



Acute Mediastinitis Following Esophageal Perforation with Swallowing of Duck Bone: A Case Report

Tran Thuc Khang

Department of Cardiovascular and Thoracic Surgery, XUYEN A Hospital, Hochiminh City, Vietnam

Email address:

khangchircardio@gmail.com

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Abstract: *Background:* Acute mediastinitis is still associated with a high morbidity and mortality. Mediastinitis secondary to esophageal perforation is a rare but potentially life-threatening condition. *Case presentation:* This report aims to present an acute mediastinitis case, in a 54-year-old healthy female patient, which originated from an intrathoracic esophageal perforation with swallowing of duck bone that confirmed by computed tomography of the chest. The patient was successfully treated by an emergency left thoracotomy, effective surgical drainage and aggressive debridement of the affected mediastinal compartments, primitive repair of perforated esophagus with intercostal muscle flap, decompressive gastrostomy and jejunostomy for feeding. Post-operatively, the patient was benefited from broad-spectrum antibiotics, intensive care and resuscitation associated with a close follow-up consequence. *Results:* Mediastinitis was well-controlled. Post interventional computed tomography scan with hydro-soluble contrast ingestion showed no extraluminal leak and good integrity of esophagus. The patient restored normally oral feeding without any complications and was discharged after 24 days of hospitalization without any sequelae. *Conclusions:* Early diagnosis is critical for expediting the choice of an optimal treatment strategy and plays an important role in improving mortality from acute mediastinitis following perforated esophagus. Besides intensive care and resuscitation, we advocate an emergency thoracic surgery for cases with established mediastinitis following intrathoracic esophageal perforation.

Keywords: Mediastinitis, Esophageal Perforation, Debridement, Surgical Drainage, Intercostal Muscle Flap

1. Introduction

Mediastinitis can be defined as an inflammation of connective tissue that involves mediastinal structures and fills interpleural spaces. In its acute form, it is a life-threatening condition if not diagnosed early or if treated inadequately [1]. Acute mediastinitis can occur in the context of cardio-thoracic surgery, esophageal perforations and oropharyngeal infections condition. In case of acute mediastinitis caused by esophageal perforation, the mortality can be higher because it is very frequently misdiagnosed and appropriate management is often delayed [2]. For acute mediastinitis secondary from esophageal perforation, it has traditionally been considered a catastrophic and often life-threatening event with mortality rates of 10% to 40% in general and even higher rates reported following spontaneous perforations in septic patients [3].

The author reports a clinical case with acute mediastinitis following thoracic esophageal perforation with swallowing of duck bone who was saved thanks to early diagnosis, urgent

thoracotomy for an aggressive debridement of necrotic tissue and effective drainage as well as primitive repair of esophagus.

2. Observation

2.1. General Patient Data

This was a 54-year-old woman who came to emergency room with chief complaint of cervical. Thoracic pain occurred from ingestion of a duck bone. She had vomiting but not noted whether the bone gone out or not. She tried to eat stick rice in order to make the bone (if still trapped in the esophagus wall) to go down the stomach (as a traditional experience), but pain did not improve. She had relatively high fever about 4 hours after the incidence, right at the time arrived our institution.

Reported on admittance, the patient had well-being but an infectious situation. She had a temperature at from 39°C to 39.5°C and felt chills. Her hemodynamic status was still stable, but her respiratory rate was more than 35 breaths per minute.

Especially, she complained a very sharp pain in the retrosternal region and left hemithorax with orthopnea.

On admittance at the emergency room, she was let to the endoscopic theatre for fiber esophago-gastroscopy without surgeons' consultation. An erosive and edematous region at a lower third of esophagus was reported with suspected image of esophageal perforation. The lesion was irrigated with physiologic solution but no foreign bodies found. After endoscopic procedure, patient had continuous and high fever (around 40.5°C and 41°C), with very clear infectious parameters (blood white count at 25.100, C reactive protein at 480, procalcitonin at 16.3). Pulmonary radiography changed rapidly between admittance and post-endoscopy (Figure 1). Broad-spectrum antibiotics were used (Vancomycin, Meropenem and Metronidazole).

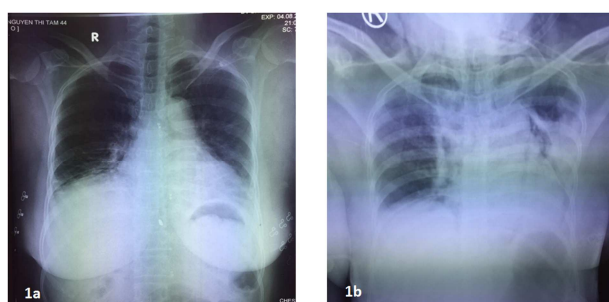


Figure 1. Preoperative anteroposterior chest X-ray showing a rapid change between admittance (1 a) and post-endoscopic time (1 b).

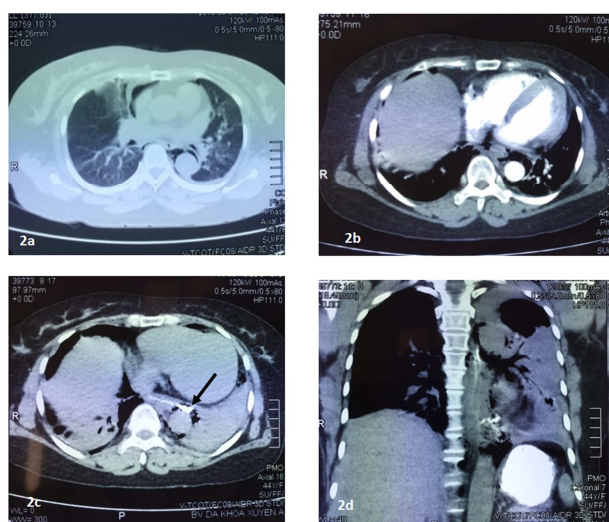


Figure 2. Computed tomography scan showing mediastinitis with free gas bubbles and localized fluid in the posterior mediastinum (2 a, 2 b, 2 c, 2 d), localized fluid in the left pleural cavity (2 d) and an esophago-pleural fistula (2 c, black arrow).

With still stable hemodynamic status, the patient was benefited from a thoracic computed tomography (CT). On CT imaging, the author found some findings such as focal soft tissue infiltration of posterior mediastinal fat, localized mediastinal fluid collections, free gas bubbles in the posterior mediastinum and left pleural effusions with no bone imaging noted. CT imaging on patient ingested hydro-soluble contrast (Omnipaque), the author found an esophago-pleural fistula

towards left pleura. The patient was urgently sent to the operating room for an emergency operation with a diagnosis of acute mediastinitis secondary to esophageal perforation after swallowing a duck bone on the patient under situation of infectious shock-threatening (after about 16 hours from admitted to our institution) (Figure 2).

2.2. Surgical Intervention

Under general anesthesia, with double lumen endobronchial tube of Carlens associated with invasive arterial monitoring and central venous catheter. The surgical procedures were carried out as the following steps:

2.2.1. Left Postero-lateral Thoracotomy and Harvest of Intercostal Muscle Flap

After entering the thoracic cavity through the 6th intercostal space, an intercostal muscle flap was harvested with a vascular pedicle for intra-thoracic use before placing a rib spreader (Figure 3 a). There was a large amount of milky fluid in the left pleural cavity with white pseudomembranous patch. Fluid was aspirated.

2.2.2. Esophagus Exposure and Lesion Evaluation

After posterior mediastinal pleura was opened, a lot of pus and necrotic mediastinal tissue were noted and these were taken for microbiological analysis (for Gram staining and culture). Esophageal dissection was being continued, an esophageal perforation of one lower third was found, that was about 1.5 - 2 cm length and about 8 cm from the gastric cardia. A silastic vessel loop was passed around the esophagus. There were no foreign bodies found (Figures 3 b and 3 c).

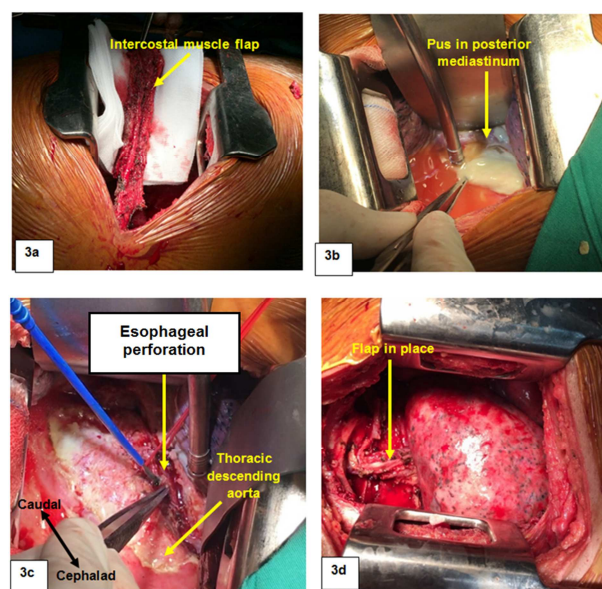


Figure 3. Showing an intercostal muscle flap harvested before placing rib retractor (3 a), macroscopic pus overflowed after mediastinal pleura opened (3 b), the location of esophageal perforation (3 c) and the flap reinforced on esophageal sutures (3 d).

2.2.3. Mediastinal Debridement

The posterior mediastinum was opened widely from the left pleura, along the esophagus and descending thoracic aorta, an

aggressive debridement of all necrotic tissue of mediastinum compartment, even prevertebral passing to the right side. Posterior mediastinal compartment and left pleural cavity were abundantly irrigated with warm physiologic solution mixed with Betadine and at that time with Vancomycin solution.

2.2.4. Esophageal Repair with Intercostal Muscle Flap

The esophageal lesion was repaired primitively with separated sutures of two layers with Vicryl 3/0. After finishing the sutures, an amount of Methylene Blue solution was flushed via nasogastric sonde in order to check the sutures' safety and no any leak from the esophagus noted. To protect the esophageal repair, the intercostal muscle pedicled flap with good viability was sutured as a buttress onto the esophageal lesion (Figure 3 d).

2.2.5. Mediastinal Drainage and Closure of the Thoracotomy

Before closing the incision, silicone drains with large bore were put in the posterior mediastinal compartment including along the esophagus just high and behind the tracheal carina, descending thoracic aorta and at the esophageal suture. Two other drains were put in the left pleural cavity. Thoracotomy was closed layer by layer as usual.

2.2.6. Abdominal Procedures

Via laparoscopy, the patient was benefited from a gastrostomy for gastric decompression and a jejunostomy for feeding.

2.3. Post-operative Follow-up

Post-operative (post-op) 14th hour, the patient had no fever, stable hemodynamic status, awake and good conscience. The infectious parameters (WBC, CRP and Procalcitonin) began to ameliorate since post-op 2nd day and reached normal values at the post-op 13th day. Patient had bowel movement at the post-op 3rd day and was fed via jejunostomy sonde since the 4th post-op day. Culture of organisms of pus and mediastinal tissue was negative, so three antibiotics (Vancomycin, Meropenem and Metronidazole) were continued.

2.3.1. Criteria for Oral Feeding

Before restoring the oral feeding at the post-op 10th day, some consequent measures were carried out:

1. Pumping of Methylene Blue solution via nasogastric sonde and confirming no blue liquid leaked through drains.
2. Having a thoracic computed tomography with hydro-soluble contrast use via nasogastric sonde that showed no extraluminal leak (Figure 4).
3. Clamping of gastrostomy and jejunostomy sondes during oral intake.

2.3.2. Management of the Thoracic Drains

The pleural and mediastinal drainage flow were decreased from the post-op 5th day and clearer. Mediastinal fluid that was taken (from drains) for culture of organisms at the post-op 7th

day was negative.

All drains were removed at post-op 14th day with following criteria:

1. No any clinical signs and symptoms.
2. Restoring normally oral feeding without any complications.
3. Drains stopped giving.
4. Good pulmonary expansion on radiography.

Gastrostomy and jejunostomy sondes were clamped and removed 5 days after removal of thoracic drains (it means at post-op 17th day).

2.3.3. Antibiotics and Discharge

Intravenous antibiotics were being continued for 3 weeks after surgery and patient was discharged at good status after 24 days of hospitalization without any sequelae.

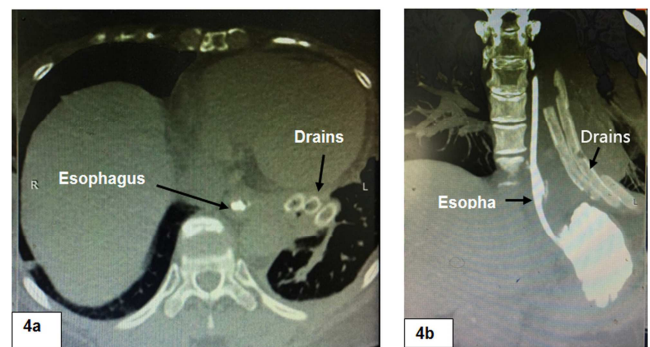


Figure 4. Post-operative computed tomography with hydro-soluble contrast ingestion showing no extraluminal leak and good integrity of esophagus.

3. Discussion

Esophageal perforation is a rare condition (3.1 per 1,000,000 per year) that can result from iatrogenic causes (usually due to para-esophageal surgery or esophagoscopy, make up to 59% of cases), spontaneous rupture (15%), foreign body ingestion (12%) and other less common etiologies (approximately 10%) [3]. The global mortality rate of acute mediastinitis is between 19 – 47% with differences influenced by the etiology of the disease [2, 4]. For acute mediastinitis secondary from esophageal perforation, it has traditionally been considered a catastrophic and often life-threatening event with mortality rates of 10% to 40% in general and even higher rates reported following spontaneous perforations in septic patients [3, 5].

The clinical presentation of acute mediastinitis is usually dramatic and is characterized by severe retrosternal chest pain, fever, chills, and dysphagia, often accompanied by evidence of septic shock [6]. In case of esophageal perforation or other rare etiologies, it can be difficult because of the nonspecific symptoms and that should be worked up and thus high suspicion is always required [3]. The author considers whether the diagnosis is difficult or not that depends on the clinical context. For this case, a chest pain and a severe cough that occurred from an ingestion of duck bone were a clear clinical clue for the surgeon, for example.

A while ago, contrast esophagography with barium is most

successful at confirming small perforations with a sensitivity of 90% [3]. Currently, this technique has completely been replaced by contrast-enhanced high-resolution thoracic CT [7]. As many reports, the author thinks that barium can cause an inflammatory response in the mediastinum, pleura, even toxic risk for patient, and it should be avoided if perforation is suspected. Alternatively, a water-soluble contrast agent, such as Omnipaque (Iohexol) or Gastrografin, is safe and preferred for initial studies [3, 8, 9]. Together with precise identification of the perforation site (with water-soluble contrast ingestion by mouth), thoracic CT provides information about the soft tissue of the mediastinum and pleural space. Radiologic features of acute mediastinitis on CT are often seen including mediastinal soft-tissue infiltration, localized mediastinal fluid collections and free gas bubbles in the posterior mediastinum. An esophageal perforation is suggested by a fistula or mediastinal air, extravasated luminal contrast or pleural effusion. CT findings also help surgeons to select a suitable surgical approach and to evaluate the patient [9, 10].

For the role of endoscopy in case of suspected esophageal perforation, Kaman L., et al. advised that careful inspection of the esophagus without air insufflation is warranted before taking out the endoscope but is not recommended as a primary diagnostic procedure as insufflated air can cause further dissection of the perforation [2]. Cross M. R., et al. also agreed that esophago-gastroduodenoscopy was delayed in order to minimize the risk of further esophageal perforation [3]. For our patient, the infectious and toxic signs appeared and worsened rapidly after a long experience of esophago-gastroscope with abundant water lavage and suction before having a consultation with thoracic surgeons. This procedure not only maximized the esophageal injury, but also aggravated and spread the infection in the mediastinum. This was a big mistake that should be kept in mind in daily clinical practice. The author suggests that esophago-gastroscope should be considered in case of a relatively-sized intraluminal foreign bodies and mediastinitis is not present. This opinion has been consented by many authors [11, 12].

In the therapeutic scope of esophageal perforation, it can be surgical or non-surgical and according several studies, primary repair of esophageal perforations is becoming widely accepted as the treatment of choice [13, 14]. In the study of Clay B. M. et al., they show a mortality of almost 25% with conservative nonoperative management [9]. So, the author considers that early operation is imperative and plays an important role to save the patient in context of mediastinitis secondary esophageal perforation because it is a serious condition. According to many studies, this opinion had a global consensus and they found that late diagnosis, and management (commonly > 24h) of perforated esophagus is the main factor associated with poor outcome [15-18].

As mentioned above, the main steps of surgical operation that the author realized were esophageal repair, aggressive surgical debridement and drainage of the contaminated mediastinal spaces. These strategies are accepted by many

authors [3, 14, 19]. For the esophageal repair technique, primary repair remains the preferred surgical treatment modality in thoracic and abdominal esophageal perforation [14]. Despite adequate surgical repair, continued esophageal leakage occurs in 20%- 40% of patients, even in more specialized centers [2, 17]. In this case, operative field was contaminated with purulent fluid, the esophageal wound edges were edematous and inflammatory, therefore the author repaired the esophageal perforation by a primary suture with reinforcement of intercostal pedicled flap in order to reduce the leak rate. With the intention of using a flap for esophageal repair, intercostal muscle flap should be harvested before placing a rib spreader to avoid traumatizing vascular pedicle. The role of buttress technique was confirmed by several authors and that has definitely improved the outcome of the surgical treatment and reinforcement with vascularized tissue decreases the fistula formation (13%) and mortality (6%), compared to repair without reinforcement (39%) and (25%) [2, 14, 12, 20]. Besides, there are various other local tissues at the site of perforation have been used to buttress the primary repair, such as pleural flaps, omental flaps, diaphragm and pericardial flaps, etc. [2, 12, 21].

Aggressive debridement of necrotic tissue and effective drainage of infected mediastinal compartments are mandatory and the cornerstones of the successful treatment of acute mediastinitis. This principle was accepted largely by many thoracic surgeons [4, 18]. The author used large bore drains and negative pressure suction system in order to facilitate secretive fluid evacuation from infected spaces. The failure to drain the suppuration adequately resulted in overwhelming sepsis and death.

To protect esophageal repair, in addition to reinforcement with flaps, the prevention of gastroesophageal reflux is also a controversial issue. Some authors used nasogastric sonde [9]. Our patient benefitted from a gastrostomy tube for gastric decompression that reduces effectively gastro-esophageal reflux. This step seems more aggressive, and it appears warranted to diminish possible, especially for lesions at higher part of esophagus. Besides, this operation is optional and relies on the surgeon's preference [13]. For this case, lesion was next to cardio-esophageal sphincter, so this procedure was done with the inference to avoid reflux and mediastinal soilage.

Post-operative follow-up is like an art and its role is as important as the surgical process. Unfortunately, the follow-up regimens are not pointed clearly in medical literatures. So, this patient was followed with a careful and reasonable sequences in order to ensure the safest outcome, such as infection control with appropriate and board spectrum antibiotics, intensive resuscitation and parenteral nutritional support, follow-up of post-operative daily drainage flow, timing and criteria to remove drains, confirming the integrity of the esophagus and the absence of any leakage, restoring oral feeding, as well as timing to stop antibiotics and to discharge. This process should be adjusted flexibly depending on specific cases in clinical practice.

4. Conclusions

Mediastinitis following perforated esophagus with foreign body ingestion is a rare but lethal complication. Early diagnosis and management positively influence outcome. Thoracic computed tomography constitutes an extremely valuable tool for diagnosis and evaluation. Esophago-gastrosocopy should be indicated carefully with consultation of thoracic surgeon. A thoracotomy is still necessary for cases with acute mediastinitis following intrathoracic esophageal perforation. Operative intervention including primary repair of esophageal perforation with vascular flap, aggressive debridement of all necrotic tissues, adequate and effective drainage of contaminated mediastinal compartments is the mainstay of surgical treatment. Post-operative care consisting of intensive resuscitation, effective antibiotics, nutrition support and follow-up is critical and decisive for the successful and complete management.

Declaration

The authors declare that they have no competing interests.

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