

# Inadvertent Tracheobronchial Placement of Feeding Tube in a Mechanically Ventilated Patient

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Nasogastric (NG) tube misplacement into the airways is a rare complication. The presence of a cuffed endotracheal or tracheostomic tube often gives primary care providers a false sense of security. This report presents a case of inadvertent NG tube insertion into the right lower lobe bronchus of a 79-year-old patient with advanced chronic obstructive pulmonary disease, resulting in pneumonia and septic shock. In this report, the literature is reviewed, the influence of tube size on complications is compared, and the reliability of different methods to verify correct tube position is discussed. We conclude that a cuffed tracheostomic tube does not prevent advancement of a large-bore feeding tube into the tracheobronchial system. If any doubt exists regarding proper tube position, a chest radiograph should be obtained prior to initiation of feeding. [*J Chin Med Assoc* 2008;71(7):365–367]

**Key Words:** complication, feeding tube, misplacement, nasogastric tube

## Introduction

The common indications for nasogastric (NG) intubation are gastric decompression in patients with bowel obstruction, preventing aspiration in intubated patients, and as an adjunct for delivery of oral agents.<sup>1</sup> In patients with mechanical ventilator dependence, an NG tube in position is essential for enteric feeding and maintaining life. Long-term placement of NG tube is associated with complications such as ulceration and bleeding from the nose, pharynx, esophagus, and stomach.<sup>2</sup> However, risks associated with tube misplacement are often overlooked. The presence of a cuffed tracheostomic tube often gives health care staff a false sense of security that an NG tube will not pass into the tracheobronchial system. This report describes a case of inadvertent tube placement into the right main bronchus in a patient with chronic respiratory failure.

## Case Report

A 79-year-old male patient with advanced chronic obstructive pulmonary disease had been admitted to the

respiratory care ward (RCW) for long-term mechanical ventilator support 20 months previously. A tracheostomy was performed before his transfer to the RCW for anticipated prolonged mechanical ventilation. The tracheostomic tube used was a high-volume, low-pressure design (inside diameter of 8.5 mm; Bivona TTS™ Tracheostomy Tube, Smiths Medical, UK). The patient's medical history included diabetes mellitus and secondary adrenal insufficiency, both of which were under medical control. No previous episode of ventilator-associated pneumonia was noted during his hospital stay. Although bedridden, his consciousness remained clear and he was able to consume soft diet at a very slow speed. Nutritional support was delivered mainly via NG tube feeding, with periodic trials of oral intake.

On the morning of the patient's accident, a 16-Fr feeding tube without a guidewire (Silicon Stomach Tube, FortuneMed, Taiwan) was blindly inserted by a ward nurse as a scheduled change. Proper placement of the NG tube was checked by auscultation over the stomach while injecting 30 mL of air with a test syringe. Enteral feeding was started through the tube smoothly. During the night of the same day, a nursing assistant



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noticed that a loop of the NG tube had appeared in the patient's mouth when she tried to infuse milk. She pulled the tube back a little and then re-advanced it toward the stomach. When she began to infuse milk again, a bout of coughing was elicited. After several unsuccessful attempts, she opened the tube and let it drain freely. This event was not reported to the duty nurse.

The following morning, a ward nurse determined that the patient's NG tube was not functioning because milk infusion induced severe choking. The ward nurse observed some milk coming out of the tracheostomic tube. A chest roentgenogram revealed that the tube had passed the inflated tracheostomy tube balloon and entered 1 division of the right lower lobe bronchus, resulting in alveolar infiltrates of the right lung (Figure 1). On examination, the patient was tachypneic, with a respiratory rate of 30/min, and responded poorly to external stimuli. He had a severe cough with copious sputum. Wheezing could be easily heard without a stethoscope. The patient's white cell count was  $26,760/\text{mm}^3$ , with a differential count of 89% neutrophils, 6% band forms, 1.5% lymphocytes, and 3.5% monocytes. On the third day, his body temperature rose to  $39^\circ\text{C}$  and he became hypotensive. His blood pressure dropped to 75/47 mmHg and his heart rate was 140/min. He was transferred to the intensive care unit (ICU) and received aggressive treatment. He recovered uneventfully.

## Discussion

NG tubes are commonly used to aliment chronically ill patients who cannot eat by themselves.<sup>3,4</sup> Many complications of feeding tube misplacement have been described in the literature and include tracheobronchopleural complications,<sup>5-7</sup> intravascular penetration,<sup>5,8</sup> enteral complications,<sup>2,5</sup> and intracranial entry.<sup>5,9</sup> The incidence of inadvertent insertion of NG tubes into the airways ranges from 0.3% to 15%.<sup>2,10</sup> The presence of a cuffed endotracheal or tracheostomic tube often gives primary health care providers a false sense of security. However, several studies revealed that an endotracheal or tracheostomic tube *in situ* may actually increase the risk of feeding tube malposition.<sup>7,10,11</sup> Rassias et al prospectively analyzed 740 enteral feeding tube insertions performed in ICUs;<sup>10</sup> 14 cases of misplacement were identified and 13 of them had endotracheal tubes in place. They concluded that the 2 risk factors for tracheopulmonary placement of feeding tubes are endotracheal or tracheostomic intubation, and altered mental status. Endotracheal tubes increase



**Figure 1.** Chest roentgenogram shows that the feeding tube has passed the tracheostomy tube and entered 1 division of the right lower lobe bronchus (arrow), resulting in right lung pneumonia.

the risk of tracheobronchial entry by preventing glottic closure and inhibiting swallowing. Altered consciousness and sedation prevent an effective cough reflex.<sup>5</sup>

Most malpositioned NG tubes in intubated patients involved stylet-stiffened small-bore tubes.<sup>6,7,10-12</sup> Woodall and colleagues compared 3 different sizes of feeding tubes and their complications.<sup>7</sup> Only small-diameter (2.7 mm) tubes penetrated the pleura and caused pneumothorax. Placement of larger-diameter (4.3 mm) feeding tubes resulted in pneumonia, but did not lead to pneumothorax. Woodall and colleagues also used cadaveric models to evaluate the ease of passing feeding tubes beyond inflated endotracheal cuffs. When small-bore tubes were used, no resistance was detected while traversing inflated cuffs.<sup>7</sup> In contrast to previous studies, our case involved a large-bore (5.3 mm) tube without a stylet. Although the patient had a large-diameter tracheostomic tube in place, the soft silicon feeding tube still passed through the inflated high-volume, low-pressure cuff without difficulty.

Traditional signs of proper tube placement include smooth insertion to its full length, absence of coughing or respiratory distress during the procedure, positive auscultation over the epigastric area, and aspiration of gastric content from the tube.<sup>1,5</sup> However, none of these criteria are reliable. False confirmation of tube placement in the stomach by epigastric auscultation is not uncommon.<sup>6,13,14</sup> Aspiration of gastric contents for confirmation can also be misleading.<sup>10</sup> In the study performed by Rassias and colleagues, they found that malposition of the feeding tube was not predictable

from clinical signs and auscultation. Although all tubes were inserted by experienced critical care nurses and doctors, chest roentgenograms still detected 2% of malpositioned tubes in their patients, many of which were asymptomatic at diagnosis.<sup>10</sup>

A chest roentgenogram is regarded as the gold standard for verifying correct tube placement.<sup>5</sup> Unfortunately, interpreting supine chest X-rays in critically ill patients can be difficult.<sup>10,15,16</sup> A malpositioned feeding tube into the left lower lung may be misinterpreted as being in the stomach.<sup>7</sup> Roubenoff and Ravich proposed a 2-step protocol for NG tube insertion.<sup>11</sup> In this procedure, the feeding tube is initially advanced blindly to 30 cm and the position is verified by X-ray. After radiographic confirmation of the tube position in the esophagus, the tube is further inserted to its adequate length and a second radiograph is taken to check the final position. Marderstein et al applied this protocol at their hospital.<sup>12</sup> The rate of feeding tube-induced pneumothorax decreased from 0.38% to 0.09%. They also found that repeated malposition in the same patient was surprisingly common. In total, 32% of patients with 1 intrabronchial misplacement ultimately had multiple misplacements.<sup>12</sup> Although the 2-step procedure improves patient safety, it has several drawbacks. This protocol is time-consuming and exposes patients to 2 X-rays.<sup>5</sup> In that only a very small percentage of patients experience NG tube misplacement, the cost-effectiveness of this 2-step procedure should be evaluated before applying it to all patients. In our opinion, this maneuver could be restricted to those with intubation difficulty or with a history of tube malposition.

This case report highlights a rare and potentially lethal complication of NG tube misplacement. We believe that this patient's feeding tube entered his trachea when it was re-advanced by a nursing assistant. The medical staff failed to detect the malposition initially. Tube position should be checked carefully every time before initiation of feeding. If any question exists with regard to proper placement, a chest radiograph should be obtained prior to initiating feeding. A high index of suspicion for this complication in a compromised, chronically ill patient will prevent accidental

infusion of milk into the lungs. The presence of a cuffed tracheostomic tube does not prevent advancement of a soft, large-bore feeding tube. Routine post-intubation X-rays should be considered for high-risk patients.

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