

CASE REPORT

Iatrogenic perforation of a Zenker's diverticulum with a nasogastric tube

LN Hannivoort, JW Vermeijden

Department of Intensive Care, Medisch Spectrum Twente, Enschede, The Netherlands

Abstract - A Zenker's diverticulum (ZD) is a herniation of the proximal oesophagus. Patients often have complaints of swallowing or regurgitation, but the diverticulum can also be asymptomatic. We present the case of a patient with an undiagnosed ZD. The ZD was discovered after a nasogastric tube perforated the diverticulum and pleural fluid was aspirated through the tube. We discuss the pathophysiology, diagnosis and treatment of a ZD, as well as methods of confirming correct placement of nasogastric tubes.

Keywords - Zenker's diverticulum, perforation, nasogastric tube

Introduction

A Zenker's diverticulum (ZD) is a herniation of the posterior oesophageal mucosa, between the m. constrictor pharyngis inferior and the pars cricopharyngea. Generally, a ZD is discovered before perforation occurs. Perforations can occur due to swallowing sharp objects, such as pieces of bone or fish bones [1], but iatrogenic perforation as a result of endoscopy has also been documented [2]. In this case report we discuss a patient with an iatrogenic perforation of a previously undiagnosed ZD after nasogastric tube insertion.

Case

A 69-year-old female was admitted to the Intensive Care Unit after a mitral and tricuspid valvuloplasty, a reconstruction of the v. cava superior and multiple coronary bypasses. She was extubated seven days later. However, after a few hours the patient developed respiratory insufficiency and had to be reintubated. After intubation, a nasogastric tube was placed without any difficulty. Upon confirming the correct placement of the tube, a litre of clear pink fluid was aspirated. This appeared to be pleural fluid, probably secondary to the earlier cardiac surgery. The aspiration of pleural fluid raised the suspicion of an oesophageal perforation. Therefore, a chest X-ray was ordered after injecting contrast through the nasogastric tube. On the X-ray, the nasogastric tube was visible in the right pleural cavity, passing over the right hemidiaphragm (figure 1). The nasogastric tube was left in place, and an oesophagoscopy was performed to determine the level of perforation. The endoscopy showed a ZD, which was perforated by the nasogastric tube, at 14 cm from the incisors. Consecutively, a gastroscopy was performed to place a new nasogastric tube, after which the old tube was removed.

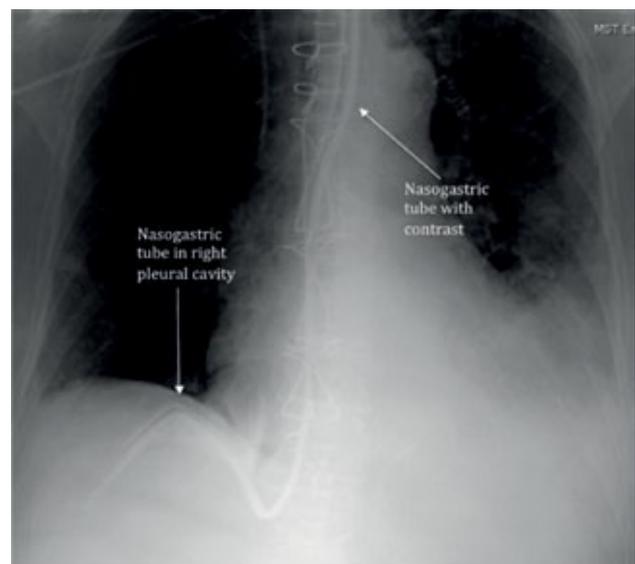
The patient was placed on a nil-per-os diet, total parenteral nutrition, and was started on broad-spectrum antibiotics. She did not develop any signs of mediastinitis, and a barium swallow two

weeks after the perforation showed no leaking of contrast into the mediastinum. Twenty days after the perforation, the patient was discharged from the Intensive Care Unit. To date, three years after the event, she has not undergone definitive treatment of her ZD.

Discussion

As indicated previously, a Zenker's diverticulum originates in the posterior side of the oesophagus, between the m. constrictor pharyngis inferior and the pars cricopharyngea. This area is also known as Killian's triangle. The pathophysiologic mechanism causing the ZD is unknown, but the current hypothesis is that the contraction and relaxation of the muscles involved in swallowing has become uncoordinated, and the pars cricopharyngea contracts or does not relax completely when food passes through. Over time, the resulting increase in pressure causes herniation of the oesophageal mucosa at the weakest spot: Killian's triangle.

Figure 1



Correspondence

LN Hannivoort

Email: lhannivoort@gmail.com

The ZD occurs more often in men than in women, and mainly in elderly people between 70 and 90 years of age. The most common complaint is dysphagia (80-90%); regurgitation of undigested food, halitosis and vocal changes can also occur. Aspiration and aspiration pneumonia are potentially fatal complications. Cervical borborygmi are nearly pathognomic for a ZD [3,4]. A barium swallow usually confirms the diagnosis; occasionally, a ZD is discovered during gastroduodenoscopy. Perforations mostly occur as complications of surgical or endoscopic treatment of the diverticulum and are rarely the first symptom of a ZD. Examples of iatrogenic perforations unrelated to treatment, are perforations caused by endoscopy [2] or transoesophageal echocardiography [5].

Recent literature mentions one case where a ZD may have been perforated by inserting a nasogastric tube, although the precise mechanism of perforation was not clarified [6].

There are several treatment methods, both surgical and (micro)endoscopic. Available techniques include suturing, stapling, electrocoagulation or lasercoagulation. Treatment of the diverticulum is usually combined with a myotomy of the upper oesophageal sphincter. This could potentially prevent high pressure while swallowing, which is presumed to be the cause of ZD, and thereby reduce the chance of recurrence [7].

Oesophageal perforation is one of many possible complications of a nasogastric tube insertion. Therefore, it is important to confirm the correct placement of the tube after insertion. The golden standard is an X-ray, which would show the tip of the nasogastric tube situated below the diaphragm [8,9]. However, this method is time-consuming, costly and exposes the patient to radiation. Unfortunately, all other commonly used methods are inferior in quality, with a lower sensitivity and specificity. The auscultation method, or "whoosh" test, is a method that was and still is commonly used. After insertion of the nasogastric tube, air is injected through the tube while auscultating the epigastric region for bubbling sounds. Recently, studies and guidelines advise

against this method, because the bubbling sounds are not easily differentiated from lung sounds or air in the pleural cavity. This is also the case with observing the aspirated fluid: many professionals have difficulty with correctly identifying gastric contents, and it is not always possible to aspirate fluid.

Another method that is becoming more favourable is checking the pH of the aspirated fluid. Gastric contents are usually acidic, with a pH below 5.5 [10]. However, many factors can influence this test. Continuous gastric feeding or medications such as proton pump inhibitors may increase the pH of gastric fluid, and regurgitation of gastric contents may lower the pH within the oesophagus. These conditions occur more often in intensive care patients, and therefore pH-analysis may not be as accurate in this category of patients, compared to patients on a regular ward or at home [11].

A third method is to measure the CO₂ in the nasogastric tube using capnography. A low amount of CO₂ would indicate the tube is in the digestive tract, whereas a high CO₂ would indicate the tube is in the upper airway. However, this method does not differentiate whether the tube is in the oesophagus or in the stomach, and therefore the test on its own is not enough to confirm the tube's correct placement [12].

Since no single test except for X-ray can accurately confirm the position of a nasogastric tube, a combination of aforementioned tests should be used, and in case of conflicting results, an X-ray should be performed [8,9].

Conclusion

The patient in our case report had an asymptomatic ZD, which was discovered after being perforated during insertion of a nasogastric tube. The patient's condition, specifically her respiratory deterioration, prevented surgical or endoscopic treatment of the ZD at that time. Therefore, she was treated conservatively, and at follow-up, two weeks later, there was no sign of leaking of contrast on a barium swallow.

References

- Al-Sebeih K, Abu-Shara KA, Sobeih A. Extraluminal Perforation Complicating Foreign Bodies in the Upper Aerodigestive Tract. *Ann Otol Rhinol Laryngol*. 2010; 119: p. 284-288.
- Martin-Hirsch DP, Lannigan FJ. Pharyngo-oesophageal Fistula Following Iatrogenic Perforation of a Pharyngeal Pouch. *J Laryngol Otol*. 1995 December; 109: p. 1215-1216.
- Nickloes TA. Zenker Diverticulum: eMedicine General Surgery. [Online]; 2009 [cited 24 November 2010]. Available from: [HYPERLINK "http://emedicine.medscape.com/article/194265-overview"](http://emedicine.medscape.com/article/194265-overview) <http://emedicine.medscape.com/article/194265-overview> .
- Ferreira LEVC, Simmons DT, Baron TH. Zenker's Diverticula: Pathophysiology, Clinical Presentation, and Flexible Endoscopic Management. *Dis Esophagus*. 2008; 21: p. 1-8.
- Sobrinho MA, Kozarek R, Low DE. Primary Endoscopic Management of Esophageal Perforation Following Transesophageal Echocardiogram. *J Clin Gastroenterol*. 2004; 38: p. 581-585.
- Frot-Martin B, Carlier RY, Morand-Blot V, Faye A, Bernard L, Vallée C. Zenker's Diverticulum Associated With Multilevel Cervical Osteomyelitis. *Spine*. 2001; 26: p. E193-E197.
- van Overbeek JJ. Pathogenesis and Methods of Treatment of Zenker's Diverticulum. *Ann Otol Rhinol Laryngol*. 2003; 112: p. 583-593.
- Vilans. Methods to confirm the position of a nasogastric tube (Dutch). [Online].; 2010 [cited 2011 May 26]. Available from: [HYPERLINK "http://protocollenvilans.kwaliteitshandboeken.nl/prot_boek/docb_sys/pdf/info/protocol/sondevoeding/controle_liggings_sonde_algemeen.pdf"](http://protocollenvilans.kwaliteitshandboeken.nl/prot_boek/docb_sys/pdf/info/protocol/sondevoeding/controle_liggings_sonde_algemeen.pdf) http://protocollenvilans.kwaliteitshandboeken.nl/prot_boek/docb_sys/pdf/info/protocol/sondevoeding/controle_liggings_sonde_algemeen.pdf .
- NVO (Nederlands Voedingsteam Overleg). NVO-standard Nasogastric Tube (Dutch). [Online].; 2010 [cited 2011 May 26]. Available from: [HYPERLINK "http://www.vkv.nl/LinkClick.aspx?fileticket=Cb3DHqAnOnQ%3D&tabid=866"](http://www.vkv.nl/LinkClick.aspx?fileticket=Cb3DHqAnOnQ%3D&tabid=866) <http://www.vkv.nl/LinkClick.aspx?fileticket=Cb3DHqAnOnQ%3D&tabid=866> .
- National Health Service. Reducing harm caused by misplacement of nasogastric feeding tubes. [Online].; 2005 [cited 2011 May 26]. Available from: [HYPERLINK "http://www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=60000&type=full&servicetype=Attachment"](http://www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=60000&type=full&servicetype=Attachment) <http://www.nrls.npsa.nhs.uk/EasySiteWeb/getresource.axd?AssetID=60000&type=full&servicetype=Attachment> .
- May S. Testing nasogastric tube positioning in the critically ill: exploring the evidence. *British Journal of Nursing*. 2007; 16: p. 414-418.
- Meyer P, Henry M, Maury E, Baudel JL, Guidet B, Offenstadt G. Colorimetric capnography to ensure correct nasogastric tube position. *Journal of Critical Care*. 2009; 24: p. 231-235.