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Case report

A case report of successful awake fiberoptic intubation in a child with severe airway burn

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Abstract The role of awake fiberoptic bronchoscopy in non burn population is well established, however, in burn patients; more evaluation is needed. Here's a case of successful management of difficult airway with fiberoptic bronchoscopy in a child with a severe degree of post-burn contractures.

1. Introduction

In chronic burn patients; multiple deformities can be encountered; the most dangerous are those affecting the airway [1–3]. The underlying dense fibrous hypertrophic sheets of scar may displace the epiglottis and vocal cords anteriorly and pulled towards the scar, circumoral and mentosternal contractures may limit the mouth opening and cervical range of motion, the nasal orifices may be closed with inability to advance nasal airways, also, the limited mouth opening may prevent introducing airways, laryngoscope blades or laryngeal mask airways. Facial burns during early childhood can cause underdevelopment of the jaw (micrognathia) [4].

Many airway equipments and techniques have been tried successfully for intubating burn patients: spontaneous ventilation under general anesthesia without muscle relaxation while doing surgical release of circumoral and mentosternal contractures followed by direct laryngoscopy or the use of intubating laryngeal mask airway, blind nasal intubation, lightwand, retrograde wire technique [5] or others.

But with repeated attempts; bleeding and secretions in the oropharynx will harm the airway and will make fiberoptic intubation impossible as a second plan. So, fiberoptic intubation from the start is the most efficient and the least traumatic.

As induction of general anesthesia is dangerous because both intubation and mask ventilation may be impossible, the awake state is the safest option [6].

2. Case presentation

A male patient 11 years old, weighing 30 kg. He had severe flame burn since he was 5 years old. He was presented to the surgery unit for release of the neck and graft application (see Fig. 1).

History was taken confirming absence of any medical illness, no history of epistaxis or nasal problems, no infectious diseases, no allergy to lidocaine or phenylephrine, no current medications (see Figs. 2–6).

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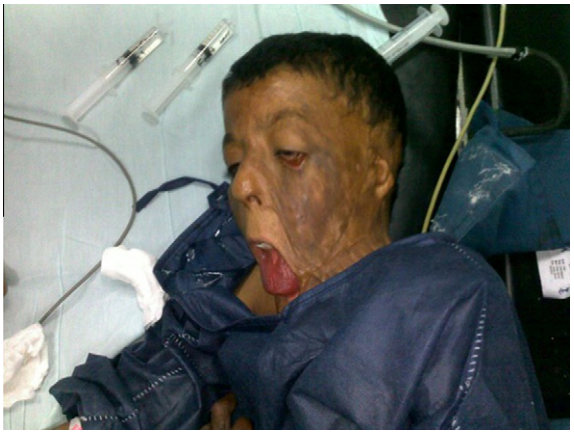

Figure 1 Chronic burn patient with multiple deformities.

Figure 4 Successful nasal intubation.

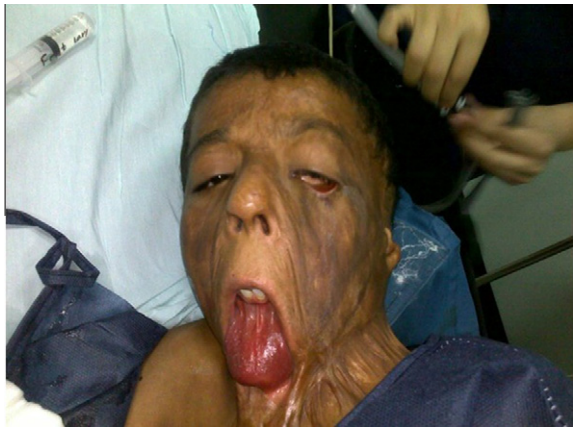

Figure 2 Circumoral and mentosternal contractures with limited mouth opening.

Figure 5 Release of the neck with graft application.

Figure 3 Severe scarring to the face and neck.

Physical examination: Severe flame burn with severe scarring to the face including the lower eyelids, neck, palms, hands. Thumb dislocation. Left eye ectropion (viable 6/6 eyes). HR: 100/min, BP: 110/70, Temp: 36.5, RR: 13/min.

Airway assessment: Severe neck flexion due to anterior neck contracture. Mouth opening was restricted with interincisor gap of 1 cm. Both nares were patent.

Awake nasal fiberoptic intubation was planned. The procedure and the need for it was explained to the patient. A written informed consent was taken pre-operatively.

The patient fasted 6 h before endoscopy. Monitoring includes ECG, pulse oximetry, capnography and arterial blood pressure. Intravenous access was obtained and infusion of normal saline started.

2.1. Preparation

IV atropine 0.01 mg/kg was given to reduce secretions, IV midazolam 0.03 mg/kg to alleviate anxiety, IV fentanyl 0.5 μg/kg was given. All resuscitation equipments were ready for use.

Both nasal passages were inspected by superficial nasal endoscopy and the right one was chosen because of its larger

Figure 6 The patient is in rigid neck collar to support the head.

size. Lidocaine spray 2% was applied to the base of the tongue and the pharyngeal walls using tongue depressor. 2 ml lidocaine 2% was applied also to the nose together with 2 ml phenylephrine 0.5%.

Oxygen was provided by nasal cannula positioned over the patient́s open mouth.

After checking the fiberoptic bronchoscope (Olympus 3.5 mm OD), a cuffed endotracheal tube 5.5 mm ID was lubricated and applied through the right nostril. Three ml of 2% lidocaine were sprayed on visualization of the vocal cords. Suction catheter facilitated the procedure.

After intubation: confirmation was done using capnography. Auscultation was done to assess equality on both sides.

Heart rate (HR), ECG and oxygen saturation were monitored continuously throughout the procedure, no decrease in oxygen saturation was noticed.

Anesthesia was induced using fentanyl 1 μg/kg, thiopental 5 mg/kg, atracurium 0.4 mg/kg. Dexamethasone 4 mg was given to counteract possible oedema due to surgery. Anesthesia was maintained using isoflurane 1%, 100% oxygen with closed circuit and intermittent positive pressure ventilation.

The patient underwent a mastoid to mastoid incision for release of the neck followed by split thickness coverage. The graft was harvested by a dermatome (thickness 0.25 mm) from the right anterior thigh to cover the raw area of 20×70 cm. An average full thickness graft from left groin as a donor site (5×7 cm ellipse) was used to cover the ectropion of the left eye after release via subciliary fascia. Right external jugular vein was identified and ligated intra-operatively.

At the end of the procedure, residual neuromuscular blockade was antagonized using neostigmine 0.05 mg/kg and atropine 0.02 mg/kg. Awake extubation was done successfully.

A smooth recovery with no complications: no nasal bleeding, no decrease in oxygen saturation, no sore throat, no voice changes were noted. I.V. paracetamol 1gm was given postoperatively.

Lastly, the patient was in rigid neck collar (Philadelphia) size 4.5 to support the head because of weakness of neck muscles.

The patient was on oral Augmentin 315 mg/8 h, repeated dressing every 12 h with good take of graft.

3. Discussion

Children carry a greater challenge for the anesthesiologist. They cannot cooperate and applying topical anesthesia to the airway for fiberoptic intubation requires gentle and smooth communication with the child, together with titrated sedation. Alternatively, simultaneous administration of a volatile anesthetic (sevoflurane) with nebulized lidocaine via a small volume nebulizer that is connected to the inspiratory limb of the circle system via a T-piece adaptor can be used for fiberoptic intubation in un-cooperative children [7]. Other options include delivery of oxygen and general anesthesia by a pediatric size endoscopy mask, or nasopharyngeal airway to facilitate fiberoptic intubation.

Care must be taken in pediatric patients because of their smaller airways, so, their mucosa can be easily touched during the manipulations of FOB leading to difficult visualization, also, the higher rates of oxygen consumption shorten the period of apnea that can be tolerated [8].

Different combinations and techniques using fiberoptic bronchoscope (FOB) are used [9]:

- Combined rigid laryngoscope – FOB technique: if the mouth opening is wide enough.
- Combined nasopharyngeal airway (NPA) – FOB technique: using an ordinary NPA {which is cut laterally} in the creation of a guide for FOB tip to the perilaryngeal area.
- Combined NPA with FOB involves administration of oxygen and general anesthesia through an {intact} NPA in one nostril, and the FOB can be introduced orally or from the opposite nasal passage. This technique is more common in pediatric patients. It provides good oxygenation with plenty of time.
- Combined endoscopy mask – FOB: endoscopy mask has a single port for administration of oxygen and anesthetic gases and another port with an insertion diaphragm wide enough to allow passage of ETT and FOB.
- Intubation with FOB through the laryngeal mask airway, intubating laryngeal mask and air-Q.
- Lastly, combined FOB with video or optical laryngoscopy.

The selection of the proper technique depends on proper examination of the patients' airway, the availability of equipments for pediatric size. The air-Q is available in pediatric size while there is no pediatric size for intubating laryngeal mask airway. Aintree is required for fiberoptic intubation through the laryngeal mask airway.

4. Conclusion

Awake fiberoptic intubation under topical anesthesia together with adequate sedation can greatly facilitate safe endotracheal intubation in burn patients.

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