Perforated diverticulitis operated at Sahlgrenska University Hospital 2003-2008

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ABSTRACT

All patients with perforated diverticulitis admitted as emergency cases and having undergone colon resection during their initial hospitalisation in the period from 1 January 2003 to 30 June 2008 at one institution were analysed with regard to morbidity and mortality. The group consisted of 106 patients (mean age 65 years, range 32-98 years), 60% of whom had comorbidity. Hartmann's procedure was the initial procedure in 77% and primary resection and anastomosis in 23%. Of these patients 18% underwent reoperation, leading to a mean number of surgical procedures during the initial hospitalisation of 1.3 (range 1-10). The mean length of stay was 17 days, the median stay 12 days (range 1-111 days). A total of 43% of the patients underwent surgery during readmissions. Among the 82 patients operated with Hartmann's procedure, permanent stoma was the end result for 35 patients (43%). Six patients died. This retrospective study confirmed that perforated diverticulitis requiring colon resection was associated with a high risk of reoperation, long hospital stay, readmittance with renewed surgery and permanent stoma. Furthermore, the procedure caused suffering and a considerable drain on resources. The results will be used as the basis for a randomised trial on laparoscopic lavage versus Hartmann's procedure.

In industrial countries, diverticulosis of the colon has a prevalence of 5% in persons under the age of 40, and the prevalence rises with age [1]. Most such patients are asymptomatic, but 15-25% develop diverticulitis [2], and they are mostly uncomplicated cases. Patients with mild to moderate lower abdominal pain and subfebrility are often treated conservatively as outpatients with restriction on oral fluids for the first 2-3 days. Oral antibiotics have frequently been part of such a regimen; however, evidence in support of their use is limited [3]. Active therapy is required for patients with diverticulitis who develop more complicated disease. The clinical manifestations of such disease may include moderate to severe abdominal pain, signs of peritonitis, fever and septic symptoms. Hinchey's classification of colonic diverticular disease [4] has been known for decades. Even if it is rarely used by surgeons, it is useful for disease staging in connection with the discussion of alternative treatment modalities.

- *Stage Ia:* Phlegmona
- *Stage Ib:* Diverticulitis with pericolic or mesenteric abscess
- *Stage II:* Diverticulitis with walled-off pelvic abscess
- *Stage III:* Diverticulitis with generalised purulent peritonitis
- *Stage IV:* Diverticulitis with generalised faecal peritonitis.

Stages I and II are generally treated with intravenous antibiotics, but some cases may require surgery. A recent study provided evidence in support of conservative treatment for Hinchey I and some Hinchey II cases [5]. Stages III and IV (**Figure 1**) are considered an indication for emergency surgery. Hartmann's procedure (HP) (**Figure 2**) or primary resection and anastomosis (PRA) are the most common surgical procedures performed in acute perforated diverticulitis, and of these HP is the most frequently used procedure [6]. However, evidence that HP and PRA are, indeed, the best options remain low-grade and needs to be substantiated in empirical studies with higher levels of evidence [7].

The present study aims to describe the results of emergency surgery for perforated diverticulitis at our institution. The study will focus on suffering and resource consumption in terms of number of operations, length of hospital stay, reoperations during readmissions, permanent stoma and mortality. The results will be used as the point of departure for a randomised trial investigating recently described alternative treatment [8].

MATERIAL AND METHODS

An application to the Research Ethics Committee was not filed as retrospective quality control studies require no such approval under Swedish law.

This retrospective study was undertaken at the Departments of Surgery at Sahlgrenska University Hospital from 1 January 2003 to 30 June 2008. The patient population was identified via the hospital record system which contains data on all admitted and dis-

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FIGURE 1

Perforated diverticulitis of the sigmoid colon

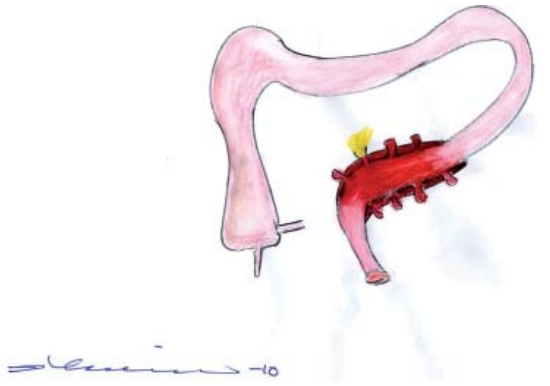
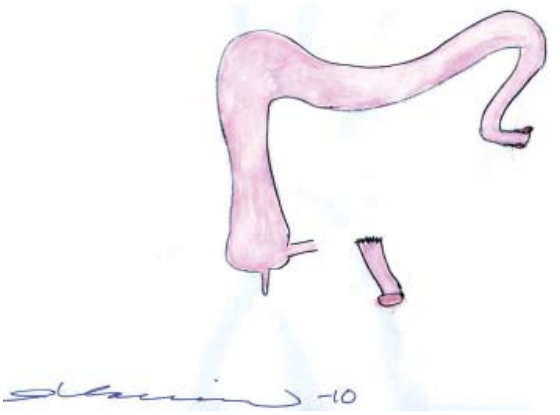


FIGURE 2

Illustration of the anatomy after Hartmann's procedure with resection of the perforated, inflamed sigmoid colon and construction of a colostomy



charged patients registered with the International Classification of Diseases coding system (ICD-10) and the specific Swedish surgical procedure codes. The search criteria were:

- Admission on an emergency basis
- Discharge diagnosis: ICD-10 code K572 or K573
- Abdominal surgery with colon resection during the hospital stay.

We excluded patients with pathologies like cancer, appendicitis or gynaecologic conditions.

The study period saw the inclusion of 1,519 patients admitted from the Emergency Rooms and later discharged with a diagnosis of diverticulitis. A total of 106 of these patients (51 men and 55 women) underwent colonic resection during their initial hospital stay with findings of complicated or perforated diverticulitis and no other pathologies. These patients were included for further analysis. The follow-up period lasted until 1 June 2009. Hinchey grading had only been used in two cases, and the population could therefore not be classified according to Hinchey.

Data were collected from case records. The following information was collected:

- Age
- Comorbidity
- Length of hospital stay
- Initial surgical procedure
- Mortality
- Reoperation during first hospital stay
- Reasons for reoperation
- Readmittance
- Reoperation during readmissions
- Type of operations
- Permanent stoma.

The definition of co-morbidity was cancer, chronic obstructive pulmonary disease, cardio-vascular disease or treatment with immuno-modulating drugs.

The SPSS software was used for statistical analysis.

RESULTS

The patients' mean age was 65 and it was significantly lower in men than in women (**Table 1**). The mean length of the hospital stay was 17 days, and the median length was 12 days, (range: 1-111) for the first emergency admittance. A total of 82% of the patients were operated once during their first hospital stay, 12% were operated twice and 6% more than twice. The mean number of operations was 1.3 (range: 1-10). HP was performed in 77% of the cases and 23% underwent PRA. Comorbidity was seen in 60%, and 44% of the patients were re-operated during a later admission, including elective procedures such as colonic reanastomosis (**Table 2**). The rate of reoperation at readmission was 43% (Table 2). Reoperation was more common among men (57%) than women (31%), $p < 0.007$. Among patients who underwent Hartmann's procedure (n = 82), 17% (n = 14) were either lost to follow-up or died, and the stoma was not reversed in 43% (n = 35) of the cases. The decision to leave the stoma permanently was made by the surgeon in 20 cases and by the patient in 15 cases. Six patients died during their first admittance, three of whom had faecal peritonitis, Hinchey IV.

DISCUSSION

Perforated diverticulitis is a potentially lethal condition. The mortality rate after emergency surgery has been reported to reach 20% [9]. Based mainly on experience and retrospective case-series, HP or PRA have evolved to

become recommended emergency procedures [7]. Over a 5.5-year period in a large University Hospital with a catchment area of 700,000 inhabitants, 106 patients underwent emergency colonic resection for diverticulitis. Having two surgery departments, the hospital was, and still is, the only hospital with an emergency service in the city of Göteborg and the surrounding areas. The annual incidence of perforated diverticulitis treated by emergency colonic resection was three cases/100,000 inhabitants. Thus, each individual surgeon's experience with this procedure is limited. The frequency and severity of the complications, the postoperative mortality and the high rate of permanent stomas found in our population suggest that patients may suffer unduly and that resource consumption is high.

We found a lower mortality than reported in many previous studies [19] which could reflect selection bias. Included were all patients admitted as emergency cases and later diagnosed as having diverticulitis and in whom a colonic resection was performed during the initial hospital stay. Only if the hospital administrative records are inaccurate and lack a correct ICD code or surgery code would cases be missed. However, these records are also the basis for the hospital's economic reimbursement. The lower mortality observed in this population than in other populations could also be rooted in improvements in care, e.g. operative care and intensive care as well as improvements related to diagnostics and treatment of complications. If the indications for emergency surgery at our hospital exclude from surgery the oldest and most severely ill patients, this would also explain the observed low mortality. We found nothing to suggest the presence of a systematic bias due to stricter indications for emergency surgery at any of the surgery departments at our hospital. Given the retrospective nature of the present study, it is, however, important to interpret the results with caution and make no firm conclusions on the present basis.

The rate of complications was high, and could largely explain the length of hospital stay and the reoperation rate observed during the initial hospital stay. In a retrospective study, Kotzampassakis et al found that patients younger than 50 years less frequently underwent emergency surgery than older patients, and when they did, they were more frequently underwent PRA than patients above this age [11]. In the only large prospective study on laparoscopic lavage for acute, perforated diverticulitis, the mean age was the same as in our retrospective material [12].

Earlier studies have reported that older patients are more likely to require emergency surgery than younger patients [13], and that a poor outcome is associated with elderly patients with significant comorbidity [14]. With a mean age of 65 years and significant comorbidity

TABLE 1

Age of all included patients by gender.

	Male	Female	Total
n	51	55	106
Age, years			
Mean ± standard deviation	58 ± 15.5	71 ± 12.4	–
Minimum	32	36	32
Maximum	88	98	98

TABLE 2

Reoperations.

	Male			Female			Total		
	no	yes	total	no	yes	total	no	yes	total
n	22	29	51	38	17	55	60	46	106
%	43	57	100	69	31	100	53	47	100

in 60% of the patients, our findings underline that our population was, indeed, a risk population. Recently, Klarenbeek et al discussed the indications for elective sigmoid resection after diverticulitis and found immunosuppression, renal failure and collagen vascular disease to be risk factors [10]. The mortality after emergency sigmoid resection in their 10-year material was 13%.

An issue often overseen is the rate of permanent stomas. In our study, 43% ended up with a permanent stoma, which is comparable to the findings in a registry-based study which reported that in 44% of patients with a colostomy after surgery for diverticulitis the colostomy was not reversed [15]. Constantinides et al presented a risk analysis for morbidity and mortality after sigmoid resection with primary anastomosis or Hartman's procedure and found, among other results, that 27% became permanent stoma carriers after Hartman's procedure. They advocated a choice between primary resection and anastomosis with a loop-ileostomy or Hartman's procedure, as primary resection with anastomosis without a covering ileostomy entailed a higher risk [7]. The rate of permanent stoma carriers may also be influenced by cultural differences.

Recent years have seen several reports on laparoscopic lavage and drainage as the surgical choice for Hinchey III, along with two prospective cohort studies, which were all recently ''meta-analysed'' [16, 17]. Toorenvliet et al concluded that at present we only have low-grade evidence for this ''minimally invasive'' alternative treatment [16]. However, the reported results are such that if reproduced in a randomised trial, they represent an improvement of therapy, both in terms of complications, number of operations and resource consumption. A health technology assessment (HTA) per-

formed by the HTA-unit of the Västra Götalands-region, Sweden, concluded that the alternative treatment is interesting and that prospective randomised trials are needed [18]. A randomised trial called ''DILALA'' was recently initiated with inclusion of patients from 14 hospitals in Scandinavia. The aim of the trial is to compare laparoscopic lavage with HP for perforated diverticulitis Hinchey III.

In summary, this report confirms earlier reports that perforated diverticulitis requiring emergency surgery comprises a high-risk condition with prolonged consequences for patients. In our hands, mortality was considerable, but possibly somewhat lower than in many previous reports. Any treatment that may hypothetically reduce complications and the need for surgery and hospital care should be considered candidates for a randomised trial.

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