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Case Report

Anaesthesia Section

Pulmonary Aspiration Albeit Rapid Sequence Induction in Achalasia Cardia- Do we have an Infallible Technique?

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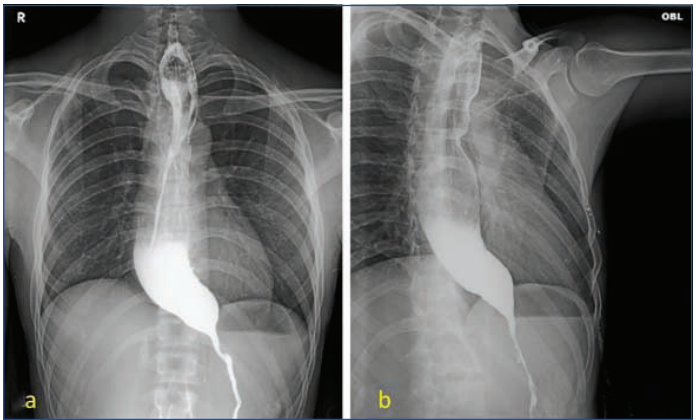
ABSTRACT

Achalasia cardia is among the conditions that pose a high risk of aspiration during induction of anaesthesia. This report is about a case of a 23-year-old male patient, where regurgitation and pulmonary aspiration occurred in a patient with achalasia cardia despite Rapid Sequence Induction (RSI). The risk of aspiration in conditions that cause stasis in the oesophagus is much higher due to the anaesthetic induced relaxation of the upper oesophageal sphincter and the proximity of the pooled contents to the oropharynx. The lower oesophageal sphincter being pathological in achalasia cardia does not relax. In this article, even though it is a case report of such an incidence, the various techniques that can be adopted to negate the risk have been explored. Preinduction oesophagoscopy and suctioning, video-laryngoscope guided intubation and ultrasound confirmation of Tracheal Tube (TT) position before initiating ventilation can be adopted in addition to head up positioning and RSI as an infallible technique to abolish the aspiration risk in patients with achalasia cardia. The case report is highlighted in the way to focus on describing safe ways of induction of anaesthesia where there is a high risk of aspiration.

Keywords: Anaesthesia, General, Inhalation, Injury, Lung

CASE REPORT

A 23-year-old, male patient presented with a history of difficulty in swallowing, regurgitation and heartburn since three years. Patient had Body Mass Index (BMI) of 20 kg/m^2 and was with grade I American Society of Anesthesiology (ASA) classification. Patient gave a history of nocturnal cough for three months. No history of recurrent upper or lower respiratory tract infection or postprandial choking. Barium swallow revealed a dilated thoracic oesophagus, more in the mid and lower 1/3rd with a maximum diameter of about 5.56 cm in the lower oesophagus and 3.5 cm in the upper oesophagus. A paucity of peristalsis and smooth tapering in the lower oesophagus with bird beak appearance was diagnostic of Achalasia cardia [Table/Fig-1a,b]. Upper gastrointestinal endoscopy showed the oesophagogastric junction at 44 cm and the Lower Oesophagal Sphincter (LES) was reported as remaining closed throughout the procedure. Stasis of food particles was not observed during the procedure. The patient was scheduled for laparoscopic Heller's cardiomyotomy.



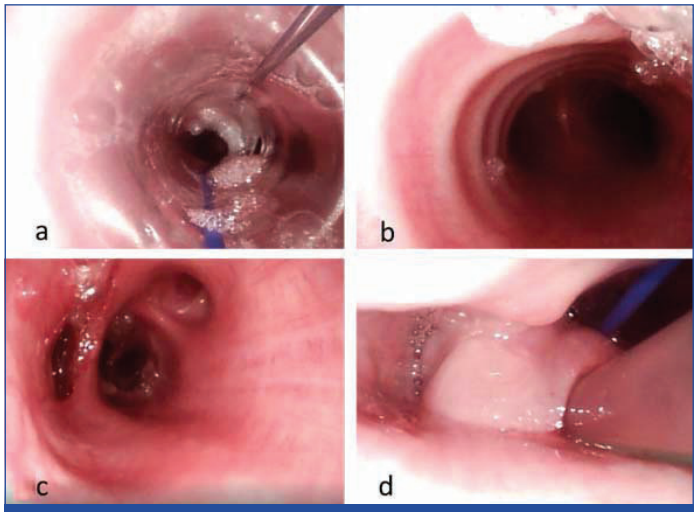
[Table/Fig-1]: Chest X-ray following barium swallow in (a) Posteroanterior view and (b) oblique view shows "bird beak" or "rat tail" appearance at the gastrooesophageal junction. The oesophagus above the narrowing is dilated. The air-fluid margin seen over the barium column indicates a lack of peristalsis.

The patient was kept nil per oral for 24 hours before surgery. He was given tablet pantoprazole 40 mg and tablet perinorm 10 mg on the night before surgery and morning of surgery. A Nasogastric Tube (NGT) was secured the night before surgery. In the pre-operative holding area, an intravenous line was secured and injection cefazolin 1 gm was given for surgical prophylaxis. In the operation theatre, routine monitoring {electrocardiogram, non invasive blood pressure, pulse oximetry and End-Tidal Carbon Dioxide ($EtCO_2$)} was established. To ensure that the tip of the NGT was in the oesophagus to thoroughly clear it of stagnant contents, the NGT was withdrawn to 40 cm at the alae nasi and about 30 mL of clear fluid was suctioned out. Injection fentanyl 100 mcg was given as premedication and preoxygenation was initiated in sniffing position. The RSI was done with injection propofol 100 mg i.v., injection succinylcholine 100 mg i.v. and cricoid pressure application was appropriately timed.

Once the fasciculations settled, direct laryngoscopy was done by the resident doctor who noticed a small collection of fluid in the pharynx and suctioned it out but failed to visualise the vocal cords and intubate. A second attempt at intubation was done by a senior anaesthesiologist. There was repooling of the fluid in the hypopharynx. A continuous suction was placed in the hypopharynx and the trachea was intubated with 8.0 mm Internal Diameter (ID) cuffed TT. The cuff was inflated and cricoid pressure was released. On ventilation, the bag felt very tight and there was no $EtCO_2$ waveform. Due to fear of ventilating into the oesophagus and aggravating chances of aspiration, the TT was hastily removed.

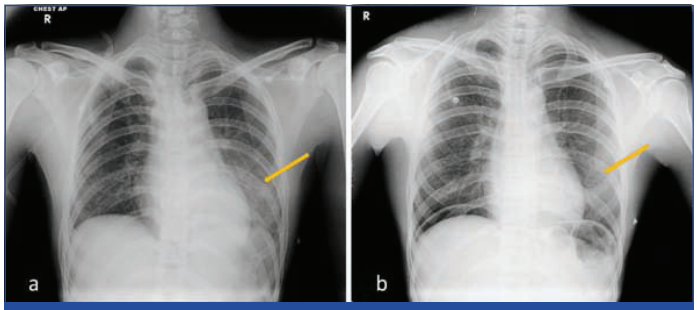
A 30 mg of propofol was supplemented, a third laryngoscopy attempt was made and the trachea was intubated. The tightness in the bag persisted and on trying to ventilate, the saturation dropped from 100% to 80%. At this point, authors suspected the silent chest to be due to intense bronchospasm precipitated by aspiration. Immediately the ventilation was stopped. The patient was instantly switched over to Trendelenberg position. The chest percussed to facilitate drainage of the aspirate into the central airways and endotracheal suctioning was done. About 5 to 10 mL of thin watery fluid was aspirated. Injection deriphyllin (Etofylline 84.7 mg and Theophylline 25.3 mg) i.v. and injection hydrocortisone 100 mg i.v. was given to break the bronchospasm. The plane of anaesthesia was deepened with injection propofol 30 mg i.v. and injection ketamine 25 mg i.v.

The spasm was partly relieved and bilateral air entry with polyphonic wheeze was now appreciated (right lung>left lung). The peak airway pressure was 40 cm H_2O, and the $EtCO_2$ trace showed a shark fin pattern. Salbutamol 4 puffs (100 mcg/puff) was given using a metered dose inhaler connected to the inspiratory limb of the breathing circuit and 2% sevoflurane was started. Fiberoptic bronchoscopy was done. Frothy secretions, which appeared like the tracheal mucosal reaction to a foreign material was noted in the trachea, both bronchi, as well as the openings of segmental bronchi [Table/Fig-2a-c]. No solid particles were seen. Over the next 30 minutes, the airway pressure decreased to 24 cm H_20. Saturation also improved to 99% with 40% inspired oxygen concentration (FiO2).



[Table/Fig-2]: a) Fiberoptic bronchoscopy shows frothy secretions indicative of the tracheal mucosal reaction to foreign material, more in the trachea around the TT: b) Varying extent in the carina; c) Primary bronchi as well as the openings of the segmental bronchi; d) No solid particles were seen. Fibreoptic bronchoscopy introduced through the mouth shows a collection of regurgitant in the hypopharynx around the endotracheal tube, nasogastric tube and the pyriform fossa despite frequent suctioning.

Injection metronidazole 500 mg was given i.v. and as the vitals were stable, and then proceeded with the surgery. The intraoperative period was uneventful, intermittent endotracheal suctioning was done. Frequent oral suctioning was required to clear out aspirate collecting in the oropharynx [Table/Fig-2d]. The surgery took three and a half hours with a total blood loss of 100 mL. Neuromuscular blockade was reversed and the patient was extubated when the patient was fully awake and after the return of protective reflexes. The patient's postoperative period was uneventful with no symptoms of cough, breathlessness, fever or any episodes of desaturation. Chest X-ray (CXR) on postoperative day (POD)-0 showed haziness in the mid to lower zone of the left lung and focal subtle reticulation indicating a resolving pattern was seen on POD-2 [Table/Fig-3a,b]. The patient was started on a liquid diet on POD-2 and was discharged on POD-4.



[Table/Fig-3]: a) Chest X-ray on postoperative day 0 shows haziness in the mid and lower zone of the left lung; b) Chest X-ray on postoperative day 2 shows focal subtle reticulation indicative of a resolving pattern.

DISCUSSION

Pulmonary aspiration is a term which is defined as the inhalation of either oropharyngeal or gastric contents into the respiratory tract [1]. Aspiration, is the most significant cause of airway related mortality in anaesthesia. It was responsible for 50% of the anaesthetic deaths and 17% had some primary airway events, leading to other morbidities like brain damage, or an emergency surgical airway. The cornerstone of management is prevention. The risks of aspiration increase with systemic illnesses like diabetes mellitus and local diseases like achalasia [2]. The practice of RSI, availability of airway gadgets with prophylactic measures against aspiration have decreased the incidence of aspiration

In this case, despite precautions such as 24 hour fasting, continuous oesophagal drainage and RSI, pulmonary aspiration could not be prevented. The key factor that favoured an uneventful recovery was the uninfected, non acidic and liquid nature of the oesophageal collections that had neither led to aspiration pneumonia or pneumonitis both of which have a turbulent course. The other contributory factors are the early diagnosis of aspiration as the cause of bronchospasm, active management of aspiration and awake extubation to prevent a similar occurrence during extubation.

Anaesthetic management of a patient with achalasia cardia should be geared towards prevention of aspiration during induction, early recognition of aspiration and appropriate treatment of aspiration if it occurs. Presently, there are no scoring systems to stratify the risk of aspiration in patients with achalasia. Our judgment that RSI would be sufficient to mitigate the risk was based on the absence of solid food particles on oesophagoscopy and no history of large volume regurgitate collecting in the throat on lying supine or during sleep. Nocturnal cough or history of recurrent lower respiratory infections indicate stasis and regurgitation into the pharynx due to relaxation of upper oesophageal sphincter during sleep, while postprandial choking suggests severe tracheal compression due to massive oesophageal dilatation [3,4]. Although the latter two symptoms were absent, the present case did give a history of nocturnal cough. A head-up position during induction also helps gravity assisted pooling of collections into the lower oesophagus and was routinely used in the days before the description of the Sellick's manoeuver [5]. It is probably not only the relative volume of the pooled contents in the oesophagus but also the consistency of the contents that determine the risk. In the report by Hay H, despite emergency intubation in supine, RSI was sufficient to prevent aspiration [4]. In this patient, as the contents were watery, relaxation of upper oesophageal sphincter following anaesthetic induction had probably resulted in early aspiration. This will most likely be the circumstance in any patient posted for elective surgery. A head-up position would have benefited in the present case. The degree of head-up tilt needed is bound to vary from patient to patient depending on patient characteristics as well as the relative volume and consistency of contents [6].

Prior suctioning through the NGT does not guarantee a total clearance of contents [7]. Oesophagoscopy with suctioning of collections under direct visualisation before induction can abolish aspiration in Achalasia cardia while the same may not be useful in conditions distal to the LES where there is a continual movement of gastric contents into the oesophagus following the relaxation of the LES under anaesthesia. Oesophagoscopy has been suggested but not routinely employed [8]. The disadvantage however is the discomfort during the procedure. Awake fibreoptic intubation is an alternative option that can be considered if the airway is also otherwise difficult.

In this particular scenario, the tight bag and silent chest had risen a doubt of oesophageal intubation. Apart from direct visualisation of TT passing through the vocal cords all other methods of confirmation of proper placement of the TT like the capnogram, bilateral air entry etc., can be done only following initiation of ventilation. The present day technologies such as video laryngoscopes and Point-Of-Care Ultrasound (POCUS) can be utilised to our advantage for confirming the proper endotracheal insertion without the necessity to ventilate

and either or both can be used in similar situations where the risk of aspiration is categorised as high [9].

During the management of aspiration, an important point to be emphasised is that the adult fibreoptic bronchoscope {Outer Diameter (OD) of 4.9 to 5.5 mm} used by anaesthesiologists have a small 2.0 mm working channel and is far inferior in suctioning when compared to the therapeutic bronchoscopes used by pulmonologists (OD of 6.0–6.2 mm) which have a working channel of 2.8 to 3.2 mm and hence cannot be relied upon if solid particles or large volumes of liquid aspirate have to be suctioned out quickly [10]. In the OT, the authors have to resort to endotracheal suctioning using 14 French (Fr) suction catheters through the TT or attach a 10 Fr catheter to the fibreoptic bronchoscope for targeted suctioning [11]. This will require the presence of an Endotracheal Tube (ETT) with a minimal ID of 8.0 mm.

CONCLUSION(S)

Anaesthetic emergencies can arise despite adequate preparation and planning. Experiences gained during the first hand management of such situations provide a platform to further conceptualise the management process and to inculcate and optimally utilise the technological advancements in the field for further refining our practices. Preinduction oesophagoscopy and suctioning, video-laryngoscope guided intubation and US confirmation of ETT position before initiating ventilation can be adopted in addition to head up positioning and RSI as an infallible technique to abolish the aspiration risk in patients with achalasia cardia.

REFERENCES

[1] Nason KS. Acute intraoperative pulmonary aspiration. Thorac Surg Clin. 2015;25(3):301-07. Doi: 10.1016/j.thorsurg.2015.04.011.
[2] Robinson M, Davidson A. Aspiration under anaesthesia: Risk assessment and decision-making, Continuing Education in Anaesthesia Critical Care & Pain. 2014;14(4):171-75. https://doi.org/10.1093/bjaceaccp/mkt053.
[3] Patel DA, Lappas BM, Vaezi MF. An overview of achalasia and its subtypes. Gastroenterol Hepatol. 2017;13(7):411-21.
[4] Dunlop SP, Travis SP. Achalasia presenting as acute stridor. Eur J Gastroenterol Hepatol. 1997;9(11):1125-28.
[5] Salem MR, Khorasani A, Saatee S, Crystal GJ, El-Orbany M. Gastric tubes and airway management in patients at risk of aspiration: History, current concepts, and proposal of an algorithm. Anaesth Analg. 2014;118(3):569-79.
[6] Hay H. Rapidly developing airway obstruction resulting from achalasia of the oesophagus. European Journal of Anaesthesiology. 2000;17(6):398-400.
[7] Sellick BA. Cricoid pressure to control regurgitation of stomach contents during induction of anaesthesia. Lancet. 1961;278(7199):404-06.
[8] Nishihara Y, Yoshida T, Ooi M, Obata N, Izuta S, Mizobuchi S. Anaesthetic management and associated complications of peroral endoscopic myotomy: A case series. World J Gastrointest Endosc. 2018;10(9):193-99.
[9] Mishra PR, Bhoi S, Sinha TP. Integration of Point-of-care Ultrasound during rapid sequence intubation in trauma resuscitation. J Emerg Trauma Shock. 2018;11(2):92-97.
[10] Paradis TJ, Dixon J, Tieu BH. The role of bronchoscopy in the diagnosis of airway disease. J Thorac Dis. 2016;8(12):3826-27.
[11] Rajkumar R, Tahir A. Augmentation of the suction capacity of a single-use flexible bronchoscope by attachment of a suction catheter. Med Read J Anaesth. 2020;1:1001-02.

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