What is the optimal management of diverticulitis today?

Willem Bemelman
Professor in Colorectal and Minimal Invasive Surgery
Academic Medical Center University of Amsterdam
Natural history over diverticulosis
lower rate of acute diverticulitis than previously thought

< 40 years
10%

> 80 years
60%
diverticulosis

1-4% develop acute diverticulitis

Shahedi et al. Gastro 2012
## Diagnosis of acute diverticulitis imaging (CT vs US)

<table>
<thead>
<tr>
<th>Study/year</th>
<th>Patients with diverticulitis</th>
<th>Patients without diverticulitis</th>
<th>Sensitivity(^a)</th>
<th>Specificity(^a)</th>
<th>Positive likelihood ratio(^a)</th>
<th>Negative likelihood ratio(^a)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>TP</td>
<td>FN</td>
<td>TN</td>
<td>FP</td>
<td>0.85 (44/52)</td>
<td>0.80 (57/71)</td>
</tr>
<tr>
<td>Verbanek, 1989 [30]</td>
<td>44</td>
<td>8</td>
<td>57</td>
<td>14</td>
<td>0.99 (73/74)</td>
<td>0.97 (84/87)</td>
</tr>
<tr>
<td>Schwerk, 1993 [29]</td>
<td>73</td>
<td>1</td>
<td>84</td>
<td>3</td>
<td>0.84 (62/74)</td>
<td>0.93 (64/69)</td>
</tr>
<tr>
<td>Zielke, 1997 [31]</td>
<td>62</td>
<td>12</td>
<td>64</td>
<td>5</td>
<td>0.85 (28/33)</td>
<td>0.84 (26/31)</td>
</tr>
<tr>
<td>Pradel, 1997 [32]</td>
<td>28</td>
<td>5</td>
<td>26</td>
<td>5</td>
<td>0.81 (42/52)</td>
<td>0.79 (42/52)</td>
</tr>
<tr>
<td>Garcia-Aguayo, 2002 [34]</td>
<td>42</td>
<td>10</td>
<td>19</td>
<td>5</td>
<td>1.00 (43/43)</td>
<td>1.00 (43/43)</td>
</tr>
<tr>
<td>Farag Soliman, 2004 [33]</td>
<td>43</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>0.92 (80–97)</td>
<td>0.90 (82–95)</td>
</tr>
<tr>
<td><strong>Summary estimate (95% CI)(^b)</strong></td>
<td></td>
<td></td>
<td><strong>0.94 (87–97)</strong></td>
<td><strong>0.99 (90–100)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Summary likelihood ratio (95% CI)(^b)</strong></td>
<td></td>
<td></td>
<td>78.4 (8.7–706.6)</td>
<td>0.06 (0.03–0.13)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**CT better for additional diagnoses**

Lameris W et al. Eur Radiol 2008
classification acute diverticulitis
modified Hinchey’s

Hinchey 0
Uncomplicated diverticulitis
(clinical diagnosis)

Hinchey I
Ia phlegmon
Ib pericolic abscess < 5 cm

Hinchey II
II pelvic, intra-abdominal or retroperitoneal abscess

Hinchey III
Purulente peritonitis

Hinchey IV
Fecale peritonitis
“Uncomplicated” diverticulitis (Hinchey Ia) antibiotics?

Patients %

- No antibiotics (n=309)
- Antibiotics (n=314)

- Open, prospective, controlled, randomized
- n = 623 in 7 years
- All patients CT
- Various antibiotics vs. No antibiotics

Chabok et al BJS 2012
Primary endpoint - time-to-recovery (n=570)

Observational vs a.b. 14 vs 12 days (median)

Full recovery criteria - patient diary

- Outpatient
- Normal diet: solid food + min. 1 L fluid orally
- $T < 38^\circ C$
- VAS < 4 (without extra pain medication)
- Resuming to pre-illness (working) activities

Daniels L et al. Submitted
Uncomplicated diverticulitis dietary restrictions?

Comparative study n=256

1 Correction for age, fever, antibiotics, Hinchey classification and complications

2 early feeding reduces hospital stay and costs (25 pts)

1 vd Wall et al. IJCD 2013
2 v Ooteghem et al. Act Gastro Belg 2013
Outpatient Versus Hospitalization Management for Uncomplicated Diverticulitis
A Prospective, Multicenter Randomized Clinical Trial (DIVER Trial)

- 132 pts randomized after CT diagnosis
- One shot iv ab

Lower costs (€ > 1100)
Failure 5% (similar)

TABLE 4. Costs of Treatment for Each Patient (All Number Are Values in Euros)

<table>
<thead>
<tr>
<th>Hospitalization Group 1</th>
<th>Outpatient Treatment Group 2</th>
<th>Costs Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
<td>Total</td>
</tr>
<tr>
<td>Physician</td>
<td>73.87</td>
<td>141.89</td>
</tr>
<tr>
<td>Nurse</td>
<td>58.74</td>
<td>58.74</td>
</tr>
<tr>
<td>Personnel variable</td>
<td>9.28</td>
<td>10.78</td>
</tr>
<tr>
<td>Medical supplies</td>
<td>5.20</td>
<td>5.51</td>
</tr>
<tr>
<td>Variable</td>
<td>0.31</td>
<td>0.31</td>
</tr>
<tr>
<td>Drugs</td>
<td>27.74</td>
<td>29.40</td>
</tr>
<tr>
<td>Variables</td>
<td>1.66</td>
<td>0.50</td>
</tr>
<tr>
<td>Diagnosis tools</td>
<td>318.53</td>
<td>337.00</td>
</tr>
<tr>
<td>Variable</td>
<td>18.47</td>
<td>18.47</td>
</tr>
<tr>
<td>Bed cost</td>
<td>265.83</td>
<td>1063.33</td>
</tr>
<tr>
<td>Nonmedical personnel,</td>
<td>94.63</td>
<td>94.63</td>
</tr>
<tr>
<td>administrative work</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total cost</td>
<td>1671.75</td>
<td>547.05</td>
</tr>
</tbody>
</table>

* Costs in emergency department.
† Bed cost for 1 day.
‡ Bed cost calculated according to the mean hospital stay of the group 1.
## Uncomplicated & Hinchey Ia diverticulitis

### Conclusions

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Effect on disease outcome</th>
<th>Level of evidence*</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-patient vs out-patient</td>
<td>No difference, out-patient cheaper</td>
<td>1b</td>
</tr>
<tr>
<td>Diet restrictions</td>
<td>No difference, earlier recovery with full diet</td>
<td>2b</td>
</tr>
<tr>
<td>Antibiotics</td>
<td>No difference, without a.b. shorter stay</td>
<td>1a</td>
</tr>
</tbody>
</table>

* Criteria according to UK National Health Service
Small abscesses can be treated with antibiotics (EL 2b & Consensus)

DIABOLO study: small abscesses might not need ab either

Vennix et al. CRD 2015
Brandt D et al. DCR 2006
Kumar RR et al. DCR 2006
Ambrosetti P et al. DCR 2005
classification acute diverticulitis
modified Hinchey’s

Hinchey 0
Uncomplicated diverticulitis (clinical diagnosis)

Hinchey I
Ia phlegmon
Ib pericolic abscess < 5 cm

Hinchey II
II pelvic, intra-abdominal or retroperitoneal abscess

Hinchey III
Purulente peritonitis

Hinchey IV
Fecale peritonitis
Large abscesses: percutaneous drainage and antibiotics (EL 2b & Consensus)

Pelvic abscesses: more aggressive therapy compared to mesocolic abscesses with percutaneous drainage and elective surgery (EL2b & no consensus)

Ambrosetti P et al. DCR 1992
Ambrosetti P et al. DCR 2005
Vennix et al CRD 2014
classification acute diverticulitis
modified Hinchey’s

Hinchey 0
Uncomplicated diverticulitis
(clinical diagnosis)

Hinchey I
Ia phlegmon
Ib pericolic abscess < 5 cm

Hinchey II
II pelvic, intra-abdominal or retroperitoneal abscess

Hinchey III
Purulente peritonitis

Hinchey IV
Fecal peritonitis
acute perforated diverticulitis
what are the options?

Purulent peritonitis (Hinchey III)
“Microscopic perforation”
- Antibiotics + drainage
- Laparoscopic lavage
- Resectional surgery

Faecal peritonitis (Hinchey IV)
“Macroscopic perforation”
- Hartman’s
- Resection and anastomosis
- Laparoscopic approach
Diverticulitis with extraluminal air can be treated with a.b. and drainage in select cases

- **Costi et al. Surg Endosc 2012**
  - Hemodynamically stable with free air with no diffuse extravasation (2001-2010)
  - CT with iv & rectal contrast
  - 36/39 (92% success)

- **Sallinen et al. CRD 2014**
  - Local peritonitis with free air n=132
  - Pericolic air (99% success), small amount distant air and no fluids, no peritonitis (86% success)
Laparoscopic lavage?

1998 First report (n=10, lavage 15L)

2008 Prospective study (n=100)
- **92%** laparoscopic procedure
- **8%** conversion to Hartmann
- **3-4%** morbidity and mortality

Selection bias?

Rizk et al. Chirurgie 1998
Myers et al. BJS 2008
Laparoscopic Lavage

Hypothesis:
Laparoscopic lavage results in a 25% reduction of mortality and severe morbidity at 1 year.

Sigmoidectomy with primary anastomosis results in a 25% higher stoma-free survival at 1 year.

Inclusion halfway (120 pts)
Primary endpoint
Severe morbidity and mortality

surgical or radiological reintervention, abdominal wall dehiscence, urosepsis, infarct, respiratory insufficiency, renal failure, stoma closure as such not)

Short term Long term Primary endpoint

% NS

Vennix et al. Lancet 2015

Early MR 2- 4%
Lavage failures

46 lavages

- Short term (n=11, 24%) 6 (13%) Hinchey IV
  1 (2%) perforated cancer

- Long term (n=11, 24%) 6 (13%) ongoing complaints
  4 (7%) cancers

Optimise identification of perforated colorectal cancer and Hinchey IV
Other outcomes ……

No further surgeries

- Lavage: 76% (initial admission) and 52% (overall)
- Resection: 90% (initial admission) and 31% (overall)

No stoma rates

- Lavage: 78% (no stoma at one year and alive) and 71% (never had a stoma)
- Resection: 74% (no stoma at one year and alive) and 19% (never had a stoma)

Vennix et al. Lancet in press
Laparoscopic Lavage Is Feasible and Safe for the Treatment of Perforated Diverticulitis With Purulent Peritonitis

The First Results From the Randomized Controlled Trial DILALA

Conclusions valid?

- Study powered for different endpoint!
- Selection bias?:
  - Eligible non included patients the same? Envelopes
  - No intention to treat (perforated cancer excluded)

SCANDIV
SCANDINAVIAN DIVERTICULITIS TRIAL

90 days results

Schultz et al JAMA 2015
classification acute diverticulitis
modified Hinchey’s

True Hinchey III can be lavaged
(beware of the perforated tumors and Hinchey IV’s)
classification acute diverticulitis
modified Hinchey’s

Hinchey 0
Uncomplicated diverticulitis
(clinical diagnosis)

Hinchey I
Ia phlegmon
Ib pericolic abscess < 5 cm

Hinchey II
II pelvic, intra-abdominal or retroperitoneal abscess

Hinchey III
Purulent peritonitis

Hinchey IV
Fecale peritonitis
Hartmann procedure or primary anastomosis for Hinchey III or IV

- **Systematic reviews**
  - Salem DCR 2004: Hartmann higher MB, MR, & permanent stoma rate
  - Constantinides DCR 2007: Hartmann higher permanent stoma rate

- **RCT’s (both prematurely stopped)**
  - Binda CRD 2013: impracticable trial (n= 34 vs 56 pts)
  - Oberkofler Ann Surg 2012: Hartman higher serious MB, higher permanent stoma rate (n= 30 vs 32 pts)
Acute diverticulitis

Resolution, no complaints (the young & immunocompromised)

Acute complicated diverticulitis

Chronic complications (stricture, fistula, bleeding)

Chronic diverticulitis

Recurrent diverticulitis
Acute abdomen

Acute diverticulitis

Hinchey Ia, Ib

Hinchey II

Perforated diverticulitis

Localised < 5 cm fluids, only free air

Diffuse/distant/contrast extravasation

Laparoscopy (Bubble test, look for a hole)

Hinchey III

Lap. lavage

Hinchey IV

Primary anastomosis (or laparoscopic Hartmann)

Colonoscopy

Clinical decision rule CT scan iv + rectal contrast

No antibiotics

Pain medication

No diet restrictions

Outpatient management

Antibiotics

Percutaneous drainage

No antibiotics

Pain medication

No diet restrictions

Outpatient management
Acute diverticulitis

Acute complicated diverticulitis

Resolution, no complaints (the young & immunocompromised)

Chronic complications (stricture, fistula, bleeding)

Chronic diverticulitis
Recurrent diverticulitis
Uncomplicated diverticulitis
Immunocompromised patients

- Low quality studies
- Pooled incidence of complicated diverticulitis in renal transplant patients with diverticulitis: 1.0% (95% CI: 0.6-1.5%)
- Incidence similar to normal population (0.6-1.5%)
- No justification for elective resection.

Acute diverticulitis

Acute complicated diverticulitis

Resolution, no complaints (the young & immunocompromised)

Chronic complications (stricture, fistula, bleeding)

No surgery

Chronic diverticulitis

Recurrent diverticulitis

sigmoidectomy

Chronic complications
Who needs surgery?

Acute diverticulitis

Acute complicated diverticulitis

resolution, no complaints (the young & immunocompromised)

Chronic complications (stricture, fistula, bleeding)

Chronic diverticulitis

Recurrent diverticulitis
Ongoing complaints and recurrences

Esther Consten

Resection vs Conservative treatment

Marguerita Stam
Trial Flow

- Exclusion: 341
- Inclusion: 109

Randomisation
- > 3 episodes
- Chronic complaints > 3 mths

- Surgical: 53
- Conservative: 56
- Operated: 47
  - Conservative: 6
  - Operated: 13
  - Conservative: 43
Results

GIQLI (primary endpoint)

\[ p = 0.0001 \]

\[ p = 0.0013 \]
Acute diverticulitis

Acute complicated diverticulitis

Resolution, no complaints (the young & immunocompromised)

Chronic complications (stricture, fistula, bleeding)

Chronic diverticulitis

Recurrent diverticulitis

No surgery

sigmoidectomy

surgery
Surgery for diverticulitis Obsolete?  
Acute diverticulitis

- No surgery
  - Hinchey 0-II
  - Select cases with diverticulitis with free air only

- Less invasive surgery
  - Lavage for true Hinchey III
  - Resection with anastomosis in Hinchey IV
  - Apply laparoscopy
Elective sigmoidectomy

- **No surgery:**
  - < 3 episodes
  - Immunocompromised
  - The young (shared decision making)

- **Laparoscopic sigmoidectomy:**
  - Chronic complications
  - Recurrent episodes > 3 (time interval > 3 months)
  - Persistent complaints