Surgery in Inflammatory Bowel Diseases

14

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14.1 Crohn's Disease

14.1.1 Introduction

Surgical treatment is required when medical therapy fails or complications such as free perforation, obstruction, hemorrhage, and severe inflammation or acute fulminant colitis require surgical treatments. Chronic complications such as recurrent bowel obstruction and neoplasia can also be surgical indications. Surgical treatments of Crohn's disease are divided into two main procedures: bowel-sparing surgery and resection of the involved bowel. Proper surgical indications and optimal timing for surgery are still controversial and continuously evolving.

14.1.2 Bowel-Sparing Surgery for Crohn's Disease

14.1.2.1 Strictureplasty

Strictureplasty is a bowel-sparing technique to conserve and minimize resected bowel segments. The principle is the enlargement of the narrowed bowel lumen to prevent bowel resection. A surgical technique, strictureplasty, was developed because the repeated recurrence of Crohn's disease causes frequent bowel resections, short bowel syndrome, and related nutritional deficiency.

Most strictureplasties are carried out for small bowel diseases. Jejunoileal stricture is known as the most frequent site to perform a strictureplasty [29]. Although colonic disease has lower risks for malabsorption than small bowel disease, the length of remaining viable bowel is still important to perform a strictureplasty.

The types of strictureplasty are decided by the number of strictures, the length of each stricture, the degree of inflammation of involved bowel segments, and the relationship among bowel strictures.

Surgical Indications for Strictureplasty

Surgical indications for strictureplasty are multiple strictures of the small bowel, previous significant bowel resection more than 100 cm, patients with short bowel syndrome, strictures without inflammatory lesions with a forming fistula or phlegmon, strictures at prior anastomotic sites, and growth retardation [8, 28, 39].

The contraindications are related to the nutritional status of patients, active disease progression, and complicated symptoms. The symptoms include perforation of the small bowel with or without peritonitis, malnutrition (serum albumin level <2.0 g/dl), fistula or phlegmon at the operative site, short distance of stricture near the segment requiring bowel resection, likelihood of anastomotic tension after strictureplasty, hemorrhage of stricture site, and malignant transformation of stricture site.

Surgical Techniques

The types are decided by the number of strictures, the length of each stricture, the degree of inflammation of involved bowel segments, and the relationship among bowel strictures. The strictureplasty can be categorized from the length of strictures and can be summarized as follows (Table 14.1).

The Heineke-Mikulicz (HM) strictureplasty is a conventional technique, which is most commonly used for short-segment strictures less than 10 cm [3, 19, 21] (Fig. 14.1).

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The Judd strictureplasty is a useful technique for a short-segment stricture with a fistulous opening (Fig. 14.2).

The Moskel-Walske-Neumayer strictureplasty can adjust the narrow distal bowel lumen into the enlarged proximal lumen throughout the "Y"-shaped enterotomy (Fig. 14.3).

The Finney strictureplasty is a procedure for an intermediate stricture from 10 to 25 cm in length by a side-to-side approach. The "U"-shaped enterotomy and anastomosis creates a blind pouch, which can resolve the stricture (Fig. 14.4).

The Jaboulay strictureplasty is a procedure for intermediate bowel stricture like the Finney strictureplasty. However, the difference of the Jaboulay strictureplasty is the anastomotic site, which is performed with relatively healthy bowels and not including stricture sites. After facing the antimesenteric border of the bowel including the stricture site, an enterotomy is performed by a longitudinal incision of a separated healthy bowel (Fig. 14.5).

Side-to-side isoperistaltic strictureplasty is a procedure for long segments of strictures more than 20–25 cm [25] (Fig. 14.6). The Poggioli strictureplasty is a modified procedure of Michelassi's side-to-side isoperistaltic strictureplasty [27] (Fig. 14.7). The Sasaki strictureplasty is a modified side-to-side isoperistaltic anastomosis with double HM strictureplasty [32] (Fig. 14.8). The Hotokezaka strictureplasty is for a long strictured segment, which needs a bowel resection simultaneously due to severe adhesion, abscess, or intestinal fistula [12] (Fig. 14.9).

Postoperative Outcomes

The rates of recurrence requiring a reoperation were estimated at 11–32 % at 5 years, 20–44 % at 10 years, and 46–55 % at 20 years ([22, 38], [42], [98]). According to the meta-analysis of outcomes after a strictureplasty for Crohn's disease, the rate of symptomatic recurrence after a jejunoileal strictureplasty was 39 % of the patients, and the cumulative reoperation rate was 41 % at 5 years and 51 % at 10 years [43].

Septic complications such as anastomotic leakage, enteroenteric fistula, and abscess after a jejunoileal strictureplasty can occur [7, 13, 35, 37, 40]. However, the rate of septic conditions after a strictureplasty was reported in 3–50 % of the patients, which was similar with that after a bowel resection [5, 30, 41]. Hemorrhage, wound infection, or bowel obstruction can also occur after a strictureplasty. Concerns of malignant transformation of the strictureplasty sites also matter because patients with Crohn's disease are at a high risk of malignancy and are exposed to immunomodulators for a long time. However, the incidence of carcinoma after strictureplasty is extremely rare since only two cases were reported where adenocarcinoma occurred at the site of strictureplasty [17, 24].

14.1.2.2 Bypass or Exclusion

A bypass or exclusion surgery was used for ileocecal Crohn's disease in the past. However, at present, bypass surgery is not recommended any longer because of the higher incidence of septic conditions after surgery and the risk of malignant transformation in the bypassed segment [1, 9, 11]. It is performed very limitedly in gastroduodenal Crohn's disease because of the immobilization of the second and third portion.

Table 14.1 Strictureplasty compared by the length of strictures

Short segments: <10 cm	Heineke-Mikulicz (HM) strictureplasty
	Judd strictureplasty
	Moskel-Walske-Neumayer strictureplasty
Intermediate segments: 10–25 cm	Finney strictureplasty
	Jaboulay strictureplasty
Long segments: >25 cm (side-to-side isoperistaltic strictureplasty)	Michelassi's strictureplasty
	Poggioli strictureplasty
	Sasaki strictureplasty
	Hotokezaka strictureplasty

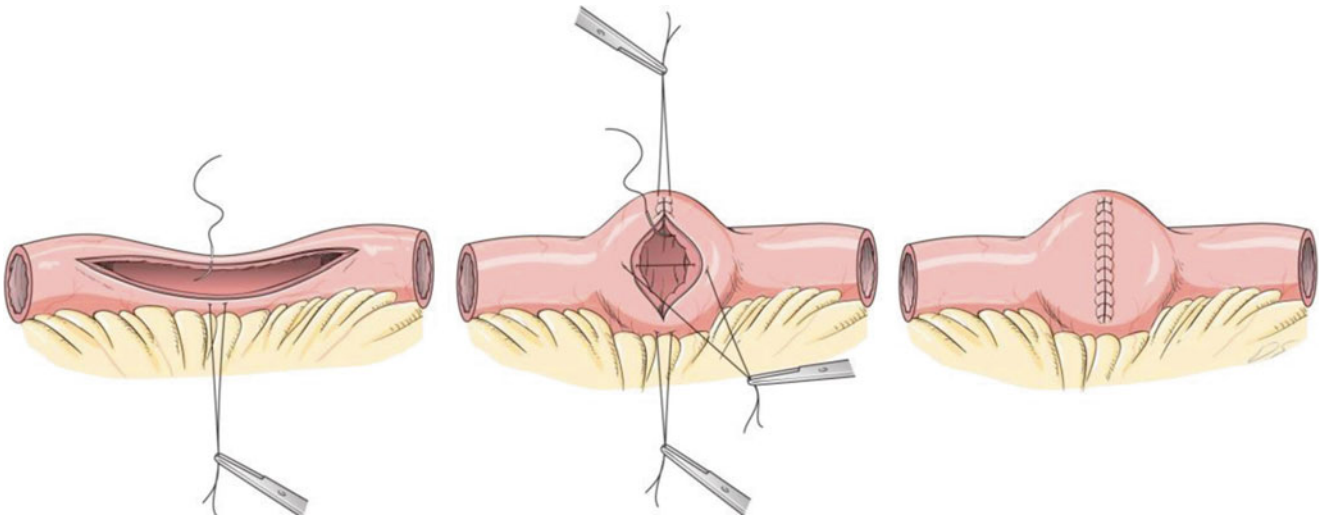

Fig. 14.1 Heineke-Mikulicz strictureplasty

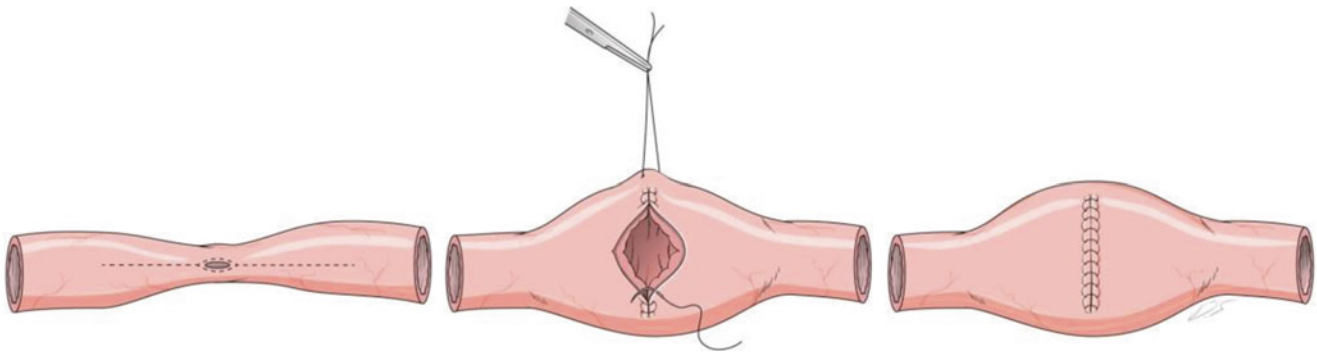

Fig. 14.2 Judd strictureplasty

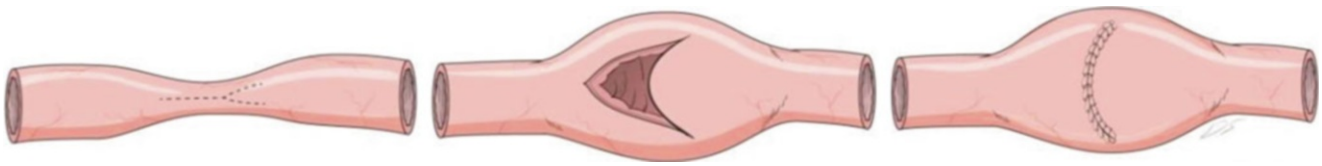

Fig. 14.3 Moskel-Walske-Neumayer strictureplasty

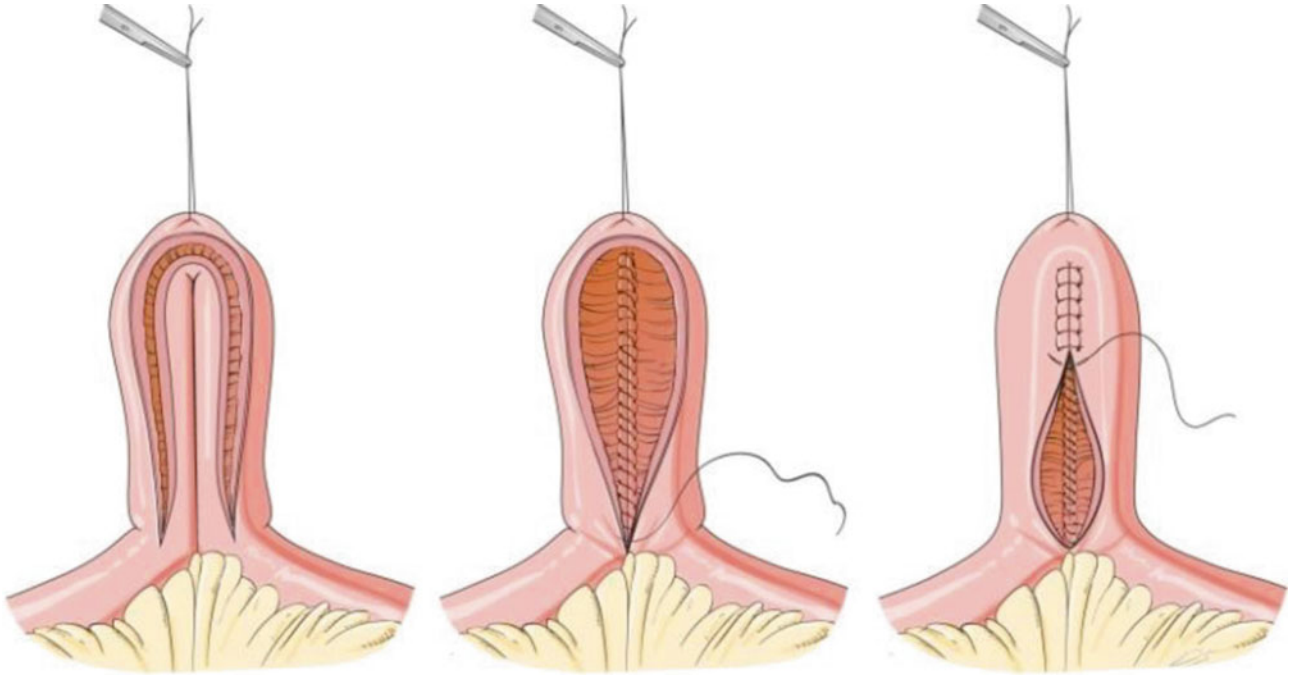

Fig. 14.4 Finney strictureplasty

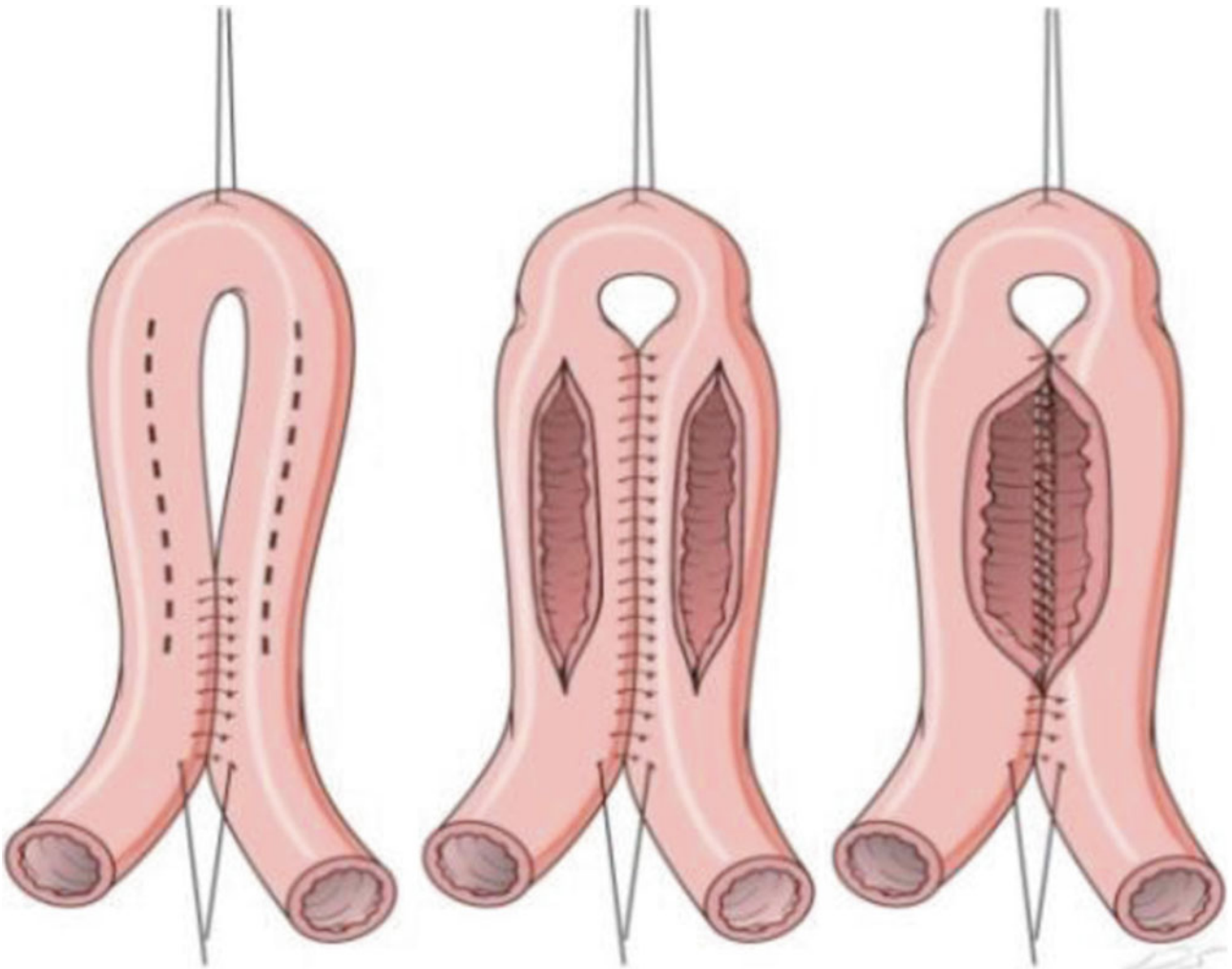

Fig. 14.5 Jaboulay strictureplasty

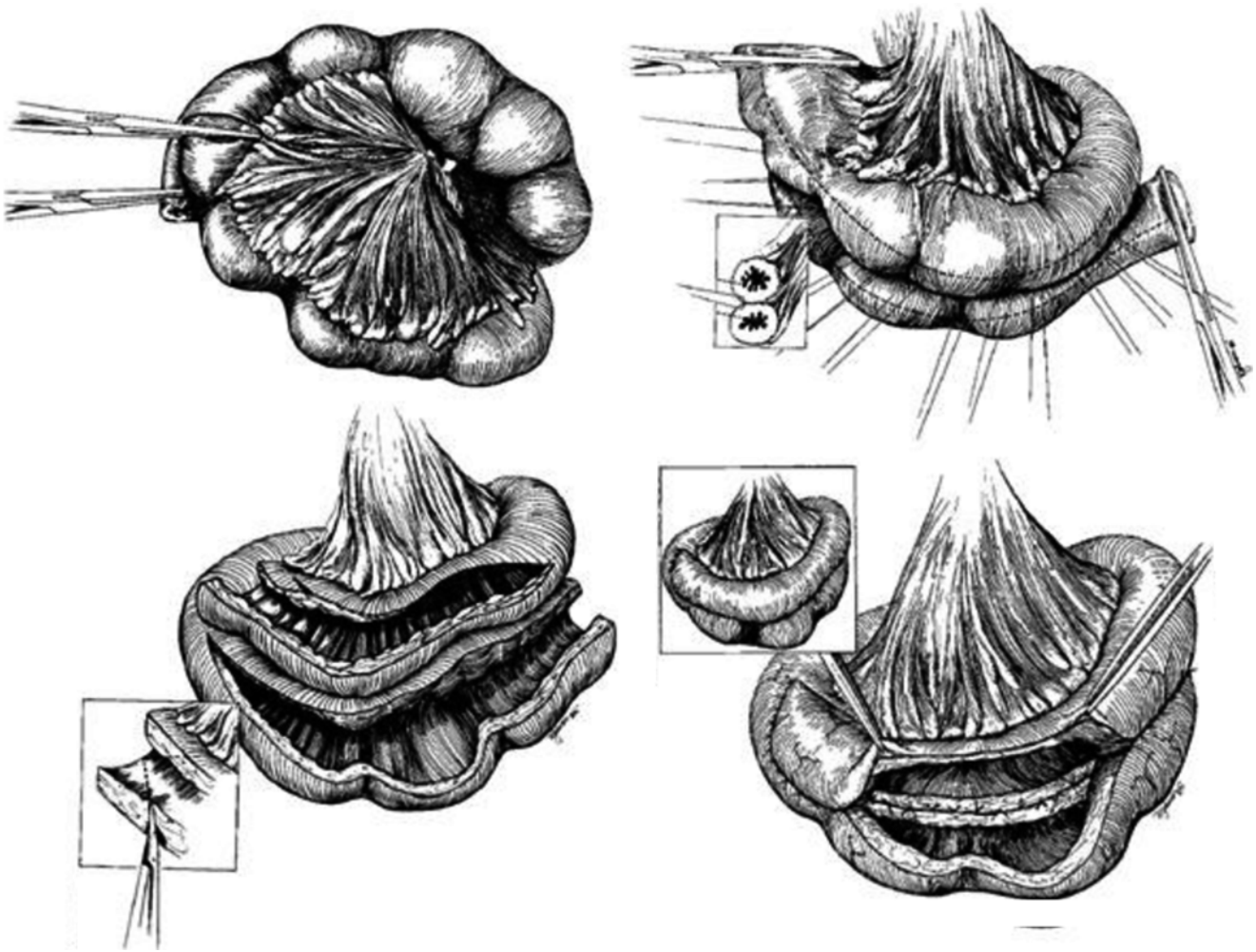

Fig. 14.6 Michelassi's strictureplasty (side-to-side isoperistaltic strictureplasty) (Printed with permission from Fabrizio Michelassi, MD)

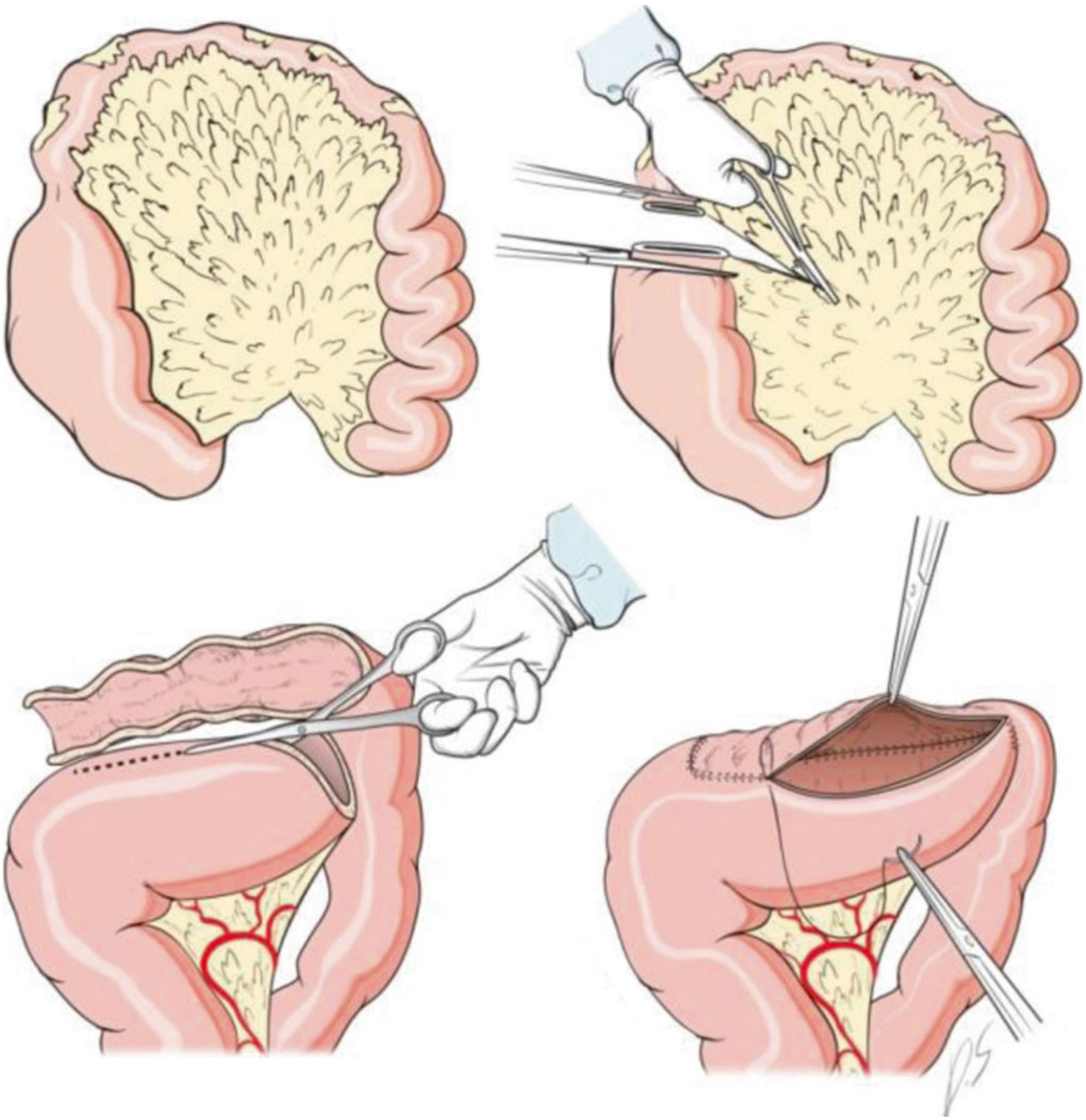

Fig. 14.7 Poggioli strictureplasty (side-to-side diseased to disease-free anastomosis)

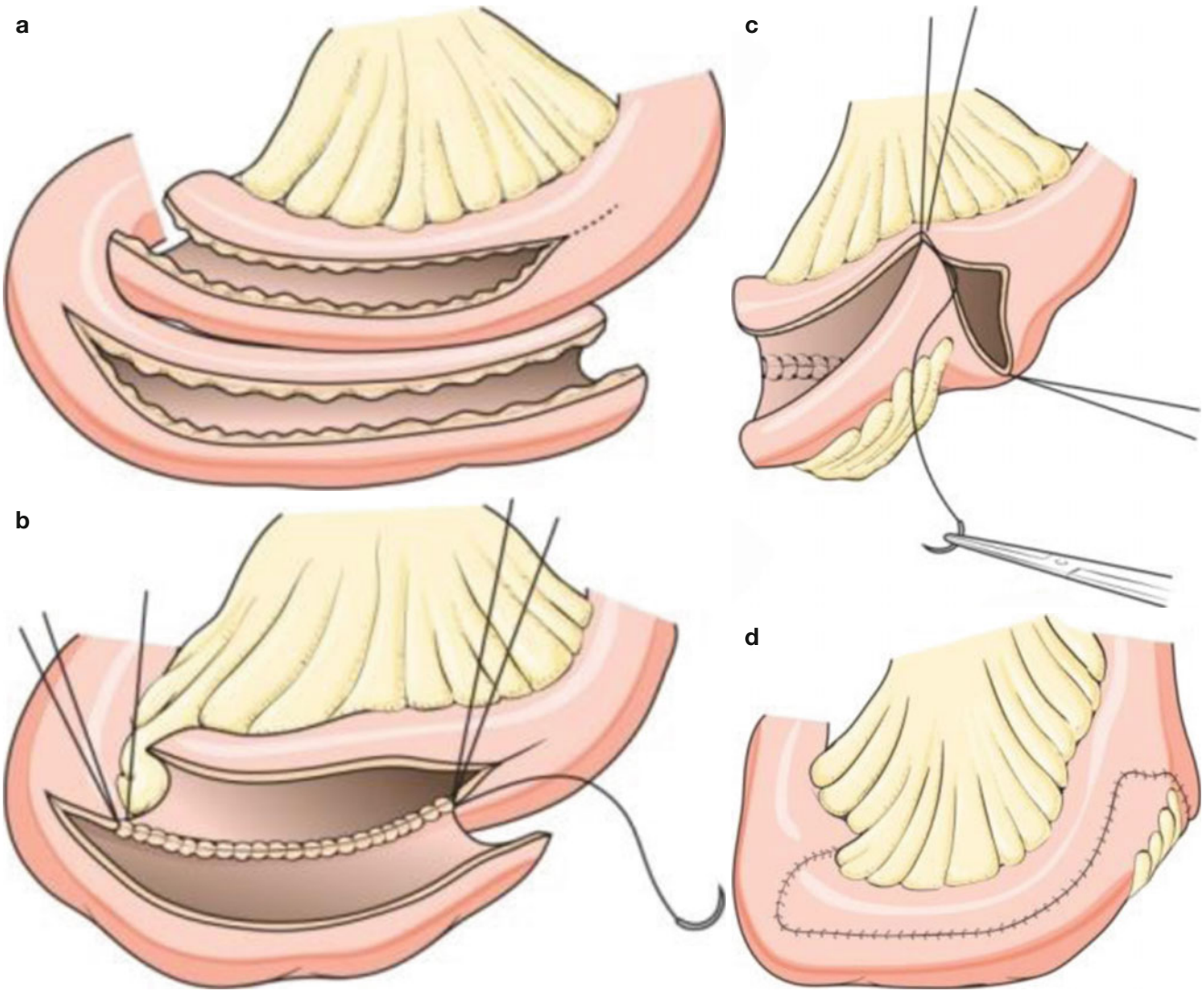

Fig. 14.8 Sasaki strictureplasty (side-to-side isoperistaltic strictureplasty with double HM strictureplasty). (**a**) The two intestinal loops are placed in a side-to-side isoperistaltic direction. (**b**) Approximated at the posterior wall of the adjacent bowels. (**c**) The end of the anastomotic site is closed transversely in the way of an HM strictureplasty. (**d**) The circumferences of both bowel ends become nonspatulated and lengthened

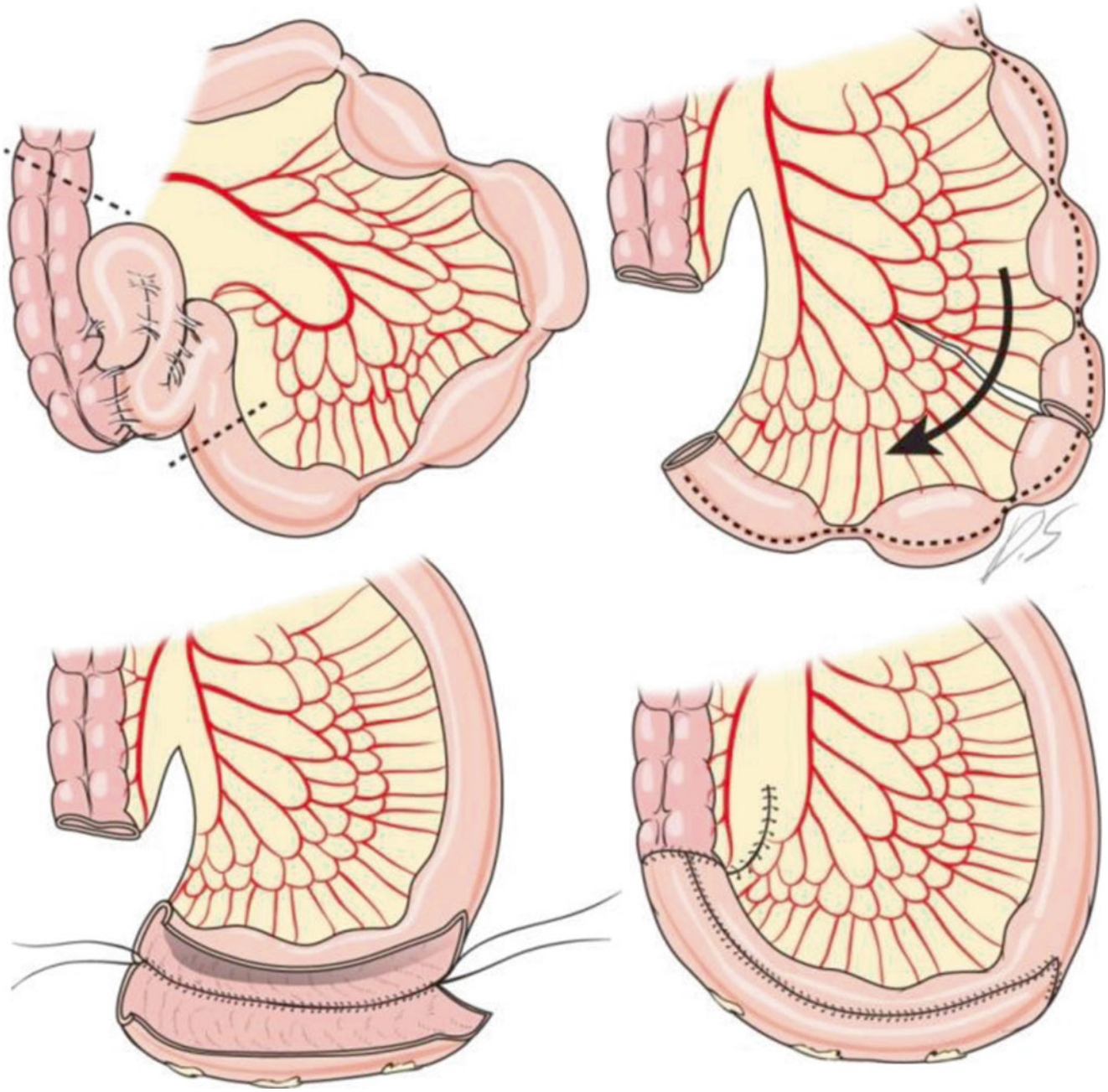

Fig. 14.9 Hotokezaka strictureplasty (side-to-side-to-end strictureplasty)

14.1.3 Resection of Involved Bowel Segment

Resection of a diseased bowel segment is the most frequently performed operation for patients with Crohn's disease. This is a surgical procedure when strictureplasty is not feasible or indicated. Preoperative evaluation to make an accurate diagnosis of the involved bowel segment is difficult. This is because patients with Crohn's disease experience transmural inflammatory bowel change with a thickened mesentery and fat wrapping (Fig. 14.10). Both the location and the extent of the diseased bowel are important to determine proper surgical procedures.

14.1.3.1 Surgical Indications

Resection of the involved bowel segment for Crohn's disease is performed in patients with bowel perforation, hemorrhage, intestinal fistula, toxic megacolon, bowel obstruction, and/or failure of medical therapy. In the situation of urgent surgery as well as elective surgery, bowel resection is usually done with a certain risk of short bowel syndrome. Stone et al. reported that chronic obstruction is the most common indication of bowel resection among patients when the small bowel is involved in Crohn's disease [36].

14.1.3.2 Surgical Techniques

The main gastrointestinal lesions of Crohn's disease are the small bowel, the ileocolonic, and the large bowel. Due to the inflammatory change of bowel segments, a thickened mesentery and fat wrapping are occasionally obstacles in identifying the vessels using clamps. Therefore, the finger fracture technique can be used (Fig. 14.11). After transillumination of the mesentery, the structure of the blood supply is identified in small bowel resection. Then the intestine and mesentery are divided by clamps, and an anastomosis is performed using a stapler or by the hand-sewn method (Fig. 14.12).

A prospective study for long-term results of stapled and hand-sewn anastomoses in patients with Crohn's disease reported that the postoperative recurrence rate of the stapled anastomosis group was lower than the hand-sewn group [14]. These results assume that a wider lumen of stapled anastomosis can bring out the lower rate of stasis and bacterial overgrowth, which can cause disease recurrence after resection [2] (Fig. 14.13).

14.1.3.3 Postoperative Outcomes

The advantage of resectional surgery is to get healthy disease-free margins for anastomosis and macroscopically clear margins. However, it was reported that the presence of diseased or disease-free margins does not influence postoperative recurrence [4, 8, 30]. There is controversy with the association of recurrence between limited resection (Fig. 14.14) and en bloc wide radical resection.

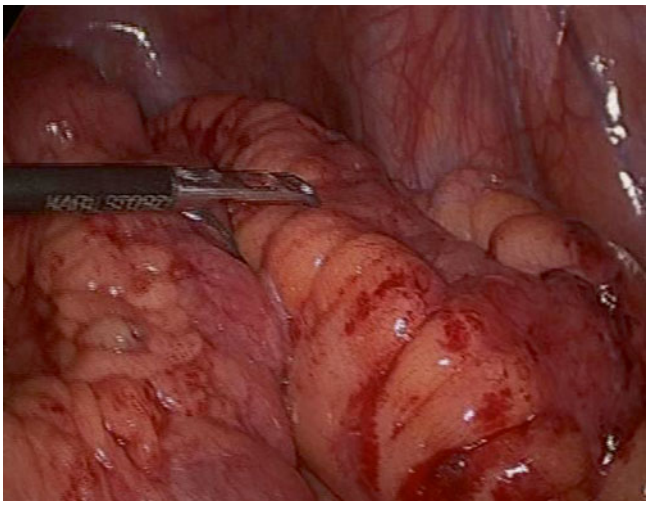

Fig. 14.10 Thickened mesentery and fat wrapping of the bowel in a patient with Crohn's disease

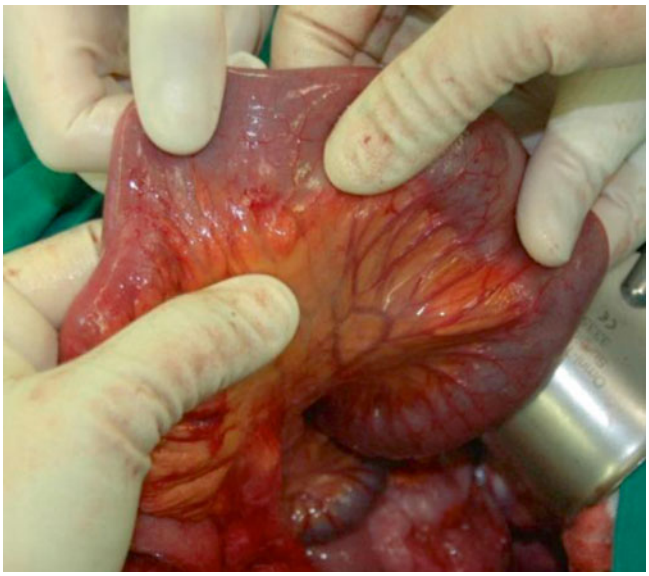

Fig. 14.11 Finger fracture technique

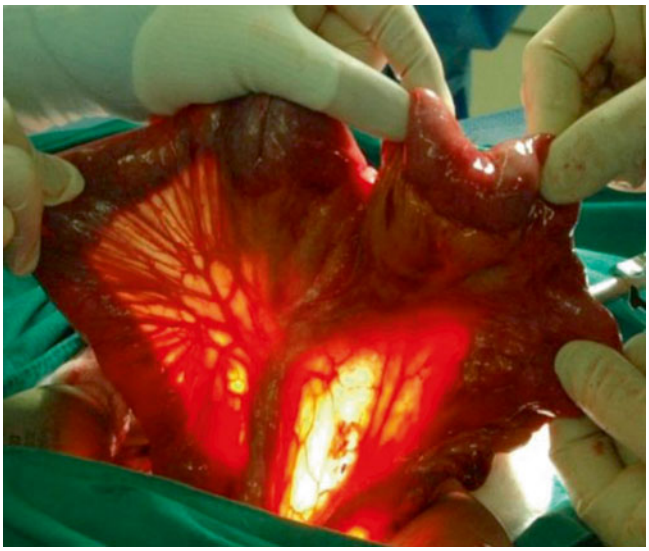

Fig. 14.12 Transillumination of the mesentery in identifying the blood supply

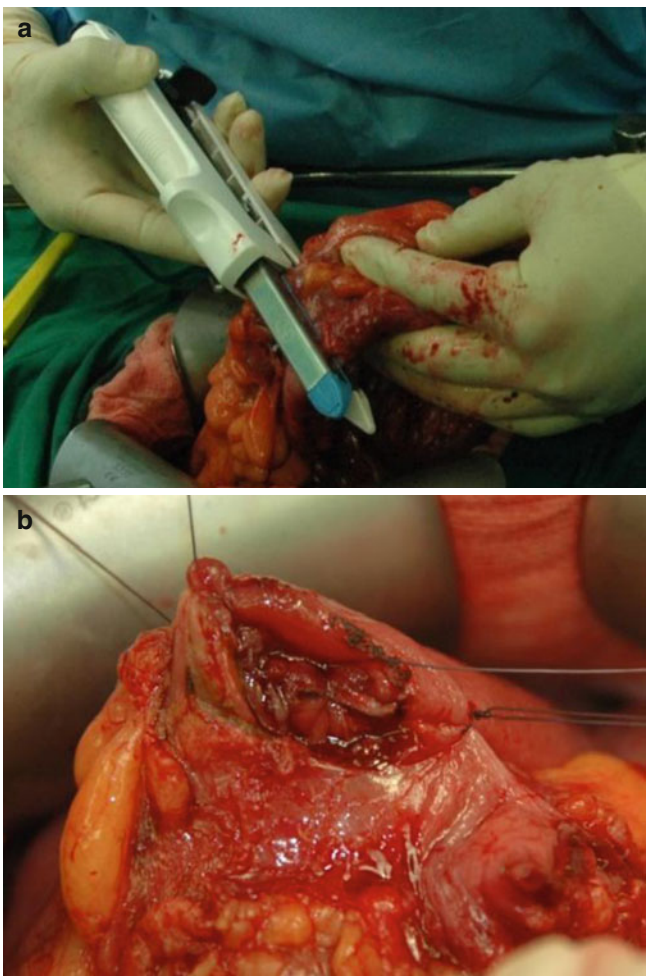

Fig. 14.13 The anastomotic technique: (**a**) stapled anastomosis vs. (**b**) Hand-sewn anastomosis

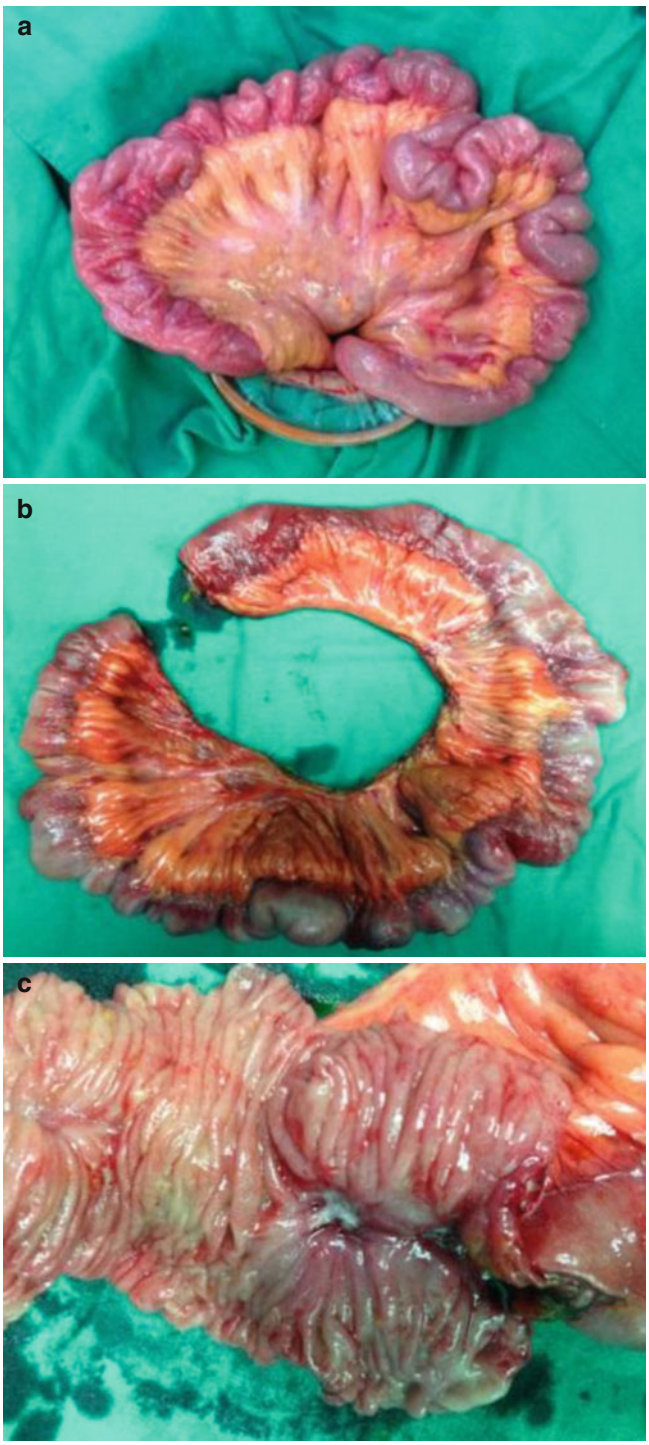

Fig. 14.14 Limited resection of the small bowel involving multiple strictures. (**a**) Extracted specimen through minilaparotomy. (**b**) Resected specimen. (**c**) Luminal feature of the small bowel involving stricture

14.1.4 Surgery for Perianal Crohn's Disease

Perianal manifestations of Crohn's disease are divided into primary and secondary lesions. Primary lesions include anal fissures and perianal ulcers. Secondary lesions are combined perianal lesions with fistulas, strictures, or perianal abscess. The principle of surgery is to achieve adequate drainage of sepsis and to preserve sphincter function without damage [33].

14.1.4.1 Surgical Indications

Crohn's perianal diseases, including skin tags, hemorrhoids, anal fissures, anorectal strictures, perianal abscesses, anorectal strictures, rectovaginal fistulas, and cancer, are potential indications for surgical management [31]. There are four categories for surgical indications: emergency treatment, "bridge" surgery, definitive treatment, and resection of proximal intestinal resection. Emergency treatment includes incision and drainage of an abscess [33]. "Bridge" surgery is managing and treating active inflammatory lesions after stabilization of the disease. Fistulotomy and flap repair of a fistula and internal sphincterotomy are indications for definitive surgery. Intestinal resection, including a proctocolectomy or a proximal bowel resection, is performed as an invasive procedure of perianal surgical treatment.

14.1.4.2 Surgical Techniques

Incision and Drainage

The main principle of incision and drainage of perianal disease is to make adequate elimination of septic conditions and to avoid sphincter damage. It is used in the acute phase and when treatment is needed immediately. Combined surgical treatments with broad-spectrum antibiotics are recommended (Fig. 14.15).

Lateral Internal Sphincterotomy

Acute and painless anal fissures are responsive to conservative therapy, which is known to be effective in the majority of patients. However, if the patients have pain due to the fissure itself, without macroscopically rectal inflammation, a lateral internal sphincterotomy can be indicated [31]. The incision of this procedure is made across the intersphincteric groove with separation of the internal sphincter from the anal mucosa (Fig. 14.16).

Fistulotomy and Fistulectomy

The surgical management of perianal fistulas in patients with Crohn's disease is decided by the presence or absence of inflammatory change of the rectum and the type and location of the fistulas. Perianal fistulas can be classified as superficial, intersphincteric, trans-sphincteric, supra-sphincteric, and extra-sphincteric fistula by Park's anatomical classification, which regards the external anal sphincter as the central reference point [26] (Fig. 14.17). The disease activity and severity of perianal Crohn's disease can be assessed by the Perianal Crohn's Disease Activity Index (PCDAI) [16] (Table 14.2).

A simple fistula is a low superficial type such as low inter- or intra-sphincteric lesions with a single external opening, which are not connected to adjacent organs such as the vagina or bladder. A complex fistula is a high type as high inter- or intra-sphincteric, supra-sphincteric, and extra-sphincteric lesions, which have several external openings [37]. Patients who have low fistulas may be treated by a one- or two-stage fistulotomy (Fig. 14.18).

Seton Procedure

The seton procedure is a surgical technique for Crohn's fistula to maintain proper pus drainage continuously and to avoid perianal abscess formation by using a seton drain. There are two kinds of seton procedures: the noncutting (loose) seton (Fig. 14.19) and the cutting seton (Fig. 14.20). The noncutting seton procedure is performed by a drain insertion through the fistula tract. According to the noncutting seton procedure, the drain is threaded into the cutaneous opening of a perianal fistula across the mucosal orifice of the fistula tract in the rectum. Then after the drain moves to the anal canal, the two ends of the drain are loosely tied. The cutting seton procedure is performed by tying the ends of the noncutting seton tightly, which can result in a slow fistulotomy by pressure necrosis [31].

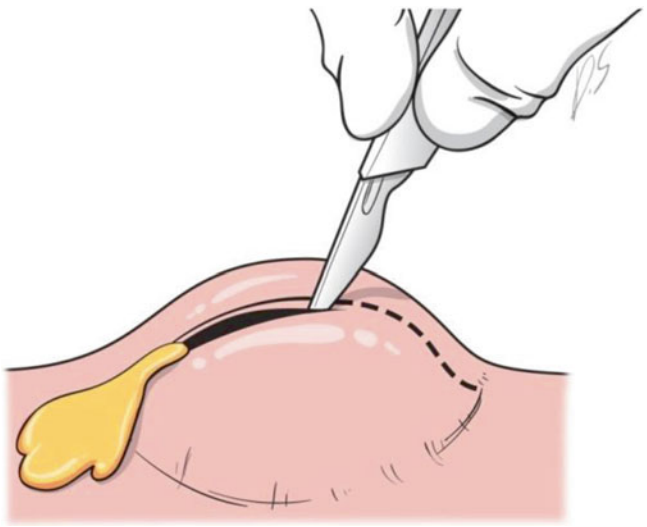

Fig. 14.15 Incision and drainage for perianal abscess

Fig. 14.16 Lateral internal sphincterotomy

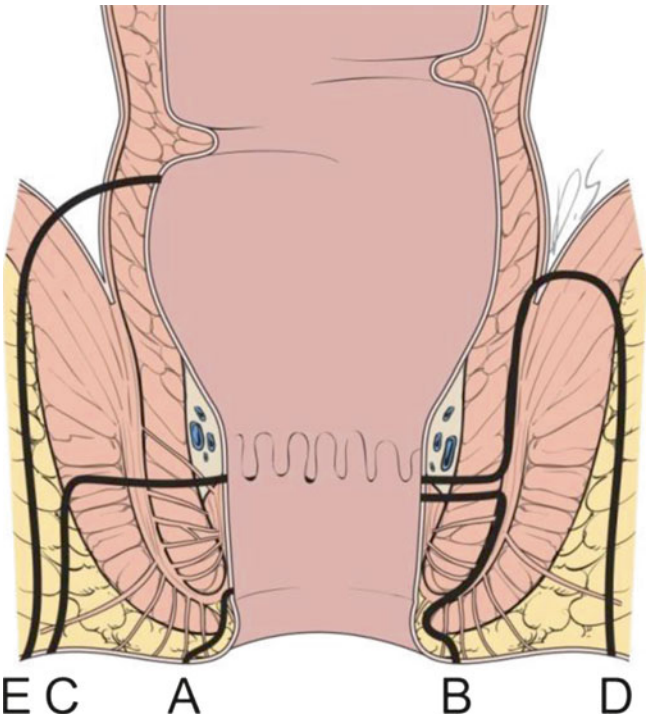

Fig. 14.17 Park's anatomical classification of perianal fistula. *A* Superficial fistula, *B* intersphincteric fistula, *C* transsphincteric fistula, *D* supra-sphincteric fistula, *E* extra-sphincteric fistula

Table 14.2 Perianal Crohn's Disease Activity Index

Perianal disease activity
Discharge
0 No discharge
1 Minimal mucous discharge
2 Moderate mucous or purulent discharge
3 Substantial discharge
4 Gross fecal soiling
Pain/restriction of activities
0 No activity restriction
1 Mild discomfort, no restriction
2 Mod. discomfort, some limitation activities
3 Marked discomfort, marked limitation
4 Severe pain, severe limitation
Restriction of sexual activity
0 No restriction sexual activity
1 Slight restriction sexual activity
2 Mod. limitation sexual activity
3 Marked limitation sexual activity
4 Unable to engage in sexual activity
Type of perianal disease
0 No perianal disease/skin tags
1 Anal fissure or mucosal tear
2 <3 Perianal fistulas
3 ≥3 Perianal fistulas
4 Anal sphincter ulceration or fistulas with significant undermining of skin
Degree of induration
0 No induration
1 Minimal induration
2 Moderate induration
3 Substantial induration
4 Gross fluctuance/abscess
Total score

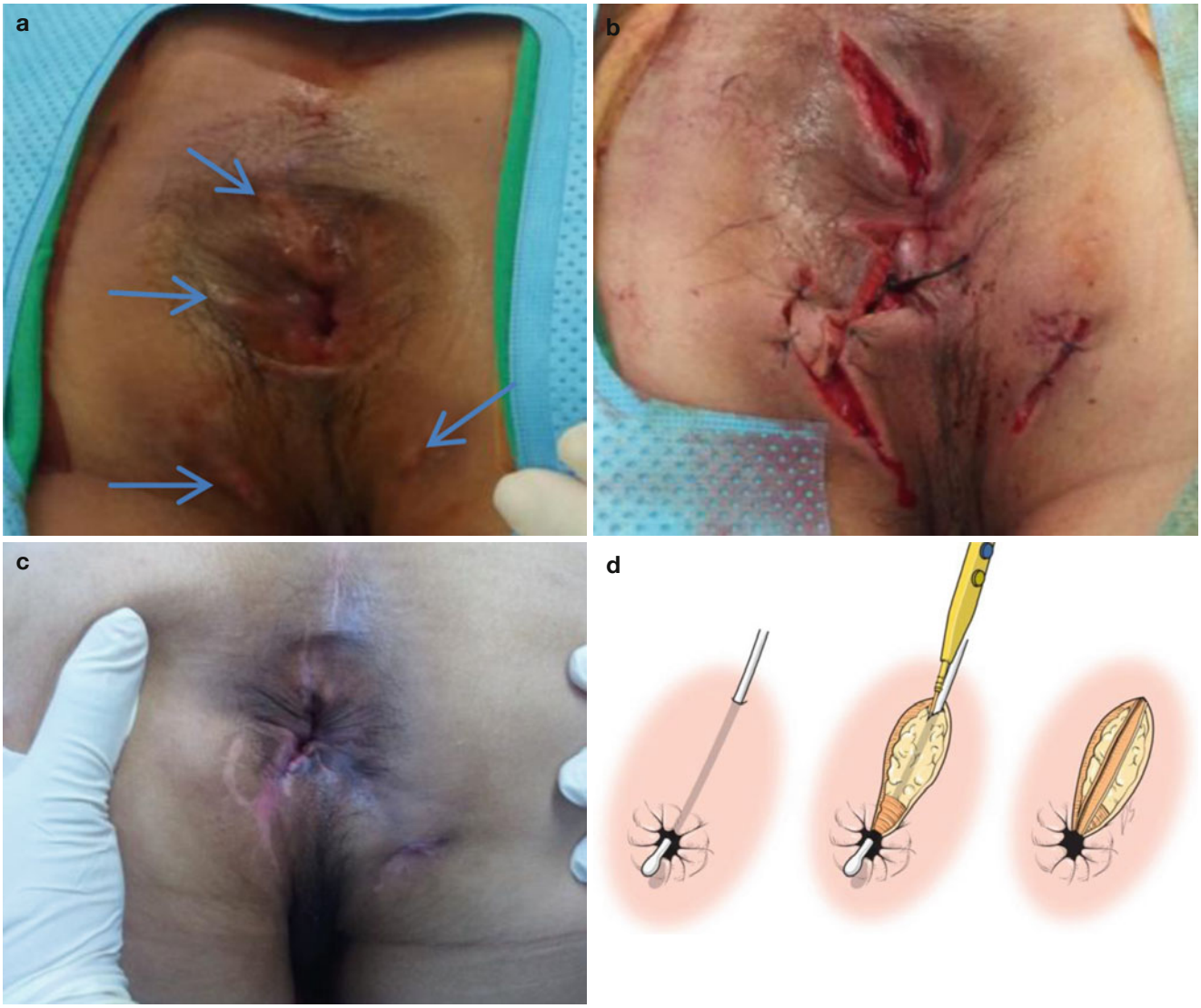

Fig. 14.18 Fistulotomy with the seton procedure. (**a**) Preoperative finding. (**b**) Immediate postoperative finding. (**c**) Postoperative finding after 6 months (*arrow*; external opening, fistula at 5 o'clock was treated by coring-out fistulectomy). (**d**) Schematic figure of fistulotomy for intersphincteric fistula

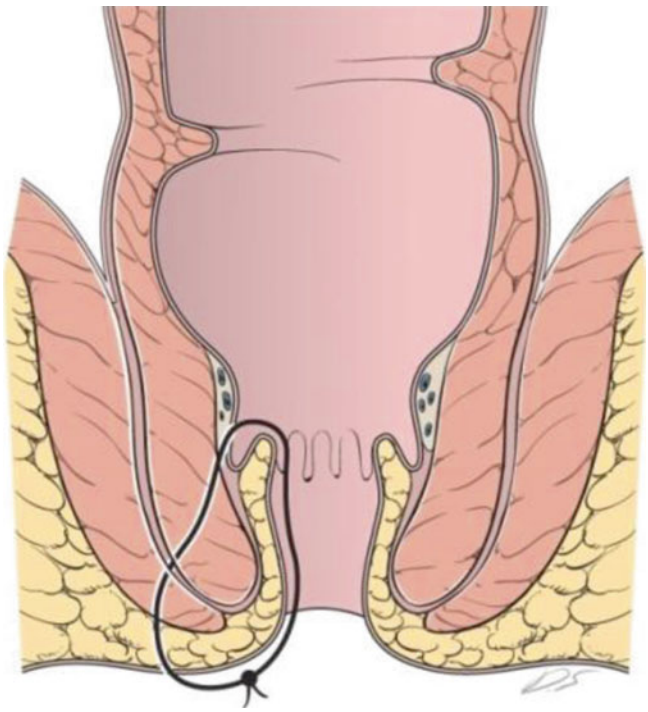

Fig. 14.19 Seton procedure: the noncutting (loose) seton

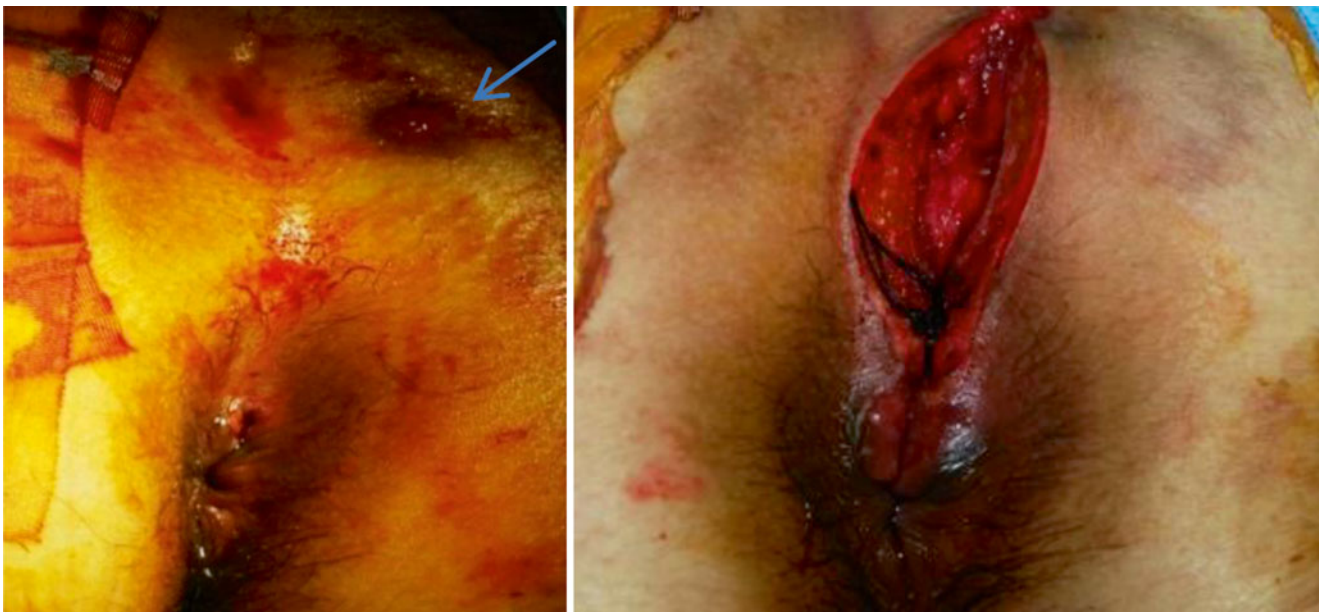

Fig. 14.20 Combined the cutting seton procedure with a fistulotomy (*arrow*; external opening)

Endorectal Mucosal Advancement Flaps

High fistulas have a higher incidence of incontinence and recurrence of fistulas. Therefore, a technique to fulfill the fistula tract by using an endorectal mucosal flap was developed (Fig. 14.21). The advantages of endorectal advancement flaps are that the open wounds are avoided and several problems are prevented by dividing the sphincteric strictures, which can cause incontinence after surgery.

Fibrin Glue Treatment of Complex Perianal Fistulas

Fibrin glue has been used as a sphincter-preserving approach for anal fistulas. This technique begins by evaluating internal and external fistulous openings. After tracing the fistula tract, instilled fibrin glue is filled into the tract [10]. The efficacy is still controversial due to the different results according to the fistula types.

Adipose-Derived Stem Cell Transplantation

Autologous adipose-derived stem cell transplantation in patients with refractory Crohn's disease has been developed since Crohn's disease is an immunologically mediated inflammatory disease. This procedure is delivered by injection of adipose-derived stem cells around the fistula opening and directly into the fistula tract.

14.1.4.3 Postoperative Outcomes

The healing rates of complex fistulas are reported as 47–67 % from the results of the seton procedure and maintenance therapy [34]. Patients who have low fistulas are treated by a one- or two-stage fistulotomy and high fistulas by a more conservative surgical therapy to reduce the risk of incontinence. The rate of incontinence after a fistulotomy is known to be about 50 % of the cases. The seton procedure is useful for continuous pus drainage and reducing the risk of perianal abscess formation.

The results of endorectal mucosal advancement flap were reported as an initial healing rate of 64–89 % and the recurrence rate of up to 50 % [23, 34]. The flap failure was associated with Crohn's colitis, active small bowel Crohn's disease, and proctitis [18]. Active perianal fistulas and long-standing duration of chronic fistulas are associated with the development of anorectal carcinoma in Crohn's disease [15, 31]. The malignancy of Crohn's perianal disease is reported as squamous cell carcinoma, basal cell carcinoma, and adenocarcinoma. Ky et al. reported the incidence of malignancy was 0.7 %, when 1,000 patients with perianal Crohn's disease were evaluated during 14 years [20].

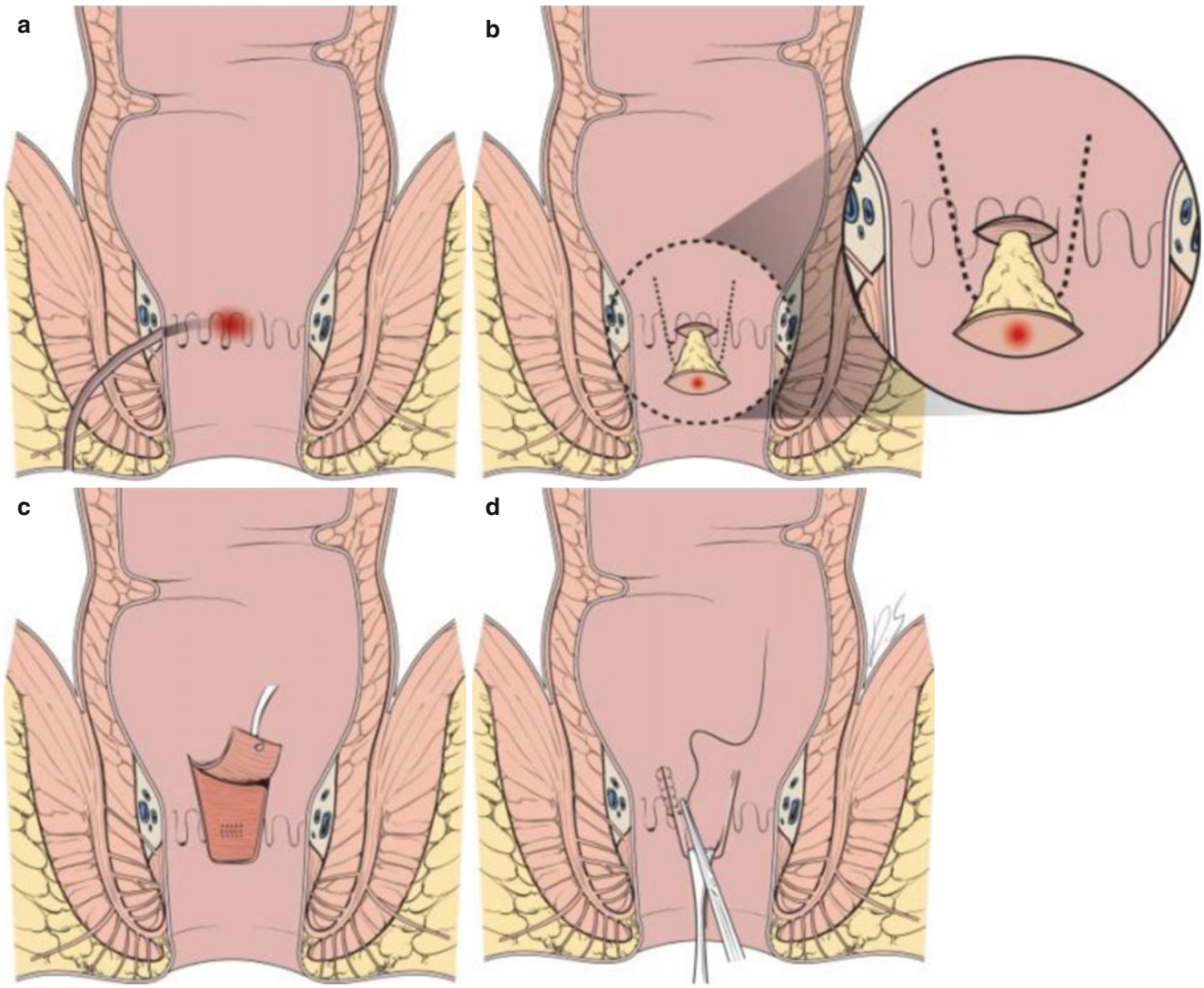

Fig. 14.21 Endorectal mucosal advancement flaps. (**a**) Identifying of the internal fistula opening. (**b**) Coring out the fistula tract. (**c**) The advancement flap and the internal opening are closed by sutures. (**d**) The advancement flap is pulled down to cover the internal opening of the fistula

14.2 Ulcerative Colitis

14.2.1 Introduction

Although medical therapy can ameliorate the inflammatory process and control most symptomatic flares of ulcerative colitis, it provides no definitive treatment for the disease yet. Proctocolectomy or total removal of the colon and rectum can be considered as one of complete treatments. Surgical management of ulcerative colitis requires a comprehensive understanding of all the surgical options. Surgical approaches in UC can be divided into emergency and elective indications (Table 14.3) [52].

A total proctocolectomy (TPC) is the gold-standard surgical procedure to cure ulcerative colitis (UC) because it removes the entire colonic mucosa. After TPC, there are several reconstruction methods. The safest method is an ileostomy, and the functional outcomes related to the sphincter-saving procedure do not matter in this procedure. However, a permanent ileostomy is psychologically difficult to be accepted by patients and to be managed effectively. Other reconstruction methods are the continent ileostomy (Kock's pouch) and a pouch-anal anastomosis. A pouch-anal anastomosis allows patients to use their anal sphincter, and then patients can return to a normal life after a TPC with ileal pouch-anal anastomosis.

14.2.2 TPC with a Brooke Ileostomy

14.2.2.1 Surgical Indications

The indications for elective surgery in patients with UC are (1) failure of medical management to control symptoms, (2) complications associated with side effects of medications, (3) stricture formation, (4) epithelial dysplasia, dysplasia-associated lesion or mass or malignancy, (5) uncontrollable extraintestinal manifestations of UC, and (6) growth retardation in children [96]. TPC with a Brooke ileostomy is a safe and feasible surgical option in terms of not only postoperative surgical complications but also postoperative quality of life [48].

14.2.2.2 Surgical Techniques

The procedure of the TPC contains the right hemicolectomy, transverse colectomy, left hemicolectomy, anterior resection, and low anterior resection, which removes the whole rectum to the dentate line. A characteristic of the Brooke ileostomy is primary maturation of the ileostomy. Primary maturation protects the serositis of the exposed ileum and facilitates healing of the ileostomy. The site of the ileostomy is in the right lower quadrant of the abdomen and the lateral one third of the rectus abdominis muscle. The skin around the ileostomy should be flat, and there must be no scars. Secure attachment of an ostomy plate is very important to maintain the quality of life of a patient with an ileostomy or a colostomy (Fig. 14.22).

14.2.2.3 Postoperative Outcomes

Complications can occur including wound infection or dehiscence, intraluminal or extraluminal bleeding, intestinal obstruction, intra-abdominal infection or abscess, and other medically related postoperative complications such as pneumonia and pulmonary and cardiovascular diseases. Postoperative sexual and voiding dysfunctions are complications after a proctectomy. Permanent retrograde ejaculation or impotence in male and dyspareunia in female can occur as a result of nerve injuries with proctectomy. The superior hypogastric nerve, inferior hypogastric nerve, and both lateral pelvic plexuses should be well preserved to protect postoperative sexual and voiding dysfunctions [51, 73, 85]. Complications related to an ileostomy are ileal necrosis and parastomal skin irritation, stenosis, hernia, and prolapse [49]. A common cause of ileal necrosis is torsion of the mesentery. If ileal necrosis occurs, resection and a new ileostomy formation are necessary.

Table 14.3 General indications for surgical treatment for UC

Elective surgery
Intractability to medical treatment
Colorectal cancer
Continuous uncontrolled hemorrhage
Uncontrolled extracolonic manifestations
Arthritis, uveitis, iritis
Emergency surgery
Toxic megacolon
Toxic colitis
Bowel perforation

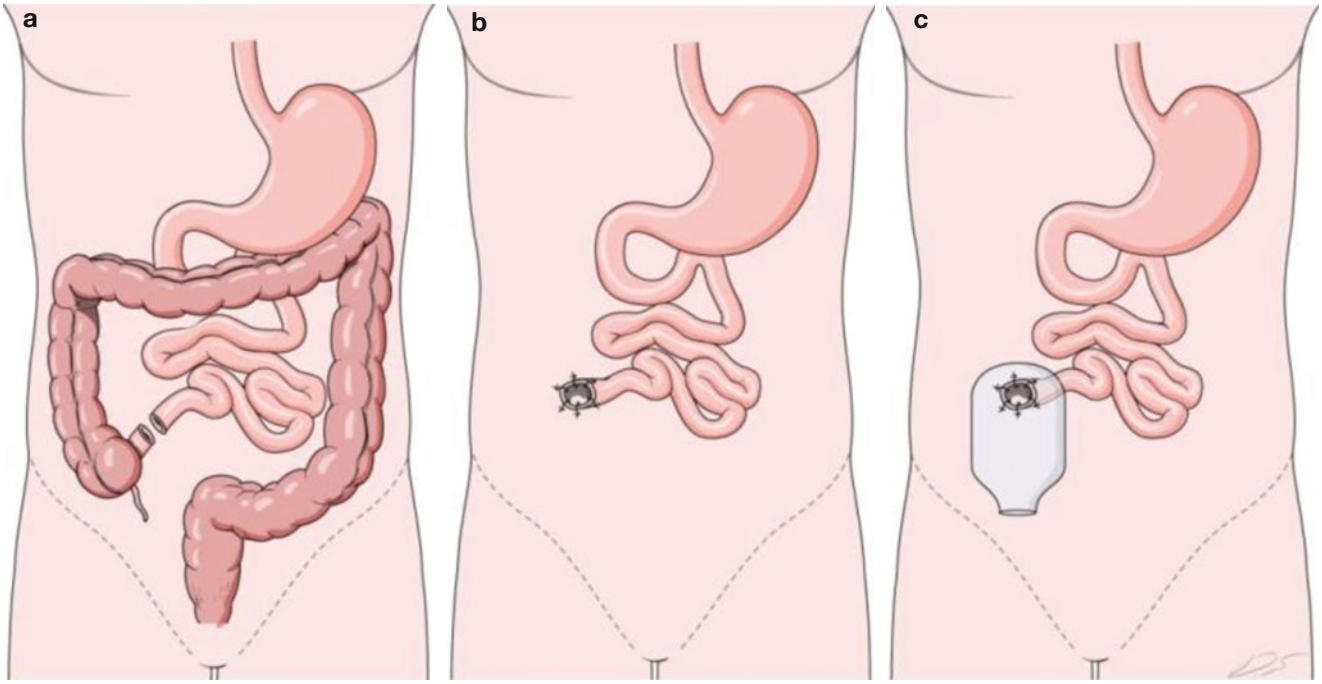

Fig. 14.22 Technique for a total proctocolectomy with a Brooke ileostomy. (**a**) Range of resection. Total colon and rectum are resected, (**b**) Brooke ileostomy, (**c**) ostomy appliances

14.2.3 TPC with an Ileal J-Pouch and Anastomosis (IPAA)

14.2.3.1 Surgical Indications

This procedure is performed electively and contraindicated in an emergency situation and attractive surgical option in terms of complete removal of the whole colorectal mucosa and preservation of the defecation function. TPC with IPAA is also indicated in familial adenomatous polyposis. However, Crohn's disease is a contraindication due to remarkable postoperative complications and poor long-term outcomes [77, 79].

14.2.3.2 Surgical Techniques

After TPC, the whole rectal mucosa is removed, and the end point of the rectal mucosa is the dentate line. The ileal J-pouch is reconstructed, and the terminal ileum is used for formation of the J-pouch (Figs. 14.23 and 14.24). Anastomosis is performed using an absorbable suture by a whole layer stitch of the ileal J-pouch, internal anal sphincter, and anal mucosa. A diverting loop ileostomy is necessary to protect the ileal J-pouch-anal anastomosis. A diverting loop ileostomy closure is usually performed 6–8 weeks later after confirming the intact ileal J-pouch-anal anastomosis. Evaluation of the ileal J-pouch is performed by a rectal examination or colonoscopy. An imaging study using contrast can be used to detect anastomosis leakage.

14.2.3.3 Postoperative Outcomes

The mortality rate is 0–1 % [70]. Anastomotic stricture after an IPAA occurs between 5 and 38 % [64, 68, 78, 80]. Anastomotic stricture can be treated by repeated dilation using a finger or dilator. Postoperative small bowel obstruction occurred in approximately 20 % of the patients. These patients eventually needed operative treatment [67].

Pouch-vaginal fistula is a problematic complication of IPAA with a 3–16 % of overall prevalence rate [54, 55, 74] (Fig. 14.25). The etiologies of a pouch-vaginal fistula are iatrogenic injury of the vaginal wall or pouch-anal anastomotic failure. The correction is divided into two methods according to the level of the pouch-anal fistula. If the location of the fistula is from the anastomosis or above the anorectal junction, the transabdominal approach is preferred. Dissection between the posterior vaginal wall and ileal pouch is divided. Then the posterior vaginal wall and ileal pouch fistula site are repaired. A new ileoanal anastomosis is performed. If the fistula is located below the anastomosis, through the anal canal, transanal or transvaginal approaches are preferred, and the advancement flap procedure is generally used. A gracilis muscle interposition can be used [83].

Pouchitis is a nonspecific inflammation and the most frequent long-term complication [72, 82, 87]. The etiology of pouchitis is unclear. However, overgrowth of anaerobic bacteria is one of the reasons for pouchitis. The main symptoms of pouchitis are abdominal cramping pain, pelvic pain, fever, malaise, anorexia, and increasing stool frequency [66, 81]. The treatment is conservative by using antibiotics such as metronidazole and ciprofloxacin.

Pelvic sepsis occurs in 5–24 % of the patients [56, 76, 84]. It is related to long-term use of steroids and malnutrition. Pelvic sepsis is the reason for early excision of the pouch to treat pelvic sepsis [86]. Overall pouch failure is 5–8 %, which leads to excision of the pouch.

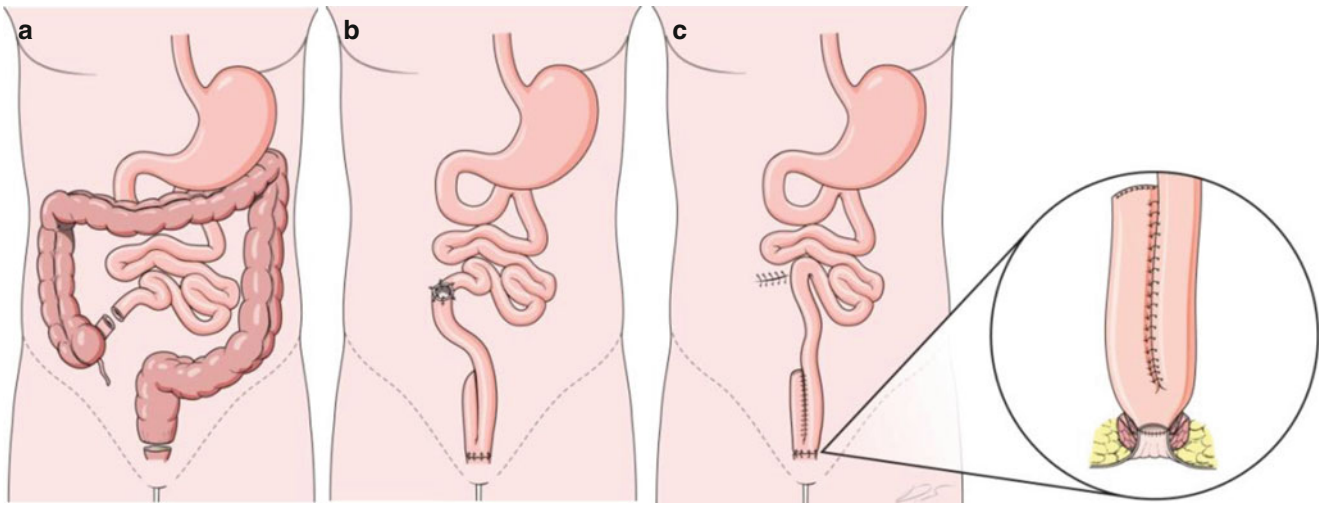

Fig. 14.23 Technique for total proctocolectomy with ileal J-pouch-anal anastomosis. (**a**) Range of resection. Total colon and rectum are resected. (**b**) Diverting loop ileostomy, (**c**) ileal J-pouch-anal anastomosis

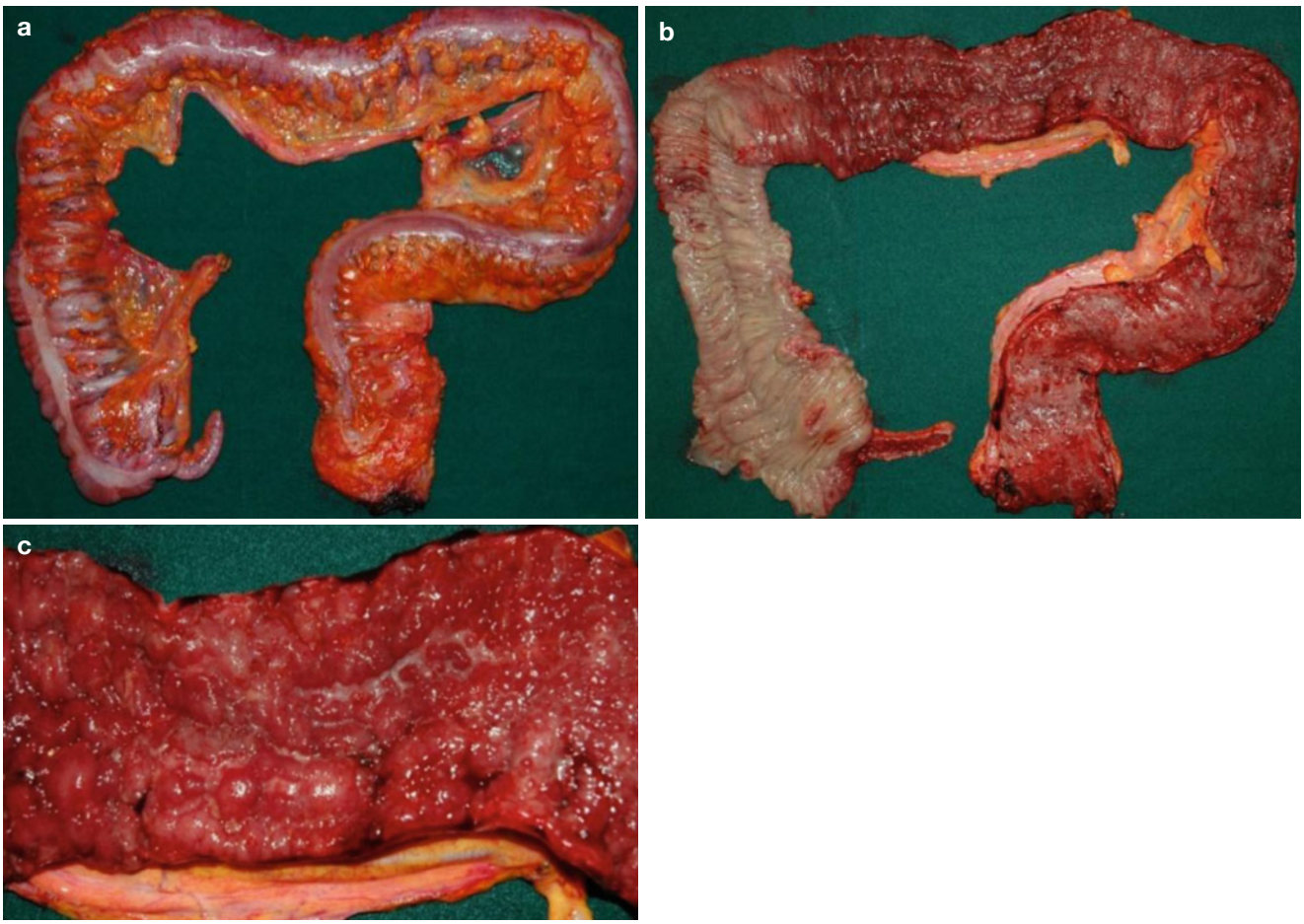

Fig. 14.24 Resected specimen after total proctocolectomy. (**a**) Resected whole specimen. (**b**) Intraluminal feature (opened specimen). (**c**) Transverse colon intraluminal feature

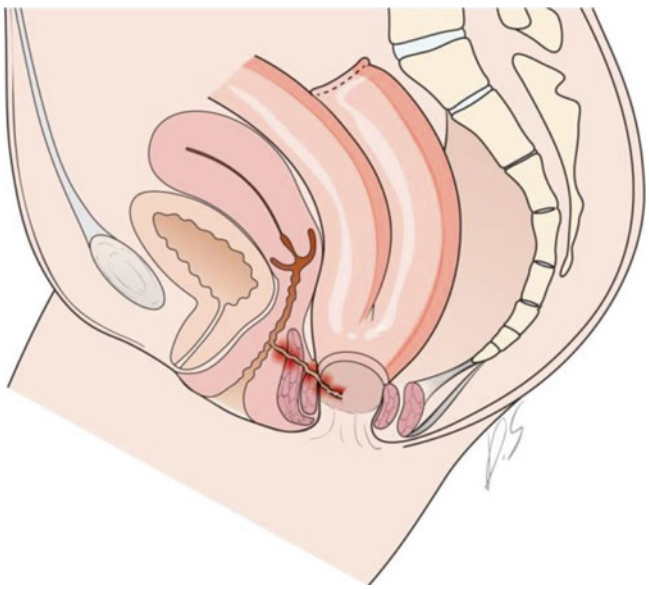

Fig. 14.25 Pouch-vaginal fistula

14.2.4 Abdominal Colectomy with an Ileorectal Anastomosis

14.2.4.1 Surgical Indications

The postoperative functional outcome of this procedure is better than a proctocolectomy because it preserves the rectum [46]. So it can be used in an elective situation. However, about 25 % of UC patients need an eventual proctectomy due to inflammation of the remnant rectum. Thus, the use of this procedure is with caution and should be decided on the patient's specific situation. Old age or high-risk patients can select this procedure. Moreover, female patients who need to preserve fertility can use ileorectal anastomosis after an abdominal colectomy.

14.2.4.2 Surgical Techniques

The resection procedures of the right colon, transverse colon, left colon, and sigmoid colon are the same as TPC except for a proctectomy. In this procedure, the rectum is preserved. Anastomosis is performed between the terminal ileum and the upper rectum (Fig. 14.26).

14.2.4.3 Postoperative Outcomes

IRA is relatively safer procedure compared to IPAA. The anastomotic leakage rate is less than 10 %, and postoperative sexual and voiding dysfunctions are uncommon [57, 62]. A major concern is the fate of the remnant rectal stump. Usually with a remaining rectum, the chance of getting cancer is high. The cumulative risk was 6 % at 20 years and 15 % at 30 years [46]. Proctitis occurs in 20–45 % of patients, and 25 % of these patients eventually need a proctectomy due to severe refractory proctitis [46, 62].

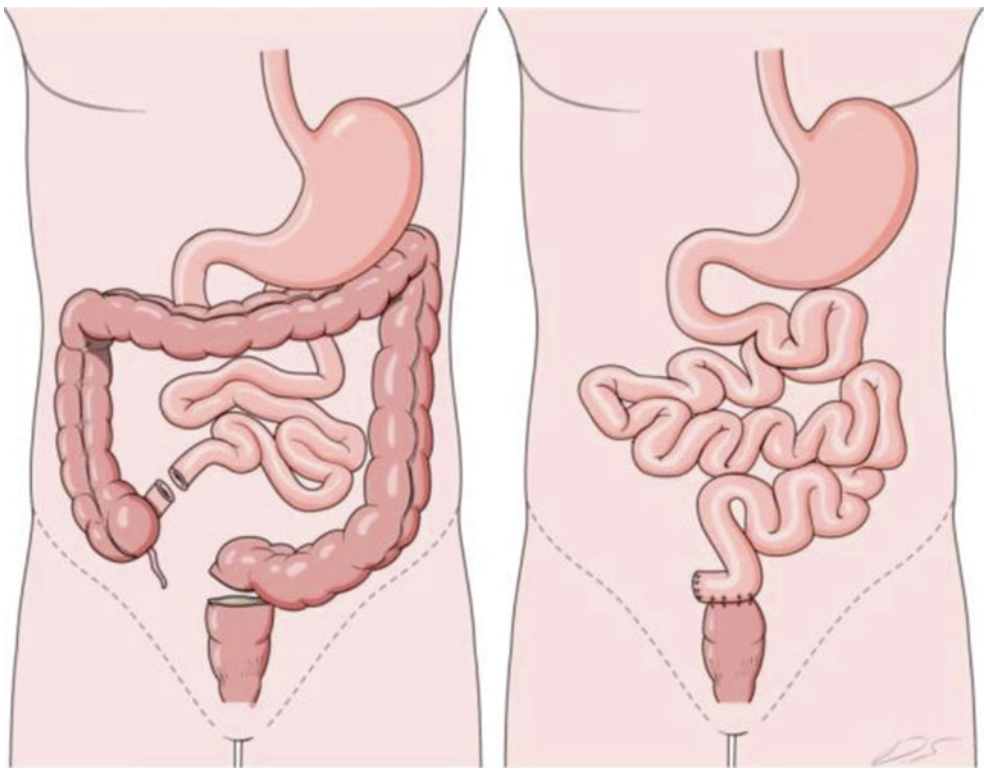

Fig. 14.26 Technique for a colectomy with an ileorectal anastomosis

14.2.5 TPC with a Continent Ileostomy

14.2.5.1 Surgical Indications

A continent ileostomy is now infrequently used because of high postoperative complications and another good alternative surgical option (IPAA). However, there is a still reasonable indication for a continent ileostomy. General indications are failed pelvic pouch, conventional ileostomy malfunction, and the patient's preference. When an IPAA fails, the continent ileostomy can be a proper option instead of a conventional ileostomy. The patient's condition, which is not an indication of IPAA, such as poor anal sphincter function or anal cancer, can be indications for a continent ileostomy.

General contraindications include desmoid disease, obesity, or a situation which anticipates short bowel syndrome after formation of a continent ileostomy and Crohn's disease. The continent ileostomy needs intermittent intubation to evacuate the contents of the reservoir. Thus, if a patient cannot perform this procedure properly due to either a physically or a mentally poor condition, the continent ileostomy is an absolute contraindication. Obesity is relative contraindication due to the risk of valve slippage, and Crohn's disease usually is not recommended due to a high incidence of postoperative complications [77, 79].

Kock's Procedure

Approximately 50 cm of the terminal ileum is used for formation of Kock's continent ileostomy (Fig. 14.27). The ileum is folded with 15 cm length at 15 cm proximal point from the resected terminal ileum. The distal tubular ileal end opening is placed usually in the right lower quadrant [58, 59, 60].

S-Shaped Continent Ileostomy

According to this procedure, the posterior part of the ileal reservoir is made. Then, the distal part of the ileum is intussuscepted into the reservoir, and a nipple is made. Moreover, seromuscular reinforcement suture is applied between the distal part of the ileum and the reservoir. The reservoir is anchored securely on the abdominal wall [75].

14.2.5.2 Postoperative Outcomes

Nipple valve slippage is the most frequent postoperative complication of a continent ileostomy with a prevalence rate about 30 % [53, 63, 65]. Symptoms are outlet obstruction, difficult pouch catheterization, and incontinence. A diagnosis can be made according to clinical symptoms. The confirmation of nipple valve slippage can be done by an imaging study such as a barium enema. Normal radiographic finding of a continent ileostomy is an inverted nipple protruding into the pouch [71]. Conservative treatment can be used initially; repair or a new formation of a nipple can be considered as a surgical option.

A second frequent complication is pouchitis (7–43 %) [47, 53, 63, 65]. Common symptoms of pouchitis are fever, diarrhea, bleeding, and abdominal pain. Bowel contents, stasis, and overgrowth of anaerobic bacteria are considered as the etiology of pouchitis. Diagnosis can be done by clinical symptoms and endoscopic findings. Typical endoscopic findings are contact bleeding, friability, and ulcerative-erythematous mucosa. Treatment is conservative with proper antibiotics [69]. An effective continuous drainage of the reservoir is necessary.

In a rare case, excision of the reservoir is necessary. Intestinal obstruction after a continent ileostomy is usually due to the problem of the nipple valve and kinking of the conduit. The incident rate of intestinal obstruction is about 5 %.

14.2.6 Abdominal Colectomy with an Ileostomy

This procedure is usually indicated in an emergency situation such as fulminant colitis or toxic megacolon (Fig. 14.28). A severely ill patient may also be a candidate for this procedure. A colectomy with an ileostomy is a relatively safe and fast procedure compared to a TPC with anastomosis because there is no rectal dissection and an anastomosis procedure [48]. Even though there is an emergency situation, if a preoperative rectal evaluation using a proctoscopy shows that there is no rectal involvement of UC, the choice of surgical treatment is a colectomy. However, if there is severe rectal bleeding, a total proctocolectomy is necessary. Specific complications of this procedure are ostomy related complications such as parastomal hernia, stoma prolapse, stenosis, and parastomal skin irritation.

14.2.7 Minimal Invasive Surgery

Laparoscopic surgery can be used, and it can be beneficial in decreasing postoperative adhesion and preserve fertility in female patients. However, the operation time is longer than open surgery, and the benefits of minimal invasive surgery for ulcerative colitis are not conclusive [44, 50, 61].

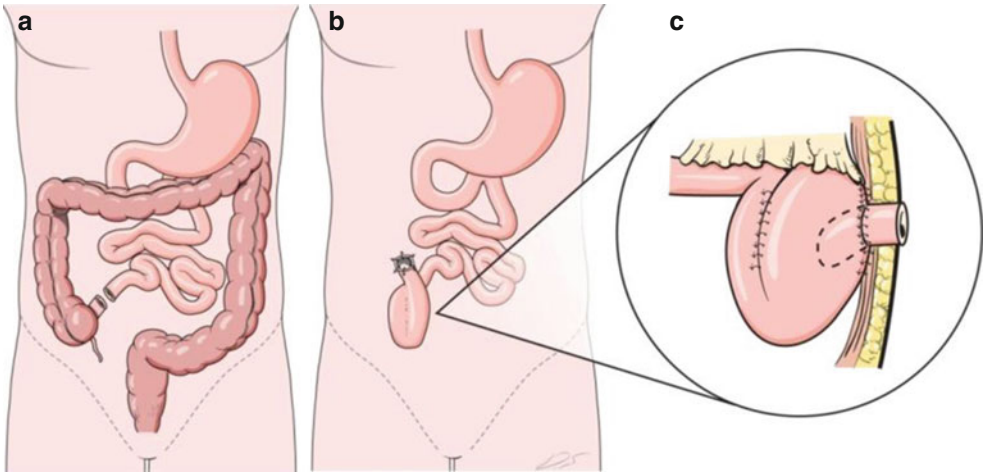

Fig. 14.27 Technique of a total proctocolectomy with a Kock's pouch. (**a**) Range of resection. Total colon and rectum are resected, (**b**) a Kock's pouch front view, (**c**) a Kock's pouch side view

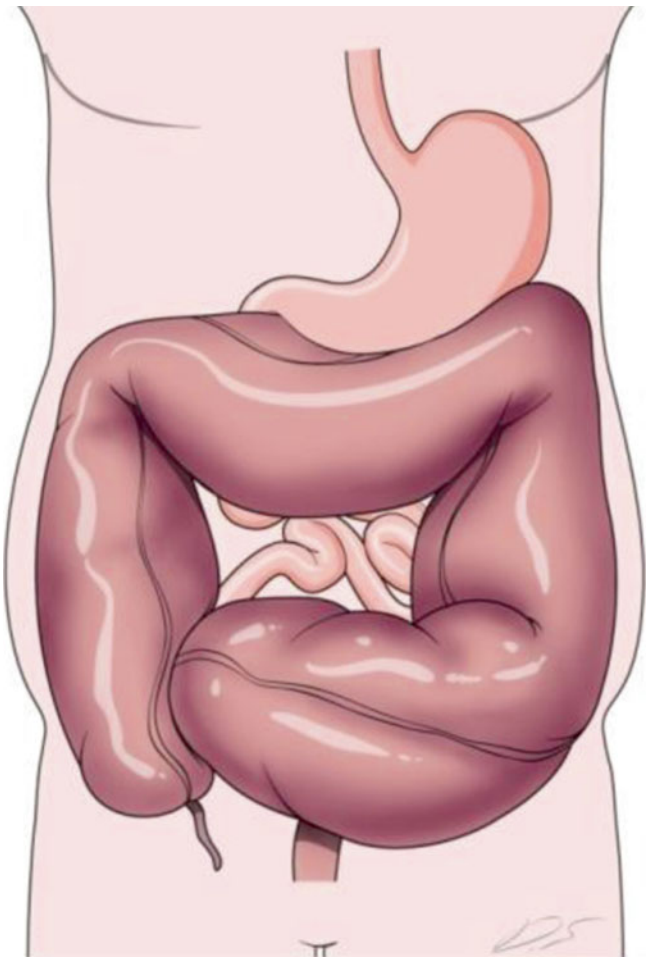

Fig. 14.28 Toxic megacolon

14.3 Behçet's Disease

There are many similarities between CD and intestinal BD in medical treatment and surgery. Both are treated with similar drugs and occasionally require repeated surgery. Surgery is considered in intestinal Behçet's disease patients who are unresponsive to medical treatment or those with bowel complications such as perforation or persistent bleeding [99]. An operation is required in about 5–10 % of patients with intestinal BD [89]. Generally, patients underwent a colonoscopy at the time of diagnosis, but some patients were first diagnosed with intestinal BD during surgery performed due to an acute or complicated presentation [93]. The general surgical treatment is resection of the involved bowel segment, but optimal surgical procedures and the length of normal bowel to be resected are still controversial.

14.3.1 Surgical Indications

The indications of surgical treatment are same with Crohn's disease. Surgery should be selected in patients with intestinal bowel perforation, intractability with medical treatment, intestinal bleeding, intestinal obstruction, presence of an abdominal mass, and enterocutaneous fistula formation. Partial intestinal obstruction, which does not respond to medical treatment, is usually elective surgery. Regarding indications for surgery between CD and intestinal BD, intestinal fistula, obstruction, and abscess were more common in patients with CD, whereas intractability with medical treatment and intestinal bleeding were more frequent in patients with intestinal BD. Early surgery is associated with a longer postoperative course free of clinical recurrence and reoperation compared with surgery performed during the course of the disease, at least in the subset of the patients with acute symptoms. Therefore, surgery should not be delayed in cases of unresponsiveness despite an appropriate effective medical treatment.

14.3.2 Surgical Techniques

The general surgical treatment is resection of the involved bowel segment. The most common involved site is the ileocecal area. In this situation, a right hemicolectomy or ileocecectomy may be the proper surgical option ([88], [97]) (Fig. 14.29). Intestinal lesions, usually at the ileocecal area, tend to recur at the anastomosis site and often require multiple operations because of perforations and fistula formation [94]. Because of mechanical trauma-induced inflammation, the pathergy phenomenon might be important here [90]. The resection margins and range are not established yet in patients with intestinal BD. If the involved colon segment is extensive from the ileocecal area to the sigmoid colon or rectum, a total colectomy or a total proctocolectomy is necessary. Others recommended a more conservative approach, resecting only grossly involved segments of bowel [91], since there seems to be no difference in the rate of recurrences after either modality.

The usual practice is to examine the bowel thoroughly during surgery, and bowel resection should include a generous normal resection margin as well as skip lesions. Since preoperative diagnosis is difficult and the recurrence rate is high, postoperative periodic follow-up with endoscopy is strongly recommended, with special attention to the anastomosis site.

Fig. 14.29 A surgical specimen after ileocecectomy in an intestinal BD patient

14.3.3 Postoperative Outcomes

Operation should be considered early in intestinal BD as complications are common and may be fatal. Recurrent ulceration is a well-recognized complication [89]. The recurrence rate of intestinal lesions was approximately 50 % at 2 years postoperatively [95]. Several types of postoperative recurrence exist, with the most common type being one or two new deep ulcers, followed by multiple aphthous ulcers and enterocutaneous fistulas. Lesions are found at or near the anastomotic site in 80 % of recurrent cases. In point of view in recurrence, repeated resections make massive intra-abdominal adhesion (Fig. 14.30), and dissection is very difficult and technically demanding.

Regarding postoperative outcomes in intestinal BD, the cumulative recurrence rates of intestinal lesions are 28 % at 1 year, 49 % at 2 years, and 75 % at 5 years. Most recurrences occurred at the anastomotic site or within the vicinity of the site as determined by endoscopy [91] (Fig. 14.31). Among the clinical variables studied, previous surgery for perforation or fistula was the only significant factor associated with postoperative endoscopic recurrence. More recently, it is identified volcano-shaped ulcers, higher CRP level (>4.4 mg/dL), and intestinal perforation on surgical pathology as independent predictors of recurrence [92]. Patients who received postoperative azathioprine had lower reoperation rates than those that did not.

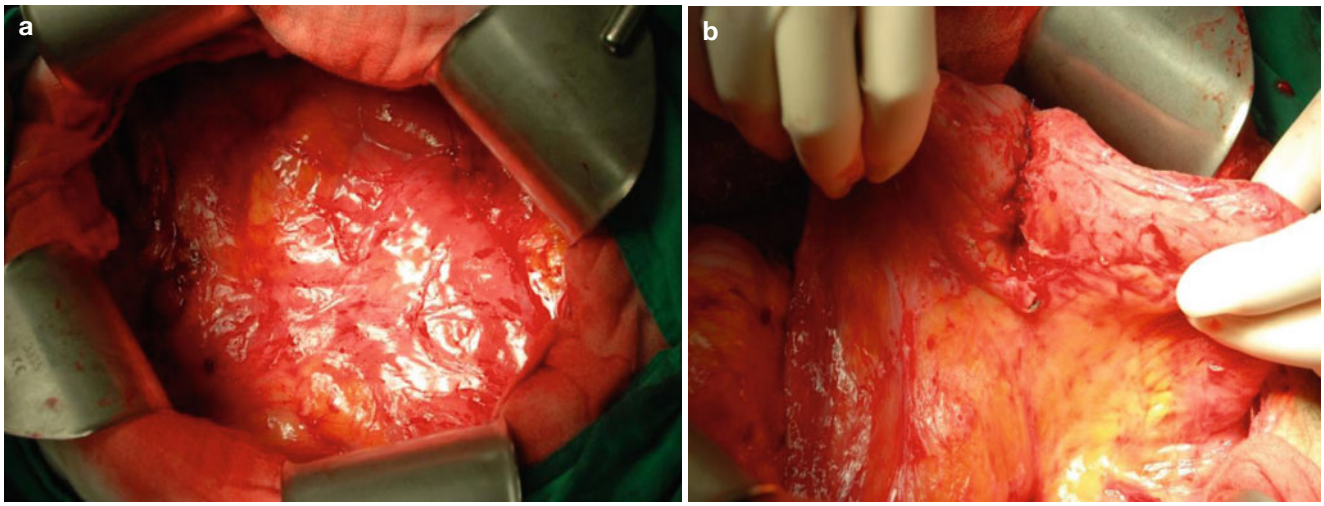

Fig. 14.30 Surgical finding in a Behçet's patient who underwent an operation three times due to recurrence. (**a**) Massive adhesion is observed. (**b**) Segmental resection of involved small bowel and end-to-end anastomosis was performed

Fig. 14.31 A recurred ulcer at the anastomotic site after surgery in a patient with intestinal Behçet's disease

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