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Seminars in ULTRASOUND CT *and* MRI

Ileal Pouch-Anal Anastomosis Surgery: Anatomy, Postoperative Complications, and Image-Guided Intervention

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Total proctocolectomy with ileal pouch-anal anastomosis (IPAA) surgery has become the surgical procedure of choice for chronic ulcerative colitis and familial adenomatous polyposis. Since its introduction in 1978, the technique of ileal pouch-anal anastomosis has improved and is commonly performed. Although associated with low mortality, postsurgical complications are frequent with which the radiologist should be familiar. An understanding of surgical technique and postsurgical anatomy facilitates the diagnosis of these frequently encountered complications and governs their potential image-guided intervention.
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Since its introduction in 1978 by Parks et al and Utsunomiya et al, total proctocolectomy with ileal pouch-anal anastomosis (IPAA) surgery has become the surgical procedure of choice for chronic ulcerative colitis and familial adenomatous polyposis (FAP).[1-7] Although total proctocolectomy with IPAA is technically demanding, gastrointestinal continuity is restored with maintenance of fecal continence and preservation of anal sphincters, elimination of the need for a permanent stoma, and improvement in the patient's quality of life. The procedure is associated with low mortality. However, early and late complications are frequently encountered; early complications include pelvic sepsis, anastomotic leaks with abscess formation, portal vein thrombus, small bowel obstruction (SBO), and late complications such as pouchitis, pouch strictures, fistula formation, and dysplasia and malignancy may occur.[3-7] This article discusses the indications for IPAA, surgical technique and postsurgical anatomy, post-IPAA complications seen on imaging, and image-guided intervention.

Indications

IPAA is an elective procedure for patients with chronic ulcerative colitis or for patients with FAP. The ulcerative colitis may be refractory to medical treatment or the side effects of the therapy may outweigh the treatment benefits. Also in the presence of dysplasia or malignancy, IPAA may be performed if standard oncologic resection is maintained. In middle to low rectal cancers, IPAA may be contraindicated as the anal sphincter may be damaged or adjuvant therapy may adversely affect the pouch and anal sphincter. Performance of an IPAA in patients with Crohn's disease remains controversial but several studies have suggested comparatively favorable functional outcomes in patients with Crohn's disease.[8-10]

IPAA has become the treatment of choice for patients with FAP as the incidence of colon cancer among patients with FAP reaches 100% if untreated. Ileal pouch adenomas are common after IPAA and risk factors that increase the likelihood of developing ileal pouch adenomas are patient >50 years of age and multiple (>1000) colonic adenomas at the time of surgery.[11]

All patients who are considered for IPAA should have intact anal sphincter function. Although age is not an absolute contraindication to this procedure, frequent episodes of incontinence and nocturnal evacuations are seen in older patients.[12] Careful patient selection is crucial to maximizing benefits from an IPAA while minimizing associated morbidity.

Surgical Technique

A colectomy is initially performed with sparing of the ileocecal pedicle and subsequently the ileum is transected within 2-3 cm of the cecum to create the ileal stump or appendage

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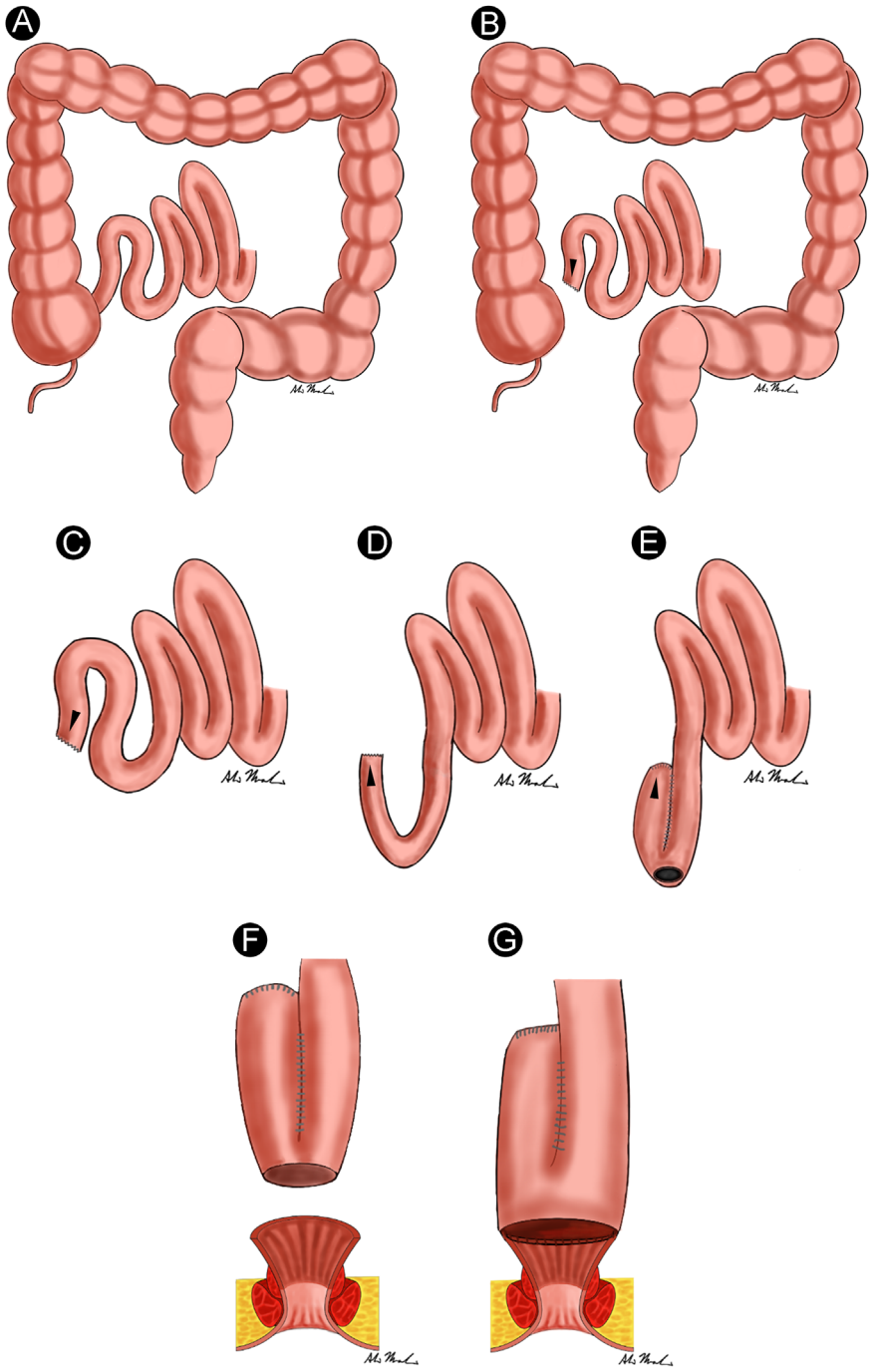

Figure 1 A colectomy is performed and an ileal stump is created (A and B). An ileal J pouch is then constructed by folding the terminal ileum back on itself (C and D). (Note the efferent limb or ileal appendage marked by a black arrowhead.) An enterotomy at the pouch apex is made where a linear stapler-cutter device creates a side-to-side anastomosis of the apposing ileal loops by cutting the bowel walls centrally to form a large pouch (E and F). A circular stapling device is inserted into the anus, which creates an anastomosis between the anus and the enterotomy site at the pouch apex (F and G).

(Fig. 1). At some institutions, confirmation of ulcerative colitis and exclusion of Crohn's disease are performed with frozen sections before completion of the IPAA. Construction of an ileal J pouch is then performed with 30-40 cm of the terminal ileum. The J pouch is usually constructed via an enterotomy at the apex of the pouch with a linear stapler cutter, which is used to create a side-to-side anastomosis of the apposing ileal loops by cutting the bowel walls centrally to form a large pouch (Fig. 1). Alternatively the ileal pouch can be hand sewn; that is performed in approximately 40% of IPAA cases.[3] Various pouch designs have been used including S, W, and J configurations; however, the J pouch is the most common type of reservoir secondary to the ease of construction and favorable outcomes.

To achieve a tension-free ileal pouch, the apex of the pouch should reach the inferior border of the symphysis pubis. A circular stapling device is then inserted into the anus and creates an anastomosis between the anus and the enterotomy site at the pouch apex (Fig. 1). This double-stapled technique requires a short length of residual anal transition zone to which the ileal pouch is anastamosed. Residual rectal mucosa is present with this technique allowing for recurrent mucosal disease and potential neoplastic transformation; however, improved functional results of the IPAA are achieved compared with an anastomosis at the dentate line. Another technique is a rectal mucosectomy that would remove nearly all residual mucosa but is associated with poorer function and higher rates of anastomotic leaks and parapouch abscesses.

A diverting loop ileostomy is used in a majority of cases, up to 79%,[3] to promote healing of the ileal pouch and ileoanal anastomosis and to decrease the incidence of pelvic and intra-abdominal sepsis and anastomotic leaks by diverting bowel contents. The ileostomy is reversed 8-12 weeks following the IPAA and after anastomotic sufficiency is confirmed with endoscopy, fluoroscopy with water-soluble contrast ("pouchography"), or both (Fig. 2).

Imaging

Pouchography, computed tomography (CT), and magnetic resonance (MR) are imaging modalities used to assess the normal pouch-anal anastomosis anatomy (Figs. 2 and 3) and to diagnose pouch-anal anastomosis-related complications.

Pouchography is typically performed prior to closure of the loop ileostomy to assess the integrity of the pouch and the distal pouch-anal anastomosis (Fig. 2).[13] Water-soluble contrast can either be instilled anterograde through the diverting ileostomy via a 14- or 16-F Foley catheter or retrograde through the anus. Retrograde opacification of the pouch is preferred and the fully distended pouch should be viewed in anteroposterior, oblique, and lateral views for optimal detection of anastomotic leaks or strictures.[13,14] Postevacuation images should also be obtained to detect occult leaks.[13,14]

CT is used when postsurgical complications are suspected or when patients present acutely with symptoms concerning for infection. CT is more sensitive for detection of abscesses compared with fluoroscopy.[6,13,14] Utilization of oral and intravenous contrast agents is recommended when a patient presents with symptoms suggestive of pelvic sepsis and water-soluble contrast can be injected transrectally into the pouch immediately prior to the CT acquisition if an anastomotic leak or dehiscence is suspected. MR is primarily used for identifying and monitoring disease activity in patients with inflammatory bowel disease (IBD). MR is also valuable in monitoring abscesses after appropriate treatment, imaging patients with complicated pouchitis after an IPAA surgery, and reassessing complications that necessitate frequent imaging such as fistulae formation.[15]

Familiarity with the surgical technique and postsurgical anatomy is essential for detection and classification of postsurgical complications, which dictates subsequent treatment.

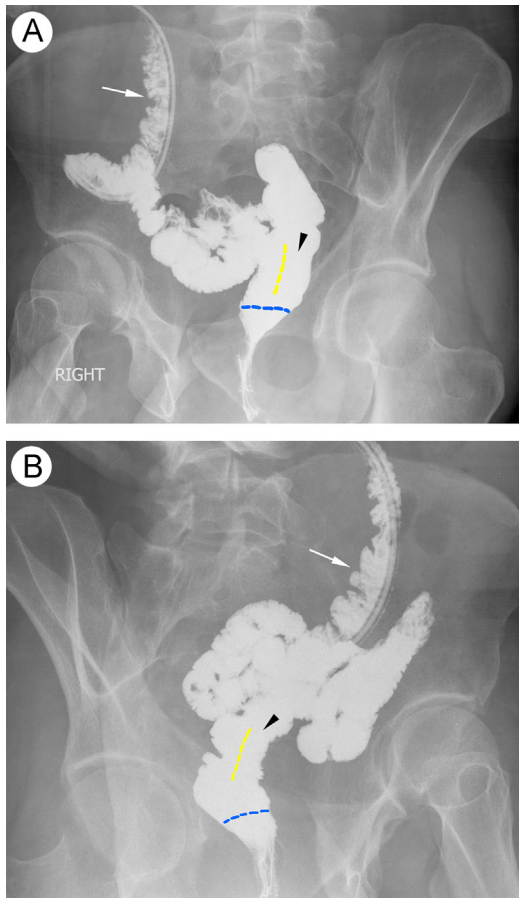

Figure 2 Bilateral oblique fluoroscopic images (A and B) obtained with water-soluble contrast injected through a temporary diverting loop ileostomy (white arrow) shows an ileal J pouch with the efferent limb or ileal appendage (black arrow). Anastomotic healing and sufficiency are confirmed on this pouchoscopy. (Color version of figure is available online.)

Postoperative Complications

The mortality associated with total proctocolectomy with IPAA is $<1\%$ owing to the fact that these patients are typically young with few or no comorbidities and the surgeries are performed at large tertiary care referral institutions.[5,16] Unlike the low mortality rate, morbidity remains significant,[5,16] but has decreased from as high as 54% reported in early studies to approximately 20% in recent literature.

Complications after an IPAA can be separated into early (within 30 days of surgery) and late (after pouch closure) complications.[5] Early complications include pelvic sepsis, anastomotic leaks and abscess formation, SBO, portal vein thrombosis, and small bowel hemorrhage. Late complications include pouchitis, fistulae formation, stricture formation, dysplasia, and malignancy.

Early Complications

Anastomotic Leaks and Abscess

The overall leak rate after an IPAA varies between 5% and 20% and the anastomotic sites are at an increased risk for

Figure 3 Axial (A and B) CT images through an IPAA show the proximal ileum (white arrowhead) and the oversewn blind end of the ileum or the efferent limb (black arrowhead). (C) The ileoanal anastomosis with a circular suture line is seen deep in the pelvis (white arrow).

dehiscence or leakage with potential abscess formation.[5,6,17] Leaks may develop from the oversewn ileal pouch, ileoanal anastomosis, or side-to-side anastomosis of the ileal pouch, so these anastomotic sites must be carefully scrutinized in patients who are suspected of having a leak. The 2 factors associated with high rates of leakage after IPAA are anastomotic tension and bowel ischemia.[5]

Controversy exists as to whether the anastomosis type, stapled or hand-sewn techniques, contributes to leaks and pelvic sepsis rates. The stapled technique resulted in improved functional results of the IPAA with lower rates of early sepsis complications in 2 studies,[18,19] although a study performed by Gecim et al showed no significant difference between the 2 techniques with regard to developing complications such as perianal fistula or abscess.[20]

The use of a diverting ileostomy and associated rates of ileoanal anastomotic leaks is controversial; Tjandra et al, on the one hand, showed a higher rate of ileoanal anastomotic dehiscence or leakage in patients who did not undergo a diverting loop ileostomy[21] and on the other hand, Sugerman et al and Dolgin et al both advocate the use of a 1-stage IPAA procedure without a temporary loop ileostomy.[22,23]

Pelvic sepsis secondary to suture anastomotic leaks or bacterial contamination of the surgical bed is the most important source of morbidity after IPAA and is the most common cause of pouch failure with an incidence ranging from 5%-37%.[5,24] Pelvic sepsis is defined as the development of abdominal, pelvic, or perianal infection within 3 months of ileal loop reversal or within 3 months of IPAA without a diverting loop ileostomy. Early sepsis usually occurs 3-6 days after an IPAA and presenting symptoms include fever; abdominal, pelvic, or perineal pain; tachycardia; or leukocytosis. Patients with pelvic sepsis have lower quality of life, worse functional outcomes, and higher rates of postoperative complications.[24]

Fluoroscopy is the modality of choice in detecting anastomotic leaks and injection of water-soluble contrast enables accurate detection and localization of leaks. On fluoroscopy, the presence of extraluminal contrast suggests a leak, sinus tract, fistula, or abscess. On CT and MR scans, mature abscesses are seen as well-defined, peripherally enhancing extraluminal fluid collections, which exert mass effect on adjacent structures and cause thickening or obliteration of peripouch mesenteric fat (Fig. 4). Abscesses may have foci of extraluminal air or air-fluid levels and are usually located posterior to the ileal pouch. Abscesses due to leaks may also be seen as collections of extraluminal contrast, which intercalate among leaves of the mesentery, forming acute angles.

Percutaneous drainage of deep pelvic abscesses is the standard of care when there are no indications for immediate surgical intervention.[25] Percutaneous drainage under CT or US guidance (Fig. 4) provides an alternative treatment to surgery or serves as a temporizing measure until surgery is indicated.[25] A transabdominal approach to draining deep pelvic abscesses can be difficult given the presence of multiple overlying structures including bowel, pelvic bones, bladder, gynecologic organs, and vasculature. The transgluteal approach is a useful and effective route to draining deep pelvic abscesses.[25-27] The catheter should be inserted as close to the sacrum as possible at the level of the sacrospinous ligament to minimize injury to the sciatic nerve (Fig. 4). The tandem-trocar technique or the Seldinger technique can be used to perform a transgluteal drainage (for a more detailed discussion of CT guided-transgluteal drainages of deep pelvic abscesses, see Harisinghani et al[25]).

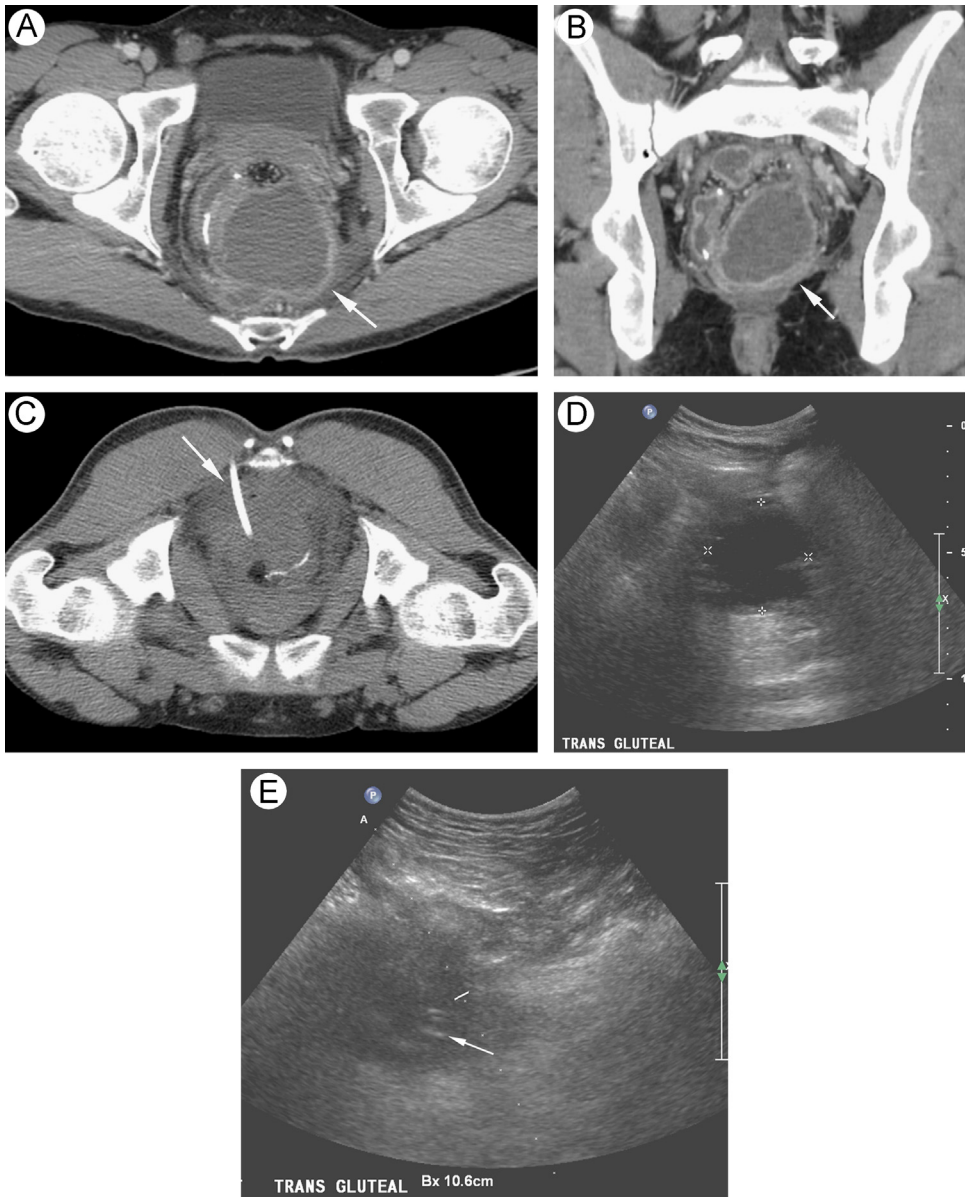

Figure 4 Axial (A) and coronal (B) CT images in a patient with Crohn's disease following IPAA demonstrate a perirectal abscess (white arrows). The abscess was drained under CT guidance (C); note the close positioning of the catheter to the sacrum (white arrow). The abscess recurred 2 months later (D) and the patient underwent US-guided drainage (E). (Color version of figure is available online.)

Small Bowel Obstruction

SBO is a common complication from an IPAA surgery with an average incidence of 11%.[3-6,13] Patients undergoing IPAA are at a high risk for obstructions due to the combined abdominal and pelvic dissections and the need for multiple surgeries.[5] Volvuli, postoperative adhesions, strictures, internal hernias (Fig. 5), and bowel torsion can cause SBO, which classically occurs at the ileostomy closure site.[6,13] SBO occurs more frequently in patients without a diverting ileostomy however, these patients have higher rates of early and late complications from obstructions requiring more frequent laparotomies.[5] CT is the modality of choice to evaluate for the site of SBO. The CT findings are not specific to IPAA and are classically seen as multiple dilated loops of distended small bowel, often with identification of a transition point. CT has the added benefit of allowing for the evaluation of other causes of abdominal and pelvic pain.

Portal Vein Thrombus

Although many different diseases can cause portal vein thrombus, an association with IBD has been established.[28-30] Preexisting conditions including IBD, sepsis related to abdominal or pelvic surgery, and portal pyemia are predisposing factors to portal vein thrombi. The hypercoagulable status of patients with IBD, heightened inflammation in the presence of pouchitis and abscesses, and dehydration secondary to diarrhea may contribute to portal vein thrombus in IBD. The mechanism of portal vein

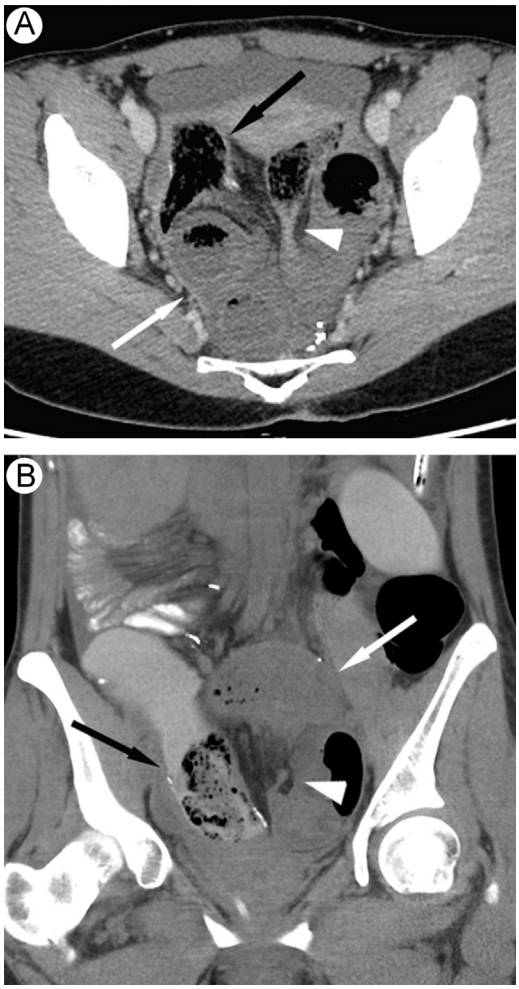

Figure 5 Axial (A) and coronal (B) images demonstrate a closed loop obstruction (white arrow) of the mid small bowel containing the ileostomy closure site, which has herniated through a mesenteric defect (white arrowhead) associated with creation of the ileoanal pouch (black arrow). The axial (A) image was obtained with intravenous contrast. The coronal image (B) was obtained after retrograde filling of the pouch and distal small bowel with enteric contrast.

thrombus after IPAA is likely multifactorial including mobilization of the small bowel to the mesenteric root, tension on the ileorectal anastomosis, and mobilization of the mesenteric vessels resulting in vascular endothelial stretch injury, which initiates a thrombotic cascade or shower emboli or both.[28-31] Portal vein thrombi after IPAA occur with a frequency of approximately 45%.[28,29] Most patients with portal vein thrombi are asymptomatic, however, they may present with abdominal pain, fever, nausea, or vomiting.[28] Thrombi are treated with anticoagulation and usually do not affect long-term pouch function or quality of life.[31]

Thrombi originate in the superior mesenteric vein and its branches and propagate into the main portal vein and can be occlusive or nonocclusive.[6] On CT, PV thrombi are seen as low-attenuation intraluminal venous filling defects (Fig. 6) and on MR, thrombi are hyperintense on T1-weighted images and of intermediate intensity on T2-weighted images. Peripheral wedge-shaped perfusion abnormalities on CT

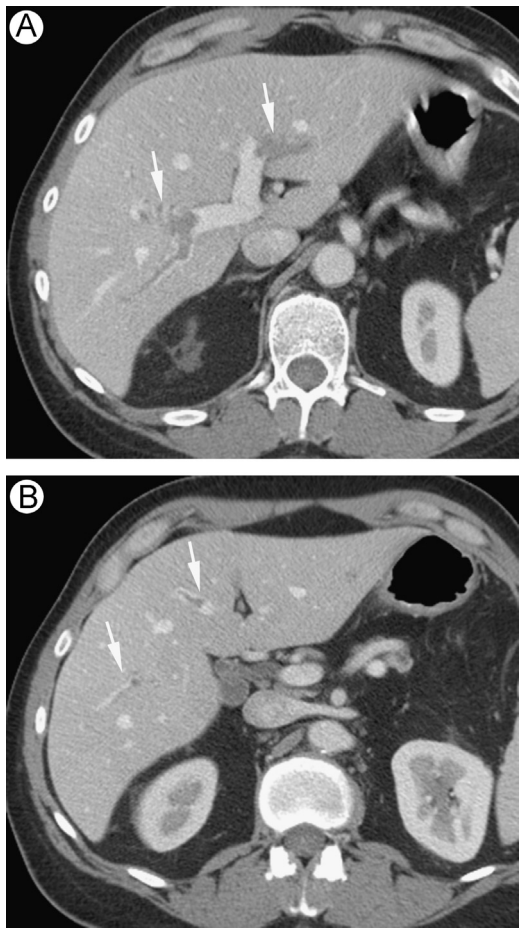

Figure 6 Two axial CT images (A and B) in a patient 3 weeks following IPAA show multiple portal venous thrombi in the right and left main portal branches extending distally (arrows).

and MR images can be seen secondary to compensatory arterial perfusion of the affected liver segments.[6,29]

Small Bowel Hemorrhage

Hemorrhage can occur directly from the ileoanal anastomosis or from pouch ischemia. Blood originating from the suture line is usually bright red in color whereas blood from pouch ischemia is dark red with clots.[5] Bleeding of the small bowel pouch after an IPAA surgery can be treated nonsurgically with pouchoscopy, clot evacuation, cauterization of the bleeding, and iced saline or saline with epinephrine enemas.[5] Intramural hematoma of the J pouch is a rare complication of IPAA procedure and can lead to scar tissue formation and even impair pouch function.[13] On CT, intramural hematoma is seen as segmental bowel wall thickening with high density in the submucosal layer.

Late Complications

Pouchitis

Pouchitis is a common complication after an IPAA with an overall incidence rate of 27%.[3,15,32,33] Approximately 20% of

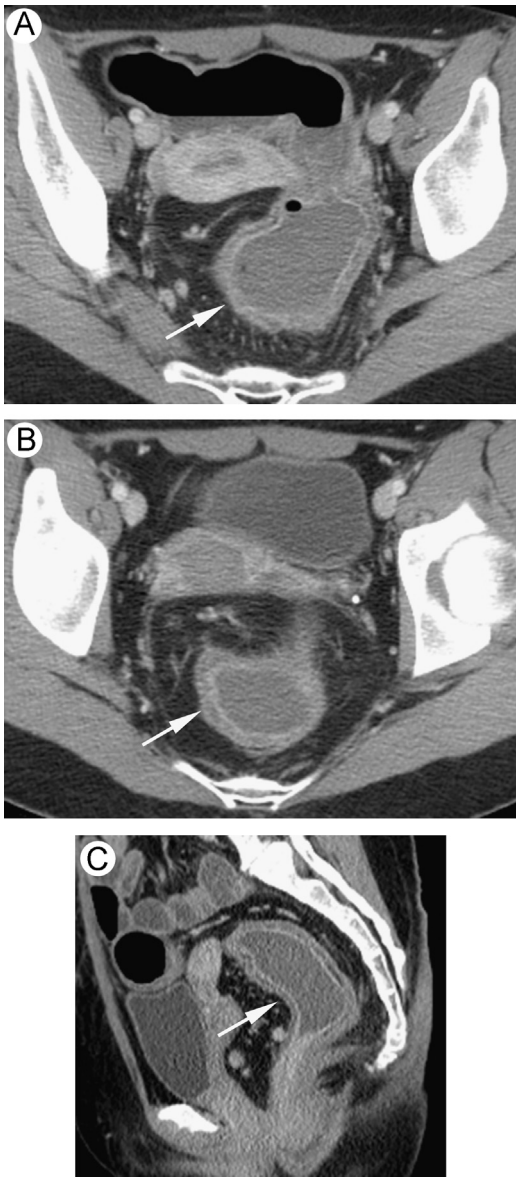

Figure 7 Axial (A), coronal (B), and sagittal (C) CT images demonstrate mucosal hyperenhancement and bowel-wall thickening of the ileum and J pouch (arrows), including a targetoid appearance suggesting submucosal edema, consistent with pouchitis.

patients would develop pouchitis 1 year after surgery and 50% of patients would be affected within 10 years of surgery.[34] The etiology of pouchitis is believed to be disequilibrium of bowel flora within the pouch.[6,15] Pouchitis is acute or chronic inflammation of the ileal pouch and patients present with watery diarrhea, abdominal pain, increased stool frequency and urgency, bright-red blood per rectum, fever, and extra-intestinal manifestations including iritis, arthritis, and pyoderma gangrenosum.[5] The diagnosis of pouchitis is suspected clinically and is confirmed endoscopically and histologically.[5,15,35] Pouchitis is characterized endoscopically by superficial ulcerations and histologically by acute granulocyte infiltration.

On pouchography, spicules, fold thickening, and pouch spasm are findings suggestive of pouchitis.[17] On CT and MR, pouchitis is seen as mucosal disease including pouch wall thickening and mucosal hyperenhancement as well as extra-mucosal disease including pouch dilatation, inflammation of the ileal pouch including surrounding fluid and stranding, peripouch lymphadenopathy, and fatty proliferation (Fig. 7).[6,13,15,17] Treatment includes medical management with antibiotic therapy and steroids, and chemotherapeutic agents can be used in refractory cases.[6,13]

Fistula Formation

Fistulae are the most difficult IPAA complication to treat and are one of the most common causes of pouch failure.[5,14,36] Fistulae can form secondary to persistent anastomotic leaks resulting in chronic inflammation and infection, inadvertent creation of a pouch-vaginal fistula due to surgical technique, or postoperative diagnosis of Crohn's disease. There is a close relationship between fistulae and Crohn's disease with a 20%-50% overall lifetime risk of fistulae formation with Crohn's disease; postoperatively fistulae may develop if Crohn's disease is not diagnosed accurately prior to surgery (Fig. 8).[5,6,13] Fistulae from Crohn's disease result from transmural spread of granulomatous disease or from anal gland infection and are more complex with multiple branches and ramifying tracts, as well as increased frequency of supralevator extension.[36,37] Fistulae are epithelialized tracts between bowel, abdominal wall, bladder, anal sphincter, and gynecologic organs.

An "anal clock" theme is used to describe the location of the origin in the anal canal and the course and direction of perianal fistula (Fig. 8). This facilitates communication with surgeons who use a similar scheme to describe perianal injuries.[38] With the patient in the lithotomy position, the anterior perineum is located at the 12 o'clock position, posterior perineum at the 6 o'clock position, the left lateral aspect of the anal canal at the 3 o'clock position, and the right lateral aspect of the anal canal at the 9 o'clock position.

The classification of perianal fistulae in Crohn's disease is variably defined[39]; however, the most commonly used classification system was proposed by Parks et al[40] that is based on the anatomical relationship of the fistula to the anal sphincters and pelvic musculature, specifically the external anal sphincter and puborectalis muscle (Fig. 9). Some investigators use the Parks classification system for evaluation of perianal fistulae in Crohn's disease.[41] Preservation of these structures is necessary to maintain fecal continence, thus the external sphincter is the keystone to the Parks classification.[38] Perianal fistulae are classified into 4 groups: intersphincteric, transsphincteric, suprasphincteric, and extrasphincteric. Intersphincteric fistulae are the most common accounting for 45% of cases where the fistulae ramify the internal anal sphincter only and travel between the 2 sphincters and out to the perianal skin (Fig. 8). Transsphincteric fistulae (30% of cases) traverse the internal and external anal sphincters and travel through the ischiorectal fossa to the skin. In suprasphincteric fistulae (20% of cases), the fistula courses superiorly through the intersphincteric space, coursing over the puborectalis muscle, then descends through the levator plate

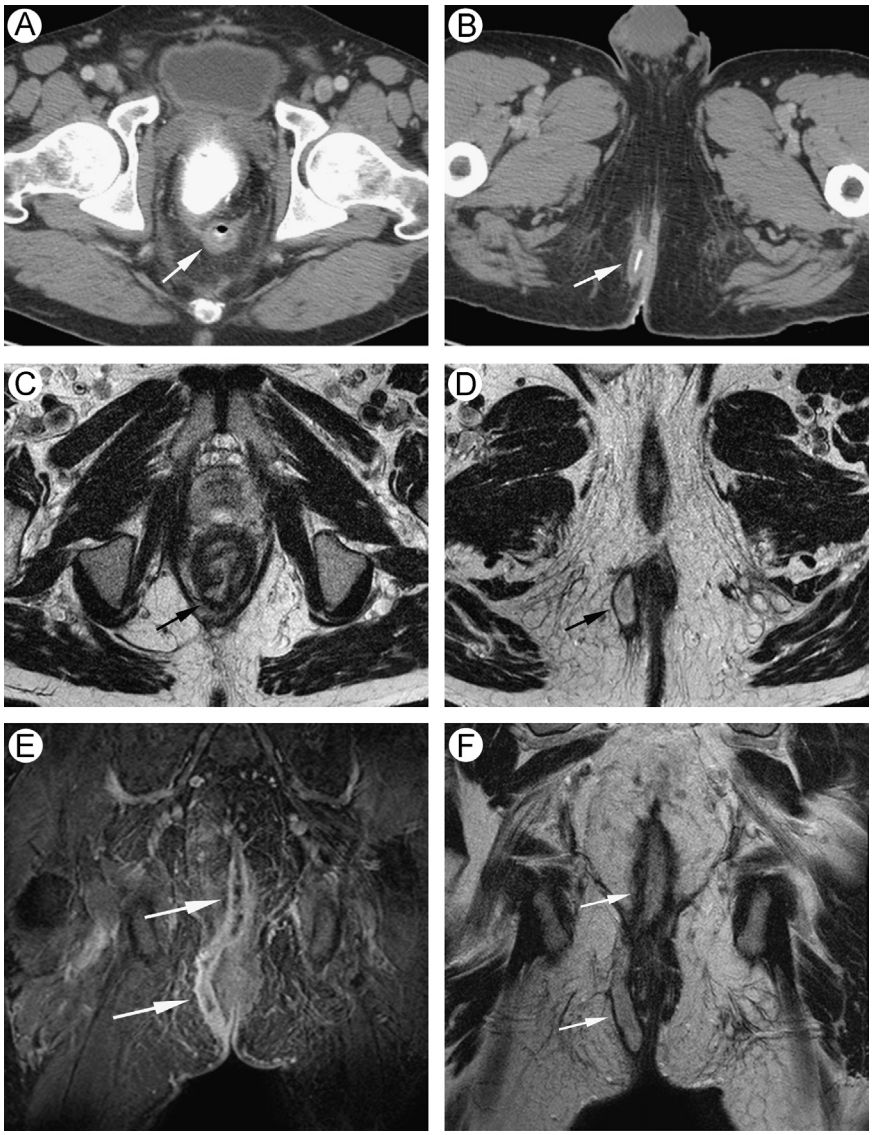

Figure 8 Axial CT images (A and B) in a patient with Crohn's disease after an IPAA shows a fluid collection in the pelvis posterior to the ileoanal anastomosis (A, white arrow) and a right perianal fistula containing enteric contrast (B, white arrow) that extends to the skin surface (not shown). Axial T2-weighted MR images (C and D) confirm the fluid collection as well as a patent perianal fistula at the 6 o'clock position (black arrows). Coronal T1 postgadolinium (E) and coronal T2-weighted (F) images demonstrate an intersphincteric fistula with supralevator extension. This case exemplifies the close relationship between fistulae and Crohn's disease.

into the ischiorectal fossa then to the skin. The extrasphincteric fistulae are the least common and account for 5%; the fistula extends from the skin through the ischiorectal fossa and levator muscles and opens directly to the rectum.[37,38] Extrasphincteric fistulae do not involve the internal or external anal sphincters and the anal canal is not involved.[38]

Pouchography was the earliest method used to detect perianal fistulae with the use of water-soluble contrast; however, fluoroscopy has low sensitivity (as low as 33%) for detection and the relationship to the anal sphincter complex cannot be assessed.[37,42] CT imaging can depict abscesses but has sensitivity as low as that of pouchography for detection of fistulae.[42] Also CT is limited in the ability to differentiate between fibrotic tracts and patent tracks.[37] Endoanal ultrasound and MR have become the imaging modalities of choice with similar accuracy in the preoperative evaluation of fistulae.[37] MR can be performed with external phased-array coils, endorectal coils, or a combination of both, but imaging with external phased-array coils is the most commonly used imaging technique.[37] The MR technique including the sequences and planes are beyond the scope of this article (for a more detailed description, see Sun et al[37] and de Miguel Criado[38]). A limitation of endoanal ultrasound is the limited field of view associated with the use of high-frequency transducers, which limits evaluation of extensive fistulous disease. Another limitation of ultrasound is that patients with Crohn's disease may not tolerate the use of an endorectal transducer secondary to pain and anal stenosis.[37]

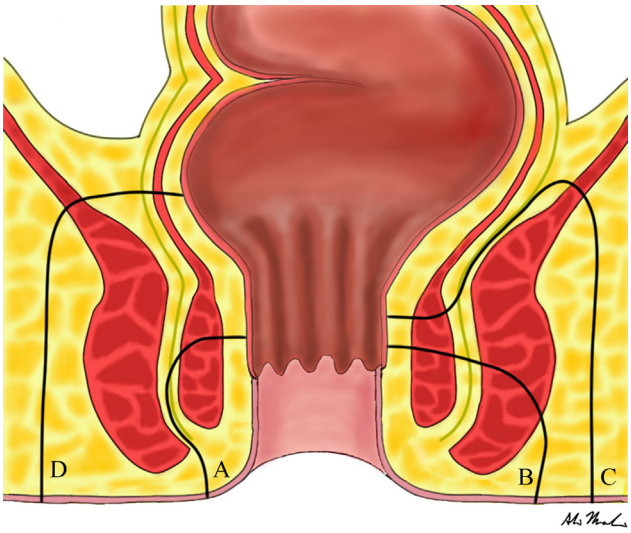

Figure 9 Parks classification of perianal fistulas. Intersphincteric fistulae (A) course through the intersphincteric space without involving the external sphincter. Transsphincteric fistulae (B) traverse both the external and internal sphincters and course below the puborectalis muscle within the ischianal fossa. Suprasphincteric fistulae (C) course superior to the puborectalis muscle traveling within the intersphincteric space and do not involve the external sphincter. Extrasphincteric fistulae (D) traverse the levator ani muscle with no involvement of the external or internal sphincters. (Color version of figure is available online.)

Perianal fistulae are treated surgically with transanal-ileal advancement flap construction.[43] Other treatment options for simple fistulae include seton placement or fistulotomy.[5]

Anastomotic Strictures

Strictures may form at the anastomosis because of ischemia or partial dehiscence at the site of anastomosis, resulting in fibrosis. Strictures can occur at the ileoanal anastomosis or at the proximal end of the J pouch.[5,6,44] Although the anal canal narrows to some degree postoperatively, strictures can be severe enough to obstruct the ileoanal pouch outlet. The rate of strictures in patients undergoing IPAA ranges from 8%-14%.[5,7]

CT is the imaging modality of choice in the assessment of stricture formation. Strictures manifest as focal bowel-wall thickening, most commonly at the staple line, with proximal bowel dilatation (Fig. 10).[6] Strictures are usually webs that can be dilated either manually or endoscopically.[5,6] The department of colorectal surgery at the Cleveland Clinic routinely performs a digital or proctoscopic assessment and dilatation at the initial postoperative clinic visit or at the time of ileostomy closure.[5] Recalcitrant anal strictures can be treated with a pouch advancement and neoileoanal anastomosis or radical revisional surgery including ileoanal anastomosis disconnection, revision, and repeat IPAA procedure.[5]

Dysplasia and Malignancy

After an IPAA, a short length of residual anal transition zone is used to anastomose the ileal pouch with the double-stapled technique. Also, the alternative surgical technique of rectal mucosectomy may theoretically fail to remove all rectal mucosa and thus does not guarantee elimination of disease.[5,45] This residual mucosa increases the risk of inflammation causing recurrent or persistent symptoms, polyp formation in patients with FAP, and neoplastic transformation.

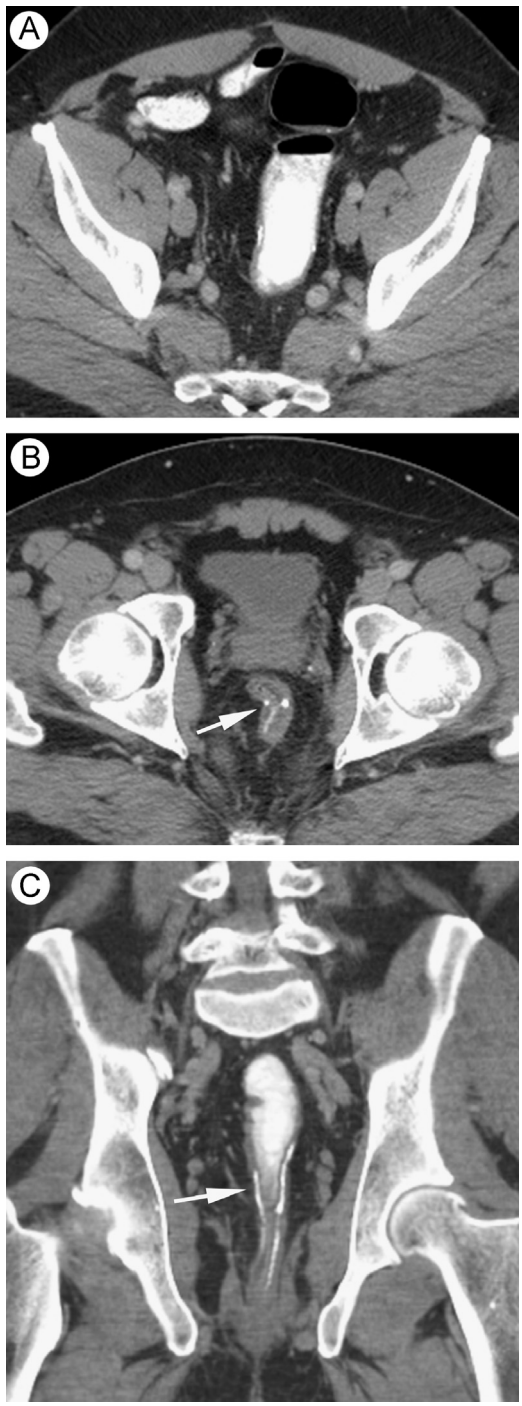

Figure 10 In this patient with ulcerative colitis, following IPAA, axial CT images proximal (A) and at the stricture (B, arrow) show a clear caliber change which is seen as a 4-cm narrowing in the distal ileal pouch just proximal to the anal anastomosis (arrow) on the coronal CT image (C).

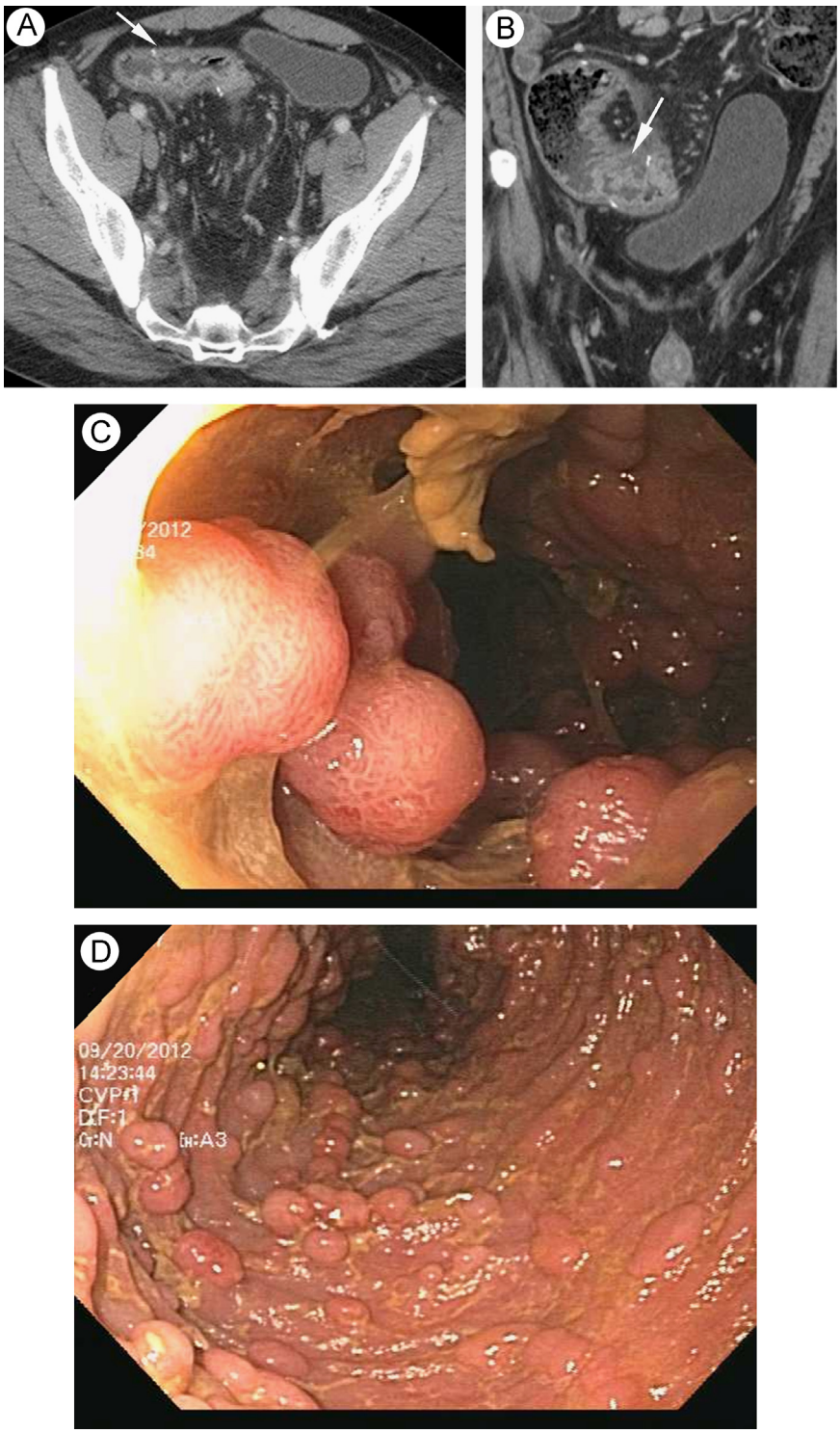

Figure 11 Axial (A) and coronal (B) CT images illustrate polypoid thickening (arrows) of the J pouch and ileoanal anastomosis in a patient with familial adenomatous polyposis. Numerous polyps were seen on endoscopy of the ileoanal anastomosis (C) and of the J pouch (D). Endoscopy images are courtesy of Dr Uri Avissar. (Color version of figure is available online.)

The retained islets in the anal glands are the major concern for developing adenocarcinoma in the ileoanal pouch. Postoperative follow-up with surveillance pouchoscopy and random biopsies have been proposed in patients after an IPAA who develop chronic pouchitis to detect malignant transformation.[46] A study performed by Gorgun and Remzi[5] followed up 178 patients who underwent serial biopsies for at least 10 years and showed that the estimated incidence of anal transitional zone dysplasia was 4.5% but no patient developed malignancy. However, they advocate periodic digital and endoscopic examinations of the ileal pouch despite the low incidence of malignant transformation.[5]

In patients with FAP, the incidence of malignancy in the rectal stump increases with age with risks up to 29% in patients at the age of 60 years.[45] Adenomatous polyps develop frequently, up to two-thirds of patients, in ileal pouch mucosa[47,48] and adenomatous polyps developed in the rectal mucosa in all patients as demonstrated in a study performed by Tajika et al (Fig. 11).[48] The rate of malignant transformation in the terminal ileum in patients with FAP can develop rapidly in an ileal pouch and the development of malignancy does not appear to follow the classic adenoma-carcinoma sequence.[11,49]

Summary

The standard surgical procedure of choice for chronic ulcerative colitis and FAP is total proctocolectomy with ileoanal pouch anastomosis. An acceptable complication rate with restoration of gastrointestinal continuity, maintenance of fecal continence with preservation of anal sphincters, elimination of the need for a permanent stoma, and improvement in the patient's quality of life has been established with IPAA. A radiologist's familiarity with the surgical technique and postsurgical anatomy is crucial for detection and classification of early and late postsurgical complications. Fluoroscopy, CT, and MR are various imaging modalities that can be used to detect early and late post-IPAA complications. US- and CT-guided percutaneous catheter placement is a valuable part in management of pelvic abscesses.

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