The small and large intestines

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ANATOMY OF THE SMALL AND LARGE INTESTINES

FUNCTIONAL ABNORMALITIES

Megacolon and non-megacolon constipation

There is no single definition of constipation; however, a bowel frequency of less than one every 3 days would be considered into:

1. **Megacolon:**
   a. Hirschsprung’s disease;
   b. non-Hirschsprung’s megarectum and megacolon;

2. **non-megacolon:**
   a. slow transit;
   b. normal transit.

Idiopathic megarectum and megacolon

This is a rare condition and the cause is not known, although in some it may result from poor toilet training during infancy and in others from a congenital abnormality of the intestinal myenteric plexus. It presents usually in the first 20 years with severe constipation. Patients with idiopathic megarectum often present with faecal incontinence due to rectal faecal loading that requires manual evacuation. Patients with megacolon are more likely to present with abdominal distension and pain.

**On clinical examination**, there may be a hard faecal mass arising out of the pelvis and, on rectal examination, there is a large faecaloma in the lumen. The anus is usually patulous, perianal soiling is common, and sigmoidoscopy is usually impossible but may show melanosis coli if the patient has been taking laxatives over many years.

**Investigation**

**Imaging**

As there is an enlarged rectum, often with distension of the colon over a variable length, a radiograph should be taken without prior bowel preparation, using a small quantity of water-soluble contrast to prevent barium impaction. There is usually gross faecal loading of the enlarged rectum and colon and, when a contrast examination is carried out, the width of the colon measured at the pelvic brim is usually more than 6.5 cm.

**Anorectal physiology tests** demonstrate delayed first sensation and raised maximum tolerated volume.
Full-thickness rectal biopsy shows normal ganglion cells, a finding that definitively distinguishes this condition from Hirschsprung’s disease.

Medical treatment
This is directed at emptying the rectum and keeping it empty with enemas, washouts and sometimes manual evacuation under anaesthesia. Thereafter, the patient is encouraged to develop a regular daily bowel habit, with the use of osmotic laxatives to help the passage of semi formed stool. Rectal evacuation with suppositories and biofeedback therapy may be useful in resistant cases.

Surgical treatment
Surgical treatment is sometimes necessary if medical therapy fails. Options that are available include:
1. Resection of the dilated rectum and colon back to normal diameter colon with normal ganglion cells confirmed by frozen section at the time of surgery, which is followed by reconstruction with a coloanal anastomosis;
2. Colectomy with the formation of an ileorectal anastomosis;
3. Restorative proctocolectomy;
4. Vertical reduction rectoplasty, which is a new procedure designed to reduce the volume of the rectum by at least 50 (Williams);
5. Stoma formation, which may be used either as a salvage operation for failure of previous surgery or as a primary intervention.

Non-megacolon constipation
These are usually otherwise healthy individuals who seek help for constipation but eat a normal diet and have a normal colon on endoscopy and barium enema. Its cause is thought to involve slow whole-gut transit or a rectal evacuation problem.

Factors influencing bowel transit time include:
- Drugs: opiates, anti-cholinergics and ferrous sulphate;
- Diseases: neurological conditions (Parkinson’s disease, multiple sclerosis and diabetic nephropathy);
  - Hypothyroidism;
  - Hypercalcaemia.

Investigation
Whole-gut transit time can be measured by asking the patient to stop all laxatives and take a capsule containing radio-opaque markers. Retention of more than 80% of the shapes, 120 hours after ingestion, is abnormal.

Defaecating proctography may be helpful if the main complaint is difficulty in evacuating stools.

Treatment
This can be done in several ways:
1. Dietary fibre. This is the first-line treatment for people with mild constipation.
2. Laxatives. It is important that patients do not fall into a cycle of laxative abuse. A number of types are available which include bulk, osmotic and stimulant agents.

3. Biofeedback. This involves conditioning an coordination of the abdominal and pelvic compartments.

**Idiopathic slow-transit constipation**
This disorder is usually seen in women and results from infrequent bowel actions, which may have been present since childhood or may suddenly follow abdominal or pelvic surgery. This is a difficult condition to treat medically; dietary measures are usually unsuccessful, and surgical treatment is justified only after careful studies and when medical treatment has been exhausted.

Total colectomy and ileorectal anastomosis is the preferred procedure, but the results are unpredictable. Other types of surgery performed include stoma creation and segmental resection, but results are variable.

**VASCULAR ANOMALIES (ANGIODYSPLASIA)**
Capillary or cavernous haemangiomas are a cause of haemorrhage from the colon at any age. In the middle-aged or elderly patient, haemangioma needs to be distinguished from other causes of sudden massive haemorrhage, such as diverticulitis, ulcerative colitis (UC) or ischaemic colitis. Angiodysplasia is a vascular malformation associated with ageing. It occurs particularly in the ascending colon and caecum of elderly patients.

The malformations consist of dilated tortuous submucosal veins and, in severe cases, the mucosa is replaced by massive dilated deformed vessels.

**Clinical features**
In the majority, the symptoms are subtle and patients can present with anaemia. About 10–15% can have brisk bleeds, which may present as melaena or significant per rectum bleeding that is often intermittent. There is an association with aortic stenosis. A mild form of von Willebrand’s disease has been thought to be involved. The coagulation abnormality resolves after aortic valve replacement.

**Investigation**
Provided that the bleeding is not too brisk, colonoscopy may show the characteristic lesion in the right colon. The lesions are only a few millimetres in size and appear as reddish, raised areas at endoscopy.

**Selective superior and inferior mesenteric angiography** shows the site and extent of the lesion by a blush.

If this fails, a radioactive test using technetium-99m (99mTc)-labelled red cells may confirm and localise the source of haemorrhage.

**Treatment**
The first principle is to stabilise an unstable circulation. Following this, the bleeding needs to be localised by colonoscopy. This allows simple therapeutic procedures such as cauterisation to be carried out.
In severe uncontrolled bleeding, surgery becomes necessary. On-table colonoscopy is carried out to confirm the site of bleeding. If it is still not clear exactly which segment of the colon is involved, then a total abdominal colectomy with ileorectal anastomosis may be necessary.

**BLIND LOOP SYNDROME**
If a blind loop of the small intestine is made, defects of absorption will appear. If this occurs in the upper intestine, the defect is chiefly of fat absorption; if in the lower intestine, there is vitamin B12 deficiency. Essentially, the stasis produces an abnormal bacterial flora, which prevents proper breakdown of the food (especially fat) and mops up the vitamins that are present. Temporary improvement will follow the use of antibiotics to destroy the bacteria causing the trouble, but the main treatment is surgical extirpation of the cause of the stasis where applicable.

**DIVERTICULAR DISEASE**
Diverticula can occur in a wide number of positions in the gut, from the oesophagus to the rectosigmoid. There are two varieties:

1. **Congenital.** All three coats of the bowel are present in the wall of the diverticulum, e.g. Meckel’s diverticulum.
2. **Acquired.** The wall of the diverticulum lacks a proper muscular coat. Most alimentary diverticula are thought to be acquired.

**Small intestine**
Most of these diverticula arise from the mesenteric side of the bowel, probably as the result of mucosal herniation through the point of entry of blood vessels.

**Duodenal diverticula**
There are two types:

1. **Primary.** Mostly occurring in older patients on the inner wall of the second and third parts, these diverticula are found incidentally on barium meal and are usually asymptomatic. They can cause problems locating the ampulla during endoscopic retrograde cholangiopancreatography (ERCP).
2. **Secondary.** Diverticula of the duodenal cap result from longstanding duodenal ulceration.

**Jejunal diverticula:** Clinically, they may

1. be symptomless,
2. give rise to abdominal pain,
3. produce a malabsorption syndrome or
4. Present as an acute abdomen with acute inflammation and occasionally perforation.

They are more common in patients with connective tissue disorders. In patients with major malabsorption problems giving rise to anaemia, steatorrhoea, hypoproteinaemia or vitamin B12 deficiency.

Resection of the affected segment with end-to-end anastomosis can be effective.
**Meckel’s diverticulum**

- Occurs in 2% of patients, are usually 2 inches (5 cm) in length and are situated 2 feet (60 cm) from the ileocaecal valve
- It should be sought when a normal appendix is found at surgery for suspected appendicitis
- If a silent Meckel’s is found incidentally during the course of an operation, it can be left alone provided it is wide mouthed and not thickened

It represents the patent intestinal end of the vitellointestinal duct. It is vulnerable to infection and obstruction in the same way as the appendix. In 20% of cases, the mucosa contains heterotopic epithelium, namely gastric, colonic or sometimes pancreatic tissue.

**In order of frequency, these symptoms are as follows:**

1. **Severe haemorrhage**, caused by peptic ulceration. Painless bleeding occurs per rectum and is maroon in colour.
   
   An operation is sometimes required for serious progressive gastrointestinal bleeding. When no lesion in the stomach or duodenum can be found, the terminal 150 cm of ileum should be carefully inspected.

2. **Intussusception.** In most cases, the apex of the intussusception is the swollen, inflamed, heterotopic epithelium at the mouth of the diverticulum.

3. **Meckel’s diverticulitis** may be difficult to distinguish from the symptoms of acute appendicitis.
   
   When a diverticulum perforates, the symptoms may simulate those of a perforated duodenal ulcer.

4. **Chronic peptic ulceration.** As the diverticulum is part of the mid-gut, the pain, although related to meals, is felt around the umbilicus.

5. **Intestinal obstruction.** The presence of a band between the apex of the diverticulum and the umbilicus may cause obstruction either by the band itself or by a volvulus around it.

**Imaging**

Meckel’s diverticulum can be very difficult to demonstrate by contrast radiology; small bowel enema would be the most accurate investigation.

Technetium-99m scanning may be useful in identifying Meckel’s diverticulum as a source of gastrointestinal bleeding.

**Meckel’s diverticulectomy**

A Meckel’s diverticulum that is broad based should not be amputated at its base and invaginated in the same way as a vermiform appendix, because of the risk of stricture. Furthermore, this does not remove heterotopic epithelium when it is present.

Alternatively, a linear stapler device may be used.

Where there is induration of the base of the diverticulum extending into the adjacent ileum, it is advisable to resect a short segment of ileum containing the diverticulum, restoring continuity with an end-to-end anastomosis.
Colon
The prevalence of diverticular disease in the western world is 60% over the age of 60 years. The condition is found in the sigmoid colon in 90% of cases, but the caecum can also be involved and, on occasion, the entire large bowel can be affected. The main morbidity of the disease is due to sepsis.

Aetiology
Diverticula of the colon are acquired herniations of colonic mucosa, protruding through the circular muscle at the points where the blood vessels penetrate the colonic wall. The rectum with its complete muscle layers is not affected. It is thought to be related to reduce fibre in the western diet. This results in low stool bulk with resulting segmentation and hypertrophy of the colonic wall musculature, thus causing increased intraluminal pressure.

The complications are the following:
1- Recurrent periodic inflammation and pain.
2- Perforation leading to general peritonitis or local (pericolic) abscess formation.
3- Intestinal obstruction:
   A. in the sigmoid as a result of progressive fibrosis causing stenosis;
   B. in the small intestine caused by adherent loops of small intestine on the pericolitis.
4- Haemorrhage: diverticulitis may present with profuse colonic haemorrhage in 17% of cases, often requiring blood transfusions.
5- Fistula formation (vesicocolic, vaginocolic, enterocolic, colocutaneous) occurs in 5% of cases, with vesicocolic being the most common.

Diagnosis
Radiology
Computerized tomography (CT). It is particularly good at identifying bowel wall thickening, abscess formation and extraluminal disease. On identification of abscesses in stable patients, drainage may be carried out percutaneously.
Barium enemas and sigmoidoscopy are usually reserved for patients who have recovered from an attack of acute diverticulitis, for fear of causing perforation or peritonitis. Barium radiology is carried out to exclude a carcinoma and to assess the extent of the disease. Where the sigmoid colon is thickened and narrowed, a ‘sawtooth’ appearance may be seen. Some strictures can be very difficult to distinguish by radiology alone and, in those circumstances, colonoscopy will be necessary to rule out a carcinoma.

Water-soluble contrast enemas may, however, be helpful in sorting out patients with large bowel obstruction. In the acute situation, it is good at detecting intraluminal changes and leakage. The sensitivity for this is of the order of 90%.

Vesicocolic fistulae should be evaluated with cystoscopy and biopsy in addition to colonoscopy. Contrast examinations may show the fistula itself. The differential diagnosis for vesicocolic fistulae (and other fistulae) includes cancer, radiation damage, Crohn’s disease (CD), tuberculosis and actinomycosis.

Colonoscopy may reveal the necks of diverticula within the bowel lumen. The differential diagnosis from a carcinoma can be impossible if a tight stenosis prevent colonoscopy. In equivocal cases, biopsies may be taken.
Management
Non-complicated diverticulosis should be treated with a high-residue diet containing roughage in the form of whole meal bread, flour, fruit and vegetables. Bulk formers such as bran, Celevac, Isogel and Fybogel may be given until the stools are soft. Painful diverticular disease may require antispasmodics.
Acute diverticulitis is treated by bed rest and intravenous antibiotics.

Operative procedures for diverticular disease
Indications for operation include general peritonitis and failure to resolve on conservative treatment. Surgery may be indicated for young patients with more than two attacks of inflammation. Some 10% of patients require an operation either for recurrent attacks, which make life a misery, or for the complications of diverticulitis.

1- The ideal operation carried out as an interval procedure after careful preparation of the gut is a one-stage resection. This involves removal of the affected segment and restoration of continuity by end-to-end anastomosis.

2- If there is obstruction, inflammatory oedema and adhesions or the bowel is loaded with faeces, a Hartmann’s operation is the procedure of choice. The involved area is resected. The rectum is closed at the peritoneal reflection, and the left colon brought out as a left iliac fossa colostomy. The once popular staged procedures using a preliminary transverse colostomy are now rarely used except by inexperienced surgeons because of the high mortality associated with them. In selected obstructed cases, the bowel can be cleaned by on-table lavage, making anastomosis much safer.

3- In acute perforation, peritonitis soon becomes general and may be purulent, with a mortality rate of about 15%. Gross faecal peritonitis carries a mortality rate of more than 50% and pneumoperitoneum is usually present; the diagnosis may not be confirmed until emergency laparotomy.
There is a choice of procedures:
A. primary resection and Hartmann’s procedure;
B. primary resection and anastomosis after on-table lavage in selected cases;
C. exteriorisation of the affected bowel, which is then opened as a colostomy, a procedure now rarely used.

4- Fistulae can be cured only by resection of the diseased bowel and closure of the fistula.
In the case of a colovesical fistula, it’s usually possible to ‘pinch off’ the affected bowel from the bladder, close it and then resect the sigmoid. In very difficult cases, a staged procedure with a preliminary defunctioning stoma may be necessary.

5- Haemorrhage from diverticulitis must be distinguished from angiodysplasia. It usually responds to conservative management and occasionally requires resection. On-table lavage and colonoscopy may be necessary to localise the bleeding site. If the source cannot be located, then subtotal colectomy and ileostomy is the safest option.

Diverticular disease and carcinoma coexist in 12% of cases.
Differentiation of diverticulitis from carcinoma of the colon???