American Journal of Medical Sciences and Medicine, 2016, Vol. 4, No. 3, 63-65
Available online at http://pubs.sciepub.com/ajmsm/4/3/4

DOI:10.12691/ajmsm-4-3-4

Tension Pneumothorax Caused by Feeding Tube Malposition: How could It Be Prevented?

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Abstract Nasoenteric feeding tube placement is routine to ensure the enteral nutrition in critically ill patients, but pulmonary complications may be encountered when feeding tubes were placed blindly at the bedside. Herein, we present a case with tension pneumothorax caused by withdrawal of incorrect positioned feeding tube to left hemithorax and most recent approaches were revised to prevent pulmonary complications during the feeding tube placement.

Keywords: *nasoenteric feeding tube, tension pneumothorax*

Cite This Article: MD Yıldırım F, MD Kara İ, MD Eren R, MD Aygencel G, and MD Türkoğlu M, "Tension Pneumothorax Caused by Feeding Tube Malposition: How could It Be Prevented?" *American Journal of Medical Sciences and Medicine*, vol. 4, no. 3 (2016): 63-65. doi: 10.12691/ajmsm-4-3-4.

1. Introduction

Enteral feeding is a successful option for nutrition in critically ill patients; however, there may be complications during the placement of the feeding tubes. Nasoenteric feeding tubes are more flexible than nasogastric tubes and therefore, there may be difficulties in placement. Incorrect placement of the feeding tube into the lungs is a rare complication. Herein, we presents a case with tension pneumothorax that caused by withdrawal of the nasoenteric feeding tube incorrectly inserted into the lung.

2. Case

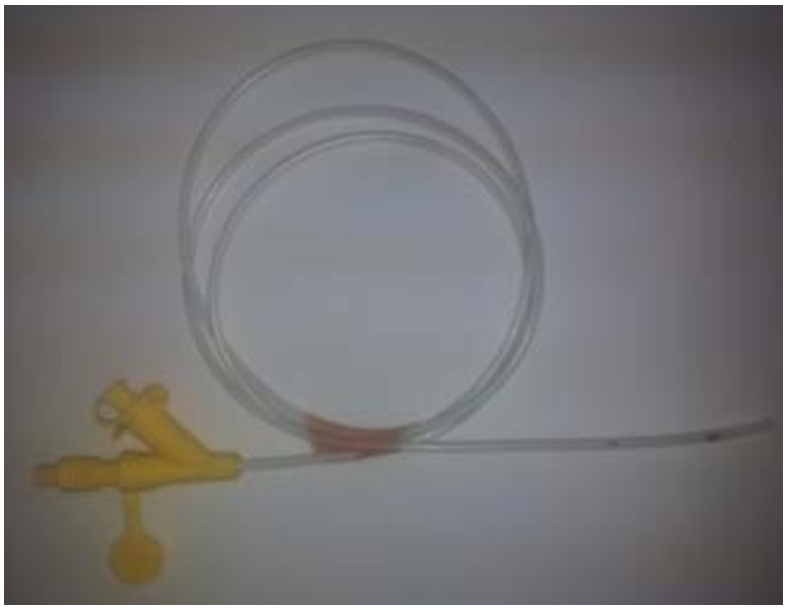

Figure 1. CompartR, 10-f/120cm feeding tube, inner diameter 2.5 mm, outer diameter 3.3 mm

A 52-year-old female, who was diagnosed with osteosarcoma two months ago, admitted to our hospital with nausea, vomiting, diarrhea, and impairment of general condition that developed after the last course of chemotherapy. At admission to the intensive care unit (ICU) her orientation and cooperation were poor. The vital

signs were as follows: arterial blood pressure: 40/20 mmHg, body temperature: 35.5 C, respiratory rate: 35/min, and heart rate: 120 beats/min. The patient had severe neutropenia; initially, fluid resuscitation was administered and vasopressor therapy was initiated considering septic shock. The patient developed cardiac arrest and was intubated. Subsequently, vasopressor therapy was discontinued at 24 hours following shock. An nasoenteric feeding tube was placed for the nutrition of the patient, which was a 10F/120 cm Compact® feeding tube (Figure 1). At first, the feeding tube was advanced to 50 cm with slight force. In order to determine if it was in the stomach at this point, a 50-ml injector was used to supply air and a stethoscope was used to listen to the gastric fundus. When the sound of air was heard, the patient was turned on her right side and the tube was advanced to 75 cm. An upper abdominal radiography was performed to confirm the tube location before initiating the nutrition therapy, and it was observed that the feeding tube did not pass through the abdomen; it followed the left main bronchus and entered into the left hemithorax (Figure 2a). The tube was removed immediately. During the removal of the tube, the patient developed sudden desaturation, tachypnea, and hypotension. A quick chest radiography was performed and revealed tension pneumothorax in the left hemothorax (Figure 2b). Therefore, an immediate tube thoracostomy was performed to ensure the expansion of the left lung (Figure 2c). Respiratory distress and hypotension were recovered in the first minutes following the placement of the chest tube. The tube of the patient that was was removed at the 12th hour and there were no additional issues at the follow-up.

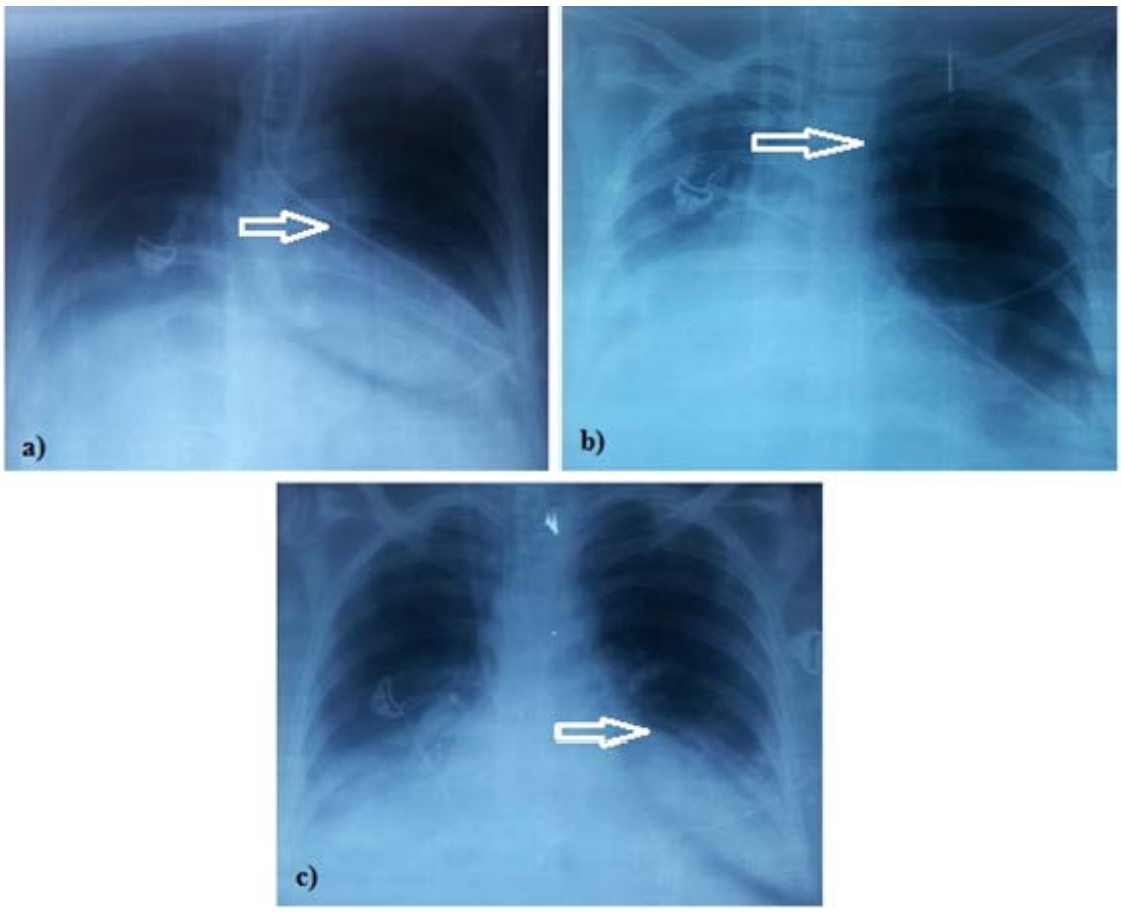

Figure 2. a) Feeding tube incorrectly placed in the left lung. b) Tension pneumothorax with mediastinal shift in the left hemithorax c) Left lung has been expanded with tube thoracostomy

3. Discussion

Early initiation of enteral feeding in critically ill patients is an important factor reducing the morbidity and mortality. Enteral feeding can be achieved by placing the feeding tubes inside the stomach or into the duodenum or small intestine by passing through the pylorus. The nasojejunal feeding tubes are considered to be associated with a safer placement due to their being softer and narrower; however, the associated complications are similar to those with the wider nasogastric tubes [1,2,3,4].

The nasoenteric feeding tubes are placed blindly at the bedside in many intensive care units (ICU). Out of the blindly-placed tubes, approximately 1.2% to 2% are placed inadvertently into the airways and 0.3% to 0.7% of such tubes cause pulmonary damage (such as pneumothorax, hemopneumothorax, hydrothorax, empyema, and pneumonia) [5,6].

There are some risk factors for the incorrect placement of the nasojejunal feeding tubes. The inadvertent tube placement becomes easier with the poor consciousness of the patient, presence of a critical disease, intubation (endotracheal or tracheotomy), lack of the cough reflex, difficulties in advancing the feeding tube, more than one attempt, improper patient movements during the procedure and existing anatomic anomalies. The fully-inflated balloon of the endotracheal tube or the tracheostomy cannula cannot prevent the feeding tubes from entering the lung in the patients under mechanical ventilation [5,7].

The patient presented here was confused and conscious, but was not cooperative. She was intubated and followed with mechanical ventilator. Although the balloon of the endotracheal tube was inflated, the tube was directed towards the left hemothorax.

The interventions to assist the proper placement of the nasoenteric feeding tubes have a wide spectrum from the simple bedside maneuvers to the electromagnetic technology. The applicable techniques include auscultation over the stomach by supplying air at bedside or aspiration of the gastric content. These methods are simple, quick, cheap, and easy to practice, but have poor reliability and accuracy. In the present case, the air was auscultated to the stomach during the placement of the feeding tube; however, it was inadvertently considered that the tube was in the stomach since it was directed towards the left lung lower lobe.

The use of imaging techniques is recommended when there are difficulties in the placement of the feeding tubes. Endoscopy, fluoroscopy, and bedside ultrasonography may be used during the tube placement. Additionally, the external magnetic guidance has been defined for confirming the location of the placement [8,9,10,11].

There are also colorimetric carbon dioxide sensors defined to minimize incorrect placement of the nasoenteral feeding tubes into the airways. The sensor is attached to the tube tip and changes color in the presence of carbon dioxide, suggesting that the tube is in the airway. Although it is considered helpful for the proper placement of the bedside feeding tubes, it is not used in clinical routine practice [12].

Abdominal radiography following the placement of the nasoenteral feeding tubes is considered the gold standard to establish tube placement; however, it has no effect on preventing the inadvertent placement during the procedure. A two-step radiography observation is recommended for this. The recommendation is to perform the radiography at 30 cm and to determine that the tube is directed towards the esophagus first, and then to advance and forward it to the stomach. However, this method is time consuming and causes additional radiation exposure for the patient [13].

In conclusion, the blind placement of the nasoenteric feeding tubes increases the risk for lung placement in patients with impaired deglutition and poor consciousness. Abdominal radiographies must be taken to determine the tube location and to follow-up the complications. The visual placement techniques seem to be safer than the blind placement in the critically ill patients.

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