Anesthesia & Clinical Research

Guimaraes et al., J Anesth Clin Res 2015, 6:10
http://dx.doi.org/10.4172/2155-6148.1000573

Case Report Open Access

A Case of Severe Head and Neck Post-Burn Contractures: Fiberoptic Intubation through an I-Gel Laryngeal Mask Maintaining Spontaneous Ventilation

Joana Guimaraes, Catia Real, Rita Frada, Jorge Orfao and Humberto Machado*

Department of Anaesthesiology, Intensive Care and Emergency, Centro Hospitalar do Porto, Porto, Portugal

***Corresponding author:** Humberto Machado, MD MSc PhD, Department of Anaesthesiology, Intensive Care and Emergency, Centro Hospitalar do Porto, Porto, Portugal, Tel: 00351-935848475; Fax: 00351220900644; E-mail: hjs.machado@gmail.com

Received date: August 11, 2015; **Accepted date:** October 27, 2015; **Published date:** October 30, 2015

Abstract

Airway management in patients with head and neck contractures can be very challenging. Severe facial and neck scars may predict difficult mask ventilation. Difficult intubation should also be expected. We analyzed the airway management in an adolescent with severe post burn head and neck contractures. The challenges during airway approach are discussed and a comprehensive analysis regarding the option for fiberoptic intubation using an I-gel laryngeal mask as a conduit is also performed. Considering the scarce literature in this topic, the techniques described here represent an important contribute to the process of decision-making when planning the airway approach in these patients.

Keywords: After burn airway; Post-burn contractures; Fiberoptic intubation; I-gel laryngeal mask

Introduction

After the acute phase injury, recovered burn patients are frequently submitted to reconstructive surgery. In the post-burn patient, judicious preoperative airway and post-burn contractures evaluation is mandatory. Airway management in patients with head and neck contractures can be challenging due to a distorted airway anatomy and may potentially lead to a "cannot ventilate cannot intubate" scenario.

As literature on fiberoptic intubation through a laryngeal mask airway in these patients is scarce [1], we analyzed the airway management of an adolescent with severe post burn head and neck contractures. The patient was admitted at our hospital for elective reconstructive surgery of the upper limb.

The main concerns for safe airway management in the post-burn patients, especially with head and neck contracture sequels, are anticipation and evaluation in addition to the preservation of spontaneous ventilation during all the process.

The challenges during airway approach are discussed and a comprehensive analysis regarding the option for fiberoptic intubation, using an I-gel laryngeal mask as a conduit, is also performed.

Case Description

A 15-yr-old adolescent, weighing 60 kg, with severe post-burn contractures of the upper body, including the face and neck, was scheduled for upper limb plastic surgery. The patient underwent to a preoperative anesthesia evaluation. After the burn episode he developed a severe depression and anxiety disorder and was medicated with valproic acid and cetirizine. No other morbidities and no allergies stated. There were no alterations in blood analysis and coagulation tests. Extreme anxiety during medical procedures excluded the option for awake regional anesthesia. Moreover, the severe neck and arm hypertrophic scars would make difficult to obtain an acceptable image for brachial plexus block with the ultrasound probe. He presented with limited mouth opening, Mallampati III, reduced tyromental distance and very limited neck mobility with no extension. General anesthesia was administered one year previously, during the acute burn injury phase. A difficult fiberoptic tracheal intubation was registered in a difficult airway card. No information about mask ventilation or adjuncts and conditions for the fiberoptic approach. Based on the airway information of the acute phase and the observed head and neck contractures a difficult intubation was anticipated. Due to the lack of compliance, an awake fiberoptic procedure was excluded. Considering the uncertainty about facemask ventilation and airway patency after induction, a fiberoptic intubation through an I-gel supraglottic airway device was planned and executed.

The patient was admitted in the hospital the day before surgery. It was introduced a proton pump inhibitor (esomeprazole) and usual medication was maintained. There was no previous history of gastroesophageal reflux. It was recommended fast during at least six hours and surgery was schedule to the next morning.

Before surgery, the difficult airway trolley was checked and the material and devices were prepared in the operating room. A videolaryngoscope was also available if needed in the process of decision-making. There were two anesthesiologists scheduled to the procedure.

In the operating room, the ASA (American Society of Anesthesiology) standard monitoring, bispectral index (BIS) analysis and train-of-4 stimulation were applied.

Anesthesia was induced with sevoflurane maintaining spontaneous ventilation and an intravenous access was obtained. Despite the use of an oropharyngeal tube to overcome upper airway obstruction it was difficult to maintain airway patency.

The airway obstruction was overcome with an I-gel® laryngeal mask airway (LMA) size 4 which was inserted at the first attempt while keeping spontaneous ventilation. No audible leak and peak airway pressure 14 cm H_2O. Vocal cords were visualized with a 3.4 mm size fiberscope at the first attempt and 2% lidocaine was sprayed through

the fiberscope channel. The glottis had a whitened mucous and the structures were deviated making more difficult the orientation of the fiberscope.

Intubation with an orotracheal tube 6.0 through the I-gel® was performed with success and tube positioning was confirmed with fiberoptics and capnography. Laryngeal mask was removed with the help of an exchanger tube to safe mask removal. Tube positioning was again confirmed with capnography. After securing the airway intravenous fentanyl and rocuronium were administered and mechanical ventilation started. During the procedure the patient was hemodynamically stable and there were no intercurrences regarding ventilation. Analgesia was provided with fentanyl bolus. For postoperative analgesia it was administered intravenous acetaminophen, cetorolac and morphine. At the end of the procedure, sevoflurane was discontinued and a bolus dose of sugamadex (120 mg) was administered. Extubation was performed considering the respiratory mechanics adequacy and after an adequate reversal of neuromuscular blockade (TOF ratio ≥ 90%). Extubation occurred without complications. Duration of general anesthesia was 60 minutes.

The patient was conducted to the recovery room with supplemental oxygen which was discontinued after confirming he was alert and cooperative and with adequate oxygen peripheral saturation. Analgesia was adjusted with intravenous morphine bolus. During hospital stay there were no intercurrences.

Discussion

Children with an expected difficult airway require careful planning and expertise. Careful evaluation in the post-burn patient with head and neck contractures is crucial since anatomical variations may be significant [1]. In the acute burn injury phase particular attention is paid to external and airway soft tissue damages [2]. During the post-burn phase, contractures in the face, neck and chest may result in upper airway obstruction, microstomia, subglottic stenosis, tracheomalacia, granuloma formation, fixation of the neck in a flexed position [1-3]. Severe facial and neck scars may predict difficult mask ventilation. Difficult intubation should also be expected. Maintenance of spontaneous ventilation during induction and intubation and avoidance of muscle relaxants is a better and safer option in these cases [1,4].

In contrast to adult anesthesia, awake fiberoptic tracheal intubation in children is rarely an option leaving the anesthesiologist no choice but to manage the airway after induction of anesthesia [4,5]. In this particular case, the patient experienced extreme anxiety facing medical procedures making impossible an awake approach. However, anesthesia induction may carry the risk of airway collapse due to loss of pharyngeal tone, negative intraluminal pressure and hypercapnia [1]. Inability to extend the neck and limitations on chin-lift and jaw thrust may compromise the possibility to overcome airway obstruction after induction. A spontaneous breathing method with sevoflurane during all phases of airway management is a good option in order to have a way out if the airway cannot be secured. It´s also important to point out that neck contractures and scaring can distort anatomy (cricothyroid membrane not palpable; scar tissue hypertrophy) making cricothyrotomy difficult or impossible.

When airway obstruction occurs the first step is to optimize the conditions: patient positioning, neck extension and chin-lift maneuvers, oropharyngeal tube insertion, two operator mask ventilation. In this case report, reduced neck mobility and inability to do jaw thrust maneuver conditioned difficulties to maintain airway patency despite the use of an oropharyngeal tube and maintenance of spontaneous ventilation. This was a situation of difficult but possible ventilation, not a "can't ventilate" scenario. If this was the case, our plan also included the option to proceed with an attempt to insert the laryngeal mask and overcome the obstruction. If not successful, it was assumed the possibility of a second attempt with a different size LMA. Given the high risk of soft tissue edema this approach should be limited to two attempts.

There is always the question of how far it is reasonable to go in the difficult airway scenario, should things not go as planned. Patients recovered from severe head and neck burns may have simultaneously a difficult ventilation and intubation.

Inability to insert the LMA would direct our decision-making plan to a nasal fiberoptic intubation using a specially designed endoscopy mask to insert the fiberscope in order to keep oxygenation and the volatile anesthetic delivery during spontaneous ventilation. However, if the "can't ventilate scenario" was present, it was previously anticipated the possibility of reducing sedation to optimize spontaneous ventilation and oxygenation and then deepen inhalational anesthesia and advance for a videolaryngoscopy attempt (Glidescope®). In this particular situation we thought to be critical to maintain spontaneous ventilation, so the use of muscle relaxants was assumed to have a high risk of degeneration into the "can't ventilate, can't intubate scenario".

Continuing with multiple attempts to intubate would also put the child at that risk. Having in mind these assumptions and the possibility of failure in an invasive airway approach it was included the decision of waken up the child in this phase of the plan.

Laryngeal mask airway (LMA) may be an excellent airway adjunct for the post burn patient, however, its use for maintaining the airway has a serious risk of dislodgement since it may not firmly situate in the larynx due to external anatomical abnormalities [1]. It should also be anticipated the risk of aspiration when using the LMA, particularly if it's not available a second generation one. Stomach aspiration using a nasogastric tube can be performed through the channel of the second generation LMA reducing risk of aspiration and gastric hyperinflation. Fasting guidelines are strongly recommended and should be respected [6].

As we could observe in this case report, LMA may be a good choice to overcome difficult mask ventilation providing airway patency while keeping spontaneous ventilation. The inefficiency of the oropharyngeal tube may be related to the presence of a lower obstruction and if this is the case a supraglottic device may be a better option.

Moreover, LMA should be used as a transitory device, acting as a conduit to fiberoptic intubation and shortening the distance to the vocal cords. As mentioned above, keeping in mind the risk of a "cannot ventilate cannot intubate scenario" spontaneous ventilation must be maintained during intubation attempts, based on a strategy of deep inhalational anesthesia and topical anesthesia of the airway.

Although successfully used in adults by highly experienced users, blind insertion of the tracheal tube through the Intubating LMA (ILMA) should be avoided because of the risk of trauma which is more pronounced in the case of a previous burned patient [1]. ILMA may be more difficult to insert in these patients due to limited mouth opening; its rigidity and the epiglottic elevating bar in the mask aperture may pose some problems guiding the fiberscope. With classic LMA and

Proseal® LMA a guide (catheter or wire) has to be advanced before intubation.

I-gel LMA may have some advantages in patients with severe head and neck contractures taking into account ease of insertion and previous studies reporting a good positioning with successful identification of the vocal cords with the fiberscope [7-9]. Fiberoptic tracheal intubation through the LMA is achieved by mounting an adequately sized tracheal tube on the fibreoptic scope. Risk of dislodgement when removing LMA must be anticipated.

There are few cases reporting the use of I-gel to facilitate fiberoptic tracheal intubation [10-15] but none of these cases was associated to the recovered burn patient and ventilation was not maintained during intubation attempts. We only found one case report describing fiberoptic intubation through I-gel LMA in a post-burn patient [16]. A nine year-old girl with a neck contracture limited to the anterior midline with no other parameters of difficult airway described. As we mentioned above, I-gel LMA was easy to insert despite limited mouth opening and neck flexion and enabled us to overcome an airway obstruction not improved with an oropharyngeal tube and attempts to elevate the mandible. It was also possible to maintain spontaneous ventilation with this device and fiberoptic intubation occurred with no incidents using inhalational anesthesia and topical anesthesia of the airway. Considering the scarce literature in this topic, the techniques described here may represent an important contribute to the process of decision-making when planning the airway approach in these patients.

Conclusion

Airway management of pediatric patients recovering from severe head and neck burns may be very challenging because scarring can impair both mask ventilation and tracheal intubation.

An invasive rescue airway may be impossible in these patients. Adequate planning and preparation is crucial in order to have a way out if the airway is not secured.

When an awake approach is not feasible, a technique that enables maintenance of spontaneous ventilation is the safest choice for airway management in non-collaborative patients.

The use of a laryngeal mask airway may be the key to overcome airway obstruction getting a faster visualization of vocal cords and a more direct access to trachea.

References

1. Caruso TJ, Janik LS, Fuzaylov G (2012) Airway management of recovered pediatric patients with severe head and neck burns: a review. Paediatr Anaesth 22: 462-468.
2. Fuzaylov G, Fidkowski CW (2009) Anesthetic considerations for major burn injury in pediatric patients. Paediatr Anaesth 19: 202-211.
3. Han T, Teissler H, Han RJ, Gaines JD, Nguyen TQ (2012) Managing difficult airway in patients with post-burn mentosternal and circumoral scar contractures. Int J Burn Trauma 2: 80-85.
4. Russo SG, Becke K (2015) Expected difficult airway in children. Curr Opin Anaesthesiol 28: 321-326.
5. Gruppo di Studio SIAARTI "Vie Aeree Difficili", Frova G, Guarino A, Petrini F, Merli G, et al. (2006) Recommendations for airway control and difficult airway management in paediatric patients. Minerva Anestesiol 72: 723-748.
6. Smith I, Kranke P, Murat I, Smith A, O'Sullivan G, et al. (2011) Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. Eur J Anaesthesiol 28: 556-569.
7. Singh J, Yadav MK, Marahatta SB, Shrestha BL (2012) Randomized crossover comparison of the laryngeal mask airway classic with i-gel laryngeal mask airway in the management of difficult airway in post burn neck contracture patients. Indian J Anaesth 56: 348-352.
8. Levitan RM, Kinkle WC (2005) Initial anatomic investigation of the I-gel airway: a novel supraglottic airway without inflatable cuff. Anaesthesia 60: 1022-1026.
9. Janakiraman C, Chethan DB, Wilkes AR, Stacey MR, Goodwin N (2009) A randomized crossover trial comparing the igel supraglottic airway and classic laryngeal mask airway. Anesthesia 64: 674-678.
10. Kim Y, Seo D, Shim K, Kim E, Lee J, et al. (2013). Successful tracheal intubation using fibreoptic bronchoscope via an I-gel supraglottic airway in a pediatric patient with Goldenhar syndrome-A case report. Korean J Anesthesiol 65: 61-65.
11. Gupta L, Chaudhary K, Bhadoria P (2012) I-Gel: A Rescue Intubation Device in Unanticipated Difficult Intubation for Emergency Laparotomy. Open Journal of Anesthesiology 2: 44-46.
12. Sharma S, Scott S, Rogers R, Popat M (2007) The i-gel airway for ventilation and rescue intubation. Anaesthesia 62: 419-420.
13. Campbell J, Michalek P, Deighan M (2009) I-gel supraglottic airway for rescue airway management and as a conduit for tracheal intubation in a patient with acute respiratory failure. Resuscitation 80: 963.
14. Emmerich M, Tiesmeier J (2012) The I-gel supraglottic airway: a useful tool in case of difficult fiberoptic intubation. Minerva Anestesiol 78: 1169-1170.
15. Michalek P, Hodgkinson P, Donaldson W (2008) Fiberoptic Intubation Through an I-Gel Supraglottic Airway in Two Patients with Predicted Difficult Airway and Intellectual Disability. Anesth Analg 106: 1501-1504.
16. Gupta R, Gupta R, Wadhawan S, Bhadoria P (2012) Tracheal intubation through Igel conduit in a child with post-burn contracture. J Anaesthesiol Clin Pharmacol 28: 397-398.