E-ISSN: 2708-1508
P-ISSN: 2708-1494
IJCRS 2025; 7(2): 133-135
www.casereportsofsurgery.com
Received: 10-06-2025
Accepted: 08-07-2025

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Tension pneumothorax as a rare complication of nasogastric tube insertion: Case report

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DOI: https://www.doi.org/10.22271/27081494.2025.v7.i2c.211

Abstract
This article presents a rare case of tension pneumothorax as a complication of nasogastric tube (NGT) insertion, highlighting the potential risks associated with this routine procedure. The case involves a 76-year-old female patient who, after sustaining multiple injuries in an accident, developed tension pneumothorax following NGT insertion into the right bronchus, causing lung injury. Despite prompt intervention, including chest drainage and surgical revision, the patient ultimately succumbed to bilateral bronchopneumonia. The article discusses previous studies on NGT-related complications, emphasizing the importance of correct insertion techniques and the need for careful monitoring to prevent severe outcomes. The findings underscore that while NGT insertion is generally considered safe, it carries significant risks that necessitate strict adherence to proper procedures and vigilant post-insertion checks to avoid life-threatening complications.

Keywords: Nasogastric tube complication, nasogastric tube misplacement, tension pneumothorax, lungs perforation, case report

Introduction
The nasogastric tube (NGT) is the most commonly used entry into the gastrointestinal tract in hospital care [1]. In surgery, it is most commonly used for upper gastrointestinal tract derivation in passage disorders or postoperatively. Nevertheless, its routine use is being abandoned as part of the fast-track protocol in selected procedures. NGT is also used in other disciplines for both derivation and initial nutrition when oral intake is not possible, e.g., in swallowing disorders or unconsciousness. For nutrition, the Salem probe [2] with one lumen and holes at the end of the probe is used, and for derivation, the biluminal Levin probe can be used. The end of the probe is smooth and rounded to minimize traumatization.
The NGT is inserted through the nostril, pharynx, and esophagus into the stomach. The insertion is not a pleasant experience for most patients and is often accompanied by gagging and vomiting. Plaster fixation is typically used to secure the position of the probe. As with any invasive procedure, there is a risk of complications, even more if the patient is not cooperative.
Common complications include aspiration of gastric contents with subsequent pneumonia—Mendelson's syndrome injuries, and bleeding from the mucosa in the nose and mouth. Additionally, esophageal injury, decubitus ulceration from prolonged retention, oropharyngeal perforation, vocal cord palsy and eventual insertion into the airway may occur [3].
We present a unique case of tension pneumothorax developement after NGT introduction with lung perforation leading to lung resection, although the procedure was perform succesfully, the patinet succumbed others complications of comorbidities. This case study conforms to CARE guidelines.

Case Study
A 76-year-old female patient with unknown comorbidities was hit by a tram while crossing the railway tracks. She was confused at the scene, with a Glasgow Coma Scale (GCS) of 12 points, neurologically free of lateralization, and cardiopulmonary stable. After transport to the trauma center, she became restless and uncooperative, requiring artificial pulmonary ventilation. A whole-body CT scan was performed, revealing subarachnoid hemorrhage, a small subdural hematoma, suspected diffuse axonal injury, fracture of the 3rd rib, and a larger hiatal hernia. After stabilization and extubation, she was transferred to our hospital

with a GCS of 10 points. Due to restlessness, she repeatedly extracted the NGT, which was each time reinserted.

Due to retrocollis, oral intake was not expected to resume soon, and a PEG was planned. The patient's condition gradually deteriorated, with an elevation of inflammatory parameters, and bronchopneumonia was confirmed on X-ray. During further restlessness, she again pulled out the NGT, but after its reinsertion, her condition deteriorated rapidly. It was confirmed that the tube had been inserted into the right bronchus, causing injury to the lower lobe of the right lung and the development of tension pneumothorax (PNO). Chest drainage was performed immediately, with a good effect on clinical status, improved saturation, and cardiopulmonary stabilization.

A bedside ultrasound showed no more PNO. Bronchoscopy revealed no tracheal or large bronchial injury, and the NGT was traced to the right lower bronchus, consistent with the CT findings. Surgical revision via thoracotomy was indicated in consultation with a surgeon.

During the surgical revision by thoracotomy on the right side, the end of the NGT was found protruding from the parenchyma of the lower lobe of segment 9 of the right lungs (see Figure 1). After the release of the pulmonary ligament and mediastinal pleura, no injury to the right main bronchus was evident. Following NGT extraction, bleeding was observed from the parenchyma at the site of injury. A stapler dissection of the duct was performed, with suturing at the end of dissection and subsequent resection of the non-aerated edge of the lung parenchyma (approximately 3x10 cm) after dissection. No further bleeding or other complications were noted. The chest drain was removed on the 5th postoperative day. There was a slight improvement in the general condition. The staples on the thoracotomy suture were removed after 14 days, and the surgical wound healed per primam.

However, the clinical condition worsened in the subsequent period. Respiratory function deteriorated, and inflammatory parameters increased. Bilateral bronchopneumonia unresponsive to antibiotic administration was detected on X-ray and CT which resulted in the patient's death.

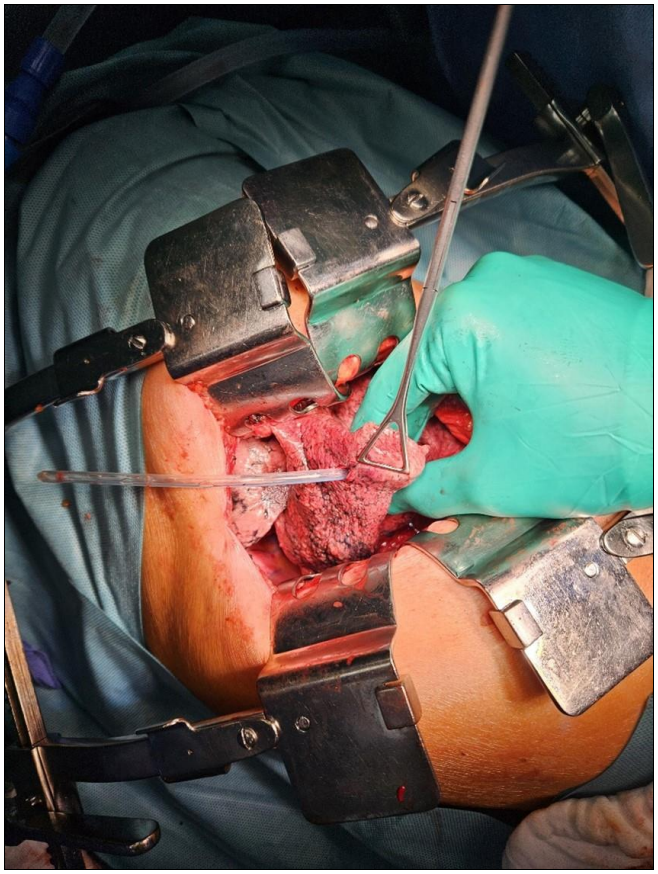

Fig 1: View of the surgical field from posterolateral thoracotomy with finding of NGT perforating the lung.

Discussion

Robert A. Sofferman and Richard N. Hubbell's 1981 study reported the association of bilateral vocal cord paralysis with relatively short-term nasogastric tube use, presented in four case histories, and also a prospective study of the effects of nasogastric tubes on the normal human larynx discovered arytenoid edema [4]. Three years later, Thomas W. Grossman and colleagues wrote about complications associated with a narrow-bore nasogastric tube. He described the use of a new narrow-bore nasogastric feeding tube with a stylet that resulted in two cases of misplacement with traumatic laceration of the visceral pleura [5]. In 2005, Jain Bhaskara Pillai published a study on thoracic complications of nasogastric tubes [6]. He described a patient with pneumothorax shortly after NGT insertion which did not require neither drainage nor operative management. The study also provided an overview and distribution of other thoracic complications of NGT insertion, divided into thoracic (tracheobronchopleural and intravascular penetration) and non-thoracic complications (enteral complications and intracranial entry). In 2017 Sarvin Sanaie published a study [1] describing methods of introducing NGT in anesthetized patients and detailing possible complications. Unlike the previous study, these

complications are divided into minor and major categories. Minor complications include kinking and coiling, tube decompression or breakage, nosebleed, sinusitis, parotitis, sore throat, and stridor. Major complications include pulmonary insertion, tracheobronchial perforation [7], esophageal perforation and stenosis, infectious complications, intracranial placement and central nervous system complications [8], nose erosion or nasal alar necrosis [9], laryngeal edema with asphyxia [10], pulmonary aspiration, pneumothorax [3], perforation of the lamina cribrosa, retropharyngeal abscess, stricture formation, and aortoesophageal fistula.

Although the introduction of NGT is considered a routine technique, it can lead to serious complications; even aspiration itself with subsequent development of pneumonia can be fatal. Penetration of the NGT into the free pleural cavity is a rare yet serious complication.

To prevent complications, it is necessary to follow the correct procedure for NGT insertion, to carefully consider the indication, and to check the position of the NGT after insertion—dew probe during breathing, aspiration of contents, pH examination (gastric contents/mucus), air insufflation test during auscultation in the epigastrium, and X-ray. In case of suspected complications, a CT scan with eventual image segmentation is recommended [11], and consultation with a specialist—in this case, a thoracic surgeon—is necessary.

Author Contribution Statement

KC - Conceptualization,Literature review, Initial draft of the manuscript. JB - Revision of the manuscript, Study supervision. MJ - Revision of the manuscript.

DH - Revision of the manuscript, Study supervision. ZK - Revision of the manuscript, Study supervision. All authors reviewed the manuscript.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethics approval

Our institution does not require ethical approval for reporting individual cases or case series.

Data statement

All data already included in the study.

Finantial statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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How to Cite This Article

Chrz KA, Bruthans J, Krška Z, Hoskovec D, Jakubův M. Tension pneumothorax as a rare complication of nasogastric tube insertion: Case report. International Journal of Case Reports in Surgery. 2025;7(2):133-135.