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Factors Affecting Mortality in Patients who Underwent Primary Suture Repair for Peptic Ulcer Perforation

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Abstract

Introduction: Primary suture is the most commonly used emergency surgery procedure for peptic ulcer perforation (PUP). The aim of this study was to evaluate factors affecting mortality in patients who underwent primary suture for PUP.

Methods: In total, 103 patients underwent primary suture for PUP between September 2009 and December 2016. Patient demographics, comorbidities, the time interval between symptom onset and hospital admission, the length of hospital stay, and morbidity and mortality data were retrospectively collected.

Results: The median age of the patients was 63 years (min: 22, max: 99 years) and 74.8% were male. In all, 45 patients had at least 1 comorbidity. The median time interval between symptom onset and hospital admission was 1 day (min: 1, max: 10 days). The mortality rate was 10.7%. Non-surviving patients were older, more frequently presented with shock, and more often had postoperative pneumonia, compared with survivors. Older age (Odds ratio [OR]: 1.22; p=0.0015) and postoperative pneumonia (OR: 84.2; p=0.0031) were independent risk factors associated with increased mortality.

Discussion and Conclusion: Advanced age and postoperative pneumonia were the factors associated with an increased risk of mortality in patients who underwent primary suture for PUP.

Keywords: Mortality; peptic ulcer; perforation.

As a result of developments in medical treatment, the need for elective surgery for uncomplicated peptic ulcer disease (PUD) has decreased [1]. Peptic ulcer perforation (PUP) is a complication of PUD that requires emergency surgery [2]. The reported incidence ranges between 7 and 10/100.000, and the postoperative mortality rate may be as high as 30% [2-4].

Primary suturing and omentoplasty is the method of surgical treatment for PUP used most often [5]. Although this procedure is typically performed as open surgery, it has been reported that laparoscopic surgery might be preferable due to the shorter healing time and lower rate of complications [6].

Predisposing factors for PUP include smoking, use of nonsteroidal drugs, stress, Helicobacter pylori infection, and advanced age [1]. Early diagnosis and treatment are the most important factors affecting the prognosis in cases of PUP. Diagnosis can easily be made based on physical examinati-

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on and the detection of subdiaphragmatic free air on direct radiograms; however, in older, immunocompromised patients, establishment of a diagnosis is not always possible [2].

Previously, advanced age, a delay in diagnosis, the presence of concomitant disease, failed primary surgery, and gastrectomy have been described as poor prognostic factors. In this study, the aim was to determine the factors affecting postoperative mortality in patients who underwent primary suturing for PUP repair.

Materials and Methods

The hospital database was screened for patients who underwent primary suture repair in the clinic between September 2009 and December 2016 with the indication of PUP. The files of 121 patients were retrospectively analyzed. Informed consent forms had been acquired from all of the patients for all medical treatments and interventions performed. The study protocol was designed in compliance with the Helsinki Declaration, and the patient data were anonymized. Since the data used in our study were obtained retrospectively from patient files, ethics committee approval was not requested.

Patients aged >18 years who had undergone primary suture repair, with or without omentoplasty, with the indication of PUP were included in the study. Patients who underwent a gastrectomy (n=4) were not included. Patients with a tumoral perforation (n=8), those whose histopathological examination of intraoperative biopsy specimens revealed the presence of malignancy (n=4), and patients whose postoperative control endoscopy detected malignancy (n=2) were also excluded from the study.

Demographic data, information regarding concomitant disease, laboratory findings, Boey score, admission details, operative data, hospital stay data, and the morbidity and mortality of the patients were evaluated. The admission period was calculated in days as beginning with the onset of symptoms until the time of surgery. Details of patients presenting with admission symptoms of shock or hypotension requiring inotropic support, respiratory distress requiring mechanical ventilation support, or acute renal failure, which may or may not have required hemodialysis can be seen in Table 1. The Boey scoring system is used to predict the prognosis of patients with PUP. The calculation evaluates the risk factors of time since perforation, the presence of preoperative shock, and concomitant disease [1]. The patients were divided into 2 groups based on survival, and the differences between those who survived and those who did not were assessed.

JMP version 12 software (SAS Institute Inc., Cary, NC, USA) was used for the statistical analysis. Categorical variables were expressed as percentages, and continuous variables as mean±SD and median (min-max). In the analysis of categorical variables, a chi-square test and Fisher's exact test were used, and the Wilcoxon signed-rank test was used for continuous variables. Conditional models for multivariate analysis of matched data were constructed to evaluate the factors affecting mortality. $P<0.05$ was accepted as the level of statistical significance.

Results

Primary suture repair was performed in 103 PUP patients with a median age of 63 (min: 22, max: 99 years). Of the total, 77 (74.8%) patients were male. Ten (9.7%) cases had a concomitant malignancy, and 45 (43.7%) had a least 1 comorbidity. The mean admission time was 1 day (range: 1-10 days). At admission, 20 (19.4%) patients displayed manifestations of shock. The median white blood cell count was 12200/mm3 (min: 2220, max: 30,100). Most of the patients had a Boey score of 0 or 1 [Boey score 0:32 (31%), 1:44 (42.7%), 2:20 (19.4%), 3:7 (6.9%)].

PUP was most frequently seen in the pyloric region (pyloric: n=42, 40.8%; prepyloric: n=37, 35.9%; postpyloric: n=24, 23.3%). The median operative time was 70 minutes (min: 20, max: 200 minutes). A total of 3 (2.9%) patients required re-operation, and 2 patients underwent truncal vagotomy and antrectomy, while the third patient underwent subtotal gastrectomy. In 9.7% of the patients, a surgical site infection (SSI) developed (superficial incisional SSI: n=4, deep incisional SSI: n=5, and organ cavity infection: n=1). During the postoperative period, pneumonia was detected in 10 (9.7%) patients. Forty-seven (45.6%) cases were monitored in intensive care unit for at least 12 hours in the immediate postoperative period.

The mortality rate was 10.7% (n=11). When the surviving and non-surviving patients were compared, the deceased patients were relatively older (85 vs. 59 years; $p<0.0001$), and they more frequently had symptoms of shock at admission (16.3% vs. 45.5%; $p=0.02$). In addition, the mortality rate was significantly higher in patients with postoperative pneumonia (5.4% vs 45.5%; $p<0.0001$) (Table 1).

The variables that yielded a statistically significant difference were included in conditional models for multivariate analysis of matched data. Age [odds ratio (OR): 1.22, 95% confidence interval (CI): 1.05-1.54; $p=0.0015$], and the development of postoperative pneumonia (OR: 84.2, 95% CI: 3.66-15330.37; $p=0.0031$) were determined to be independent risk factors of mortality.

Table 1. Factors affecting mortality

Variable	Survivors, n (%)	Non-survivors, n (%)	p
Age, median (years)	59 (22- 99)	85 (66- 99)	<0.0001
Gender			NSδ
Male	71 (77.2%)	21 (54.5%)	
Female	6 (22.8%)	5 (45.5%)	
Presence of comorbidity			NS
Yes	40 (43.5%)	5 (45.5%)	
No	52 (56.5%)	6 (54.5%)	
Admission symptoms of shock			0.02
Yes	15 (16.3%)	5 (45.5%)	
No	77 (83.7%)	6 (54.5%)	
Duration of symptoms (years)	1 (1- 7)	1 (1- 10)	NS
Boey score			NS
0	30 (32.6%)	2 (18.2%)	
1	38 (41.4%)	6 (54.5%)	
2	19 (20.6%)	1 (9.1%)	
3	5 (5.4%)	2 (18.2%)	
Localization			NS
Pyloric	39 (42.4%)	3 (27.3%)	
Prepyloric	31 (23.9%)	6 (54.5%)	
Postpyloric	22 (33.7%)	2 (18.2%)	
Operative time, median (minutes)	70 (20- 200)	90 (40-150)	NS
Need for reoperation			NS
Yes	2 (2.2%)	1 (9.%1)	
No	90 (97.8%)	10 (90.9%)	
SSI		NS	
Yes	9 (9.8%)	1 (9.1%)	
No	83 (90.2%)	10 (90.9%)	
Pneumonia			<0.0001
Yes	5 (5.4%)	5 (45.5%)	
No	87 (94.6%)	6 (54.5%)	

δ: Not significant; SSI: Surgical site infection.

Discussion

Although PUD can be successfully managed nowadays with medical treatment, PUP is not an uncommon complication of this disease, and it absolutely requires surgery in many cases. Since PUP surgery is typically performed under emergency conditions, it may be associated with a very high mortality rate, especially in elderly patients with comorbidities. A correlation between the risk of mortality, advanced age, and postoperative pneumonia was detected in this study.

A similar correlation between advanced age and increased mortality risk related to PUP surgery has been demonstrated many times in the literature [5,7,8]. Multiple comorbidities in the elderly, a decline in general health, insufficient nutrition, and unfavorable alterations in their immune system likely contribute to the increased risk of mortality [9]. Our data also indicated that advanced age was an independent risk factor affecting mortality. In previous studies, it was reported that female gender might be a bad prognostic factor post-PUP surgery, since women often live longer than men, and thereby represent a larger portion of the aged population and often have more comorbidities as a result [9,10]. In our study, though there were more male patients in the mortality group (54.5%), we did not determine any effect of gender on mortality.

Numerous scoring systems have been developed to predict the prognosis of patients who will undergo emergency surgery for PUP [11,12]. All of these scoring systems consider parameters such as age, the presence of septic complications related to PUP, and delay in treatment. The Boey scoring system is one of the most widely used. The Boey score

evaluates the presence of a major concomitant disease, preoperative shock symptoms, and perforation diagnosis delay of more than 24 hours. In the presence of all 3 of these risk factors, it has been reported that the mortality rate approaches 100% [12]. However, in our study, no correlation was found between the Boey score and mortality. Interestingly, 5 patients with all 3 risk factors survived.

We think that developments in medical knowledge and technology since the description and assessment of these risk factors has increased the chances of survival for older patients and those with concomitant disease.

Currently, the most frequently preferred surgical method to treat PUP is repair with primary suturing [13]. Successful application of this method using a laparoscopic approach has been reported in prospective randomized studies [14-16]. In the most recently published meta-analysis, though with only low to moderately strong levels of evidence, it was indicated that the favorable safety profile of a laparoscopic approach may decrease abdominal septic complications [6]. The literature data have suggested that laparoscopic surgery in the treatment of PUP decreased pulmonary complications [16]. An open surgical technique was used in all of the cases in this study, and the development of postoperative pneumonia was determined to be a risk factor affecting mortality. Use of a laparoscopic technique may decrease the incidence of pneumonia and related mortality.

The most important limitation of our study is its retrospective design. Furthermore, all of the cases were treated with open surgery. The limited number of patients is another weak point of our study. However, analysis of data obtained from a patient population treated and followed up by an experienced surgical team at a tertiary care center increases the clinical value of our study.

In conclusion, our results have demonstrated that advanced age is a factor in increased mortality in patients undergoing repair of PUP using primary suturing. Development of postoperative pneumonia is also associated with mortality. The world population is gradually aging, and more frequent use of laparoscopic methods may decrease the incidence of postoperative complications and pneumonia, and prevent related mortality.

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