DIVERTICULOSIS

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DEFINITIONS

- Diverticulum: sac like protrusion (of the colonic wall)

- Diverticulosis: presence of diverticula
  - Can be symptomatic or asymptomatic

- Diverticular disease
  - Clinically significant symptomatic diverticulosis due to diverticular bleeding
  - Diverticulitis
  - Segmental colitis associated with diverticula
  - Symptomatic uncomplicated diverticular disease

DEFINITIONS

- Diverticular bleeding
  - Characterised by painless hematochezia due to segmental weakness of the vasa recta associated with diverticulum
- Diverticulitis: inflammation of diverticulum
  - Acute or chronic
  - Uncomplicated
  - Complicated by diverticular abscess, fistula, bowel obstruction or free perforation
- Segmental colitis associated with diverticular (SCAD) or diverticular colitis
  - Inflammation in inter-diverticular mucosa without involvement of diverticular orifices
- Symptomatic uncomplicated diverticular disease (SUDD)
  - characterised by persistent abdominal pain attributed to diverticular in absence of macroscopically overt colitis or diverticulitis
  - "smouldering diverticulitis"; especially when wall thickening present in absence of inflammatory changes on computer tomography

EPIDEMIOLOGY

- Age dependant prevalence
  - 20% by age 40; 60% by age 60

- Geographic variability of distribution
  - Western/Industrialised
    - 5-45% prevalence
    - 95% sigmoid diverticula
      - 65% limited to sigmoid
      - 24% predominantly sigmoid with other parts
      - 7% equally distributed through colon
      - 4% limited to segment proximal to sigmoid colon

EPIDEMIOLOGY

- Geographic variability of distribution
  - Asia
    - 13-25% prevalence
    - Predominantly right sided
- Overall increase in prevalence
  - But sticks to the relevant side

EPIDEMIOLOGY

- Diverticular bleeding
  - 5-15% of those with diverticulosis
    - 1/3 have massive bleeding
  - 50-90% right colon
  - ? Pathology
    - Right sided diverticula have wider necks and domes, exposing greater length of vasa recta to injury
    - Thinner wall of right colon

EPIDEMIOLOGY

- Diverticulitis
  - 4-5% with diverticulosis → diverticulitis
  - 63 years mean age
  - 16% of admission for acute diverticulitis < 45 years

- < 50 years of age
  - Male > Female
- 50-70 years of age
  - Male < Female
- > 70 years
  - Marked Female

RISK FACTORS

- Aldoori WH et al, A prospective study of diet and the risk of symptomatic diverticular disease in men. *Am J Clin Nutr*. 1994;60(5):757

- Strate LL et al, Nut, corn, and popcorn consumption and the incidence of diverticular disease. *JAMA.* 2008;300(8):907

RISK FACTORS

- Diet
  - Fibre… Contentious
    - Doesn't reduce predisposition
    - Doesn't reduce symptoms with SUDD
    - Inversely associated with risk of symptomatic diverticular disease

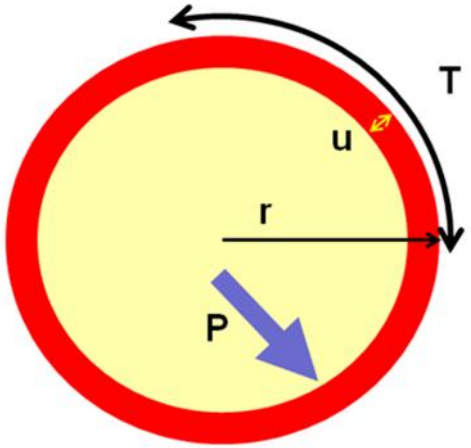
RISK FACTORS

- Diet
  - Fat + Red meat
    - Risk of diverticular disease significantly increased with diets low in fibre and high in fat/red meat
  - Seeds + Nuts
    - No associated with increase risk of diverticulosis, diverticulitis or diverticular bleeding

RISK FACTORS

- Physical activity
  - Vigorous physical activity reduces risk of diverticulitis and diverticular bleeding
- Obesity
  - Increased risk in diverticulitis and diverticular bleeding
- Smoking
  - Increased risk for perforated diverticulitis and a diverticular abscess

PHYSICS IS PHUN



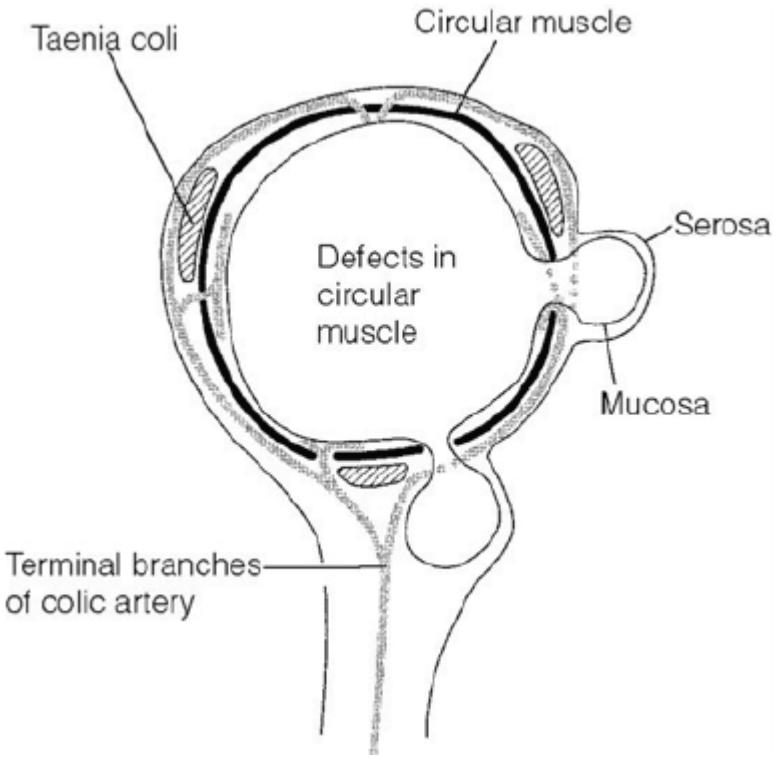
$$\text{Wall Tension (T)} = \frac{\text{Transmural Pressure (P)} \times \text{Radius (r)}}{2 \times \text{Wall Thickness (u)}}$$

Change in pressure in a tubular structure required to cause distension is proportional to surface wall tension, inversely proportional to its radius

PATHOGENESIS - DIVERTICULOSIS

- Segmentation of narrow sigmoid colon predisposes to high intraluminal pressures
  - Laplace's law

- Protrusion of mucosa at weak points where terminal arterial branches penetrate circular muscle adjacent to taeniae



CLASSIFICATION OF DIVERTICULAR DISEASE

- Comparison between elective and emergency series is difficult, due to
  - Inconsistency in diagnosis
  - Description of gross and radiological pathology
  - Peritoneal contamination

- Classifications
  - Killingback
  - Hinchey

KILLINGBACK'S CLASSIFICATION (1983)

- Abscess
  - Peridiverticular
  - Mesenteric
  - Pericolic (pelvic)
- Perforation
  - Free
  - Concealed
  - Gangrenous sigmoiditis

Peritonitis

a. Serous
b. Purulent
c. Faecal
   i. Local
   ii. Pelvic
   iii. Generalised (diffuse)

ADAPTED HINCHEY (1978)

- Stage I: Diverticulitis associated with peri-colic abscess
- Stage II: Distant abscess (retroperitoneal, pelvic)
- Stage III: Purulent peritonitis
- Stage IV: Faecal peritonitis

DEFINING NATURE AND EXTENT

- Haglund et al. Complicated diverticular disease of the sigmoid colon. An analysis of short and long term outcome in 392 patients. *Ann Chir Gynaecol.* 1979:68(41)

DEFINING NATURE AND EXTENT

- 392 patients
  - 25% required emergency operation
  - Of those operated
    - 1/3 had no evidence of perforation
      - Mortality 3%
    - 2/3 had perforation
      - Mortality 33%

- i.e. if threshold for operation is inappropriately low, more patients with mild disease and an intrinsically good prognosis are subjected to Sx

EMERGENCY - ACUTE DIVERTICULITIS

- Few days Hx increasing lower abdominal pain
  - Localises to LIF
- Associated
  - Nausea
  - Altered bowel habit
  - Irritation of pelvic viscera
- Pain and tenderness can be maximal to right of midline, depending on disposition of sigmoid
- DDx: pathology of large/small bowel, genitourinary, arterial (ruptures), abdominal wall pathology

EMERGENCY - FISTULA

- Potential for fistulation between inflamed diverticulum and adjacent viscera
  - Colovesical
  - Colovaginal (more common after hysterectomy)
  - Vesicocolic (pericolic abscess at apex of sigmoid, adheres to and ruptures into vault of bladder)
    - UTI symptoms, pneumaturia
    - DDx: Crohn's, Colon/Bladder Ca

EMERGENCY - ABSCESS

- Pericolic, pelvic or mesocolic abscesses

- Presentation
  - Localised lower abdominal sepsis
  - Systemic upset
  - Can sometimes be palpable
  - Usual detection on CT

EMERGENCY - HAEMORRHAGE

- Presentation
  - Painless
  - Profuse
    - Colour dependant on colonic bleeding source
      - Left: bright red, clots
      - Right: darker, plum coloured

- Rarely exsanguinating

EMERGENCY - OBSTRUCTION

- Left side colonic obstruction secondary to fibrous structuring
  - Presents identical to progressive carcinoma obstruction

- Ix/Mx
  - Ca = Diverticulitis
  - AXR confirming obstruction
  - Contrast study to confirm site
- Ca vs Diverticulitis
  - Normally confirmed only after resection
  - Left colon cancer may be found in mass in 20-25% cases

INVESTIGATIONS

- Acute diverticulitis/abscess
  - AXR/CXR: sub-diaphragmatic gas not absolute indication for operation
  - CT > ultrasound / singe contrast enema
    - Poor evidence base however
    - 97% sensitivity
  - PR before contrast study
  - Sigmoidoscopy before laparotomy
    - Exclude anorectal conditions influencing proposed operation (rectal neoplasm)

INVESTIGATIONS

- Obstruction
  - plain AXR
  - single contrast enema
- Fistula
  - barium enema
  - Increasing CT, can reveal rarer fistulas
- Haemorrhage
  - mesenteric angiogram

MANAGEMENT

- Highly evolving

- Relatively few sigmoid diverticular cases require surgery
  - Abscesses < 5cm usually resolve with ABx alone

- Emergency surgery
  - When to operate
  - When to resect
  - When to anastomose

WHEN TO OPERATE?

- Most difficult of the 3

- Absolute: widespread evidence of peritonitis AND free gas
  - not: extravasation of contrast alone

- Otherwise: vigorous resuscitation AND ABx Rx
  - Conservative Mx for up to 3/7
  - Can manage pneumo-peritoneum without an operation if rapid clinical improvement or risk of surgery too high

CONSERVATIVE MANAGEMENT

- Less severe episodes
  - Oral metronidazole + trimethoprim

- Major sepsis
  - Gentamicin (7mg/kg daily) + metronidazole (500mg TDS)
    - Requirements for activity against enterococci and use of penicillin derivatives unconvincing / not essential

WHEN TO OPERATE?

- Surgical options in perforated diverticulitis
  - Conservative
    - Laparoscopic lavage + drainage
    - Laparotomy
      - With +/-out suture
      - With +/- drainage
      - With +/- proximal stoma
    - Exteriorisation of sigmoid loop
  - Radical
    - Resection without anastomosis (Hartmann's procedure)
    - Resection + anastomosis
    - Resection + anastomosis + proximal stoma

WHEN TO RESECT?

- With good indications for surgery, resection of the sigmoid has been popular

- Original review of those requiring laparotomy (Hinchey III/IV) confirmed increased survival if perforated colon resected
  - Rather than leaving in situ, drainage, and/or proximal colostomy

LAPAROSCOPIC PERITONEAL LAVAGE

- Taylor CJ et al, Perforated diverticulitis management by laparoscopic lavage. *ANZ J Surg*. 2006;76(11):962-5.
- Myers E et al, Laparoscopic peritoneal lavage for generalized peritonitis due to perforated diverticulitis. *Br J Surg*. 2008;95(1): 97-101.

- Laparotomy can be avoided in patients
- lower overall morbidity and mortality

WHEN TO RESECT?

- Newest papers
  - Contamination is worst → resection improves survival
    - Therefore, laparotomy indicated, resect sigmoid

- If misdiagnosed and found during laparoscopy
  - Avoid resection, post operative ABx
  - Stoma formation, drainage or resection unwarranted
    - High morbidity and mortality

WHEN TO ANASTOMOSE?

- V. A. Constantinides, et al. Primary resection with anastomosis vs Hartmann's procedure in non-elective surgery for acute colonic diverticulitis: a systematic review. *Dis Colon Rectum*. 2006;49(7): 966-81.

- Systematic review
  - Mortality after PRA is less for Hinchey > 2
  - PRA 7.4% vs Hartmann's 15.6%

WHEN TO ANASTOMOSE?

- Haemorrhage
  - Strenuous efforts pre-operative
    - Angiography if active bleeding
    - Colonoscopy
    - Labelled red cell scan
  - Perioperative
    - Colonoscopy
  - If bleeding point cannot be found and targeted resection is not possible then "blind" subtotal colectomy must be performed
  - Usually precarious patient
    - Unwise to perform ileorectal anastomosis
    - Ileostomy + closure of rectal stump

CONTROVERSIES - TIMING

- Urgent operation is required increasingly infrequently
- Majority of patients do not experience significant recurrent complications over 10 years to justify resection
- High numbers of surgically treated patients with low mortality and morbidity and single stage procedures
  - However is this life saving
  - Was the operation required at all

CONTROVERSIES – ELECTIVE SX

- Ambrosetti P, Long-term follow-up after first acute episode of sigmoid diverticulitis: is surgery mandatory?: a prospective study of 118 patients. *Dis Colon Rectum*. 2002;45(7):962-6.

- Relation of severity on CT with risk of delayed complication
  - Mild – 14%
  - Severe – 39%
- Corollary: majority of patients do not suffer further attack

CONTROVERSIES – ELECTIVE SX

- Not unreasonable to discuss elective resection with
  - patient < 50 years
  - Post severe episode of diverticulitis
  - Continuing symptoms
  - Serious structural changes in colon

- Patient admitted twice with acute sepsis
  - Consideration for operation
  - Consider medical appropriateness

THANK YOU