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Original research

Improving results of surgery for fecal peritonitis due to perforated colorectal disease: A single center experience

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HIGHLIGHTS

- This study investigates results of surgery for fecal peritonitis due to colorectal perforation during the last decade.
- It shows lower rates of complications and mortality and highlights the MPI as the strongest predictor of outcomes.
- MPI score may help to select patients who better benefit from colorectal resection for fecal peritonitis.

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ABSTRACT

Purpose: fecal peritonitis due to colorectal perforation is a dramatic event characterized by high mortality. Our study aims at determining how results of sigmoid resection (eventually extended to upper rectum) for colorectal perforation with fecal peritonitis changed in recent years and which factors affected eventual changes.

Method: Seventy-four patients were operated on at our institution (2005–2014) for colorectal perforation with fecal peritonitis and were divided into two numerically equal groups (operated on before (ERA1-group) and after (ERA2-group) May 2010). Mannheim Peritonitis Index (MPI) was calculated for each patient. Characteristics of two groups were compared. Predictors of postoperative outcomes were identified.

Results: Postoperative overall complications, major complications, and mortality occurred in 59%, 28%, and 18% of cases, respectively, and were less frequent in ERA2-group (51%, 16%, and 8%, respectively), compared to ERA1-group (68%, 41%, and 27%, respectively; $p = .155$, .02, and .032, respectively). Such results paralleled lower MPI values in ERA2-group, compared to ERA1-group (23(16–39) vs. 28(21–43), $p = .006$). Using receiver operating characteristic analysis, the best cut-off value for MPI for predicting postoperative complications and mortality was 28.5. MPI > 28 was the only independent predictor of postoperative overall ($p = .009$, OR = 4.491) and major complications ($p < .001$, OR = 23.182) and was independently associated with a higher risk of mortality ($p = .016$, OR = 13.444), as well as duration of preoperative peritonitis longer than 24 h ($p = .045$, OR = 17.099).

Conclusions: results of surgery for colorectal perforation with fecal peritonitis have improved over time, matching a concurrent decrease of MPI values and a better preoperative patient management. MPI value may help in selecting patients benefitting from surgical treatment.

1. Introduction

Generalized peritonitis caused by free colonic perforation, has become more frequent during past two decades [1,2] and its optimal management is still a matter of debate. Improvements in surgical and radiological interventional techniques, advances in intensive care management, and progress in the treatment of peritoneal sepsis have recently led to the proposal of mininvasive-non-resective surgical strategies [3,4], even if Hartmann procedure

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and sigmoid resection with primary anastomosis still remain the cornerstone of surgical management for peritonitis due to recto-sigmoidal perforation.

Historically, several predictors of postoperative outcomes in patients operated for peritonitis due to colonic perforation have been proposed, including age, American Society of Anesthesiologists score, severity of peritonitis, duration of septic status and organ failure [5]. However, identification of patients who may benefit from a surgical resective treatment remains difficult and morbidity and mortality after resective surgery are still very frequent.

The current retrospective single center analysis aims at: 1) evaluating how the frequency of complications and mortality in patients who underwent recto-sigmoid resection for colorectal perforation and fecal peritonitis has changed at our center during the last decade; 2) identifying factors associated with increased risk of complications and mortality among such patients.

2. Patients and methods

2.1. Study population

Clinical records of the Department of General and Oncological Surgery, Ospedale Mauriziano "Umberto I", Torino, were queried to identify all consecutive patients who underwent left hemicolectomy or sigmoidectomy, extended or not to the upper rectum, for fecal peritonitis due to colon perforation in the period between January 2005 and March 2014. Demographic, clinical, operative, pathologic, and postoperative information were collected. In particular, the disease underlying colon perforation (diverticulitis, ischemia, or tumor), the presence and duration of peritonitis-related organ failure at the operation, the extension of peritonitis based on operative findings (widespread or localized -i.e. below mesocolic), the ASA score, the type (Hartmann Procedure versus Primary Aanastomosis) and duration of the operation, and data concerning the postoperative course were reviewed from medical charts. Mannheim Peritonitis Index was retrospectively calculated for each study patient [6]. Table 1 shows the prognostic factors considered for MPI calculation and the scores assigned to each factor. Postoperative complications were classified according to the Dindo score [7]. Dindo III-IV-V complications were classified as major complications. When more than one complication occurred in the same patient, the most severe one (according to Dindo classification) was considered. Mortality was defined as any death occurring during the hospital stay or within 90 days after surgery. Data collection and analysis were performed according to the institutional guidelines and to the ethical standards of the Helsinki Declaration. To analyze the changes in our practice and their impact on short-term outcomes over time, patients were divided into two groups with equal numbers of patients (37 each): an early era (ERA1) and a late era (ERA2). ERA 1 includes patients operated between January 2005 and May 2010. ERA 2 includes patients operated between May 2010 and March 2014.

The paper has been worded in line with the STROBE Statement [8].

Table 1
Factors determining the Mannheim Peritonitis Index.

Risk factors	Scores
Age >50 years	5
Female sex	5
Organ failure	7
Malignancy	4
Preoperative duration of peritonitis >24 h	4
Origin of sepsis not colonic	4
Diffuse generalized peritonitis	6
Exudate	
Clear	0
Purulent	6
Fecal	12

2.2. Surgical procedures

The choice of performing PA or HP was taken case by case and based on patient pre-existing comorbidities, preoperative clinical conditions and intraoperative findings. Specifically, patients in worse clinical conditions (e.g older, with associated comorbidities, acute organ failure due to diffuse peritonitis) more frequently underwent HP procedure, while for patients in better shape PA was more likely the procedure performed.

The colorectal resection was performed according to the standard technique as was the creation of the end-colostomy or the loop ileostomy. A specific step in the PA operation was the intraoperative colonic lavage performed with a standardized procedure, consisting in: (1) appendectomy; (2) introduction of a Foley catheter through a small cecotomy at the site of the appendectomy; (3) clamping of the terminal ileum; (4) colotomy proximal to the site of the bowel perforation with insertion into the colon of a corrugate tube, which is fixed to the intestinal wall with a manual purse-string; (5) wash out of the colon with a sterile saline solution until a clean water was obtained through the corrugate tube [9]. The colonic anastomosis was then performed with a transanal mechanical circular stapler.

The stoma reversal operation was performed at least 3 months after the first operation. Before undergoing stoma reversal, a colonic transit study from the ileostomy to the anus was carried out in patients who previously underwent PA, in order to test the integrity of the anastomosis. In patients who underwent HP, a rectal enema was performed before surgical bowel restoration, in order to assess the length of the rectal stump.

2.3. Calculation of Mannheim Peritonitis Index and definition of best cut-off with respect to predicting postoperative outcomes

MPI was calculated for each patient, according to risk factors and related scores is shown in Table 1. Organ failure was based on patient's condition at the time of operation and defined as previously reported [10]: renal failure, creatinine level above 150 mmol/l; hemodynamic failure, systolic arterial pressure lower than 90 mmHg and/or requiring inotropic support; respiratory failure, arterial partial pressure of oxygen less than 60 mmHg. The performance of MPI in predicting postoperative outcomes was assessed using receiver operating characteristics (ROC) analysis. The accuracy of MPI in discriminating patients with and without postoperative overall and major complications or mortality was assessed by calculating the area under the curve and the asymptotic significance level of each curve compared with the diagonal reference line (area under the curve ¼ .500). Using the best cut-off values determined by the ROC analysis, rates of overall and major complications and of mortality were compared among patients.

2.4. Statistical analysis

Statistical analysis was performed using the software SPSS statistical software (version 20.0; SPSS Inc., Chicago, IL, USA). Categorical variables are expressed as absolute numbers and percentage and compared by the chi-square or Fisher exact test, as appropriate. Continuous variables are expressed as median values (range) and compared by the Mann–Whitney U test. Results with a p value < .05 were considered statistically significant; all p values