Diagnosis and classification of ileal pouch disorders: consensus guidelines from the International Ileal Pouch Consortium

Bo Shen, Gursimran S Kochhar, Revital Kariv, Xiuli Liu, Udayakumar Navaneethan, David T Rubin, Raymond K Cross, Akira Sugita, André D'Hoore, Jason Schairer, Francis A Farraye, Ravi P Kiran, Philip Fleshner, Joel Rosh, Samir A Shah, Shannon Chang, Ellen Scherl, Darrell S Pardi, David A Schwartz, Paulo G Kotze, David H Bruining, Sunanda V Kane, Jessica Philpott, Bincy Abraham, Jonathan Segal, Rocio Sedano, Maia Kayal, Stuart Bentley-Hibbert, Dino Tarabar, Sandra El-Hachem, Priya Sehgal, James T McCormick, Joseph A Picoraro, Mark S Silverberg, Charles N Bernstein, William J Sandborn, Séverine Vermeire

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Center for Interventional Inflammatory Bowel Disease (Prof B Shen MD), **Division of Colorectal Surgery** (Prof R P Kiran MD), **Department of Radiology** (S Bentley-Hibbert MD), **and Division of Digestive and Liver Diseases** (P Sehgal MD), **Columbia University Irving Medical Center–New-York Presbyterian Hospital, NY, USA; Division of Gastroenterology, Hepatology, and Nutrition,** (G S Kochhar MD, S El-Hachem MD) **and Division of Colon and Rectal Surgery** (Prof J T McCormick DO) **Allegheny Health Network, Pittsburgh, PA, USA; Department of Gastroenterology, Tel Aviv Sourasky Medical Center and Faculty of Medicine, Tel Aviv University, Tel Aviv, Israel** (Prof R Kariv MD); **Department of Pathology and Immunology, Washington University, MO, USA** (Prof X Liu MD); **IBD Center and IBD Interventional Unit, Center for Interventional Endoscopy, Orlando Health, Orlando, FL, USA** (U Navaneethan MD); **Inflammatory Bowel Disease Center, University of Chicago Medicine, Chicago, IL, USA** (Prof D T Rubin MD); **Inflammatory Bowel Disease Program, University of Maryland School of Medicine, Baltimore, MD, USA** (Prof R K Cross MD); **Department of Clinical Research and Department of Inflammatory Bowel Disease, Yokohama Municipal Citizens Hospital Yokohama, Japan** (Prof A Sugita MD); **Department**

Restorative proctocolectomy with ileal pouch–anal anastomosis is an option for most patients with ulcerative colitis or familial adenomatous polyposis who require colectomy. Although the construction of an ileal pouch substantially improves patients' health-related quality of life, the surgery is, directly or indirectly, associated with various structural, inflammatory, and functional adverse sequelae. Furthermore, the surgical procedure does not completely abolish the risk for neoplasia. Patients with ileal pouches often present with extraintestinal, systemic inflammatory conditions. The International Ileal Pouch Consortium was established to create this consensus document on the diagnosis and classification of ileal pouch disorders using available evidence and the panellists' expertise. In a given individual, the condition of the pouch can change over time. Therefore, close monitoring of the activity and progression of the disease is essential to make accurate modifications in the diagnosis and classification in a timely manner.

Introduction

Despite advances in medical therapy, colectomy is required for patients with medically refractory ulcerative colitis, poor tolerance of medications, colitis-associated neoplasia (in approximately 20% of patients), or familial adenomatous polyposis.[1] Surgical options for these patients include total proctocolectomy with end ileostomy, total colectomy with ileorectal anastomosis, and restorative proctocolectomy with ileal pouch–anal anastomosis (IPAA) or continent ileostomy. IPAA has become a common choice for most patients, as it substantially improves patients' health-related quality of life by preserving the natural route of defecation and avoiding a permanent stoma. However, this reconstructive surgery can be associated with various adverse sequelae. The underlying disease process (ulcerative colitis or familial adenomatous polyposis), surgical factors, and alteration in the anatomy and luminal environment can contribute to these adverse effects.

Over the past four decades, restorative proctocolectomy with construction of the ileal pouch has undergone numerous technical modifications. For example, various ileal pouch configurations have been designed, with the J pouch being the most commonly constructed. Other rarely used configurations of the pouch include the S pouch and Kock pouch, and the rarer W, H, and T pouches, and barnett continent ileal reservoir (appendix p 1). Although those pouch configurations share some adverse sequelae, some complications are specific to selected pouch designs. Advances in basic and clinical sciences have resulted in an improved understanding of aetiopathogenesis, diagnosis, and management of ulcerative colitis, familial adenomatous polyposis, and ileal pouch disorders. We assembled a panel of 37 international experts in inflammatory bowel disease, familial adenomatous polyposis, ileal pouch disorders, colorectal surgery, gastrointestinal pathology, gastrointestinal radiology, and paediatric gastroenterology to develop this consensus guideline for the diagnosis and classification of various ileal pouch and associated systemic disorders. The goals for the development of this reference document are to show the spectrum of pouch disorders, and to provide tools for practicing clinicians to recognise, appropriately diagnose, manage, and possibly prevent ileal pouch disorders.

Data collection

Search strategy and selection criteria

The steering committee first reviewed the published studies relevant to each statement. We searched MEDLINE, Google Scholar, EMBASE, and the Cochrane Central Register of Controlled Trials for studies published in English between Jan 1, 2000, and Oct 31, 2020 (figure 1). We used the search terms "inflammatory bowel disease", "Crohn's disease", "ulcerative colitis", "colectomy", "total proctocolectomy", "restorative proctocolectomy", "endoscopy", "pouchoscopy", "ileal pouch", "pouch", "pelvic pouch", "continent ileostomy", "Kock pouch", "postoperative", "complications", "anastomotic leak", "abscess", "sepsis", "fistula", "stricture", "stenosis", "obstruction", "prolapse", "intussusception", "twist", "volvulus", "floppy pouch complex", "pouchitis", "diversion pouchitis", "cuffitis", "dysplasia", "neoplasia", "cancer", "pouch polyps", and "anemia". The articles describing Crohn's disease, ulcerative colitis, familial adenomatous polyposis, pouchitis, cuffitis, Crohn's disease of the pouch, ileal pouch disorders, postoperative complications, and diagnosis and classification of these disorders were reviewed and relevant articles were included in this Review.

Consensus process

To be included in the consensus group, investigators were required to meet at least two of three criteria. First, they had to be in clinical practice focused on adult or paediatric inflammatory bowel disease (IBD) with experience in pouchitis and ileal pouch disorders. Second, they had published pouch-related articles. Finally, they had expertise in clinical IBD and its pathology and radiology, familial adenomatous polyposis, or colorectal surgery. The members of the steering committee had to have expertise in IBD care, diagnostic and therapeutic IBD endoscopy, advanced endoscopy, familiarity with gastrointestinal radiology, gastrointestinal pathology, or surgical modalities of IBD. Responsibilities of the steering committee include invitation and approval of panelists, screening of literature, and generation and revision of recommended items before the Delphi meetings. Members of the steering committee along with members of whole consensus group did the voting, revision, and re-voting.

We used the Delphi method to prepare this guideline document.[2] The consensus group (the core investigators in the consensus group comprise the steering committee) consists of nationally or internationally renowned IBD experts in medical, surgical, pathological, and imaging sciences. The steering committee invited the panellists on the basis of their involvement in clinical, educational, and academic activities related to ileal pouch disorders. The steering committee generated point items using the review of published studies that were circulated among members of the committee via group email. Multiple revisions were made according to the feedback from each committee member. The committee-approved draft was distributed among all members of the consensus group via email; the document was further revised multiple times on the basis of comments from the members. A virtual Continuing Medical Education consensus meeting (certified by the Accreditation Council for Continuing Medical Education and the American Osteopathic Association) with the first-round voting process was convened on Jan 16, 2021. The participants voted anonymously on their agreement with the statements, provided comments, and suggested revisions. The second round of the web-based voting process for the revised statements was done within 2 months of the virtual meeting. A statement was accepted if more than 80% of participants agreed with it.

This document was thus developed using published studies and a consensus among expert participants in the group. The guidelines were organised into the following sections: structural complications, inflammatory disorders, functional disorders, pouch neoplasia, and deficiencies and metabolic and systemic abnormalities associated with pouch. We used the Centre for Evidence-based Medicine methodology (University of Oxford, UK) to generate recommendations (appendix p 4). We graded the evidence level from 1 to 5 (with 1 having the strongest evidence) and graded recommendation from A to D (A being the most highly recommended).

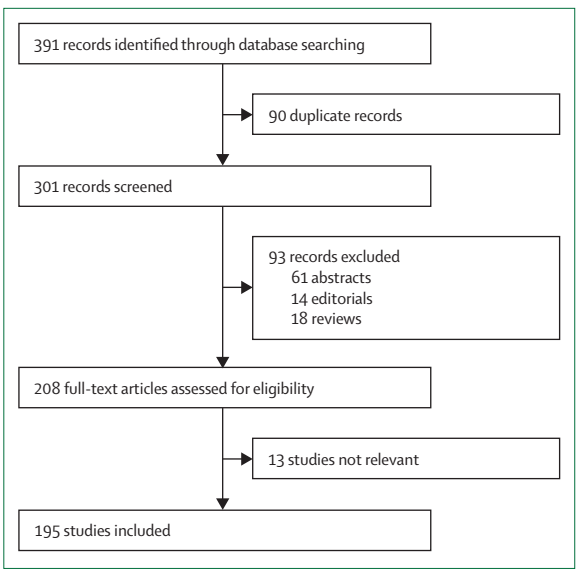

Figure 1: **Study selection**

Findings and guidelines

Narrative review

Published articles had to meet at least one of the following three criteria: (1) any randomised controlled studies and case-control studies related to restorative proctocolectomy and IPAA, pouchitis, or ileal pouch disorders; (2) case series of pouchitis (sample size [n]>100), pouch-related abscess or sepsis, pouch stricture, obstruction, fistula, Crohn's disease of the pouch, irritable pouch syndrome, anaemia, pregnancy, infertility, vitamin D or B12 deficiency, nephrolithiasis (n>50), pouch sinus, vaginal fistula, afferent limb syndrome, efferent limb syndrome, prolapse, floppy pouch complex, cuffitis, pre-pouch ileitis, obstructive defecation or dyssynergic defecation (n>20), tip of the J-pouch leak, twist or volvulus, or megapouch (n>10); or (3) studies of rare pouch disorders (defined as conditions that have been reported in case reports or case series or noticed by more than one panellist in their clinical practice) were eligible for evaluation. The consensus guidelines in Crohn's disease, ulcerative colitis, IBD, familial adenomatous polyposis, or pouchitis from the major professional societies (including the American College of Gastroenterology and European Crohn's and Colitis Organisation) were referenced. The selection criteria for the articles were determined by members of the steering committee of the basis of published studies and consensus as to their relevance to the consensus statements (table). Anatomy and landmarks of the pouch and diagnostic evaluation of the pouch disorders are provided in the appendix (appendix pp 1, 7).

of Abdominal Surgery, University Hospital Leuven, Belgium (Prof A D'Hoore MD); **Department of Gastroenterology, Henry Ford Health System, Detroit, MI, USA** (J Schairer MD); **Division of Gastroenterology and Hepatology, Mayo Clinic Florida, Jacksonville, FL, USA** (Prof F A Farraye MD); **Division of Colorectal Surgery, University of California–Cedars Sinai Medical Center, Los Angeles, CA, USA** (Prof P Fleshner MD); **Department of Pediatric Gastroenterology, Goryeb Children's Hospital–Atlantic Health, Morristown, NJ, USA** (Prof J Rosh MD); **Alpert Medical School of Brown University and Miriam Hospital, Gastroenterology Associates, Providence, RI, USA** (Prof S A Shah MD); **Division of Gastroenterology, New York University Langone Health, New York, NY, USA** (S Chang MD); **New York Presbyterian Hospital, Jill Roberts Center for IBD, Weill Cornell Medicine, Gastroenterology and Hepatology, New York, NY, USA** (Prof E Scherl MD); **Division of Gastroenterology and Hepatology, Mayo Clinic, Rochester, MN, USA** (Prof D S Pardi MD, D H Bruining MD, Prof S V Kane MD); **Department of Gastroenterology, Vanderbilt University Medical Center, Nashville, TN, USA** (Prof D A Schwartz MD); **IBD Outpatients Clinic, Catholic University of Paraná, Curitiba, Brazil** (Prof P G Kotze MD); **Department of Gastroenterology, Hepatology, and Nutrition, Cleveland Clinic, Cleveland, OH, USA** (J Philpott MD); **Houston Methodist and Weill Cornell Medical College, Houston, TX, USA** (Prof B Abraham MD); **Department of Gastroenterology and Hepatology, Hillingdon Hospital, Uxbridge, UK** (J Segal MBChB); **Department of Medicine, Division of Gastroenterology, Western University, London, ON, Canada** (R Sedano MD); **Department of Gastroenterology, Icahn School of Medicine at Mount Sinai Hospital, New York, NY, USA** (M Kayal MD); **IBD Clinical**

	Description	Evidence level (range 1–5)*	Grade of recommendation (range A–D)†
1. Structural complications			
1. Pouch leaks and consequences			
1.1.1	Anastomotic leak is defined as anastomotic or suture-line separation leading to fluid collection, abscess, fistula, or sinus tract.	2a	B
1.1.2	Pelvic sepsis refers to an infectious process present around the pouch in the true pelvis distal to the pelvic inlet.	2b	C
1.1.3	Pelvic abscess refers to a collection of purulent exudate outside the pelvic pouch with or without anastomotic dehiscence.	2b	C
1.1.4	Perianal abscess refers to a collection of purulent exudate immediately surrounding the anus.	2b	C
1.1.5	Pouch sinus is defined as a blind tract or cavity with the orifice originating from the bowel and mostly resulting from chronic anastomotic leak and abscess. The most common location of a pouch sinus is the posterior presacral space.	2b	B
1.1.6	Epithelialised pouch sinus can evolve from presacral chronic abscess cavity or sinus, which resembles a diverticulum on imaging. A true diverticulum can occur at the stoma closure site or anterior wall of the distal pouch body, which may result from the surgical technique or pouch dysmotility.	5	D
1.1.7a	Fistula in patients with ileal pouches is defined as an abnormal passage from one epithelial surface (eg, the ileal pouch, cuff, anal transition zone, or dentate line) to another epithelial surface (eg, the vagina, bladder, or abdominal, perianal, or perineal skin).	2c	C
1.1.7b	Extra-pouch fistula can be categorised based on the location of the internal and external (or target organ) openings and complexity. Common types of extra-pouch fistulas are pouch–vaginal fistula, ano–vaginal fistula, fistula-in-ano, perianal fistula, and enterocutaneous fistula. The fistula can be simple or complex.	2c	C
1.1.7c	Pouch–vaginal fistula refers to a fistula tract originating from the pouch body, cuff, anal transition zone to the vagina or labia. Common causes of pouch–vaginal fistula are surgical ischaemia-associated anastomotic leak, iatrogenic surgical injury, Crohn's disease or Crohn's disease-like condition, anterior distal pouch body or cuff prolapse, and cryptoglandular source.	2b	C
1.1.7d	Perianal fistula refers to an abnormal connection between the pouch, cuff, anal transitional zone, or anus canal and skin area immediately surrounding the anus. Perianal fistulas can be classified into single or multiple, and simple or complex, based on the number, relationship to internal and external anal sphincters, and presence of an abscess.	2c	D
1.1.7e	Leak at the tip of the J refers to a defect at the suture line or staple line of the location, which can lead to a pelvic abscess, fistula, or sinus.	4	D
1.1.7f	Exit conduit or nipple valve fistula occasionally can occur in a continent ileostomy, often with the internal opening being at the base of the valve.	5	D
2. Obstruction			
1.2.1a	Pouch stricture refers to abnormal narrowed bowel in patients with ileal pouches. Pouch stricture can be intrinsic or extrinsic, based on its relation to the lumen, wall, and extraluminal anatomy.	2b	C
1.2.1b	Pouch stricture can be categorised on the basis of location. Common locations of pouch strictures are the stoma closure site, segment of pre-pouch ileum between the stoma closure site and pouch inlet, pouch inlet, pouch body, and pouch–anal anastomosis in patients with pelvic pouches, and the nipple valve and exit conduit in those with continent ileostomies.	2b	C
1.2.1c	Pouch–anal anastomotic stricture is common and is considered a distinct clinical entity, which can be diagnosed with digital examination.	2b	C
1.2.1d	Intrinsic pouch stricture should be characterised by a combined assessment of endoscopy, histology, and imaging.	2b	C
1.2.1e	We recommend using a combined classification with at least location, length, traversability to a gastroscope or paediatric colonoscope, and the presence of ulcer to describe a pouch stricture (eg, a 3 cm passable ulcerated stricture at the pouch inlet).	2c	C
1.2.2	The long-term absence of the faecal stream can result in stricture of the diverted pouch.	4	D
1.2.3	Floppy pouch complex refers to a constellation of disorders whereby redundant pouch or bowel leads to luminal angulation or obstruction. These disorders include afferent limb syndrome, pouch prolapse, intussusception, pouchocele, and some forms of pouch twist.	4	D
1.2.4	Afferent limb syndrome refers to a condition in which a redundant loop of the distal afferent limb or adhesion causes a sharp angulation at the pouch inlet and an obstructive clinical presentation.	4	D
1.2.5	Efferent limb syndrome refers to a condition in which a kinking of an excessively long efferent limb in an S pouch results in ineffective evacuation.	4	D
1.2.6	Obstruction from pouch–rectal anastomosis can occur in an excessively long rectal stump in a pelvic pouch causing a sharp angulation between the pouch body and rectal stump. Proctitis or long rectal cuffitis is common in pouch–rectal anastomosis.	4	D
1.2.7	Pouch prolapse is an intussusception of the distal pouch that can block the outlet or even come through the anorectal ring (overt pouch prolapse). Pouch prolapse can be mucosal or full thickness. Anterior rectal cuff prolapse can also occur, mimicking cuffitis.	4	D
1.2.8	Pouchocele is a term adopted from rectocele, describing the bulging of the anterior wall of the pouch into the posterior wall of the vagina or pouch wall to the perineum.	5	D
1.2.9	Pouch twist refers to a condition in which a sharp horizontal bend or spiral turn (ie, volvulus-like) causes an obstructive clinical presentation.	4	D
1.2.10	Distal pouch septum refers to the presence of a bar-like structure at the pouch outlet, which mostly results from surgical technique. Patients with distal pouch septum can present with symptoms of outlet obstruction.	5	D
1.2.11	Exit conduit or nipple valve stenosis is common in a continent ileostomy, resulting in difficulty with self-catheterisation and obstructive symptoms. The stenosis can be intrinsic (eg, from repeated trauma of the catheter) or extrinsic (eg, from angulation and slipped valve).	4	D

(Table continues on next page)

	Description	Evidence level (range 1–5)*	Grade of recommendation (range A–D)†
(Continued from previous page)			
3. Other adverse sequelae			
1.3.1	Megapouch refers to a functional complication characterised by diffuse dilation of the pouch body (>12 cm in diameter) or small bowel (>6 cm in diameter) in the absence of mechanical obstruction.	4	D
1.3.2	Pouch bezoars often result from structural or functional obstruction of the pouch outlet. Underlying causes should be treated and the bezoars can be removed endoscopically if feasible.	4	D
1.3.3	Perianal or peristomal dermatitis refers to skin irritation or inflammation immediately surrounding the anus or stoma site.	4	D
1.3.4	Trapped ovary syndrome, inclusion cysts, or retention cyst can occur in patients with pelvic surgery, including ileal pouch–anal anastomosis and are characterised by intermittent or persistent pelvic fluid collection.	5	D
1.3.5	Portal or mesenteric vein thrombi can occur perioperatively in restorative proctocolectomy.	4	D
1.3.6	Pouch bleeding refers to a passage of blood or blood clots transanally in patients with pelvic pouches or through exit conduit in those with continent ileostomies.	4	D
1.3.7	Pain or discomfort at the stoma closure site is reported in patients with staged ileal pouch surgery.	5	D
1.3.8	There are anastomotic variants from pouch construction, such as an excessively long efferent limb of a J pouch (the rabbit-ear configuration) and redundant corner of the distal rectal stump at the anastomosis (dog-ear configuration).	5	D
4. Pouch failure and pouch excision			
1.4.1	Pouch failure is defined as the need for a permanent stoma, with or without excision of the pouch, or reconstruction of a new pouch.	2b	B
1.4.2	Chronic persistent perineal sinus often develops after pouch excision, particularly in those with perianal fistula or abscess.	2c	C
1.4.3	Post-pouch-excision U-shaped afferent limb is a rare cause of partial small bowel obstruction or fistula in those with permanent end ileostomy and pouch failure.	5	D
2. Inflammatory disorders of the pouch			
1. Pouchitis			
2.1.1	Pouchitis is diagnosed on the basis of a combined assessment of symptoms (eg, increased stool frequency, urgency, incontinence, nocturnal seepage, abdominal cramping, and pelvic discomfort) and endoscopic findings of inflammation. Histology plays an important role in the diagnosis and differential diagnosis of chronic pouchitis.	2a	B
2.1.2	When pouchitis is present, there is inflammation of the pouch body characterised by altered vascular pattern, granularity, erythema, exudates, friability, erosions, or ulcers on endoscopy.	2b	B
2.1.3	Serological and faecal markers, such as C-reactive protein, faecal calprotectin, or faecal lactoferrin, can be used as adjunct measures to further quantify pouch inflammation.	2b	B
2.1.4	Pouchitis can clinically be classified into acute or chronic with an arbitrary cutoff of 4 weeks based on the duration of persistent symptoms despite therapy. If there are more than 3–4 acute episodes per 12 months, this can represent a form of chronic pouchitis. Pouchitis has been classified into episodic or persistent phenotypes on the basis of pattern of activity. This classification can overlap with the classification of acute *vs* chronic pouchitis.‡	2c	C
2.1.5	Pouchitis can be classified into idiopathic (primary) or secondary on the basis of presence of identifiable causes.	5	D
2.1.6a	Pouchitis can be classified into antibiotic responsive, antibiotic dependent, or antibiotic refractory phenotypes, on the basis of response to commonly used antibiotics.	2b	B
2.1.6b	Antibiotic-responsive pouchitis refers to pouchitis with a favourable symptomatic or endoscopic response to conventional antibiotic therapy.	2b	B
2.1.6c	Antibiotic-dependent pouchitis refers to pouchitis with a favourable symptomatic or endoscopic response to conventional antibiotic therapy but with recurrent (>3–4 episodes per year) relapses requiring maintenance of antibiotics.‡	2b	B
2.1.6d	Antibiotic-refractory pouchitis refers to the minimum or absence of symptomatic and endoscopic response to 2–4 weeks of conventional antibiotic therapy, even if pouchitis had previously responded to antibiotics.‡	2b	B
2.1.7	Ischaemic pouchitis or ischaemia-associated pouchitis is diagnosed on the basis of characteristic endoscopic and histological features.	4	D
2.1.8	Immune-mediated pouchitis is diagnosed on the basis of a combined assessment of clinical, endoscopic, histological, and serological features.	4	D
2.1.9	In clinical practice, characterisation of pouchitis requires a combined assessment of different perspectives. A practical classification system can consist of duration, response to antibiotic therapy, such as chronic antibiotic-refractory pouchitis.	2b	B
2.1.10	The cause of pouchitis can evolve and shift over time and the disease phenotype of pouchitis is not static either.	5	D
2.1.11	Pouchitis is infrequent in patients with underlying familial adenomatous polyposis.	2c	C
2.1.12	Pre-pouch ileitis is inflammation found in the pre-pouch ileum (>5–10 cm above the pouch inlet) and can coexist with inlet stricture. It is associated with an increased risk of inflammation in the pouch body and the risk of pouch failure.‡	2c	C
2.1.13	The configuration of the ileal pouch in paediatric patients can appear different from that in adults on endoscopic and imaging because of different surgical technique, disease, and age-related factors.	4	D
2.1.14	Small bowel bacterial overload is normally present in most patients with ileal pouches who have faecal stasis in the pouch and the lack of a valve structure between the pouch body and afferent limb. Conventional breath tests may not be reliable in patients without a large bowel.	4	D

(Table continues on next page)

	Description	Evidence level (range 1–5)*	Grade of recommendation (range A–D)†
(Continued from previous page)			
2. Cuffitis			
2.2.1	Cuffitis is defined as the presence of endoscopic and histologic inflammation of the rectal cuff.	4	D
2.2.2	Cuffitis is classified into (topical) mesalamine or corticosteroid-responsive, corticosteroid-dependent, or corticosteroid-refractory phenotype.	4	D
2.2.3	Cuffitis is categorised into classic (ie, remnant ulcerative colitis) and non-classic (ie, Crohn's disease-associated, ischaemia-associated, prolapse-associated, pouch–rectal anastomosis, neoplasia-associated, or dyssynergic defecation-associated) phenotypes. A combined evaluation with clinical assessment, endoscopy, histology, cross-sectional imaging, defecography, or manometry is often needed to differentiate between the causes.	4	D
2.2.4	The disease course and treatment response of classic cuffitis (occurring in the 2–2·5 cm cuff) and inflammation in pouch–rectal anastomosis may be different.	4	D
3. Crohn's disease or Crohn's-like disease of the pouch			
2.3.1	The terms Crohn's disease of the pouch and Crohn's-like disease of the pouch can be used interchangeably. Crohn's disease of the pouch can affect any extra-pouch segments of the gastrointestinal tract synchronously or metachronously.	2c	C
2.3.2	Crohn's disease can result from: a pouch in which the precolectomy diagnosis was Crohn's colitis; inadvertently, in which the precolectomy diagnosis was ulcerative colitis but after pouch creation, the colectomy histopathological assessment suggests Crohn's disease; or inadvertently, in which the precolectomy diagnosis was ulcerative colitis but after pouch creation, de-novo Crohn's disease was diagnosed. Crohn's colitis is considered to be true Crohn's disease of the pouch, whereas the presence of preoperative or perioperative diagnosis of ulcerative colitis or indeterminate colitis is described as Crohn's-like disease of the pouch.	2c	C
2.3.3	A diagnosis of Crohn's disease of the pouch is made on the basis of a combined assessment of clinical, endoscopic, histological, and imaging features. The following features are suggestive of de-novo Crohn's disease of the pouch, irrespective of preocolectomy diagnosis of Crohn's disease: non-caseating, non-crypt-rupture-associated granulomas on intestinal biopsy of the pre-pouch afferent limb, pouch body, or cuff; segmental or skip lesions (such as longitudinal ulcers) or strictures in the pouch or small bowel; late development of fistulas or abscess (6–12 months after stoma closure); and pre-pouch ileitis.‡	2c	C
2.3.4	The presence of non-caseating, non-crypt rupture-associated granulomas in the afferent limb, pouch body, or cuff biopsy is highly suggestive of, but not required, for the diagnosis of Crohn's disease of the pouch.	4	D
2.3.5	The presence of transmural inflammation in the pouch is insufficient to make a diagnosis of Crohn's disease of the pouch.	4	D
2.3.6	The differential diagnosis of non-healing ulcers or persistent strictures or fistula of the pouch includes neoplasia and Crohn's disease.	4	D
2.3.7	Crohn's disease of the pouch can be classified into inflammatory, fibrostenotic or stricturing, or fistulising or penetrating phenotype.	2c	C
4. Diversion pouchitis			
2.4	Diversion pouchitis refers to a diffuse inflammatory condition in patients with a diverted ileal pouch and ileostomy.	4	D
5. Postcolectomy pan-enteritis			
2.5	Postcolectomy pan-enteritis can rarely occur after resection of the colon with or without the construction of the ileal pouch in ulcerative colitis. Its disease course is often aggressive, requiring advanced medical therapy.	4	D
3. Functional pouch disorders			
3.1	Irritable pouch syndrome refers to a condition in which patients present with symptoms (eg, urgency, abdominal cramps, increased bowel frequency, or decreased bowel consistency) in the absence of endoscopic, histological inflammation, or structural disorders. Currently, irritable pouch syndrome is considered a diagnosis of exclusion.	2c	C
3.2	Dyssynergic defecation or functional evacuatory difficulty refers to a condition in which patients present with excessive straining and a sense of incomplete evacuation in the absence of structural outlet obstruction.	2c	C
3.3	Pouchalgia fugax, a term adopted from proctalgia fugax, refers to functional recurrent anopouch pain with episodes of sharp pain lasting from seconds to several minutes in the absence of pain between episodes.	5	D
3.4	Neuropathic pain at the pouch–anal anastomosis refers to a painful and sensitive spot at the anastomosis.	5	D
4. Neoplasia in the ileal pouch			
4.1	Neoplasia of the pouch should be confirmed by at least one gastrointestinal pathologist.	2c	C
4.2	Neoplasia in the ileal pouch–anal anastomosis is predominantly glandular dysplasia or adenocarcinoma on histology.	2c	B
4.3	Dysplasia and adenocarcinoma in patients with ileal pouch–anal anastomosis predominantly originate at the cuff or anal transition zone, rarely in the pouch body or afferent limb.	2a	B
4.4	Lymphoma, squamous-cell dysplasia, or cancer are rarely seen in patients with ileal pouch–anal anastomosis.	4	D
4.5	Dysplasia and adenocarcinoma in patients with ileal pouch–anal anastomosis predominantly occur in those with a precolectomy diagnosis of colitis-associated colorectal neoplasia.	2a	B
4.6	Annual surveillance pouchoscopy is suggested in patients with a precolectomy diagnosis of colitis-associated dysplasia or cancer.‡	2a	B
4.7	The need and frequency of surveillance pouchoscopy depend on the risk. Irrespective of precolectomy colorectal neoplasia, surveillance endoscopy (every 1–3 years) is suggested for patients with other purported risk factors—ie, the presence of primary sclerosing cholangitis, chronic pouchitis, chronic cuffitis, Crohn's disease of the pouch, long-duration of ulcerative colitis (a total ≥8 years), or the presence of a family history of colorectal cancer in first-degree relatives.‡	2b	B

(Table continues on next page)

	Description	Evidence level (range 1–5)*	Grade of recommendation (range A–D)†
(Continued from previous page)			
4.8	Surveillance pouchoscopy (every 3 years) is suggested in the patients without the risk factors outlined in 4.7.‡	2c	C
4.9	Patients with any dysplasia of the ileal pouch, cuff, or anal transition zone who do not elect to have surgery should undergo close surveillance pouchoscopy, initially 3–6 months and yearly afterward.‡	4	D
4.10	In surveillance pouchoscopy, at least three biopsies are taken from the cuff or anal transition zone along with biopsies from the afferent limb and pouch body and submitted in separate containers. Endoscopically evident lesions should be sampled and submitted separately.	4	D
4.11	Routine surveillance pouchoscopy is not recommended in patients with a continent ileostomy.	5	D
4.12	Annual surveillance pouchoscopy is recommended for patients with familial adenomatous polyposis or other cancer-predisposing disorders.‡	2c	C
4.13	Squamous cell carcinoma or adenocarcinoma may develop in long-standing fistulas from the anastomosis, persistent presacral sinus, or perianal fistulas, and referral to the colorectal surgeon is considered for the examination.	4	D
5. Associated deficiencies, and metabolic and systemic abnormalities			
5.1	Anaemia is common in patients with ileal pouches, which is often multifactorial, predominantly from chronic inflammation, or bleeding, or both. We recommend annual screening for anaemia and monitoring pouch disease activity with complete blood counts, comprehensive metabolic panel, and C-reactive protein.	2c	C
5.2	Vitamin B12 or vitamin D deficiency is common in patients with a continent ileostomy or ileal pouch–anal anastomosis and yearly evaluation is recommended.	2c	C
5.3	Low bone mineral density, including osteopenia and osteoporosis, is common in patients with ileal pouch–anal anastomosis, particularly in those with concurrent primary sclerosing cholangitis. Routine screening (at least every 3 years) of bone loss with dual energy x-ray absorptiometry is recommended.‡	2c	C
5.4	De-novo coeliac disease can occur after restorative proctocolectomy. However, false-positive coeliac serology is seen in patients with ileal pouch–anal anastomosis. A combined assessment of clinical, endoscopic, histological, and serological evaluation is recommended for the diagnosis. We recommend duodenal biopsy and coeliac serology (eg, tissue transglutaminase A and IgA) in patients with chronic antibiotic-refractory pouchitis, anaemia, or iron deficiency.	4	D
5.5	Nephrolithiasis has been reported in patients with ileal pouches and its evaluation can be considered in those with acute abdominal or flank pain.	4	D
5.6	Mental health issues such as depression and anxiety are common in patients with ileal pouches and bowel symptoms or structural, functional, or inflammatory disorders. We recommend routine screening of the patients with chronic bowel symptoms and mental health issues with appropriate psychological or psychiatric referral or intervention. We recommend using validated depression and anxiety questionnaires along with quality-of-life scores.	4	D
5.7	Sexual dysfunction can occur in both men (eg, erectile or ejaculation dysfunction), and women (eg, dyspareunia). We recommend asking about intimacy or using sexual questionnaires in preoperative evaluation and postoperative follow-up.	2c	C
5.8	Benign prostate hypertrophy is reported in adults with ileal pouch–anal anastomosis, including young patients. Digital examination for prostate cancer screening may not be reliable in patients with a pouch. A transperineal, rather than transpouch, approach is recommended if a prostate biopsy is required.	2c	C
5.9	Restorative proctocolectomy with ileal pouch–anal anastomosis decreases fertility or fecundity in female patients. The laparoscopic approach reduces risk when compared with open surgery.	2a	B
5.10	Caesarean section should be considered the mode of delivery of choice for patients with ileal pouches, especially those with mucosectomy and hand-sewn anastomosis or those with difficulties in labour, to prevent anal sphincter injury and long-term effects on pouch function. Individualised decisions should derive from the patient, obstetrician, and colorectal surgeon.	4	D
5.11	Postoperative excessive weight gain can be associated with a risk of adverse pouch outcomes, such as chronic pouchitis, presacral sinus, and pouch failure. The measurement of mesenteric fat area and peripouch fat area with cross-sectional imaging can provide diagnostic and prognostic clues.	4	D
5.12	Extraintestinal manifestations of inflammatory bowel disease are common in patients with ileal pouches and are risk factors for pouchitis.	2c	C
5.13	Concurrent primary sclerosing cholangitis in patients with ulcerative colitis and ileal pouches poses a higher risk of enteritis, pouchitis, and possibly neoplasia. Diagnostic and surveillance pouchoscopy (every 1–3 years) is recommended.‡	2c	C
5.14	Liver transplantation for primary sclerosing cholangitis does not seem to affect pouch outcome or vice versa. The diagnostic and surveillance pouchoscopy schedule is the same as for patients with non-liver transplanted primary sclerosing cholangitis.	4	D

*Evidence level was graded into: (1a) systemic review with homogeneity of RCTs; (1b) individual RCT; (1c) all or none; (2a) systemic review of cohort studies; (2b) individual cohort study; (2c) outcome research or ecological studies; (3a) individual case-control study; (4) case-series; and (5) expert opinion. †Grades of recommendations range from A (consistent level 1 studies), B (consistent level 2–3 studies or extrapolation from level 1 studies), C (level 4 studies or extrapolation from level 2 or 3 studies), to D (evidence or troublingly inconsistent or inconclusive studies of any level; appendix p 4). ‡The quantified duration, interval, or length in the recommendation is based on the agreement with relevant evidence in principle and a combined assessment of current literature and clinical adjustment of the panellists.

Table: **Consensus statements for the diagnosis and classification of ileal pouch disorders**

Structural complications

Anastomotic, staple-line, or suture line leaks or strictures are common in patients with restorative proctocolectomy and IPAA or continent ileostomy. Subsequently, some patients develop infectious complications or obstructive symptoms. Restorative proctocolectomy with

Center, University Hospital Center Dr Dragiša Mišović, Belgrade, Serbia

(Prof D Tarabar MD); **Department of Pediatrics, Columbia University Irving Medical Center–Morgan Stanley Children's Hospital, New York, NY, USA** (J A Picoraro MD); **Mount Sinai Hospital Inflammatory Bowel Disease Centre, Toronto, ON, Canada** (Prof M S Silverberg MD); **Inflammatory Bowel Disease Clinical and Research Centre, University of Manitoba, Winnipeg, MB, Canada** (Prof C N Bernstein MD); **Department of Gastroenterology, University of California San Diego, San Diego, CA, USA** (Prof W J Sandborn MD); **Department of Gastroenterology, University hospitals Leuven, Leuven, Belgium** (Prof S Vermeire MD)

Correspondence to: Prof Bo Shen, Center for Inflammatory Bowel Diseases, Columbia University Irving Medical Center–NewYork Presbyterian Hospital, New York, NY 10032, USA
bs3270@cumc.columbia.edu

See **Online** for appendix

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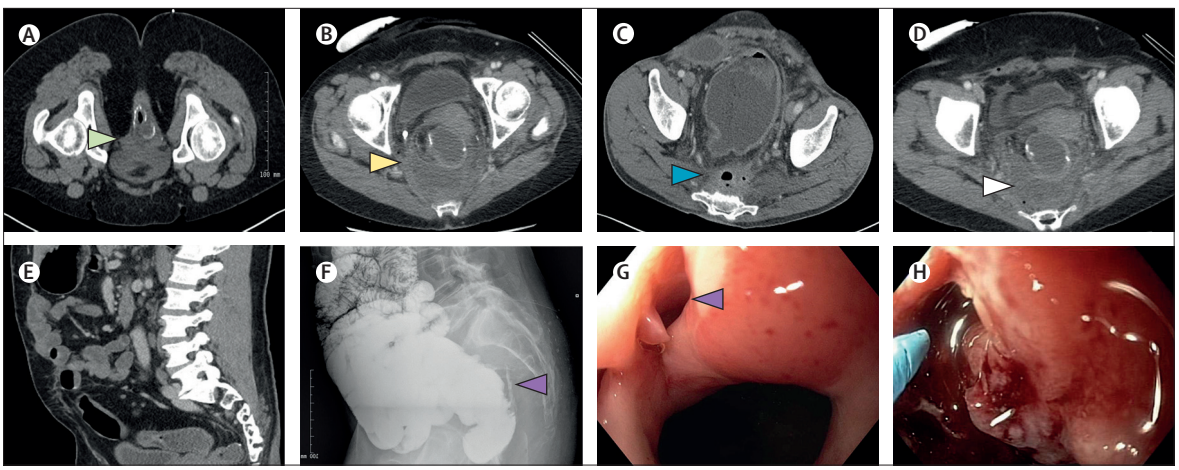

Figure 2: **Pouch leaks, sepsis, abscess, and fistula**
(A) Staple anastomotic leak (green arrow). (B) Pelvic sepsis (yellow arrow). (C) Pelvic abscess (blue arrow). (D) Immediate postoperative peri-pouch fluid collection (white arrow). (E) Complex perianal fistulas with setons from anastomotic leak. (F–G) Presacral sinus resulting from anastomotic leak (purple arrows). (H) Endoscopic sinusotomy with needle knife.

the construction of an ileal pouch can cause other structural or mechanical complications.

Pouch leaks and consequences

Leaks at the anastomosis, staple line, or suture line can occur any time after the surgery (figure 2A–C). Anastomotic leak typically occurs as an early complication within 90 days after surgery. However, late-onset leaks can also occur.[3]

In the absence of a diverting stoma, anastomotic leaks can be more likely to lead to pelvic and abdominal sepsis or peritonitis. In the presence of a loop ileostomy, anastomotic leaks are more likely to be small, have a subclinical course, and only become apparent on pouchography or MRI scans before ileostomy closure or delayed as a septic problem after ileostomy closure. Any pelvic septic event in the vicinity of the staple line should be considered a leak. It is sometimes hard to distinguish a small leak from an infected haematoma within the pelvis. The classification of treatment-oriented anastomotic leakage following anterior resection of the rectum can be applied to leak at the pouch–anal anastomosis.[4]

One of the detrimental consequences of an anastomotic leak is pelvic sepsis (figure 2B). The definition of sepsis as systemic inflammatory response syndrome (including changes in blood pressure, heart rate, and organ failure) does not apply to this concept of pelvic sepsis, which relates to a local infectious process within the pelvic area. A Cleveland Clinic (Cleveland, OH, USA) study[3] reported a prevalence of early pelvic abscess of 6·4% and late pelvic abscess of 2·8%.[3] Pelvic sepsis can be associated with pouchitis. In 68 patients identified with apparent antibiotic-dependent recurrent pouchitis, 38% of cases were found to have chronic pelvic sepsis.[5] Peripouch fluid collection immediately after pouch construction can, however, be a normal postoperative change (figure 2D).

Anastomotic leaks can also lead to pelvic or perianal fistulas or abscesses (figure 2C, E). The common causes of perianal fistula and abscess in patients with a pouch are Crohn's disease, surgical leaks, or cryptoglandular infection. Perianal disease should lead to consideration for Crohn's disease, especially in the presence of concurrent luminal inflammation.

Chronic anastomotic leak or abscess can result in pouch sinus, with the most common location at the presacral space (figure 2F–G). Pouch sinus is a common cause for pouch failure,[6] with a reported frequency of 2·8%–8%.[6–9] Pouch sinus shares similar risk factors with chronic pouchitis, such as male sex.[10]

Fistula formation is common in patients with pelvic or abdominal pouches, with various causes, locations, configurations, and outcomes. Our expert panel suggests that fistula in restorative proctocolectomy with IPAA or continent ileostomy can be categorised into pouch fistula (ie, pouch–pouch fistula; figure 2H) or extra-pouch fistula (recommendations 1.1.7a and 1.1.7b, table). Extra-pouch fistulas include enterocutaneous fistula, ano–vaginal fistula, fistula-in-ano (figure 3E), and perianal fistula (figure 3F), and pouch–vaginal fistula (figure 4A–D; recommendation 1.1.7c, table). The most common causes of pouch fistula are anastomotic complications (eg, leak or stricture), ischaemia, sepsis, Crohn's disease, or Crohn's disease-like condition, and cryptoglandular abscesses. Pouch fistula has also been classified into anastomotic related, IBD-related (with sub-classifications Crohn's disease [type A] and non-Crohn's disease [type B]) in origin, cryptoglandular related, and malignancy related.[11] Timing of the development of fistula after IPAA could help determine the probable cause. Our expert panel suggests that

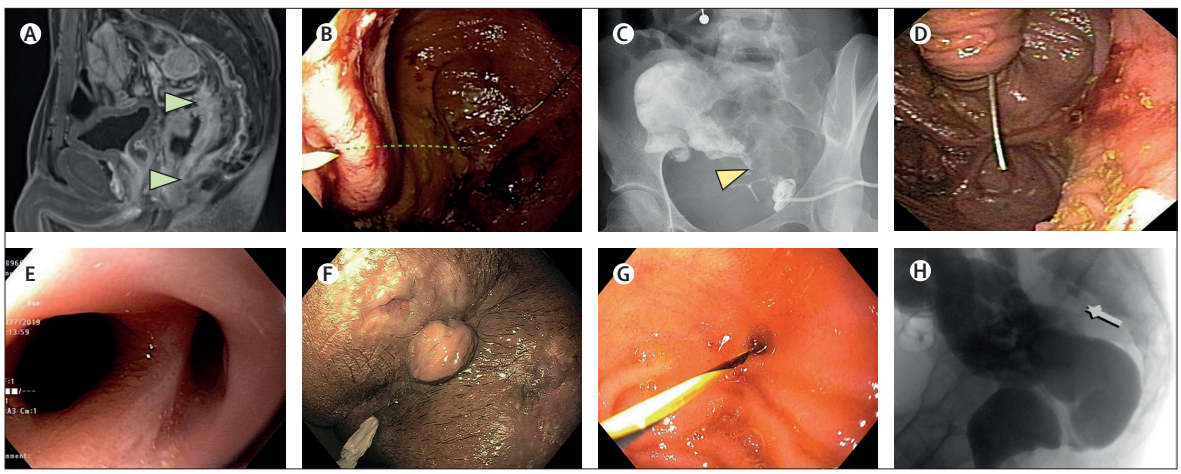

Figure 3: **Pouch fistulas**
(A) Pouch–pouch fistula from anastomosis to the tip of the J (green arrows). (B) Pouch–pouch fistula from anastomotic leak detected with a guidewire (green dotted line). (C) Enterocutaneous fistula from a Barnett pouch body to skin with drained abscess cavity on fistulogram (yellow arrow). (D) Enterocutaneous fistula originated from the base of the nipple valve of a Kock pouch. (E) Fistula-in-ano. (F) Branched perianal fistulas with multiple opening from Crohn's disease. (G–H) A leak at the tip of the J detected with a guidewire and gastrografin pouchography (white arrow).

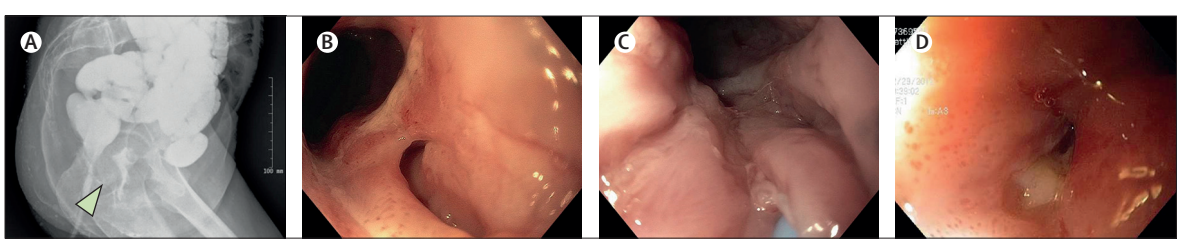

Figure 4: **Pouch–vaginal fistulas**
(A) Pouch–vaginal fistula originating from the anastomosis (green arrow) and opacification of the vagina on gastrografin pouchography. (B) Pouch–vaginal fistula originated from the anastomosis. (C) Pouch–vaginal fistula originated from the dentate line with a seton in place. (D) Pouch–vaginal fistula from Crohn's disease.

fistulas occurring within 6–12 months of pouch construction are probably surgical, whereas fistulas arising more than 6–12 months after pouch construction are likely to be caused by Crohn's disease.

The presence of perianal fistula in patients with restorative proctocolectomy and IPAA is not necessarily indicative of Crohn's disease of the pouch (recommendation 1.1.7d, table). The common causes are Crohn's disease, surgical leaks, or cryptoglandular sources. The fistula tract can be short or long, single or multiple, or simple or branched (figure 3F). Perianal fistula can be further classified using Parks' classification.[12]

The tip of the J site is prone to surgical ischaemia, which can manifest as ulcer, leak, abscess, sepsis, or sinus (figure 3G–H). The defect or leak at the tip of the J can be detected by an endoscopic guidewire, gastrografin enema, or pelvic MRI (recommendation 1.1.7e, table).

Pouch–vaginal fistula is a unique phenotype of fistula and is one of the most severe complications in women after IPAA. Causes of pouch–vaginal fistula include Crohn's disease, iatrogenic injury, surgical ischaemia, pouch prolapse, and cryptoglandular abscess (figure 4A–D; recommendation 1.1.7c, table). Of 102 patients with a pouch–vaginal fistula after IPAA, fistulas developed within 12 months after stoma closure, and 43 fistulas occurred after 12 months; a postoperative delayed diagnosis of Crohn's disease was associated with treatment failure.[13]

Common configurations of a continent ileostomy are the Kock pouch[14] and barnett continent ileal reservoir.[15] The main causes of a dysfunctional continent ileostomy are mechanical, such as prolapse, stenosis, fistula, or abscess (figure 4C–D). The base of the nipple valve is susceptible to form fistulas and abscesses (recommendation 1.1.7f, table).

Obstruction

The terms obstruction, stricture, or stenosis are often used interchangeably in publications. Stricture is generally defined in studies as a narrowing of the lumen of the gastrointestinal tract. A luminal narrowing that prevents the non-resistant passage of an endoscope suggests a clinically significant stricture.[16] However, various opinions about the definition of pouch strictures were expressed by the investigators in the consensus group. Our expert panel suggests that a stricture can be defined as difficulty in the passage of a gastroscope or paediatric colonoscope, or luminal narrowing of more than 50%, with or without pre-stenotic luminal dilation.

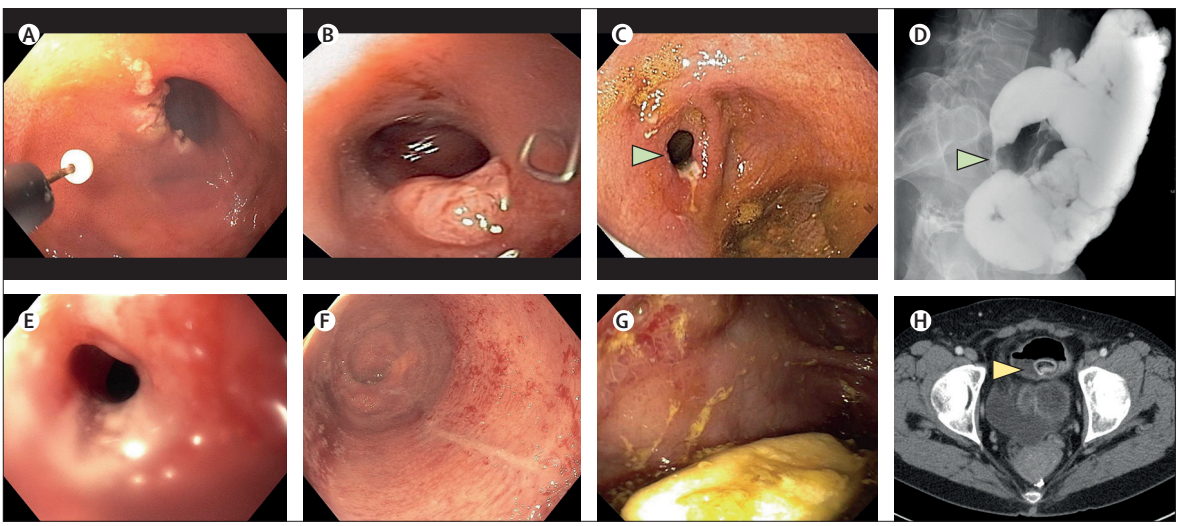

Figure 5: **Pouch strictures and bezoars**
(A) Stricture at the end-to-end anastomosis undergoing endoscopic stricturotomy. (B) A stricture at pouch–anal anastomosis. (C–D) A moderate, ulcerated stricture at the pouch inlet on pouchoscopy and contrast pouchography (green arrows). (E–F) Pouch–anal anastomosis stricture in a diverted pouch with mild diversion pouchitis. (G–H) A pouch bezoar in the lumen of a Kock pouch (yellow arrow).

Pouch stricture can be classified as either intrinsic (eg, non-steroidal anti-inflammatory drugs [NSAID]-induced ulcerated stricture) or extrinsic (eg, adhesion-associated luminal narrowing; recommendation 1.2.1a, table). Intrinsic pouch strictures are common in patients with restorative proctocolectomy and IPAA or continent ileostomy (figure 5A–E). Common causes of pouch stricture are the use of NSAIDs, surgery-associated ischaemia, and Crohn's disease or Crohn's disease-like conditions. Our expert panel suggests that strictures at the anastomosis or stoma closure site are probably surgical, whereas strictures in the pouch body and pre-pouch ileum could result from Crohn's disease and Crohn's disease-like conditions. Crohn's disease of the pouch might be clinically overdiagnosed because of the absence of distinctive features.[17] Pre-pouch ileal strictures can also coexist with ileitis, whereas chronic pouchitis typically does not cause strictures at the pouch inlet or pouch body.

Pouch strictures can be categorised by location (recommendation 1.2.1b, table). Furthermore, pouch strictures can be ulcerated or non-ulcerated and inflammatory or fibrostenotic based on the presence of an ulcer, inflammation, or fibrosis; mild, moderate, or severe (non-traversable) based on the resistance to the passage of a gastroscope or paediatric colonoscope; single or multiple; short or long, with a cutoff of 4–5 cm; simple or complex (the presence of adjacent structural abnormalities, such as an abscess); and benign or malignant.[18] The distinction between an inflammatory versus fibrostenotic stricture can be difficult. The presence of prestenotic luminal dilation is suggestive of a fibrotic stricture.[16] Our expert opinion is that chronic pelvic sepsis or persistence of presacral pouch sinus can inhibit pouch expansion, which can lead to a narrowed pouch, but not a true stricture of the pouch body.

Pouch–anal anastomotic stricture is a distinct form of pouch stricture. An anastomotic stricture is a common finding with a stapled or handsewn anastomosis, especially after double-stapled anastomosis, but can also occur in handsewn anastomoses (recommendation 1.2.1c, table). Patients with long-term faecal diversion can present with a distal pouch or anastomotic stricture (recommendation 1.2.2, table) and diversion pouchitis (figure 5E–F).[19] A combined description with the assessment of clinical, endoscopic, radiographical, and histological features of pouch intrinsic strictures is recommended for monitoring, treatment, response to therapy, and prognosis.

Various forms of extrinsic pouch strictures can occur in patients with restorative proctocolectomy and IPAA or continent ileostomy. Floppy pouch complex has increasingly been recognised (figure 6A–C; figure 7). The phenotypes of floppy pouch complex are best shown with contrast pouchography, barium or magnetic resonance defecography, and pouchoscopy (recommendation 1.2.3, table).[20–23] It is speculated that the development of floppy pouch complex or its phenotypes might be related to reduced adhesions or restricted surgical field view with laparoscopic IPAA.

Afferent limb syndrome is defined as a sharp extrinsic angulation at the pouch inlet causing luminal narrowing with or without dilation of the proximal bowel. Afferent limb syndrome is one of the causes of partial bowel obstruction or dyschezia symptoms and is best visualised using defecography (figure 6A–C) (recommendation 1.2.4, table).[24,25]

An S pouch is constructed for patients who cannot feasibly have J pouches. Although patients with S pouches have a lower risk of chronic pouchitis than those with J pouches,[26] they are prone to the development of extrinsic obstruction from efferent limb syndrome (figure 6D–E;

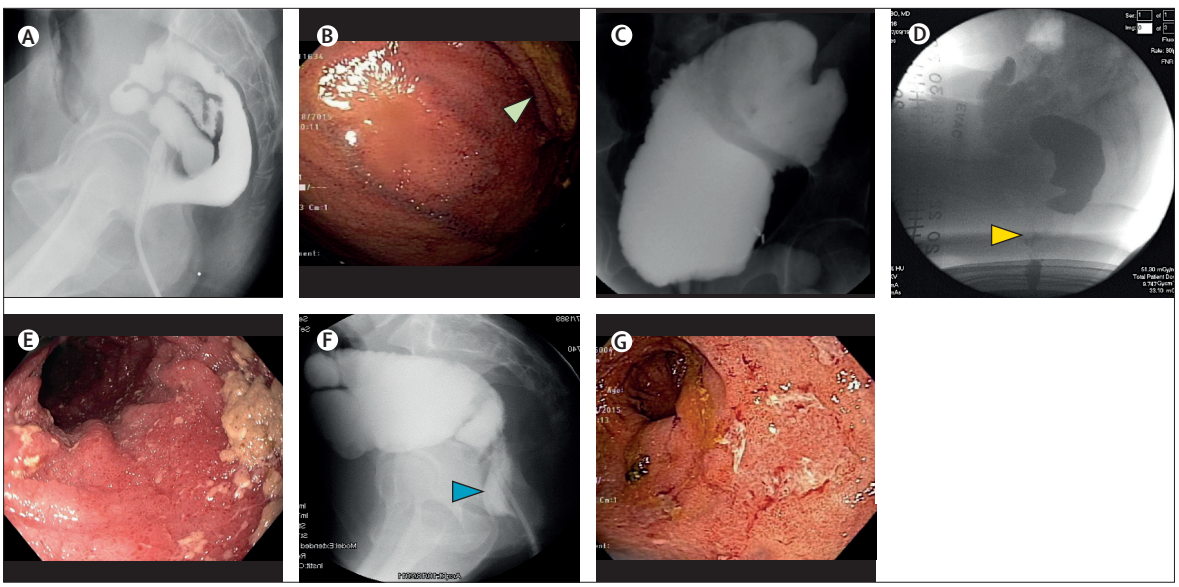

Figure 6: **Afferent and efferent limb syndromes**
(A) Redundant afferent limb trapped in the pouch body. (B–C) Afferent limb syndrome with a sharp angulation the pouch inlet (green arrow) and failure to show the afferent limb on gastrografin pouchography. (D–E) Efferent limb syndrome in an S pouch with an excessively long efferent limb (yellow arrow) causing partial obstruction during defecation. (F–G) Pouch rectal anastomosis, with a long rectal stump (blue arrow) with inflammation.

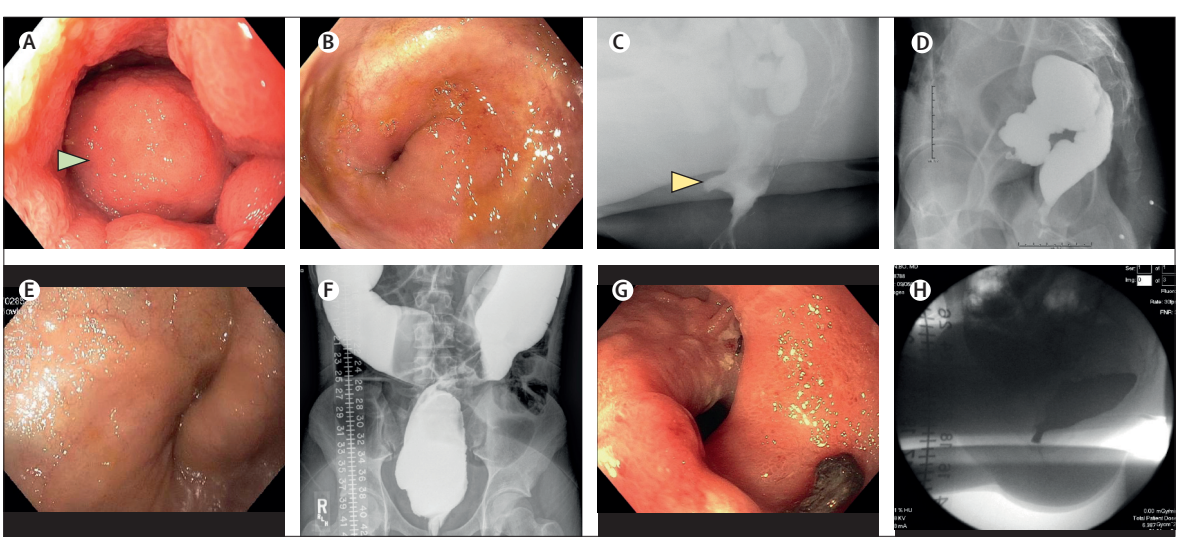

Figure 7: **Floppy pouch complex and its phenotypes**
Pouch prolapse (green arrow). (B) Pouch intussusception. (C) Pouchocele (yellow arrow). (D) Pouch paperclip horizontal folding. (E–F) Pouch volvulus. (G–H) Pouch vertical twist on pouchoscopy and barium defecography.

recommendation 1.2.5, table) and afferent limb syndrome.[27] Efferent limb syndrome is defined as a sharp extrinsic angulation between the pouch body and the efferent limb of an S pouch, leading to outlet obstruction and difficult and painful defecation. Patients with a pouch–rectal anastomosis retain an excessively long rectal cuff that can become obstructed, similar to patients with pelvic pouches. The terms pouch–rectal anastomosis and ileal pouch with excessively long cuff have been used interchangeably (figure 6F–G). Pouch–rectal anastomosis has been done for selected patients with Crohn's colitis who require colectomy.[28] Pouch–rectal anastomosis can also be constructed because of technical reasons such as those patients with mesenteric tension and difficulty in the reach of the pouch body to a standard-length (2–2·5 cm) rectal stump (recommendation 1.2.6, table). Patients with efferent limb syndrome or pouch–rectal anastomosis often present with debilitating symptoms such as bloating and dyschezia.

Pouch prolapse is the most common phenotype of floppy pouch complex (recommendation 1.2.7, table). The most commonly prolapsed segments are the anterior

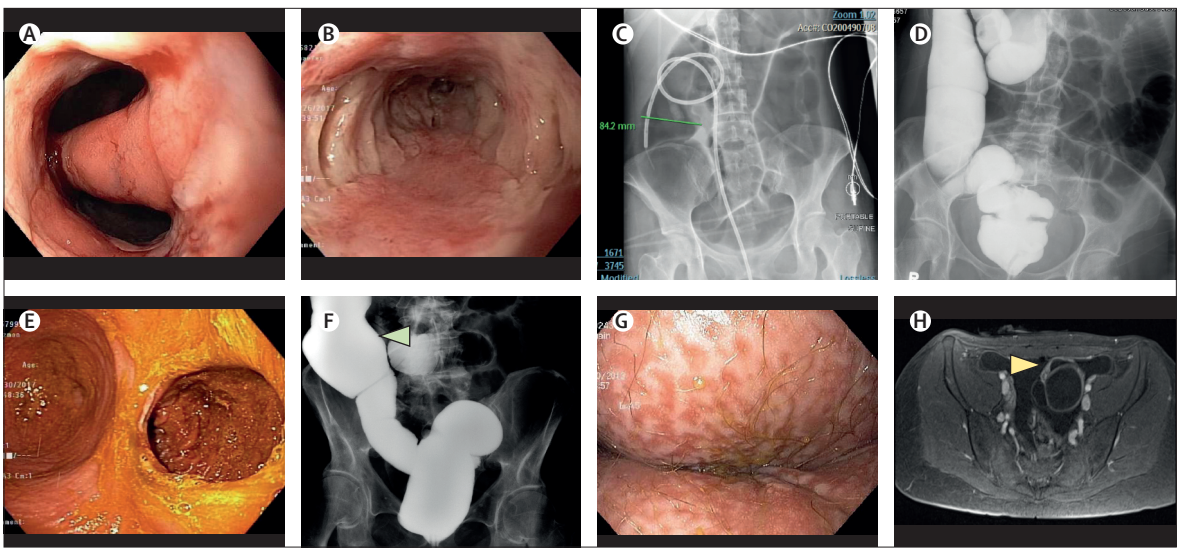

Figure 8: **Miscellaneous disease conditions of the pouch**
(A) Distal pouch septum. (B) Strictured nipple valve in a Kock pouch. (C) Megapouch with dilated pouch and small bowel. (D) Small bowel ileus sparing the pouch body. (E–F) Pseudopouch from dilated side-to-side anastomosis at the ileostomy site (green arrow). (G) Perianal dermatitis. (H) Trapped ovary syndrome (yellow arrow).

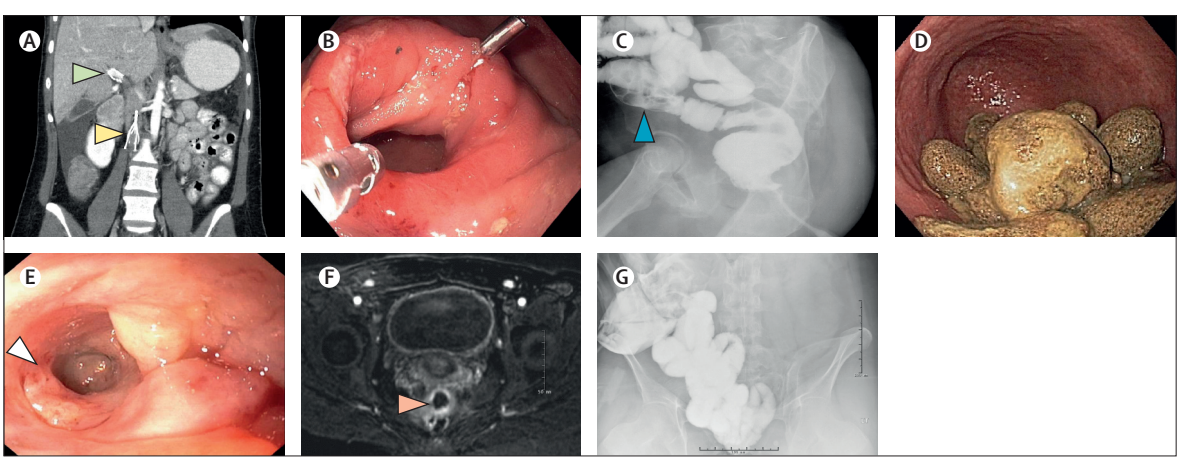

Figure 9: **Miscellaneous disease conditions of the pouch**
(A) Portal vein thrombi with transjugular intrahepatic portosystemic shunt (green arrow) and deep vein thrombosis of the lower extremities with a filter in vena cava (yellow arrow). (B) Pouch inlet ulcer bleeding undergoing endoscopic therapy. (C–D) A so-called rabbit-ear pouch configuration with a faecal bezoar trapped in the excessively long tip of the J-site bowel (blue arrow). (E) A so-called dog-ear (white arrow) at the apex of the pouch in relationship to the pouch lumen (white arrow). (F) Persistent perineal sinus (red arrow). (G) Post-pouch-excision U-shaped afferent limb in the pelvis.

wall of the distal pouch body and the cuff. Prolapsed bowel can partially or completely block the pouch outlet and it can protrude outside the anus (figure 7A). Patients with circumferential prolapse can present with pouch intussusception (figure 7B). In a survey study of 269 colorectal surgeons who did a total of 23541 pouches, 83 pouches (0·4%) were reported as having prolapse symptoms.[29] Of 3176 patients who underwent ileal pouch surgery in the Cleveland Clinic, 11 (0·3%) were diagnosed with pouch prolapse.[30]

Our expert panellists noted that pouchocele is predominantly seen in female patients (recommendation 1.2.8, table), which often coexists with pouch prolapse and weak pelvic muscles (figure 7C).

Pouch folding, twist, even pouch volvulus are seen frequently in the era of laparoscopic and robotic surgery in which there is a great reduction in adhesion formation in the pelvis (figure 7D–H; recommendation 1.2.9, table).[31,32]

A distal pouch septum results from the failure of firing staples vertically through the whole pouch body figure 8A; recommendation 1.2.10, table). Some patients with a distal pouch septum present with symptoms of obstructive defecation.

Patients with a continent ileostomy can also develop pouchitis.[26] Additionally, unique structural complications can occur, such as strictures at the nipple valve (figure 8B; recommendation 1.2.11, table).

Other adverse sequelae

The consensus group believes that it is helpful for clinicians to recognise rare adverse structural sequelae of restorative proctocolectomy with IPAA or continent ileostomy. Patients can develop megapouch with an unknown cause (figure 8C–D; recommendation 1.3.1, table). A subset of patients with megapouches were found to have a paradoxical contraction of pelvic muscle on manometry.[33] Megapouch can also occur in long-standing Kock pouches (ie, individuals with Kock pouches for years).

Pouch bezoars can lead to bowel obstruction (figure 5G–H). The exact cause of pouch bezoars is not known, however, dietary factors might have a role (recommendation 1.3.2, table). A study from a subspecialty Pouch Center at Cleveland Clinic reported 12 patients with ileal pouch bezoars, including five (0·4%) in the 1390 patients with J pouches and seven (13·0%) of 54 patients with continent ileostomies.[34]

The lumen side-to-side anastomosis at the stoma closure site can excessively dilate, resulting in the formation of a pseudopouch in the area (figure 8E–F). Patients with pseudopouches usually present with symptoms of partial small bowel obstruction or small intestinal bacterial overgrowth, such as bloating, distension, and pain at the stoma site.

Perianal dermatitis is a non-specific finding to IPAA (figure 8G). Indeed, perianal dermatitis is a result of frequent pouch evacuations with enzymatic active pouch effluent. It can result from chronic pouchitis, Crohn's disease of the pouch, chronic cuffitis, functional or structural obstructive defecatory disorders, or redo-pelvic pouches. Similarly, peristomal dermatitis can also occur in patients with continent ileostomy or ileostomies (recommendation 1.3.3, table).

Trapped ovary syndrome, inclusion cyst, or retention cyst can occur in patients with IPAA.[35] Symptomatic patients often require aspiration or drainage (figure 8F; recommendation 1.3.4, table). Portal-vein thrombosis can develop in patients undergoing restorative proctocolectomy with IPAA (recommendation 1.3.5, table). Portal-vein thrombosis usually resolves after anticoagulation therapy (figure 9A),[36] and might be a contributing factor for pouchitis.[37]

Pouch bleeding can occur any time after pouch construction with or without ileostomy (recommendation 1.3.6, table) and the amount of bleeding varies. Pouch bleeding can be early onset (<30 days from pouch construction) or late onset (≥30 days after pouch construction). The reported prevalence of pouch bleeding at the early phase of IPAA was 3·4% in the Cleveland Clinic series.[3] Early onset pouch bleeding is typically from anastomotic ulcer or haematoma along the staple or suture line, which can be treated conservatively. If extensive bleeding occurs, endoscopic control of the bleeding should be considered (figure 9B). Late onset pouch bleeding can result from anastomotic ulcer, cuffitis, and (rarely) pouchitis,[3] Crohn's disease of the pouch, pouch prolapse, or inflammatory or familial adenomatous polyposis-associated polyps.

Intermittent or persistent pain at the stoma site is common. It can be visceral or somatic and because of adhesions, strictures, abscess, scar neuropathy, hernia, or pseudopouch with a side-to-side anastomosis (figure 8E–F; recommendation 1.3.7, table).

Occasionally, variants of IPAA, such as so-called rabbit-ear J pouch and dog-ear pouch, are seen in practice (figure 9C–D; recommendation 1.3.8, table). Dog-ear configuration can be a consequence of a double-stapled anastomosis. At the beginning of the laparoscopic era, there were difficulties in getting a straight anastomotic closure of the distal rectum at the level of the pelvic floor, leading to oblique staple lines and a typical dog-ear configuration. The dog-ear is formed by the distal part of the rectum (figure 9E).

Pouch failure and pouch excision

Despite medical, endoscopic, or surgical therapy, some patients can develop pouch failure, defined as the need for a permanent stoma, with or without excision of the pouch, or reconstruction of a new pouch (recommendation 1.4.1, table). During a median follow-up of 84 months in a case registry of 3707 patients, 197 (5·3%) patients developed pouch failure, with 119 (3·2%) undergoing pouch excision, 32 (0·8%) having a non-functioning pouch (eg, Crohn's disease of the pouch, pouch fistula, chronic pouchitis, and pouch sinus), and 46 (1·2%) undergoing pouch revision or surgical redo of the pouch.[3]

Management strategies of a failed pelvic pouch include faecal diversion with the construction of an ileostomy leaving the pouch in situ or having pouch excision and pouch redo with a new pelvic pouch or conversion to continent ileostomy. There are advantages and disadvantages to leaving the pouch in situ versus pouch excision.[38] It is reported that 21–40% of patients with pouch failure and pouch excision developed a persistent perineal sinus (figure 9F; recommendation 1.4.2, table).[39–41] Risk factors for the development of persistent perineal sinus include a diagnosis, before pouch excision, of perianal fistula or abscess.[41] Another complication is the development of U-shaped afferent limb after pouch excision (figure 9G; recommendation 1.4.3, table). This abnormality results from a dropped long loop of the afferent limb into the true pelvis. Along with gravity and adhesion, it can cause partial small bowel obstruction symptoms. A fistula can develop from this loop of the bowel to a persistent perineal sinus due to a pelvic abscess.

Inflammatory disorders of the pouch

Pouchitis is the most common long-term adverse sequela in patients with restorative proctocolectomy and IPAA. Other inflammatory disorders of the pouch, such as Crohn's disease of the pouch, cuffitis, and inflammatory polyps can also occur. Symptomatology alone is not

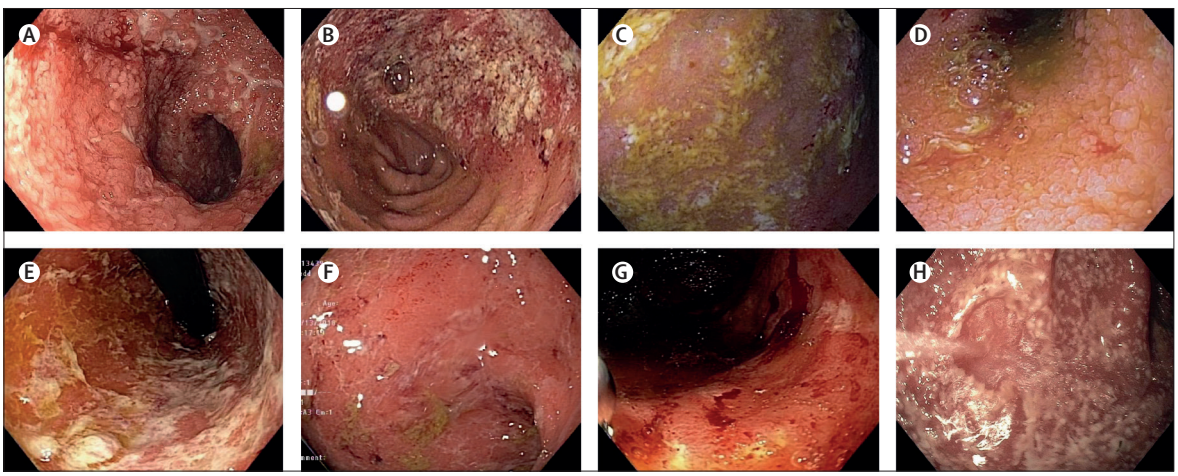

Figure 10: **Phenotypes of pouchitis**
(A) Classic pouchitis with diffuse inflammation in the pouch body. (B) Ischaemic pouchitis affecting half of the pouch body. (C–D) Diffuse pouchitis (C) and diffuse enteritis (D) in a patient with primary sclerosing cholangitis. (E) *Clostridioides difficile* pouchitis with mucosal exudates. (F) Non-steroidal anti-inflammatory drug-associated haemorrhagic pouchitis. (G) Radiation pouchitis with friable mucosa. (H) Faecal stasis-associated pouch from functional pouch outlet obstruction.

adequate for the diagnosis and differential diagnosis of these inflammatory disorders; pouchoscopy with histology is the most useful diagnostic modality.[42] Using pouchoscopy, inflammatory status has been categorised on the basis of the location and distribution pattern: normal, pre-pouch afferent limb, pouch inlet, diffuse inflammation, focal inflammation of the pouch body, cuffitis, and pouch with fistulas identified after 6 months from ileostomy closure.[43] On histology, adaptive changes of pouch mucosal to faecal stasis result in colonic metaplasia with flattening of villi and increased number of chronic inflammatory cells in the lamina propria, which needs to be differentiated from true pouchitis (appendix p 8).

Pouchitis

A combined assessment of symptoms, endoscopy, and histology is often required for the diagnosis of pouchitis. There are currently no validated scoring instruments for the diagnosis and management of pouchitis. Several composite indices have been developed. Among them are the Pouchitis Disease Activity Index (PDAI)[44] and Pouchitis Activity Score (PAS).[45] By contrast with PDAI, which includes acute histology score only, the PAS divided inflammation on histology into acute and chronic. There is a poor association between symptoms, endoscopy, and histology scores in pouchitis using the PDAI.[42,46] There is an association between endoscopy and acute and chronic histological inflammation, but there is no significant association between symptoms and histology scores (recommendation 2.1.1, table). It is important to document detailed features of inflammation on endoscopy (figure 10; recommendation 2.1.2, table). For endoscopic evaluation, the presence of an ulcer or ulcerated surface is the most reliable indicator of pouch inflammation.[47] Serological and faecal markers such as C-reactive protein,[48] faecal calprotectin,[49] and faecal lactoferrin[50] can also be used to quantify pouch inflammation (recommendation 2.1.3, table).

Pouchitis represents a disease spectrum with various aetiopathogenesis, disease phenotype, response to therapy, and prognosis. Various classifications of pouchitis have been proposed and used. For example, pouchitis can be classified as acute or chronic, or idiopathic or secondary (recommendations 2.1.4 and 2.1.5, table). Various definitions of chronic pouchitis have been used, as outlined by a systemic review.[51]

The pathogenesis of pouchitis is largely unknown. It is generally believed that pouchitis mostly results from an abnormal immune response to luminal dysbiosis in genetically susceptible hosts. The gut microbiota has an essential role in the pathogenesis of pouchitis. Primary or idiopathic pouchitis is believed to mainly result from dysbiosis of pouch microbiota, without identifiable pathogenic bacteria, virus, or fungus. Clinically, antibiotic therapy is the main treatment modality for active pouchitis. Pouchitis can then be categorised into antibiotic responsive, antibiotic dependent, or antibiotic refractory (recommendation 2.1.6a, table). Classification based on the response to antibiotic therapy has been applied in clinical trials.[52–57]

Secondary pouchitis is triggered by clearly identifiable causes. Examples of secondary pouchitis are *Clostridioides difficile* pouchitis (figure 10E), cytomegalovirus-associated pouchitis, NSAID-induced pouchitis (figure 10F), radiation pouchitis (figure 10G), or pouch outlet obstruction[58] (figure 10H). The modification of these triggering factors often helps improve or resolve pouchitis.[59]

Ischaemia has a role in the pathogenesis in some patients with chronic pouchitis. Ischaemic pouchitis is characterised by an asymmetric distribution of

inflammation (eg, inflammation limited to the proximal or distal pouch, or afferent limb part of J-pouch body sparing the efferent limb part, or ulcer limited to the vertical staple line) on pouchoscopy (figure 10B), and extracellular hematoidin deposits on histology (recommendation 2.1.7, table).[60,61]

Autoimmunity also has a role in the pathogenesis in some patients with chronic pouchitis. The terms immune-mediated pouchitis, autoimmune pouchitis, pouchitis with autoimmune features, or immune-mediated pouchitis have been used to describe patients with chronic pouchitis with histological features similar to autoimmune enteritis and concurrent autoimmune disorders. Patients with immune-mediated pouchitis often have other systemic autoimmune disorders, such as primary sclerosing cholangitis, Hashimoto's thyroiditis, and rheumatoid arthritis.[62,63] Immune-mediated pouchitis often coexists with inflammation in the pre-pouch afferent limb on endoscopy (figure 10C–D) and histology (recommendation 2.1.8, table). Examples of immune-mediated phenotypes are primary sclerosing cholangitis-associated pouchitis or enteritis and IgG4-associated pouchitis (figure 10C–D). Histological evaluation of immune-mediated pouchitis can show increased crypt apoptosis or a great number of IgG4-expressing plasma cells.[64,65]

Combined classification such as chronic antibiotic-dependent pouchitis, chronic antibiotic-refractory pouchitis, or chronic antibiotic-refractory pouchitis associated with cytomegalovirus is often used in clinical practice or trials (recommendation 2.1.9, table).[53,56,66] Additionally, the phenotype of pouchitis might change (recommendation 2.1.10, table). For example, acute, antibiotic-responsive pouchitis can become cytomegalovirus-associated chronic antibiotic-refractory pouchitis. Furthermore, some patients with chronic pouchitis could later on be diagnosed with Crohn's disease of the pouch.

Pouchitis is not common in patients undergoing restorative proctocolectomy with IPAA for familial adenomatous polyposis, although there are reported discrepancies in prevalence (recommendation 2.1.11, table).[22,67,68] The clinical presentation of pouchitis in patients with familial adenomatous polyposis can differ from those with ulcerative colitis. Patients with familial adenomatous polyposis pouchitis can present incomplete evacuation, dyschezia, and increased stool frequency and urgency.

Pre-pouch ileitis can be described independently or along with pouchitis (recommendation 2.1.12, table). The frequency and diagnostic criteria of pre-pouch ileitis varies between studies. In a study of 576 patients who had underlying ulcerative colitis or indeterminate colitis with a total of 1448 pouchoscopies, pre-pouch ileitis was found in 33 (5·7%) patients with ulcerative colitis or indeterminate colitis.[69] Pre-pouch ileitis usually coexists with pouchitis or, in some cases, afferent limb strictures.[70] There are controversies and differing expert opinions in the definition of pre-pouch ileitis. Pre-pouch ileitis, instead of being a binary diagnosis, can represent a phenotype with varying causes and clinical presentations (appendix p 9). Pre-pouch ileitis and concurrent pouchitis might not have overlapping aetiopathogenetic pathways. This consensus group agrees that making the diagnosis of pre-pouch ileitis has clinical implications, but acknowledges the limitations of existing data. It is unclear whether pre-pouch ileitis is a distinct entity from Crohn's disease, but a combination of the following five factors would favour Crohn's disease-associated pre-pouch ileitis, according to our expert opinion. First, the presence of late-onset fistula (more than 6–12 months IPAA). Second, inflammation found in other regions of the bowel. Third, stricture at the pouch inlet or other anatomical location other than the pouch–anal anastomosis. Fourth, inflammation of the pouch body with serpiginous ulcers. Finally, the presence of non-caseating granulomas found on biopsy of the affected region. In addition to Crohn's disease,[71] pre-pouch ileitis can also be seen with backwash ileitis from diffuse pouchitis, inlet stricture-associated faecal stasis, the use of NSAIDs, or surgical ischaemia. Biopsy of the pre-pouch ileum should be interpreted in the context of the pouch and rectal cuff biopsies. The presence of pre-pouch ileitis could be associated with an increased risk for pouch failure.[71]

Pouch configuration and mucosal pattern in a paediatric pouch can differ from that in the adult pouch (recommendation 2.1.13, table). The current pouchitis activity indices, such as PDAI[44] and PAS,[45] were designed only for adult patients. Construction of an ileal pouch in a paediatric patient can be challenging because of the anatomy, the recognised more aggressive disease phenotype, and growth and psychosocial factors.[72] One of the commonly used surgical techniques is the pull-through J pouch. The pull-through technique often results in a smaller pouch body than a classic J pouch in adults and prominent peripouch fat or mesentery (appendix p 10). Paediatric pouches have a higher incidence of postoperative complications than adult pouches, but there are comparable long-term outcomes.[73] Change in diagnosis to Crohn's disease and the development of fistulas are risk factors for pouch failure.[74] The risk of pouch failure is higher in children with IPAA for ulcerative colitis than it is for children with IPAA for for familial adenomatous polyposis.[75]

Theoretically, patients with ileal pouches have some degree of afferent limb bacterial overgrowth due to the absence of the ileocaecal valve-like structure between the pouch body and afferent limb. To distinguish small bowel bacterial overgrowth in patients who do not have a pouch, the term small bowel bacterial overload is used (recommendation 2.1.14, table). There are insufficient studies on the role of small bowel bacterial overload by glucose breath test in chronic pouchitis.[76,77] Small bowel

bacterial overload can be physiological or pathological. Patients with functional or structural obstruction are particularly at risk for small bowel bacterial overload. Clinical presentation and response to antibiotic therapy in small bowel bacterial overload overlap with that of pouchitis.

Cuffitis

The cuff, a remnant part of the distal rectum, is present in patients without mucosectomy during pelvic pouch construction. It is anticipated that chronic inflammatory changes on histology are common in patients with endoscopically normal cuff, as seen in ulcerative colitis in remission in those without colectomy. Residual rectal mucosa might be present in some patients with mucosectomy. Inflammation in a long cuff (>4–5 cm) is harder to treat than when present in a short cuff. Cuffitis is common in patients with IPAA who did not have mucosectomy (recommendation 2.2.1, table).

Cuffitis classification can be helpful for clinical management. Most patients with cuffitis respond to topical mesalamine or corticosteroids. On the basis of response to topical therapy, cuffitis can be categorised (recommendation 2.2.2, table).[78] Patients with refractory cuffitis should be further evaluated for non-remnant ulcerative colitis-associated inflammation, such as Crohn's disease, prolapse, and malignancy. Some patients with topical therapy-refractory cuffitis, especially in those with pouch–rectal anastomosis, can require biological therapy or surgical mucosectomy.[79]

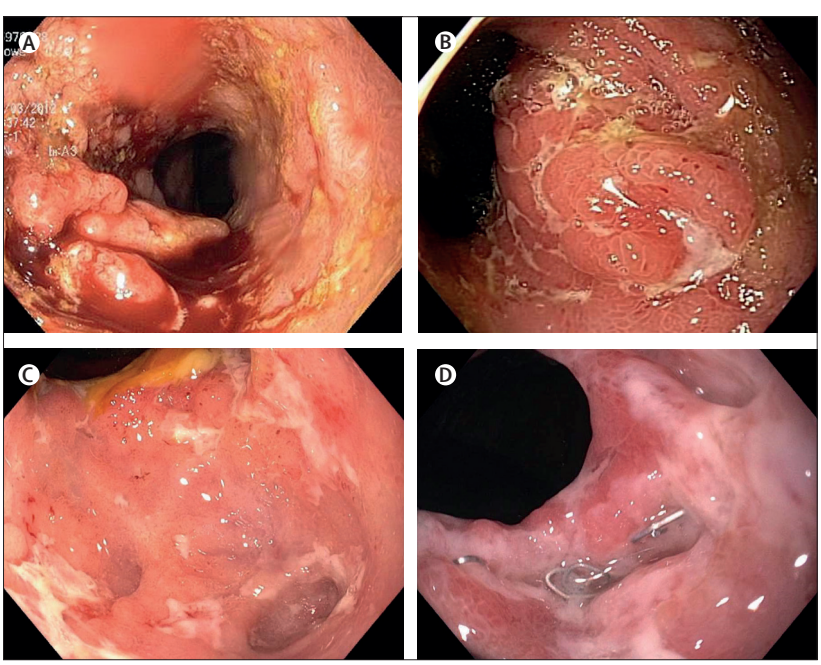

Figure 11: **Patterns of cuffitis**
(A) Classic cuffitis with circumferential inflammation and pseudopolyps. (B) Prolapse-associated anterior cuffitis. (C) Anterior cuffitis due to dyssynergic defecation with mucosal defects. (D) Anastomotic separation presented with cuff inflammation.

Not all cuffitis is a form of remnant ulcerative colitis. Cuffitis can result from other causes, giving rise to classic versus non-classic cuffitis (figure 11; recommendation 2.2.3, table). For example, collagenous cuffitis has been reported.[80] Cuff prolapse in floppy pouch complex can present with anterior cuffitis. Crohn's disease of the pouch can affect the cuff, anal transition zone, or perianal area. A careful histology evaluation of cuff biopsies can help clarify the diagnosis, such as granulomas for Crohn's disease, and elongation of glands or intramucosal fibrosis for prolapse. To date, there is no published histological classification of cuffitis.

Inflammation in the rectal remnant in the pouch–rectal anastomosis is common and more challenging to treat than classic cuffitis (recommendation 2.2.4, table).

Crohn's disease or Crohn's disease-like condition of the pouch

The terminology of Crohn's disease of the pouch or Crohn's disease disease-like conditions have been used (recommendation 2.3.1, table);[81–83] however, the diagnostic criteria vary among published studies.[81–84] A meta-analysis showed an estimated incidence of 10·3% for Crohn's disease of the pouch.[84] The discrepancy in diagnostic criteria and duration of follow-up between studies explains the variation in the frequency of Crohn's disease of the pouch. Giving a diagnosis of Crohn's disease in a paediatric or adult patient who had restorative proctocolectomy with IPAA for ulcerative colitis has a substantial medical and psychosocioeconomic effect. Whether Crohn's disease of the pouch is a part of the IBD spectrum or a distinct phenotype from classic Crohn's disease and classic ulcerative colitis is debatable. There was extensive discussion among the members of the consensus group on different perspectives on terminology and diagnostic criteria for Crohn's disease of the pouch. However, there was consensus that it would be of great value to develop uniform terminology regarding Crohn's disease of the pouch and its phenotypes (recommendation 2.3.1, table). We were able to reach an agreement on the terminology and diagnostic criteria, recognising the discrepancy among authors and existing use of terminology in clinical practice and published studies. We believe that characterisation and diagnosis of Crohn's disease of the pouch are useful for its management and improvement in prognosis.

Diagnosis of Crohn's disease of the pouch can be challenging, as common features of the disease, such as skip lesions, discrete ulcers, stricture, fistula, and abscess, can also be seen in surgery-associated complications in reconstructive procedures, such as restorative proctocolectomy with IPAA. Crohn's disease of the pouch develops from different settings such as those with a preoperative diagnosis of Crohn's disease and development of de-novo disease after colectomy (recommendation 2.3.2, table). Whether selected patients with Crohn's colitis are

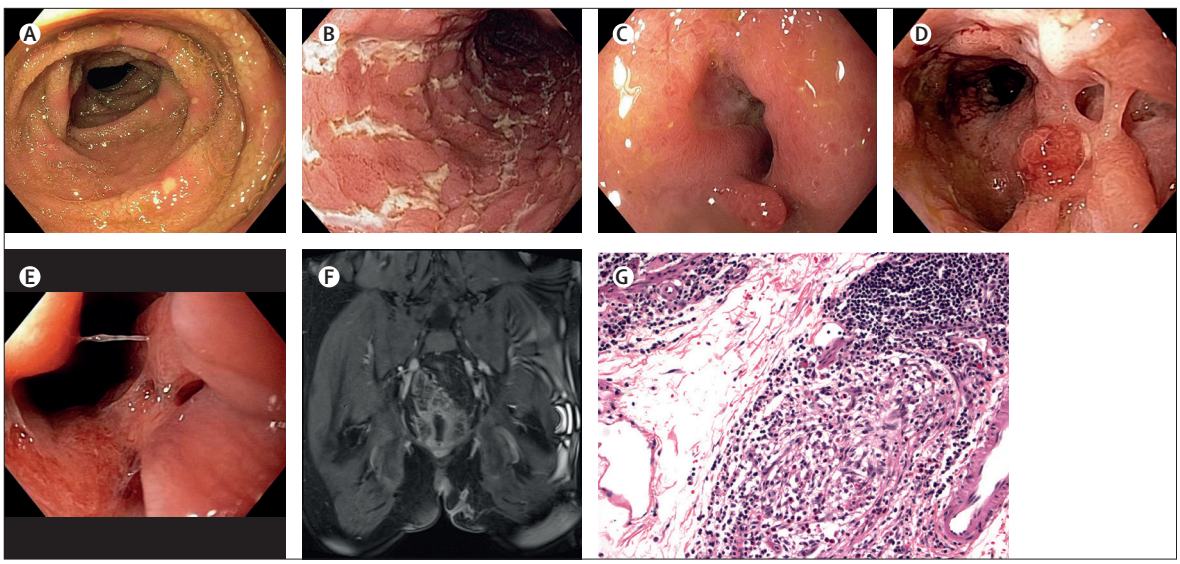

Figure 12: **Crohn's disease of the pouch**
(A) Crohn's disease with discrete ulcers and erosions in the pre-pouch ileum. (B) Crohn's disease with longitudinal ulcers in the pre-pouch ileum. (C) Crohn's disease with stricture at the pre-pouch ileum. (D–F) Crohn's disease with perianal fistulas. (G) Perivascular non-caseating granulomas in the surgically resected pouch specimen in a patient with Crohn's disease of the pouch (haematoxylin and eosin stain, 20×).

considered as candidates for restorative proctocolectomy with IPAA is still controversial.[85] Although de-novo Crohn's disease can occur in patients after restorative proctocolectomy with IPAA for ulcerative colitis, patients with Crohn's colitis undergoing IPAA might not necessarily develop Crohn's disease of the pouch.[86] The disease course and prognosis of Crohn's disease of the pouch arising from variable settings are different.[87,88]

Caution should be taken when Crohn's disease of the pouch is diagnosed. The most commonly reported diagnostic criteria in a meta-analysis were the presence of fistula or fistulas, stricture of the pouch or pre-pouch ileum, or pre-pouch ileitis.[81] There are potential adverse clinical and mental effects on patients after a diagnosis of Crohn's disease of the pouch, therefore, strict criteria are now proposed (recommendation 2.3.4, table).[89] Biopsy should be taken from the area outside the suture-line or staples to avoid yielding foreign body-associated granuloma and confusion with Crohn's disease. The presence of non-caseating, non-mucinous granulomas is suggestive of, but not required for, its diagnosis (recommendation 2.3.4, table). The presence of transmural disease on cross-sectional imaging or histopathology of excised pouch specimen is not sufficient for making the diagnosis of Crohn's disease of the pouch as transmural disease can also be seen in chronic pouchitis (recommendation 2.3.5, table).[90] Non-healing ulcers or persistent strictures or fistulas should be evaluated for neoplasm and Crohn's disease (recommendation 2.3.6, table).

Crohn's disease of the pouch can be further classified into inflammatory, fibrostenotic (or stricturing), and fistulising (or penetrating) phenotypes adopted from the Montreal classification for Crohn's disease (figure 12; recommendation 2.3.7, table).[82,91–94] The diagnosis and classification of Crohn's disease of the pouch have helped guide medical,[94,95] endoscopic,[96] and surgical[97] therapy. Although stricturing or fistulising Crohn's disease of the pouch is often associated with poor prognosis, inflammatory Crohn's disease of the pouch often responds well to biological therapy. The natural history of Crohn's disease of the pouch is different from Crohn's disease in patients without a pouch or in patients with classic pouchitis or cuffitis. Most patients with Crohn's disease of the pouch require long-term medical therapy, and some patients might need endoscopic or surgical therapy. Crohn's disease in patients with perianal disease or pouch–vaginal fistula sparing the pouch body or afferent limb in IPAA has been successfully treated with the conversion of the pelvic pouch to a Kock pouch without recurrent Crohn's disease in some patients.[98] Crohn's disease of the pouch along with chronic pouchitis have collectively been called chronic inflammatory pouch complications.[99,100] A favourable response of mucosal inflammation to biologics is not necessarily suggestive of Crohn's disease of the pouch because a response can also be observed in chronic pouchitis.[101]

Diversion pouchitis

Long-standing faecal diversion can result in diversion pouchitis and diversion-associated distal pouch stricture (appendix p 11; recommendation 2.4, table). There is insufficient research on diversion pouchitis.[102,103]

Post-colectomy pan-enteritis

Post-colectomy enteritis was first described in 1963;[104] it is characterised by diffuse, continuous inflammation of the

small bowel (appendix p 11; recommendation 2.5, table). A retrospective study of 5284 patients with colectomy for ulcerative colitis showed that 42 (0·8%) patients developed pan-enteritis.[105] Studies show that the disease entity only occurs in patients with underlying ulcerative colitis, affecting anywhere from the duodenum to the neoterminal ileum proximal to the stoma.[106–108] Occasionally, the stoma can also be involved. These patients might or might not have a diverted pouch in situ. Histological features of post-colectomy enteritis are similar to those in ulcerative colitis.

Functional pouch disorders

Functional disorders are suspected in patients with a pouch who present with gastrointestinal symptoms in the absence of major structural or inflammatory diseases. It can take 6–12 months after stoma closure for the adaption of ileal pouch mucosa to faecal stream and stasis. Therefore, frequent loose bowel movements during this period are considered normal. Also, trace amounts of peripouch fluid collection even many years after stoma closure could cause pelvic discomfort (appendix p 12).

Irritable pouch syndrome is the most common functional disorder of the pouch and its presentations overlap with inflammatory disorders of the pouch (recommendation 3.1, table).[109–113] Irritable pouch syndrome is characterised by visceral hypersensitivity[113] and enterochromaffin cell hyperplasia.[110] Patients with irritable pouch syndrome have compromised health-related quality of life, compared with inflammatory pouch disorders.[3] Irritable pouch syndrome is associated with depression and anxiety.[111] Treatment of irritable pouch syndrome is similar to that of irritable bowel syndrome.

Dyssynergic defecation, along with floppy pouch syndrome, can be categorised into functional and structural obstructive defecatory disorders. On manometry, dyssynergic defection is characterised by paradoxical contractions and failure of balloon expulsion, and in some patients, sawtooth contraction patterns (recommendation 3.2, table; appendix p 12).[114,115] However, dyssynergic defecation can coexist with structural or inflammatory disorders of the pouch, such as pouchocele (figure 7C), cuff diverticulum (appendix p 12), pouchitis, cuffitis, floppy pouch complex, anastomotic stricture, and perianal disease.

Other functional pouch disorders, such as pouchalgia fugax (recommendation 3.3, table) and neuropathic pain at the pouch–anal anastomosis (appendix p 12; recommendation 3.4, table), are sometimes seen.

Neoplasia in the ileal pouch

The risk for rectal neoplasia in ulcerative proctitis is not increased and routine surveillance is not recommended. By contrast, the risk of neoplasia for cuff or cuffitis in patients with IPAA can be higher than ulcerative proctitis, and surveillance is recommended. Patients with restorative proctocolectomy and IPAA are still at risk of developing neoplasia. Pouchoscopy has a key role in surveillance for neoplasia. Visual inspection, digital examination, and image-enhanced endoscopy can augment the detection of neoplasia. The diagnosis of pouch neoplasia needs confirmation from at least one gastrointestinal pathologist (recommendation 4.1, table). For patients with pouch inflammatory polyps, the consensus group did not reach an agreement on the biopsy protocol and the indication for polypectomy.

Low-grade dysplasia, high-grade dysplasia, adenocarcinoma, or squamous cell carcinoma can occur in patients with restorative proctocolectomy and IPAA (figure 13; recommendation 4.2, table).[116–118] Dysplasia and adenocarcinoma in patients with IPAA are mainly detected at the cuff or anal transition zone. Adenocarcinoma in the cuff or pouch has histomorphological and molecular features similar to those of ulcerative colitis-associated adenocarcinoma, rather than small bowel adenocarcinoma.[119] Adenocarcinoma in IPAA is rare and has a poor prognosis.[120]

There are case reports of pouch lymphoma (figure 13G).[116,121,122] Another rare cancer in patients with IPAA is squamous cell carcinoma at the anal transition zone, with a pooled cumulative incidence below 0·06% (figure 13E–F; recommendation 4.4, table).[123] Human papillomavirus can be a risk factor for squamous cell carcinoma.

Surveillance strategies mostly rely on risk stratification,[123] although there is wide variation in the surveillance for pouch neoplasia among clinicians and practices.[124] Because there is an increased risk of pouch neoplasia, annual surveillance is recommended for patients with a precolectomy diagnosis of colorectal neoplasia (recommendations 4.5 and 4.6, table). Surveillance every 1–3 years is recommended for patients with other risk factors (recommendation 4.7, table). Surveillance every 3 years can be considered in patients without risk factors (recommendation 4.8, table).

Pouch neoplasia, once confirmed, requires appropriate endoscopic or surgical intervention. The prognosis of pouch cancer is poor[120] and the natural history of pouch neoplasia is not well defined. Therefore, patients with any grade dysplasia who elect to defer surgical intervention should undergo intensive surveillance (recommendation 4.9, table).

In surveillance pouchoscopy, at least three biopsies are taken from the cuff or anal transition zone, along with biopsies from the afferent limb and pouch body. Endoscopically evident lesions should also be sampled (recommendation 4.10, table).

Inflammatory polyps in the afferent limb, pouch body, or cuff can develop in the setting of chronic mucosal inflammation (figure 14A–D). The cancer risk in inflammatory polyps has been described as low for neoplasia.[125]

There is only one case report of adenocarcinoma of a Kock pouch in a patient with precolectomy diagnosis of ulcerative colitis.[126] Therefore, routine surveillance in

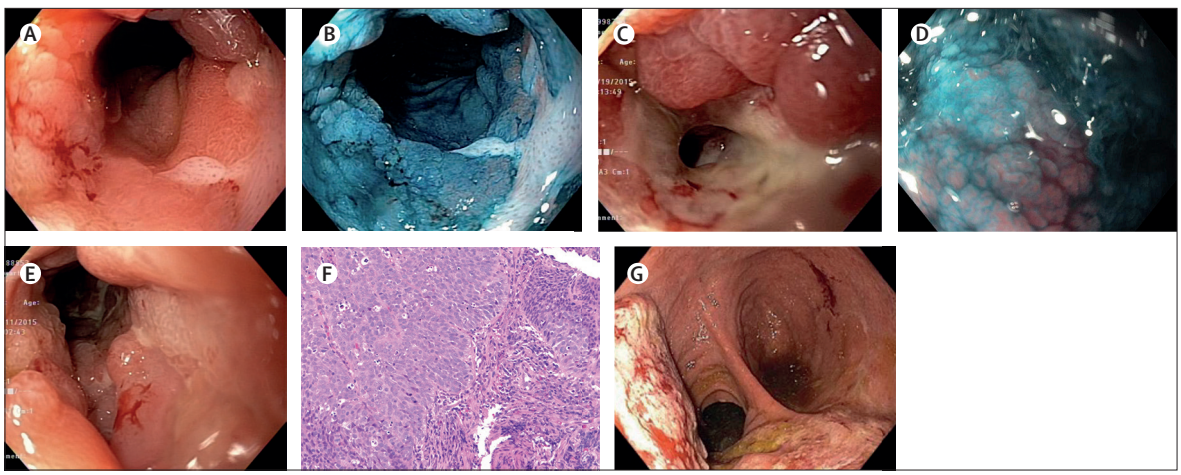

Figure 13: **Pouch neoplasia**
(A–B) Low-grade dysplasia on white-light endoscopy and dye-based chromoendoscopy. (C) Malignant stricture from adenocarcinoma with ulcers in the distal pouch and cuff mimicking Crohn's disease. (D) Mucosal detail of pouch carcinoma on chromoendoscopy. (E–F) Nodular anal transition zone and high-grade squamous intraepithelial lesions (haematoxylin and eosin stain 20×). Histology photo courtesy of Ilyssa Gordon (Cleveland Clinic, Cleveland, Ohio). (G) Pouch lymphoma.

patients with continent ileostomy is not recommended (recommendation 4.11, table).

Polyps in the afferent limb, pouch body, or anal transition zone carry a high risk of neoplasia in patients with underlying familial adenomatous polyposis (figure 14E–F). Biopsy and polypectomy are recommended. Along with ulcerative colitis and familial adenomatous polyposis, restorative proctocolectomy with IPAA is sometimes done in several cancer-predisposing disorders, including *MUTYH*-associated polyposis, juvenile polyposis, polymerase proofreading-associated syndrome, constitutive mismatch repair deficiency syndrome, which is biallelic Lynch syndrome. As recommended by the American College of Gastroenterology,[127] patients with IPAA for familial adenomatous polyposis or other cancer-predisposing disorders require routine annual surveillance pouchoscopy, along with a strategy of phenotyping, management, and chemoprevention (recommendation 4.12, table). Adenomas can develop in the ileal pouch or residual rectal mucosa.[128–134]

Patients with a pouch who have long-standing fistulas or sinuses, like those with non-pouch Crohn's disease, may carry an increased risk for the development of squamous cell cancer or adenocarcinoma.[135] Referral to colorectal surgeons for examination under anaesthesia is suggested (recommendation 4.13, table).

Associated deficiencies, and metabolic and systemic abnormalities

Most adverse metabolic abnormalities equally affect patients with normal pouches or inflammatory disorders of the pouch. Therefore, patients with or without pouch disorders should be managed similarly. Some patients might try restrictive diets to help pouch function, which can affect nutritional status.

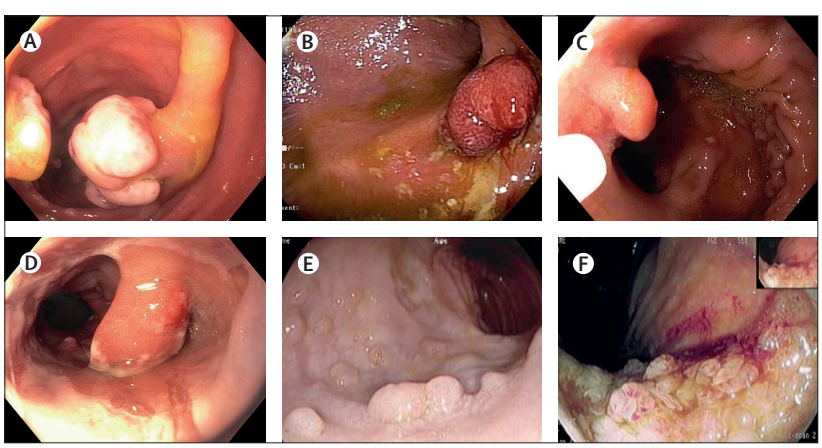

Figure 14: **Pouch polyps**
(A) Pedunculated inflammatory polyps in the pre-pouch afferent limb. (B) Vascular inflammatory polyps at the pouch inlet. (C) A cuff adenomatous polyp in a patient with a pouch and ulcerative colitis. (D) Pedunculated inflammatory polyp of the cuff in a patient with ulcerative colitis. (E) Diffuse adenomatous polyps of the pouch body in familial adenomatous polyposis. (F) Carpet-like polyps in the cuff in familial adenomatous polyposis.

The reported frequency of anaemia ranges from 5% to 56%.[136] There is no association between inflammatory pouch disorders and the risk of anaemia.[137] Routine screening for anaemia and iron deficiency is recommended (recommendation 5.1, table). Once the diagnosis of anaemia is made, further evaluation is appropriate.

The aetiopathogenesis of vitamin B12 deficiency can result from colonic metaplasia of ileum mucosa with decreased absorption, faecal stasis, or bacterial overgrowth in the pouch.[138,139] In a study of 171 patients with ileal pouches, low serum vitamin B12 concentrations were found in 25%. Approximately a third of restorative proctocolectomy patients had an abnormal Schilling test, with 5% having a low referenced serum cobalamin.[140] Deficiency in folic acid is rare. The reported frequency of

vitamin D deficiency (≤20 ng/dL) in a specialty pouch clinic ranged from 21·6% to 42·5%.[141–143] Evidence suggests that vitamin D deficiency is not associated with inflammatory disorders of the pouch.[141,142] However, the presence of concurrent primary sclerosing cholangitis poses an additional risk.[141] Therefore, routine screening of vitamin B12 and D deficiencies is recommended (recommendation 5.2, table).

Most patients with ileal pouches had exposure to systemic corticosteroids for ulcerative colitis before colectomy. A case-control study showed that 83 (31·1%) of 267 patients with ulcerative colitis and IPAA and 18 (15·1%) in 119 patients with ulcerative colitis and without IPAA had low bone mineral density.[144] Fragility fracture was also more common in the patients with IPAA than the group without IPAA.[144] In a separate study of 53 patients with pouch older than 50 years, the frequency of osteopenia was 43·4% and osteoporosis was 13·2%.[145] It seems reasonable to attribute the risk of fracture and osteoporosis in these patients to the previous exposure to corticosteroids rather than to the pouch itself. Routine screening for bone loss is recommended (recommendation 5.3, table).

There are case reports of de-novo coeliac disease after pouch surgery.[146,147] False-positive coeliac serology, mainly antigliadin antibodies, is more common than de-novo coeliac disease in patients with IPAA,[148] although colectomy might unmask previously underdiagnosed coeliac disease. Evaluation for coeliac disease is recommended for suspected patients (recommendation 5.4, table)

Patients with IPAA are at risk of developing calcium oxalate and calcium phosphate stones.[149] Nephrolithiasis is in the differential diagnosis for intermittent abdominal pain in patients with pouches (recommendation 5.5, table; appendix p 13).

Although there is insufficient prospective assessment of mental health disorders, the use of antidepressants or anti-anxiety drugs is common in patients with inflammatory or functional ileal pouch disorders. The reported frequency of depression or anxiety was 20·4% in patients with ileal pouches with a precolectomy diagnosis of Crohn's disease or indeterminate colitis, 12·7% in patients with ulcerative colitis, and 12·1% in patients with familial adenomatous polyposis.[150] The frequency is higher in patients with ulcerative colitis and pouchitis than those without pouchitis.[150] Routine screening for mental health issues in this patient population is recommended (recommendation 5.6, table).

Sexual dysfunction is a concern for male[151] and female patients[152] after IPAA. Nocturnal pouch activity was associated with a worse sexual function.[152] Routine screening with proper questionnaires is recommended for these patients (recommendation 5.7, table).

Benign prostate hypertrophy has been reported in patients with IPAA, even in adults (<50 years).[153,154] One of the risk factors is the presence of an S pouch, presumably due to more extensive manipulation during pouch construction. However, whether benign prostate hypertrophy is a direct result of IPAA is unknown. The digital prostate examination might not be reliable in patients IPAA because of the surgical anatomy and scar tissues.[154] A transperineal approach is recommended if a prostate biopsy is required (recommendation 5.8, table; appendix p 13). Pelvic external-beam radiation or brachytherapy can cause pouchitis (appendix p 13).[155]

Infertility and infecundity have been concerns for patients with restorative proctocolectomy and IPAA (recommendation 5.9, table). Infertility rates after IPAA are high for both open and laparoscopic approaches. However, laparoscopy was associated with a significantly reduced time to conceive compared with the open approach.[156,157] Post-laparoscopic IPAA infertility rate is comparable with the global infertility rate.[158] The superiority of laparoscopic surgery to open surgery regarding infertility risk must be carefully examined through studies with larger sample sizes. Referral to a gynaecologist for in-vitro fertilisation is recommended if the patient goes more than 1 year without pregnancy after intentionally trying. At the time of diagnosis of severe genetic disorders, such as familial adenomatous polyposis, the possibility of diagnosis before implantation and treatment including in-vitro fertilisation should be discussed.[159,160]

Gastrointestinal symptoms such as abdominal pain, diarrhoea, and urgency are commonly associated with menses in patients with IPAA.[161] However, restorative proctocolectomy with IPAA does not seem to adversely affect menstrual function.[162]

Whether vaginal delivery or caesarean section is the preferred route of delivery in patients with IPAA remains controversial. It is generally believed that handsewn IPAA with more manoeuvring anal sphincters, is inferior to stapled IPAA in terms of the incidence of soiling. However, caesarean section obviates the risk of sphincter injury during delivery and hence of further sphincter compromise for patients with ileal pouches. Therefore, caesarean section should be recommended for all patients with ileal pouches in whom difficulties with labour are anticipated or those with handsewn IPAA with mucosectomy. In all patients with an ileal pouch, a discussion between the patient, obstetrician, and colorectal surgeon, regarding the potential mode of delivery is recommended (recommendation 5.10, table).

An excessive postoperative gain in bodyweight (defined as a 15% increase from the index weight at the time of pouch construction),[163,164] visceral adipose area,[165] or greater peripouch adipose area[166] are associated with adverse pouch outcomes, including chronic pouchitis, presacral sinus, or pouch failure. The measurement of mesenteric fat area and peripouch fat area should be taken and reported with cross-sectional imaging (recommendation 5.11, table).

Commonly reported extraintestinal manifestations in patients with ileal pouches include joint (eg, peripheral

arthritis, ankylosing spondylitis, and sacroiliitis), skin (eg, pyoderma gangrenosum and erythema nodosum), liver (eg, primary sclerosing cholangitis), and eye (eg, uveitis and episcleritis) diseases. It is not probable that pouchitis has some novel extraintestinal manifestations that are not seen in Crohn's disease or ulcerative colitis. The presence of extraintestinal manifestations is associated with pouchitis in general and with chronic pouchitis.[167] Patients with extraintestinal manifestations should be closely monitored for pouchitis (recommendation 5.12, table).

Patients with primary sclerosing cholangitis-associated IBD undergoing restorative proctocolectomy have an increased frequency of neoplasia in the surgically resected specimen, postoperative pelvic sepsis, and long-term mortality.[168] Primary sclerosing cholangitis is a risk factor for chronic antibiotic-refractory pouchitis[169] and enteritis at the afferent limb.[170,171] In a retrospective study of 65 patients with primary sclerosing cholangitis and restorative proctocolectomy for IBD, the 5-year cumulative incidence of pouch neoplasia was 5·6%.[172] Nevertheless, patients with ulcerative colitis and primary sclerosing cholangitis with cirrhosis are also at an increased risk for peristomal varices if they undergo proctocolectomy and Brooke ileostomy.[173] Therefore, restorative proctocolectomy with IPAA is still preferred over ileostomy in these patients. For patients with IPAA and primary sclerosing cholangitis, diagnostic (for pouchitis) and surveillance (for dysplasia) pouchoscopy every 1–3 years is recommended (recommendation 5.13, table). Subtotal colectomy with ileal rectal anastomosis could be an alternative to IPAA in selected patients, although the rectal segment still requires surveillance biopsies for dysplasia. Liver transplant for primary sclerosing cholangitis does not appear to affect the risk for chronic pouchitis,[174] and the presence of the IPAA in patients with liver transplant for primary sclerosing cholangitis does not seem to have an adverse effect on patient survival or graft survival, or post-transplant operative complications (recommendation 5.14, table).[175,176]

Conclusions

Pouchitis and ileal pouch disorders are common in patients with restorative proctocolectomy and ileal pouches. This consensus document provides guidelines for the recognition and accurate diagnosis of these disorders. Clinicians should familiarise themselves with healthy anatomy and landmarks of various configurations of ileal pouches. Close monitoring of disease course is required as the disorder and disease phenotype evolve. The diagnosis of many complex pouch disorders requires a combined assessment of clinical, endoscopic, histological, and imaging features.

Contributors

BS conceived and had the final responsibility to submit this Review. The steering committee was made of up BS, GSK, UN, FAF, DAS, JSc, RKC, CNB, RPK, PF, XL, SAS, MSS, and DSP. All authors were involved in the voting, preparation, and review of the manuscript.

Declaration of interests

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