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Case report

Respiratory distress and tracheal deviation secondary to sigmoid volvulus – A case report

Dificultad respiratoria y desviación traqueal secundaria a vólvulo sigmoideo – Un reporte de caso

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ABSTRACT

Introduction: The trachea is a semiflexible tube of 1.5 to 2 cm in width and 10 to 13 cm in length. Its deviation might be caused by not only diverse thoracic but also abdominal pathologies, which may compromise the airway. We present a case of a severe tracheal deviation due to an abdominal pathology causing displacement of mediastinal structures.

Clinical Case: A 78-year-old woman presents with difficulty breathing. History of chronic bedridden and frequently constipated, last stool 5 days prior. On physical examination, cachectic complexion, dry mucous membranes, breathing superficially with scarce wheezing, SatO2 82% on room air. Abdomen distended with an absence of bowel sounds. Chest x-rays show severe tracheal deviation and abdominal x-ray with coffee bean sign. A laparotomy evidences a large sigmoid volvulus. A sigmoidectomy and descending colon colostomy is performed. Room air oxygen saturation improved after extubation to 96%.

Conclusion: Desaturation and tracheal deviation were caused by a large sigmoid volvulus. Although these pathologies were thoracic, clinicians should suspect different underlying pathologies, in this case, abdominal.

Keywords: Intestinal volvulus; trachea; Respiratory Distress Syndrome

1. Introduction

The trachea is a semiflexible tube of 1.5 to 2 cm in width and 10 to 13 cm in length. It begins in the lower portion of the larynx between C6-C7 vertebrae, extending inferiorly to T4-T5 where it bifurcates into the two main bronchi for the lungs. The tracheal wall consists of up to 20 incomplete rings of hyaline cartilage forming the anterior and lateral circumference, with smooth muscle at the posterior wall, which is embedded into a fibrous membrane of elastic connective tissue. It connects the upper airway as a tunnel through the neck and superior mediastinum. (Brand-Saberi, 2014)

Due to the laxity of the trachea, it is vulnerable to position changes secondary to neck and thoracic pathologies that may increase pressure or volume, displacing the trachea. (Greene, 2013; Edwards, *et al.*, 2014; Chandra *et al.*, 2008; Prada, 2017; Shepard, *et al.*, 2018; Ghai, *et al.*, 2011; Mallat, *et al.*, 2010) Examples include thyroid goiter (Mallat, *et al.*, 2010), direct or indirect traumatism of the thorax or neck (Zhao *et al.*, 2017), congenital cardiac disease (Greene, 2013), swelling of surrounding structures (Perri, *et al.*, 2007), and structural deformities such as kyphoscoliosis (Kim, *et al.*, 2016), as well as pulmonary pathologies such as lung collapse, atelectasis, agenesis of the lung, pneumothorax, stenosis of the airway, or tumor growth (Shepard, *et al.*, 2018; Kim, *et al.*, 2016).

The volvulus of the sigmoid is a wrapping or twist of the sigmoid colon at the mesosigmoid, causing a colonic obstruction. Surgical management is recommended and depending on findings, sigmoidectomy, as it has a high recurrence and grave prognosis. However, if the volvulus is partial and chronic, the sigmoid may become distended significantly increasing its volume without wall rupture, displacing other abdominal organs (Sabri, *et al.*, 2020; Sivasankaran, *et al.*, 2006) Abdominal pathologies are rarely described as a cause of thoracic pathologies, much less a tracheal deviation.

A tracheal deviation may compromise airway ventilation, or impair intubation. (Kim, *et al.*, 2016) We present the case of a severe tracheal deviation due to a chronic sigmoid volvulus causing displacement of mediastinal structures. The present case report adheres to the CARE checklist for reporting clinical cases.

2. Clinical case

A 78- year-old woman presents to the emergency room due to difficulty breathing. History of depression, bedridden during the past 8 years, mute for the past 4 years, with assisted oral intake, and frequently constipated. The last stool is reported 5 days prior. The family denies any other important diagnosed medical history. On physical examination, cachectic complexion, dry mucous membranes, breathing superficially with scarce wheezing, SatO2 82% on room air. Abdomen distended to tension, tympanic, non-painful upon palpation, bowel sounds are absent. Chest x-ray reveals important tracheal deviation, mediastinal widening, and elevation of the diaphragm due to bowel dilation (Figure 1). The abdominal x-ray shows a coffee bean sign, most consistent with sigmoid volvulus, with abundant fecal matter in the rectum (Figure 2).

Figure 1 – Anterior-posterior projection of Chest x-ray.
Important tracheal deviation and mediastinal widening with slight shift to the right due to an elevated bilateral diaphragm due to dilated bowel.

Figure 2 – Anterior-posterior projection of an abdominal x-ray.
Significant dilatation of the bowels (suspected colon). Presence of heterogeneous opacities related to fecal content. Sign of the coffee bean most consistent with a sigmoid volvulus.

Due to the size of the sigmoid colon, and the risk of bowel ischemia, gangrene, and perforation, surgical treatment (laparotomy) is indicated by the assessing surgeon. The patient is stabilized, and the family accepts surgical treatment and signs informed consent. Laparotomy is performed 2 hours later. Anesthesiology reports moderate difficulty passing endotracheal tube. Under general anesthesia, the laparotomy is performed, finding the sigmoid colon distended (>15cm diameter), with a 180° rotation causing partial lumen obstruction, and abundant fecal matter. The bowel wall is thick, suggesting chronic distention. Due to the un-prepared colon (fecal contamination), a sigmoidectomy is performed, with descending colon colostomy and Hartman's procedure. Jackson-Pratt drain is placed. The procedure was uneventful. Room air oxygen saturation improved after extubation to 96%. Post-surgical chest x-ray shows improvement of tracheal deviation and mediastinum (**Figure 3**)**.** The patient begins oral-intake 24 hours post-intervention and is managed as an out-patient on the 4th postoperative day, with a functional colostomy.

Figure 3 – Postoperative control anterior-posterior Chest X-ray.
Improvement of mediastinal and the tracheal positioning. Distended gastric chamber.

One-month postoperative, the patient is admitted to intensive care due to severe dehydration, malnutrition, and pneumonia. Stools through colostomy daily or every other day. The patient is admitted to intensive care, where she is stabilized. Due to difficulty with oral intake and patient condition, an open gastrostomy under light sedation and local anesthesia is performed on the 14th in-hospital day, without surgical complications. She deceases 3 weeks later due to complications of pneumonia.

3. Discussion

The upper and lower mediastinal shift is a clinical and radiological marker that can assess the diagnosis of underlying pathology. The tracheal deviation is an indicator of upper mediastinal shift, and a shift in the position of the heart indicates a lower mediastinal shift. (Khajotia, 2012)

The tracheal deviation is normally caused by external forces, such as the increase in pressure in intrathoracic pathologies like tension pneumothorax, and masses that directly push the trachea laterally. Although it is not very common, another reason for a deviation could be caused by the elevation of the diaphragm caused by abdominal masses such as in the presented case. Ayala, J., *et al.* presented a case where an 11-year-old patient presented a delayed congenital diaphragmatic

hernia manifestation with the presence of gastric volvulus and marked mediastinal deviation. (Anaya-Ayala, *et al.*, 2008). Kang, B., *et al.* also documented a mediastinal shift caused by a large sigmoid adenocarcinoma. (Kang, *et al.*, 2020). Similar to the present case, all patients' primary complaints were shortness of breath, caused by the mediastinal shift they suffered, from an abdominal pathology. Although clinical findings also indicated abdominal pathology due to globular abdomen, the chest x-ray demonstrated evidenced bowel dilation under the diaphragm, confirmed with the abdominal x-ray. Although there were no signs of abdominal irritation, the low oxygen saturation and risk of colonic perforation indicated urgent surgical treatment. (Khajotia, 2012)

Radiology studies can aid in the planning process. X-rays provide valuable data but are limited by a two-dimension image. Computed tomography (CT) provides a detailed evaluation of a patient, allowing to evaluate all tissues, the cause of displacement, tumors, bony and/or anatomic deformities, among others. (Charles, *et al.*, 2019) In this case, it was not needed, as clinical and x-ray findings were highly consistent with a sigmoid volvulus. However, CT could have anticipated anesthesiology the severity of tracheal deviation for better intubation planning, while also excluding other more frequent neck pathologies. (Kim, *et al.*, 2016).

Sigmoid volvulus is associated with anatomical variations, chronic constipation, systemic and local neurologic disease, adhesions, pregnancy, toxins, megacolon, and metabolic disease. (Lal, *et al.*, 2006; Lou, *et al.*, 2013) The advanced age of the current patient and the corresponding aging physiological changes, such as sarcopenia, diminish neuronal chemical transmissions, thereupon the decrease in bowel movements altogether added to the condition where a bowel volvulus could arouse. Moreover, the chronic bedridden she was subjected to, increased the probability of constipation. The sigmoid was most likely exposed to partial obstruction, allowing it to increase its size progressively over time. This helped create a thicker muscular wall, preventing ischemia, gangrene, and colonic perforation due to bowel dilation. (Lou, *et al.*, 2013)

The gold standard for management is midline laparotomy with sigmoidectomy in case of necrosis or aperistaltic bowel. Although end-to-end anastomosis may be attempted, due to the fecal contamination, end-colostomy with Hartmann's procedure is recommended, with anastomosis in a second procedure. However, if the sigmoid maintains vascular and wall integrity, mespsigmoidopexy after detorsion may be indicated. Rectal tube placement and proctoscopy may be considered, nonetheless, these techniques have a risk of perforation and are specifically performed in patients with no evidence of peritonitis or ischemic bowel. (Kiyaka, *et al.*, 2021; Lou, *et al.*, 2013)

The clinical pearls of this case include the following. Bedridden patients, while low mobility, and neurological pathologies, can easily present constipation, which leads to an increase in sigmoid size, and in turn risk of volvulus. Although the primary symptom and motive for emergency care was shortness of breath and difficulty breathing, clinical reasoning should be applied by physicians to evaluate the patient as a whole, and consider alternative diagnoses and treatment options (Quiroga-Garza, *et al.*, 2020). Due to the age of the patient, medical history, and clinical presentation, pathologies such as acute heart infarction, pulmonary thromboembolism, and pneumonia, among others needed to de discarded.

4. Conclusion

Respiratory symptoms may be caused by non-thoracic pathologies. Physicians must always use clinical reasoning and evaluate all of the patient's medical history and clinical findings, to evaluate

differential diagnoses and treatment options. A large sigmoid volvulus was the cause of respiratory distress and tracheal deviation.

5. Conflicts of interest

The authors declare that there are no conflicts of interest to develop the work or publish it among the proponents and participants in this work.

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References

Anaya-Ayala, J. E., Naik-Mathuria, B., & Olutoye, O. O. (2008). Delayed presentation of congenital diaphragmatic hernia manifesting as combined-type acute gastric volvulus: a case report and review of the literature. *Journal of pediatric surgery*, *43*(3), E35–E39. https://doi.org/10.1016/j.jpedsurg.2007.11.015

Brand-Saberi BEM, Schäfer T. Trachea (2014): Anatomy and physiology. *Thorac Surg Clin.*;24(1):1-5. 10.1016/j.thorsurg.2013.09.004

Chandra P, Schmidt RM, Madan P, Topkara VK. (2008) Mediastinal sarcoma with deviated tracheal anatomy. *J Thorac Oncol.* 3(1):82-83. https://doi.org/10.1097/JTO.0b013e31815ba2b5

Fox, Charles J., III, Cornett, Elyse M., Ghali, G.E. (2019). Catastrophic Perioperative Complications and Management: A comprehensive textbook. Switzerland: Springer.

Edwards DS, Davis I, Jones NA, Simon DW. (2014) Rapid tracheal deviation and airway compromise due to fluid extravasation during shoulder arthroscopy. *J Shoulder Elb Surg*.23(7):e163-e165. 10.1016/j.jse.2014.03.006

Ghai A, Hooda S, Wadhera R, Garg N. (2011) Gross tracheal deviation: Airway challenges and concerns - Two case reports. *Acta Anaesthesiol Belg*.

Greene A, Gaver R. (2013) Tracheal deviation secondary to massive cardiomegaly in a two month old child with newly diagnosed total anomalous pulmonary venous return. *J Clin Anesth*.25(7):602-603. 10.1016/j.jclinane.2013.04.016

Kang, B. Y., Sioda, N., Rahma, A., Ali, M., Zhao, X., & Anzalone, T. (2020). Mediastinal Shift due to Obstipation from Sigmoid Adenocarcinoma. *American journal of respiratory and critical care medicine*, *202*(7), e113–e116. https://doi.org/10.1164/rccm.201910-1953IM

Khajotia R. (2012). Respiratory Clinics: MEDIASTINAL SHIFT: A SIGN OF SIGNIFICANT CLINICAL AND RADIOLOGICAL IMPORTANCE IN DIAGNOSIS OF MALIGNANT PLEURAL EFFUSION. *Malaysian family physician : the official journal of the Academy of Family Physicians of Malaysia*, *7*(1), 34–36.

Kim HJ, Choi YS, Park SH, Jo JH. (2016) Difficult endotracheal intubation secondary to tracheal deviation and stenosis in a patient with severe kyphoscoliosis -a case report. *Korean J Anesthesiol*.;69(4):386-389. https://doi.org/10.4097/kjae.2016.69.4.386

Kiyaka, S. M., Sikakulya, F. K., Masereka, R., Okedi, X. F., & Anyama, P. (2021). Sigmoid volvulus in an adolescent female: A case report. *International journal of surgery case reports*, *87*, 106430. https://doi.org/10.1016/j.ijscr.2021.106430

Lal, S. K., Morgenstern, R., Vinjirayer, E. P., & Matin, A. (2006). Sigmoid volvulus an update. Gastrointestinal endoscopy clinics of North America, 16(1), 175–187. https://doi.org/10.1016/j.giec.2006.01.010

Lou, Z., Yu, E. D., Zhang, W., Meng, R. G., Hao, L. Q., & Fu, C. G. (2013). Appropriate treatment of acute sigmoid volvulus in the emergency setting. *World journal of gastroenterology*, *19*(30), 4979–4983. https://doi.org/10.3748/wjg.v19.i30.4979

Mallat J, Robin E, Pironkov A, Lebuffe G, Tavernier B. (2010) Goitre and difficulty of tracheal intubation Goitre et difficulte. *Ann Fr Anesth Reanim*;29(6):436-439. 10.1016/j.annfar.2010.03.023

Perri B, Cooper M, Lauryssen C, Anand N. (2007) Adverse swelling associated with use of rh-BMP-2 in anterior cervical discectomy and fusion: a case study. *Spine J*.;7(2):235-239. 10.1016/j.spinee.2006.04.010

Prada LR. (2017) A Case of a Rapidly Enlarging Neck Mass with Airway Compromise. *J Clin Diagnostic Res*.;11(5):14-16. 10.7860/JCDR/2017/25685.9874

Quiroga-Garza, A., Teran-Garza, R., Elizondo-Omaña, R. E., & Guzmán-López, S. (2020). The Use of clinical reasoning skills in the setting of uncertainty: a case of trial femoral head migration. Anatomical Sciences Education, 13(1), 102-106.

Sabri Selcuk Atamanalp. (2020). Sigmoid volvulus: An update for Atamanalp classification. Pakistan Journal of Medical Sciences, 36, 1137-1339.

Shepard J-AO, Flores EJ, Abbott GF. (2018) Imaging of the trachea. *Ann Cardiothorac Surg*.;7(2):197-209. 10.21037/acs.2018.03.09

Sivasankaran, S., Kawamura, A., Lombardi, D., & Nesto, R. W. (2006). Gastric volvulus presenting as an acute coronary syndrome. Texas Heart Institute journal, 33(2), 266–268.

Zhao Z, Zhang T, Yin X, Zhao J, Li X, Zhou Y. Update on the diagnosis and treatment of tracheal and bronchial injury. *J Thorac Dis*. 2017;9(1):E50-E56. 10.21037/jtd.2017.01.19

RESUMEN

Introducción: La tráquea es un tubo semiflexible de 1-5 a 2 cm de ancho y 10 a 13 cm de longitud. Puede presentar desviaciones en su trayecto, no solo por patologías torácicas, sino también abdominales, las cuales pueden comprometer la vía aérea. Presentamos el caso de una desviación severa de la tráquea por una patología abdominal que ocasionó desplazamiento de las estructuras mediastinales.

Reporte de caso: Mujer de 78 años que se presenta por dificultad respiratoria. Antecedente de postramiento crónico en cama y estreñimiento frecuente, con última deposición 5 días previos. En la exploración física presenta complexión caquéctica, mucosas secas, respiración superficial

con sibilancias, saturando 82% al aire ambiente. Abdomen distendido con ausencia de ruidos intestinales. Radiografía torácica muestra desviación traqueal severa y la radiografía abdominal muestra signo del grano de café. En el abordaje por laparotomía se evidencia un vólvulo sigmoideo grande. Se realizó sigmoidectomía y colostomía del colon descendiente. La saturación al aire ambiente mejoró después de la extubación a 96%.

Conclusión: La desaturación y desviación traqueal fueron causadas por un vólvulo sigmoideo grande. Aunque estas patologías eran torácicas, el clínico debe sospechar diferentes patologías de base, como en este caso, abdominales.

Palabras clave: vólvulo intestinal; tráquea; síndrome de dificultad respiratoria.