

# Surgical Outcome of Oesophageal Diversion and Exclusion Procedure in the Management of Oesophageal Perforation: A Retrospective Observational Study

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## ABSTRACT

**Introduction:** Oesophageal perforation is a life-threatening condition with high mortality rates. Various treatment options are available for the management. Oesophageal exclusion with diversion completely diverts the secretions entering the mediastinum, thereby prevents mediastinitis.

**Aim:** The present study aimed to estimate mortality and the causes of oesophageal perforation in patients who underwent oesophageal exclusion and diversion procedure.

**Materials and Methods:** The present retrospective observational study was conducted in Surgical Gastroenterology Department at Madras Medical College, Tamil Nadu, India from January 2019 to May 2024. A total of 46 patients had oesophageal perforation; 14 patients were managed conservative treatment, 32 patients were managed by operative treatment, including 25 patients who underwent oesophageal exclusion and diversion procedure. The surgical outcome of these 25 patients who underwent diversion

cervical oesophagostomy and oesophageal exclusion for oesophageal perforation were evaluated. Parameters like age, sex, cause of perforation, location of oesophageal perforation, duration from symptom onset to hospital admission, postoperative morbidity, and mortality were recorded.

**Results:** The mean age of the patients was 44.16 years, with 16 male and 9 female. Mortality rate was 4 (16%). The thoracic portion of the oesophagus was the most common site of perforation in 24 (96%) patients. Spontaneous perforation (9 patients, 36%) was the most common cause of oesophageal perforation, followed by foreign body-induced perforation (8 patients, 32%).

**Conclusion:** Oesophageal diversion and exclusion procedure can be safely performed in a septic patients and in patients with delayed presentation. Oesophagostomy reversal is also an easy technique that does not cause much morbidity to the patients. In most of the patients, oesophagostomy that spontaneously closed doesn't require reversal.

**Keywords:** Boerhaave syndrome, Mediastinitis. Oesophagostomy

## INTRODUCTION

Oesophageal perforation is a life-threatening condition with mortality over 40% [1]. Selection of treatment option depends upon age, comorbidities, cause of perforation, site of perforation, and time delay from the onset of symptoms [2]. Various surgical treatment procedures are available, including primary repair, vascularised muscle flap cover, debridement, oesophageal resection, and oesophagostomy with exclusion. Primary closure is not useful in patients with delayed presentation and sepsis. Oesophageal resection needs oesophageal dissection from mediastinum, that cause more inflammatory response and increase injury to the patient. End oesophagostomy requires future complex surgery like gastric or colonic conduit procedure. In patients who presented to hospital and patients with septicemia, oesophageal exclusion and diversion procedure completely divert secretions and prevent further mediastinal contamination [3,4]. Lateral cervical oesophagostomy with oesophageal exclusion completely divert secretion and is easily reversible [5], and doesn't require future complex procedure like gastric or colonic conduit.

The present study aimed to estimate mortality and the causes of oesophageal perforation in patients who underwent oesophageal exclusion and diversion procedure at the institute.

## MATERIALS AND METHODS

The present retrospective observational study was conducted in the Surgical Gastroenterology Department at Madras Medical

College, Chennai, Tamil Nadu, India from January 2019 to March 2024. Data were collected from departmental records. A total of 46 patients had oesophageal perforation; 14 patients were managed by conservative treatment, 32 patients were managed by operative treatment, and 25 patients underwent oesophageal exclusion and diversion procedure.

### Inclusion criteria:

- Patients with thoracic and abdominal oesophageal perforation managed by oesophageal exclusion and diversion procedure.
- Adult patients, male and female, <70 years of age.
- Both early (<24 hours from symptom onset and hospital admission) and late presentation (>24 hours from symptom onset and hospital admission) of oesophageal perforation were included.

### Exclusion criteria:

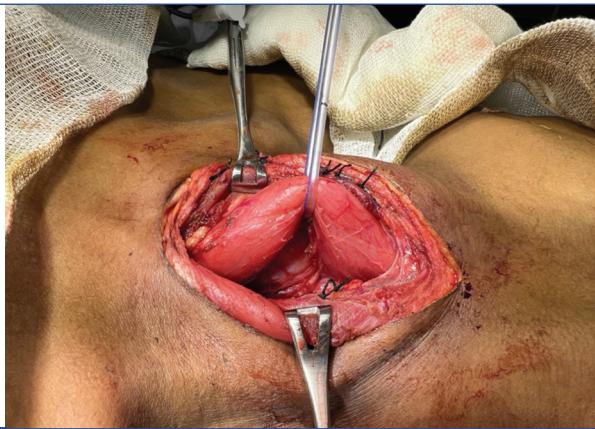
- Conservatively treated patients.
- Patients treated by other modes of treatment.
- Cervical oesophageal perforation.
- Paediatric patients.

### Study Procedure

An oblique left-side neck incision along the anterior border of the sternocleidomastoid muscle was used for a cervical loop

oesophagostomy. The omohyoid muscle was divided, the middle thyroid vein was ligated, and the left recurrent laryngeal nerve was preserved. The oesophagus was hooked out and transfixated by absorbable Vicryl suture material near the thoracic inlet. The cervical oesophagus was opened longitudinally, and a loop oesophagostomy was done.

A midline laparotomy incision was made; the mediastinum was drained if any collections were present. The lower end of oesophagus, just above the Oesophago-Gastric (OG) junction, was transfixated by absorbable Vicryl suture material, and a feeding jejunostomy was done by modified Witzel technique for enteral nutrition. A bilateral intercostal tube was inserted. [Table/Fig-1-4] shows the oesophagostomy technique and intraoperative pictures.



[Table/Fig-1]: Oesophagus hooked out for oesophageal exclusion and diversion loop oesophagostomy.



[Table/Fig-4]: Patient planned oesophagostomy reversal.

Parameters like age, sex, cause of perforation, site of perforation, duration from onset of symptoms to hospital admission, procedure undergone, postoperative morbidity, and mortality were recorded. Alive patients were followed for six months after discharge.

## STATISTICAL ANALYSIS

The collected data were entered into Microsoft Excel 2016 and analysed using IBM Statistical Package for the Social Sciences (SPSS) Statistics for Windows, Version 29.0 (Armonk, NY: IBM Corp). The Kaplan-Meier Curve was used for the survival analysis.

## RESULTS

A total of 25 patients underwent an oesophageal exclusion and diversion procedure. Sixteen (64%) of the patients were males, and 9 (36%) were females. Iatrogenic perforation occurred in 7 (28%) patients, while road traffic accidents caused perforation in 1 (4%) patient [Table/Fig-5]. The iatrogenic perforation happened following dilation for corrosive stricture in five patients, following upper gastrointestinal endoscopy in one patient, and following rigid endoscopy in one patient.



[Table/Fig-2]: Diversion lateral oesophagostomy.

Variables	Values
Mean age (years)	44.16
<b>Gender</b>	
Male	16(64%)
Female	9(36%)
<b>Cause of perforation</b>	
Spontaneous (Boerhaaves)	9(36%)
Foreign body	8(32%)
Iatrogenic	7(28%)
Trauma	1(4%)
<b>Location of perforation</b>	
Thoracic oesophagus	24(96%)
Abdominal oesophagus	1(4%)
<b>Duration between symptom and treatment</b>	
<24 hour	5(20%)
>24 hour	20(80%)
Overall mortality	4 (16%)

[Table/Fig-5]: Showing baseline characteristics.

Mortality occurred in four patients, the overall mortality rate was 6%. Three patients died within the first postoperative week, and one patient expired on the 14th postoperative day. The causes of death included two patients with spontaneous oesophageal perforation, one patient with foreign body-induced perforation, and one patient with iatrogenic perforation [Table/Fig-6].

The rest of the patients were followed for six months after discharge. Among them four patients underwent coloplasty at later period, four patients underwent oesophagostomy reversal, one patient underwent gastric pull-up, and one patient underwent antrectomy



[Table/Fig-3]: Denture removed (one of the foreign bodies that caused oesophageal perforation).

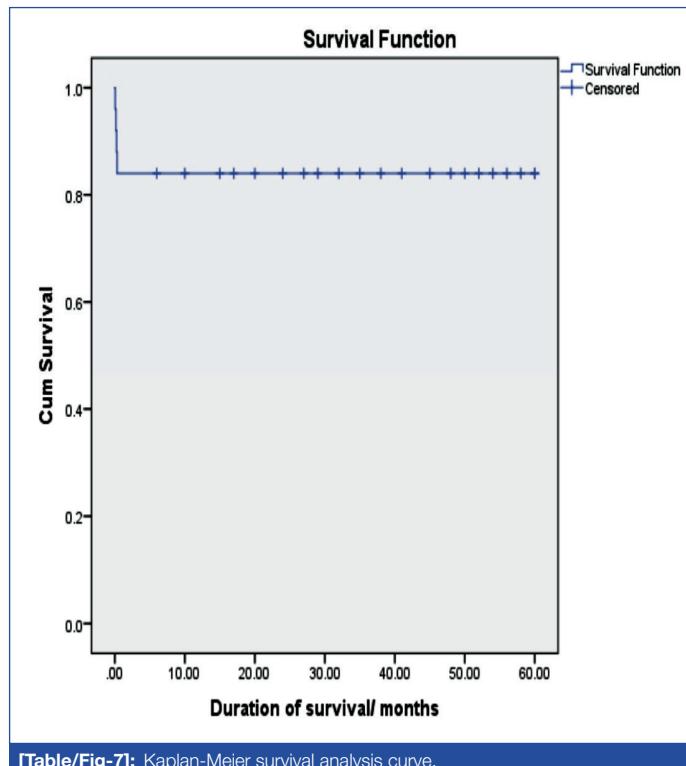
Age (years)	Gender	Cause of perforation	Location of perforation	Duration between symptom and treatment	Cause of death
42	Female	Iatrogenic	Thoracic oesophagus	>24 hours	Sepsis and MODS
52	Male	Spontaneous	Thoracic oesophagus	>24 hours	Mediastinitis and sepsis
55	Male	Spontaneous	Thoracic oesophagus	>24 hours	Sepsis
69	Male	Foreign body	Thoracic oesophagus	>24 hours	Sepsis

[Table/Fig-6]: Mortality details.

MODS: Multiple organ dysfunction syndrome

and Gastroduodenostomy procedure. Eleven patients remained symptom-free. Oesophagostomy spontaneously closed, and these 11 patients were followed for minimum of six months to maximum of 60 months by doing upper gastrointestinal endoscopy and oral contrast X-ray to confirm the closure of oesophageal perforation.

The [Table/Fig-7] shows the Kaplan-Meier survival analysis curve. Y-axis shows survival function, X axis shows the duration of survival. In this graph, the survival probability remains high, close to 1. The mark "+" indicates censored data, which signifies that the event of interest did not occur during the study period and that the study ended before the event occurred.



[Table/Fig-7]: Kaplan-Meier survival analysis curve.

## DISCUSSION

Complete oesophageal exclusion can cause anastomotic leak and stricture when reconstruction is attempted [6]. Standard loop oesophagostomy provides only partial diversion and causes mediastinal contamination [7]. Koniaris LG et al., published their technique of lateral cervical oesophagostomy with distal oesophageal ligation, resulting in no leak or stricture on follow-up [5].

In case of oesophageal transection with end oesophagostomy, reestablishment of oesophageal continuity needs a gastric or colonic conduit, which is a technically challenging procedure [8,9]. In the present study, oesophageal perforation was more common in men, as mentioned in another study [10]. The thoracic portion of the oesophagus is the most common location for perforation, followed by the abdominal part, of the oesophagus, and the same was noticed in other studies [10-12]. The mortality rate in this study

was 16%. A recent systematic review of 39 studies also showed also showed an overall mortality of 13.3% [11]. Mortality occurred in 2/9 (22.2%) spontaneous perforation patients, 1/7 (14.3%) of iatrogenic perforation patients, and 1/8 (12.5%) foreign body-induced perforation patients.

Another study indicated mortality rates of 14.8% for spontaneous perforation cases, 13.2% for iatrogenic cases, and 2.1% for foreign body-induced perforation cases [13]. Mortality is more common in spontaneous oesophageal perforation cases because of delayed presentation of spontaneous perforation cases for treatment compared to iatrogenic perforation or foreign body-induced perforation patients. In the present study, the causes of perforation were as follows: spontaneous perforation occurred in 9 (36%) patients, foreign body was the cause in 8 (32%) patients, iatrogenic sources accounted for 7 (28%) patients, and 1 (4%) was due to a road traffic accident.

In one systematic review, the cause of perforation were determined to be 46.5% iatrogenic, 37.8% spontaneous, and 6.3% foreign body-induced [11]. All mortality happened in patients who underwent surgery >24 hours after symptom development. Brinster CJ et al., reported patient treated within 24 hours had mortality rate of 14%, whereas those with delayed treatment (>24 hours) had mortality rate of 27% [14]. Amudhan A et al., reported an overall mortality rate of 6.2%, with no mortality in patients managed within 24 hours [15]. Ulagendraperumal S et al., reported mortality rate of 6.66% in the early treatment group and 16.66% in delayed treatment group [16]. In our country, most patients present to the hospital more than 24 hours after symptom onset. In the present study group, primary closure was not useful and oesophageal resection was more complex procedure to withstand the treatment. In such scenario oesophageal exclusion and diversion procedures are simpler and result in less morbidity and mortality for patients.

## Limitation(s)

The present study was a retrospective study with a small study population. Long-term follow-up is needed.

## CONCLUSION(S)

Oesophageal diversion and exclusion procedure can be safely performed in a septic patient and those with delayed presentation. Oesophagostomy reversal is a straightforward technique that does not cause significant morbidity to the patients. In most cases, oesophagostomy that closes spontaneously does not require reversal.

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