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Cervical Emphysema and Pneumomediastinum Caused by a Nasogastric Tube: A Case Report

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Patient: Female, 94-year-old
Final Diagnosis: Cervical emphysema and pneumomediastinum
Symptoms: Cervical emphysema and pneumomediastinum
Clinical Procedure: —
Specialty: General and Internal Medicine • Otolaryngology

Objective: Unusual clinical course

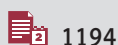
Background: The nasogastric tube (NGT) is a common medical device, and serious complications associated with NGT insertions are rare. The most common serious complication is tracheal insertion; cervical emphysema and pneumomediastinum are rare. There are several methods for confirming the location of the NGT, but a single method of confirmation is often inadequate. Confirmation by air insufflation into the NGT is currently not recommended and is highly invasive. Here, we report a case of cervical emphysema and pneumomediastinum caused by an NGT.

Case Report: A 94-year-old woman experienced a stroke and was hospitalized for neurosurgery. The nurse inserted an NGT and performed insufflation, but air sounds were not detected. Chest radiography did not reveal the tip of the NGT. Computed tomography (CT) revealed cervical emphysema, pneumomediastinum, an NGT bent in the esophagus, and the distal end of the NGT in the nasopharynx. Nasopharyngeal endoscopy revealed damaged nasopharyngeal mucosa and the distal end of the NGT. The patient was diagnosed with insufflated air passing through the damaged nasopharynx, which had spread to the cervical area and mediastinum. The NGT was removed, and the patient was treated with antibiotics. CT showed cervical emphysema, and the pneumomediastinum resolved after 20 days.

Conclusions: It is important to recognize that there are numerous serious and unexpected complications associated with NGT. Different methods should be considered and used to confirm the location of an NGT. Further studies on the confirmation methods and dissemination of such knowledge are required to reduce NGT complications.

Keywords: Intubation, Gastrointestinal • Mediastinal Emphysema • Nasopharynx • Pneumomediastinum, Diagnostic

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Background

Nasogastric tube (NGT) insertion is a common medical procedure performed in hospitals. NGTs are used for nutritional management, decompression of the gastrointestinal tract, and intraoperative management. Although the technique is standardized, it is a blind procedure, and confirmation of the correct position of the NGT is sometimes inadequate. The percentage of pulmonary complications associated with NGT was reported to be 2% [1]. Radiography, insufflation, and aspirate pH measurements are the known methods for confirming proper NGT insertion. Many guidelines discuss, but do not explicitly mention, ways to confirm proper NGT insertion [2]. Several complications of NGT insertion have been reported [1];

however, cervical emphysema and pneumomediastinum are rare. Here, we report a case of cervical emphysema and pneumomediastinum caused by air leakage from the NGT into an injured nasopharynx.

Case Report

A 94-year-old woman with a cardioembolic stroke was admitted to our neurosurgery department. The patient's medical history included hypertension, diabetes mellitus, dyslipidemia, atrial fibrillation, and myocardial infarction. The patient was unconscious and unable to be fed orally because of a cardioembolic stroke. The patient lacked coordination in swallowing

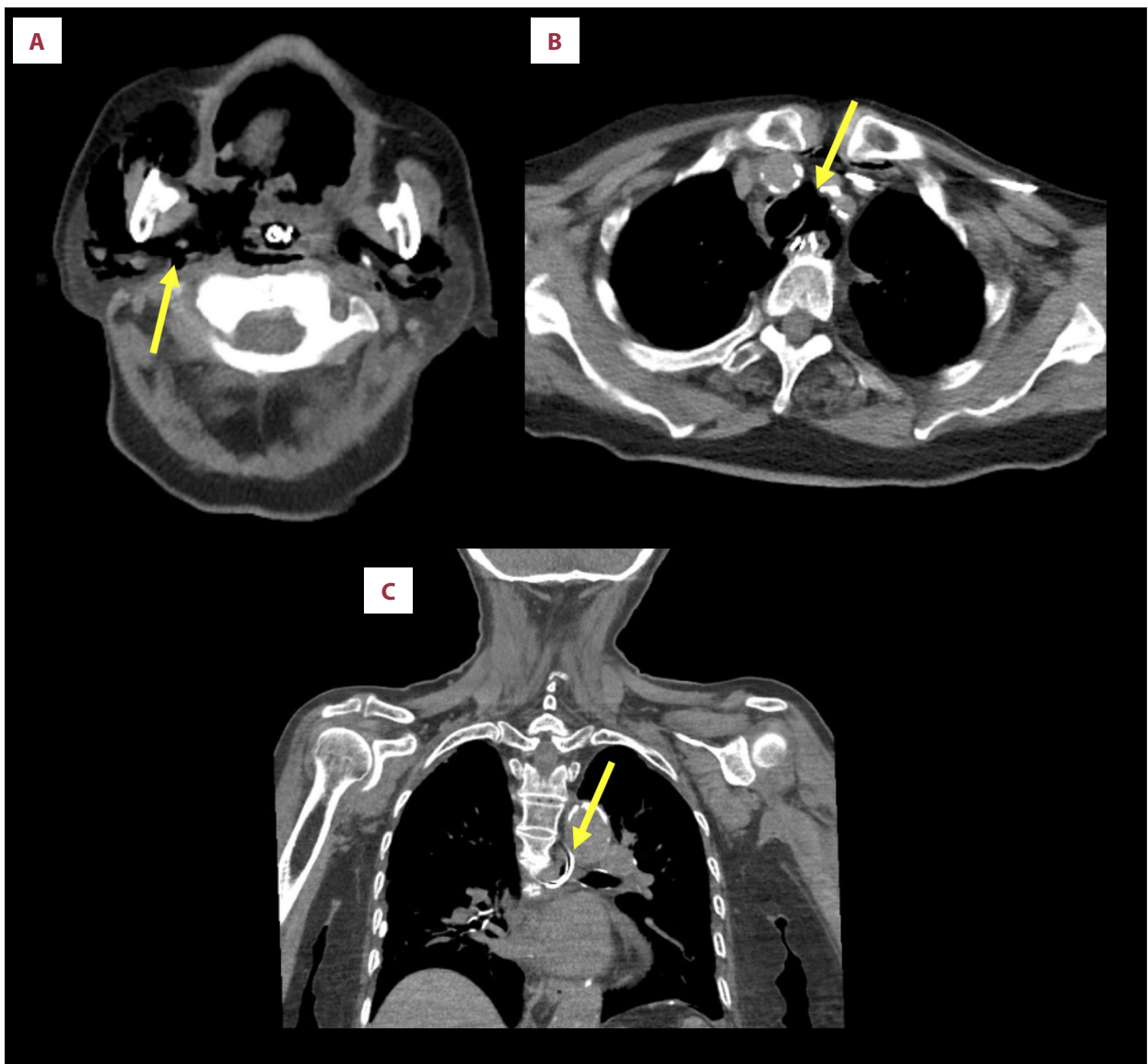


Figure 1. (A) Computed tomography (CT) scan shows cervical emphysema and the distal end of the NGT in the nasopharynx (arrow). (B) CT scan shows pneumomediastinum (arrow). (C) CT scan shows the bent NGT at the esophagus (arrow).

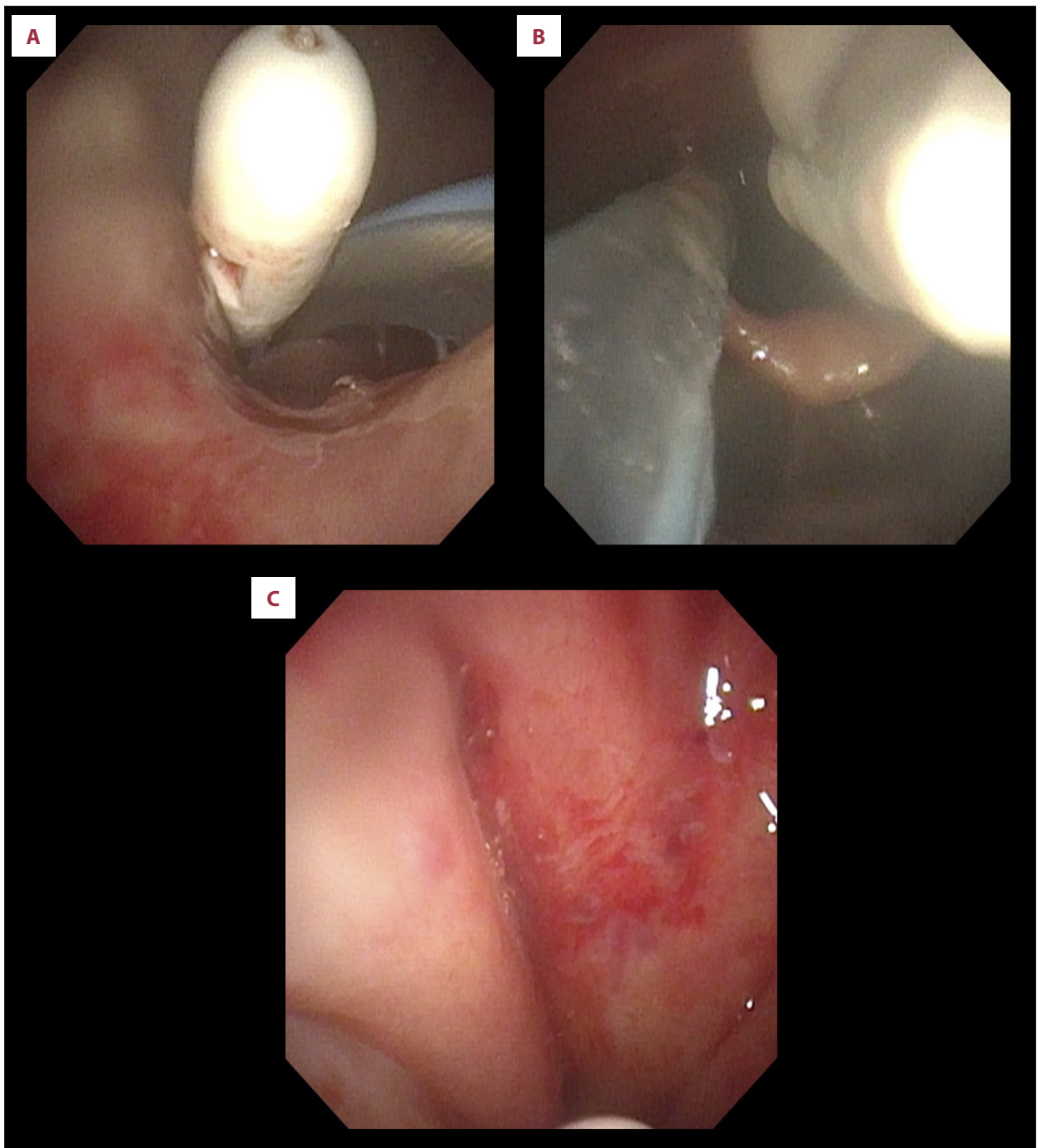


Figure 2. (A) Nasopharyngeal endoscopy shows the nasopharynx and the NGT distal end. (B) Nasopharyngeal endoscopy shows the bent NGT. (C) Nasopharyngeal endoscopy shows a mucosa-damaged nasopharynx.

movements. An experienced nurse inserted an NGT of 12Fr once, which showed resistance during insertion. The nurse insufflated air into the NGT but could not hear the sound of air bubbles. Chest radiography did not reveal the distal ends of the NGT in the stomach. Computed tomography (CT) performed 15 min after the NGT insertion to confirm the gastric tube position showed cervical emphysema and pneumomediastinum.

The NGT was bent in the esophagus, and the distal end of the NGT was in the nasopharynx (Figure 1). The patient was referred to our department. Physical examination revealed subcutaneous crepitus. Nasopharyngeal endoscopy revealed damaged nasopharyngeal mucosa and the distal end of the NGT (Figure 2). We concluded that the air was insufflated through the damaged nasopharynx and retropharyngeal space into the

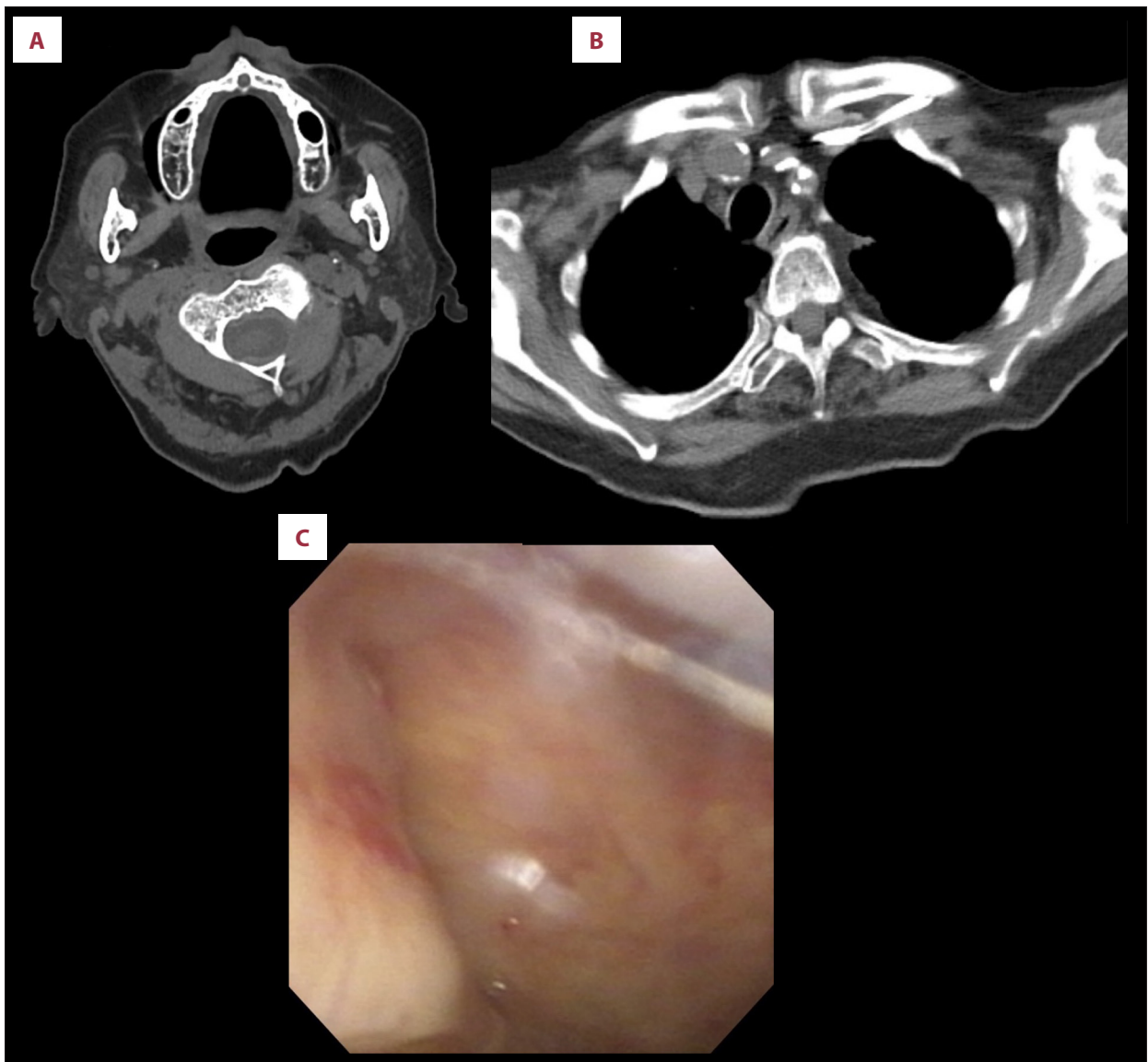


Figure 3. (A) CT scan shows cervical emphysema had disappeared. (B) CT scan shows that the pneumomediastinum had disappeared. (C) Nasopharyngeal endoscopy shows recovery of the nasopharyngeal mucosa.

cervical area and mediastinum. The NGT was removed 30 min after insertion, and the patient was treated with sulbactam sodium and ampicillin sodium for 18 days.

We performed percutaneous endoscopic gastrostomy after 14 days because of prolonged total parenteral nutrition. Gastrointestinal endoscopy revealed no stenotic lesions or mucosal damage to the esophagus. CT showed that cervical emphysema and pneumomediastinum had resolved after 20 days (Figure 3A, 3B). Nasopharyngeal endoscopy revealed the recovery of the damaged nasopharynx after 20 days (Figure 3C).

Discussion

NGT placement is a common medical procedure in many hospitals. Doctors and nurses use NGTs, and most have experience with it. However, NGT insertion is a blind technique, and complications associated with NGT have been reported in several cases [3]. The most common complications were aspiration pneumonia, pneumothorax, empyema, and pneumomediastinum [4]. Serious complications include inadvertent insertion of the NGT into the trachea and esophageal perforation [3,5]. Rare complications include NGT insertion into the brain after head trauma [6], NGTs being bitten off and swallowed [7], NGTs wrapped around the tracheal tube [8], and NGTs wrapped around the epiglottis [9].

Risk factors for NGT complications include altered levels of consciousness, sedation, and decreased pharyngeal reflexes [2]. Many cases of NGT insertion are high-risk, and complications can occur at any time. Elderly patients often have decreased pharyngeal reflexes, and NGT insertion should be cautiously performed. NGT insertion under general anesthesia should be cautiously performed because general anesthesia involves sedation and immobilization. Using NGTs with atraumatic or radiopaque olive tips reduces the risk of complications. Reinsertion should be attempted if resistance occurs during the NGT insertion.

Several methods could be used to confirm the location of the NGT. Several guidelines for NGT insertion have been previously published. In a review of the guidelines for NGT insertion, the confirmation methods included radiography, the appearance of the aspirate, the pH of the aspirate, and carbon dioxide detection [2]. An otolaryngologist or gastroenterologist can perform endoscopy-guided NGT insertion. Insufflation is not currently recommended because emphysema can occur due to insufflation, and air bubbles may be heard when the NGT enters the trachea [10]. Radiography is the most recommended method according to each guideline. pH measurement is also recommended. Confirmation using multiple methods is recommended [2]. Therefore, a combination of radiography and pH measurements can be a good confirmatory method. Several studies have reported that if the pH of the aspirate is 5.5, it is correct for intragastric retention, and a pH of 6.0 indicates additional chest radiography [11]. Although measuring the pH of the aspirate is a good method, it is important to note that proton pump inhibitors and H₂-receptor antagonists increase gastric pH [2]. In addition, a patient with head and neck cancer had an NGT inserted into his trachea because of false-positive pH aspirates [12]. Chronic aspiration of saliva, food particles, and bacterial infections may result in false-positive pH aspiration results [12]. In cases where the combination of radiography and pH measurement is inadequate, other combination methods can increase safety. A recent study that identified NGT in the stomach of 89% of screened patients has reported ultrasonography as an effective confirmation method for NGT location [13]. A simple and less invasive method, like ultra-sonography, is suitable during the COVID-19 pandemic in ARDS patients requiring prone positioning [13]. If multiple confirmation methods are inconclusive, nasopharyngeal endoscopy may be used to confirm the NGT insertion. Although

nasopharyngeal endoscopy does not prevent esophageal perforation, it can prevent tracheal insertion and the positioning of the NGT in the pharynx. Regardless, other confirmatory tests should be performed. In the present case, CT revealed an abnormal NGT position, and CT is a reliable method for confirming the tumor location before using an NGT. Although CT cannot be performed in all cases, it should be performed in cases with difficult NGT insertion. A combination of different confirmation methods may be helpful for the safe insertion of NGTs.

Causes of cervical emphysema and pneumomediastinum have been reported, including dental surgery [14,15], mastoid fracture due to baseball injury [16], diastatic rupture of the cecum [17], and acute perforated diverticulitis [18]. Various patients received prophylactic antibiotic therapy [15]. In cases of air insufflation through the oral cavity or pharynx, the antibiotic of choice is penicillin [15]. Our patient was treated with sodium ampicillin and sodium sulbactam and showed no signs of infection.

However, we did not find similar reports in our recent literature search. Complications due to curved NGTs have been reported, and the cause was the same as in our case [8,9]. These complications may be attributed to the soft NGT and blind technique used for NGT insertion. NGT insertion requires caution because unexpected complications have been reported.

Conclusions

It is important to recognize that there are numerous serious complications associated with NGTs. The main cause of complications was the blindness of the technique. Therefore, confirmation methods after NGT insertion to confirm the location of NGT should be considered. It should be noted that insufflation is not recommended. Multiple confirmation methods, such as radiography and pH measurements, should be performed to ensure correct NGT placement, thereby preventing complications of NGT insertion.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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