# **Diverticular disease**

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## **History**

"...we not infrequently find between the bands of longitudinal muscle fibers in the sigmoid, a series of small, dark, pearshaped tumours, which are formed by herniae of the mucous membrane through the gaps in the muscle coat."

Jean Cruveilhier 1849

## Epidemiology



## **Localisation**

#### Western societies:

Involvement of sigma: 90%

Right-sided involvement: 15%

### <u>Asia:</u>

Right-sided involvement: more prominent

# **Etiology / Pathogenesis**



#### Pathological findings:

Thickening of the muscle wall and shortening of the taenia, with a resulting accordion-like bunching of the folds 2-fold increase in elastin deposition between the muscle cells in the taenia. The elastin is laid down in a contracted form, presumably causing shortening of the taenia and the resulting bunching of the circular muscle.

Altered colonic motility:

A higher resting, postprandial, and neostigmine-stimulated pressures in diverticular patients compared to controls

theory of 'segmentation'  $\rightarrow$  generate excessively high pressures within each segment forcing the mucosa to herniate.

Dietary factors:

low fiber  $\rightarrow$  increased colonic transit times and decreased mean stool weights

## **Natural course**



1) [Sarin S, Boulos PB. Long-term outcome of patients presenting with acute complications of diverticular disease. Ann R Coll Surg Engl 1994;76:117]

2) [Stollman N, Raskin JB. Diverticular disease of the colon. Lancet2004;363:631]
[Schoetz DJ. Diverticular disease of the colon: a century old problem. Dis Colon Rectum 1999;42:703]
[Mueller MH et al. Long-term outcome of conservative treatment in patients with diverticulitis of the sigmoid colon. Eur J Gastroenterol Hepatol 2005;17:649]

## **Risk factors / modifying factors**

Fibre intake: Controversial<sup>1)</sup>

- Possible benefit for symptomatic uncomplicated diverticular disease<sup>2)</sup>
- Inverse correlation fibre intake diverticular complications<sup>3)</sup>

Physical activity: protective effect on symptomatic diverticulosis<sup>4</sup>)

Smoking: controversial<sup>5),6)</sup>

- 1) [Peery AF et al. A high-fiber diet does not protect against asymptomatic diverticulosis. Gastroenterology 2012;142:266]
- 2) [Brodribb AJ. Treatment of symptomatic diverticular disease with a high-fibre diet. Lancet1977;1:664]
- [Smits BJ et al. Lactulose in the treatment of symptomatic diverticular disease: a comparative study with high-fibre diet. Br J Clin Pract 1990;44:314] [Taylor I et al. Bran tablets and diverticular disease. Br Med J 1976;1:1988]
- 3) [Aldoori WH et al. A prospective study of diet and the risk of symptomatic diverticular disease in men. Am J Clin Nutr 1994;60:757] [Crowe FL et al. Diet and risk of diverticular disease in Oxford cohort of European Prospective Investigation into Cancer and Nutrition (EPIC): prospective study of British vegetarians and non-vegetarians. BMJ 2011;343:d4131]
- 4) [Aldoori WH et al. Prospective study of physical activity and the risk of symptomatic diverticular disease in men. Gut 1995;36:276]
- 5) [Hjern F et al. Smoking and the risk of diverticular disease in women. Br J Surg2011;98:997]
- 6) [Aldoori WH et al. A prospective study of alcohol, smoking, caffeine, and the risk of symptomatic diverticular disease in men. Ann Epidemiol 1995;5:221]

## **Risk factors / modifying factors (2)**

- Alcohol consumption: prob. no effect<sup>1</sup>)
- Caffein consumption: prob. no effect<sup>1</sup>)
- Obesity: in association w/ low fibre/high fat/meat diet, risk for CO<sup>2</sup>) BMI >30kg/m<sup>2</sup> vs. <21kg/m<sup>2</sup>: Diverticulitis RR 1.78, diverticular bleeding RR 3.19
- NSAID: risk for complications (diverticulitis, bleeding)<sup>3)</sup> ASA: diverticulitis HR 1.25, diverticular bleeding 1.70 NSAID: 1.72, diverticular bleeding 1.74

3) [Strate LL et al. Use of aspirin or nonsteroidal anti-inflammatory drugs increases risk for diverticulitis and diverticular bleeding. Gastroenterology 2011;140:1427]

<sup>1) [</sup>Aldoori WH et al. A prospective study of alcohol, smoking, caffeine, and the risk of symptomatic diverticular disease in men. Ann Epidemiol 1995;5:221]

<sup>2) [</sup>Strate LL et al. Obesity increases the risks of diverticulitis and diverticular bleeding. Gastroenterology2009;136:115]

## **Clinical Features of acute diverticulitis**

Left lower quadrant pain

(intermittent or constant, associated with a change in bowel habits)

Fever, anorexia, nausea, and vomiting

Dysuria and urinary frequency: "sympathetic cystitis"

#### Physical exam:

localized tenderness in the left lower quadrant, guarding and rebound tenderness, palpable mass.

#### Lab values:

WBC is frequently elevated (normal in 45% of pat.) No other laboratory abnormalities are routinely helpful.

## **Differential Diagnosis**

Acute appendicitis Crohn's disease Colonic carcinoma Ischemic colitis Pseudomembranous colitis Complicated ulcer disease Ovarian cyst, abscess, torsion Ectopic pregnancy

Suspect if RLQ symptoms or nonresolution with medical therapy Suspect if apthous ulcers, perianal involvement, or chronic diarrhea Suspect if weight loss, bleeding. Diagnose with colonic evaluation after acute inflammation resolved Suspect if high-risk patient, bloody diarrhea, or thumbprinting. Diagnose with limited flexible sigmoidoscopy Suspect with antibiotic use or diarrhea. Diagnose with stool toxin or limited flexible sigmoidoscopoy Suspect if pneumoperitoneum or peritonitis, or with clinical history, NSAID use, or dyspepsia Suspect in female patient with unilateral pain. Diagnose with pelvic or transvaginal ultrasound Suspect in female patient of childbearing age. Diagnose with pregnancy test and ultrasound

# Diagnosis

- Clinical diagnosis with low accuracy<sup>1)</sup>
  - PPV 65%
- High accuracy for CT and ultrasound
  - CT: PPV 95%, NPV 99%; Sensitivity (69-)95%, Specifity 75-100%<sup>2,3)</sup>
  - US: PPV -100%, NPV 99%; Sensitivity 84-98%, Specifity 80-98%<sup>4-6</sup>
- CT prognostically useful<sup>7,8</sup>
  - Severity of initial CT predicts failure of medical treatment and risk of secondary complications

<sup>1) [</sup>Toorenvliet BR et al. Colonic diverticulitis: a prospective analysis of diagnostic accuracy and clinical decision-making. Colorectal Dis2010;12:179]

<sup>2) [</sup>Doringer E. Computed tomography of colonic diverticulitis. Crit Rev Diagn Imaging 1992;33:421]

<sup>3) [</sup>Liljegren G et al. Acute colonic diverticulitis: a systematic review of diagnostic accuracy. Colorectal Dis 2007;9:480

<sup>4) [</sup>Verbanck J et al. Can sonography diagnose acute colonic diverticulitis in patients with acute intestinal inflammation? J Clin Ultrasound 1989;17:661]

<sup>5) [</sup>Schwerk WB et al. Sonography in acute colonic diverticulitis: A prospective study. Dis Colon Rectum 1992;35:1077]

<sup>6) [</sup>Zielke A et al. Prospective evaluation of ultrasonography in acute colonic diverticulitis. Br J Surg 1997;84:385]

<sup>7) [</sup>Ambrosetti P et al. Computed tomography in acute left colonic diverticulitis. Br J Surg1997;84:532]

<sup>8) [</sup>Ambrosetti P et al. Colonic diverticulitis: impact of imaging on surgical management - a prospective study of 542 patients. Eur Radiol 2002;12:1145]

# **Diagnosis – imaging signs**

- air or contrast filled diverticula
- pericolic stranding (98%)
- wall thickening (70%)
- perocolic phlegmona (35%)
- Abscesses
- Perforation / free air



[Doringer E. Computed tomography of colonic diverticulitis. Crit Rev Diagn Imaging 1992;33:421] [Ambrosetti P et al. Computed tomography in acute left colonic diverticulitis. Br J Surg 1997;84:532]

## **US** -Imaging



#### hypoechoic bowel wall thickening

hyperechogenicity surrounding the bowel wall, implying active inflammation

presence of diverticula or abscesses

# Staging

Hinchey	Description	Mortality
0	Acute uncomplicated	0%
la Ib	<b>Confined pericolic inflammation / phlegmone</b> <b>Confined pericolic abscess</b>	0% <5%
II	Distant abscess (retroperitoneal or pelvic)	<5%
ш	Generalized putride peritonitis ('noncommunicating')	13%
IV	Generalized fecal peritonitis ('communicating')	43%

[Hinchey EJ et al. Treatment of perforated diverticular disease of the colon. Adv Surg 1978;12:85]

# Staging

#### Hansen/Stock classification

- 0 Diverticulosis
- Acute uncomplicated diverticulitis
- II Acute complicated diverticulitis
  - a. Phlegmon, peridiverticulitis
  - **b.** Abscess, sealed perforation
  - c. Free Perforation
- III Chronic recurrent diverticulitis

### Endoscopy

- Not indicated in acute phase
  - Although probably relatively safe
    - Acute colonoscopy w/ better compliance, no higher complication rate, lower cecum intubation rate<sup>1</sup>)
    - Probably higher perforation rate (n=1), lower cecum intubation rate<sup>2)</sup>
    - Flexible sigmoidoscopy?<sup>3)</sup>





Complete colonic evaluation after resolution of diverticulitis

[Lahat A et al. The feasibility and risk of early colonoscopy in acute diverticulitis: a prospective controlled study. Endoscopy 2007;39:521]
[Sakhnini E et al. Early colonoscopy in patients with acute diverticulitis: results of a prospective pilot study. Endoscopy2004;36:504]
[Tan L et al. Early flexible sigmoidoscopy in the evaluation of acute left iliac fossa pain. Colorectal Dis 2000;2:84]

## **Management of diverticulosis**

## **Management of diverticulosis**

<u>diet</u> :

- whole grains, fruit and vegetables
- no need to avoid seeds, nuts, popcorn or fruit skins

constipation and a low-fibre diet:

- increase of fibre intake and fluid gradually may minimise flatulence and bloating
- bulk-forming laxatives

<u>Exercise</u>

Avoid obesity

stop smoking

## **Treatment acute phase**

#### • Uncomplicated diverticulitis: medical treatment

- Success rate? 70 100% (~ 85%)<sup>1)</sup>
- Need for surgery? <10%</p>

1) [Rafferty J et al. Practice parameters for sigmoid diverticulitis. Dis Colon Rectum 2006;49:939]







No effect of antibiotics when compared to no antibiotics

Non-inferiority between single compound compared to double compound Tx

No difference short versus long IV antibiotic therapy

# **Need for Hospitalisation / Therapy**

## **Consider outpatient management:**

- tolerate oral intake,
- severity of illness
- no comorbid diseases
- available outpatient support

# **Consider Hospitalisation:**

- Very elderly
- Significant comorbidities
- Immunosuppressed
- high fever and signifikant WBC

[Rafferty J et al. Practice parameters for sigmoid diverticulitis. Dis Colon Rectum 2006;49:939]

## Recurrence

Risk of recurrence according to stage<sup>1)</sup>

- Hinchey Ib 12.7%
- Hinchey II 41.2%

20% of pat. with acute uncompl. diverticulitis have a recurrence in 5y

Emergency surgery: mortality up to 6%, morbidity up to 72%<sup>2</sup>)

1. [Kaiser AM et al. The management of complicated diverticulitis and the role of computed tomography. Am J Gastroenterol 2005;100:910] 2. [Alvarez JA et al. Presentation, management and outcome of acute sigmoid diverticulitis requiring hospitalization. Dig Surg 2007;24:471]

## **Elective prophylactic surgery**

'Recurrent attacks are less likely to responded medical therapy'

'and have a higher mortality rate'

'therefore, most authorities agree that elective resection is indicated after two curesks of uncomplicated diverticulitis'

Why?

[Parks TG. Natural history of diverticular disease of the colon. Clin Gastroenterol 1975;4:53] [Imbembo AL et al. Diverticular disease of the colon. In: Textbook of Surgery, 14th edn. WB Saunders 1991;910] [Stollman NH et al. Practice Guidelines . Diagnosis and Management of Diverticular Disease of the Colon in Adults. Am J Gastroenterol 1999;94:3110] 10 % of pat. managed with elective surgery after 1 episode experience shortterm complications Risk higher in the elderly

25 % experience long-term complications

<5% risk of emergent OP due to complications in pat. treated without OP

Even in young pat. with recurrent diverticulitis, data do not support elective surgery

Factors to be considered:

immunosuppression, comorbidities, age, pat. preference

#### Recurrence and major complications requiring surgery after uncomplicated diverticulitis

Main author	Year	Number	FU years	Recur- rence, %	Surgery %
Ambrosetti [17]	1994	226	2	18	3
Elliot [18]	1997	185	5	14	4
Makela [19]	1998	366	10	15	5
Biondo [20]	2002	327	7	16	1
Chautems [21]	2002	118		32	0
Mueller [22]	2005	252		34	1
Anaya [23]	2005	25,058	8	19	5
Moreno [24]	2007	325	6	35	7
Salem [25]	2007	116	5	3	0
Hall [26]	2011	954		36	4

→risk of future major complications small

- $\rightarrow$ risk of future emergency operation need small
- $\rightarrow$ Medical treatment of future attacks still reasonable / effective

Percentage of patients with a major complication as their first presentation

Main author	Year	Number	%
Nylamo [29]	1990	48	96
Lorimer [30]	1997	154	95
Hart [7]	2000	58	78
Somasekar [31]	2002	108	97
Andeweg [32]	2008	183	80

90% of letal perforations as first attack<sup>1)</sup>

60% of patients with need for emergency surgery as first attack<sup>2)</sup>

Risk of Hartmann's procedure after full recovery of medically treated acute diverticulitis 1/2'000 patientyears<sup>3)</sup>

Uncomplicated disease course after conservative / surgical treatment of first attack in 73% vs. 79%4)

# $\rightarrow$ most patients presenting with major complication of diverticulitis do so as first episode

#### $\rightarrow$ Elective surgery not effective in preventing future complicated attacks

- 1) [Chapman J et al. Complicated diverticulitis: is it time to rethink the rules? Ann Surg2005;242:576]
- 2) [Alexander J et al. Results of changing trends in the surgical management of complications of diverticular disease. Surgery 1983;94:683]
- 3) [Janes S et al. Elective surgery after acute diverticulitis. Br J Surg2005;92:133]
- 4) [Larson DM et al. Medical and surgical therapy in diverticular disease: a comparative study. Gastroenterology1976;71:734]

#### Recurrence of diverticulitis after surgery

Main author	Year	Number	%	Main author	Year	Number	FU years	Recur- rence, %
Breen [34] Thorn [35] Killingback [36] Andeweg [32] Egger [37]	1986 2002 2004 2008 2008	100 75 127 183 124	15 8 1 8 0	Ambrosetti [17] Elliot [18] Makela [19] Biondo [20] Chautems [21] Mueller [22] Anaya [23] Moreno [24] Salem [25] Hall [26]	1994 1997 1998 2002 2002 2005 2005 2007 2007 2011	226 185 366 327 118 252 25,058 325 116 954	2 5 10 7 8 6 5	18 14 15 16 32 34 19 35 3 36

 $\rightarrow$  risk of future episodes is reduced, but not eliminated

 $\rightarrow$ Benefit must be weighed to surgical risk

elective surgery with mortality 1.2-2.3%<sup>1,2</sup>, risk factors e.g. age >75y (OR 7.9), obesity (OR5.2)

1)[Pessaux P et al. Risk factors for mortality and morbidity after elective sigmoid resection for diverticulitis: prospective multicenter multivariate analysis of 582 patients. World J Surg 2004;28:92]

2) [Netri G et al. The role of surgical treatment in colon diverticulitis: indications and results. Ann Ital Chir 2000;71:209]

#### What about patients with chronic symptoms?

**Recurrence of symptoms after surgery for uncomplicated diverticulitis** 

Main author	Year	Number	%	
Benn [38]	1986	501	20	
Breen [34]	1986	100	60	
Munson [39]	1996	78	27	
Thorn [35]	2002	75	33	
Thaler [40]	2003	236	5	
Killingback [36]	2004	127	9	
Andeweg [32]	2008	183	22	
Egger [37]	2008	124	25	

 $\rightarrow$  Surgery not so effective in controlling symptoms after uncomplicated diverticulitis

## **Guidelines on operative treatment**

Task force of the American Society of Colon and Rectal Surgeons:

'the number of attacks of uncomplicated diverticulitis is not necessarily an overriding factor in defining the appropriateness of surgery'

'the decision to recommend elective sigmoid colectomy ... should be made on a case-by-case basis'

#### Association of Coloproctology of Great Britain and IrelandACPGBI

'the majority of patients presenting with acute diverticulitis can be managed with a conservative medical approach in the longer term' 'the decision on elective resection should be made on an individual basis'

Standards Committee of The Amercian Society of Colon and Rectal Surgeons. Practice parameters for sigmoid diverticulitis. Rafferty J et al. Dis Colon Rectum 2006;49:939

ACPGBI Position Statement on Elective Resection for Diverticulitis. Fozard JB et al. Colorectal Dis 2011;Suppl 3:1

## Taken to daily practice

#### **Elective surgery**

after successful medical treatment of uncomplicated acute diverticulitis

- Plain number of attacks no longer a central, undependent factor
- Other factors to be considered
  - Severity of index attack (severe initial attack as predictor of future complications)
  - Age of patient (no clear evidence for more aggressive course in youngerpatients)<sup>1)</sup>
  - **Comorbidities** (e.g. immunosuppression as risk factor for complications)
  - Interference of attacks with daily life (e.g. tolerance of pain; work; travel habits...)

<sup>1) [</sup>Kotzampassakis N et al. Presentation and treatment outcome of diverticulitis in younger adults: a different disease than in older patients? Dis Colon Rectum 2010;53:333]

## To make a long story short

# Indication for elective surgery arises from intention to prevent further attacks, not from intention to prevent future complications

## **Discussion**

