Successful awake nasotracheal intubation using a fiberoptic bronchoscopy in a patient with impaired mouth opening due to temporomandibular joint ankylosis

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Temporomandibular joint ankylosis is a rare disease that characterized by mouth opening limitation, which causes problems with basic functions such as eating and breathing as well as anesthetic problems such as facial dysmorphism. Surgical treatment is essential to correct these disorders, but airway management during general anesthesia can be very challenging because difficult ventilation and intubation are anticipated. Fiberoptic nasotracheal intubation is the gold standard, and it is important to plan and implement which nostril to access when actually doing it. We are presenting a case of a patient who successfully and safely underwent fiberoptic bronchoscopy according to the intubation plan which supported by pre-operative CT and fiberoptic laryngoscopy.

Keywords: Airway management; Intubation; Temporomandibular joint; Ankylosis

INTRODUCTION

Temporomandibular joint (TMJ) ankylosis is a pathological condition characterized by fusion of the mandibular condyle and glenoid fossa of the temporal bone. It has characteristic of the loss of joint movement resulted from the fusion of the bones which are within the joint or from the calcification of the ligaments around it [1,2]. TMJ ankylosis may be caused by trauma, local or systemic infection, and systemic diseases such as ankylosing spondylitis, rheumatoid arthritis, and psoriasis, among others. It can also occur

as a result of prior gap arthroplasty or occur congenitally or secondary to severe rheumatoid arthritis or tumors in the TMJ area [2,3]. Patients with chronic TMJ ankylosis typically show as a “bird-faced” deformity with a convex facial profile, characterized by micrognathia and retrognathia. Facial dysmorphism and limitations in mouth opening may cause difficulties with eating, speech, and sleep [4]. A multistage surgical protocol is utilized to improve mandibular function, correct associated facial deformity, reduce pain, and prevent reankylosis in patients with TMJ ankylosis [1]. Management of general anesthesia, is challenging in pa-

tients with TMJ ankylosis; limited mouth opening and facial deformity interfere with face mask ventilation and intubation. Various methods including fiberoptic intubation, semi-blind nasal intubation, retrograde endotracheal intubation, bi-nasopharyngeal airway, a fluoroscope-aided retrograde placement of a guidewire for tracheal intubation, or tracheostomy are available to secure the airway [5]. We report the case of a 25-year-old man with bilateral TMJ ankylosis, who underwent, safe and successful nasotracheal intubation using a fiberoptic bronchoscopy.

CASE REPORT

A 25-year-old man (height 165 cm, weight 40 kg) was admitted for surgical treatment of bilateral TMJ ankylosis. He had a history of surgical removal of infantile fibromatosis in bilateral temporal fossa 25 years ago and TMJ gap arthroplasty 19 years ago. These surgical operations resulted in TMJ ankylosis, which necessitated additional surgery. This patient was decided to undergo Lefort I osteotomy, bilateral sagittal split ramus osteotomy, and bilateral total TMJ reconstruction. Preoperative airway evaluation showed limited mouth opening with mandibular retraction, and a significantly convex facial profile, ("bird-faced" deformity) (Fig. 1), all of which suggested that endotracheal intubation was likely to be difficult. We planned awake fiberoptic nasotracheal intubation with the possibility of tracheostomy in mind due to the failure of endotracheal intubation. In order to verify laryngeal fibroscopy before surgery, we con-

sulted with an otolaryngologist, and it was expected that there would be no difficulty in accessing both nostrils in the

Fig. 1. Facial and intraoral photography images. (A) Facial asymmetry, severely convex facial profile, micrognathia. (B) Maximal mouth opening state.

Fig. 2. Laryngeal fibroscopy images. MT: middle turbinate, IT: inferior turbinate.

Fig. 3. Pre-operative facial CT images. Relatively wide left nostril on axial view (A) and coronal view (B), and nasal septum deviation, right inferior turbinate hypertrophy on coronal view (C).

evaluation of laryngeal fibroscopy (Fig. 2) and pre-anesthesia evaluation. We decided to try first left nostril that would be more accessible because the left nostril looked wider on facial computed tomography (CT) images (Fig. 3) one year ago.

The patient underwent standard monitoring, including electrocardiography, noninvasive blood pressure monitoring, capnography, end-tidal vapor analysis, pulse oximetry, and bispectral index evaluation in the operating room on the day of surgery. The anterior nares and tongue base were topicalised using 2% lidocaine jelly using cotton swabs, after which continuous oxygenation was maintained using nasal prongs, and glycopyrrolate (0.2 mg) was intravenously injected to reduce oral and nasal secretion. We sprayed 10% lidocaine into the nasal cavity for easy entry of the fiberoptic bronchoscope. Thereafter, 4% lidocaine was additionally sprayed while checking the tube entry path using a 3.1 mm outer diameter fiberoptic bronchoscope (Olympus LF-DP; Olympus optical Co., Ltd, Tokyo, Japan) entered through the left nostril. After sufficient pretreatment, we inserted a fiberoptic bronchoscope with a 5.1 mm outer diameter (Olympus MAF-TM; Olympus optical Co., Ltd, Tokyo, Japan) loaded with nasotracheal tube (inner diameter, 6.5 mm, outer diameter, 9.5 mm) through the left nostril; however, contrary to expectations, access through the left nostril was difficult. We did not attempt advancement of the bronchoscope to avoid the risk of intranasal hemorrhage and at-

tempted access through the right nostril. Following checking of the glottis and trachea using fiberoptic bronchoscope, we gently inserted a nasotracheal tube without resistance and auscultated both lungs to confirm lung sounds and correct placement of the nasotracheal tube. Propofol (1.5 mg/kg) and remifentanyl (1 mcg/kg) were injected, followed by radial arterial and left subclavian central catheterization. The surgery lasted about 12 hours without major problems. After surgery, the patient was administered sugammadex (4 mg/kg) to reverse neuromuscular blockade and was transferred to the intensive care unit, and nasotracheal intubation was maintained. The patient was extubated the day following surgery and was transferred to the ward and discharged 16 days postoperatively.

DISCUSSION

General anesthesia in patients with TMJ ankylosis is a definite challenge for anesthesiologists. Our patient had mandibular retraction and significantly limited mouth opening, which were expected to result in considerable difficulty with face mask ventilation, as well as endotracheal intubation. Various methods have been reported to secure the airway in patients with TMJ ankylosis, and fiberoptic nasotracheal intubation is considered the gold standard in patients with TMJ ankylosis, who show limited mouth opening. Other methods, such as blind nasotracheal intubation,

retrograde nasotracheal intubation, or tracheostomy may also be considered in the relevant cases [4,6]. Nasotracheal intubation may cause complications such as bleeding, edema, avulsion of the turbinate, and retropharyngeal perforation. Blind nasotracheal intubation is associated with poor visualization of the larynx and requires multiple attempts and is therefore associated with a greater risk of the aforementioned complications and also of acute respiratory distress or aspiration [7]. And, retrograde intubation or tracheostomy is too invasive for the patient to be a first-line choice. Fiberoptic nasotracheal intubation is not a perfect method. First, the patient must be cooperative, the fiberoptic scope must be equipped, the procedure takes time-consuming, the fiberoptic scope field of view can be obscured by secretions or blood, and an experienced anesthesiologist is required [8]. Nevertheless, if the fiberoptic nasotracheal intubation is decided as the first attempt in a patient with TMJ ankylosis who cannot open the mouth, thorough planning and preparation will be required.

It is necessary to select the appropriate nostril and pathway prior to attempting fiberoptic nasotracheal intubation. The following pathways are used for intubation through the nasal cavity: a lower pathway that involves insertion of the tube to reach the nasal floor below the inferior turbinate and an upper pathway that involves entry of the tube between the inferior and middle turbinates. The lower pathway is usually preferred because the upper pathway is associated with a higher risk of epistaxis and complications such as cribriform plate injury and skull base fracture [7]; however, insertion of the nasotracheal tube into the desired pathway is invariably challenging.

Tests to preview the structure of the nostril in advance include Rhinometry, facial CT and laryngeal fibroscopy, among others. Rhinometry is the screening test of obstructive sleep apnea and it can help with the selection of nostrils. Facial CT provides accurate anatomical delineation and allows us to assess which side is easier to enter and whether there is any distortion of the bony structure [9]. Laryngeal fibroscopy is practically the most important test because it can see whether it is actually easy to enter the bronchoscope and safely access to the vocal cord [10].

If there are no history of nasal obstruction and no specific structural abnormalities, it has not yet been established which nostril is safe. Some reports recommend nasotracheal

intubation through the right nostril because the bevel of the tube does not toward the turbinates and is easier to pass through the vocal cords. However, a few others recommend tube insertion through the left nostril because it reduces the risk of turbinate injury from the sharp tube tip and allows greater space for the laryngoscope blades and Magill forceps on the right side of the oropharynx [11,12]. A few authors have reported no difference between the nostrils with regard to the difficulty of intubation and complication rates [13]. Despite thorough preoperative evaluation, it is often difficult to predict the nostril that should be chosen. Our patient also underwent facial CT and laryngeal fibroscopy. The laryngeal fibroscopy was checked no difficulty in entering both nostrils, but the left nostril space was relatively wide on the facial CT scans of the patient, and the right inferior turbinate mild hypertrophy was shown, so we selected left nostril first attempt. However, after nasotracheal intubation tube passed through the anterior part of the left nostril, we felt significant resistant, so we pulled it out without forcefully advancing it, and subsequently we re-inserted the tube into the right nostril and successfully completed intubation. In order to find out the cause of the failure of the left nostril, which was the first choice, we looked closely at the facial CT taken after the patient's surgery and consulted an otolaryngologist. Facial CT (Fig. 4) revealed a left nasal septal spur, which was not visualized on fiberoptic bronchoscopy, and the resistance encountered during intubation through the left nostril was perhaps attributable to the spur. Nasal sep-

Fig. 4. Post-operative facial CT image shows left nasal septal spur.

tum deviation, nasal septal spur, thickening of the mucous membrane of the turbinates, and nasal polyps, are among the many contributors to difficult nasotracheal intubation. These anatomical structural abnormalities can cause various complications such as intubation failure, epistaxis, turbinectomy, and even perforation of the pyriform fossa [7,14]. In this patient, there was deviation of the nasal septum and right inferior turbinate hypertrophy, but these structures are not bony structures, so it is considered that the passage of the tube was not more difficult than the left nostril with the nasal septal spur. However, epistaxis and turbinectomy may be also occurred by septal deviation and hypertrophy, it is always suggested to perform nasal endotracheal intubation gently without excessive force.

In conclusion, fiberoptic bronchoscopy is the gold standard to endotracheal intubation for general anesthesia in patients with TMJ ankylosis. This should be done by an experienced anesthesiologist, supported by adequate regional airway anesthesia with the patient's cooperation, and prepared for other emergency airway methods in intubation failure. Moreover, poor access into both nostrils may be observed in some patients, and if severe nasal bleeding or airway obstruction occurs, patients may be at risk not even having a chance to attempt additional intubation. Therefore, a careful anesthetic approach is essential to minimize these complications. Thorough understanding of the nasal anatomy, particularly of the patient's turbinates is essential prior to attempting nasotracheal intubation to select the appropriate nostril. However, it should also be understood that selection by pre-anesthetic evaluations should not be regarded as absolute or invariant.

In this case, pre-anesthetic evaluation based on facial CT and laryngeal fibroscopy clearly delineated the nasal anatomy in the patient, and general anesthesia could be performed safely and successfully through careful decision-making and preparation.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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