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ORIGINAL ARTICLE

Factors Affecting Mortality in Planned Relaparotomy Performed Patients

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ABSTRACT

Objective: Secondary peritonitis or abdominal sepsis and intra-abdominal hemorrhages are associated with high mortality rates and are still challenging among surgeons. Planned relaparotomy is one of the underestimated treatment options of these intractable clinical entities. This study aimed to identify mortality rates and factors affecting mortality in the patient treated by planned relaparotomy for persisting intraabdominal infection and hemorrhage in a single institution.

Material and methods: This retrospective study performed by collecting patients' data from the archive of our university hospital and records of operations performed in our department. Forty-two patients treated with planned relaparotomy for 19 years were included to study. Indications for planned relaparotomy were secondary peritonitis and intraabdominal hemorrhage.

Results: Overall , secondary peritonitis, and intraabdominal hemorrhage groups' mortality rates were 52.4%, 59.3%, and 28.5% respectively ($p < 0.05$). Factors observed relating mortality were presence of malignancy ($p = 0,037$), mesenteric ischemia ($p = 0,029$), development of organ failure ($p = 0,001$) and presence of anastomosis ($p = 0,006$).

Conclusion: High mortality rate could be due to underway infections and repeated surgical trauma-related multiple organ failures, independent factors as the presence of malignancy, and mesenteric ischemia raises the risk of mortality in planned relaparotomy patients. The data from this study and the available literature reveals that the factors which predict mortality in patients who undergo a relaparotomy are related to the severity of the disease.

Keywords: Laparotomy, relaparotomy, mortality, open abdomen

INTRODUCTION

The estimated incidence of secondary peritonitis or abdominal sepsis is 0.93% for emergency admissions and still associated with a high mortality rate of around 30 percent, despite improvements in antibiotic treatments and intensive care facilities. Surgical treatment of secondary peritonitis consists of control of the source of infection, preoperative peritoneal lavage to decrease the bacterial load, and the prevention of persistent or recurrent infections [1, 2].

Some patients are prone to persisting intraabdominal infections regardless of the initial cleansing of the peritoneal cavity and eradication of surgical infections [3].

Primary surgical treatment modalities for persistent peritonitis are planned relaparotomy (PRL) and relaparotomy on demand (ROD). Although there are many studies comparing the effect of these two approaches on mortality, differences between these two modalities were not statistically significant due to the heterogeneity of these studies [4-9].

The principles of planned relaparotomy have been suggested for patients with diffuse peritonitis being at high risk of persistent intraabdominal infection and developing multiple organ failures [10]. Key advantages of this modality are early recognition of complications, limited adhesion formation during early laparotomy, relief of intraabdominal pressure, spontaneous drainage and simplified re-intervention. Also has some disadvantages such as fistula

formation, repeated damage to the abdominal and intestinal wall, prolonged intubation and ICU stay [5, 8].

Inability to achieve adequate source control at the index operation is an absolute indication for PRL, but there are still controversies about this surgical treatment due to high mortality rate and difficulties in patient selection and determine the time to end PRL.

The objective of this study was to identify mortality and factors affecting on mortality in patients treated with PRL for persisting intraabdominal infections and hemorrhage.

MATERIALS and METHODS

We performed a retrospective study by collecting patients' data from the archive of our university hospital and records of operations performed in our department. Forty-two of sixty-two patients treated with PRL between August 1998 and April 2017 were included in the study. Indications for PRL were presence of secondary peritonitis and intraabdominal hemorrhage.

Secondary peritonitis was defined as an intra-abdominal infection caused by perforation, infection, ischemia, or necrosis of part of the digestive tract. Intra-abdominal hemorrhage was defined as development of severe and uncontrollable bleeding during elective or emergent surgery. Multiple organ failure was defined as the occurrence of insufficiency at least two organ systems.

The decision to perform PRL was made during the index operation, and postoperative course of the patient did not affect this decision later on. The time interval between operations was 24-48 hours regardless of patients' clinical condition. Index operation was defined as the initial laparotomy of a patient for secondary peritonitis. Consequent operations were performed with Bogota Bag fashion (Figure 1 and 2).

Figure 1: A view of the second operation of 37th patient.

Figure 2: A view of 37th patient after consecutive operations

We evaluated the effects of factors on mortality defined as patient-related or surgical. We compared the lethal and surviving groups. Factors related to patients were the age of the patients, PRL indications, the presence of malignant disease, and source of intraabdominal infection. Factors related to surgical treatment were the presence of anastomoses, the time interval following the index operation and the total number of operations.

We used the SPSS version 15 for statistical analysis. p values were calculated by Mann-Whitney-U and Chi-square tests, and being less than 0.05 was considered to be statistically significant.

RESULTS

Sixty-two patients were treated with PRL between August 1998 and April 2017. However, 42 of these were included in the study because of the missing records of 20 patients. The mean age of patients was 56.9 ±14.8 ranging from 18 to 81. The mean age of patients in mortality group and survivor groups were 58.4 and 55.3 respectively. Male to female ratio was 33/9. Mean operation number of patients was 3.52± 2.6. Source of infection, the time interval following the index operation and operation numbers were not statistically different.

Indications for PLR were secondary peritonitis (76.2%), intraabdominal hemorrhage (16.7%), and open abdomen due to intestinal edema (7.1%). Leading causes of secondary peritonitis were perforation of the digestive tract, mesenteric ischemia and related necrosis, and anastomosis leakage. Mortality was 59.3% and 28.5% in secondary peritonitis patients and hemorrhage group respectively, and this difference was statistically significant ($p < 0.05$).

Overall mortality was 52.4% (22 patients) for our patients. Cause of death was multi-organ failure syndrome in 19 patients, cardiac problems for two patients and pulmonary embolism for one patient (Table 1).

Table 1 General characteristic of patients

Patient number	Age	Sex	Total operation number	Cause of mortality	Indication of planned re-laparotomy
1	50	M	2	MOF	Iatrogenic sigmoid perforation with colonoscopy
2	71	M	3	MOF	Anastomosis leakage after total gastrectomy for gastric cancer
3	64	M	3	Survive	Anastomosis leakage after hemicolectomy for colon cancer
4	59	F	3	Survive	Bleeding after Radical hysterectomy for cervix cancer
5	49	M	4	Pulmonary emboli	Gastric perforation due to gastric cancer
6	70	F	4	Survive	Iatrogenic cecum perforation
7	38	M	2	MOF	Anastomosis leakage after hemicolectomy for colon cancer
8	51	F	7	MOF	Anastomosis leakage after total gastrectomy for gastric cancer
9	51	M	3	Survive	Intraabdominal infection due to peptic ulcus perforation
10	63	M	2	Survive	Bleeding after abdominoperineal resection for rectum cancer
11	45	M	2	MOF	Mesenteric ischemia
12	58	M	4	Survive	Perforation due to intestinal obstruction
13	53	M	3	MOF	Anastomosis leakage after gastrojejunostomy for marginal ulcer bleeding
14	70	M	2	Survive	Intestinal edema due to intestinal obstruction
15	74	M	3	MOF	Anastomosis leakage after ileoileostomy for intestinal obstruction
16	54	M	4	MOF	Mesenteric ischemia
17	25	F	3	Survive	Bleeding after penetrating abdominal trauma
18	18	M	2	Survive	Gastric perforation due to penetrating abdominal trauma
19	60	F	4	Survive	Anastomosis leakage after ileoileostomy for Chron ileitis
20	66	M	3	Myocardial infarction	Anastomosis leakage after total gastrectomy for gastric cancer
21	69	M	5	MOF	Anastomosis leakage after ileoileostomy for intestinal obstruction
22	73	M	1	MOF	Perforation due to intestinal obstruction
23	52	M	3	Survive	Perforation due to ulcerative colitis
24	71	M	4	MOF	Anastomosis leakage after ileoileostomy for intestinal obstruction
25	30	M	12	MOF	Anastomosis leakage after jejunoileostomy for intestinal obstruction
26	76	M	4	Myocardial infarction	Mesenteric ischemia
27	70	M	3	Survive	Bleeding due to blunt abdominal trauma

MOF: Multi-organ failure

Eighteen patients had had malignant disease. Thirteen of them had died due to intraabdominal infection (72%). Five of them survived.

Source of infections for secondary peritonitis was upper gastrointestinal tract in twelve patients and lower gastrointestinal tract for twenty patients. Mortality rates were 50% and 70% respectively, without any statistical significance.

Factors observed to be related with mortality were presence of malignancy, mesenteric ischemia, development of organ failure and the presence of anastomosis. These results are summarized in (Table 2).

Table 2. Factors affecting mortality.

FACTORS	p Value
Patient-Related Factors	
Age	>0.05
Presence of malignancy	=0.037
Source of infection	>0.05
Mesenteric ischemia	=0.029
Development of organ failure	=0.001
Surgical related factors	
Presence of anastomosis	=0.006
Time interval between operations	>0.05
Number of operations	>0.05

DISCUSSION

Surgical treatment options for patients with severe intraabdominal infection are limited and controversial. Although a planned relaparotomy has disadvantages, such as evisceration, incisional hernia, and fistula development, it appears that there is no significant difference between a planned relaparotomy and a laparotomy on demand regarding mortality and cost efficiency; one is not superior to the other [9, 11, 20].

In this study in which we examined patients who underwent a planned relaparotomy, the overall and secondary peritonitis mortality rates were found to be 52.4% and 59.3% respectively. In recent years, the mortality rates have ranged from 14-54% in studies conducted on various series of planned relaparotomy performed due to secondary peritonitis [5, 6, 8, 12-14] In a meta-analysis which included eight randomized studies published in 2002; the median mortality rate was 33%. However, patients with ischemic diseases or malignancies along with those who underwent a planned relaparotomy following intraabdominal bleeding and trauma were not included in these studies (9). Our study aimed to evaluate the factors affecting mortality in all patients for whom a planned relaparotomy was performed, but not just for those who underwent this procedure because of secondary peritonitis. We believe that the higher mortality rate in our series compared with the literature is a result of differences in the inclusion criteria. Our study incorporated patients those were expected to have high mortality due to primary disease (with or without a relaparotomy) as well as those who had undergone a relaparotomy because of intraabdominal infection following elective surgery. For example, three patients were operated on for mesenteric vascular ischemia in our study, and the expected mortality rate for this syndrome alone is approximately 70-80%. In addition to that, treatment of complications which may develop in the follow-up of these patients might also result in mortality, especially in a clinic where large number of oncological surgical procedures have been performed like ours.

Different studies have documented the variables associated with mortality in patients who had a relaparotomy, including the patient's age, the pre-operative Acute Physiology and Chronic Health Evaluation II (APACHE II) score, the disease type, failure to control the septic origin, the severity of peritonitis in the patient, the Mannheim Peritonitis Index (MPI) score, and the type and number of complications which are present (6, 12-16). In this study, the APACHE II score could not be calculated because of the disorganization of the records and was not included.

Advanced age was defined as a poor prognostic factor in both patients with secondary peritonitis and those who underwent a planned relaparotomy [16-18]. Koperna et al. showed a correlation between advanced age (patients over 70 years old) and mortality in 523 patients who underwent a relaparotomy because of secondary peritonitis (8). In our study, the age of mortality was higher, but the difference was not significant.

Using a univariant analysis, we found that malignancy, mesenteric ischemia, organ failure, and the number of anastomoses performed were related to mortality. Organ failure increased the mortality risk by 12-fold, and additional anastomoses led to an almost four times higher risk. Also, undergoing an anastomosis was found to be related to high mortality by Martinez- Casas et al. in that study which is featuring 254 patients who had a relaparotomy

(p=0.05). However, it was not found to be an independent variable for predicting mortality in the logistic regression analysis [16]. Similarly, preoperative organ failure was found to be a factor which increased mortality by Hutchins et al., but it could also not be shown to be an independent variable for predicting mortality (19). In our study, organ failure and the presence of anastomosis (p values of <0.001 and 0.045, respectively) were found to be the most important prognostic factors in the logistic regression analysis. However, the heterogeneous distribution of the group should also be considered, as emphasized by the present meta-analysis. The mortality rate is still high in patients who undergo a planned relaparotomy, and this is true despite advances in medical care and surgical techniques. That high mortality rate could be due to underway infection and repeated surgical trauma-related multiple organ failure, independent factors as the presence of malignancy and mesenteric ischemia raises the risk of mortality in PRL patients. The data from this study and the available literature reveals that the factors which predict mortality in patients who undergo a relaparotomy are related to the severity of the disease. Furthermore, we observed that an increase in the number of anastomoses also affected mortality. Since our study is heterogeneous, well-planned, randomized, controlled studies are needed for further evaluation of this topic. Also, scoring systems that can predict daily mortality or possible organ failure in these patients are needed as well as intensive care scoring systems that can help us implement measures to prevent organ failure in patients who undergo a planned relaparotomy.

CONFLICT of INTEREST STATEMENT

The authors declare no conflict of interest.

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