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Management, Prognosis and Early Mortality of Patients with Esophageal Perforation

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ABSTRACT

Introduction: The diagnosis, treatment, and follow-up of 19 patients diagnosed with esophageal perforation in our hospital were evaluated against the current literature.

Methods: The 19 patients diagnosed with esophageal perforation in our hospital's General Surgery Clinic between 2013 and 2023 were retrospectively examined in terms of demographic characteristics, perforation type, diagnostic method, time to treatment, localization and width of perforation, treatment methods applied, morbidity, and mortality.

Results: Of the 19 patients, 11 (57.9%) were male. The mean age was 59.2 (22-82). Etiologically, the most common cause was foreign body, and the most common level of perforation was the thoracic esophagus. Twelve of the patients were diagnosed within 24 hours. Six cases were managed non-operatively and followed with endoscopic intervention. 8 patients died.

Conclusion: Despite current diagnostic and therapeutic methods, esophageal perforation is still a disease with a high mortality rate.

Keywords: Esophageal perforation, mediastinitis, esophageal stent

Introduction

Esophageal perforation is a rare condition, but when it does occur, it is associated with high morbidity and mortality. Mediastinitis due to a perforation may develop in patients, which is an extremely risky condition due to sepsis and mortality. The literature is unclear about the true incidence of esophageal perforation (1). With the widespread use of endoscopy for diagnosis and treatment, esophageal perforations have become more common (2). The symptoms and findings of esophageal perforation vary depending on the location of the perforation, how it happens, and the time since it was diagnosed. Apart from etiology and localization, Harrich et al. (3) classified esophageal perforations according to tomography and endoscopy findings.The perforations were all graded systematically from I to IV in the study according to the presence of air in the mediastinum, mediastinitis or sepsis, leakage of oral contrast, persistent fistula, long-stretch rupture or necrosis. Rapid diagnosis and treatment are vital, as the mortality rate almost doubles from 14% to 27% when diagnosed more than 24 hours after perforation (4). Treatment types include surgical methods such as open thoracotomy, thoracoscopy, or laparotomy and omentoplasty, as well as non-invasive methods such as endoscopic stenting (5). Another method to treat esophageal perforation is with endoscopic vacuum therapy, which is similar to negative pressure wound therapy (6). In this study, we aimed to evaluate and discuss the cause and location of perforation, along with the clinical features and treatment methods applied in 19 cases of esophageal perforation diagnosed and treated at our hospital, in light of the literature.

Methods

The study was approved by the Clinical Research Ethics Committee of Mersin University (approval number: 1103, date: 13.11.2024), nineteen cases, for which data were available, diagnosed and treated with esophageal perforation in our hospital between 2013 and 2023 were retrospectively reviewed. Patient demographics, albumin, c-reactive protein, hemoglobin, platelet, creatinine values at the time of diagnosis, perforation type, diagnosis method, time to treatment, perforation location, and width, treatment methods, morbidity, and mortality were

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analysed. Cases diagnosed within the first 24 hours were considered early diagnosis, and cases that were admitted to the hospital and diagnosed more than 24 hours later were considered late diagnosis.

Statistical Analysis

The distribution of the study's data, which analyzed the cases of esophageal perforation, was evaluated by the Kolmogorov-Smirnov test. The data belonging to the cases were given as percentage, mean ± standard deviation, or median [minimum-maximum (max.)].

Results

Eleven of the cases were male (57.9%) and eight were female (42.1%). The mean age was 59.2 (22-82). Table 1 shows the demographic characteristics, symptoms, radiological findings and primary pathology of the cases.

Seven of the cases (36.8%) were caused by foreign bodies, six cases (31.6%) were iatrogenic, with one occurring after thyroidectomy and five after endoscopy, and the (31.6%) were spontaneous perforations due to Boerhaave syndrome.

Twelve of the patients were admitted to the hospital within 24 hours and received an early diagnosis; seven patients were admitted and diagnosed after 24 hours. The diagnostic methods used in these cases were esophagoscopy or thoracic tomography.

Esophageal perforation occurred in two patients during the endoscopic dilatation procedure and in one patient during the procedure for variceal bleeding. One patient with esophageal cancer had a rupture during endoscopic stent placement. All of these patients were diagnosed at an early stage during the procedure.

Mediastinitis developed in 11 patients (57.9%), with one patient followed up for a neck abscess secondary to perforation. When evaluating the location of the perforation, seven patients (36.8%) had a perforation in the thoracic oesophagus. Six (31.6%) patients had a perforation at the level of the cervical esophagus, and six (31.6%) the abdominal esophagus. The max perforation width was determined to be 7 cm.

Diagnostic chest tomography revealed pneumomediastinum in 13 patients (68.4%), bilateral pleural effusion in five patients, and left-sided pleural effusion in one patient. In addition, pneumothorax was noted in two patients.

Surgery was used as a treatment in 13 patients (68.4%). In nine of these cases, the perforation site was accessed through thoracotomy, while in four, a cervical incision was used. In one case, a feeding gastrostomy was performed in the same session through a median incision above the umbilicus. In three cases, the distal esophagus was closed, in two of them a drain was placed from the proximal esophagus to the hypopharynx to provide drainage, and in one of them a cervical esophagostomy procedure was performed Two patients had an esophagectomy, and three a primary suture of the perforation. Anastomotic leakage developed in one patient, and anastomotic repair was performed by relaparotomy. As a postoperative complication, a tracheopleural fistula developed in one patient. Dehiscence of the wound also occurred in one patient, who underwent a revision of the wound. Total parenteral nutrition (TPN) support therapy was provided in all cases. Intraoperative endoscopy was performed in four patients; three of them underwent intraoperative endoscopic stenting, while the other patient underwent hemoclip placement. Six cases were followed non-operatively with endoscopic intervention. Stents were placed in 3 of these patients and hemoclips were applied to the other 3. The mean hospital stay was 19 (1-80) days.

Eight patients (42.1%) died. Four of these were in the group of patients diagnosed early.One patient in this group, who was diagnosed early and died, is included in the group of patients managed non-operatively with endoscopic intervention.

Table 1. The demographic characteristics, symptoms, radiological findings and primary pathology of the cases

Age (year)	59.2±29.9
Gender (%)	
Male	11 (57.9%)
Female	8 (42.1%)
Symptoms and signs (%)	
Neck abscess	1 (5.3%)
Chest pain	3 (15.8%)
Dyspnea	9 (47.4%)
Dysphagia	6 (31.6%)
Etiology (%)	
Foreign body	7 (36.8%)
Iatrogenic	6 (31.6%)
Spontaneous	6 (31.6%)
Mediastinitis (%)	11 (57.9%)
Perforation level (%)	
Cervical	6 (31.6%)
Thoracic	7 (36.8%)
Abdominal	6 (31.6%)
Pneumomediastinum(%)	13 (68.4%)
Pleural effusion	5 (26.3%)
Need for surgery	13 (68.4%)
Duration of hospitalisation (day)*	19 (1-80)
Mortality	8 (42.1%)
Diagnostic time (%)	
Early	12 (63.2%)
Late	7 (36.8%)
CRP (mg/L)*	52 (0.1-511)
Hemoglobin level (g/dL)	12.4±2.4
White blood cells (x10^3/µL)*	12745 (4386-115000)
Platelets (x10^3/µL)	277166±113011
Creatinine (mg/dL) *	0.69(0.21-2.08)
Albumin (gr/dL)	3.2±0.67

*Signed data are given as median (minimum-maximum) because they are not normally distributed
CRP: C-reactive protein

Discussion

This study was conducted through a retrospective evaluation of 19 esophageal perforations diagnosed and treated in our clinic.

Esophageal perforation is a rare condition, but when it does occur it is associated with high morbidity and mortality. Due to the effectiveness of many specialties such as cardiology, general surgery, thoracic surgery and gastroenterology in the diagnosis and treatment of esophageal diseases, there is an increase in the use of endoscopic diagnostic and treatment methods in esophageal pathologies. Therefore, whereas spontaneous injury used to be the most common etiology of esophageal perforation, today more than half of all esophageal perforations are iatrogenic, and most of them occur during endoscopy (7). Especially when an intervention such as therapeutic dilatation is added to upper gastrointestinal endoscopy, the probability of perforation reaches 0.1% (4,8). for this reason, when a balloon dilation procedure is performed in achalasia, even the slightest suspicion of a perforation should be monitored. One of our cases was diagnosed with achalasia and perforated following endoscopic dilatation. In this case, the esophageal perforation was treated surgically. Esophageal perforation was the result of an endoscopic procedure in five of our cases, two of which were caused by endoscopic dilatation. The localizations where esophageal perforations are seen in the literature are in order of frequency, cervical, abdominal, and thoracic (6%, 21%, 27%) (9). In our study, consistent with the literature, the most common localization of esophageal perforation was the thoracic region. Spontaneous esophageal perforations usually occur at the distal supracardiac level. In our cases, spontaneous rupture was the cause of two of the five patients who developed a perforation at the level of the abdominal esophageal tract. Esophageal perforation after foreign body ingestion accounts for approximately 12% of the etiology, and is common at the level of the cricopharyngeus muscle. Esophageal perforation after foreign body ingestion accounts for approximately 12% of the etiology and often occurs at the level of the cricopharyngeal muscle (10). The most common cause in our cases was a foreign body, with seven cases. In three of the patients who developed perforation at the level of the cervical esophagus, the cause was a foreign body. Perforation may also occur after surgical procedures such as vertebral surgery, thyroidectomy, decortication, mediastinal lymph node dissection, and tracheotomy (1,2). In a case diagnosed with anaplastic thyroid cancer, esophageal perforation, along with associated esophageal fistula and neck abscess, developed after thyroidectomy.

The dominant radiological finding seen in our cases was pneumomediastinum. Perforations in the distal part of the esophagus cause pneumothorax on the left, while those more proximally, cause pneumothorax on the right (5,11). Two of our cases had pneumothorax on the left. In both cases, the perforation was at the distal esophageal level. Furthermore, if the esophageal tract is perforated, mediastinitis and pleural inflammation may develop within a short time.The development of sepsis and mortality is extremely common in these patients. Eleven of our cases developed mediastinitis. Our mortality rate was 42.1%.

There are two approaches in the treatment of esophageal perforation: conservative and surgical. Non-surgical treatment of esophageal perforation can be applied in stable patients with early onset, limited esophageal mucosal disruption, and minimal contamination of surrounding spaces (12). Conservative management includes stabilising the patient within 48 hours of injury, TPN, and broad-spectrum antibiotic therapy for at least 7 days (2). Endoscopy has a significant place in the non-invasive treatment of esophageal perforation. Many esophageal perforations that are related to endoscopy can also be treated endoscopically (13,14). Nowadays, it is possible to achieve mechanical closure of an esophageal perforation with endoscopic clips. Endoscopic procedures can also be performed using tissue adhesives or stents (15). Six patients were treated non-invasively, three underwent endoscopic stent placement, and three underwent endoscopic hemoclip placement. One patient undergoing non-invasive treatment resulted in death. Primary repair, resection, separation, and esophagostomy are the most common methods of surgical treatment. In our cases, surgical treatment was applied to 13 patients, primary repair was performed in three patients, resection in two patients, and esophagectomy and esophagostomy in three patients, within a total of 13 patients who received surgical treatment.

Intraoperative endoscopic intervention is also one of the possible treatment methods (16,17). The most important factor in survival in esophageal perforation is early diagnosis and early treatment intervention (18). With early diagnosis and surgery, survival has been reported to be 93% (12). Sepsis causes multiple organ failure and is a leading cause of death (19). Nowadays, there is a shift away from aggressive treatments such as esophagectomy and esophagostomy, with less aggressive methods becoming more common (20). With the development of endoscopic procedures in recent years, it is now possible to perform effective non-invasive treatment of esophageal perforations. Intraoperative endoscopic treatment was performed in four patients. Mortality occurred in two of 10 patients who received endoscopic intervention and in seven of 12 patients who had surgery.

Study Limitations

The limitations of our study were that it was retrospective, and the number of patients was small due to it being a single-centre study.

Conclusion

Despite today's improvements in examination and treatment, esophageal perforation is still a serious health problem. Despite better outcomes with early diagnosis of non-abdominal esophageal perforation and endoscopic intervention that occurs especially in the first 24 hours, esophageal perforation remains an important cause of mortality.

Ethics

Ethics Committee Approval: The study was approved by the Clinical Research Ethics Committee of Mersin University (approval number: 1103, date: 13.11.2024).

Informed Consent: Retrospective study.

Footnotes

Authorship Contributions: Surgical and Medical Practices - E.R., H.B., H.C.; Concept - E.R., H.S., H.B., K.Ş.; Design - E.R., H.S., H.B., K.Ş.; Data

Collection or Processing - H.S., H.B., K.Ş., Z.N.H., M.K.A.; Analysis or Interpretation – E.R., H.S., H.B.; Literature Search - E.R., H.B., K.Ş., H.C.; Writing – E.R., H.B., K.Ş.

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