Research Article / Araştırma Makalesi

Togetherness Reminded by the Earthquake: Relationship Between Stress and Peptic Ulcer Perforation

Depremin Hatırlattığı Bir Birliktelik: Stres-Peptik Ülser Perforasyonu İlişkisi

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Abstract

Background: Severe stress is one of the leading causes of peptic ulcer perforations. Peptic ulcer perforation is a clinical condition that can be fatal if not treated urgently. This study aimed to investigate the effects of social stress caused by the earthquakes in Kahramanmaraş on peptic ulcer perforation.
Materials and Methods: A retrospective evaluation was conducted on 66 peptic ulcer perforation cases operated on in three major centers in Şanlıurfa, considering two large earthquakes that occurred on February 6, 2023, and by comparing the 6-month periods before and after the earthquakes. Patients were assessed in terms of age, gender, diagnostic method, perforation site, surgical technique, operation time, length of hospital stay, and mortality. Our study also evaluated laboratory parameters such as white blood cell (WBC) count, hemoglobin, urea, creatinine, and albumin levels.
Results: In the 6 months prior to the earthquakes, 21 patients underwent surgery for peptic ulcer perforation, whereas 45 patients were operated on for the same reason in the 6 months following the earthquakes; there were two deaths in each group. The number of patients operated on after the earthquakes was significantly higher than the number of patients operated on before the earthquakes. Furthermore, the two groups were also compared in terms of demographic data and laboratory findings; no significant differences between the two groups were observed regarding these parameters.
Conclusions: Stress plays a remarkable role in the development of peptic ulcer perforation. In stressful situations that affect the general population, such as earthquakes, it is essential to assess stress tendencies and dyspeptic complaints in patients presenting to the hospital. Patients with positive findings should undergo endoscopy if necessary, followed by appropriate gastric treatment.

Keywords: Earthquake-related stress, Peptic ulcer, Peptic ulcer perforation

Öz

Amaç: Şiddetli stres, peptik ülser perforasyonlarının önde gelen nedenlerinden biridir. Peptik ülser perforasyonu ise acil müdahale edilmezse mortal seyredebilen bir klinik tablodur. Bu çalışmada Kahramanmaraş'ta meydana gelen depremlerin neden olduğu sosyal stresin peptik ülser perforasyonu üzerindeki etkilerinin araştırılması amaçlanmıştır.
Materyal ve Metod: 6 Şubat 2023'te meydana gelen 2 büyük deprem baz alınarak, depremden önceki ve sonraki 6 aylık dönemlerde Şanlıurfa'da perforasyon vakalarının kabul edildiği üç büyük merkezde ameliyat edilen 66 peptik ülser perforasyon vakası retrospektif olarak değerlendirildi. Hastalar yaş, cinsiyet, tanı yöntemi, perforasyon yeri, cerrahi teknik, ameliyat süresi, hastanede kalış süresi ve mortalite açısından değerlendirildi. Çalışmaya ayrıca beyaz kan hücresi (WBC), hemoglobin, üre, kreatinin ve albümin düzeyleri gibi laboratuvar parametreleri de dahil edildi.
Bulgular: Depremden önceki 6 ayda 21 hasta peptik ülser perforasyonu nedeniyle ameliyat edilirken, depremden sonraki 6 ay aynı nedenle 45 hasta ameliyat edildi. Her grupta ikişer ölüm gerçekleşti. Depremden sonra ameliyat edilen hasta sayısı, depremden önce ameliyat edilen hasta sayısından anlamlı olarak daha fazlaydı. İki grup, demografik veriler ve laboratuar bulgular açısından da karşılaştırıldı. Karşılaştırılan bu parametreler açısından iki grup arasında anlamlı farklılık mevcut değildi.
Sonuç: Stres, peptik ülser perforasyonu gelişiminde önemli bir role sahiptir. Deprem gibi toplumun genelini etkileyen stres durumlarında, hastaneye başvuran hastalarda stres eğilimi ve dispeptik şikayetler mutlaka sorgulanmalıdır. Pozitif bulguları olan hastalar gerekirse endoskopiye alınmalı ve sonrasında uygun mide tedavisi düzenlenmelidir.

Anahtar Kelimeler: Depremle ilişkili stres, Peptik ülser, Peptik ülser perforasyonu

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Introduction

Although stress is negatively affects people's lives, it is also an unavoidable part of modern life and daily routines. Exposure to stress in everyday life can lead to physical, behavioral, emotional, and psychological issues and development of chronic diseases. Stress initially causes changes in psychological state, but prolonged stress can also lead to organic disorders (1).

Ulcerative lesions in the upper gastrointestinal system that occur in areas exposed to peptic fluid (acid–pepsin) are referred to as "peptic ulcers." Peptic ulcers occur due to an imbalance between endogenous protective factors (e.g., mucus, bicarbonate secretion, adequate blood flow, and prostaglandins.) and aggressive factors (e.g., acid and pepsin secretions, reduced blood flow, and decreased prostaglandin synthesis) (2,3). Although the etiology of peptic ulcer is multifactorial, one of the most important factors is stress (1).

Along with stress, many other factors contribute to ulcer etiology. Nonsteroidal anti-inflammatory drugs (NSAIDs) are another significant factor. Prostaglandins exert a protective effect by forming a gastric barrier. However, in individuals using NSAIDs, the inhibition of mucosal cyclooxygenase activity leads to a reduction in prostaglandin concentration in the gastroduodenal mucosa, which is known to be the most important mechanism behind NSAID-associated mucosal toxicity. Ulcers caused by NSAIDs are often asymptomatic (3).

The effect of smoking on ulcer development originates from the problems caused by nicotine, such as reduced duodenal blood flow, increased gastric acid production, and increased duodenogastric reflux (3).

Alcohol is known to contribute to peptic ulcer development, either through the progression of alcoholic cirrhosis, which increases the incidence of peptic ulcers, or by causing acute gastric mucosal damage. Furthermore, caffeine in food contributes to peptic ulcer development by increasing gastric acid secretion and gastrin release (2).

Peptic ulcer cases have two complications that require urgent intervention. Perforation and bleeding are clinical conditions with increased occurrence under stress in peptic ulcer cases, and if not properly addressed, can be fatal. These complications typically arise from inadequate treatment of the etiological factors causing peptic ulcers or severe exposure to these factors (4).

Şanlıurfa, where our clinic is located, was among the provinces affected by the earthquakes centered in Pazarcık and Elbistan on February 6, 2023, which caused massive destruction in many provinces. Numerous buildings collapsed due to the earthquakes in the city, and nearly 200 people lost their lives. The intense tremors, followed by days of rescue operations from collapsed buildings, and the months-long demolition of damaged structures, exposed the city's population to severe psychological stress.

The aim of this study was to investigate the effects of social stress caused by the earthquakes on peptic ulcer perforation cases treated in our clinic.

Materials and Methods

Considering the earthquakes that occurred in the Pazarcık and Elbistan districts of Kahramanmaraş, data from 66 patients who underwent surgery for peptic ulcer perforation in our clinic and two major hospitals in Şanlıurfa during the 6-month periods before and after the earthquakes were retrieved from hospital archive systems. The data were retrospectively analyzed.

The three hospitals included in the study are the major centers in the province that treat cases of gastric perforation.

The patients were assessed in terms of age, gender, diagnostic method, perforation site, surgical technique, operation time, length of hospital stay, and mortality. Laboratory parameters, including white blood cell (WBC) count, hemoglobin, urea, creatinine, and albumin levels, were also analyzed. Patients who were diagnosed with gastric or duodenal perforation after emergency evaluation and whose diagnosis was confirmed intraoperatively were included in the study. Patients with perforation sites other than the stomach or duodenum, those with perforations due to other causes (tumor, trauma, etc.), patients whose perforation was found to be due to different etiologies those who had previously received or were currently receiving treatment for gastritis or ulcers, and those with a history of gastric surgery for any reason were excluded from the study.

In both groups, all patients were diagnosed through physical examination, direct radiography, and intravenous (IV) contrast-enhanced abdominal tomography. Furthermore, patients were operated on under general anesthesia. Fifty-five patients (83%) underwent surgery using an open technique, whereas 11 patients (17%) were operated on using a laparoscopic technique. Perforation repair in all patients was performed using the Graham omentoplasty procedure. Intraoperative biopsy of the perforation area was not performed. Postoperative elective gastroscopy and gastroscopic biopsy were recommended for all patients.

Data analysis

Statistical analysis of the dataset used in the study was performed using SPSS version 21.0 (SPSS Inc., Chicago, Illinois, USA). Distribution of the variables was examined initially using Kolmogorov–Smirnov and Shapiro–Wilk tests. Normally distributed variables were expressed as mean ± standard deviation, whereas non-normally distributed variables were expressed as median [interquartile range (IQR)]. Student's t-test was used to compare two independent groups if the variable exhibited normal distribution; otherwise, the Mann–Whitney U test was applied. Additionally, a chi-square goodness-of-fit test was used to determine whether the number of patients operated on before and after the earthquake was evenly distributed (i.e., whether the observed values fit the expected values). A p-value of <0.05 was considered statistically significant for all analyses.

Data availability

All data generated or analyzed during this study are included in this paper.

Informed consent

Informed consent forms were obtained from the patients whose data were used in the study, indicating their acceptance of the treatment.

Results

Before the earthquake, between August 6, 2022, and February 6, 2023, 21 patients underwent surgery for peptic ulcer perforation in the general surgery clinics of the three hospitals. After the earthquake, between February 6, 2023 and August 6, 2023, the number of patients who underwent surgery was 45. These 66 patients who met the study criteria were included in the study.

One female patient (5%) and 20 male patients (95%) were operated on before the earthquake, and nine female patients (20%) and 36 male patients (80%) were operated on after the earthquake. Two patients (10%) who underwent surgery before the earthquake and two patients (4%) who underwent surgery after the earthquake died. The 4 patients who died did not have any additional disease. These patients were admitted very late after perforation and died due to sepsis despite appropriate antibiotic therapy. The 4 patients who died did not have any additional disease. These patients were admitted very late after perforation and died due to sepsis despite appropriate antibiotic therapy. Mean age of the 21 patients operated on before the earthquake was 41.62 (±16.15) years, mean length of hospitalization was 5.81 (±1.89) days, and mean operation time was 57.86 (±9.43) minutes. Furthermore, mean age of the 45 patients operated on after the earthquake was 45.36 (±16.36) years, mean length of hospitalization was 5.64 (±1.25) days, and mean operation time was 59.11 (±13.79) minutes (Table 1). Before the earthquake, 13 patients (62%) had prepyloric perforation and eight (38%) had postpyloric perforation. After the earthquake, 23 patients (51%) had prepyloric perforation and 22 (49%) had postpyloric perforation. The prepyloric perforations were located in the antrum, whereas the postpyloric perforations were located in the duodenal bulb.

According to laboratory findings, before the earthquake, mean serum albumin level was 3.95 (±0.41) g/dL, mean urea level was 32 (±30.93) mg/dL, mean creatinine level was 1.0 (±0.64) mg/dL, mean hemoglobin level was 14.7 (±1.21) g/dL, and mean WBC level was 12.976 (±4,078) $10e^3$/µL. After the earthquake, mean serum albumin level was 4.01 (±0.56) g/dL, mean urea level was 35.07 (±23.28) mg/dL, mean creatinine level was 0.97 (±0.51) mg/dL, mean hemoglobin level was 13.84 (±2.18) g/dL, and mean WBC level was 12.851 (±4.214) $10e^3$/µL (Table 1).

When the patients were evaluated in terms of comorbidities, four patients had coronary artery disease, four had congestive heart failure, and eight had diabetes mellitus. Two patients had previously undergone colon resection due to colon cancer, and one had undergone laparotomy with adhesiolysis due to ileus.

Statistical analysis revealed no significant difference in age, length of hospitalization, operation time, and other laboratory parameters evaluated before and after the earthquake (Table 1).

The chi-square goodness-of-fit test was used to determine whether the proportion of patients operated on for perforation before and after the earthquake was equal. The proportions showed statistically significant differences due to the earthquake; χ^2 (1, N = 66) = 8.73, p = 0.003 (Table 2).

Table 1. Laboratory parameters and other findings of surgical patients

Parameters	Perforation time						*p* value
	Before the earthquake (n_1 = 21)			After the earthquake (n_2 = 45)			
	Min	Max	$\overline{X} \pm SS$	Min	Max	$\overline{X} \pm SS$	
Age	19	72	41.62 ± 16.15	18	76	45.36 ± 16.36	0.91
Length of stay	1	8	5.81 ± 1.89	3	9	5.64 ± 1.25	0.58
Operation time	30	70	57.86 ± 9.43	40	90	59.11 ± 13.79	0.78
Albumin	3.1	4.6	3.95 ± 0.41	2.7	5.1	4.01 ± 0.56	0.20
Urea	12	121	32 ± 30.93	10	115	35.07 ± 23.28	0.14
Creatinine	0.6	3.4	1.0 ± 0.64	0.5	3.7	0.97 ± 0.51	0.51
Hemoglobin	11.9	16.6	14.7 ± 1.21	7.3	18.4	13.84 ± 2.18	0.07
WBC	3,200	19,900	12,976 ± 4,078	4,100	27,800	12,851 ± 4,214	0.73

Note. WBC, white blood cell.

Table 2. Chi-square test values for perforation time and number of surgical patients

Perforation time	Number of surgical patients	*p*
Before the earthquake	21	0.003
After the earthquake	45	

Discussion

The most substantial complications of peptic ulcers are bleeding and perforation. The development of these complications is influenced by various factors involved in ulcer formation, including physiological and psychological stress. Prolonged stress as well as short-term, intense stress can contribute to the severity of these complications (5). In both cases, patients require emergency intervention. Otherwise, outcomes can potentially be fatal. The incidence of perforation in peptic ulcer cases is approximately 2%–10,

and mortality rates for peptic ulcer perforations are approximately 10%–40% (5-7). In the present study, the mortality rate was 4 (6%).

In a review published by Russell et al., it was stated that if unavoidable stress is not managed appropriately or if the patient cannot adapt well to this stressful situation, this increases the susceptibility to many diseases such as peptic ulcer, diabetes mellitus, asthma, hypertension, atherosclerosis, myocardial infarction, infections, and cancer (1). In the present study, comorbid conditions associated with stress-related ulcer perforation were identified in 19 (28%) patients.

Lanas et al. reported in their study that *Helicobacter pylori* infection was detected in nearly 100% of duodenal ulcers, but this rate was lower in gastric ulcers (3). Therefore, to evaluate *H. pylori* infection and gastric mucosa, elective gastroscopy and biopsy were recommended for all patients included in the study during the post-discharge period.

Numerous studies have shown that while the acute stress response is vital, prolonged stress can lead to various complications. The main point emphasized by these studies is that increased corticosteroid levels, elevated gastric acid secretion, and reduced blood flow to the gastrointestinal system due to stress responses contribute to the development of gastric ulcers (1,8,9). The significant difference in the number of patients operated on before and after the earthquake in the present study supports the idea that stress increases the risk of ulcer development and subsequent perforation.

In a study by Wysocki et al., it was observed that 88.1% of ulcer perforations were duodenal, and 11.9% were gastric. Additionally, the study noted that 77.6% of duodenal ulcer perforations and 66.7% of gastric ulcer perforations were predominantly in men (10). There are also studies in the literature indicating a higher incidence of gastric ulcer perforations and a predominance of female gender (11). However, general literature suggests that perforations occur 2–8 times more frequently in men. In the present study, 30 patients (45%) had postpyloric (bulbar) perforations, whereas 36 patients (55%) had prepyloric (antral) perforations. Of the patients evaluated in the present study, 56 (85%) were men and 10 (15%) were women.

The meta-analysis published by Cirocchi et al. and many other studies have found that that laparoscopic surgery yields similar positive outcomes to open techniques in perforation surgery. Consequently, minimally invasive surgical methods have begun to gain popularity in the management of gastric and duodenal perforations (12-14). Eleven patients in the present study underwent laparoscopic surgery. This indicates that, in our region, there is still a strong preference for open surgery in peptic ulcer perforation cases. Thus, different studies can be conducted to examine the criteria for choosing between laparoscopic and open surgery in perforation patients.

In our cases, we used the Graham omentoplasty technique for all repairs. Although some studies suggest there is no significant difference in postoperative complications between simple closure and Graham closure techniques, the omentum-assisted Graham closure remains the most frequently used technique (15).

Despite the inclusion of three centers, the limitations of the study include its retrospective design, potential for other patients with perforations to have sought care at different centers during the 1-year period, exclusion of previously treated patients, and the lack of comparison with patients who did not receive treatment.

The nearly twofold increase in peptic ulcer perforation cases in the 6 months following the earthquake, compared to the same period before the earthquake, is deem to be a clear indicator of the impact of stress factors on the etiology of peptic ulcer perforation.

We believe that providing psychological support to patients with dyspeptic symptoms and stress tendencies, particularly in stressful situations affecting the society in general, and ensuring that necessary tests and treatments are properly managed, can help prevent an increase in peptic ulcer symptoms and complications.

Ethical Approval: *This study was approved by the Harran University Clinical Research Ethics Committee (Date: 11/13/2023–HRÜ/23.21.30).*

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