

## INCIDENCE AND MANAGEMENT OF CERVICAL ANASTOMOTIC LEAK AFTER TRANSHIATAL ESOPHAGECTOMY FOR CANCER ESOPHAGUS

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Received : 15/11/2023  
Received in revised form : 27/12/2023  
Accepted : 12/01/2024

**Keywords:**

Esophageal cancer, THE, Cervical anastomotic leak, Incidence, Management.

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DOI: 10.47009/jamp.2024.6.1.75

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Acad Med Pharm  
2024; 6 (1); 392-396



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### Abstract

**Background:** The incidence of cervical anastomotic leak after transhiatal esophagectomy (THE) for carcinoma esophagus has traditionally been high at around 20%. Surgery is still the mainstay of treatment. We sought to determine the incidence and management of cervical esophageal leaks after esophagectomy for cancer of esophagus in our centre. **Materials and Methods:** Between January 2018 to December 2022, 143 patients with cancer of esophagus underwent THE as primary treatment. A contrast computer tomography (CT) scan of chest and abdomen helped establish the extent of growth. A methylene blue test was done followed by a contrast conray swallow. Patients were categorised in early and late leak group with each group having patients with mild, moderate and severe leak. **Result:** Of 143 patients, 17 had cervical anastomotic leak of which 12 were males and 5 females. Twenty nine percent had early and 71% late leak. Ten patients had mild, 6 moderate and 1 severe leak. The patient with severe leak died on 11th postoperative day. Of remaining 16 leaked patients, methylene blue and conray swallow together detected the leaks, all of which healed by conservative measures. Patients in cervical leak group had stricture rate of 29%. **Conclusion:** Cervical leaks after esophagectomy remain a significant morbidity. The need for conservative treatment and surgical intervention should be carefully weighed as per severity of leak and general condition of the patient. Postoperative optimization of nutritional status and through appraisal of surgical wounds helps to prevent and identify leaks earlier.

## INTRODUCTION

Esophagogastric anastomotic leaks are the most feared surgical complications following resection of esophageal cancers and continue to be a significant cause of morbidity and mortality after esophagectomy. Various factors implicated in etiology of anastomotic leaks include technique of anastomosis (end to end or end to side), type of conduit (stomach, jejunum or colon), location of anastomosis (cervical or intrathoracic), single or double layered anastomosis, manual or mechanical anastomosis, the stage of the tumor, additional radiotherapy or chemotherapy used in the treatment and nutritional status.<sup>[1,2]</sup> Decreased blood supply of the gastric conduit and faulty surgical technique still remain the most important predisposing factors.<sup>[3]</sup> A final conclusion whether manual or mechanical anastomosis is better has not yet reached to any consensus.<sup>[4,5]</sup> Traditionally cervical anastomoses are said to have high leakage and stenosis rate and low

mortality as compared to thoracic anastomosis which have high mortality and low leakage rates.<sup>[6,7]</sup> The severity of the leaks range from asymptomatic and minor anastomotic defects detected only on contrast studies, to more fulminant leaks causing systemic sepsis and multiorgan failure.<sup>[3]</sup> Despite decreasing trend in incidence throughout the world for the last few decades,<sup>[8]</sup> esophageal anastomotic leaks are still a significant factor responsible for morbidity and mortality after esophagectomy. Surgery is still the mainstay of treatment for resectable esophageal cancer with a five-year survival rates as high as 40% to 50% achieved after curative resection in specialized centers.<sup>[9]</sup> Various biological factors adversely effect the success of surgical management that forms the primary treatment of esophageal cancers. Lack of serosa and a rich network of vertically and transversely placed submucosal lymphatic network accounts for frequent extension of this tumor to regional and distant lymph nodes irrespective of the tumor location in the esophagus.<sup>[10]</sup>

Squamous cell carcinoma forms the dominant histology worldwide with more commonly involving the mid and upper two-third of esophagus. However adenocarcinoma has been showing an upward trend involving the lower third of esophagus.

We sought to determine the incidence and management of cervical esophageal leaks after esophagectomy for cancer of esophagus in our centre.

## MATERIALS AND METHODS

Between January 2018 to December 2022, 143 patients with cancer of esophagus were operated all of whom underwent transhiatal esophagectomy. All patients had surgical resection chosen as primary treatment and none received any neoadjuvant chemoradiation. Only those patients in whom gut continuity was restored by using a stomach tube taken up through posterior mediastinum were selected for the study. Patients were thoroughly evaluated preoperatively for general physical condition, nutritional and cardiopulmonary status. A preoperative esophagogastroduodenoscopy and histopathology of lesion was carried out to determine the type of tumor. A non-contrast computer tomography of chest and abdomen helped establish the extent of growth and relation to surrounding structures.

The procedure of transhiatal esophagectomy is a two-incision technique of esophageal resection involving one supraumbilical midline incision from xiphisternum and another neck incision without opening the thorax. The stomach is mobilized on a left gastroepiploic artery pedicle. Left gastric and short gastric arteries are sacrificed and thorough lymph node dissection around upper one third of stomach and lower esophagus is done. The crura of the esophageal hiatus are then widened and blunt finger dissection of thoracic esophagus away from surrounding thoracic structures is done. The cervical incision is given in the lower part of the neck medial to left sternocleidomastoid muscle. The cervical esophagus is identified and separated from trachea and surrounding structures. The specimen is then excised including upper one third of stomach, lower esophageal sphincter, whole of thoracic esophagus along with the growth and distal part of cervical esophagus. A stomach tube is constructed from the remaining part of the stomach that is taken up retrosternally in posterior mediastinum and anastomosed with the cervical esophageal stump in single layer using 2-0 vicryl that goes through and through the stomach and esophageal wall including the mucosa. All anastomoses were hand sewn. All patients had feeding jejunostomy done and a Ryle's tube placed across the anastomosis. Digital dilatation of Pylorus was done in all cases. A right chest drain was put as a routine and left drain was put in case of pleural breach on left side. An abdominal drain in the region of the hiatus was also put along with a corrugated neck drain in the region of

esophagogastric anastomosis. Feeding in all was started on 2nd postoperative day through feeding jejunostomy. A methylene blue test was done on 7th postoperative day followed by a contrast barium swallow the next day. In patients who did not have any evidence of anastomotic leak, the nasogastric tubes were removed on the day of barium contrast study and patients started on oral feeds initially with plain water and gradually allowed solid foods. The thoracic and abdominal tubes were removed second day after oral intake (10th postoperative day). In patients where there was a suspicion of excessive leakage through the neck drain or features of mediastinitis or sepsis after 3rd postoperative day but prior to the 7th postoperative day, the methylene blue test was performed earlier. Any extravasation of the methylene blue dye through drains or contrast on barium swallow constituted the definition of anastomotic leak. Patients who had any one of the tests (methylene blue or barium swallow) negative were subjected to esophagoscopy to identify the leak. One diagnosed with a leak and based on the time of appearance patients were categorised into Group 1 (early leak) and Group 2 (late leak). Each group had patients further separated into three sub groups- a classification devised by our institution.

- a. Mild leak -- extravasation of only a streak of dye and contrast or minimal amount of oral liquids without solids.
- b. Moderate leak -- extravasation of considerable quantity of dye and contrast or considerable amount of oral liquids with solids.
- c. Severe leak-- extravasation of whole of dye and contrast or most of oral intake along with features of mediastinitis and sepsis.

In all the patients with mild leak, the nasogastric tube was removed on seventh day and patients started on small quantities of oral semisolid diet only. Feeding jejunostomy however was continued. A repeat methylene blue test and barium contrast was done ten days after initial contrast study. In all the leak healed with conservative measures.

Moderate leak patients were put on a conservative regimen of nil per orally and feeding jejunostomy for next fifteen days after detection of leak and a repeat methylene blue test followed by contrast study was done. Patients who had healed were discharged while those with persistent leak were treated either by surgery or stenting.

Patients with severe leak were subjected to surgical closure of leak as soon as detected. These patients had contents from cervical leak that trickled down into the thorax causing pleuritis and mediastinitis. Right posterolateral thoracotomy in fifth intercostal space was done, thoracic cavity thoroughly washed and cleaned. All had disruption of the gastroesophageal anastomotic line causing leak. The cervical incision was opened, anastomosis identified, necessary debridement if needed done. Some had reanastomosis of gastric stump with remnant esophagus done while some had diversion procedures performed on them.

All the patients during their immediate postoperative period in hospital were maintained on a strict nutritional regimen to prevent any mineral or electrolyte imbalance. Adequate enteral feeding of carbohydrates, fats and proteins was maintained besides regular albumin and multivitamin infusion to aid in healing. These measures ensured that our patients did not have electrolyte imbalance at any time in postoperative hospital stay. With the gradual increase in oral feeds from liquids to solids, the jejunostomy feeds were stopped and patients encouraged to take orally. Jejunostomy tube was kept in situ for 6 weeks after discharge. All patients were then referred to medical oncology for postoperative chemoradiation.

## RESULTS

The clinical data of patients involved in study is given in [Table 1].

Of the 143 patients, 87 (61%) were males and 56 (39%) females with a male to female ratio of 1.6 : 1. The age of patients ranged from 45 years to 78 years with a mean age of  $64.76 \pm 12.2$  years. 44 (31%) of the tumours were located in upper third of thoracic esophagus, 88 (61%) in middle third of thoracic esophagus and 11 (8%) in abdominal esophagus and GE junction.

109 (76%) patients had squamous cell carcinoma, 34 (24%) had adenocarcinoma of the esophagus.

64% of the patients belonged to TNM stage I to II and 34% to stage III to IV. [Table 1].

Eighty-three [ 83 (58%)] of our patients gave history of some weight loss. Considering loss of 10% of body weight in last six months as significant, 51 (36%) patients had a mean loss of 6.24 kg with a range of 5 to 7.5 kg.

Mean haemoglobin was 13gm% with a range of 10 to 15 gm% while mean serum albumin level was 3.34mg/dl. All patients were evaluated for pulmonary functions and mean FEV1 2.25 L was observed. Mean hospital stay of patients was  $13.25 \pm 3.5$  days.

Of the 143 patients operated 17 (12%) had cervical anastomotic leak. The characteristics of all patients with cervical anastomotic leak is given in [Table 2]. Of five (5) patients in Gp.1, Three (3) had severe leak. One (1) each had moderate and mild leak both of which healed by conservative treatment. Two of the patients with severe leak had both the cervical and abdominal incisions reopened, necrotic gastric anastomotic line excised, Kocherization of duodenum done to gain length of stomach tube and reanastomosis done. Third patient had total gastrectomy and cervical esophagostomy done with the aim to construct gut continuity at a later stage. However all three patients died. Of the Twelve (12) patients in Gp. 2, none had severe leak while Eight (8) had mild and Four (4) moderate leak. All mild leaks and one with moderate leak healed spontaneously by conservative methods. Two in the moderate group had cervical anastomosis refashioned while one preferred stenting. Assessed 3 months after discharge, 5 patients in cervical anastomotic leak group and 21 in non leak group developed anastomotic strictures and needed on an average of 3 sessions of dilatations.

There were 14 (10%) deaths in our study group. Four (4) of the patients who died belonged to cervical anastomosis leak group. All three patients with severe leak died after reoperation within 10 days of initial surgery, 2 due to severe mediastinitis and sepsis while one died due to pulmonary embolism. Fourth death in the leaked group was due to sudden cardiac arrhythmia 3 weeks after surgery. This patient belonged to late leak group. The other 10 mortalities belonged to the non leak group. Out of these 10 patients, 2 had ventilator related complications and died within 10 days postoperatively, 5 died during postoperative chemoradiation due to bone marrow depression and sepsis within 1st year after surgery and 3 died due to unrelated sudden cardiac event 2 years after surgery. All mortalities occurred in the age group of > 60 years.

**Table 1: Clinical Data of patients involved in study.**

S No.	Characteristic	TotalNo.	Percentage
1.	Total No. of patients operated	143	
	Males	87	(61%)
	Females	56	(39%)
2.	Age range	45 - 78 years	
	Mean age	$64.76 \pm 12.2$	
3.	Location of tumor		
	Upper third of thoracic esophagus	44	(31%)
	Middle third of thoracic esophagus	88	(61%)
	Abdominal esophagus and GE junction	11	(8%)
4.	Tumor Pathology		
	Squamous cell carcinoma	109	(76%)
	Adenocarcinoma	34	(24%)
5.	Mean Haemoglobin	13gm%	
6.	Mean FEV1	2.25L	
7.	Mean serum albumin	3.34gm/dl	
8.	Tumour Stage		
	I	29	(20%)
	II	62	(43%)
	III	37	(26%)
	IV	15	(11%)
9.	Mean hospital stay	$13.25 \pm 3.5$ days	

**Table 2: Characteristics of patients with cervical leak**

1. No. of patients leaked 17
Males 12 (71%)
Females 5 (29%)
2. Time of leak
Early 5 (29%)
Late 12 (71%)
3. Severity
Mild 9 (53%)
Moderate 5 (29%)
Severe 3 (18%)
4. Pathology
Squamous cell carcinoma 13 (76%)
Adenocarcinoma 4 (24%)
5. Detection of leak
Methylene blue and Conray 9 (65%)
Methylene blue only 3 (22%)
Conray only 2 (14%)
Endoscopy 5 (36%)
6. Mortality 4 (23%)
Mediastinitis and sepsis 2
Pulmonary embolism 1
Sudden arrhythmia 1

## DISCUSSION

Esophagogastric anastomotic leaks are the most feared surgical complications following resection of esophageal cancers and continue to be a significant cause of morbidity and mortality after esophagectomy. The incidence of cervical anastomotic leak after THE for carcinoma esophagus has traditionally been high at around 20%.<sup>[1,11,12]</sup>

Some series report anastomotic leak rate of around 13% to 10% but these included patients with benign esophageal disease and transthoracic anastomosis.<sup>[13,14]</sup> Our study reported an incidence of 12% for patients with carcinoma esophagus which could be due to our series having majority of tumors detected in stage I and II and also due to improved surgical techniques. Earlier studies with high incidence of leak had majority of cancers reported in stage III and above.<sup>[1]</sup>

Despite straightforward management and its not so common association with death, the long-term consequences of cervical leaks cannot be ignored. Leaks may be due to conduit ischemia and technical errors, or a combination of the two.<sup>[15]</sup> These leaks range clinically from asymptomatic fistulae to those causing systemic sepsis thereby betraying any standard management protocol. Despite improvements in surgical results over last couple of decades, they constitute a significant complication.<sup>[8]</sup> Earlier thought to be less lethal,<sup>[3]</sup> cervical leaks were found to be as morbid as those complicating thoracic anastomoses.<sup>[15]</sup> Though constructed in the neck it may leak into the mediastinum or pleural space with attendant morbidity and mortality.<sup>[16,17]</sup> Two of our patients with cervical leak had contents gravitating into the mediastinum and died due to severe mediastinitis.

Time of leak has a profound effect on the overall outcome of the surgery. Leaks that manifest earlier in first 7 days are more likely to be severe, need

reoperation, cause complications and even death.<sup>[3,6,15]</sup>

Our series had 60% mortality in early leak group. This high incidence may be due to small sample size in early leaked group (3 of 5). Late leak group had 8% mortality (1 of 12).

Diagnosis of the anastomotic leak as early as possible is of paramount importance. Thorough clinical and biochemical examination and daily inspection of wound sites and drains should be carried out. Any suspicion of excessive drainage or features suggestive of sepsis should prompt investigation to look for any leak. Alteration in cardiac rate and rhythm especially first time atrial fibrillation is often the first and only indicator of anastomotic insufficiency.<sup>[18]</sup> Early symptoms of sepsis may be as inconsequential as persisting pain and minor changes in neurological status, such as reduced compliance.<sup>[19]</sup> Bed side methylene blue test, barium swallow, oral contrast CT radiography and endoscopy have all been used to diagnose and identify leaks.<sup>[20]</sup> In our series three patients with severe leak had objective evidence of anastomotic leak in form of excessive drainage through neck and chest drains and features of sepsis and mediastinitis. Out of the rest 14 patients Methylene blue and Barium swallow together detected leaks in 9 (65%) of patients, Methylene blue only in 3 (22%), Barium swallow only in 2 (14%) and Endoscopy in 5 (36%). Despite refinement in anastomotic techniques and better postoperative management as many as one-third of cervical esophagogastric anastomotic leaks result in stricture formation as healing occurs.<sup>[14]</sup> Reported incidences of anastomotic strictures have varied from 10 to 31%.<sup>[12,21,22]</sup> Of late the use of PPI and the development of better and safer dilatation techniques resulted in a major decrease in morbidity caused by these strictures.<sup>[8]</sup> In our series the overall stricture formation was around 19%, with patients in cervical leak group having stricture rate of 38% while



those in non leak group having a stricture rate of 17%. These are consistent with that reported in literature. Multiple endoscopic dilatations in those surviving have reported good functional outcome with considerable decrease in postoperative dysphagia. The surviving patients continue to be on our 6 monthly follow up with an overall three-year mortality of 10%.

## CONCLUSION

In conclusion though considerable improvements in technique and management have been made, cervical leaks after esophagectomy remain a significant morbidity with manifestations ranging from subtle fistulae to life threatening sepsis. The need for conservative treatment and surgical intervention should be carefully weighed as per severity of leak and general condition of the patient. Postoperative optimization of nutritional status and through appraisal of surgical wounds helps to prevent and identify leaks earlier. Contrast radiography though a cardinal investigation might not detect leak in all cases in isolation. We therefore recommend combination of bed side methylene blue test and contrast radiography with esophagoscopy reserved if both the investigations together cannot detect leak. We also found that in mild leaks as described by us, continuation of semisolid diet does not adversely affect healing provided distal passage is patent.

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