Diverticulitis: How Many Attacks are Too Many?

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BASICS
Pathophysiology Diverticular Disease

- Increased intraluminal pressure
- Sigmoid colon most commonly involved (95%)
  - Smallest diameter
  - Laplace’s law: generates highest pressure
- Incidence of diverticular disease increases with age:
  - 30% at age 60
  - 60-80% at age 80
Risk Factors

• Low fiber Diet
• Smoking
• Constipation
• Obesity
• NSAIDS
Complications

- Obstruction
- Bleeding
- Fistula
- Sepsis, Perforation
- May co-exist with IBD

Specimen showing blood in diverticulae
Clinical Classification

• Uncomplicated vs. Complicated

• Uncomplicated
  • Pericolic soft-tissue stranding, colonic wall thickening, phlegmon

• Complicated: Acute diverticulitis +
  • Abscess
  • Obstruction
  • Perforation
  • Fistula
Significance of Diverticulitis

- Significant problem in Western Countries
- One of the most common causes of acute surgical admission
- 152,000 yearly hospitalizations
- Annual costs of diverticular disease estimated at $2.7 billion per year

Nationwide Inpatient Sample during the period 1991-2005:

- Ratio of hospital discharges for diverticulitis increased from 5.1 to 7.6 cases per 1000 inpatients.

- Patients underwent surgery for uncomplicated diverticulitis declined from 17.9% to 13.7% ($P < 0.001$).
- Imaging: CT Scan
Management: Acute Uncomplicated Diverticulitis

- Conservative Management
  - Nonoperative: Bowel rest, Antibiotics
    - PO or IV depending on severity: Anaerobic/GN coverage
  - Outpatient or Inpatient

- Successful in > 70% pts

ANTIBIOTICS AND FAILURES REQUIRING EMERGENCY SURGERY
Long-term outcome in 445 Patients after Diagnosis of Diverticular Disease.

- Retrospective cohort study, Danish Patient Register and National Register
- M/F = 30/70, median age 75 years

Moreno AM et al. Colorectal Dis 2007
Long-term outcome in 445 Patients after Diagnosis of Diverticular Disease.

- 73% received conservative treatment primarily

- 35.3% had suffered clinical recurrence of DD, of these 15.9% were subsequently operated.

- 3.6% of the patients died of causes related to diverticulitis.
  - Possible high-risk groups for recurrence were males and their age above 70 years.
• DIVER Trial: Multicenter RCT

• 132 Patients, 5 Hospitals in Spain

• Outpatient vs. Hospital Treatment of Uncomplicated Diverticulitis (CT Confirmed) + Abx

• Same rate of treatment failure

• Overall health care cost per episode was 3 times lower in outpatient group

• No difference in QOL

• Important costs saving without negative influence on QOL

Blondo S, Ann Surg 2014
Risk of Emergency Colectomy and Colostomy in Patients with Diverticular Disease.

- Retrospective cohort study
- 25,058 patients
- Only 5.5% of patients had recurrent hospitalizations during which an emergency colectomy/colostomy was performed

SO HOW MANY ATTACKS IS TOO MANY?
Elective Surgery for the Treatment of Acute Uncomplicated Diverticulitis

- In 1999 Practice Parameters of the ASCRS and EAES recommended elective surgery
  - After 2 episodes of uncomplicated acute diverticulitis
  - After 1 episode in young patients

ASCRS = American Society of Colon and rectal Surgeons
EAES = European Association for Endoscopic Surgery

Stollman NH. *Am J Gastroenterol.* 1999;94(11):3110-3121;
Elective Surgery for the Treatment of Acute Uncomplicated Diverticulitis

- In 2006 the ASCRS recommended that elective surgery should be made on an individual basis after a favorable response to conservative treatment.

ASCRS = American Society of Colon and rectal Surgeons
EAES = European Association for Endoscopic Surgery

Stollman NH. *Am J Gastroenterol.* 1999;94(11):3110-3121;
Clinical Practice Guideline Task Force of ASCRS (2014):

“The decision to recommend elective sigmoid colectomy after recovery from uncomplicated acute diverticulitis should be individualized.”
Uncomplicated diverticulitis treated nonoperatively

- report lower recurrence rates ranging from 13% to 23%
- low rates of subsequent complicated disease
- need for emergency operation (<6%)

Hall JF, Dis Colon Rectum 2011
Eglinton, Br J Surg 2005
Broderick – Villa G, Arch Surg 2005
Anaya DA, Arch Surg 2005
• After recovering from an initial episode of diverticulitis, the estimated risk of needing emergency surgery with stoma formation:
  – 1 in 2000 patient-years of follow-up.
  – Which means - 18 pts would undergo elective colectomy to prevent 1 emergency surgery for recurrent diverticulitis.

• The practice of recommending elective colectomy to prevent a future recurrence requiring stoma formation is not supported should be discouraged.

Janes S, Br J Surg 2005
Anaya DA, Arch Surg 2005
2 or more attacks?

- Patients with more than 2 episodes are not at an increased risk for morbidity and mortality in comparison with patients who have had fewer episodes

- The impact of decline in elective surgery for diverticular disease demonstrated
  - Increase in abscess formation
  - No rise in the rate of emergency colectomy

Ricciardi R Dis Colon Rectum 2009
Special Considerations

- **Transplant patients, patients maintained on chronic corticosteroid therapy, immunosuppressed patients, patients with chronic renal failure or collagen-vascular disease**
  - More likely to have failure of medical management
  - Greater risk of recurrence disease
  - High mortality rate with medical therapy alone

- **Surgeons should maintain a low threshold to recommend operative intervention as definitive treatment with the first hospitalization for acute diverticulitis in these patients**

Hwang SS, Dis Colon Rectum 2010
Klarenbeek BR, Ann Surg 2010
Complicated Diverticulitis

- Elective colectomy should typically be considered after the patient recovers from an episode of complicated diverticulitis
Complicated Diverticulitis

- Neither phlegmon nor extraluminal gas alone seen on imaging is considered complicated disease

- Mesocolic abscesses of $\geq 5$ cm or pelvic abscesses with or without percutaneous drainage $\rightarrow$ elective colectomy should typically be advised
  - retrospective data (small numbers) have shows recurrence rates as high as 40%

Ambrosetti P, Dis Colon Rectum 2000
Kaiser AM, Ann J Gastroenterol 2005
Complicated Diverticulitis

- Diverticulitis is complicated by stricture or fistula formation → elective or semi-elective resection is generally necessary to provide symptomatic relief

Klarenbeek BR, Ann Surg 2010
Diverticulitis in Young Patients

- < Age 50

- No clear consensus


Diverticulitis in Young Patients

• Longer lifespan – higher cumulative risk for recurrent attacks
  – However, overall rate of recurrence remained relatively low → 27%
  – After 1st attack in young patients → only 7.5% required subsequent emergency surgery
    • Anaya DA, Arch Surg 2005

  – Retrospective data collected on young patients with CT-confirmed initial episodes of diverticulitis demonstrated
    • Low 2.1% rate of emergency surgery at subsequent attacks
      – Nelson RS, Dis Colon Rectum 2006
Treatment
• High fiber intake used to treat increased spasm and increased segmental contractions by British in 1970s

• Dietary Allowances now recommend 22-28 g of dietary fiber as correct intake in women and 28 to 34 g in men – varies with size

• But western dietary fiber study reveals intake varies between averages of 8-10 g in most

• In vegan diets as much as 40-50 g/day

# Overview of Probiotics for Diverticulitis (Cont’d)

<table>
<thead>
<tr>
<th>Probiotic Study/Year</th>
<th>Stage</th>
<th>N Follow-Up</th>
<th>Outcome</th>
</tr>
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<tbody>
<tr>
<td>L. casei, 5-ASA, or both 2006¹</td>
<td>Symptomatic uncomplicated</td>
<td>90 12 months</td>
<td>Increased remission rate</td>
</tr>
<tr>
<td>L. casei + 5-ASA 2008²</td>
<td>Symptomatic uncomplicated</td>
<td>75 24 months</td>
<td>Increased remission rate</td>
</tr>
<tr>
<td>VSL#3 + balsalazide 2007³</td>
<td>Uncomplicated</td>
<td>30 12 months</td>
<td>Improved symptoms</td>
</tr>
<tr>
<td>L. acidophilus + L. helveticus + Bifidobacterium 2010⁴</td>
<td>Symptomatic uncomplicated</td>
<td>45 6 months</td>
<td>Prevented recurrence, improved symptoms</td>
</tr>
</tbody>
</table>

**In summary …**

| 5 different probiotic protocols tested in various stages of diverticulitis (no placebo-controlled studies) | With up to 40 months follow-up in 334 pts | Have produced suggestive but inconclusive results |
Indication for Elective Surgery

• 291 patients 111 (38%) treated conservatively, 180 (62%) underwent surgery (108 acute and 72 elective)

• Conservatively group diverticulitis recurrence rate 48% (88 patients).

• Indications for elective surgery were:
  – recurrent attacks of diverticulitis with persistent complaints (36%)
  – complaints of stenosis (40%)
  – fistula (14%)
  – persistent abscesses (3%)
  – recurrent diverticular bleeding

• Using immunosuppression therapy, chronic renal failure, collagen-vascular diseases: have 5-fold greater risk (36% vs. 7%) of a perforation in recurrent episodes of diverticulitis.

Elective Sigmoid Resection

- Open, Lap, Robotic

- Sigmoid Resection
  - Proximal Margin: compliant bowel
    - Include thickened, woody or grossly diseased bowel
    - Not all diverticula bearing colon must be removed
  - Distal: upper rectum
## Open vs. Laparoscopy

<table>
<thead>
<tr>
<th>Author/year</th>
<th>n</th>
<th>Lap/Open</th>
<th>Op time (min)</th>
<th>Morbidity (%)</th>
<th>Hospital stay (days)</th>
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<tbody>
<tr>
<td>Bruce/96</td>
<td>25</td>
<td>Lap</td>
<td>397**</td>
<td>12</td>
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<td>17</td>
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<tr>
<td>Liberman/96</td>
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<td>Lap</td>
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<td>14</td>
<td>6.3**</td>
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<tr>
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<td>Open</td>
<td>183</td>
<td>14</td>
<td>9.2</td>
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<tr>
<td>Coogan/97</td>
<td>59</td>
<td>Lap</td>
<td>190</td>
<td>-</td>
<td>3.8</td>
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<tr>
<td></td>
<td>52</td>
<td>Open</td>
<td>108</td>
<td>-</td>
<td>9.3</td>
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<tr>
<td>Kholer/98</td>
<td>27</td>
<td>Lap</td>
<td>165*</td>
<td>16</td>
<td>7.9*</td>
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<tr>
<td></td>
<td>34</td>
<td>Open</td>
<td>121</td>
<td>61.7</td>
<td>14.3</td>
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<tr>
<td>Dwivedi/02</td>
<td>66</td>
<td>Lap</td>
<td>212*</td>
<td>18</td>
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<tr>
<td></td>
<td>88</td>
<td>Open</td>
<td>143</td>
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<tr>
<td>Senagore/02</td>
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<td>1.6*</td>
<td>3.1*</td>
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<tr>
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<td>101</td>
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<td>6.8</td>
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<tr>
<td>Lawrence/03</td>
<td>56</td>
<td>Lap</td>
<td>170**</td>
<td>9*</td>
<td>4.1**</td>
</tr>
<tr>
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<td>215</td>
<td>Open</td>
<td>140</td>
<td>27</td>
<td>9.0</td>
</tr>
</tbody>
</table>

* *p<0.05  ** * *p<0.001
## Laparoscopy: Diverticulitis

<table>
<thead>
<tr>
<th></th>
<th>Laparoscopy</th>
<th>Laparotomy</th>
<th>p</th>
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<tbody>
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<td>O.R charges ($)</td>
<td>10,589</td>
<td>8,207</td>
<td>0.05</td>
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<tr>
<td>Hospital cost ($)</td>
<td>11,500</td>
<td>13,400</td>
<td>0.29</td>
</tr>
<tr>
<td>Hospital charges ($)</td>
<td>29,981</td>
<td>36,745</td>
<td>0.11</td>
</tr>
<tr>
<td>Morbidity (%)</td>
<td>14</td>
<td>14</td>
<td>0.11</td>
</tr>
<tr>
<td>Mortality</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Liberman, Surg Endosc 1996*
Emergent Surgical Intervention

- According to current ASCRS guidelines
  - Sigmoid resection, end colostomy, closure of distal stump
  - Overall Morbidity up to 29%
  - Mortality 10-20%
  - Long LOS (20+ days)
  - Colostomy closure technically difficult
  - “Temporary” colostomies often never closed (30%-75%)

- This has been challenged by European Association for Endoscopic Surgery recommendations + several studies
- Alternative to HP include: PA +/- Diversion & Lap Lavage

• Practice Parameters for Sigmoid Diverticulitis

• The Standards Committee of The American Society of Colon and Rectal Surgeons

• The laparoscopic approach is appropriate in selected patients. Level of Evidence III, Grade of Recommendation A

• Laparoscopic colectomy may have advantages over open laparotomy, including less pain, smaller scar, and shorter recovery. There is no increase in early or late complications.

• Cost and outcome are comparable to open resection. Laparoscopic surgery is acceptable in the elderly and seems to be safe in selected patients with complicated disease

Rafferty et al, DCR 2006
**Bottom Line!**

- Most perforations and complications do not occur after recurrences, happen at first attack
- Conservative management of recurrent nonperforated diverticulitis associated with low rates of Morbidity & Mortality with mild course

Take Home Message

• As few patients will actually require urgent surgery, should limit discussion regarding this uncommon complication.

• Instead should focus on discussion of risks and benefits of surgery, QOL implications, and the higher likelihood of similar episodes as the reason to, or not to, consider surgery.

• Potential poor functional outcomes and persistent abdominal symptoms after elective sigmoid colectomy for diverticulitis should be considered as well.
Thank You