Diverticulitis
To Cut or Not to Cut?

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Overview:

- Introduction
  - Terminology
  - Pathogenesis
  - Epidemiology
  - Clinical features
  - Complications

2. Surgery in Uncomplicated Diverticulitis

3. Surgery in Complicated Diverticulitis

4. Conclusion / Recommendations
**Introduction:**

Terminology:

- **Diverticulosis:**
  - presence of asymptomatic noninflamed diverticula
  - diverticula: saccular outpockets of the colon

- **Diverticulitis:**
  - acute inflammation/infection of one or more diverticula

- **Diverticular disease:**
  - includes all signs & symptoms that may result from the presence of diverticula
Introduction:

Terminology:

- **True diverticula:**
  - contains all the layers of the colon wall:
    - mucosa, submucosa, muscularis externa
  - congenital

- **False or Pseudodiverticula:**
  - involves only the mucosa & submucosa which herniates through the muscularis externa layer
  - acquired
  - represents most diverticula
Pathogenesis:

• main pathogenic factor for development of diverticula:
  - increased intraluminal pressure within the colon
  - circular muscle thickening
  - increased content of elastin within taeniae coli

• diverticula develop in areas of structural weakness in colon wall:
  - where vasta recta, branches of marginal artery, penetrate circular muscle

• when circular muscle contracts, may occlude the lumen
  - if two contractions occur close together, this may isolate colon segment
Pathogenesis:

• LaPlace Law:
  - \( P = \frac{T}{R} \)
  - increase \( P \) \( \rightarrow \) increase wall tension
  - diverticula develops

• theories for diverticulitis:
  - impacted stool in neck of diverticula \( \rightarrow \) obstruction & abrasion
  - microperforation of diverticula due to increase intracolonic pressure
  - ischemia of diverticular sac

  - results in:
    - infection of pericolic tissue
    - free perforation
Pathogenesis:

- areas affected:
  - ~95% occur in the left colon (in western countries)
    - predominately in the sigmoid colon
  - congenital diverticula usually located in right colon
Epidemiology:

- exact incidence & prevalence of diverticulosis is unclear

- most people with diverticulosis remain asymptomatic throughout life–no treatment

- <40 years of age:
  - uncommon: ~2 to 5%
  - men > women
  - more likely to have complications of diverticulitis

- thereafter: linear increase with age

- estimated that diverticula present:
  - in 33% of the population >45 years of age
  - in 66% of the population >85 years of age

- of all patients with diverticulosis:
  - ~10 to 25% (40%) will develop diverticulitis
  - most common in 6th & 7th decades
Epidemiology:

- estimated that diverticula present:
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- of all patients with diverticulosis:
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- of all patients with diverticulitis:
  - ~15 to 30% will require operation due to complications  (Almy et al., 1980)
Epidemiology:

- Parks (1975):
  - n=521
  - average age at presentation: 61.8 years
  - > 92% were >50 years of age
  - 96% of patients had involvement of sigmoid colon
  - 65.5% of patients had sigmoid colon as sole site of involvement
  - ~50% had symptoms <1 month before presentation

- 65% were treated medically:
  - 26% needed further care – usually within 5yrs of original attack
  - 35% required surgery (for complications)
Clinical Features:

- evidence of acute diverticulitis

- symptoms:
  - malaise
  - fever
  - chills
  - obstipation
  - diarrhea or constipation
  - nausea & vomiting
  - anorexia
  - left lower quadrant abdominal pain
  - generalized abdominal pain
  - frequency or urgency

- signs:
  - temperature $> 38 \degree C$
  - leukocytosis $\pm$ left shift
  - palpable abdominal mass
  - left lower quadrant tenderness
  - localized versus diffuse peritonitis
  - dysuria, fecaluria, pneumaturia
  - pelvic or abdominal abscess
Complications:

- complications of diverticular disease consist of:
  - abscess
  - perforation
  - bleeding
  - fistula
  - obstruction or stricture
The Literature: Natural Course of Diverticulitis

  - n = 366:
    - patients admitted to Oulu University Hospital 1981-1990 with followup to 1996
    - disease confirmed by: double-contrast barium enema, colonoscopy or operative finding

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>&lt; 50 years</th>
<th>50 – 70 years</th>
<th>&gt; 70 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Diverticulitis</td>
<td>79.7 %</td>
<td>75.4 %</td>
<td>70.8 %</td>
</tr>
<tr>
<td>Perforation</td>
<td>18.9 %</td>
<td>17.3 %</td>
<td>19.5 %</td>
</tr>
<tr>
<td>Bleeding</td>
<td>1.4 %</td>
<td>3.9 %</td>
<td>8.0 %</td>
</tr>
<tr>
<td>Fistula</td>
<td>--</td>
<td>2.2 %</td>
<td>--</td>
</tr>
<tr>
<td>Stricture</td>
<td>--</td>
<td>1.1 %</td>
<td>1.8 %</td>
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</tbody>
</table>
The Literature: Course of Diverticulitis After Medical Treatment

  - those patients who underwent an operation on first presentation, none developed recurrent diverticulitis
  - those patients who were treated medically first:

<table>
<thead>
<tr>
<th>Recurrence</th>
<th>&lt; 50 years</th>
<th>50 – 70 years</th>
<th>&gt; 70 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Diverticulitis</td>
<td>22 %</td>
<td>9.6 %</td>
<td>1.5 %</td>
</tr>
<tr>
<td>Complication (Perforation, Stricture, Fistula, Bleeding)</td>
<td>10.2 %</td>
<td>6.7 %</td>
<td>5 %</td>
</tr>
<tr>
<td>Overall</td>
<td>32%</td>
<td>17%</td>
<td>7%</td>
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<tr>
<td>Median Time of Recurrence</td>
<td>4 yrs</td>
<td>2yrs 2 mo.</td>
<td>1yr</td>
</tr>
</tbody>
</table>
Elective Surgery & Diverticulitis:

- the literature is unclear with regards to:

- the indication and timing of elective surgery in patients who become asymptomatic after successful conservative treatment of acute diverticulitis

- advocates of early elective resection argue:
  - elective surgery is safe, cures diverticulitis definitively
  - prevents the development of life-threatening complications

- opponents:
  - dispute the prophylactic value of early surgery
  - since majority of patients operated upon in an emergency setting
    - present initially with the complication without any previous history of diverticulitis
  - majority of patients remain asymptomatic lifelong after successful medical treatment of their acute attack
The Literature: Course of Diverticulitis After Medical Treatment

- many retrospective studies have evaluated course of uncomplicated diverticulitis:

<table>
<thead>
<tr>
<th>References</th>
<th>n</th>
<th>Follow-up (yrs)</th>
<th>Recurrent Diverticulitis (%)</th>
<th>Secondary Surgery (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zollinger (1968)</td>
<td>229</td>
<td>1-11</td>
<td>35</td>
<td>4</td>
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<tr>
<td>Parks et al. (1970)</td>
<td>297</td>
<td>2-16</td>
<td>25</td>
<td>4</td>
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<td>Larson et al. (1976)</td>
<td>99</td>
<td>7-12</td>
<td>13</td>
<td>9</td>
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<tr>
<td>Haglund et al. (1979)</td>
<td>262</td>
<td>2-12</td>
<td>28</td>
<td>11</td>
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<tr>
<td>Gall et al. (1988)</td>
<td>73</td>
<td>4</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Nylamo (1990)</td>
<td>57</td>
<td>10</td>
<td>42</td>
<td>5</td>
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<tr>
<td>Sarin et al. (1994)</td>
<td>72</td>
<td>2.9-5.6</td>
<td>7</td>
<td>0</td>
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<tr>
<td>Farthmann et al. (2000)</td>
<td>72</td>
<td>1-11</td>
<td>21</td>
<td>11</td>
</tr>
</tbody>
</table>
The Literature: Course of Diverticulitis After Medical Treatment

- according to these studies:
  - ~70% of patients have no further complaints
  - recurrent diverticulitis is observed in 7 – 35%
  - secondary operation is necessary in only few patients (0 – 11%)

- the results of these studies:
  - do not support an early or prophylactic sigmoid resection after first attack of acute diverticulitis has resolved
  - serious complications cannot be prevented by prophylactic resection
    - because in ~70% of pts this is the initial presentation
The Literature: Course of Diverticulitis After Medical Treatment

- from these studies:

  - recurrent attacks of diverticulitis:
    - require readmission in ~30% of patients
    - recurrence occurs in 50% of patients within the 1st year of initial tx
    - ~90% are readmitted within 5 years

  - medical treatment of recurrent disease:
    - is less effective
    - complication rate increases with subsequent attacks
Further:

- the course after medical treatment of complicated diverticulitis is poor

- in a prospective survey (Farmakis et al., 1993):
  - 37 of 43 initially conservatively treated patients developed recurrent complications
  - 9 of whom died

- compared to:
  - 2 of 77 patients initially managed by sigmoid resection
  - 1 of whom died

- therefore, in patients with complicated diverticular disease:
  - elective resection should be performed
Diverticulitis in Young Patients

- relative rare in patients < 40 years of age
- accounts for ~2 to 5% of total number of patients

- young patients:
  - more likely to have complications of diverticulitis
  - often misdiagnosed with appendicitis
    - 33% of patients with diverticulitis <40 yrs of age were correctly diagnosed (Chodak et al., 1981)
  - male patients predominate
  - tend to present with severe symptoms on initial presentation

- often require surgery during initial episode of diverticular disease:
  - 66% to 77% (Chodak et al., 1981; Eusebio et al., 1973)
Diverticulitis in Immunocompromised Patients

- Immunocompromised patients:
  - include: organ transplants, steroids, chemotherapy, AIDS, diabetes
  - more likely to present with minimal or few symptoms of diverticulitis
  - usually fail to respond to medical therapy and require surgery (Perkins et al., 1984)
  - high morbidity and mortality
Recommendations:

- Indications for Surgery:
  - Elective (uncomplicated):
    - recurrent (2 or more) attacks of diverticulitis
    - one attack in a younger patient < 50 years old
    - one attack in a patient with radiologic evidence of perforation or abscess treated successfully medically
    - one attack in an immunocompromised patient (eg. organ transplants, steroids, chemotherapy)

- Primary Complications:
  - Sepsis
  - Fistula
  - Obstruction
  - Hemorrhage
Surgery in Complicated Diverticulitis: Perforation

• ‘severity’ of diverticulitis $\rightarrow$ predictor of outcome

• classification of the severity of diverticular disease: (Hinchey et al. (1978))

  Stage I: pericolic or mesenteric abscess
  Stage II: walled-off pelvic abscess
  Stage III: generalized purulent peritonitis
  Stage IV: generalized fecal peritonitis
Surgery in Complicated Diverticulitis: Perforation

- Stage I and II:
  - recommended: resection with primary anastomosis (Standards Task Force, 1995)
  - preoperative CT-guided percutaneous drainage of abscesses
    - if feasible
    - avoids a two-stage approach (Ambrosetti et al., 1992; Stabile et al., 1990)

- mortality rates: 0 to 6% (Belmonte et al., 1996; Alanis et al., 1989; Oertli et al., 1993)

  - mortality rates:
    - Stage III: 6 – 27%
    - Stage IV: 35 – 65% (Nagorney et al., 1985; Tudor et al., 1994)
• Stage III:

- recommended: Hartmann’s procedure
  (primary resection, proximal end colostomy, closure of rectal stump)
- mortality rates: 0 – 14% (Peoples et al., 1990; Elliott et al., 1997)

- Note:

- some surgeons advocate resection with primary anastomosis
  (Belmonte et al., 1996; Alanis et al., 1989; Oertli et al., 1993; Makela et al., 1998)
- mortality rates: 0 – 17%
• Stage IV:
  - recommended: Hartmann’s procedure
    - due to increase risk of anastomotic leakage in fecal-loaded colon and peritoneal contamination
  - mortality rates: 0 – 19 % (Peoples et al., 1990; Elliott et al., 1997)
Surgery in Complicated Diverticulitis: Fistulas

• develop in ~2% of all patients with diverticulitis
• due to localized perforation of colon into adjacent organ/structure
• most common:
  colovesical fistula (50 - 68%) (Colcock et al., 1972; Pontari et al., 1992)
  - male > female
  - pneumaturia, fecaluria, abdominal pain, urinary symptoms (frequency, urgency, dysuria), hematuria, fever & chills
  colovaginal fistula (~25%)
  colocutaneous fistula – usually follow prior resection

• colovesical fistula:
  Tx: - total sigmoid resection with anastomosis of colon to proximal rectum
  - fistula may be resected and defect sutured
  - foley catheter left in bladder 7-10 days