—Case Reports—

Use of a Rigid Curved Laryngoscope for Observation and Debridement of Degenerated Cricoid Cartilage in Nasogastric Tube Syndrome: A Case Report

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Nasogastric tube syndrome (NGTS) is a complication of NGT placement that can cause sore throat, bilateral vocal cord paralysis, and airway constriction. Although rare, this condition should be known by all physicians because it is sometimes fatal. We report a case of NGTS that was successfully diagnosed and debrided with a rigid curved laryngoscope. A 79-year-old man was referred to our department for evaluation of persistent pharyngeal pain and dysphagia after thoracic aortic aneurysm surgery. He had restricted bilateral vocal fold abduction, and the NGT had been placed for nearly 120 days. After induction of general anesthesia, the patient underwent laryngeal examination using a rigid curved laryngoscope, which revealed ossified cricoid cartilage in the postcricoid area, leading to confirmation of NGTS. The NGT was removed, and the protruding bony lesion was debrided. Subsequently, the patient underwent gastrostomy to improve his nutritional status. One month later, the postcricoid lesion improved, and the patient was able to tolerate an oral diet. The pathophysiology of NGTS is thought to involve ulceration of the postcricoid mucosa and injury of the posterior cricoarytenoid muscle by contact with the NGT. Although the treatment has not been established, early removal of the NGT is important. In the present case, the rigid curved laryngoscope was useful for resection of the bony lesion, which contributed to early epithelialization and symptom improvement.
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Key words: nasogastric tube syndrome, rigid curved laryngoscope, cricoid cartilage, vocal cord paralysis

Introduction

Nasogastric tube (NGT) insertion is common in daily medical practice for purposes such as gastric evacuation, confirmation of gastric contents, and administration of drugs and nutrition. However, in rare cases, it can cause a complication called NGT syndrome (NGTS). NGTS comprises pharyngeal mucosal ulceration and bilateral vocal cord paralysis caused by blood flow obstruction or infection at the site of contact between the NGT and mucosa. NGTS sometimes causes airway obstruction, which requires attention. However, because lesions occur at the first natural constriction of the upper gastrointestinal tract, observation, even by laryngoscopy or upper gastrointestinal endoscopy, is difficult. In addition, few studies have reported ulcers, except in postmortem examinations[1]. Therefore, diagnosis of NGTS is currently based on the presence of an NGT and symptoms such as sore throat, hoarseness, and dyspnea.

The rigid curved laryngoscope (**Fig. 1a**) was developed in Japan for transoral endoscopic laryngeal and pharyngeal surgery. The curved part of the laryngoscope ventrally elevates the larynx, allowing a wide field of view from the hypopharynx to the esophageal inlet, thus facilitating observation of lesions in this area (**Fig. 1b**). Here, we report a case of NGTS that was confirmed by using a rigid curved laryngoscope, which allowed clear observa-

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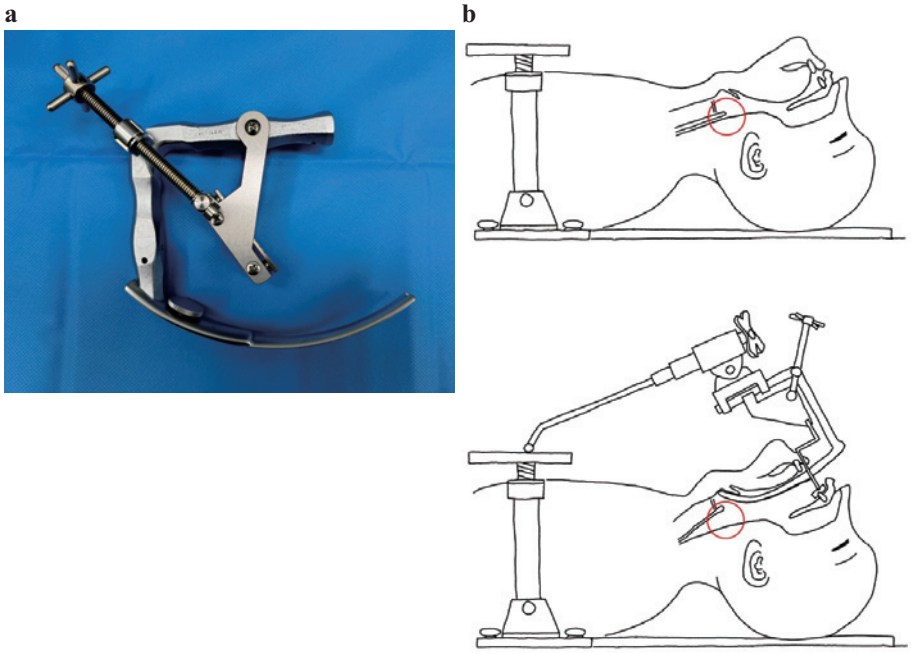

Fig. 1 a: Rigid curved laryngoscope, b: Image of expansion of the hypopharynx with a rigid curved laryngoscope. The fold of the laryngoscope pushes the larynx up ventrally, allowing a wide range of view of the hypopharynx (circle).

tion of an ulcer that was debrided by removing the exposed cricoid cartilage.

Case Report

A 79-year-old man with a history of thoracic and abdominal aortic aneurysms, left common iliac artery aneurysm, angina pectoris, hypertension, and chronic obstructive pulmonary disease underwent total arch aortic replacement surgery for a thoracic aortic aneurysm in the department of cardiovascular surgery in our hospital. An NGT was inserted as part of postoperative ventilator management. Tracheostomy was performed on the 12th postoperative day, and the patient was weaned from ventilator management on the 22nd postoperative day. The NGT remained in place because of prolonged dysphagia during treatment. The tracheal cannula was removed on the 89th postoperative day, and the patient was transferred to a rehabilitation hospital on the 98th postoperative day. Swallowing training was continued at the rehabilitation hospital, but his oral intake was unstable because of persistent pain on swallowing; thus, NGT withdrawal was difficult. On the 120th postoperative day, the patient was readmitted to our cardiovascular surgery department for a thorough examination of pain during swallowing, after which he was referred to our department. During the initial examination, he had no symptoms of respiratory distress or inspiratory wheezing, his

Fig. 2 Neck plain CT (cricoid cartilage level) scan at the initial examination. No foreign body or mass was observed, and the nasogastric tube passed through the midline.

SpO_2 was 98% in room air, and his consciousness level was clear. Laryngoscopy revealed no swelling, edema, or pharyngeal or laryngeal ulceration. Analysis of vocal fold movement showed paracentral fixation on the left and restriction of abduction on the right; the 10-Fr NGT was still in place. Neck plain computed tomography (CT) scan confirmed that the NGT was in the midline of the pharynx and revealed no obvious abnormal findings (**Fig. 2**). An upper gastrointestinal endoscopy was performed to investigate the cause of sore throat and to

identify any cervical esophageal lesions. A bony lesion noted in the postcricoid region, which was suspected to be a foreign body, was difficult to remove (**Fig. 3**). Therefore, we examined the lesion in detail and excised it under general anesthesia on the 15th day of hospitalization. A rigid curved laryngoscope was applied to the laryngeal aspect of the epiglottis, and the larynx was lifted to widely expand the hypopharynx. A bony lesion was observed in the postcricoid area, and ulceration was observed on the contralateral posterior pharyngeal mucosa (**Fig. 4**). Palpation of the bony lesion with curved forceps revealed ossified cricoid cartilage that was integrated with the surrounding laryngeal structures. The exposed bony lesion was partially excised using curved forceps, and the mucosa of the ulcer was biopsied.

The NGT was the suspected cause of the symptoms and was removed. Pathologically, the resected bony lesion was degenerated cartilage, and the biopsied mucosa was found to be an ulcer, with no evidence of malignancy. Postoperative neck contrast-enhanced CT scan showed a bony defect in a part of the cricoid cartilage plate, confirming that the resected bony lesion was cricoid cartilage (**Fig. 5**). Indirect swallowing training was started immediately after surgery, and gastrostomy was performed on the 5th postoperative day as an alternative nutritional route. Proton pump inhibitors and prostaglandins were administered to protect the wound and promote healing. At approximately 1 week postoperatively, pain on swallowing gradually improved, but there was no improvement in vocal cord movement. On the 20th postoperative day, the patient was transitioned to direct swallowing training, and his oral intake stabilized quickly. On the 31st postoperative day, a re-examination under general anesthesia, using the same procedure, revealed that the exposed cricoid cartilage was covered by mucosa and that the contralateral ulcer lesion had healed (**Fig. 6**). The patient was transferred to a rehabilitation hospital on the 46th postoperative day, after stabilization of self-intake of a diet of finely cut meal. Because the airway was maintained during treatment, no tracheostomy was performed.

This case report was prepared in accordance with ethical guidelines for clinical research. Informed consent was obtained from the patient for publication of this article and any photographs.

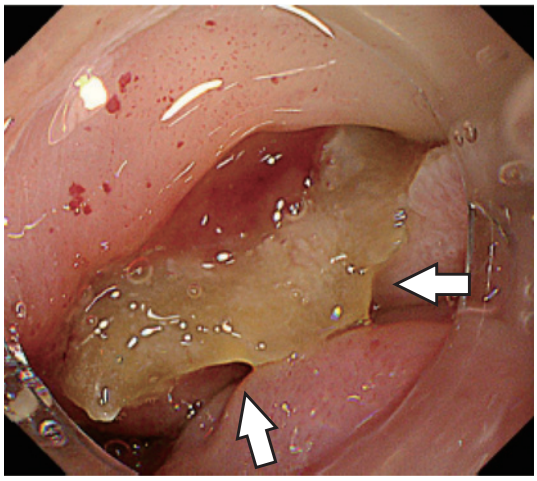

Fig. 3 Bony lesion in the postcricoid area on upper gastrointestinal endoscopy. A foreign body suspected because the view of the postcricoid region was limited was actually a protrusion of the ossified cricoid cartilage.

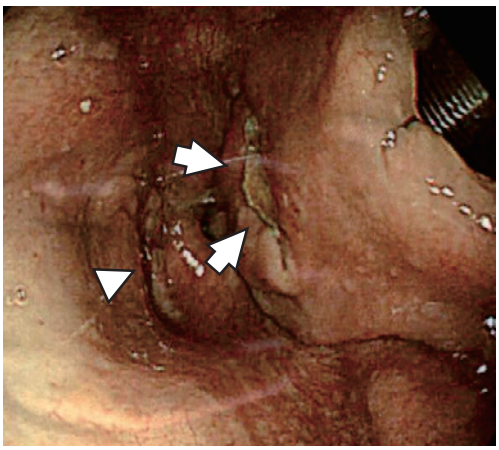

Fig. 4 The hypopharynx was deployed with a rigid curved laryngoscope and observed by upper gastrointestinal endoscopy. A known bony lesion (arrows) in the postcricoid area was palpated and integrated with the laryngeal structures. An ulcerative lesion (arrowhead) was noted on the contralateral mucosa.

Discussion

The present case of NGTS was confirmed by using a rigid curved laryngoscope to clearly observe the lesion and was treated by debridement of the exposed cricoid cartilage. The first case of NGTS was reported in 1981 by Sofferman et al.[1], who defined the syndrome as (1) caused by NGT placement, and characterized by (2) sore throat and stridor and (3) vocal cord paralysis (often bilateral). Although there have been reports of similar cases since then, the literature on cases diagnosed by actual observation of the affected lesion is limited[2]. In our search of the literature, including the PubMed, Google Scholar, and Cochrane databases, this is the first report in which

Fig. 5 Postoperative neck contrast-enhanced CT scan (cricoid cartilage level). Discontinuity and a defect in the dorsal contour of the cricoid cartilage indicated that the lesion debrided intraoperatively was an ossified cricoid cartilage.

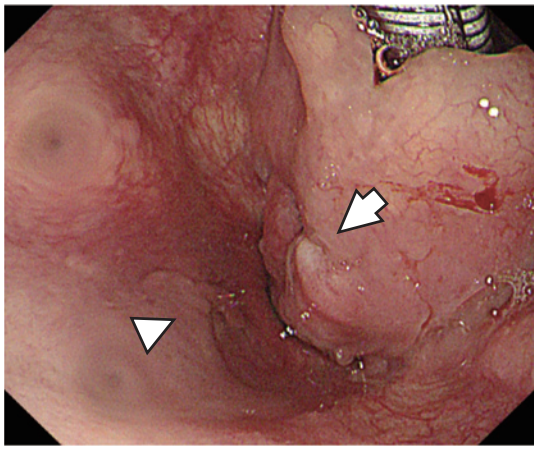

Fig. 6 Findings of reobservation of the lesion using a rigid curved laryngoscope. The area where the ossified cricoid cartilage was reduced is covered by mucosa (arrow), and the ulcer in the contralateral mucosa has healed (arrowhead).

the NGTS lesion was clearly observed with a rigid curved laryngoscope and treated by debridement of the exposed cricoid cartilage.

The pathogenesis of NGTS is thought to involve (1) abrasion of the NGT and pharyngeal mucosa by swallowing movements, (2) pressure of the NGT between the cricoid cartilage and cervical spine when in supine position, and (3) pressure exerted by the NGT on the postcricoid mucosa by contraction of the cricopharyngeal muscle, which results in mucosal injury, blood flow disturbance, and infection. Injury to the posterior cricoarytenoid muscle is thought to restrict vocal fold abduction, and symptoms include sore throat, pain on swallowing, hoarseness, and dyspnea[1,3].

The risk factors for NGTS in our patient include poor nutritional status, immunodeficiency, and complications of diabetes[1,2,4,5]. Other risks include osteophyte formation in the cervical spine, because of high pressure between the NGT and cricoid cartilage[1] and gastroesophageal reflux[2]. Risk factors related to the NGT include duration of NGT placement, use of a large-diameter tube[6,7], and passing of the NGT through the median rather than the left or right piriform fossa[3]. Brousseau et al.[5] reported that onset of symptoms was from 12 hours after NGT intubation to 2 weeks after extubation. Although the threshold diameter at which the risk increases has not been determined, Kanbayashi et al.[6] reported that a case of NGTS developed in a patient with a 16-Fr NGT, which healed after replacement with a 12-Fr NGT. A 10-Fr NGT was used for our patient but was placed for longer than 16 weeks, which may have triggered NGTS. An NGT should be used as a route of nutritional administration for a short time, approximately 4 to 6 weeks[8,9].

There are no specific diagnostic criteria, and a comprehensive assessment is often based on the presence of sore throat, pain on swallowing, and vocal cord paralysis during NGT placement, as well as on the course of symptoms after NGT removal. Diagnosis can be difficult because pharyngeal ulcers are located in the first natural constriction of the upper gastrointestinal tract and often cannot be observed by laryngoscopy or upper gastrointestinal endoscopy while the patient is conscious[2]. In our case, the initial diagnosis based on symptoms and vocal cord paralysis in the presence of a NGT was confirmed by observing the lesion with a rigid curved laryngoscope under general anesthesia.

Although there is no established treatment for NGTS, it is necessary to secure the airway and remove the NGT as soon as possible. In addition, antibacterial agents for local infection and systemic proton pump inhibitors or steroids for wound protection and anti-inflammatory purposes are administered. Sano et al.[7] reported that the interval from NGT removal to improvement of respiratory distress and vocal cord paralysis was 1 day to 3 months, but many lesions may not have been accurately evaluated after treatment. Although our patient had restricted vocal cord movement, tracheostomy was not performed because there were no symptoms of respiratory distress and no wheezing. The posterior cricoarytenoid muscle was also considered to be severely deficient because the cricoid cartilage, which is deeper than the muscle layer, was exposed, and it is likely that vocal fold

movement will not improve in the future.

By pushing the larynx up ventrally and fixing it in place, the rigid curved laryngoscope enabled a wide field of view of the normally closed hypopharyngeal cavity. The original use of the laryngoscope was to expand the surgical field for transoral endoscopic resection of superficial pharyngeal cancer; however, in recent years, it has been used for procedures such as foreign body removal and transoral incisional drainage around the hypopharyngeal cavity[10,11]. This device allowed us to easily observe lesions in the postcricoid region that had not been accurately evaluated previously. Furthermore, use of curved forceps was useful because the ossified lesion in the postcricoid area could be excised and treated locally, and tissue could be collected from the same area, to differentiate it from a malignant tumor.

Because the NGT is widely used in daily practice, NGTS needs to be widely recognized as a potentially fatal complication. A rigid curved laryngoscope was useful for observing and debriding lesions.

Conclusion

A rigid curved laryngoscope and curved forceps were effective tools for observing and debriding a lesion attributable to NGTS caused by long-term NGT placement.

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