



AWAKE FIBEROPTIC TRACHEAL INTUBATION AND AT-RISK EXTUBATION IN A PATIENT WITH ANTICIPATED DIFFICULT AIRWAY DUE TO POST-TRAUMATIC ANKYLOSIS OF TEMPOROMANDIBULAR JOINTS

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SUMMARY – In this case report we present successful airway management in a patient with predicted difficult airway using the Difficult Airway Society guidelines. Our patient presented with recurrence of severely reduced mouth opening due to post-traumatic bilateral temporomandibular ankylosis, and was scheduled for surgical resection of the mandibular articular processes. Awake fiberoptic intubation was planned. After light sedation and thorough topicalization of the nasal cavity the flexible optic bronchoscope was successfully navigated into the trachea with 'spray-as-you-go' technique and the endotracheal tube was railroaded over it. After a two-point check of the endotracheal tube placement the patient was put under anesthesia. The surgery was uneventful. Finally, a plan with surgeons for safe extubation was made and the patient was extubated uneventfully on the next day using the airway exchange catheter in the intensive care unit.

Key words: *Awake tracheal intubation; At-risk extubation; Difficult airway; Trismus*

Introduction

Temporomandibular joint (TMJ) ankylosis often occurs after misdiagnosis, delayed treatment, inadequate surgery, prolonged immobilization, or insufficient physiotherapy for intracapsular or subcondylar mandibular fractures. This condition is challenging to

treat because it requires complete release of ankylosis followed by restoration of the condylar height to facilitate full range of motion and good occlusion^{1,2}. Trismus is defined as restricted mouth opening that measures less than 35 mm interincisal distance, and severe trismus is an interincisal distance less than 10 mm. Nasal intubation and tracheostomy have traditionally been performed in patients with trismus but both options are invasive and associated with potential complications and difficult airway management³. That is why awake tracheal intubation should be consid-

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ered. The benefit of this technique in securing the airway before induction of anesthesia is that the patient maintains spontaneous ventilation and airway tone until the trachea is intubated⁴. The preferred route is nasal with fiberoptic bronchoscope since there is limited mouth opening. Several other options are possible, such as retromolar intubation, submental intubation, and front of neck access (FONA), e.g., tracheotomy.

We present a case of a patient with anticipated difficult airway due to post-traumatic ankylosis of TMJs scheduled for surgical correction.

Case Report

A 46-year-old man was admitted to the Department of Otolaryngology, Head and Neck Surgery for treatment of post-traumatic bilateral ankylosis of TMJs causing trismus (Fig. 1). The patient was involved in an airplane accident 7 years before, suffering polytrauma with brain contusion, skull base fracture,

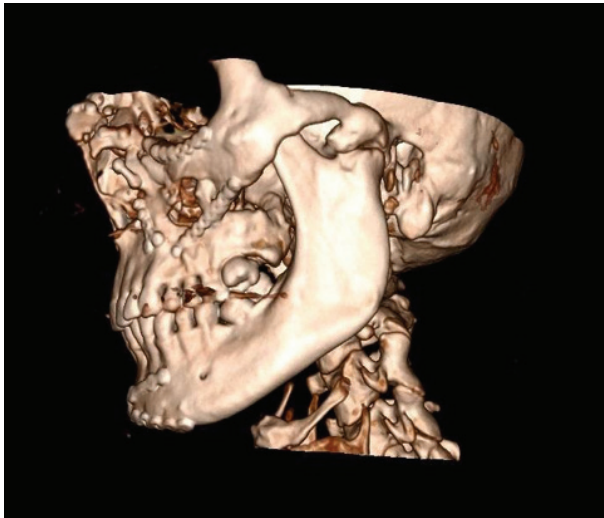


Fig. 1. 3D reconstruction showing ankylosis before surgery.

bilateral contusion of the eyeballs, orbital fracture, and multifragmentary fractures of facial bones. During hospital stay, temporary tracheostomy was performed. Consequently, post-traumatic bilateral ankylosis of the TMJs developed and bilateral condylectomy was performed 3 years before. This time, surgical resection of the mandibular articular process on both sides was planned.

Preoperative airway evaluation was significant because of limited mouth opening (interincisor distance of 8 mm), neck scarring due to previous tracheotomy, and previous airway difficulty in addition to previous head surgery and presenting condition with computed tomography showing stage 3 bilateral ankylosis. Difficult airway was anticipated and a plan of anesthetic management was made accordingly. Experienced anesthesiologist reviewed the patient the day before surgery and performed preoperative evaluation. Upon arrival in the operating room, standard anesthetic monitoring was initiated and an i.v. line was obtained. Two anesthesiology residents were tasked with monitoring the patient's vital parameters and sedation during the procedure, while the experienced anesthesiologist performed the procedure. The patient was premedicated with 1 mg of intravenous midazolam and 5 mcg of intravenous sufentanil. Oral cavity was topicalized with 2% lidocaine using MADgic laryngo-tracheal mucosal atomization device (MAD) and topical vasoconstrictor was applied in the nasal cavity. Since swallowing was impossible, we skipped gargling 10% lidocaine spray into the oral cavity. Supplemental oxygen with flow of 3 L/min *via* nasal cannula was initiated. Transnasal fiberoptic intubation using a face-to-face approach was performed with the patient awake and spontaneously breathing in the semi-recumbent position. The spray-as-you-go technique was used for topicalization of the pharynx, larynx and trachea with 2% lidocaine using working channel of the bronchoscope for pushing lidocaine mixed with air to allow dispersion of anesthetic (total amount of 5 mg/kg of lidocaine). After navigating the bronchoscope into the trachea just above the carina, a 6.5 mm inner diameter cuffed armored endotracheal tube was successfully railroaded over the bronchoscope without resistance. After the two-point check of tracheal tube placement by visualization of the tracheal lumen with flexible optical bronchoscope and capnography, the endotracheal tube cuff was inflated and anesthesia was induced. The course of anesthesia was uneventful. During the surgery, ankylosis of both TMJs was approached through temporal and periauricular cuts. The condylar processes were resected and the mandible was separated from the temporal bone on both sides (Fig. 2). Extubation plan was discussed with surgeons and delayed extubation in the Intensive Care Unit (ICU) was planned after airway edema resolves. High doses

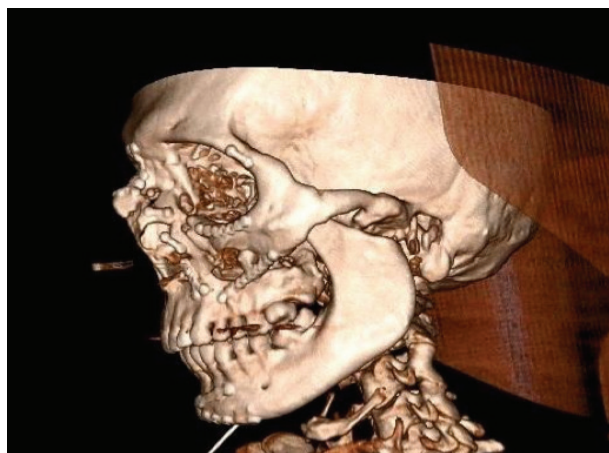


Fig. 2. 3D reconstruction showing release of the joint after surgery.

of dexamethasone (8 mg i.v. twice *per day*) were administered for swelling reduction. After ENT consultation and airway visualization with the fiberscope, the patient was successfully extubated using an airway exchange catheter as *per* the Difficult Airway Society guidelines for at-risk extubation. He was transferred to the ward in good condition a day after that.

Discussion

As mentioned earlier, TMJ ankylosis is challenging to treat because it requires complete release of ankylosis followed by restoration of the condylar height to facilitate full range of motion and good occlusion^{1,2}. However, it is not only a challenge to the surgeons, it is a challenge for airway management for anesthesiologists, and even more in case of the staff less trained in airway management outside the operating room in case of emergency.

Awake fiberoptic tracheal intubation (AFOI) is indicated if there is predicted difficulty to oxygenate using a face mask or supraglottic airway, and should be considered when difficult intubation is predicted⁵. However, this procedure requires regular training and skill, special equipment, and good preparation. A checklist for AFOI is a useful tool to prevent human errors and equipment failure.

As our patient presented with limited mouth opening, i.e., trismus, there was obvious concern about the ability to intubate the patient and it was clear that the nasal route had to be used. In consultation with the

surgeon, the patient and senior anesthetist, a decision was made to proceed with awake tracheal intubation using fiberoptic bronchoscope in order to minimize the potentially catastrophic consequences of failed intubation in an anesthetized patient.

With its high safety and success rate, this technique has proven to be the gold standard for difficult airway management but great attention should be paid to making a strategy for successful implementation, considering sedation, topicalization, oxygenation and performance, including ergonomics during the procedure⁴. Good communication and teamwork are absolutely necessary in order to achieve good success rates with this technique.

Another approach in a similar situation could be awake tracheotomy performed under local anesthesia. Neck scarring from previous tracheotomy presents a risk factor for the difficult front of neck access, so this was reserved as a plan B in our case.

A different option that can be considered is retromolar intubation. The retromolar space presents an access point to the oropharynx and can be used to successfully perform orotracheal intubation. There are two methods of retromolar intubation, one with a flexible fiberoptic scope and another one with a rigid intubating endoscope, e.g., Bonfils^{6,7}. Retromolar intubation is less invasive and is associated with less morbidity than tracheostomy and submental intubation. As the operative field is in close proximity and intraoperative assessment of dental occlusion is required, submental intubation can also be an option, but it is invasive⁸ and not routinely performed in our department.

The patient received light sedation with midazolam and sufentanil to prevent any coughing or discomfort during the procedure. Some authors advocate using remifentanyl infusion, as well as dexmedetomidine while others prefer a sedation-free approach⁹.

Airway topicalization can be achieved by the application of local anesthetics using nebulizers, atomizers, spray-as-you-go technique or transtracheal injection of local anesthetic. The most commonly used local anesthetic is lidocaine. Glossopharyngeal and superior laryngeal nerve blocks are another option. When the nasal route is used, application of a vasoconstricting agent, in our case ephedrine, is recommended.

Important part of AFOI is oxygenation before and during the procedure, and high-flow nasal oxygen (HFNO) is gaining ever more popularity in advanced

airway management. Since the HFNO device is not readily available in our operating room, we provided supplemental oxygen throughout the procedure using a low-flow nasal cannula. This is an alternative, which worked well in this case when only light sedation was used. Nasal cannula has its limitations since it can provide only low flows up to 4 L/min of oxygen. Backup plan was ventilation by face mask attached to the anesthesia machine, with nasopharyngeal airway prepared. Oxygen insufflation by nasopharyngeal airway could also be an alternative, as it is described in the literature¹⁰.

Patient positioning and ergonomics play an important role in performing this technique. We opted for the face-to-face approach¹¹.

The team of surgeons and anesthesiologists decided to postpone extubation of our patient since airway edema after mandibular resection is always a problem. By transferring the patient to the ICU and extubating after optimization of all the patient and non-patient factors, the procedure was much safer (see Fig. 1). The most important factors were swelling of the surgical field, which could obstruct the airway and the level of the patient's sedation. Extubation was performed the day after the surgery using the airway exchange catheter in order to preserve airway access in case of emergency^{12,13}. Cuff leak test and fiberoptic visualization of airway structures are recommended before extubation. Another option in cases like this is to perform temporary tracheostomy at the end, or before the start of the surgery. This approach would allow immediate weaning from the ventilation at the end of the surgery and postoperative care at the high dependency unit.

Conclusions

This case report aims to highlight the importance of airway assessment, planning and management according to the Difficult Airway Society guidelines throughout the procedure, from the induction to extubation in a patient with post-traumatic trismus. Good airway management includes not only intubation, but also maintaining airway safety during shared airway in head and neck surgery and extubation planning. Team approach in airway management should include all the participants involved in patient care, not only in the operating room, but also in the ICU, post anes-

thetia care unit or the ward, depending on the planned patient care. Systemic handover of patients between caregivers, oral and written, is obligatory in order to improve patient safety.

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Sažetak

FIBEROPTIČKA TRAHEALNA INTUBACIJA NA BUDNO I RIZIČNA EKSTUBACIJA U BOLESNIKA S OČEKIVANIM OTEŽANIM DIŠNIM PUTOM ZBOG POST-TRAUMATSKE ANKILOZE TEMPOROMANDIBULARNIH ZGLOBOVA

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U ovom prikazu slučaja opisujemo uspješno zbrinjavanje dišnog puta u bolesnika s predviđenim otežanim dišnim putom primjenjujući smjernice koje je izdalo Difficult Airway Society. Bolesnik se prezentirao otežanim otvaranjem usta posljedično obostranoj post-traumatskoj ankilozi temporomandibularnih zglobova. Planirana je budna fiberoptička intubacija za kiruršku resekciju obaju mandibularnih zglobnih nastavaka. Nakon lagane sedacije i temeljite topikalizacije nosne šupljine fleksibilni optički bronhoskop je uspješno navigiran u traheju tehnikom *spray-as-you-go* te je endotrahealni tubus postavljen preko njega. Nakon dvostruke provjere položaja endotrahealnog tubusa bolesnik je anesteziran. Kirurški zahvat je protekao bez neočekivanih događaja. U dogovoru s operaterima primijenjen je plan za sigurnu ekstubaciju te je ona učinjena bez neočekivanih događaja dan kasnije primjenom tzv. katetera "izmjenjivača" u jedinici intenzivnog liječenja.

Ključne riječi: *Trahealna intubacija na budno; Rizična ekstubacija; Otežani dišni put; Trismus*