



## Original Research Article

# Management of post-operative suction pneumothorax after trans-hiatal esophagogastrrectomy

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## ARTICLE INFO

## Article history:

Received 01-03-2021

Accepted 17-03-2021

Available online 14-05-2021

## Keywords:

Trans- hiatal

suction pneumothorax

Esophagogastrrectomy

suction pneumothorax

## ABSTRACT

**Objective:** This observational study was done to know the factors responsible and management of suction pneumothorax after trans-hiatal esophagogastrrectomy.

**Materials and Methods:** Progressive observational study of 415 patients who underwent trans-hiatal esophago-gastrrectomy and 35 patients who underwent trans-abdominal esophago-gastrrectomy in last five years, for carcinoma esophagus and followed in immediate post-operative period for suction pneumothorax.

**Results:** Ten patients from trans-hiatal group and two patients from trans-abdominal group complicated with suction pneumothorax in immediate post-operative period. It is the corrugated rubber drain site behind the neck incision close to esophago-gastric anastomosis which is responsible for maximum number of cases of suction pneumothorax. Withdrawal of corrugated rubber drain is the first and effective treatment, if diagnosis is made at an earliest point of occurrence of suction pneumothorax. If pneumothorax and air leak is not diagnosed and treated, then other fatal pulmonary complications can occur.

**Conclusion:** Trans-hiatal esophageal dissection is usually associated with mediastinal pleural breach, so bilateral intercostal tube thoracostomy is a rational part of this surgery. Also close observation in immediate post-operative period is necessary to pick-up suction pneumothorax at an earliest point of suspicion

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## 1. Introduction

Transhiatal esophago-gastrrectomy has become the standard of the care for esophageal carcinoma. All those patients who undergo trans-hiatal esophago-gastrrectomy, predominantly for malignant lesion of the esophagus, corrugated rubber drain CRD is usually put behind the cervical incision at the esophago-gastric anastomotic site in the neck and in the abdomen close to diaphragmatic hiatus, in addition to bilateral intercostal thoracostomy tubes to drain the dissection area and anastomotic site in case of leaks. In patients who undergo transabdominal esophago-gastrrectomy, single corrugated rubber drain or tube drain is put in the abdomen close to the esophago-gastric anastomotic site at the diaphragmatic hiatus.

## 2. Materials and Methods

This post-operative surgical series was collected in the department of cardiovascular and thoracic surgery at Sher-i-Kashmir institute of medical sciences, Srinagar, Jammu and Kashmir INDIA. Progressive observational study of 415 patients who underwent trans-hiatal esophago-gastrrectomy and 35 patients who underwent trans-abdominal esophago-gastrrectomy in last five years, for carcinoma esophagus and followed in immediate post-operative period for suction pneumothorax.

## 3. Results

415 patients underwent transhiatal esophago-gastrrectomy for esophageal carcinoma in last five years and 35 patients underwent trans-abdominal esophago-gastrrectomy for gastro-esophageal (GE) junction growth in our

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department of cardiovascular and thoracic surgery. Twelve patients were seen in the last 5 years who had post-operative complication in the form of suction pneumothorax. Six patients were diagnosed on the first post-operative day; five patients on the second post-operative day and one patient was diagnosed on the third post-operative day on chest X-ray. Two patients diagnosed on second post-operative day with suction pneumothorax had undergone trans-abdominal esophagogastrectomy having one abdominal corrugated rubber drain (CRD), but no intercostal thoracostomy tube drain. Six patients from transhiatal group developed suction pneumothorax on left side; three patients developed suction pneumothorax on right side by sucking in of air through cervical CRD drain site, while one patient developed suction pneumothorax on left side by sucking in of air through abdominal CRD site. Two patients from trans-abdominal group developed left sided suction pneumothorax by sucking in of air through abdominal CRD drain site.

### 3.1. Pre-operative evaluation

This study group of patients had routine evaluative work-up, but needed immediate, judicious and additional post-operative care for suction pneumothorax, with increased morbidity and even mortality, If not diagnosed and treated at the initial point of suspicion. The retrospective re-evaluation of these patients showed that all these patients were operated by the same surgeon of our department, who does not apply fixation suture on the gastric side of the anastomosis with retropharyngeal tissue. Patients with sucking in of air through cervical CRD had short neck. Other possible mechanism of sucking in of air through neck CRD is migration of drain deep into esophageal dissection tract.

### 3.2. Surgical procedure

Ten patients underwent trans-hiatal esophago-gastrectomy and two patients underwent trans-abdominal upper partial gastrectomy with 5 cm of esophageal resection for gastro-esophageal junction carcinoma. Intra-operatively all ten transhiatal procedures had grossly visible bilateral pleural breach, while none of the patients in transabdominal group had appreciable pleural breach on operating table. Out of ten patients in transhiatal group who developed suction pneumothorax and had already bilateral chest tube drains, one patient who was diagnosed on third post-operative day needed additional intercostal thoracostomy tube for significant air leak and unexpanded lung, while patients in trans-abdominal group needed left sided intercostal chest tube drains for post-operative suction pneumothorax through abdominal corrugated rubber drain, even when there was no visible pleural breach intra-operatively. Only one patient who was diagnosed on third post-operative day developed significant breathlessness and dropped her arterial blood oxygen saturation. This patient even after

putting second chest tube on right side and by withdrawing cervical CRD had persistent air leak through right sided intercostal chest tubes and unexpanded lung on right side, and developed lung consolidation, needed mechanical ventilation, but died due to these respiratory complications with diabetes mellitus and obesity being other contributory factors. All other patients were managed by withdrawing CRD which was responsible for sucking in of air, and none of them developed any respiratory complications.

## 4. How to Diagnose

All those patient who underwent transhiatal esophago-gastrectomy and developed suction pneumothorax, having bilateral intercostal thoracostomy tubes, started with significant air leak through intercostal thoracostomy chest tubes and there are decreased chest movements on the involved side with significantly decreased air entry on the same side. Patient may be breathless and even may have decrease in arterial blood oxygen saturation. The most important clinical sign is intelligent and close observation of CRD site, and intercostal peritubal area where there may be audible sound produced with inspiration and expiration of the patient, importantly during inspiration. This post-operative complication can be confirmed by PAV chest x-ray. We registered additional twenty five patients who had sucking in of air through CRD site, but no pneumothorax due to handling of small amount of sucked air by already put in bilateral intercostal thoracostomy tubes, which stopped of its own due to adhesion formation and closure of the communicating tract between pleural cavity and atmosphere through CRD site.

## 5. Management

Suspicion is the first thing in early diagnosis of this manageable and non-fatal complication, otherwise there is delayed expansion of lungs and patient persists with serous drainage for a longer period of time from intercostal thoracostomy tubes and may need intercostal tube drains for a longer period of time which increases chances of infectious complications. Also patients complain of chest discomfort, which hampers chest movements and increases chances of respiratory complications. Eleven patients who developed suction pneumothorax were managed by withdrawing the corrugated rubber drain by one to one and a half inches. Only one patient was managed by manipulating CRD, putting additional intercostal chest tube and ventilating the patient mechanically.

## 6. Discussion

It should be noted that transhiatal esophagogastrectomy represents the best surgical option for patients with esophageal carcinoma and high anesthetic risk because it is associated with reduced surgical trauma, decreased

incidence of respiratory distress, and length of postoperative stay in hospital.<sup>1</sup> All patients of transhiatal esophagogastrectomy need judicious and close post-operative observation to prevent these complications and subsequently morbidity and mortality. Although our standard method of putting CRD is just under strap muscles of neck superficial to anastomotic site, but possibly due to deep migration of CRD the communicating track is established between pleural space and atmosphere, which causes sucking in of air and subsequently suction pneumothorax. Migration of drain is a known mechanism after surgical intervention.<sup>2-4</sup> New onset subcutaneous emphysema in the chest and neck may indicate a leak of the esophageal anastomosis.<sup>4</sup> Fever, tachycardia, and hypoxemia also may develop in patients with this complication.<sup>4</sup> Postoperative chest radiographs should be checked for pneumothorax and for placement of any chest tube.<sup>4</sup> This complication should be differentiated from suction pneumothorax by close observation and early diagnosis to prevent increased morbidity, hospital stay and mortality. Esophageal leak can be confirmed by a swallowing study with water-soluble contrast material.<sup>5</sup> Respiratory complications in different forms is one of the major post-operative complications, but this complication has decreased with laparoscopic transhiatal esophagectomy for esophageal cancer,<sup>6,7</sup> possibly due to under vision mediastinal dissection and less chances of mediastinal pleural breach. The transhiatal procedure is associated with a significantly lower morbidity and mortality rate,<sup>7</sup> but needs intelligent observation in immediate post-operative period, till the communicating tract between pleural space and atmosphere is obstructed by fibrinous deposition, and subsequent fibrosis. Pneumothorax is the most common complication in performing transhiatal esophagectomy but is easily managed by inserting chest tubes.<sup>8-10</sup> Refinement in patient selection, surgical technique, increased surgical experience and intensive perioperative care, technical complications can be minimized and subsequently significant reduction in mortality rate after esophagectomy.<sup>11</sup> Minor pulmonary complications like pneumothorax identified by chest film occur in nearly all patients undergoing transhiatal esophagogastrectomy,<sup>12</sup> but may need early identification and prevention of added morbidity.

## 7. Conclusion

All those patients who undergo any mediastinal dissection, whether for transhiatal esophagogastrectomy or for transabdominal esophagogastrectomy, mediastinal pleural breach is possible in majority of the patients, so bilateral intercostal thoracostomy tube drainage is always needed after surgical resection to prevent lung compression from suction pneumothorax and subsequent complications, even when there is no lung injury. Keen observation and closely

listening at cervical and abdominal corrugated rubber drain (CRD) site should be a routine by the attending doctor of the patient. This complication should be managed by withdrawing CRD by one to one and a half inch first, followed by additional intercostal thoracostomy tube on the involved side, if not helped by withdrawing CRD. CRD should not be kept too deep in the cervical area and above the diaphragmatic hiatus in the abdomen. Also limited, but optimal widening of the diaphragmatic hiatus during transhiatal mediastinal dissection of esophagus should be followed. It should be a routine to check intercostal thoracostomy tube sites for possibility of sucking in of air through peri-tubal area. Suction pneumothorax predominantly occurs on left side.

## 8. Source of Funding

None.

## 9. Conflict of Interest

None.

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**Cite this article:** Ganaie FA, lone GN, Ashraf HZ, Wahid S.  
Management of post-operative suction pneumothorax after trans-hiatal  
esophagogastrectomy. *IP J Surg Allied Sci* 2021;3(1):4-7.