileal pouch–anal anastomosis (IPAA).

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Emergency surgery for ulcerative colitis

Despite significant advancements in medical therapy, emergency colectomy rates in severe ulcerative colitis have not decreased and represent approximately half of the total number of colectomies performed for this condition. Furthermore, the rate of emergency colectomy at index presentation persists at 10–15% [5, 8]. One should be continually mindful that for these patients, the consideration of colonic surgery or a stoma is an entirely novel entity and early involvement from the surgical team (clinical team, dietetic service and stoma therapist) is paramount from both a treatment and patient counselling point of view. Where possible, the treating team should also ensure that other forms of colitis such as infectious (e.g. pseudomembranous secondary to *Clostridium Difficile* or *Cytomegalovirus*) have been excluded as these may respond to tailored antimicrobial or antiviral therapy.

When to operate?

One of the most challenging aspects of surgical management of severe UC is timing of surgery. In the acute peritonitic abdomen with evidence of megacolon or imminent/present perforation, the indication to perform an immediate colectomy is clear. The colitic inpatient demonstrating a hesitant response to medical therapy poses a greater challenge. Ideally, sufficient time should be given to medical therapy to gauge a response but not at the risk of postponing surgery to a point where the peri-operative course will be compromised. Delay to surgery for acute severe UC has been shown to increase post-operative complications and length of stay [9, 10]. In particular, prolonged steroid use prior to colectomy has been associated with higher post-operative infective complications [11]. The American College of Gastroenterology (ACG) therefore recommends consideration of surgery in any patient who fails to progress after 3–5 days of intravenous steroids [12]. Similarly, the American Society of Colorectal Surgery (ASCRS) guidelines suggest surgery or second-line therapy if there is no response within 48–96 h of appropriate first-line therapy [13]. Subsequent failure of second-line therapy within 5–7 days should prompt discussion of surgery. This interval is chosen as mean response time of monoclonal antibodies that has been shown to be within this timeframe [14]. Continued medical therapy beyond this interval is unlikely to be effective rescue therapy and may increase the peri-operative morbidity of subsequent colectomy as the patient becomes increasingly systemically unwell with deteriorating nutritional status [15]. This again highlights the importance of early consultation with the surgical and multidisciplinary team in this setting.

Operation choice

While more modern surgical techniques prevail in the elective scenario and will be discussed hereafter in further detail, the favoured procedure in the urgent or emergency setting remains a subtotal colectomy with end ileostomy and rectal stump. The rectal stump is either left in situ or incorporated into the fascia of a lower abdominal wound thereby discharging as a mucus fistula [16].

The rectal stump or rectosigmoid remnant may either remain intrapelvic, sutured subcutaneously to the wound or fashioned externally as a mucous fistula. The rationale for preserving the rectum in the urgent or emergency setting is multifactorial. It avoids the additional morbidity of a synchronous proctectomy in an unwell, physiologically compromised patient. It minimises pelvic nerve damage and preserves anatomical tissue planes facilitating any future pelvic surgery in addition to enabling pathological diagnosis of the resected specimen which will guide future surgical options [16, 17]. Historically, it also provided the patient with a potential future restorative option via ileorectal anastomosis if a long-term stoma was deemed unacceptable, however, this is now somewhat less relevant with the widespread adoption of ileal–anal pouch reconstruction [17, 18].

The potential risks of leaving the rectum in situ include continuous bleeding from the rectum and perforation or "blow-out" of the stump, but these are largely superseded by the additional morbidity of pelvic dissection in the emergency setting [16]. The risk of 'blow-out' is minimised by incorporating the upper end either within the fascia or opening onto the skin. A 2009 systematic review of emergency colitis surgery by Teeuwen et al. [19] demonstrated no major difference in 30-day mortality between non-restorative subtotal colectomy (9%, $n=411$) and panproctocolectomy (8.3%, $n=265$). Overall morbidity for subtotal colectomy was 56.3% and for panproctocolectomy 67.2%. Post-operative major haemorrhage occurred in 0 (0%) out of 16 and 3 (14.3%) out of 21 cases which were recorded, respectively. A rectal stump "blow-out" was reported in 11 (6.7%) out of 163 subtotal colectomies. It is noteworthy that all studies included were retrospective and pre-operative data concerning patient status were largely unavailable. Therefore, these results should be interpreted with caution as the emergency panproctocolectomy group may represent a less acutely unwell cohort of patients and lend some selection bias to the findings.

Management of the rectal stump

The choice between leaving the rectal stump intrapelvic, subcutaneous or creating a mucous fistula is a subject of much debate. Creation of a mucous fistula was favoured

originally due to the presumed lower risk of subsequent pelvis sepsis from a stump blow-out. Fashioning a mucous fistula, however, requires a longer segment of potentially inflamed bowel to remain and imposes a second stoma on the patient. It can produce an excessive amount of fluid and can necessitate earlier completion proctectomy as a result. Previous studies have reported comparable rates of pelvic sepsis (3–33%) between both options, therefore the practice of creating a formal mature mucous fistula has decreased in popularity [20–24].

More modern decision-making generally lies between leaving a short intrapelvic stump and securing a longer stump subcutaneously. Concerning "blow-out" of the closed rectal or rectosigmoid stump, higher rates of pelvic sepsis (12–33%) have been found to occur with a shorter rectal stump [20, 22]. Trickett et al. [25] reported an incidence of 33% of pelvic sepsis if a short intrapelvic stump is created, 6–12% in patients with an intraperitoneal stump, and in 3–4% of patients with a subcutaneously placed stump mucous fistula. The subcutaneous fixation of a closed rectosigmoid stump potentiates a higher surgical site infection rate (6–13%) but arguably this is a relatively trivial morbidity in terms of sepsis risk and length of stay when identified and managed appropriately. From a technical perspective, a short intrapelvic rectal stump may add to the complexity of a subsequent laparoscopic proctectomy ± IPAA by disturbing the pelvic peritoneum prompting adhesions and distorting the anatomy but also creating problems grasping the shortened stump.

Laparoscopic versus open surgery for emergency colectomy

With regard to surgical approach, a systematic review by Teeuwen et al. [19] included seven studies reporting outcomes for laparoscopic subtotal colectomy in the emergency setting [26–32]. 174 patients were included for analysis. Overall mortality was 0.6% ($n=1$), 3.4% conversion to open ($n=6$), and morbidity varied from 16 to 37%. Of these seven studies, three compared open with laparoscopic resection [26–28]. While it is important to note that all comparative data are non-randomised and retrospective, they suggest that the laparoscopic approach may result in reduced length of hospital stay [26, 27] and fewer wound and respiratory infections [28].

Elective surgery for ulcerative colitis

Elective surgery is commonly performed for intractable disease despite maximum medical therapy, unacceptable quality of life, amelioration of extraintestinal manifestation of IBD or development of dysplasia/malignancy. Historically, the surgical options in the elective setting for ulcerative colitis were a non-restorative panproctocolectomy with end ileostomy or total colectomy with ileorectal anastomosis. Over the last 40 years, the restorative panproctocolectomy with ileal pouch–anal anastomosis (IPAA) has become the operation of choice.

Parks and Nicholls of St. Mark's Hospital described the ileal–anal pouch in 1978 with results from five patients [33]. They performed an open panproctocolectomy with a short rectal stump and subsequent mucosectomy of any remaining anorectal mucosa proximal to the dentate line. The pouch was fashioned using the terminal ileum in an S-like configuration and a hand-sewn ileal–anal pouch anastomosis was undertaken with a defunctioning loop ileostomy. Since the advent of IPAA, many aspects of the surgery remain under debate including approach, number of stages, hand-sewn versus stapled anastomosis and ideal pouch configuration.

An IPAA can either be done as a one-stage operation, a two-stage procedure (panproctocolectomy, IPAA and loop ileostomy which is subsequently reversed) or a three-stage procedure (subtotal colectomy and end ileostomy, completion proctectomy with IPAA and loop ileostomy and reversal of loop ileostomy). Pre-operative considerations include certainty of diagnosis of inflammatory bowel disease, patient clinical status, patient expectations and surgeon experience/preference. If considering a one- or two-stage approach, it is important to note that the pouch failure rate of indeterminate colitis (27%) or Crohn's disease (50%) far exceeds that of U.C (11%). IPAA should not be routinely carried out in the setting of a pre-operative diagnosis of Crohn's disease due to the high failure rates. Additionally, a diagnosis of Crohn's disease will be made post-operatively for 4–15% of patients previously thought to have indeterminate colitis [34]. Robust pre-operative histological evidence of UC is thus preferable. While Crohn's disease and indeterminate colitis are not absolute contraindications to pouch formation, the less favourable outcomes are an essential component of pre-operative patient counselling and informed consent. If there is any doubt about the diagnosis, a delayed approach to pouch creation, i.e. three stage, should be considered to allow for histopathological confirmation of disease prior to IPAA consideration. A non-restorative panproctocolectomy and end ileostomy may be considered for patients with poor sphincter function who are willing to accept a permanent stoma. In addition, patients who cannot accept the functional limitations of a pouch or ileorectal anastomosis for social, cultural or employment reasons may opt for an ileostomy in lieu.

Ileorectal anastomosis

An ileorectal anastomosis (IRA) may be considered for a small group of select patients and still holds a place, albeit

a diminishing one, in the modern surgical management of UC. Ideally, these patients should have a minimal burden of rectal disease with no dysplasia, normal anal sphincter function and a healthy distensible rectum capable of acting as a reservoir. This can be assessed using pre-operative anorectal manometry to measure the maximum tolerated volume of air and rectal compliance [35]. IRA may be considered for women of child-bearing years planning to conceive, as proctectomy with IPAA is associated with decreased fecundity due to pelvic adhesions and nerve damage [36–38]. The patient should be appropriately counselled that they will require ongoing endoscopic surveillance due to the risk of cancer in the rectum which can reach up to 20% in 30 years [39]. Furthermore, approximately half of these patients will require a subsequent proctectomy due to persistent inflammation of the rectal stump [40, 41]. The morbidity rate for IRA has been reported from 8 to 28% with anastomotic leak rates varying from 2 to 9% [42]. These figures are comparable to published data for IPAA in which a 2012 meta-analysis of 93 studies found a 7.5% incidence of pelvic sepsis [43]. Functional outcomes for IRA vary and are likely highly reliant on appropriate patient selection. A retrospective study by Moirera et al. [41] found patients with an IRA had significantly fewer bowel motions than IPAA but increased urgency, dietary and work restrictions. Tonelli et al. [35] found increased day and nocturnal seepage rates in IPAA compared to IRA, however ,in both studies quality of life scores were comparable between the two groups.

Laparoscopic versus open

Laparoscopic procedures for IPAA have gained popularity due to proposed faster recovery time among other benefits. A systematic review of 11 studies from the Cochrane group in 2009 [44] found no difference in mortality or morbidity. Reoperation and readmission rates were not significantly different. Operative time was significantly longer in the laparoscopic group, but cosmesis scores were higher. A further systematic review, however, found that a laparoscopic approach was significantly associated with a shorter length of hospital stay, reduced intra-operative blood loss and lower incidence of wound infection [45]. No significant differences in pouch failure rate were observed.

Hand-assisted laparoscopic (HAL) segmental colectomy has been performed with use of a gel port, through which the hand of the operating surgeon can pass without the loss of pneumoperitoneum. The proposed advantages are that the benefits of laparoscopic surgery are retained with shorter operative times (one of the major criticisms of laparoscopic colectomy compared with open) and a lower learning curve for trainee and non-laparoscopic surgeons [46]. Studies examining HAL proctocolectomy have shown comparable outcomes between hand-assisted and the conventional laparoscopic approach including complications and length of stay with significantly shorter operative times [47, 48]. Rivadeneira [47] reported a significantly shorter return of bowel function, however, this did not impact overall length of stay.

Transanal IPAA

Transanal total mesenteric excision (TaTME) is an emerging trend in rectal cancer surgery with early reports demonstrating oncologically acceptable outcomes and favourable perioperative morbidity [49]. Similarly, transanal proctectomy and IPAA are being performed increasingly for ulcerative colitis [50, 51].

This technique has been described using a transanal access port and establishment of pneumorectum. The dissection is commenced 2–3 cm superior to the dentate line and may be continued through the TME plane or a close mesorectal dissection. The pouch is then delivered, the length of rectal cuff determined by the surgeon and an anastomosis performed either by a hand-sewn or stapled technique [51]. The potential advantages of this approach include access to the distal rectum in a narrow pelvis [52] and the ability to inspect the quality of the mucosa for IPAA and alter the cuff length if necessary to facilitate a tension-free anastomosis with minimal residual rectal mucosa [50]. A comparative study by van Overstraeten et al. [53] reported outcomes from 97 patients undergoing transanal IPAA compared with 119 who underwent an abdominal approach. They demonstrated that the odds of post-operative morbidity were 0.52 times lower in the group undergoing transanal IPAA compared with the abdominal approach ($p = 0.026$). The transanal approach was also associated with a statistically significant lower conversion rate, shorter operative time and shorter hospital stay. No difference in anastomotic leak rates was found.

Mesenteric excision

Mesocolic and/or total mesorectal excision (TME) remains the standard of care for oncological colorectal surgery due to potential lymphatic spread and direct invasion of tumour [54, 55]. This practice is inconsistent, however, when it comes to inflammatory bowel disease surgery. A flush colonic dissection is commonly favoured, whereas the TME plane is often entered for rectal dissection due to familiarity and its avascular properties. A disadvantage of performing TME, however, is autonomic nerve damage with potential resultant sexual dysfunction [56]. On the converse, disadvantages of a close mesorectal or perirectal dissection include bleeding from mesorectal vessels [57]. This, however, is arguably somewhat negated now due to widespread use of haemostatic vessel sealing devices. A randomised

controlled trial from Bartel et al. [58] demonstrated significantly increased severe (grade 3) complications in the TME group in addition to higher 30-day readmission rate. Initial early quality of life measurements favoured the close mesorectal dissection (CMD) group, however, no difference was seen at 12 months. Anastomotic leak rates did not differ significantly, however, there were more leaks identified in the TME group (6/31 vs 2/28). It has been proposed that a lower rate of pelvic sepsis may be associated with close mesorectal dissection compared with TME due to less empty space in the pelvis as a result of the retained mesorectum. This may minimise accumulation of blood/infected fluid [57, 58]. With regard to sexual and bowel function, Hicks et al. [56] reported better faecal continence in the close mesorectal dissection group, but no difference in sexual function or overall faecal incontinence-related quality of life.

One-, two- or three-stage IPAA

A single-stage operation for IPAA construction is an attractive concept for multiple reasons but one fraught with potential morbidity. The consequences of anastomotic leak and subsequent pelvic sepsis are potentially devastating. On the converse, if successful, this procedure avoids further general anaesthetic for the patient, decreases overall length of stay in hospital and avoids complications pertaining to both an ileostomy and those of ileostomy reversal surgery.

A study from St. Mark's reviewing their experience with pouch construction found that a one-stage procedure was associated with a significantly higher incidence of pouch failure (i.e. excision of pouch and/or permanent ileostomy) compared with a two-stage procedure, 15% versus 8% ($P < 0.016$) [59]. Other groups such as Toronto, however, have reported equivalent failure rates [60]. Remzi et al. [61] found no difference in early septic complication rates between the diverted and non-diverted group in a retrospective comparative study. While patients in the one-stage group had more post-operative ileus, complications such as small bowel obstruction, haemorrhage, anastomotic stricture and pouch failure necessitating excision or permanent diversion were more common in the group with a diverting ileostomy. Patients in the diverting ileostomy group were also more likely to require a return to theatre in the case of a post-operative small bowel obstruction. Use of pre-operative steroids has been shown to be associated with higher anastomotic leak rate in a non-diverted population [62, 63]. It would therefore appear prudent to strongly consider a three-stage procedure in this scenario. This risk, however, must be balanced against that of ileostomy morbidity which ranges from 15 to 30% [64]. There is conflicting literature on the formation of an IPAA while on anti-TNF therapy. Previous papers have found peri-operative anti-TNF therapy to be associated with increased infective complications [65]. A 2013 meta-analysis, however, found no difference in for UC patients, whereas in the Crohn's disease cohort, post-operative infections were increased in the biologics group [66].

Historically, a three-stage IPAA procedure was typically performed due to the potentially devastating effects of anastomotic leakage in what is often a high-risk cohort due to steroid use, suboptimal nutritional status among other factors. Recently published data from Lee et al. [67] found no significant difference in peri-operative complications or pouch failure rates between two- and three-stage procedures in a retrospective study of 212 patients. The latter group was more likely to have had an emergency initial operation however (78%), rendering performance of a pouch an index presentation unsuitable in the majority of patients.

A modified two-stage IPAA has been described. This comprises an initial subtotal colectomy with end ileostomy and subsequent proctectomy, IPAA without a diverting loop ileostomy [68, 69]. This differs from a traditional two-stage approach whereby a panproctocolectomy, IPAA and loop ileostomy is performed at index procedure with subsequent second-stage ileostomy closure. This approach is potentially advantageous in avoiding a loop ileostomy and the associated complications thereof while facilitating optimisation of the patient for restorative surgery. Furthermore, it obviates the need for a third operation, i.e. ileostomy reversal. Studies by Swenson et al. [70] and Traynor et al. [71] found equal functional outcomes [70] and peri-operative morbidity [71] but shorter hospital stay [70, 71] and decreased cost [70] comparing the modified two-stage approach compared to a three stage. Zittan et al. [69] reported their experience of traditional versus modified two-stage IPAA, demonstrating a lower rate of anastomotic leak in the modified group ($p < 0.001$) despite the cohort having a higher UC disease severity at presentation.

Prospective randomised data are lacking on this topic so one must be continually mindful in their appraisal of the potential bias of retrospective comparative data. They are nevertheless interesting and suggest that in well-selected patients, a one- or two-stage operation (modified or otherwise) may be a safe and feasible option. Ideally, this decision should be made on a case-by-case basis noting the patient, disease and institutional factors that may influence the outcome of each approach.

Hand-sewn or stapled anastomosis

The original ileal–anal pouch surgery as described by Parks and Nicholls [33] comprised a mucosectomy with stripping of the remnant rectal mucosa and hand-sewn anastomosis to the dentate line. The stripping of mucosa superior to the dentate line theoretically reduces the risk of recurrent UC in any rectal mucosa remnant. The disadvantages of this approach are time consummation, being technically challenging and

the theoretical risk of incontinence and sphincter damage from prolonged anal dilatation [64, 72].

A more modern approach is the double stapling technique. The rectum is divided 1–2 cm superior to the dentate line with a linear stapling device, typically without a mucosectomy to avoid prolonged anal retraction. The anastomosis is then completed using a circular stapler, joining the ileal reservoir to the anorectal remnant. A potential risk is that rectal tissue will be inadvertently left behind risking residual or recurrent disease in the cuff. Earlier trials comparing hand-sewn to stapled technique found no difference in functional outcomes or complications and thus advocated a hand-sewn anastomosis due to this risk [73, 74]. A meta-analysis of 4183 patients from Lovegrove et al. [75] also supported comparable rates of bowel frequency and use of anti-diarrhoeal agents, however, patients with a stapled anastomosis tended towards improved nocturnal function and had significantly higher resting and squeeze pressures in the post-operative period. Median follow-up time was 26 months. Ideally, longer follow-up data are needed to assess whether these improved manometric findings correlate with long-term improved function. With regard to inflammation of the rectal cuff or anal transitional zone (ATZ), the rate was 3.3% in the hand-sewn group compared with 9.9% in the stapled group, but this did not reach statistical significance ($P=0.16$). The use of intra-operative glyceryl trinitrate (GTN) may further improve post-operative continence. A randomised controlled trial by Winter et al. [76] demonstrated significantly lower incontinence scores at 3- and 12-month follow-up in the group treated with a single intra-operative dose of 0.2% topical GTN. These findings support that a stapled anastomosis does not appear to be inferior to a hand-sewn approach while carrying the advantage of decreased operative time and potential tendency towards improved functional outcome.

Configuration

The three-limb S-pouch configuration used by Parks and Nicholls [33] decreased in popularity due to high rates of pouch intubation to facilitate emptying. This led to subsequent development of the J- or W-type configuration [77]. Additional options have also been described including a K-, U- and H-shaped pouch, but our focus will remain on the more commonly performed configurations. The J-pouch is generally favoured due to comparable ease and timeliness of construction. A 2007 meta-analysis by Lovegrove et al. [78] found no difference in post-operative complications between the pouch designs. However, patients with a J-pouch had statistically significant increased bowel movements and use of anti-diarrhoeal medications. Patients with a W-pouch had a significantly greater need for regular pouch catheterisation compared with a J-pouch on initial analysis, however, these findings were not supported on sensitivity analysis of randomised controlled trials and higher-quality studies. Similarly, a more recent systematic review by Simillis et al. [79] found that the J-pouch was associated with increased seepage and urgency compared to other configurations. These findings suggest that the comparable ease of J-pouch construction may come at the cost of poorer functional outcomes, but further data are needed to elucidate this. It is argued that these findings may be associated with shorter follow-up periods, i.e., 12 months and that these differences may subside following a period of pouch maturation and adaptation. A randomised controlled trial of J- versus W-pouch by McCormick et al. [80] found significantly fewer bowel movements in the W-pouch group at 12 months but no significant difference at a median of 8-year follow-up. There was no disparity between groups with regard to incontinence or urgency. The J-pouch group trended towards increased use of anti-diarrhoeal medications but this was not of statistical significance. Furthermore, there was no difference in quality of life assessment. A summary of the pouches can be found below in Table 1.

Conclusions

Although many questions remain unanswered regarding the best practice, it is indisputable that surgery for UC has made significant advancements over time. The advent of the IPAA in particular has revolutionised the surgical treatment of this disease and the patient experience.

In the emergency setting, the choice of operation remains subtotal colectomy with end ileostomy. Due to the increased risk of pelvic sepsis from a short rectal stump, a subcutaneously placed rectosigmoid remnant may result in decreased morbidity. While laparoscopic emergency colectomy may result in decreased length of stay and post-operative wound and respiratory infections, it is essential that patient care is not compromised for its sake if unfeasible or significantly prolonging time to resection of diseased bowel.

For elective surgery, patient factors and expectations remain integral to the decision-making process. An ileorectal anastomosis may still have a role for patients with minimal rectal disease with absent dysplasia and women

Table 1 Summary of pouch configurations

Pouch	Advantages	Disadvantages
J	Ease of construction Decreased operative time	May have increased BMs and seepage
W	Larger volume/reservoir	Longer operative time
S	Useful when additional length required	Obstructive defaecation Need for self-catheterisation

of child-bearing years in particular, but IPAA remains the gold standard. Additionally, the option of permanent end ileostomy following proctocolectomy must not be omitted in patients who are not prepared or able to adopt the necessary lifestyle changes of IRA or IPAA. Multiple factors remain under debate regarding pouch surgery including number of stages, anastomosis and configuration. Due to the paucity of prospective randomised controlled data, many of these questions remain unanswered.

At present, there is no so-called "one-size" approach to the surgical treatment of UC and each option carries potential significant morbidity. As with many aspects of surgical practice, decision-making often comes down to a balanced and individualised risk assessment. The management should ultimately be tailored on a case-by-case basis according to the patient's condition, expectations and surgeon or centre experience.

Compliance with ethical standards

Conflict of interest The authors declare no conflict of interest. The authors received no support, financial or otherwise, for this paper. No research involving human or animal participants was conducted

Research involving human participants and/or animals No research involving human participants and/or animals was conducted for the purpose of this paper.

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