American Journal of Case Reports

e-ISSN 1941-5923
© Am J Case Rep, 2018; 19: 244-248
DOI: 10.12659/AJCR.906846

Received: 2017.08.27
Accepted: 2017.10.04
Published: 2018.03.05

Bilateral Pneumothoraces in a Trauma Patient After Dobhoff Tube Insertion

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABCDEF 1 **Ali Abidali**
ABDEF 1,2 **Alicia Mangram**
CDEF 1,2 **Gina R. Shirah**
ACDE 1 **Whitney Wilson**
ADE 3 **Ahmed Abidali**
E 4 **Phillip Moeser**
ABCDEF 1,2 **James K. Dzandu**

1 Department of General Surgery, HonorHealth John C. Lincoln Medical Center, Phoenix, AZ, U.S.A.
2 Department of Trauma Surgery, HonorHealth John C. Lincoln Medical Center, Phoenix, AZ, U.S.A.
3 New College of Interdisciplinary Arts and Sciences, Arizona State University, Glendale, AZ, U.S.A.
4 Medical Diagnostic Imaging Group, HonorHealth John C. Lincoln Medical Center, Phoenix, AZ, U.S.A.

Corresponding Author: Alicia Mangram, e-mail: Alicia.Mangram@honorhealth.com
Conflict of interest: None declared

Patient: Male, 74
Final Diagnosis: Pneumothorax
Symptoms: Hypoxemia • shortness of breath
Medication: —
Clinical Procedure: —
Specialty: Surgery

Objective: Diagnostic/therapeutic accidents

Background: Dobhoff tube insertion is a common procedure used in the clinical setting to deliver enteral nutrition. Although it is often viewed as an innocuous bedside procedure, there are risks for numerous complications such as tracheobronchial insertion, which could lead to deleterious consequences. We present to our knowledge the first reported case of bilateral pneumothoraces caused by the insertion of a Dobhoff tube. In addition, we also discuss common pitfalls for confirming the positioning of Dobhoff tubes, as well as risk factors that can predispose a patient to improper tube placement.

Case Report: We present the case of a 74-year-old male patient with multiple orthopedic injuries following an auto-pedestrian collision. Five attempts were made to place a Dobhoff tube to maintain enteral nutrition. Follow-up abdominal x-ray revealed displacement of the Dobhoff tube in the left pleural space. After removal of the tube, a follow-up chest x-ray revealed iatrogenic bilateral pneumothoraces. Acute hypoxemic respiratory failure ensued; therefore, bilateral chest tubes were placed. Over the next three weeks, the patient's respiratory status improved and both chest tubes were removed. The patient was eventually discharged to a skilled nursing facility.

Conclusions: Improper placement of Dobhoff tubes can lead to rare complications such as bilateral pneumothoraces. This unique case report of bilateral pneumothoraces after Dobhoff tube placement emphasizes the necessity of using proper diagnostic techniques for verifying proper tube placement, as well as understanding the risk factors that predispose a patient to a malpositioned tube.

MeSH Keywords: Chest Tubes • Enteral Nutrition • Iatrogenic Disease • Intubation, Gastrointestinal • Pneumothorax

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/906846

2469 — 4 13

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

Background

A Dobhoff tube is a narrow-bore flexible tube with a diameter of 4 mm, used to deliver enteral nutrition. It is used in patients with a functional gastrointestinal tract, but who are unable to meet their nutritional requirements through oral intake [1,2]. Unlike nasogastric tubes, which can be used for gastrointestinal drainage, suction cannot be applied to a Dobhoff tube, limiting its use to enteral feeding and medication delivery. Furthermore, Dobhoff tubes have a smaller diameter and are more flexible when compared to nasogastric tubes, making it more comfortable for patients.

Dobhoff tubes are inserted into the stomach or the duodenum by way of nasal passage with the use of a guidewire, called a stylet, which is removed after confirmation of correct placement. Dobhoff tubes have a metal weighted end composed of lead and wrapped in silicone that helps guide it through the gastrointestinal tract. The tip of the Dobhoff tube can be placed either in the stomach or in the second or third portion of the duodenum to achieve post-pyloric feeding [2]. Post-pyloric feeding is another advantage that Dobhoff tubes provide, since this is not achievable with nasogastric tubes. Common indications for post-pyloric feeding include patients with increased risk for aspiration, significant esophageal reflux, or gastric outlet obstruction [2].

The current gold standard for diagnostic confirmation of a blindly inserted Dobhoff tube placement for purposes of enteral nutrition or medication delivery is radiographic examination (level A evidence) [3]. Radiographically, a correctly positioned tube should pass vertically midline below the level of the carina, it should not enter the right or left bronchi, and the tip of the tube should be visible below the level of the diaphragm.

The use of Dobhoff tubes are not without complications. Due to the tubes metal stylet, the tube can be inadvertently directed into the airway, especially in patients with altered gag or cough reflex [2]. If the mal-positioned tube is advanced into the lung, the metal stylet provides enough rigidity to cause tracheopulmonary complications, including pneumothoraces [1,2,4]. A study of 9,931 insertions of narrow-bore feeding tubes revealed that 1.9% of tube insertions were misplaced into tracheobronchial tree. Of the 187 tube misplacements, there were 35 cases of pneumothoraces, five of which resulted in patient's death [5].

The purpose of this case report is to present a patient who sustained bilateral pneumothoraces following Dobhoff tube placement, discuss methods for assessing tube position, and describe risk factors that may predispose a patient to a mal-positioned tube. There are numerous case reports of Dobhoff tube insertions causing unilateral pneumothorax, but to our knowledge, this case is the first to document bilateral pneumothoraces.

Case Report

74-year-old Caucasian male with history of alcohol abuse presented as a trauma I after an auto-pedestrian collision. On presentation, the patient's airway was patent, with normal respirations. He was hemodynamically stable: blood pressure was 110/59 mm Hg, heart rate was 57 beats per minute, oxygen saturation was 100% on room air. His Glasgow coma scale (GCS) was 15, He was intubated in the trauma bay for reduction and splinting of multiple limb fractures. Trauma workup included the following: history, physical, computed tomography (CT) of the head, neck, chest, abdomen, pelvis, x-rays, and focused assessment with sonography for trauma (FAST). The patient was noted to have the following injuries. Chest injuries included the right clavicular and eight rib fractures, left ninth and tenth rib fractures, with no evidence of pneumothorax. Limbs injuries included open right ulna fracture with radial head dislocation, closed right medial malleolus and fibular neck fracture, open left tibia and fibula fracture.

Standard management for the patient's injuries were instituted, including intramedullary nail rodding of the left tibia, open reduction, and internal fixation of left fibula, right radius, and ulna. The patient was extubated on hospital day (HD) 2. On HD 4, the patient was diagnosed with alcohol withdrawal. Standard clinical institution withdrawal assessment for alcohol (CIWA) was initiated, which included the use of benzodiazepines as treatment. Due to his altered mental status and concern for aspiration, he was evaluated by a speech therapist and was classified as a high risk for aspiration. Therefore, his diet was changed to NPO (nothing by mouth). In efforts to maintain enteral nutrition and avoid prolonged starvation, the decision was made to place a temporary Dobhoff tube. Initial attempts by the registered nurse to insert the Dobhoff tube across the nasopharynx were met with resistance. Initial attempts failed to traverse the tube without resistance, and a more senior nurse attempted to insert the Dobhoff tube. Five attempts in total were made to pass the tube into the stomach. Ultimately, the tube was advanced to 65 cm. Auscultation of the epigastric region with insufflation of air into the tube revealed a loud "whooshing" sound, which suggested proper placement. Aspirate from the feeding tube was retrieved, which was presumed to be gastric contents. Throughout the course of the feeding tube placement, the patient neither coughed excessively nor experienced any respiratory distress.

Follow-up abdominal x-ray (Figure 1) revealed the Dobhoff tube had traversed the left main stem bronchus, into the left pleural space. The tip of the feeding tube reached far inferolaterally

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Figure 1. Abdominal x-ray revealing the Dobhoff tube traversing the left main stem bronchus into the pleural space with the tip resting far inferolaterally (see arrow).

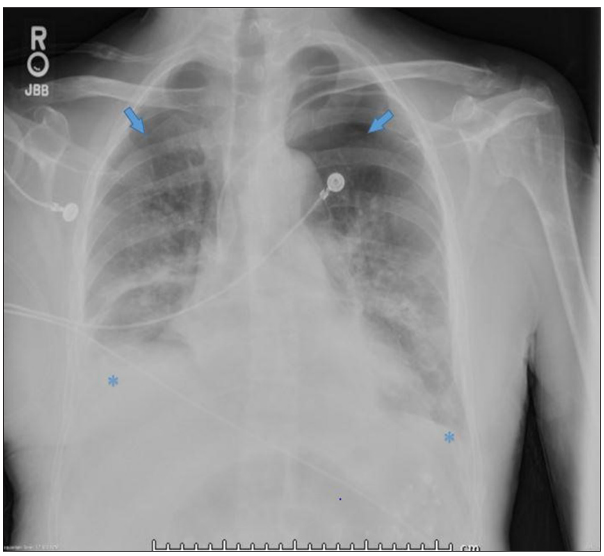

Figure 2. Chest x-ray after feeding tube was removed, revealing bilateral apical pneumothorax left greater than right (see arrows). Also shown in the x-ray are bilateral pleural effusions right greater than left (asterisks).

at the level of L2. Immediately after interpreting the x-ray, the radiologist instructed the nurse to remove the Dobhoff tube, and to order an immediate chest x-ray. The Dobhoff tube was promptly removed, and the chest x-ray revealed bilateral pneumothoraces (Figure 2). Of note, prior daily chest x-rays, including

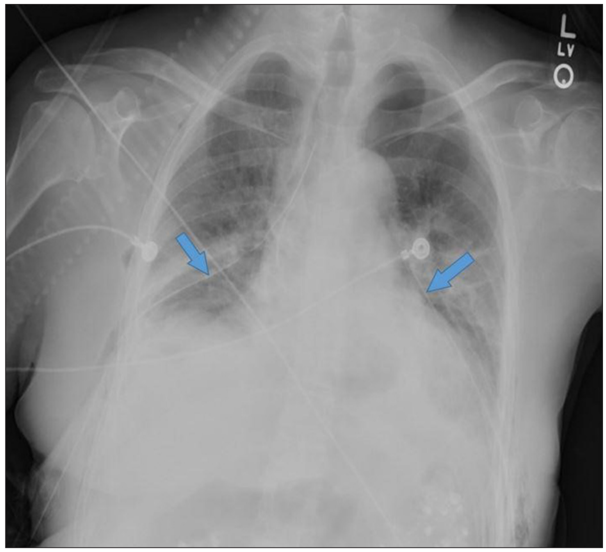

Figure 3. Chest x-ray revealing bilateral chest tubes (see arrows) with near resolution of bilateral pneumothorax.

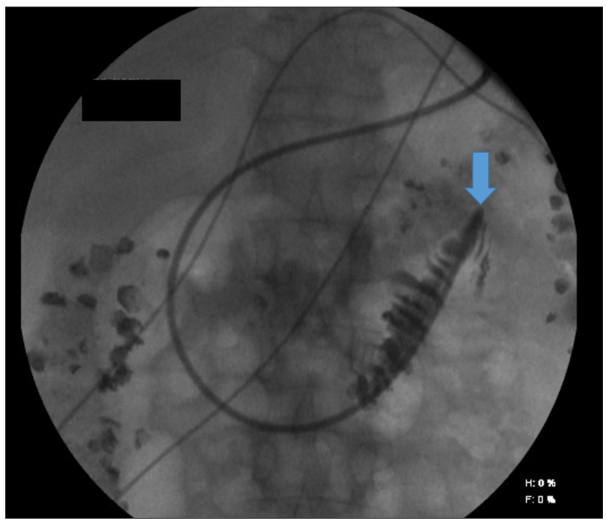

Figure 4. Abdominal x-ray after fluoroscopic guided Dobhoff tube placement. Small amount of contrast injected to confirm Dobhoff tube (see arrow) positioning in the fourth portion of the duodenum.

one earlier that morning, revealed no evidence of pneumothorax. The patient then went into respiratory distress requiring BiPAP (bilevel positive airway pressure). Bilateral 28F chest tubes were placed. Resolution of right and decreased size of left pneumothorax was visualized on repeat chest x-ray (Figure 3).

On HD 5, the patient underwent a fluoroscopic guided Dobhoff tube placement to maintain enteral nutrition. The Dobhoff tube was advanced through the right nasal cavity, and the tube was confirmed to be in the distal esophagus. A Bentson wire was used to advance the tube into the fourth portion of the duodenum (Figure 4). A small amount of contrast was injected to

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)
Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

confirm duodenal placement of the tube. There were no complications with this insertion of the Dobhoff tube. On HD 6, the patient was intubated due to hypercapnic respiratory failure and worsening mental status changes; pneumothoraces remained stable and chest tubes remained on suction. On HD 8, the patient was started on broad spectrum antibiotics for pneumonia and extubated. After complete resolution of the pneumothoraces, the left chest tube was removed on HD 11 and the right chest tube removed on HD 12. The patient remained in the hospital due to severe soft tissue injury to the left lower extremity, which required a split thickness skin graft on HD 16. On HD 20, the Dobhoff tube was removed, and a pureed diet was initiated after evaluation by the speech therapist. On HD 25, the patient was discharged to a skilled nursing facility. Prior to discharge the patient was educated about his injury, including care plan expectation for the iatrogenic bilateral pneumothoraces, and extremity injuries. The patient failed to appear during a scheduled follow-up visit at the trauma clinic office.

Discussion

This case report describes bilateral pneumothoraces secondary to Dobhoff tube placement in a critically ill trauma patient. There are over 1.2 million feeding tubes insertions annually in the United States [4], with no known reported cases of bilateral pneumothoraces secondary to Dobhoff tube displacement. Often deemed as a benign procedure, feeding tube insertions carry a 2% risk of malposition within the tracheobronchial tree, a 0.7% risk of pneumothorax/hemothorax, and a 0.3% risk of death [6]. To place the risks of Dobhoff tube insertion into perspective, previous studies have shown a 1.3% risk of pneumothorax with central line insertions. While feeding tube insertion avoids the risk of line infection, the risks of pulmonary complications with Dobhoff tube insertion are comparable to that of central line placement.

In this case, the patient's pneumothoraces were managed appropriately with bilateral chest tubes, which provided near complete resolution (Figure 3). To explain the bilaterality of pneumothoraces, we speculate that the Dobhoff tube was initially inserted into one side of the airway causing a pneumothorax on that side. After repeated failed attempts, the Dobhoff tube likely passed through the contralateral airway, causing a second pneumothorax on the contralateral side. Each unsuccessful attempt to insert the tube into position likely increased the patient's risk for tracheopulmonary complications.

Another possible explanation for the bilateral pneumothoraces is diagnosis of buffalo chest syndrome. The term "buffalo chest" arose due to the fact that the buffalo has a single pleural cavity, lacking separation of the two hemithoraces. In normal human anatomy, there are two distinct, anatomically separated pleural cavities. However, there are numerous case reports describing buffalo chest syndrome, including one that describes bilateral pneumothoraces after a percutaneous procedure on one side of the hemiothorax, suggesting the diagnosis of buffalo chest syndrome [7]. In regard to our patient, placement of a single chest tube on one side of the hemithorax with resolution of bilateral pneumothoraces would have confirmed diagnosis of buffalo chest syndrome. However, in the acute clinical setting, the diagnosis of buffalo chest syndrome was not part of the differential at the time.

Although fluoroscopic guided feeding tube placements are costly [2], they possess an extremely low complication rate. A study comparing 126 fluoroscopic guided feeding tube placements and 242 blind bedside feeding tube placements revealed a 4% complication rate with blind bedside tube placements, and 0% complication rate with fluoroscopic tube placements [8]. With such diminished risk of complications, continued, unsuccessful attempts of blind bedside Dobhoff tube placement should be avoided, and a more effective and safer modality should be pursued such as fluoroscopic guided Dobhoff tube placement.

There are numerous drawbacks to blind bedside confirmatory testing for Dobhoff tube placements. In our case, the registered nurse auscultated over the abdomen while he injected air into the Dobhoff tube to assess the position of the tube. The loud "whooshing" sound incorrectly suggested proper placement. It has been demonstrated in prior studies that air may still be auscultated in patients who have undergone tracheobronchial tube placement [6,9,10]. According to published reports [10], the sensitivity of auscultation in the left upper quadrant of the abdomen, to determine gastric positioning of inserted feeding tubes was 41.6%. Moreover, there are also pitfalls in visual analysis of gastric content aspirate to assess Dobhoff tube positioning. Pleural fluid can be aspirated from a mal-positioned tube in the pleural space and by visual analysis alone could be mistaken for gastric contents [10]. Previous studies have demonstrated a 57.5% sensitivity for determining gastric positioning of feeding tubes by analyzing gastric aspirate appearance [10]. With such low sensitivities, auscultation over the abdomen with air injection into the tube and visual analysis of aspirated tube contents may provide false reassurances for tube positioning and should not be used alone to assess Dobhoff tube position [6,9,10].

There is a myriad of bedside tests used to assess proper placement of Dobhoff tubes. According to the American Association of Critical Care Nurses practice guidelines, bedside techniques to assess Dobhoff tube positioning for purposes of enteral nutrition should not be used as a sole means to confirm placement [3]. Rather, they should be used to help determine the optimal time for radiographic confirmation of tube position. Color change capnography used to detect carbon dioxide may allow assessment of tracheobronchial placement. However,

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

carbon dioxide may still be detected when the tube is not in the airway (i.e., in the mouth), and might not be detected when the tube is in the tracheobronchial tree if the ports are occluded [11]. In addition, pH testing of Dobhoff tube aspirate is another method to determine placement. A pH of less than 5.0 is used to indicate gastric placement. However, the pH method is not useful for detecting placement of a feeding tube in the esophagus, because the aspirate could be refluxed gastric fluid. Other limitations of pH testing include difficulty obtaining aspirate with small-bore tubes and gastric pH fluctuations with the use of acid reducing medications or recent ingestion of food [3]. Due to the limitations of bedside techniques in confirming Dobhoff tube placement, x-ray remains the gold standard in confirmatory testing [1,9,10].

It is also important to note that feeding tube insertions causing pulmonary complications are not always related to tracheobronchial insertion. A previous case report has shown a 70-year-old male who underwent nasogastric tube insertion was found to have a left pleural effusion. Follow-up endoscopy revealed a perforated esophagus attributed to the feeding tube insertion, and the patient ultimately required thoracotomy, wash-out, and primary esophageal repair [12]. Therefore, physicians should have a firm understanding of the wide variety of feeding tube complications as well as an understanding for patients who are at high risk for such complications.

Healthcare providers must also be cognizant of predisposing risk factors that may increase the risk of Dobhoff tube malpositioning during insertion. In particular, these risk factors include patients who are critically ill, heavily sedated, intubated, or those with altered level of consciousness [10,13]. These predisposing conditions result in the compromise of airway reflexes, swallowing mechanism, and the patient's ability to report discomfort during placement of the Dobhoff tube [10,13]. Our case report emphasizes this clinical pearl as it presents a patient with three of the four mentioned risk factors who ultimately sustained bilateral pnemothoraces due to a Dobhoff tube mal-positioning. Ironically, the aforementioned predisposing risk factors, which place patients at high risk for tracheopulmonary complications, are also common indications for Dobhoff tube insertions to maintain enteral nutrition. Therefore, it is imperative that clinicians understand proper techniques for Dobhoff tube placements, associated risk factors, proper methods of tube position assessment, and have an appropriate level of suspicion for the plethora of complications with every Dobhoff feeding tube insertion,

Conclusions

Dobhoff feeding tube insertions are associated with risks of malposition into the tracheobronchial tree, pneumothorax, esophageal perforation, and even death. To our knowledge, this is the first case to demonstrate bilateral pneumothoraces from Dobhoff tube insertion. In the setting of the difficult to place Dobhoff tube, we recommend fluoroscopic guided tube insertions instead of repeated blind bedside attempts. Bedside testing for Dobhoff tube positioning, such as auscultation over the abdomen and visual analysis of aspirate, lack sensitivity and should not be used as a sole means to confirm tube placement. All Dobhoff feeding tube positions should be confirmed radiographically prior to use. Healthcare providers should be aware of predisposing risk factors for a mal-positioned Dobhoff tube and have a high index of suspicion for pulmonary complications in all Dobhoff tube insertions. In efforts to standardize Dobhoff feeding tube insertions and reduce iatrogenic complications, our institution has undertaken the task of creating an algorithm for all Dobhoff feeding tube insertions subsequent to this incident.

Conflicts of interest

None.

References:

1. Mordiffi SZ, Goh ML, Phua J, Chan Y-H: Confirming nasogastric tube placement: Is the colorimeter as sensitive and specific as X-ray? A diagnostic accuracy study. Int J Nurs Stud, 2016; 61: 248–57
2. Aguilar-Nascimento JED, Kudsk KA: Clinical costs of feeding tube placement. J Parenter Enteral Nutr, 2007; 31(4): 269–73
3. Metheny NA: Initial and ongoing verification of feeding tube placement in adults (applies to blind insertions and placements with an electromagnetic device). Crit Care Nurse, 2016; 36(2): e8–e13
4. Smith C: A team-based protocol and electromagnetic technology eliminate feeding tube placement complications. Yearbook of Medicine, 2011; 2012: 409–11
5. Sparks DA, Chase DM, Coughlin LM, Perry E: Pulmonary complications of 9931 narrow-bore nasoenteric tubes during blind placement. J Parenter Enteral Nutr, 2011; 35(5): 625–29
6. Rassias AJ, Ball PA, Corwin HL: A prospective study of tracheopulmonary complications associated with the placement of narrow-bore enteral feeding tubes. Crit Care, 1998; 2(1): 25–28
7. Rali AS, Manyam H: Bilateral pneumothoraces following BiV ICD placement: A case of buffalo chest syndrome. Amer J Case Rep, 2015; 16: 703–6
8. Hillard AE, Waddell JJ, Metzler MH, Mcalpin D: Fluoroscopically guided nasoenteric feeding tube placement versus bedside placement. Sout Med J, 1995; 88(4): 425–28
9. Priest O, Phillips LD, Hanna GB: Risks of using bedside tests to verify nasogastric tube position in adult patients. Eur Med J Gastroenterol, 2014; 3: 49–56
10. Weinberg L, Skewes D: Pneumothorax from intrapleural placement of a nasogastric tube. Anaesth Intensive Care, 2006; 34(2): 276–79
11. Gilbert RT, Burns SM: Increasing the safety of blind gastric tube placement in pediatric patients: The design and testing of a procedure using a carbon dioxide detection device. J Pediatr Nurs, 2012; 27(5): 528–32
12. Isik A, Firat D, Peker K et al: A case report of esophageal perforation: Complication of nasogastric tube placement. Am J Case Rep, 2014; 15: 168–71
13. Freeberg SY, Carrigan TP, Culver DA, Guzman JA: Case series: Tension pneumothorax complicating narrow-bore enteral feeding tube placement. J Intensive Care Med, 2010; 25(5): 281–85

This work is licensed under Creative Common Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0)

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]