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Difficult Airway Management in Post - Burn Patient - A Case Study

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Abstract

We describe a case of a very difficult intubation in an acute burn injury patient, which was safely navigated through careful planning and teamwork. Multiple techniques were used as described by the difficult airway algorithm and the patient was finally intubated using a fibreoptic intubation technique. In this report, we provide various modes of airway management used and the most efficient technique when it comes to anticipated difficult airway management in an acute burn patient.

Introduction

Burn injury patients provide a lot of challenges to every aspect of medicine. Complications can vary from difficult airways to contracture formation. Burns covering more than one third of the body surface area cause release of multiple inflammatory mediators, hypovolemia and tissue injuries. These effects along with the change of starling forces lead to flow of fluid from blood to both kinds of tissues, injured and non-injured. This causes severe general tissue edema including the soft and hards palates, epiglottis and vocal cords leading to a very challenging airway management for almost all major burn patients. The restriction of neck movement due to edema further aggravates the situation for an anesthesiologist. Burn patients usually come for various kinds of surgeries ranging from fasciotomy and release of contractures to simple procedures like change of dressing, which can be just as challenging nonetheless. There are various techniques that can be used for airway management of a severe burn patient, the devices range from Combitube [1] to intubating LMA [2] to more complex procedures such as fibreoptic bronchoscopy.

In this report, we describe the use of multiple techniques in order to intubate a patient with severe burn Injury of the neck and thorax who came for emergency fasciotomy.

Case

A 30 years old female with no prior comorbid, presented to operating theater for emergency fasciotomy of bilateral upper limbs after corrosive burn, which occurred 24 hours prior to her arrival. The burn area encompassed the maxillary and mandibular area of the face, neck, thorax and the upper limbs

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(approximate total boy surface area of burn was 40%). The lips and neck were grossly swollen, despite these factors, the patient was vitally stable, conscious, oriented and maintained oxygen saturation on Hudson facemask with 5 litres oxygen O_2. On preoperative evaluation, the patient was predicted as difficult airway (mask ventilation and intubation) due to massive face and neck edema. There was severe restriction in flexion and extension of the neck, with mouth opening of up to 2 fingers breath (interincisor GAP)

After applying monitors, a difficult airway trolley was called for, along with video laryngoscope, multiple sizes of ETT and LMAs. A fibreoptic bronchoscope was kept aside as an alternative. After preoxygenating the patient with 100% Fio2 the patient for 3 minutes the patient was induced with titrated doses of Propofol, upon loss of consciousness and jaw tone, an intubation was attempted using video-laryngoscope. Upon laryngoscopy it was noticed that the epiglottis was grossly swollen obstructing the view of the glottis. Edema was so severe that even a bougie was not able to pass through. Hence, the laryngoscopy was abandoned and a laryngeal mask airway of size 3 was put in place. After ensuring that the patient was ventilating adequately through the supraglottic device, it was decided that a fibreoptic intubation would be attempted. Anesthesia was maintained with 2-3%isoflurane and 100% FIO2.

A fibreoptic bronchoscopy was attempted by a senior registrar of the anesthesia team, which was unsuccessful. The LMA was placed back in position and adequate ventilation ensured. The on call anesthesia attending was called for but as this was an emergency procedure the surgery team was asked to proceed as the patient of maintaining oxygenation on LMA. The procedure took approximately 1.5 hours during which time the airway was maintained with LMA, Nalbuphine 0.1 mg/kg and paracetamol 15 mg/kg was injected for pain control. No relaxant was used and the procedure was performed on spontaneous ventilation with hand assist by the anesthesiologist. The on call ENT resident was kept on standby in case emergency tracheostomy was to be performed.

After the procedure it was decided that the patient should be intubated and electively ventilated in the ICU until the edema subsides after which time she would be extubated. The Anesthesia team was allotted various tasks, one resident was on the drugs and another on monitoring and a third resident was assigned to assist the attending on the bronchoscopy. The anesthesia consultant attempted fibreoptic bronchoscopy through the LMA. The bronchoscopy was successful and tracheal carina was identified, but when the ETT (size 6) was tried to railroad through the LMA it got stuck on the tip of the supraglottic device. The bronchoscope was hence pulled out. The classic LMA was replaced by the intubating LMA and an ETT of smaller size was loaded onto the bronchoscope. Bronchoscopy was tried again and after multiple attempts, the anesthesiologist was able to identify the glottis opening through the bubbles that were produced in the bloody field by the patient's breathing. Following the bubbles, the trachea and carina were identified and an uncuffed size 5.5mm ETT was inserted through the intubating LMA. Capnograph was observed to confirm successful intubation; bilateral air entry was confirmed through auscultation. Tube exchanger was used to change the uncuffed ett with a cuffed ETT of the same size. Again, the intubation was confirmed through Capnograph an bilateral equal air entry. The ETT was secured and the patient was shifted to intensive care unit.

Discussion

As mentioned, our patient came for an emergency fasciotomy after suffering from burn injury to face, neck, thorax and bilateral upper limbs. The areas of concern in our patient were the facts that it was an emergency procedure so the patient wasn't visited by an anesthesiologist, which made the scenario more complicated. Secondly, the patient had suffered the injury more than 24 hours prior to her arrival and had developed extensive edema over her face and neck compromising the airway significantly.

The key to successful airway management is extreme vigilance, efficient communication, being able to alter decision considering the time and situation in hand and reassessing the event as it takes place [3].

There were several devices that were used in order to achieve a controlled airway, these included laryngeal mask airways of different sizes, an intubating laryngeal mask airway, video laryngoscope and fibreoptic bronchoscope guided intubation.

We initially used a video laryngoscope for the first attempt at laryngoscopy as opposed to a conventional laryngoscopy, as it has been used successfully in airway management of patients who had history of previous or anticipated history of difficult airway [4]. But due to the severity of edema in the airway it resulted in failure.

Since an attempt at laryngoscopy had failed and mask ventilation was difficult, a laryngeal mask airway was used as a rescue device for ventilation of the patient. LMA has been a very useful device in difficult airway management. A report was published in 1998 that showed LMA to be a rescue device in 94% of the patients included in the study [5].

Not only did the LMA provide as a mean of ventilating the patient in the case of difficult laryngoscopy, it was also used for conduct the entire surgery during which time alternate means of intubation were being arranged. LMA has been used for ventilation of patients with acute burn injury particularly in the paediatric population [6].

As mentioned, we also used an intubating LMA in order to aid the use of fibreoptic resulting in a successful intubation. A study was published in 2001 in which 254 patients with difficult airways were managed using an intubating LMA [7]. Many experts have acknowledged the use of multiple techniques for the management of difficult airway. These range from simple instruments like a laryngeal mask airway to more advanced skills like fibreoptic intubation [8]. A case report in 2018 successfully demonstrated use of fibreoptic bronchoscopy for intubation in pediatric burn patients [9].

It is stipulated that due to the advent of newer and more easier techniques, fibreoptic bronchoscopy is seem to be practiced less and hence not used for difficult airway management as much as it should be. This trend needs to change as we found this technique extremely useful [10].

Furthermore, American society of anesthesiologist recommend the use of various techniques and instruments that can be employed in the planning of an anticipated difficult intubation, these techniques range from awake intubation, video-assisted laryngoscopy, intubating stylets or tube-changers, SGA for ventilation (e.g., LMA, laryngeal tube), SGA for intubation (e.g., ILMA), rigid laryngoscopic blades of varying design and size, fiberoptic-guided intubation, and lighted stylets or light wands.

Despite all the latest innovations and developments there are still scenarios in which, there is no option but to provide a surgical airway for the patient such as a tracheostomy. Open percutaneous tracheostomy has been used in severe burn patients with complete airway obstruction as a rescue airway management technique [11]. Thankfully, our patient was maintaining good saturation even when ventilated through a laryngeal mask airway, which gave us enough time to perform a fibre optic bronchoscopy in order to secure the airway.

Preparing for a difficult airway and being observant throughout in addition with being flexible with multiple techniques is the key to successful airway management of a post burn patient [12].

Conclusion

Severe burn patients often present with difficult airways for the anesthesiologist. A closed loop communication between the surgery, anesthesia and ENT team is very important in order to device an efficient plan for successful airway management. Several techniques have been advised and used in the past but fibreoptic bronchoscopy seems to be the technique of choice. Indeed, it is a valuable skill for any physician to attain when it comes to managing difficult airway cases particularly in post burn patients.

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