An unusual malposition of the nasogastric tube in the pleural space: a case report

Dino Eminente, Sonia Zotti, Emanuele Gilardi, Tommaso Grandi, Silvia Navarin, Federica Sambuco, Francesco Travaglino

Emergency Department, Department of Emergency Medicine, Fondazione Policlinico Universitario Campus Bio-Medico di Roma, Italy

Abstract

Nasogastric Tubes (NGT) are widely used in hospitals, *e.g.* for the administration of nutrients or drugs and gastric release after major surgeries. Blind insertion of these tubes is usually performed by nurses, residents, and other health care providers. In this case report, we present an incident of misplacement of the NGT, located in the pleural space, and causing pneumothorax. NGT can be inserted accidentally into the airways leading to complications like pneumonia, pneumothorax, and even death. Mechanically ventilated patients are at high risk of having an NGT misplaced, since they often have reduced consciousness and weak cough reflex.

Correspondence: Dino Eminente, Department of Emergency Medicine, Fondazione Policlinico Universitario Campus Bio-Medico di Roma, Italy.
E-mail: dino.eminente@unicampus.it

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Introduction

A Nasogastric Tube (NGT) is a flexible tube made of silicone or polyurethane that can be inserted trans-nasally into the stomach.[1] It is commonly used for the delivery of feed, medications, fluids, or for drainage of gastric contents. NGT placement can be normally done bedside, although in patients with an abnormal anatomy, *e.g.* pharyngeal pouch, this may be done under X-ray guidance or in endoscopy.[2] If the patient shows signs of respiratory distress-like cough, gasping, or cyanosis, the tube may be entered into the trachea. This event requires the NGT to be withdrawn immediately to allow the patient to recover. If NGT insertion has failed after three attempts or if the tube has been pulled out by the patient on three occasions, it is recommended to contact an expert team as soon as possible.[3] Even tough pH impedance measurement is the gold standard to confirm the correct placement of NGT,[4] in clinical practice this is commonly confirmed via the whoosh test (auscultation *i.e.* introduction of air via the NGT whilst listening with a stethoscope), or by visual inspection of fluid from the tube, and observation of water bubbles.[5] According to current guidelines, pH≤5.5 as fist-line testing for initial NGT is considered safe and this range excludes placement in the respiratory tract.[4] However, for blind inserted NGT, an X-ray remains the safest method to confirm the tip position, being nowadays a rapid and low-cost procedure that does not require intravenous sedation, compared to real-time view technologies.

Case Report

A 79-year-old male was admitted to the Emergency Department for acute respiratory distress due to pneumonia. The patient had a Charlson Comorbidity Index of 8, including arterial hypertension, type 2 diabetes mellitus, chronic ischaemic heart disease with a previous placement of three stents, paroxysmal atrial fibrillation, peripheral arterial disease complicated by two tibial ulcers under regular ambulatory medications, chronic vascular encephalopathy, emphysematous Chronic Obstructive Pulmonary Disease (COPD) being a heavy smoker and mild obesity (Body Mass Index, BMI, 32). Despite these multiple comorbidities, the patient lived a regular life before hospital admission, being autonomous in performing daily activities.

He was taken by an ambulance to our emergency room due to a sudden onset of dyspnoea at rest in a recent history of fever, non-responsive to paracetamol for four days, that aggravated during the last hours until a drowsy state. The patient's vital parameters on admission to triage included a heart rate of 118 bpm, an arterial blood pressure of 147/86 mmHg, a peripheral oxygen saturation of 88% in Venturi mask with 31% fraction of inspired O_2, a respiratory rate of 30 breaths per minute and a body temperature of 37.7°C. The arterial blood gas analysis revealed a respiratory acidosis due

to a hypercapnic respiratory failure by multifocal pneumonia confirmed through the computed tomography of the chest performed after his arrival. Non-invasive mechanical ventilation was immediately started with good compliance through the use of oro-nasal mask and without the need for any sedative therapy, *e.g.* dexmedetomidine. After one day of non-invasive mechanical ventilation, despite a slight amelioration in arterial oxygenation, there was no improvement in the patient's neurological assessment, and an NGT was inserted for feeding purposes. Neither abnormal resistance nor cough reflex was noted during insertion. Fluid was aspirated via the NGT and a chest X-ray was performed. Meanwhile, a drop-bag was connected to the NGT, and, while the X-ray was being taken, serum-blood fluid accumulated in the bag (Figure 1). During the entire procedure, the patient's vital parameters remained stable. Despite the severity of his acute respiratory failure, there was no evidence of desaturation, tachycardia, or discomfort that could suggest any lung accidental insertion. As recommended by guidelines, a chest X-ray was performed to check the correct NGT positioning before its use. As shown in Figure 2, the imaging documented the NGT with its distal end into the right main bronchus. Therefore, the tube was immediately removed, and a chest X-ray was repeated after a few minutes, showing a moderate pneumothorax in the right apical site with the lung apex image seen at the posterior arch of the 4th rib and the collapse of the remaining right lung (Figure 3). The patient suddenly presented dyspnoea with severe desaturation requiring a manual ventilation while an emergency chest tube was inserted in 2nd right intercostal space obtaining a complete re-expansion of the lung as shown in Figure 4. Notwithstanding the immediate prescription of empirical

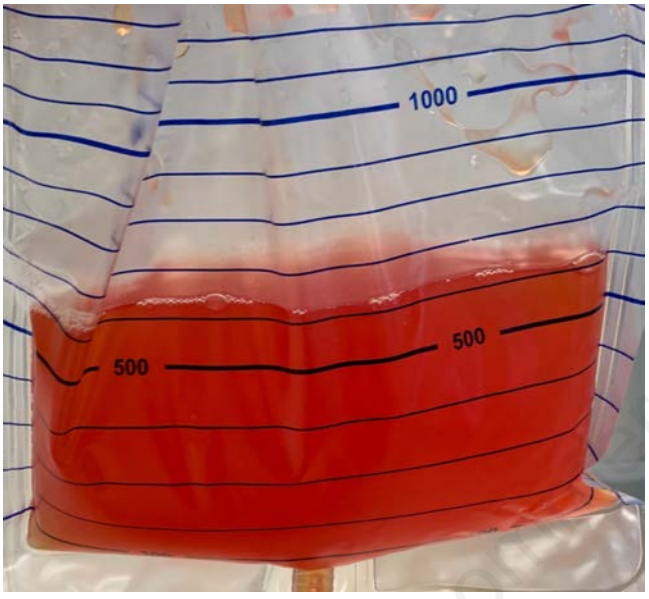

Figure 1. Naso-gastric tube serum-blood drainage.

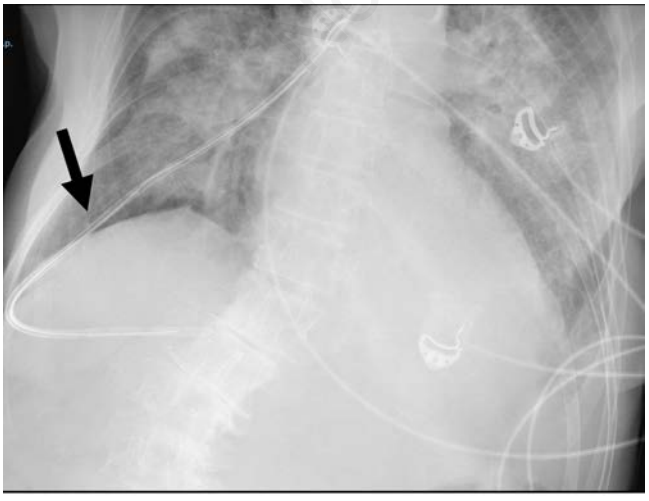

Figure 2. Naso-enteric tube with its distal end projecting at the right basal site seen by X-rays.

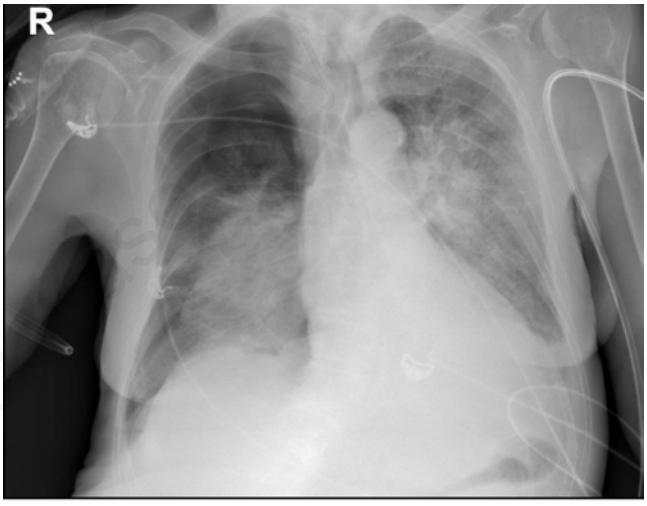

Figure 3. Apical pneumothorax with right collapsed lung.

Figure 4. Lung re-expansion after chest tube insertion.

antibiotic therapy to avoid mediastinitis, the patient's clinical condition progressively worsened and the pulmonary infection could not be controlled. He eventually presented a condition of septic shock, requiring blood cultures, an upgrade of antibiotic therapy, and the starting of inotropes to support vital parameters. The patient was transferred to the Intensive Care Unit but he passed away shortly afterwards.

Discussion and Conclusions

This case illustrates how a malposition of an NGT may lead to a potentially fatal event in acute clinically ill patients. Although considered a relatively simple and innocuous procedure, the integrative review on Adverse Events (AEs) caused by NGT around the world by Motta *et al*., concluded that bedside insertion of an NGT is associated with severe complications, most commonly respiratory ones.[6] Specifically the most frequent respiratory AE was pneumothorax, followed by pleural effusion and broncho-aspiration related to enteral nutrition. This was confirmed by the Food and Drug Administration (FDA) which reported 51 cases of pneumothorax related to NGT placement.[7] In most cases, urgent intervention was required, including needle decompression or chest tube insertion.[7] Despite what happened in our case report, Motta *et al*. also underlined that the inadvertent introduction of an NGT into the tracheal tree often resulted in patient discomfort.[6] This may be explained by the fact that hospitalized patients undergoing mechanical ventilation in severe respiratory failure, often present an altered consciousness and a weak or absent cough reflex.

In addition, several of these events reported in the review were associated with cardiopulmonary arrest and death.[6] This strongly underlines the importance of performing a chest X-ray before starting the enteral nutrition through the NGT. Chest X-ray, when properly performed and interpreted, is the most accurate method for distinguishing between gastric and pulmonary placement of a newly inserted NGT.[6] However, in high-risk patients (such as patients who are critically ill or have an altered level of consciousness or diminished or absent gag reflex), extra cautions should be taken and an NGT placement should be guided by fluoroscopy or endoscopy.[8] If a complication like a pneumothorax is present, early removal of the NGT should be mandatory in addition to the insertion of a chest tube by an expert team, if necessary.[9] Connection of the NGT to a water-seal one-way valve can help to detect aberrant placement and avoid worsening pneumothorax.

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