

## Surgical Management of Esophageal Perforation: Systematic Literature Review

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### Abstract

This review is aiming to discuss the surgical management of esophageal perforation, the presented review was conducted by searching in Medline, Embase, Web of Science, Science Direct, BMJ journal and Google Scholar for, researches, review articles and reports, published over the past years were searched up to November 2019 for published and unpublished studies and without language restrictions, if several studies had similar findings, we randomly selected one or two to avoid repetitive results. On the basis of findings and results this review found the management significantly depend on many factors like the time between the perforation and the treatment and the severity of the perforation, on the other hand, many approaches used to manage the esophageal perforation such as primary closure using stomach fundus, pleural, diaphragmatic, or pericardial flap, emergency esophagostomy, primary repair, drainage alone, debridement and drainage, reinforced repair, esophageal resection.

**Keywords:** *Surgical; Management; Esophageal Perforation; Primary Repair*

### Introduction

Esophageal perforation is associated with increase in the morbidity and mortality, in which the probability of death is linked to the time of the initiation of the intervention. Studies show that, the mortality rate if we initiated the treatment with 24 hours is about 10% to 25% which can reach up to 40% to 60% if we delayed the intervention to 48 hours [1-3].

Many factors can participate in the high risk of death from Esophageal perforation, which like the anatomical characteristic and the location of the esophagus is plying main role in the great increase in mortality rate, through its location can provide the bacteria of the

stomach and the digestive enzymes with an access to the mediastinum which can cause many complications like “severe mediastinitis, empyema, sepsis, and multiple organ dysfunction syndrome” [4]. Another important factor is that the “the rarity of this condition and its nonspecific presentations” which can delay the early diagnoses and the initiation of the treatment in more than 50% of the cases. But through the improvement in the medicine and the advancement of the surgical and the pharmaceutical innovation, in addition to the improve of the quality of the postoperative management and care; all of this factor together play significant role in the positive outcome of esophageal perforation in the past 2 decades [4].

Many management approaches and procedure has been introduced in the past few decades to manage and prevent the fatal complication of esophageal perforations which include operative and non-operative options, the Surgical intervention always the management of choice to prevent the “esophageal injury-induced inflammatory damage” [5,6]. Many studies showed and evidence that primary repair should be done as soon as possible without any regard to the time before the diagnoses is made, other procedures include “reinforced repair, debridement and drainage, and esophageal resection with simultaneous or stage reconstruction” [7-16].

Some studies suggested that the non-operative option by “adequate drainage of pleural fluid collections and sepsis treatment” [21] can be considered instead of the harmful surgical interventions [19,20] recently some studies considered other options such as self-expandable metallic stents to cover the perforated area [22,23].

Although the advancement of the management approaches the mortality rate still between 15% to 50% [17,18]. Many factors like the type of esophageal perforation, the time, severity of the perforation and the early initiation of the management. All together play important role in determining the type of the outcome [24] for that we are conducting this review in the literature aiming to find the best approaches in the management of esophageal perforations.

**Materials and Methods**

The present review was conducted November 2019 in accordance with the preferred reporting items for systematic reviews and meta-analyses (PRISMA) declaration standards for systematic reviews. We reviewed all the topics on surgical management of esophageal perforation. such as primary closure using stomach fundus, pleural, diaphragmatic, or pericardial flap, emergency esophagostomy, primary repair, drainage alone, debridement and drainage, reinforced repair, esophageal resection.

To achieve this goal, we searched Medline, Embase, Web of Science, Science Direct and Google Scholar for, researches, review articles and reports, published over the past 15 years.

Our search was completed without language restrictions. Then we extracted data on study year, study design, and key outcome on diabetes. The selected studies were summarized and unreproducible studies were excluded. Selected data is shown in the table 1.

Author and year	Sample	Surgical Management	Key point
Bradley L 1996 [24]	Sixty-six patients (39 male and 27 female)	primary closure using stomach fundus, pleural, diaphragmatic, or pericardial flap	Esophageal perforation remains an important thoracic emergency. Aggressive operative therapy remains the mainstay for treatment; however, conservative management may be preferred for contained perforations and the esophageal T tube may be used for late perforations.
Narendar M 2002 [25]	57 patients	Emergency esophagectomy, primary repair, drainage alone	Esophageal perforation needs aggressive treatment. The treatment depends mainly on two factors: perforation in a healthy esophagus, and perforation with a preexisting underlying intrinsic esophageal disease causing distal obstruction. Esophageal perforation associated with stenotic lesions (benign or malignant) needs esophageal extirpation. Perforation in a healthy esophagus should be treated by primary closure if encountered early.
Markus H 2005 [26]	Seventeen patients	Debridement and drainage, reinforced repair, esophageal resection	Our data support the individualized surgical management of EP, based on careful evaluation of various patient-related factors, including CT findings.

**Table 1:** Results from sequencing studies.

**Inclusion criteria**

Inclusion criteria were management of esophageal perforation: surgical.

**Exclusion criteria**

Irrelevant articles [not related to the aim of this review and articles that did not meet the inclusion criteria in this review.

**Data extraction and analysis**

Information relating to each of the systematic review question elements was extracted from the studies and collated in qualitative tables. Direct analysis of the studies of surgical management of esophageal perforation

**Results and Discussion**

Retrospective clinical review of 66 patients (39 males and 27 female) treated at Emory University affiliated hospitals for esophageal perforation between 1973 and 1993. The cases were classified according their causes as Iatrogenic 48 injuries (73%), barogenic 12 patients (17%), trauma 3 (5%) and 3 from infection and other causes. As the 12 of the managed through non-operative approaches and the other 58 through operative as described in table 2 [24].

Cause	No. of the patients	Underlying Disease		Survival
		Yes	No	
Iatrogenic	48	38	10	36/48--75%
Spontaneous	12	4	8	9/12--7%
Trauma	3	0	3	2/3--75%
Infection	3	2	1	3/3--100%
Total	66	44	22	50/66--76%

**Table 2:** Causes of perforation.

Table 3 [24] describe they types of the operative approaches that had been used the average time for each and the survival rate.

Operation	No. of Patients	Hours to Diagnosis	Survival
Primary repair	28	19.7 ± 38.2 (1-192)	23/28--82%
Drainage	15	52.6 ± 43.2 (3-144)	8/15--53%
Open	8	41.6 ± 33.9 (3-96)	7/8--88%
Closed	7	65.1 ± 48.9 (7-144)	1/7--14%
Resection	7	14.3 ± 10.6 (1-36)	4/7--57%
T-tube drainage	3	216.0 ± 98.0 (96-336)	2/3--67%
Exclusion and diversion	1	120	1/1--100%
Total	54	40.5 + 63.4 (1-336)	38/54--70%

**Table 3:** Operations for esophageal perforation.

On the other hand, the nonoperational approaches which include “limiting oral intake and giving parenteral antibiotics for 7 to 10 days in 12 patients”. The followed by contrast esophagram to monitor the healing process. Overall the study had 76% survival rate for all

patients. "Six patients with perforations complicating endoesophageal management of esophageal varices were a high-risk subset with an 83% mortality rate" [24].

"Retrospective review was made of 57 patients with esophageal perforations treated at the Department of Surgery, Postgraduate Institute of Medical Education and Research, Chandigarh, India, between September 1986 and December 2001". The cases were classified according their causes as Iatrogenic 44 (77%), spontaneous perforations 6 (11%), Foreign body ingestion 4 (7%), blunt trauma in 2 (4%) and caustic injury in 1 patient. emergency esophagostomy was done to 33 (58%), primary repair 4 (7%), and drainage alone 4 (7%), on the other hand, non-operative treatment has been used to treat 16 (28%) of the patient. The overall outcome survival rate reach about 86% for all of the cases, death in about 8 (14%). Boerhaave syndrome recorded the highest mortality among the other causes by rate of 67% [25].

All of the medical records of esophageal perforation patients who admitted to the Department of Visceral and Transplantation Surgery, University of Ulm, Germany, between November 2001 and November 2004 for treatment. The total number of the patients was 17 with mean age about 63 years old the major cause of the esophageal perforation was iatrogenic (11 /17) Thoracic computed tomography (CT) to determine the location of the perforation and the inflammation site, sepsis was found in 50% of the cases followed by sample to test serum C-reactive protein and leukocytosis which were found remarkable increased. (3) patients treated by drainage, (3) by primary repair (n = 3), total of (4) patients had reinforced repair, (5) cases had esophageal resection, and (5) patients treated by conservative measures. The overall survival rate was 82.4%. the death 17.6% was among the patient with pre-existing liver dysfunction and other comorbidities [26].

In the overall result of the reviewed studies esophageal perforation appear to be difficulty entity to be manage due to the factor of the time and the severity of the cases when they arrived to the hospital and most of the cases are associated with pre-existing liver or other comorbidities. On the other hand, the result of the serious complication always makes the major cause of the death which include sepsis and "severe mediastinitis, empyema, sepsis, and multiple organ dysfunction syndrome". In general, two major approaches of management showed up in the review which are the operative and non-operative approach. The operative management include mainly primary repair, drainage, and esophageal resection. Other option is the non- operative management which include treatment by conservative measures and antimicrobials.

### Conclusion

The results of this studies show the surgical management of esophageal perforation. On the basis of findings and results this review found the management significantly depend on many factors like the time between the perforation and the treatment and the severity of the perforation, on the other hand, many approaches used to manage the esophageal perforation such as primary closure using stomach fundus, pleural, diaphragmatic, or pericardial flap, emergency esophagostomy, primary repair, drainage alone, debridement and drainage, reinforced repair, esophageal resection.

### Conflict of Interest

The authors of this article haven't receive and support for this work and it was completely self-funded.

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