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DEEP NECK INFECTIONS FOLLOWING AN UNEXPECTEDLY DIFFICULT INTUBATION

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ABSTRACT
Although rarely reported after endotracheal intubation, deep neck infections are potentially life-threatening because they may result in compromised airway, mediastinitis, thrombophlebitis and sepsis. In this report, we present a 69-year-old diabetic patient who developed deep neck infections after an unexpectedly difficult intubation. Postoperatively, the patient complained of neck pain, sore throat, dysphagia and fever. Computed tomography of the neck and thorax revealed deep neck infections in the prevertebral space and pharyngeal area. Despite the conservative treatments with nil per os and intravenous antibiotics, the patient persistently complained of symptoms. The follow-up computed tomography showed the aggravated abscess lesion of the neck. An awake fiberoptic intubation was completed and surgical exploration was performed. Patient's recovery was slow and gradual because of persistent drainage and swallowing difficulty. Three weeks after operation, the patient was discharged from the hospital with complete recovery.

INTRODUCTION

Even though intubation is generally simple and safe, serious injuries to the airway are sometimes reported [1-3]. Deep neck infections (DNIs) are defined as infections that spread into the head and neck [4]. When intubation is challenging, oropharyngeal microorganisms may go into the deep neck space through the site of injury and cause DNIs. The widespread use of antibiotics has reduced the incidence and mortality of DNIs but complicated head and neck anatomy often makes early detection of DNIs difficult, and a high level of attention is required to avoid any delay in treatment [4]. Diabetic patients with DNIs especially tend to have frequent complications with significant morbidity, therefore, particular attention should be paid to control hyperglycemia in diabetic patients who are or are planning to be intubated [5]. In the current study, we report a case of a diabetic patient who had infections of the deep neck area following an unexpectedly difficult intubation, and who was treated with antibiotics and surgical drainage.

CASE REPORT

A 69-year-old man weighing 64.8 kg (body mass index, 25.5), with a medical history of diabetes mellitus, hypertension, and hypercholesterolemia, was admitted to our hospital for a coil embolization under general anesthesia because of a 5 mm anterior communicating artery aneurysm. Preoperative laboratory tests were normal and there was no notable tracheal deviation on radiographic images. The Mallampati classification of his oral opening was class Ⅲ with only the soft and hard palates visible in a seated position. Cervical motion was not limited and the extent of mouth opening was appreciable.

No medication was given before entering the operating room. He was given 100% oxygen under standard monitoring. Anesthesia was induced with propofol (100 mg) and lidocaine (40 mg). When mask ventilation was established, muscle relaxation was undertaken with rocuronium (0.6 mg/kg). Orotracheal

intubation was attempted using a #3 Macintosh blade and 7.5 mm endotracheal tube with a bendable wire stylet in the sniffing position. The tip of the stylet was within the distal opening of the endotracheal tube. The Cormack-Lehane's laryngeal exposure grade was Ⅳ in the Sellick maneuver, meaning that neither the glottis nor the epiglottis was visible. Direct laryngoscopy was attempted several times, but it was unsuccessful. Bleeding was noted during the attempts. Blind intubation with a light wand was conducted but it was difficult to maneuver the tube to the opening of the glottis. Intubation was accomplished using a light wand twice. Endotracheal intubation was confirmed based on bilateral breath sounds and end-tidal CO_2. A nasogastric tube was placed in an attempt to decompress the gastric distension, but it was also difficult and unsuccessful. Anesthesia was maintained with nitrous oxide, oxygen, and sevoflurane. Vital signs, oxygen saturation, and end-tidal CO_2 were kept within normal ranges.

Emergence was uneventful but the trachea was not extubated because of safety concerns. The patient was transferred to the intensive care unit (ICU) 1 hour after the procedure. Oxygen was given through a T-piece with FiO_2 35-40%. The patient removed the endotracheal tube by himself 5 hours after he was transferred to the ICU. Oxygen saturation was 97-100% with an O_2 facial mask. He was transported to a general ward on the first postoperative day.

On the second postoperative day, the patient complained of neck pain, sore throat, and dysphagia, and he exhibited a fever of 38°C. There was swelling and tenderness in the neck area, but no crepitation on physical examination. Endoscopic examination of the upper airway showed diffuse edema on the pharynx but absence of definite trauma. Computed tomography (CT) of the neck and thorax revealed free air in the clavicle, diffuse swelling and fat plane infiltration in the entirety of the right neck, and mucosal swelling indicating inflammatory changes in the prevertebral space and pharyngeal area (Fig. 1). The airway was maintained for breathing. Treatment was begun with nil per os (NPO) and intravenous triple antibiotics (tazocin/clindamycin/tobramycin). An esophogram was ordered in an attempt to rule out esophageal injury, but it could not be carried out; the patient experienced such extreme neck pain that he could not swallow the necessary dye. During the following days, the patient persistently complained of pain, dysphagia, and fever. The neck CT revealed inhibition of free air flow and aggravation of an abscess lesion (Fig. 2). The antibiotic regimen was switched to 3rd generation cephalosporin and tazobactam.
A central line was inserted to begin total parenteral nutrition. A CT conducted on the 12th postoperative day showed an aggravated abscess in the parapharyngeal space, prevertebral space, and retropharyngeal area (Fig. 3). Antibiotics were then switched to vancomycin and meropenem and surgical intervention was decided upon in order to drain the abscess. An awake fiberoptic intubation was completed without any complication, and was followed by incision and drainage of the lesion. The patient was transferred to the ICU and he was placed on mechanical ventilation. Extubation was done three days after the operation and the patient was transferred out of the ICU. Recovery was slow and gradual because of persistent drainage and difficulty in swallowing. Three weeks after the exploratory surgery, the patient was discharged from the hospital, having completely recovered.

Fig 1. Neck CT on postoperative day 2. Free air noted in the supraclavicular area and right parapharyngeal space.

Fig 2. Neck CT on postoperative day 7. Aggravation of free air is noted in the space containing the abscess lesion, including the parapharyngeal space, prevertebral space and retropharyngeal area.

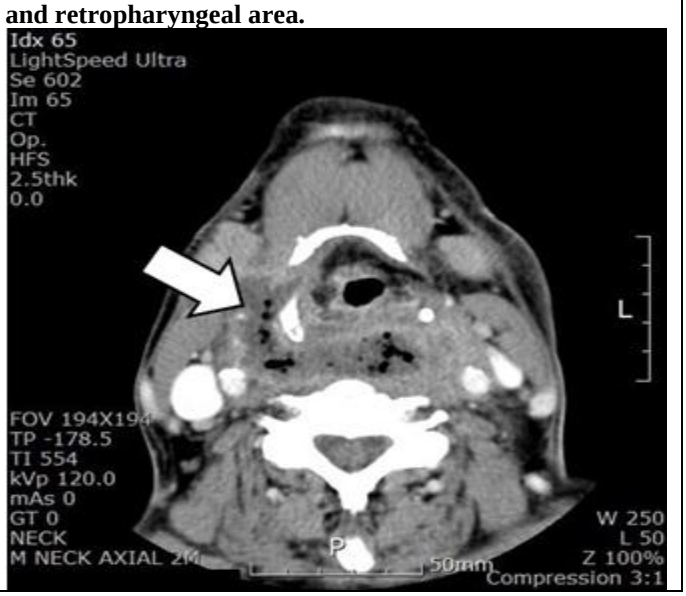
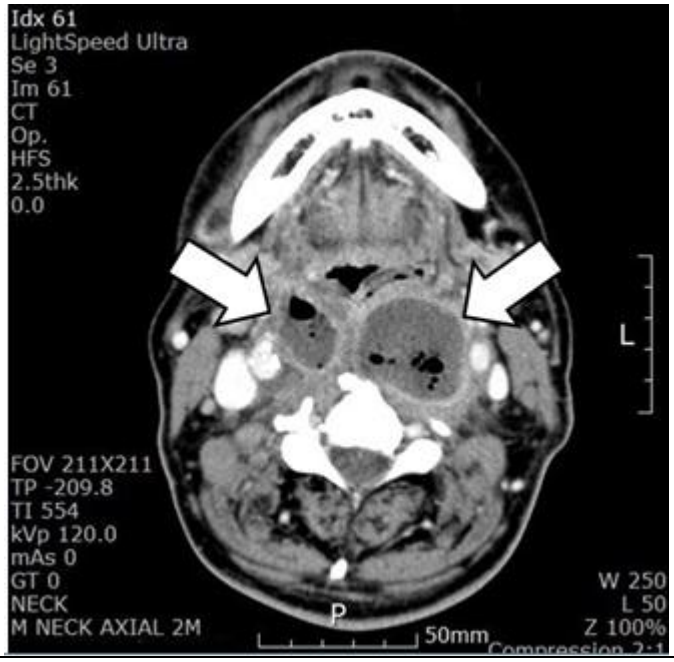


Fig 3. Neck CT on postoperative day 12. Aggravated abscess lesion noted in the parapharyngeal space, prevertebral space and retropharyngeal area.



DISCUSSION

Deep neck infections (DNIs) are an uncommon complication of endotracheal intubation. DNIs occur in a potential space along the fascial planes and spaces of the head and neck. Multiple layers of cervical fascia encase the neck and form the potential head and neck spaces. These fascial levels constitute important anatomic limitations for the spread of infection and serve to sequester infections; when fascial barriers break, infection spreads along the fascial planes [4]. The neck has a complex anatomy, where infections are usually secondary to contiguous spread from local sites, following fascial planes to create deep neck space abscesses [6]. Although most cases have been reported following emergent or difficult intubation, DNIs can occur even after uncomplicated insertion of laryngeal mask airways [7]. DNIs are potentially life threatening because they may result in compromised airways, may spread along the fascia toward the mediastinum, and may cause sepsis after thrombophlebitis of the internal jugular vein [8].

Endoscopic examination of the upper airway revealed no pharyngolaryngeal injury in our patient. However, a difficult intubation probably caused invisible trauma, such as a micro-perforation of the pharyngeal wall, which allowed pathogens to travel into the potential space. Konstantinou *et al*. [9] found that traumatic manipulations during difficult laryngoscopy and endotracheal intubation cause bacteremia. A difficult intubation may induce pressure on the pharyngeal mucosa, giving rise to laceration and bleeding. In their study, patients with easy intubations experienced a low incidence of bacteremia (2.2%), whereas it was much higher (10%) in patients with a difficult intubation. Their results suggest an association between pharyngeal injury and bacteremia. The postoperative implications of bacteremia were not known, but the authors recommended that difficult intubation (two or more attempts) might be a reason for antibiotic prophylaxis. Antibiotics were not given to our patient before DNI-related symptoms appeared because the uncomplicated coil embolization was regarded as a low-risk procedure for infection in our institute. If our patient had taken antibiotics directly after the intervention, the outcome would most likely have been substantially different.

History, physical examination, laboratory tests, and diagnostic imaging each provide important information when evaluating a patient for DNIs [4]. Initial assessment of the airway is a primary concern, and any signs of respiratory distress and impending airway catastrophes should be immediately and aggressively managed. Patients are usually systemically unwell and typically present with neck pain, odynophagia, dysphagia, and dyspnea [10,11]. Medical risk factors for DNIs include diabetes mellitus, HIV infection, steroid therapy, chemotherapy, and other sources of immune dysfunction [4]. Diabetes is frequently cited as the most common related systemic disease in DNI studies [12]. Patients with diabetes are vulnerable to frequent infections and face a significant morbidity rate. Hyperglycemia alters the host's immune function, including all aspects of polymorphonuclear leukocytes function, cellular immunity, and complement activity [13]. A higher rate of extended space infection and complication in diabetic patients may be caused by failure of a patient's immune function to confine the infection to localized spaces.

Surgical drainage is the classic approach in the treatment of DNIs with suspected abscess formation and is felt by many investigators to be the first-line treatment in such cases [12]. A study by Mayor *et al*. [14] found that conservative treatment does not increase mortality or length of hospitalization in DNIs. In selective cases, uncomplicated DNIs with abscess or cellulitis can be successfully treated with antibiotics and careful monitoring. Simultaneous medical treatment for underlying diseases such as diabetes can improve a patient's general immune status. However, conservative management may not be sufficient for diabetic patients who have demonstrated a lack of response to such treatment [5]. In patients with diabetes, surgical drainage was necessary because of the lack of clinical response to medical therapy, and diabetes was the only variable that explained the lack of response to antibiotics.

In our patient, traumatic intubation provoked the initial DNIs and diabetes seemed to play an important role in its progress. The patient was diagnosed with diabetes 12 years ago and his blood sugar level was not well modulated even during his hospital stay. Our medical team should in the future pay particular attention to hyperglycemia and to draining the early-stage abscesses, considering that diabetic patients with DNIs tends to have more frequent complications and longer hospital stays [13]. Regrettably, we did not pay sufficient attention to the control of blood sugar levels in this patient, and we did not drain the abscess in an early stage.

Endotracheal intubation via direct laryngoscopy in patients with DNIs is demanding because of distorted airway anatomy, tissue immobility, and limited access to the mouth. In advanced cases, the induction of general anesthesia may accelerate complete airway obstruction and make even mask ventilation impossible, requiring emergency tracheostomy [15]. Tracheostomy using local anesthesia is safe in most patients but is inappropriate in others. Therefore, fiberoptic intubation using topical anesthesia is suggested as the first choice for airway control in adult patients with DNIs. If the awake fiberoptic intubation is unattainable, or if attempts at intubation have failed, tracheostomy under local anesthesia is a good alternative [10].

Difficult intubation can cause DNIs which may be life threatening. In particular, diabetic patients are more susceptible to DNIs after traumatic intubation, and such patients tend to heal more slowly and have more frequent complications than do non-diabetic patients. Therefore, the treatment of DNIs in diabetic patients should be aggressive and deliberate. Control of blood sugar level is also critical in the progress of DNIs and surgical drainage should be considered in the early stages when there is a lack of response to medical treatments.

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None.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

STATEMENT OF HUMAN AND ANIMAL RIGHTS

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

REFERENCES

1. Im KS, Lee JM, Kim JB, Lee MH, Kim DJ, Jung HJ. (2008). Retropharyngeal abscess after an unexpected difficult tracheal intubation. *Korean J Anesthesiol*, 54, 356-358.
2. Heater DW, Haskvitz L. (2005). Suspected pharyngoesophageal perforation after a difficult intubation: a case report. *AANA J*, 73, 185-7.
3. Furst I, Ellis D, Winton T. (2000). Unusual complication of endotracheal intubation: retropharyngeal space abscess, mediastinits, and empyem. *J Otolaryngol*, 29, 309-311.
4. Vieira F, Allen SM, Stocks RM, Thompson JW. (2008). Deep neck infection. *Otolaryngol Clin North Am*, 41, 459-483.
5. Boscolo-Rizzo P, Marchiori C, Zanetti F, Vaglia A, Da Mosto MC. (2006). Conservative management of deep neck abscesses in adults: the importance of CECT findings. *Otolaryngol Head Neck Surg*, 135, 894-899.
6. Biller JA, Murr AH. (2004). The importance of etiology on the clinical course of neck abscesses. *Otolarynol Head Neck Surg*, 131, 388-391.
7. Paciuc M. (2009). Deep neck abscess and mediastinitis after laryngeal mask anesthesia. *Anesth Analg*, 108, 1356-7.
8. Marty-Ané CH, Picard E, Jonquet O, Mary H. (1995). Membranous tracheal rupture after endotracheal intubation. *Ann Thorac Surg*, 60, 1367-1371.
9. Konstantinou E, Argyra E, Avraamidou A, Fotis T, Tsakiri M,Voros D *et al*. (2008). Difficult intubation provokes bacteremia. *Surg Infect (Larchmt)*, 9, 521-4.
10. Ovassapian A, Tuncbilek M, Weitzel EK, Joshi CW. (2005). Airway management in adult patients with deep neck infections: a case series and review of the literature. *Anesth Analg*, 100, 585-589.
11. Gidley PW, Ghorayeb BY, Stiernberg CM. (1997). Contemporary management of deep neck space infections. *Otolaryngol Head Neck Surg*, 116, 16-22.

12. Ridder GJ, Technau-Ihling K, Sander A, Boedeker CC. (2005). Spectrum and management of deep neck space infections: an 8-year experience of 234 cases. *Otolaryngol Head Neck Surg*, 133, 709-714.
13. Huang TT, Tseng FY, Liu TC, Hsu CJ, Chen YS. (2005). Deep neck infection in diabetic patients: comparison of clinical picture and outcomes with non diabetic patients. *Otolaryngol Head Neck Surg*, 132, 943-947.
14. Plaza Mayor G, Martínez-San Millán J, Martínez-Vidal A. (2001). Is conservative treatment of deep neck space infections appropriate? *Head Neck*, 23, 126-133.
15. Irani BS, Martin-Hirsch D, Lannigan F. (1992). Infection of the neck spaces: a present day complication. *J Laryngol Otol*, 106, 455-458.