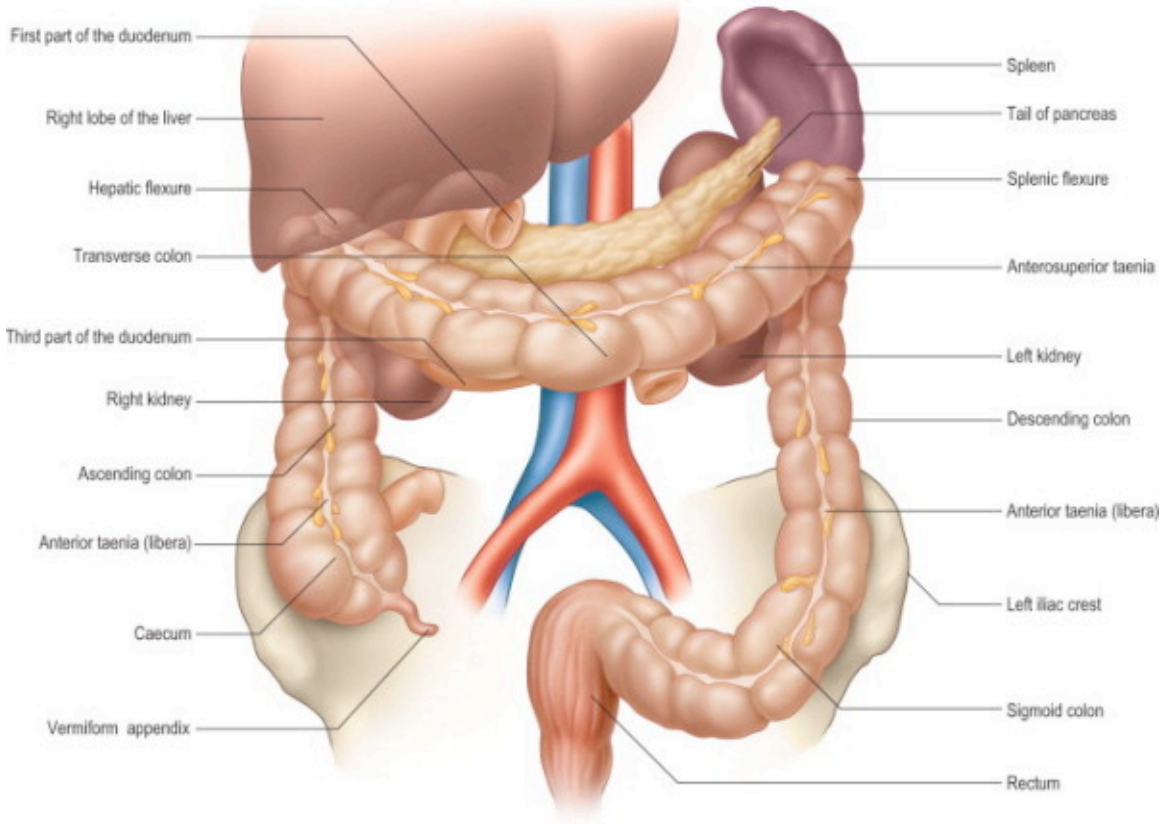
Different surgical procedures involving the colon

1. Anatomy

Right and left colon are considered retroperitoneal whereas transverse and sigmoid colon are intraperitoneal structures. First surgical step is mobilization of the colon and its mesentery. Proximal and distal sites for anastomosis are selected and their mesentery divided.



Primary anastomosis, diverting stoma (when unstable hemodynamics, infection etc) are then performed. Stomas are surgically created openings between a hollow organ and the skin connected directly (or in some cases with the use of a tube). Stomas are used in situations in which diversion of, decompression of, or access to the bowel lumen is needed, for example in peritonitis, radiation enteritis or inflammatory bowel disease.

Stomas can produce social and psychological problems, skin irritation, metabolic derangements (depending what part of the bowel is used and how high the output is), stoma retraction, prolaps, stenosis or ischemia.

2. Surgical things to look out for:

For all procedures involving the colon there are a couple of surgical things to look out for: ureters when mobilizing left splenic flexure or duodenum (therefore often times urology will be called in to place stents for better visualization of ureters to avoid that complication- especially in cases or prior abdominal surgeries or large tumor masses), bleeding from pelvic plexus, splenic injury, excessive traction on the liver leads to venous bleeding.

3. What are the procedures performed?

Right hemicolectomy

A right hemicolectomy is usually performed for cancer of the cecum and ascending colon, and for some hepatic flexure. In a classic right hemicolectomy, the ileocolic, right colic, and right branch of the middle colic vessels are divided and removed with the contiguous mesentery. An ileocolic anastomosis is typically performed. Care must be taken to identify the right ureter, the ovarian or testicular vessels, and the duodenum. If the omentum is attached to the tumor, it should be removed en bloc with the specimen.

Extended right hemicolectomy

An extended right hemicolectomy with an anastomosis between the ileum and the distal transverse colon is according to M.D. Anderson Surgical Oncology Handbook, typically performed for cancer of the hepatic flexure and proximal transverse colon. In the extended right hemicolectomy, the ileocolic, right colic, and middle colic vessels with their contiguous mesentery are divided and removed. The inferior mesenteric vein may be divided and included in the specimen. Care must be taken to protect the duodenum, pancreas, and spleen. Cancer of the transverse colon and

splenic flexure can be resected with a modification of this procedure that includes resecting the colon to the level of the proximal descending colon. In this procedure, the ascending branch of the left colic artery is preserved, providing excellent blood supply to the distal anastomosis.

Transverse colectomy

A transverse colectomy may be undertaken for mid transverse colon cancers as long as satisfactory resection margins and an adequate lymphadenectomy can be obtained. The transverse colon is resected along with the middle colic vessels and its mesentery. At times, the inferior mesenteric vein is also divided and included in the resected specimen. Both the hepatic and splenic flexures may need to be mobilized in order to achieve a tension-free anastomosis. When mobilizing the splenic flexure, care must be taken not to apply much traction to the omentum or colon, as this will invariably result in splenic capsule tears.

Left hemicolectomy

A left hemicolectomy is appropriate for tumors in the distal transverse or descending colon and for selected patients with proximal sigmoid colon cancer. The left branch of the middle colic vessels, the inferior mesenteric vein, and the left colic vessels along with their mesenteries are included with the specimen. In some cases, a segmental colectomy may be performed as long as adequate resection margins and lymphadenectomy are achieved (Rouffet et al.)

Sigmoid colectomy

For sigmoid colon cancers, segmental or sigmoid colectomy is appropriate. The inferior mesenteric artery is divided at its origin, and dissection proceeds just under the superior rectal vessels toward the pelvis until adequate margins are obtained. As with right-sided tumors, care must be taken while mobilizing the sigmoid and descending colon to identify the left ureter and the left ovarian or testicular vessels.

Subtotal and total colectomy

A subtotal or a total abdominal colectomy is indicated if there are synchronous neoplasms on the right and left sides of the colon. Occasionally these procedures are performed in patients presenting with obstructing-left sided tumors. For patients with hereditary nonpolyposis colorectal cancer (HNPCC) who present with a colon cancer, total abdominal colectomy is the procedure of choice. It is also used in

selected patients with Familial Adenomatous Polyposis (FAP) and MUTYH associated polyposis.

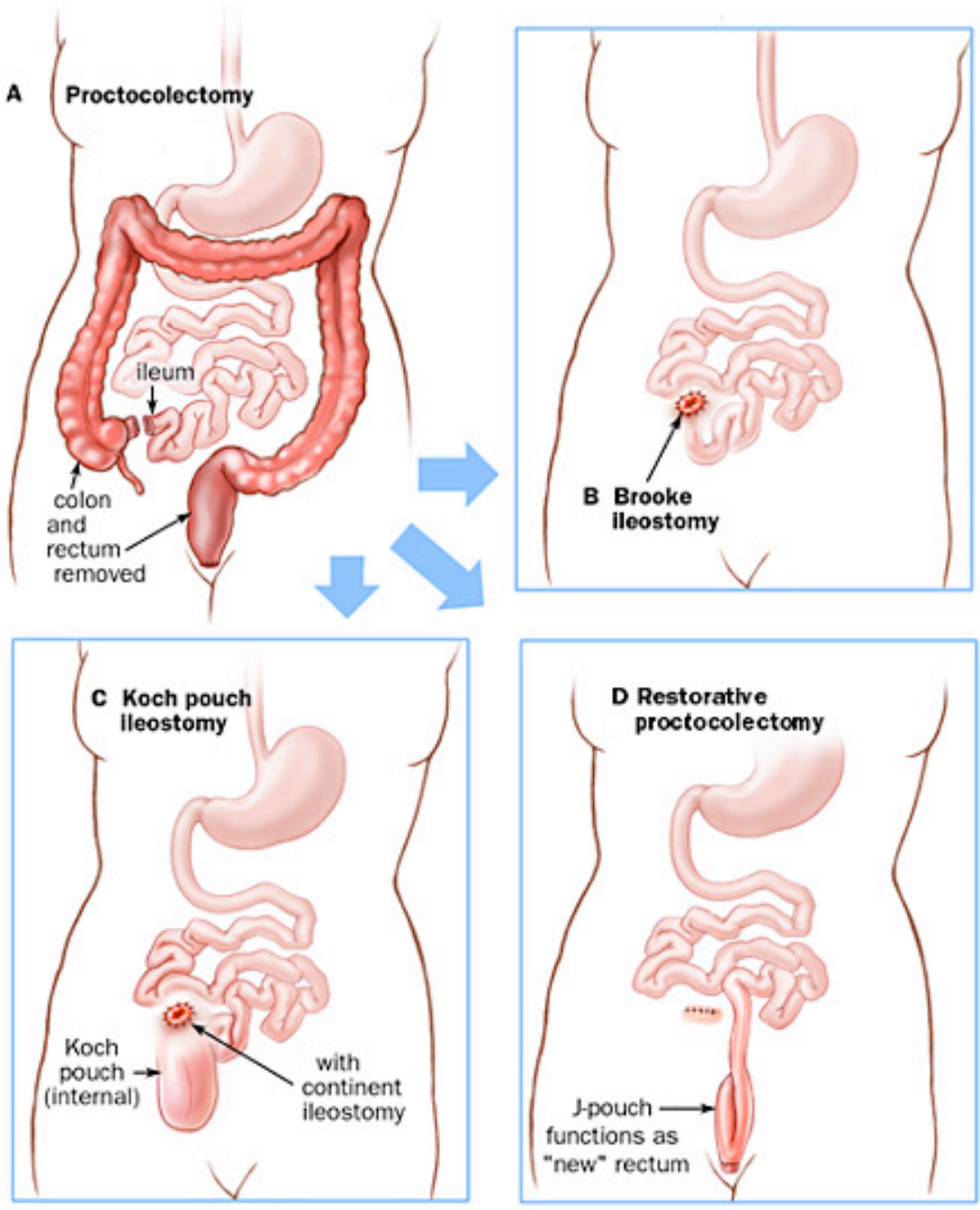
endoscopic look at FAP (Wikipedia)

Mutations in the MUTYH (mutY homolog E. coli) gene cause an autosomal recessive form of FAP which is also called MUTYH-associated polyposis. These polyps do not appear until adulthood and are less numerous than those found in patients with APC gene mutations.

Mutations in this gene affect the ability of cells to correct mistakes made during DNA replication. Both copies of the MUTYH gene are mutated in individuals who have autosomal recessive familial adenomatous polyposis. Most reported mutations in this gene cause production of a nonfunctional or low functioning glycosylase enzyme. When base excision repair in the cell is compromised, mutations in other genes build up, leading to cell overgrowth and possibly tumor formation.

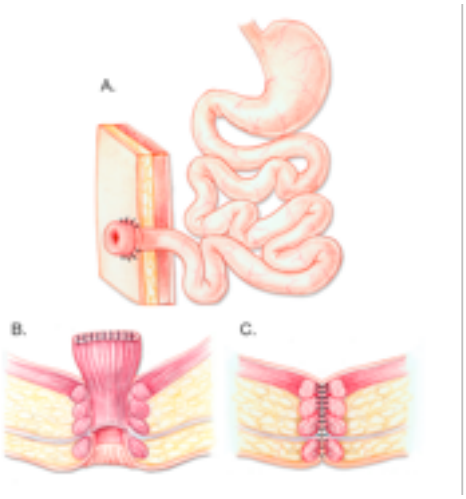
4. Surgical procedures involving ileum, colon, rectum and anus

These procedures are mostly indicated for ulcerative colitis but also for Crohn's disease or FAP.



Proctocolectomy with permanent ileostomy

The rectum is left in place to drain the anus. The proximal end of the rectum may be closed as a Hartman's pouch or closed at the distal sigmoid level and brought up the skin of the lower abdomen as a mucous fistula. A subtotal colectomy is used in acutely ill patients. It leaves the patient with an ileostomy which may be temporary or permanent and maintains future options for the patient. Disadvantages of this procedure include the requirement for an external stoma bag and the risks associated with a retained diseased rectum. Although it has disadvantages, overall patient acceptance of a conventional ileostomy is quite high. Long term, almost all patients will require another operation after a subtotal colectomy and ileostomy to takedown the ileostomy or to remove the patient's remaining rectum. This later option can be accomplished with or without reconstruction (pouch-anal anastomosis)



A: Ileostomy, B: Hartman pouch, C: excised rectum and anus

Proctocolectomy with Continent Ileostomy (Kock Pouch)

To reduce some of the problems with a conventional ileostomy, a continent ileostomy was developed. This intrabdominal pouch is comprised of 2 - 3 loops of small bowel and an intuscepted valve which provides internal storage for the patient's intestinal contents. The pouch is attached to the abdominal wall with a flush ostomy opening. The patient empties the pouch 4-6 times per day by inserting a catheter through the stoma into the pouch. A continent ileostomy eliminates the requirement for an external stoma bag. Despite multiple technical modifications, valve slippage remains a significant problem with this operation and is reported to occur in 5-15% of patient followed long term. If significant valve slippage occurs (usually manifested by pouch incontinence or difficulty with pouch intubation) surgical correction is required. A continent pouch which cannot be intubated results in a complete small bowel obstruction. If the pouch cannot be intubated with a

catheter, endoscopic intubation may be required. Development of pouch anal procedures has significantly reduced the demand for continent ileostomas.

Restorative Proctocolectomy with Ileal Pouch Anal Anastomosis (IPAA)

This operation removes the entire colon, upper rectum, and anal mucosa. The distal ileum is then fashioned into a pouch or reservoir and connected to the anus. Several types of pouch construction have been described (eg. S, J, W, H). Most commonly the "J" pouch is used which also is the easiest to construct. A temporary ileostomy is often constructed during the first stage of the procedure.

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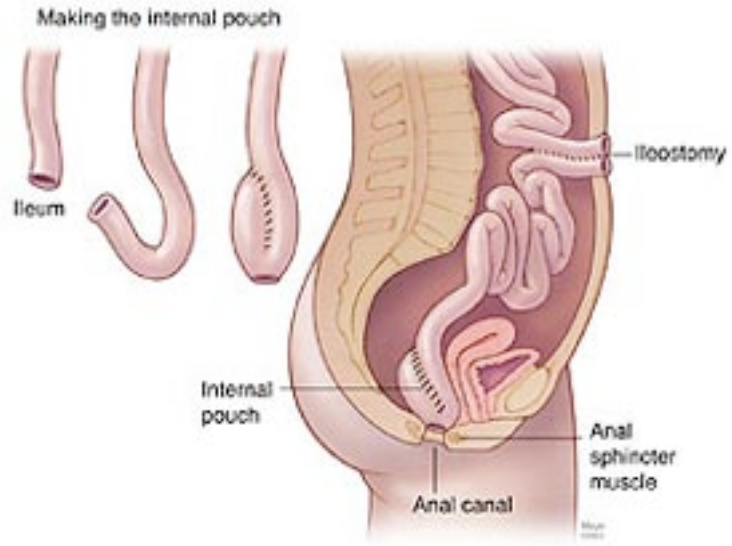
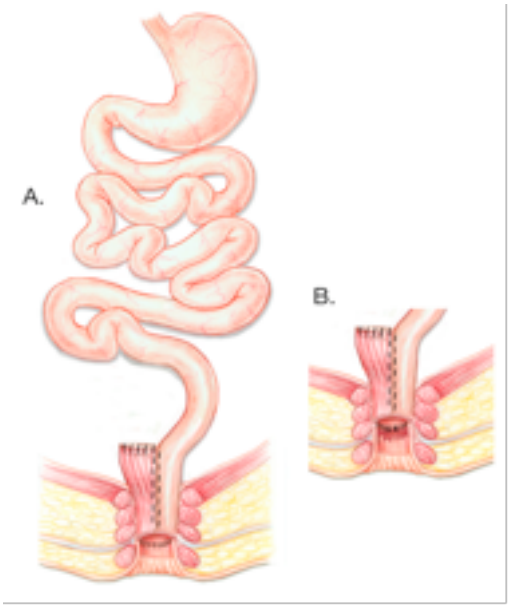


Advantages of this operation include the elimination of all colorectal mucosa and preservation of reasonable postoperative bowel function via an anal route. The complicated technical requirements of the surgery lead to several disadvantages. Most patients need a temporary stoma (loop ileostomy) for 6-8 weeks to allow complete healing. Thus two operations and hospitalizations are required. Postoperative bowel function is variable but patients average 8-10 movements per day in the initial postoperative period and 4-6 movements per day at one year after surgery. Other side effects are anal seepage or soilage or pouchitis (often presents as urgency, increased frequency, and loose bloody stools).

Proctocolectomy with Ileal Pouch Anal Transitional Zone Anastomosis

This procedure is a modification of the ileal pouch anal procedure. In some patients (no steroids, well nourished, easy operation) a temporary stoma with this procedure is avoided. This eliminates the second surgery. However, this option places the patient at greater risk if a septic pouch complication occurs. A potential limitation of this surgery is the retention of one to two cm of anal transition zone.



5. Pre-operative assessment

Patients are expected to follow general NPO guidelines (see also section 1A). Other things to consider are: Inflammatory bowel disease, cancer-> malnourishment, anemia of chronic disease, steroids, higher risk of DVT - precise reasons for the increased risk of DVT are uncertain; likely, contributing factors are the need for pelvic dissection, patient positioning (eg, use of stirrups), and indications for surgery (eg, inflammatory bowel disease, cancer). In general bowel preparation has fallen out of favor in abdominal surgery due to concerns of electrolyte imbalances or dehydration. If performed 2 common solutions are used: Polyethylene glycol (PEG)-; sodium phosphate (NaP); magnesium citrate (Mg-citrate)-; and sodium picosulphate, citric acid and magnesium oxide (PSMC)-containing preparations.

Bowel preparation has been challenged by newer studies that did not find any differences in wound healing or anastomotic leak (1-4) but even may lead to complications like hypermagnesemia (when Mg-Citrate used- after colonectomy hypomagnesia possible), hypocalcemia (mostly with NaP- causes hyperphosphatemia and concurrent hypocalcemia) among others. Even the Society of colorectal surgeons acknowledges this paradox. (good review is "Commonly used preparations for colonoscopy: Efficacy, tolerability and safety – A Canadian Association of Gastroenterology position paper" by Barkun, A et al 2006)

From society of colorectal surgeons:
“The role of ritual in colorectal surgery is no better illustrated than in the hoary tradition of bowel preparation. Bolstered by industry's profit motive and physicians' fear of litigation, this awkward and unproven practice remains universal, despite a handful of prospective studies and a meta-analysis that suggest it is unnecessary and may actually lead to more wound infection (5). Recent practice guidelines acknowledge this paradox(6). All types of mechanical preparation occasionally engender serious complications (7,8,9). “

6. Intra-operative anesthetic management

Patients with a bowel obstruction or ileus are at risk for aspiration. Taking a good clinical history will help you filter out these patients. A rapid sequence induction may be indicated. In open procedures an epidural (also section 6) might be beneficial and your anesthesia maintenace will depend on the placement. Laparoscopic surgeries are thought to be less painful and hence oftentimes no epidural will be placed although epidurals also have the benefit of reducing postoperative ileus, even in laparoscopic surgery (11, 12). Ongoing muscle relaxation is often requested by the surgeons to facilitate visualization. In Colon surgery we use a single dose of Ertapenem. Mostly restrictive fluid management in bowel surgeries is indicated as studies have shown benefits in terms of healing and bowel edema. This concept has especially proven helpful in fast track bowel surgery. The term “fast track” in colon surgery was first used by Professor Henrik Kehlet (10). Originally concerned primarily with patients' pain and length of stay, it has evolved to mean different things to different parties. Basically, fast track colon surgery can be seen as the global package of perioperative care encompassing preoperative, operative, and postoperative techniques, which in aggregate result in fewer complications, a reduction in cost, less postoperative pain, a reduction in the hospital length of stay, and quicker return to work and normal activities.

7. Intra-operative monitoring

Depending on the extent of the surgery and the patients comorbidities in addition to standard monitors PIVs, +/- A-line, +/- CVP (difficult access), a foley catheter and NGT/OGT (also section 8) can be placed.

8. References

1. Contant C, et al. Mechanical bowel preparation for elective colorectal surgery: a multicentre randomised trial. The Lancet, 2007, 370: 2112-2117

2. Slim K, Vicaut E, Panis Y, Chipponi J. Meta-analysis of randomized clinical trials of colorectal surgery with or without mechanical bowel preparation. Br J Surg 2004;91(9):1125–1130.

3. Guenaga KF, Matos D, Castro AA, Atallah AN, Wille-Jorgensen P. Mechanical bowel preparation for elective colorectal surgery. Cochrane Database Syst Rev 2003;(2):CD001544.

4. Slim K, Vicaut E, Panis Y, Chipponi J. Meta-analysis of randomized clinical trials of colorectal surgery with or without mechanical bowel preparation. Br J Surg 2004;91(9):1125–1130.

5. Platell C, Hall J. What is the role of mechanical bowel preparation in patients undergoing colorectal surgery? Dis Colon Rectum 1998;41:875-882.

6. Moore J, Hewett P, Penfold JC et al. Practice parameters for the management of colonic cancer I: surgical issues. Recommendations of the Colorectal Surgical Society of Australia. Aust N Z J Surg 1999;69:415-421.

7. Schelling JR. Fatal hypermagnesemia. Clin Nephrol 2000;53:61-65.

8. Campisi P, Badhwar V, Morin S, Trudel JL. Postoperative hypocalcemic tetany caused by fleet phospho-soda preparation in a patient taking alendronate sodium: report of a case. Dis Colon Rectum 1999;42:1499-1501.

9. Bergeron E, Ouellette D, Dubé S, Beauchamp G. Bowel preparation with polyethylene glycol electrolyte lavage solution is potentially hazardous in patients with carcinoma of the cardia: a case report. Can J Surg 1997;40:456-458.

10. Kehlet H and Wilmore DW, Multimodal strategies to improve surgical outcome.Am J Surg 2002; 183(6):630-41

11. Jorgensen H, Wetterslev J, Moiniche S, Dahl J B. Epidural local anaesthetics versus opioid-based analgesic regimens for postoperative gastrointestinal paralysis, PONV and pain after abdominal surgery. Cochrane Database Syst Rev. 2000;(4):CD001893.

12. Neudecker J, Schwenk W, Junghans T, Pietsch S, Bohm B, Muller J M. Randomized controlled trial to examine the influence of thoracic epidural analgesia on postoperative ileus after laparoscopic sigmoid resection. Br J Surg. 1999;86:1292–1295.