|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||
International Journal of Medical Science and Diagnosis Research (IJMSDR)
Available Online at www.ijmsdr.com
PubMed (National Library of Medicine ID: 101738825)
Volume 3, Issue 4; April: 2019; Page No. 128-135
Original Research Article
crossref DOI: https://dx.doi.org/10.32553/IJMSDR/v3i4.20

MANAGEMENT OF LOWER ESOPHAGEAL & GASTRO-ESOPHAGEAL JUNCTION PERFORATIONS- OUR EXPERIENCE & LITERATURE REVIEW

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Conflicts of Interest: Nil

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Abstract:

Esophageal perforation is a challenging and potentially deadly disease process. Diagnosis can be delayed or missed despite optimal imaging, and symptoms are often nonspecific. The optimal treatment strategy continues to be debated among thoracic surgeons, adding to the therapeutic challenge that this disease process presents. While surgery remains the gold standard for treatment, less invasive and endoscopic methods are being explored, and their role is evolving.

We present two cases of esophageal perforation- one due to boerhaave's syndrome and other, following heller's myotomy. Treatment modalities for both the conditions are discussed in detail. Apart from discussing the possible etiologies, we also explore surgical and non-surgical methods of management of esophageal perforation as well as the new techniques used for repair of esophageal perforation and their efficacy.

Keywords: Heller's Myotomy, Esophageal Perforation, Management of Perforation

Introduction

Esophageal perforations due to varied etiologies pose unique surgical challenges. The common etiologies includeendoscopic procedures, nasogastric tube placement, endotracheal intubation, transesophageal echocardiography, minitracheostomy, foreign bodies, trauma. Irrespective of the etiologies the diagnosis is challenging & often delayed. The patients are clinically unstable due to delayed diagnosis & widespread mediastinitis& or peritonitis.

The treatment involves a multidisciplinary approach involving careful planning & management of imaging, interventions, surgery & nutritional rehabilitation. We present our experience in management of lower esophageal perforations in 2 cases using a multidisciplinary approach and a review of literature evaluating optimal approach to further guide the care of these critically ill patients.

Case 1

57 year old patient was referred from a district hospital with a chest drain in situ with a diagnosis of Boerhave's syndrome. On examination the patient was breathless had a pulse rate of 108/ min, BP of 90/60 mm of Hg on ionotropic support. He had decreased breath sounds in the left mid & lower lung fields.

Patient was fluid resuscitated with strict input-output & CVP monitoring after which the ionotrops could be tapered. A chest CT scan revealed massive collection in the left mid & lower zones with extravasation of contrast from the lower esophageal perforation &mediastinitis.

The chest tube was repositioned & drained purulent fluid. The patient's clinical condition worsened over 2 days with worsening tachycardia, breathlessness & requiring re-introduction of ionotrops. Patient was posted for emergency surgery &loop esophagostomy was done in the left cervical region & a feeding jejunostomy was done. Post-operatively the clinical condition improved & the patient was weaned off supports, he was extubated on post-operative day 2 & maintained saturation. Jejunostomy tube feeding was started & his nutritional status improved. Patient had persistent purulent discharge from the chest drain but showed clinical improvement. His tachycardia resolved, he maintained saturation without supplemental oxygen & tolerated jejunostomy tube feeds with weight gain. Repeat imaging was performed at 2 weekly interval with re-positioning of chest drains done thrice. Chest drain was accidentally removed after 45 days after which the patient was clinically stable. After 2 months of conservative management the repeat CT with gastrograffin contrast given through the esophagostomy revealed a narrow well formed esophago-pleural fistula with minimal loculated collection & scanty contrast extravasation through the tract into the well localised loculated pleural cavity. The patient was continued on conservative management with progressive improvement in clinical & nutritional status. **Case 2**

A 45 year old patient referred from a peripheral hospital on post-operative day 11 following laparoscopic Heller's myotomy in view of severe breathlessness & pain in abdomen. On examination he was breathless with a saturation of 90% on supplemental oxygen, had a pulse rate of 120/min, BP of 88/58 mm of Hg on ionotropic support. A CECT done at the referring institute mentioned the presence of minimal free fluid in the peritoneal cavity without any active extravasation of contrast. A repeat CECT was done in prone position with on table contrast which revealed active extravasation of contrast from the myotomy site & bilateral gross pleural effusion.

Figure 1: Cect Scan Taken at Prone Position Showing Leak of Contrast

Chest tubes were placed bilaterally which drained serous fluid. Patient's saturation improved following chest tube insertion. In view of gross contrast extravasation patient was posted for emergency exploratory laparotomy. Gross tissue edema was noted at the gastro-esophageal junction. The fundal wrap was taken down & perforation was identified the myotomy site. The perforation margins were freshened was sutured with 2-0 silk sutures in 2 layers & 2 intra-abdominal drains were placed, one adjacent to the perforation site & other in the pelvis. On post-operative day 1 the patient had bile in the drain fluid which progressively increased in amount. Patient showed clinical worsening with increased tachycardia & persistent bilious drain. On post-operative day 5 patient was sent for esophageal stenting. A self-expandable metallic stent (SEMS) was placed endoscopically. On post-operative day 6 the patient was posted for re-exploration. The perforation site was identified. Drain tube placed adjacent to the site was draining well & was kept in situ, a thorough peritoneal lavage was given & a feeding jejunostomy& a venting gastrostomy were done.

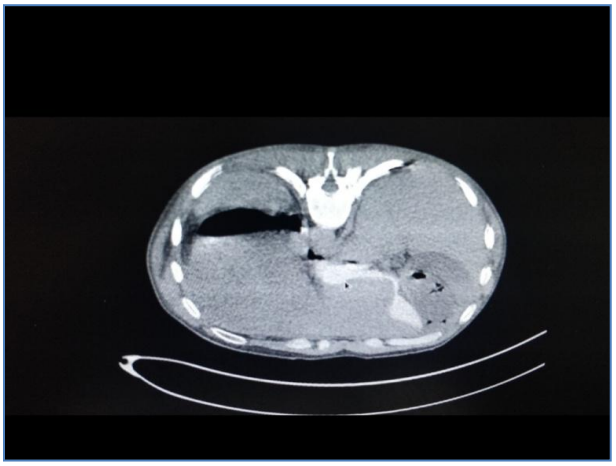

Figure 2: Extraperitoneal Passage of Contrast

Patient showed clinical improvement on post-operative day 3 (after the re-exploration). He was started on jejunostomy tube feeds with a high protein diet & supplemental parenteral nutrition & gained weight. The drain output decreased progressively & changed from bilious to purulent to serous. After 50 days post-operatively the drain output reduced to about 10ml per day serous. Patient was started on oral feeds which he tolerated well. Repeat CECT did not show any contrast extravasation. The abdominal drain &jejunostomy tube were removed & patient was discharged with stable vitals & tolerating oral feeds. On follow up after 1 month the patient had no complaints. The SEMS was removed & patient was discharged after 2 days of observation.

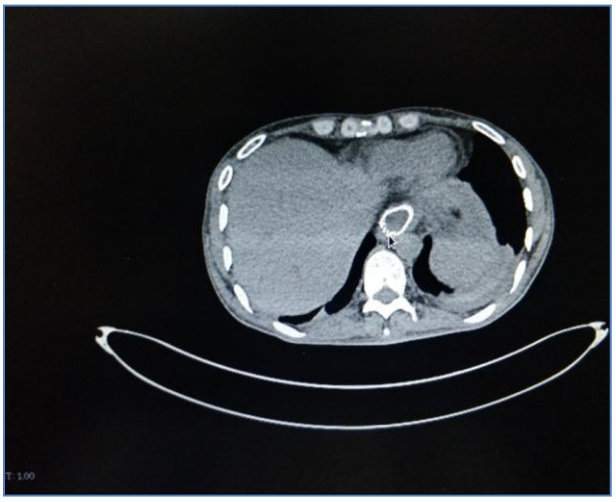

Figure 3:- Site of Myotomy is Stented. No Leak of Contrast is Seen.

Discussion

Esophageal perforation is a surgical emergency associated with high morbidity and mortality. The reason for this manifold increase in mortality is due to the unique anatomical configuration and location of the esophagus, which allows bacteria and digestive enzymes easy access to the mediastinum, leading to the development of severe mediastinitis, empyema, sepsis, and multiple organ dysfunction syndromes [1].

Table1: Etiology of Esophageal Perforations

Endoscopic
- Diagnostic endoscopy
- Endoscopic biopsy
- Endoscopic stent placement
- Endoscopic laser therapy
- Endoscopic dilations

Nasogastric tube placement
Endotracheal intubations
Transesophageal echocardiography
Minitracheostomy
Foreign bodies:-
Bones, dentures, button batteries
Trauma
- Blunt
- Penetrating

Boerhaave's syndrome
Caustic agents
- Acid and alkali

Severe Reflux and Mallory-Weiss tear
Infective causes
- Candida
- Herpes
- Syphilis
- Tuberculosis

Malignancy of esophagus, lung and other mediastinal structures

Table 2:- Diagnosis of Esophageal Perforations

HISTORY
CLINICAL EXAMINATIONS
PLAIN RADIOLOGY
- Abdominal X-Ray erect
- Chest X-Ray PA view
- Neck X-Ray lateral view

CONTRAST RADIOLOGY
- Gastrograffin study (water soluble contrast)
- CT scan of chest and abdomen with oral contrast
- MRI chest and abdomen

ECG

Recent evidence indicates that a substantial number of patients with esophageal perforation can be managed by nonoperative measures. The criteria for nonoperative management was initially described by Cameron et al in 1979 and modified by Altorjay in 1997 [2,3]. These include: early diagnosis or delayed diagnosis with contained leak, perforation not in the abdomen, contained perforation in the mediastinum, content of the perforation draining back to the esophagus, perforation does not involve neoplasm or obstruction of the esophagus, absence of sepsis, presence of experienced thoracic surgeon and contrast imaging in the hospital [2,3].

Table 3: Criteria for Nonoperative Management of Esophageal Perforation

- Contained disruption within the mediastinum
- Drainage of the cavity back into the esophagus
- Early detection of perforation
- No evidence of neoplasm
- Not an abdominal perforation
- Not accompanied by obstructive esophageal pathology
- Availability of advanced imaging modalities and thoracic surgery

Data from Altorjay et al. [17] and Cameron et al. [18]

There is no clear cut recommendation for indication of surgery but it includes: early postemetic perforation, hemodynamic instability, intra-abdominal perforation, extravasations of contrast into adjacent body cavities and presence of underlying malignancy, obstruction or stricture in the region of the perforation and surgically fit patient [1, 4-9, 15,16]. Different procedures described for esophageal perforation include primary repair with or without reinforcement [1, 4-14], simple drainage of the thoracic cavity [19], exclusion diversion operation [20], and single stage esophageal resection with or without primary reconstruction [1, 10, 21-25]. As a general principle all perforations require wide mediastinal drainage by opening the parietal pleura in its entire length of the esophagus [1, 4-10]. Necrotic nonviable and grossly contaminated tissue in the mediastinum and the parietal pleura must be debrided. The esophagus and often the esophagogastric junction must be dissected completely to identify the site of perforation and mobilize the esophagus for a tension-free repair [1, 4-10]. All esophageal repairs should be drained by a large bore intercostal chest tube. A feeding jejunostomy should be always added for nutrition. Patients diagnosed with late perforations can usually be repaired primarily with reinforced muscle or pleura [26, 27, 28]. If primary repair is not possible because of the local tissue friability or there is severe mediastinitis, esophageal resection or exclusion and diversion should be considered [19,20]. Exclusion and diversion comprises of cervical esophagostomy (diversion of the cervical esophagus and creating a salivary fistula), gastric decompression with a gastrostomy, esophagogastric junction stappling and jejunostomy [29].

Table 4: Treatment Options for Esophageal Perforations

OPERATIVE	NON-OPERATIVE
Primary closure Primary closure with buttressing of repair with Omentum onlay graft Latissimus dorsi muscle Pleural flap T-tube drainage Drainage only Esophagectomy with Immediate reconstruction Delayed reconstruction Exclusion and diversion	Conservative management Esophageal stenting Fibrin glue applications Endoclip application

The possibility of direct esophageo-pleural fistula(EPF) and extent of mediastinitis are determined by anatomic relationship of esophagus to the pleura, the amount of mediastinal fat and intervening connective tissue.[30] The diagnosis of EPF is difficult as the clinical sign and symptom are nonspecific. Conservative therapy includes drainage of the empyema, local irrigation, tube feeding, gastrostomy, or jejunostomy.[31] It is followed by definite surgery which includes repair or direct reconstruction of the esophagus. Early diagnosis and management of the EPF is important as it carries poor prognosis.

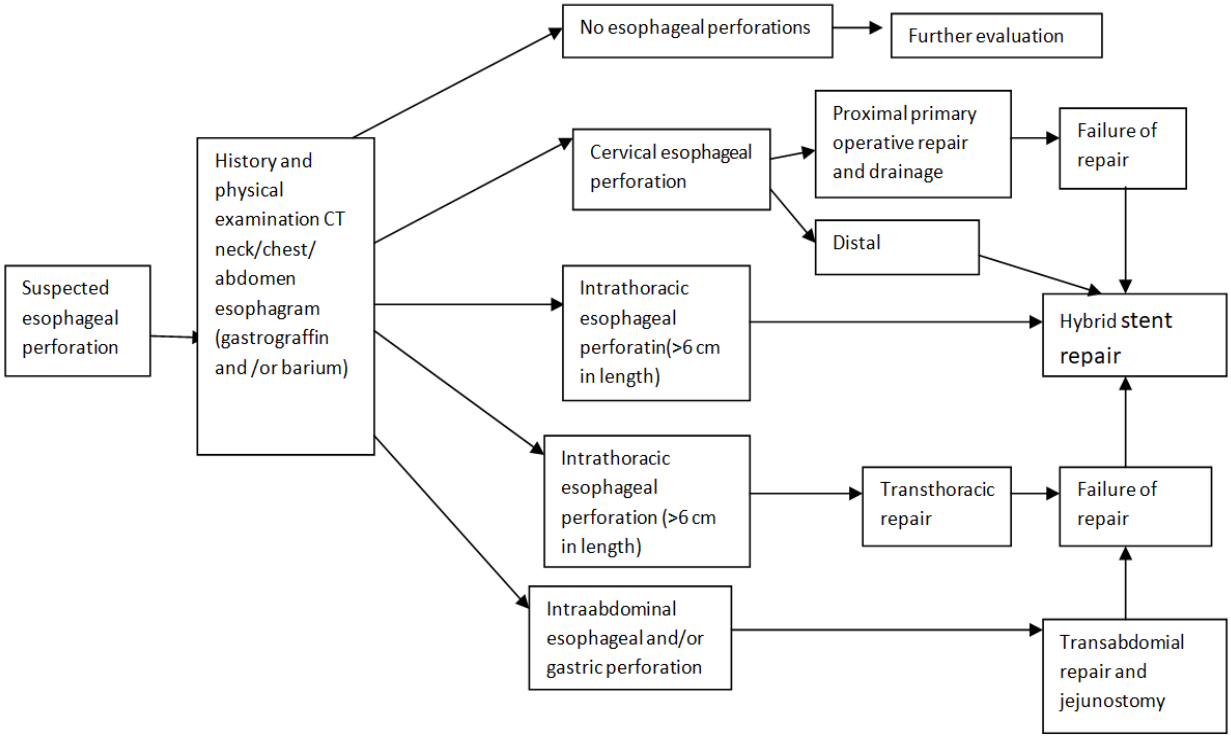

Figure 4: Treatment Algorithm for Esophageal Perforation

With engineering and technological advancements, self-expanding metallic esophageal stents became available in the 1990's based on techniques used to manufacture endovascular stents. Self-expanding metal stents offered multiple advantages including being inserted with a flexible esophagoscopy, significantly less esophageal dilatation, a lower rate of migration and improved palliation for malignant esophageal strictures and malignant tracheo-esophageal fistulae (32, 33). Like any technique, esophageal stent use for acute perforation does have its associated morbidities. The principle complication associated with stent use remains stent migration (34). The use of an esophageal stent also commits the patient to a return to surgery for stent removal and/or revision if migration does occur.Esophageal stent placement as monotherapy for esophageal perforation is inadequate and does not recognize the traditional goals of therapy for a patient with an esophageal perforation; a principle confirmed by a recent literature review by Dasari and colleagues (35). Licht et al. in their 2016 retrospective publication (n=49) also affirmed that combination of stent placement, enteral tube feeding for nutritional support, combined with drainage was highly effective in achieving healing. A substantial portion (82%) received a jejunostomy tube with 95% successful anastomotic healing (36)

Table 5: Mortality Prediction Scoring System for Esophageal Perforation

One point for each of the following

- Age>75 years
- Tachycardia
- Leukocytosis
- Pleural effusions

Two points for each of the following

- Fever
- Noncontained leak on barium esophagram
- Respiratory compromise
- Time to diagnosis >24 h

Three points for each of the following

- Presence of malignancy
- Hypotension

Data from Abbas et al. [18]

The continued success of the concept of treating an esophageal perforation without surgical repair has led to further development of other innovative endoluminal approaches to these disorders. Direct endoluminal closures of iatrogenic perforations have been reported with clips (through-the-scope, over-the-scope) and endoluminal suturing techniques (37-39). A recent metaanalysis reviewed current literature reporting on endoclip technique in closure of iatrogenic perforations. The authors concluded that use of endoclips in the esophagus could be considered when perforation diameter is small (less than 2 cm) but recommend surgical intervention if perforation is recognized late (greater 24 hours), or larger perforation diameter (>2 cm) and if there is evidence of leak into the mediastinum (40). Verlaan et al. performed a large metaanalysis on various endoscopic closure systems. They authors reported successful closure with endoclips (90.2%) and over-the-scope clips (87.8%) but also concluded that there remains many limitations in current literature including the lack of randomized control trials and low methodological quality of studies (41). Wound vacuum therapy has also been investigated and shows promise, especially in patients with an esophageal fistula (42). A single-center retrospective study by Mennigen et al. compared 30 patients who underwent endoscopic stent placement to fifteen patientswith vacuum therapy. Though a small study, their findings were promising with high success rates for vacuum therapy (43).

Conclusion

Management of esophageal perforations pose challenge. A high index of clinical suspicion & an appropriately timed imaging study is essential. The patients require a multidisciplinary team management involving expert radiologists, interventional gastro-enterologists, surgeons, intensivists & dieticians. The decision & timing of intervention (both surgical & endoscopic) & conservative management & adequate nutritional support are crucial for successful management of these critically ill patients.

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