Int J Burn Trauma 2024;14(4):96-100
www.IJBT.org /ISSN:2160-2026/IJBT0157398

Case Report

Combined awake videolaryngo-bronchoscopy intubation with HFNC preoxygenation for predicted difficult airway in a patient with post-burn mentosternal scar contracture

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Received April 24, 2024; Accepted July 2, 2024; Epub August 25, 2024; Published August 30, 2024

Abstract: Airway management and safety remain a difficult challenge during reconstructive surgery in patients with extensive post-burn mentosternal scar contractures. Current guidelines do not recommend the use of direct laryngoscopy for predicted difficult airway because of the risk of intubation failure and airway emergencies: the consequences of wrong decisions can be fatal, and the patient is at serious risk. At present, video-laryngoscopy is the most commonly used technique for routine orotracheal intubation. Awake tracheal intubation with fibro-bronchoscopy also remains a valid option when possible, ensuring the patient's spontaneous breathing during the procedure. However, when videolaryngoscopy is used in combination with this method, the efficiency of these devices can be increased, and a better result can be achieved. We report a case of successful management of a predicted difficult airway with combined video laryngo-bronchoscopy in an awake patient with post-burn neck scar contractures.

Keywords: Burn airway, neck contracture, fiberoptic bronchoscopy, videolaringoscopy, awake tracheal intubation, high flow nasal cannula, difficult airway

Introduction

Videolaringoscopy is currently the most recommended intubation technique for routine use and for predicted and unpredicted difficult intubation [1-3]. However, awake fiberoptic intubation remains a good choice for the expected difficult airway because when applied correctly this technique never leads to a point where a patient's breathing is compromised before a secure airway has been established [4]. This approach has various indications: patients with head and neck disease (including malignant tumors, previous surgery or radiotherapy), reduced mouth opening, limited neck extension, obesity, obstructive sleep apnoea and progressive airway impairment. The combination of these two techniques allows for better performance of these devices and facilitates the achievement of the intended purpose. The idea of using laryngoscopy to facilitate other airway management tools (e.g. to achieve a better visualization of the glottis) is not new: in numerous reports, videolaryngoscopy has been used to assist fiberoptic bronchoscopy in various clinical scenarios [5, 6].

Airway management of patients with neck burn contracture requires a degree of attention. Anatomical deformities may include limited opening of the mouth with cycactriform outcomes, obliterated nasal passages, decreased oropharyngeal space, fixed flexion deformity of the neck, limited extension of the atlanto-occipital joint, reduced submandibular space, alterations and deformities of the trachea. Reduced or no extension of the head results in non-alignment of the oral, pharyngeal and laryngeal planes for intubation [7]. Awake tracheal intubation is considered a safe approach for management of the airway in a patient with neck burn contracture, particularly in cases where both intubation and ventilation difficulties are expected [8]. This intubation technique, howev-

https://doi.org/10.62347/JNPY4151

er, can be uncomfortable unless a number of steps are taken. The first fundamental step is patient compliance. In fact, the patient remains conscious and therefore adequate counselling during the preoperative assessment phase is essential. According to the guidelines, the fundamental part to increase the success rate of the procedure is the local anaesthesia, which must be sprayed about 30-40 minutes before the procedure and involves the use of aerosol masks or atomisers or by using local anaesthetics to block the nerves responsible for the innervation of the pharyngo-laryngeal region (glossopharyngeal nerves and thyroid nerves) [9]. Another fundamental step is the method of performance: the patient's position, the choice of an appropriate tube, the accurate cleaning of the secretions are important to increase the success rate of the procedure [9].

Sedation, contrary to popular belief, has a less important role because it only has the task of relaxing the patient, causing anxiolysis. In fact, too high doses, in the case of inadequate local anaesthesia, can cause apnoea and difficulty in ventilating and oxygenating of the patient. The most commonly used drugs are generally: Remifentanil, midazolam and ketamine [9]. In patients receiving sedation in a variety of settings, the administration of oxygen has been shown to reduce the incidence of desaturation. In this particular case, we used a High-Flow Nasal cannula to improve the patient's oxygenation by exploiting some of its physiological effects: the high flows allow carbon dioxide in the dead space to be "washed out", overcome the resistance to the expiratory flow and generate positive nasopharyngeal pressure (acting as PEEP). In addition, the high flows are usually heated to body temperature and are fully humidified, so that the mucociliary functions are preserved and the patient does not complain of any discomfort [10]. All this allows for optimised oxygenation of the patient. We report a case report of a patient with extensive post-burn neck scar contractures in whom the combined videolaryngo-bronchoscopy successfully managed difficult airway during awake tracheal intubation.

Case report

The study protocol complied with the Declaration of Helsinki of 1975 and the patient provided written informed consent before participating in the study.

A 73-year-old woman presented to our hospital in April 2024 for reconstructive surgery with post-burn contracture of the neck and microstomia due to improper domestic use of denatured alcohol which caused a bottle explosion with damage to the face, neck, hands and chest. The patient had a scare concracture extending from her lower lip and face to approximately 8 cm below the base of the neck.

The preoperative anaesthetic assessment revealed the expected difficulty of airway management using the El-Ganzouri risk index with a total score of 10, indicating a high probability of difficult intubation. The patient had a mouth opening of less than 4 cm (1 point), a thyromental distance of less than 6 cm (2 points), Mallampati class IV (2 points), severe neck hypomobility with an angle of extension of less than 80° (2 points), no teeth prognosis (1 point) and a previous intubation difficulty (2 points) reported by another anaesthetist to the patient for another surgical procedure in another hospital without documentation or further details (**Figures 1**, **2**). The patient was carefully informed of the intubation procedure with all the risks involved, including the risk of tooth avulsion due to the presence of unstable teeth.

Before taking the patient to the operating room, an 18-gauge peripheral venous catheter was place in the right hand, and the patient was nebulised with 4% lidocaine 30 minutes before surgery to anesthetise the upper airway with minimal discomfort to the patient. In this case, local nerve blocks could not be administered due to the contracture and due to the alteration of the anatomical structures. An intensive care unit bed was reserved for the patient, which would have been necessary for protected extubation and intensive post-operative monitoring. In the operating room standard monitoring began by attaching a five-lead electrocardiograph, a blood pressure cuff (non-invasive monitoring) and an oxygen saturation probe. The surgeon was advised of the possibility of emergency tracheotomy if necessary. High-Flow Nasal Cannula was used for pre-oxygenation at FiO_2-100% and a flow of 60 l/min.

We premedicated the patient with paracetamol 1 g, dexamethasone 4 mg and clonidine 75

Figure 1. Front view of the patient.

Figure 2. Side view of the patient.

mcg. Subsequently, we started a continuous infusion remifentanil 0.05 mcg/kg/min and administered midazolam 2 mg. The oral route was chosen to perform awake intubation, so we implemented local anesthesia using Lidocaine 2% using a dedicated atomizer and then we gently inserted the blade of the video laryngoscope, using Glidescope® with a size 3 hyperangulated blade. Before reaching the glosso-epiglottic fold, additional doses of Lidocaine 2% were sprayed under visualisation to target deeper structures and make the procedure more comfortable for the patient and finally, when awake videolaryngoscopy was complete, the view of the glottis was partial (**Figure 3**) [11]. The fibre-optic bronchoscope was inserted through the mouth and the procedure with this device was greatly facilitated by the videolaryngoscope which created all the good conditions for optimising the procedure. When the fibre-optic bronchoscope reached the laryngeal aditum, another additional dose of Lidocaine 2% was sprayed on the vocal cords through the device itself: this allowed easy access to the trachea and a final administration of local anesthetic. Once the tracheal carina was reached, the tube was inserted into the trachea using the guidance of the device and the patient was safely administered general anesthesia. Vital parameters were stable and peripheral oxygen saturation was always 100%. At the end of the procedure, the patient was transferred to the intensive care unit and was safely extubated with no complications.

Discussion

Burn disease is difficult to manage and always requires a multidisciplinary team. The consequences of this pathology can be divided into two phases: acute burn injury and chronic post-burn scar. Analgesia, careful fluid balance, and early intubation are important elements of the initial emergency management. Long-term complications of burns, such as disfiguring scars on exposed areas of skin and functionally significant contractures, often require surgical treatment [12]. Early measures for scar care may improve the outcome.

The underlying fibrous tissue and hypertrophic scars may deform the larynx, mouth and mandible. Severe chin-sternal contracture may severely limit the range of cervical motion, making the sniffing position difficult. Finally, a history of aspiration may indicate tracheal stenosis, which may prevent further advancement of

Figure 3. Videolaryngoscopic visualisation.

the endotracheal tube. In these patients, airway management becomes fundamental. Adequate prehospital assessment, the use of modern intubation devices and careful application of the guidelines improve the final outcome.

However, even the use of more innovative techniques when singly used (such as videolaryngoscopy or fibrobronchoscopy) cannot exclude the difficulty of airway management. If the airway anatomy is too distorted due to soft issue retraction, bronchoscopy or videolaringoscopy may be problematic [13]. For these reasons, the choice of a combined technique, where possible, can improve the efficiency of each device and can increase the success rate of intubation. The simultaneous use of videolaryngoscopy and flexible bronchoscopy can help to achieve success in difficult tracheal intubation. A videolaryngoscope may help to open the oropharynx and facilitate the identification of anatomical landmarks, while a flexible bronchoscope can act as a steerable bougie, thereby avoiding trauma to airway structures and facilitating passage through a distorted airway [14]. When this combined technique is used for awake tracheal intubation, the safety of the procedure is preserved, allowing airway management with constant oxygenation of the patient.

The effectiveness of this combined technique has also been demonstrated in another similar clinical case [15], although further studies are needed to confirm these preliminary results.

It is a safe technique that can be used especially in the elective setting for reconstructive surgery of mentosternal scar contracture. For urgent surgery, the technique may be difficult to perform due to the time required to prepare the patient, which would delay the start of surgery.

In addition, allergy to local anaesthetics or rejection of the treatment by the patient contraindicates its use.

Conclusion

The simultaneous use of a videolaryngoscope and a fibre-optic bronchoscope is, when possible, a valid option for the awake tracheal intubation and may improve the chances of success in patients with post-burn mentosternal scar concracture. In the post-burn patient, careful preoperative assessment of the airway and scar is essential. Spontaneous ventilation may need to be maintained at all times and muscle relaxants should be avoided. Oxygenation during the procedure with a high-flow nasal cannula is safe and effective and ensures excellent oxygenation and comfort for the patient.

In patients with extreme deformity, the underlying functional and anatomical alteration may be such that all intubation attempts fail. A surgeon should be available and ready to intervene for possible emergent tracheotomy placement.

Disclosure of conflict of interest

None.

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