Esophageal perforation: life threatening complication of endotracheal intubation

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Abstract

Objective: To raise awareness of this complication of tracheal intubation, to emphasize the gravity due to delayed diagnosis, and to advocate a surgical treatment. Methods: Between April 1980 and January 2000, 97 patients were treated for esophageal perforation in our department. We reviewed the cases of perforation occurring after attempted tracheal intubation. Each case is presented. Discussion is focused on diagnosis and treatment. Results: Esophageal perforation occurred after attempted endotracheal intubation in five cases among 58 iatrogenic perforations. There were four women and one man (mean age 72 years). In all cases, it was for a planned operation. Intubation was performed by a single lumen tube in three cases and a double lumen tube in two cases. Presenting symptoms were acute in one case and insidious in four cases. Free interval before diagnosis and treatment was long in all but one case, with an average of 179 h (range 5–432). Two patients suffered from septic shock when they were transferred. All patients were operated on. Two patients died. Conclusion: Post intubation esophageal perforation is one of the most life threatening esophageal perforation. Delayed diagnosis is the first cause of gravity. Prevention of this complication begins with recognition of a potentially difficult intubation. Good outcome follows from rapid diagnosis and early surgical treatment. © 2001 Elsevier Science B.V. All rights reserved.

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1. Introduction

Esophageal perforation is a life threatening lesion leading to death in 6–34% of cases according to the status of the patients, the free interval between perforation and treatment, the presence of underlying esophageal disease, the site and cause of the perforation [1,2]. The esophageal tear may be spontaneous (Boerhaave’s syndrome), induced by a foreign body, post traumatic or iatrogenic. In this group of iatrogenic esophageal perforation we want to focus on perforation occurring after attempted endotracheal intubation. Few reports have been published about the subject in the last 10 years probably due to its low frequency of occurrence [3–6]. However misreading of this complication sometimes leads to delaying the diagnosis, then to worsening the prognosis. Subsequent infection spreads into the mediastinum and responsibility of the physician is engaged. Herein we present 5 cases in a series of 58 esophageal iatrogenic perforations treated in one center. This report will emphasize on prevention and early diagnosis of this accident.

2. Methods

A review of all patients treated in our unit for esophageal perforation has been performed. The review was retrospective between 1980 and 1995, then prospective from 1996 to January 2000. The patient records were retrieved and medical history, clinical data, free interval between perforation and treatment, investigations, treatment applied and outcome detailed for all patients.

The diagnosis of esophageal perforation was achieved by a water-soluble contrast swallow if clinical conditions allowed. The management techniques varied between the patients but were guided by generally accepted principles of treatment [2]: broad spectrum antibiotherapy and appropriate resuscitation before surgical treatment as much as possible. All patients had a rigid esophagoscopy performed by the surgeon prior to definitive management. The aims of surgery were to remove debris and clean the mediastinum and pleura, to prevent continued leakage from the esophagus, to conserve the esophagus if there was no underlying disease and to resect obstructing irreparable lesions. The surgical approach was chosen according to the site of the break and the result of esophagoscopy.
3. Results

Between April 1980 and January 2000, we treated five cases of esophageal perforation occurring during attempted endotracheal intubation. These five cases are presented below. Are excluded in this study 18 cases of spontaneous perforations (Boerhaave’s syndrome), 20 cases of perforation by foreign body and 53 other iatrogenic perforations also treated during the same period.

3.1. Case 1

An 83-year-old woman underwent mastectomy for carcinoma in December 1989. It was reported that endotracheal intubation was difficult but the intervention was performed and conducted without any other anesthesiologic problem. Nothing was noted during recovery from anesthesia and oral feeding began in the 2nd post operative day (p.o.d.). Since then the patient pointed out mild pain swallowing which increased the following days. Then fever appeared on the 4th p.o.d. associated with a swelling of the patient’s neck. A retropharyngeal abscess was disclosed during a laryngoscopy. Broad spectrum antibiotherapy was instituted and the patient was transferred to us on the 6th p.o.d. Clinical examination revealed clinical signs of septic shock: temperature 39.6°C, tachycardia, polypnea and mottled skin discoloration. The chest X-ray showed superior mediastinal enlargement without pleural shadow. Rigid esophagoscopy showed pus flowing out of a tear located in the posterior part of the pharynx just above upper esophageal sphincter, 15 cm from the incisors. The patient was operated on. Through a left cervicotomy along the anterior edge of the sternocleidomastoid muscle, the retropharyngeal area and posterior mediastinum was cleaned, drained and the tear was sutured in two layers. A limited laparotomy was added to perform a feeding jejunostomy. A respiratory distress syndrome appeared early in the postoperative course and the patient was transferred to the intensive care unit. She was still ventilated when a peritonitis appeared on the 19th p.o.d. by perforated duodenal ulcer. She was operated on through laparotomy but she died on the 20th p.o.d. by multiorgan failure.

3.2. Case 2

In February 1993, a 62-year-old demented woman who suffered from cholelithiasis was operated on. The anesthetist reported that tracheal intubation was difficult and successful after a few attempts. On recovery from anesthesia nothing was noted. On the 3rd postoperative day, beginning oral feeding, the nurse noted mild wry faces of the patient when she swallowed but this was attributed to a refusal of food. The temperature was 37.8°C on the 5th day but no focus of infection was found. On the 15th p.o.d. temperature was 39°C associated with polypnea, tachycardia and mottled skin discoloration. A CT scan showed a posterior mediastinal abscess beginning on the cervical region and spreading below the aortic arch associated with a right pleural effusion.

Broad spectrum antibiotherapy was performed and the patient was referred to us. By rigid esophagoscopy we found a pharyngeal tear of 2 cm just under the upper esophageal sphincter, 17 cm from the incisors. A nasogastric tube was inserted and then the patient was operated on. A left cervicotomy was performed along the frontal edge of the sternocleidomastoid muscle. A large retropharyngeal and posterior mediastinal abscess was aspirated and the region was cleaned. The tear was located in the middle of the pharynx 1 cm above the cricopharyngeal muscle, it was sutured in two layers and drained. Then a right thoracotomy in the 5th intercostal space was added, to clean and drain the lower part of the posterior mediastinum. Due to unstable septic shock the patient was transferred to the intensive care unit where her condition deteriorated subsequently. She died by multi-organ failure on the 6th p.o.d.

3.3. Case 3

A 69-year-old woman was planned to be operated on mediastinal lymph node dissection in July 1995. She suffered from mediastinal recidive of a thyroid carcinoma which was treated 2 years before. The intervention was planned to be performed by right thoracotomy on left side ventilation. Intubation was performed by a double lumen endotracheal tube. The first attempt of endotracheal intubation was unsuccessful. The tube was slipped into the esophagus, then it was withdrawn and ventilation was recovered by face mask. Esophageal perforation was early suspected by the anesthetist because of blood stained sputum into the patient’s mouth and sudden appearances of cervical subcutaneous emphysema. Then the patient was intubated by a single lumen tube and was transferred to us.

Air in the mediastinum and subcutaneous emphysema was seen on the chest X-ray. By rigid esophagoscopy we found a 3 cm tear in the posterior wall of the esophagus 18 cm from the incisors. The patient was operated on by three approaches: a left cervical incision allowed cleaning and drainage of the retropharynx but the tear was too deep to be sutured by this approach; through a right thoracotomy the mediastinum was cleaned, the tear sutured and drained and mediastinal lymph node was resected. A limited laparotomy was added to perform a decompressive gastrostomy and a feeding jejunostomy. The postoperative course was uneventful. The patient was awaked from anesthesia and extubated the day after, began to eat on the 11th p.o.d. and discharged on the 17th p.o.d. After a post operative follow up of 5 years, the patient is doing well without major sequella.

3.4. Case 4

In this case, the accident happened in our department in May, 1999. A 73-year-old man was submitted to a thoracoscopy for diagnosis of a solitary pulmonary nodule suspected to be metastatic of a sarcoma of his arm resected 2 years before. The first attempt of tracheal intubation failed and the tube was penetrated into the esophagus. The second
was also established. 

Left cervical approach allowed a 2 cm tear located on the posterior part of the esophagus, 3 cm below the upper esophageal sphincter (18 cm from the incisors) to be seen by rigid esophagoscopy. The patient was operated on by three surgical approaches: (1) Laparotomy was performed through an upper mid line incision. A perforated ulcer was found and sutured, then gastrostomy was done to relieve stomach distension and a feeding jejunostomy was also established. (2) Left cervical approach allowed a surgical emergency and prompt recognition and initiation of treatment is essential to a favorable outcome.

4. Discussion

Emergency intubation required for acute respiratory failure, airway obstruction or prevention of gastric aspiration are frequent circumstances leading to this accident [3]. However in our five cases, tracheal intubations were performed for planned interventions. It was noted in three cases in our series that face anatomy particularities prevented from having enough vision of the glottis during laryngoscopy before intubation. A short broad neck, short opening of the mouth, limited motion of the cervical vertebrae are impeding conditions leading to this accident. Valuation of these difficulties are assessed during the pre anesthesiologic visit and graduated by Mallanpati classification [7]. Excessive use of force, poor muscular relaxation of the patient, poor visualization of the appropriate anatomy and lack of experience are the main causes of perforation. If a stylet is used its tip must not protrude beyond the edge of the tube. The esophageal tear is usually located in the upper third of the esophagus below the opening on the posterior wall or in the piriform sinus. This is an usual site for instrumental perforations, the other one being situated in inferior esophagus just above the esophagogastric junction [8]. At cervical level the esophageal wall shows weakness that is caused by the crossing of fibers from the constrictor of the pharynx muscle and the crico pharyngeal muscle. This zone projects opposite the cervicothoracic junction (C5–C6 vertebrae). Following the first attempted tracheal intubation which produces the tear, positive pressure applied with a face mask to allow the patient to breathe induces a subcutaneous emphysema and spreads contaminated mouth secretions into the mediastinum. Acute subcutaneous emphysema appearing at that time allows an early diagnosis as happened in one of our cases.

Apparition of a neck or dorsal pain, fever, or subcutaneous emphysema after a tracheal intubation implies research of an accident of intubation. A combination of dysphagia and subcutaneous emphysema is sufficient to suggest the diagnosis. A bronchoscopy allows to rule out a tracheobronchial rupture. A water soluble contrast swallow or a CT scan have an equal sensibility to rule out an esophageal perforation. Only piriform sinus lesion may be diagnosed by laryngoscopy, so one mustn’t be satisfied with a normal laryngoscopy as happened in case 5. In unconscious ventilated patient a sepsis may be the only clinical sign [9]. This is a surgical emergency and prompt recognition and initiation of treatment is essential to a favorable outcome.
There are very few case reports of medical treatment [4]. Medical treatment has been applied only after early diagnosis. It consisted of broad spectrum antibiotic therapy and parenteral nutrition for 7–10 days. However we do not advocate medical treatment in esophageal perforation especially in such a case as Dubost et al. [3]. It is a wide perforation produced by the tip of the endotracheal tube entailing massive inoculation. Furthermore ventilation by face mask after the perforation increases spreading inoculation into the mediastinum. In case 5, medical treatment was actually applied unintentionally because until the 6th p.o.d. the esophageal tear was unknown. Medical treatment failed in that case.

We consider that the only indication for non-surgical treatment of esophageal perforation might be a small esophageal fissure found on control esophagography after esophageal dilation for a stenosis surrounded by mediastinal sclerosis as created by previous radiotherapy or caustic burning. Those are the conditions as defined by Cameron et al. [10] for medical treatment reporting eight cases, five of which were post-operative: small perforation drained into the esophageal lumen with mild general sign. Except for this precise case, our attitude is deliberately surgical. We consider that there are very few indications for an exclusive medical treatment.

Early surgical treatment allows to suture the tear in excellent conditions for favorable healing. It is a simple and safe intervention almost conducted through one cervical approach except in case 3 in which the tear was not accessible by the cervical one. Furthermore, a failing in medical treatment obliges to suture in inflamed esophageal tissues which increases risk of leakage as in case 4.

The esophageal tear has to be sutured in two layers with buttressing as much as possible [11]. Esophageal exclusion must be avoided and whatever the delay between perforation and treatment, conservative surgical treatment must be applied, except in case of perforation of malignant stenosis of the esophagus. This attitude is commonly advocated by most authors [11–13].

A thoracic approach must be associated to the cervical one in case of delayed diagnosis in which the mediastinal infection is not sufficiently drained by the only cervical approach. We favorably add a feeding jejunostomy.

Two patients died in our group of five patients. The free interval between perforation and treatment was high in the two cases and the patients suffered from septic shock when they were transferred to us. In four of our five cases clinical signs were insidious, which explains the high free interval in all but one patient; it was 179 h, range 5–432 h. Rarity of the affection (5% of esophageal perforations we have treated) is one of the reason of delayed diagnosis and in our series late diagnosis was the principal reason for the high mortality rate. This subgroup of esophageal perforation is likely to be more serious than spontaneous esophageal perforation (Boerhaave’s syndrome) which have been reported to be one of the most life-threatening causes of esophageal perforation. Mortality rate reported in recent series of Boerhaave’s syndrome is below 20% [12,13].

5. Conclusion

Post intubation esophageal perforation is one of the most life-threatening iatrogenic esophageal perforation. Prevention of this complication begins with recognition of a potentially difficult intubation and applying good practice rules. Rapid diagnosis and early surgical treatment leads to good outcome.

References


Appendix A. Editorial Comment

In this issue of the Journal, Jougon and colleagues [1] report on five patients with upper oesophageal perforation which complicated endotracheal intubation. They draw attention to this particular hazard of intubation and the
potential, as well as real fatal consequences, of its late diagnosis and treatment.

Problem intubations are encountered in 1.2–2.5% of all patients undergoing anaesthesia and the characteristic features of the difficult airway are well documented. In over 90% of cases difficult intubation can be predicted by the presence of these features, which relate to congenital or acquired anatomical anomalies of the face and neck.

In elective operations these features can be identified by appropriate pre-anaesthetic assessment. In emergency situations recognition of anomalies may be overlooked, or become apparent only after induction when intubation is being undertaken.

Various guidelines have been drawn up by anaesthetist organisations and responsible bodies aimed at overcoming the problems of intubation [2,3]. The use of a bougie and/or stylet to guide the tube into the airway, which is recommended by some, is helpful but may itself cause perforation [4,5].

In thoracic surgical operations, although the bulkier double lumen tube may present additional hazards, bronchoscopic assistance by the surgical team and intubation using the intubating bronchoscope are usually at hand and facilitate intubation. Also, in such cases, one would expect the chance of an early/earlier diagnosis to be higher but this does not necessarily follow as can be seen by case 4 of Dr Jougon et al. [1].

Most perforations occurring at intubation are caused by false root passage of the tube or bougie into the oesophageal lumen and then through the wall. The site of mucosal laceration and that of external wall rupture is usually in close proximity of one to another and they are usually located within 3–5 cm of the upper oesophageal sphincter. In some instances, notably when the rupture is caused by a guide bougie, the mucosal laceration may be 8–10 cm higher (proximal) than the external oesophageal wall perforation. Effectively, in these cases there is dissection as well as perforation of the oesophagus and whilst the mucosal perforation is at, or about, the level of the pharyngo–oesophageal junction, the oesophageal leak is in the mediastinum. This has relevance to clinical presentation, investigation and therapeutic methods in these perforations.

It is worth emphasising that in two of the five cases reported by Jougon and colleagues [1], surgical subcutaneous emphysema, one of the cardinal signs of perforation, was absent and when present the manifestation was immediately after the incidental rupture. In our experience these features are not unusual when perforation is cervico–mediastinal as portrayed above. Dysphagia followed by tachycardia, tachypnoea and mild temperature are almost always present. The importance of underlining this is that some clinicians rely on the presence of surgical emphysema and/or pneumothorax alone to initiate investigations for suspected oesophageal perforation whereas the general signs are at times, more relevant to early investigation.

The consequence of ignorance of early manifestation is delayed diagnosis which jeopardises the patient’s quality of life and/or survival [6,7].

We believe that the investigation of suspected intubation perforation should comprise plain anterio–posterior and lateral view chest radiography in erect position and urgent-to-emergency contrast (radiography) study and endoscopic examination.

The aim is to diagnose the level of mucosal breahe and the site of outer wall perforation.

We share the view of Jougon and his colleagues that only extremely small perforations (in the order of 1–2 mm), localised in the neck and/or mediastinal space and diagnosed early may be treated successfully by conservative medical regimes. In these cases a nutritional route (other than per oral) antibiotics and strict supervision is required. We also concur with their conclusion that early surgical operation of repair and drainage is almost always attended by successful outcome when perforation is in the cervical oesophagus, and when diagnosis is made soon after the incident. These perforations should, however, be differentiated from thoracic oesophageal rupture because of the anatomical characteristic of the mediastinal spaces and particularly when diagnosed later than 48 h.

Considering the anatomical arrangement of neck spaces and continuity of these with the mediastinum, drainage of the neck alone can hardly be expected to achieve its goal if collection is tracking in the mediastinum. It is worthwhile to record that in some cases of cervical oesophageal perforation treated by simple drainage, a diverticulum (or a blind track) remains as a sequellae of the event.

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