

Airway management in patient with retractable scar in neck: a case report

Abstract

44-year-old male patient hospitalized 4 months ago for presenting a 25% body surface burn in thoracic limbs and face; as well as airway. Developing a retractable scar in the anterior neck which progressed, so it was scheduled by plastic surgery service for scar release plus the application of anterolateral free thigh flap.

Anesthetic management was given with general anesthetic with intubation in an awake patient with flexible fibroscopy, based on fentanyl and intravenous propanidid, once vocal cords are crossed with the fibroscope endotracheal tube is introduced and balanced general anesthesia is provided. Surgical anterolateral free thigh flap procedure ends, endotracheal tube is removed, without complications. In the late postoperative period, the patient presents favorable evolution with adequate flexion and cervical extension with the use of the flap.

Keywords: burn, difficult airway, awake intubation, retractable scar, propanidid

Volume 12 Issue 3 - 2020

Barbabosa Balanzario Manuel Alejandro, Sánchez López Roberto Alejandro, Flores Uribe Cynthia Edith, Gil López Jorge Guillermo, Carriola Zamilpa Carlos Ignacio, Puente Solorio Armando, Cruz Martinez Cynthia

Anesthesiology Service of the Medical Center Lic, Adolfo LópezMateos, Institute of Health of the State of Mexico

Correspondence: Manuel Alejandro BarbabosaBalanzario, Anesthesiology Service of the Medical Center Lic, Adolfo LópezMateos, Institute of Health of the State of Mexico, Toluca, Mexico, Tel 7225716794, Email manalebarbal@gmail.com

Received: January 28, 2020 | **Published:** May 5, 2020

Introduction

The airway management of patients with neck burn contracture requires skill and competence. The airway can be difficult for one or several of the following reasons: restricted mouth opening (healed mouth angles), obliterated nostrils, decreased oropharyngeal space, fixed neck flexion deformity, limited atlanto-occipital joint extension, reduction of the submandibular space or alteration of the tracheal position.

Onah¹ has described a clinical classification system for postburn mentosternal contractures comprising four major groups based on the location of the contracting band and extent of flexion or extension away from the anatomical position of the neck and jaws. Each group is further sub-classified based on the contracting segment width. Jeong et al.² modified the Onah classification (Table 1) and found significant correlation between modified Onah class 2b and 3 and Cormack grade 3 and 4 laryngoscopic views (sensitivity and specificity 86.0% and 84.9%, respectively). The application of the modified Onah class can reduce the frequency of an unanticipated failure to visualize laryngeal structures and potential unnecessary interventions related to over-prediction of airway difficulty in patients with post-burn mentosternal contractures.

Fixed flexion deformity results in nonalignment of the oral, pharyngeal and laryngeal planes for intubation. In a patient undergoing multiple surgical procedures, the release of neck contracture is performed first to ensure easier control of the airways in subsequent surgeries. Strategies for airway management, intraoperative problems and concerns in extubation of patients with neck of patients with retractable scar.³ The scarce information in patient with retractable scar in neck and almost null for the use of propanidid in awake intubation mainly based on data from published randomized clinical trials and case reports that were identified through the Pubmed, Medline and Google Scholar databases.

Table 1 ThemodifiedOnah classification²

Type	Degree of contracture
1	Mild anterior contracture: the patient is able to flex the neck and bring the neck and jaws to the anatomical position while erect
a)	Narrow, <2 fingerbreadths
b)	Broad, >2 fingerbreadths
2	Moderate anterior contracture: attempts at extension away from the anatomical position result in a significant pull at the lower lip
a)	Narrow, <2 fingerbreadths
b)	Broad, >2 fingerbreadths
3	Severe anterior contracture: the patient's neck is contracted in the flexed position and the chin is occasionally restrained down to the anterior trunk The patient is unable to reach anatomical position of the neck and jaws

Case report

44-year-old male patient hospitalized 4 months ago for presenting a 25% body surface burn in thoracic limbs and face; as well as airway. Developing a retractable scar in the anterior neck which progressed to a point where food intake was difficult due to access to the mouth. He avoided the conversation due to the difficulty of speech, his limited ability to communicate, food intake and the appearance of his face, especially that of his mouth and neck, forced him to seek medical attention.

At the first physical examination(Figure 1-3),the patient is shown with a 44 mm horizontal and 20 mm vertical oral openingwith

lower lip retraction (Figure 4) grade III oral opening scale and grade IV Mallampatti-Samsoon-Young scale with a limited mandibular protuberance keeping lower incisors in front of upper incisors, as well as a facial surface with epithelized mixed second degree burns, in the anterior cervical region, a retractable scar that prevents neck extension conditioning Bellhouse-Doré scale grade IV, scales such as Patil-Aldrete, sterno-mental distance and neck circumference could not be measured by anatomical distortion, anterior chest burns with adequate epithelialization, preoperative tests revealed no nutritional deficiencies, a chest x-ray is performed presenting cervical flexion (Figure 5). Therefore, computed tomography is taken, revealing presents an increase in oral, laryngeal and pharyngeal angles (Figure 6), corroborated in the reconstruction of soft tissue (Figure 7), a vascular reconstruction is also performed for surgical planning (Figure 8); so it was scheduled by plastic surgery service for scar release plus the application of anterolateral free thigh flap.



Figure 1



Figure 2



Figure 3



Figure 4

Anesthetic management

We give general anesthetic with intubation in an awake patient with flexible fibroscopy; a patient is placed in a sitting position, nebulization with 2% simple lidocaine is applied for 10 min and simple lidocaine is administered in swabs through nostrils. Antisialog with atropine and analgesia based on fentanyl and intravenous propanidol is given latency and flexible fibroscope is introduced through the right nostril, patient remains in spontaneous ventilation, glottis is located, simple lidocaine is instilled 2% in a spray-as-you-go technique and once vocal cords are crossed with the fibroscope endotracheal tube is introduced (Figure 9), capnography line is observed, induced and balanced general anesthesia is provided (Figure 10). Surgical anterolateral free thigh flap procedure ends (Figure 11,12), endotracheal tube is removed, without complications. In the late postoperative period, the patient presents favorable evolution with adequate flexion and cervical extension with the use of the flap (Figure 13-15).



Figure 5



Figure 8

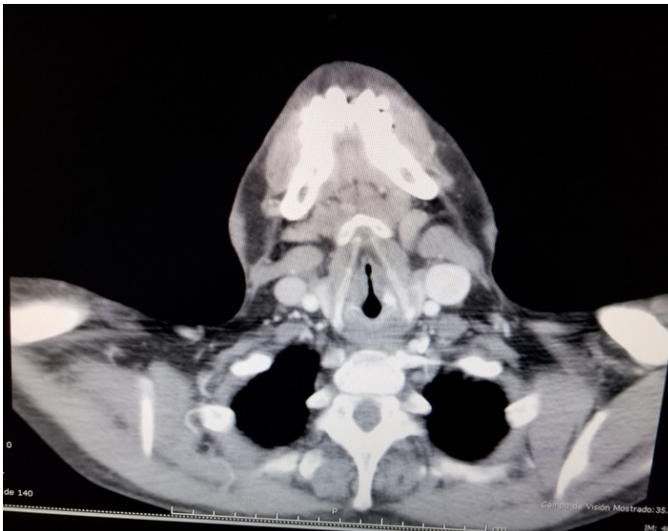


Figure 6



Figure 9

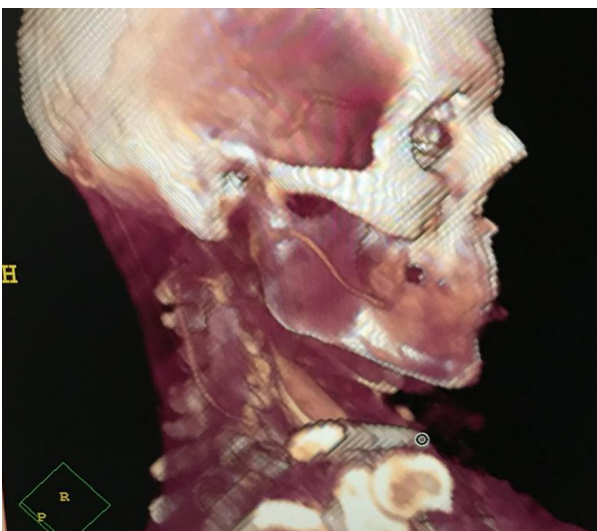


Figure 7



Figure 10



Figure 11



Figure 12

Discussion

The patient had late burn complications, that is, contractures. The anesthesiologist's main concern is the potential risk of the difficult airway. We did not consider retrograde intubation or tracheotomy because the anterior structures of the neck, including the larynx, trachea and carotid arteries were neither identifiable nor palpable.⁴

Airway management of patients with neck burn contracture is a challenge for the anesthesiologist. Patient evaluation includes history, physical examination and airway. A safe approach to the management of the airways of a patient with a moderate to severe retractable neck scar is to secure the airway with the patient awake. The anesthesiologist

must have a previously planned strategy for intubation of the difficult airway.⁵



Figure 13



Figure 14

The recommended options for airway management of these patients include, lidocaine (1–4%) is most commonly used for airway anesthesia for awake intubation. It is important to be cognizant of the amount of lignocaine used (toxic plasma levels >5 mg/ml) as it is quickly absorbed from the oral and tracheal mucosa. Total lidocaine dose should be limited to 8.2 mg/kg.⁶ Use of such high doses of lignocaine is safe as the drug is administered in fractional doses at different sites in the airway over a period of time.

Topical anesthesia is the mainstay of airway preparation in patients with burn contracture of the neck and can be achieved by use of aerosol sprays, nebulization, gargling or spray-as-you-go technique (SAYGO). Nebulization involves inhalation of vapour (4 ml of lidocaine 4%) through the nose or mouth for nasal or oral intubation,

respectively. Cotton-tipped nasal pledgets soaked in 2–4% lidocaine are placed (for 15 min for optimal effect). Alternatively, 2% lidocaine jelly can be squeezed into each nostril and the patient is asked to sniff vigorously. The patient is instructed to gargle with viscous lidocaine 2%. The solution is expectorated to avoid excess local anesthetic absorption. In the SAYGO technique, the fiberscope is advanced in the hypopharynx where the glottic structures are visualized. Lidocaine 2% solution (1 ml lignocaine and 9 ml air drawn in a 10-ml syringe) is injected via the working channel of the fiberscope on the mucosa. Alternatively, an epidural catheter (introduced through the side port) can be threaded out of the end of the scope and lignocaine injected onto the cords. The catheter can also be placed through the cords allowing a further dose to be injected below the cords. The SAYGO technique is particularly useful in patients with patients with burn contracture of neck as it is usually not possible to perform nerve blocks to anesthetize the upper airway.



Figure 15

Nerve blocks of superior laryngeal and translaryngeal nerve blocks are usually not possible in patients with burn contracture of the neck due to lack of access to the anterior and lateral neck, hyoid bone and limited or no neck extension.

Awake fiberoptic-guided intubation in patients with burn contracture of the neck location of the glottis and insertion of the fiberscope into the trachea can be difficult because of the fixed flexion deformity of the neck and distortion of upper airway structures by the fibrotic scar. Maneuvers that facilitate glottis visualization, such as jaw thrust and head extension may not be possible in such patients. Sometimes, because of extreme flexion deformity of the neck, it may be very difficult or even impossible to advance the tracheal tube over the scope into the trachea when the fiberscope has been successfully placed in the trachea. An important reason for this difficulty is deviation of the course of the tube from that of the fiberscope toward the epiglottis, arytenoids cartilage, pyriform fossa or esophagus.^{7–9} Esophageal intubation may occur despite correct placement of the fiberscope into the trachea.^{10,11} To overcome difficulty with railroading (advancing a tracheal tube over a fiberscope) the tube, the following is recommended: reducing the gap between the fiberscope and trachea, use of flexible tube and 90° anti-clockwise rotation of the tracheal tube.⁷ Compared to a polyvinyl chloride (PVC) tube, a flexible tracheal

tube is easier to advance over the fiberscope as it can change direction more easily to follow the course of the fiberscope.^{12,13} Warming a PVC tracheal tube is not recommended in patients with burn contracture of the neck. A warm PVC tracheal tube is softer and hence more likely to get kinked in the acutely angled naso- or oro-pharynx of the patient with extreme flexion deformity of the neck.¹⁴ For oral intubation, airway intubators such as the Berman,¹⁵ Ovassapian¹⁶ and Williams¹⁷ are available. However, in patients with microstomia (cicatrisation following oral burns), these airways may not be accommodated through the narrowed inter-incisor gap. The cut barrel of a 10-ml syringe has been used as a bite-guard during oral awake fiberoptic-guided tracheal intubation in a patient with limited mouth opening.¹⁸ A patient with obliterated nares, extreme microstomia and severely limited neck extension was managed by awake oral fiberoptic-guided intubation aided by a Williams airway intubator¹⁹ Assessing the correct airway-intubator size is important. The measured length from the lips to the back of the tongue on lateral neck X-ray was used to determine the airway size.¹⁹ A similar patient was managed by awake oral fiberoptic intubation aided by Berman's airway that allows the tracheal tube to pass directly through its channel into the glottis.²⁰

With the supraglottic airway devices, the Intubating Laryngeal Mask Airway-Fastrach™ (ILMA) can be used for ventilation and to facilitate either blind or fiberoptic guided tracheal intubation. In patients with patients with burn contracture of the neck in whom face-mask ventilation is expected to be difficult, the ILMA may be inserted after topical anesthesia of the upper airway. If intubation through the ILMA is unsuccessful, the following maneuvers may be performed; (1) up-down maneuver (slowly withdrawing the inflated cuff from the pharynx 5–6 cm and then reinserting it²¹ which repositions a down-folded epiglottis during blind ILMA use); (2) optimization maneuver²² adjusting the ILMA position until optimal seal is obtained; (3) extension maneuver²³ (pulling the handle of the ILMA backward the operator); (4) Chandy maneuver²³ (this maneuver consists of two sequential steps). The first step enables optimal alignment of the laryngeal aperture and the bowl of the mask.

The metal handle is used to rotate the device in the sagittal plane to establish optimal ventilation with minimal resistance to bag ventilation and minimal audible leaks during manual ventilation. In the second step, just before blind intubation the ILMA-Fastrach is slightly lifted (but not tilted) away from the posterior pharyngeal wall using the metal handle. This facilitates the smooth passage of the endotracheal tube into the trachea; (5) change of size of ILMA.

In patients with extreme flexion of the neck with the mouth opening directed inferiorly, it may not be possible to introduce the ILMA in the conventional manner. The hypotenuse of the triangle formed on joining the tip of the mouth portion with the machine end of the ILMA is the minimum distance required between the hard palate and the most anterior part of the patient's chest for successful ILMA placement.²⁴ Following tracheal intubation through the ILMA, removal of the ILMA with use of the stabilizer rod has to be performed with utmost care to avoid accidental extubation. Pushing the tracheal tube further into the trachea before attempting removal of ILMA can help prevent inadvertent extubation.²⁴ At times it might be prudent to leave the ILMA and tube in place until after the contracture has been released.²⁴

The Laryngeal Mask Airway (LMA) has a role in the management of the difficult airway as a definitive airway or as an aid to tracheal intubation, either blindly or with fiberoptic guidance. Blind passage of a tube exchanger or a bougie into the trachea can be attempted

followed by removal of the LMA and intubation with a tracheal tube over the guiding device.²³ The LMA can be used successfully as a bridge to restore the airway in a patient who cannot ventilate or intubate. However, the LMA may not always be correctly placed because of anatomical abnormalities and may be displaced by intraoperative position changes.²⁶ Other supraglottic devices such as the ProSeal LMA, I-gel and laryngeal tube may be similarly used. A Combitube was successfully used in a patient with burn contracture of the neck with limited mouth opening and tracheal stenosis that precluded tracheal intubation.²⁷

Intubation by direct laryngoscopy is practiced when mask ventilation is expected to be satisfactory following induction of anesthesia (intravenous or inhalational) and intubation is expected to be difficult but possible. Preoxygenation is important.⁴ In cases where difficulty is anticipated, intubation or laryngoscopy is performed without use of neuromuscular blocking agents. The combination of fentanyl (2 mg/kg) and midazolam (0.03 mg/kg) followed 5 min later by propofol (2.5 mg/kg) provides acceptable intubating conditions in a majority of patients.⁴ If intubation is judged to be easy, (favorable Cormack grade), neuromuscular block can be provided by rocuronium 0.9 mg/kg. External laryngeal manipulation, use of a smaller than regular sized tracheal tube, stylet, bougie and McCoy laryngoscope blade can facilitate intubation. The use of a two-person intubation technique is particularly useful in this setting, wherein, one anesthesiologist performs laryngoscopy and optimal laryngeal manipulation to obtain the best possible view of the glottis and a second anesthesiologist intubates the trachea. In case of unilateral scars, the epiglottis and vocal cords are pulled toward the side of the scar and the laryngoscope should be advanced ipsilaterally toward the direction of the scar.²⁶ Use of a light wand in patients with burn contracture of the neck is hampered by thick scar tissue that may obscure light and result in esophageal intubation.

Video-assisted rigid laryngoscopy or video laryngoscopy (VL) is a useful adjunct to facilitate tracheal intubation in patients with burn contracture of the neck. While direct laryngoscopy is associated with failure when a laryngeal view cannot be obtained, VL frequently overcomes this obstacle. However, difficulties may be encountered in advancing the tracheal tube toward the laryngeal view of the video-monitor. This disadvantage can be overcome by using fiberoptic bronchoscopy as a guide wire under VL view.²⁹ Chong et al.³⁰ reported successful airway management. Awake intubation using fiberoptic bronchoscopy under GlideScope. Video laryngoscope guide with severe patients with burn contracture of the neck.

Tumescent anesthesia (TA) involves subcutaneous infiltration of a large volume of very dilute lignocaine (as low as 0.05% or 0.1%) and adrenaline (1:200,000). This allows administration of up to 55 mg/kg of lidocaine.³¹ TA has been used safely for harvesting skin grafts, liposuction and patients with burn contracture of the neck release. Factors that contribute to the safety of TA include dilute solution of lidocaine, a relatively avascular subcutaneous/fibrous tissue, lipid solubility of lignocaine, vasoconstrictive effect of adrenaline and compression of vasculature from infusion of a large volume of solution.³² The solution is infiltrated along the incision line and into the surrounding tissues. Safe and quick surgical neck contracture release facilitates tracheal intubation. Neck contracture release prior to intubation was first described by Tanzer³³ in 1964 who suggested release of the inferior half of the neck under local anesthesia when

difficulties are anticipated. Further release can then follow successful intubation. The interval between incision and tube insertion may be rather critical.

The preparation of our patient includes an explanation of the proposed procedure, sedation, administration of antisialogog and regional airway anesthesia. This had to be provided in a personalized way since access for external infiltration of local anesthetic to the superior laryngeal nerve or transtracheal application of local anesthetic was incapable due to the anatomical modifications that conditioned the scar tissue. We opted for a nasal route considering the clinical characteristics of our patient, nebulizations with lidocaine as well as lidocaine impregnated swabs in the nasal passages with an adequate approach to the airway and visualization of the airway with spray-as-you-go technique under sedation with fentanyl and adjuvant propanidid (3 a 5 mg/kg) it increases the respiratory volume approximately 300% and the respiratory frequency like 20%. This hyperventilation persists on average 40 seconds, followed by hypoventilation that lasts two to five seconds. After this, the respiratory volume per minute, simultaneously with the start of respiratory stimulation, lowers blood pressure and increases the pulse rate. Systolic blood pressure decreases 10% and diastolic blood pressure 15%, while the pulse increases on average to 15%, returning to normal in two minutes,³⁴ with adequate tolerance to the procedure without reviewing the literature on this drug in this type of patients.

Conclusion

The anesthetic management of this patient with burns and contractures presented a special challenge to the intubation skill of the anesthetist. It demonstrated the need for careful approach to the problem of difficult airway under anesthesia. Propanidid is an ultra-short acting agent, useful in anesthesia for sedation and induction, it has shown us its safety, efficacy and versatility in short procedures such as intubation in the awake patient. This case demonstrated the useful role played by fibroscope in the management of difficult airway with particular reference to patients with retractable scar in neck.

References

1. Onah II. A classification system for postburn mentosternal contractures. *Arch Surg.* 2005;140:671–675.
2. Jeong IM, Seo WG, Woo CH, et al. Prediction of difficult intubation in patients with postburn sternomental contractures: modified Onah class. *Korean J Anesthesiol.* 2009;57(3):290–295.
3. Prakash S, Mullick P. Airway management in patients with burn contractures of the neck. *Burns.* 2015;41(8):1627–1635.
4. Apfelbaum JL, Hagberg CA, Caplan RA, et al. Practice guidelines for management the difficult airway: an updated report by the American Society of Anesthesiologists Task Force on Management of the Difficult Airway. *Anesthesiology.* 2013;118(2):251–270.
5. Thomas J Caruso, Luke S Janik, Gennadiy Fuzaylov. Airway management of recovered pediatric patients with severe head and neck burns: a review. *Paediatr Anaesth.* 2012;22(5):462–468.
6. British Thoracic Society guidelines on diagnostic flexible bronchoscopy. *Thorax.* 2001;56(Suppl. I):i1–21.
7. Asai T, Shingu K. Difficulty in advancing a tracheal tube over a fiberoptic bronchoscope: incidence, causes and solutions. *Br J Anaesth.* 2004;92(6):870–881.

8. Katnelson T, Frost EAM, Farcon E, Goldiner P, et al. When the endotracheal tube will not pass over the flexible fiberoptic bronchoscope. *Anesthesiology*. 1992;76(1):151–152.
9. Schwarz D, Johnson C, Roberts J. A manoeuvre to facilitate flexible fiberoptic intubation. *Anesthesiology*. 1989;71(3):470–471.
10. Koga K, Asai T, Latta IP, et al. Effect of size of a tracheal tube and the efficacy of the use of the laryngeal mask for fibroscope-aided tracheal intubation. *Anaesthesia*. 1997;52(2):131–135.
11. Moorthy SS, Dierdorf SF. An unusual difficulty in fiberoptic intubation. *Anesthesiology*. 1985;63(2):229.
12. Calder I. When the endotracheal tube will not pass over the flexible fiberoptic bronchoscope. *Anesthesiology*. 1992;77(1):398.
13. Hakala P, Randell T, Vali H. Comparison between tracheal tubes for orotracheal fiberoptic intubation. *Br J Anaesth*. 1999;82(1):135–136.
14. Prakash S, Kumar A, Kumar M, et al. Successful detection and management of kinked tracheal tube in a patient with severe post-burn contracture of the neck. *Indian J Anaesth*. 2013;57(1):90–91.
15. Berman RA. A method for blind oral intubation of the trachea or esophagus. *Anesth Analg*. 1977;56(6):866–887.
16. Ovassapian A. Fiberoptic endoscopy and the difficult airway. 2nd ed. New York: Lipincott-Raven; 1996.
17. Williams RT, Maltby JR. Airway intubator. *Anesth Analg*. 1982;61(3):309.
18. Gupta P, Talwar V, Verma S, et al. Modified mouth prop for orotracheal fiberoptic intubation. *J Anaesthesiol Clin Pharmacol*. 2006;22:65–67.
19. Sahajanandhan R, Saravanan P, Ponniah M, et al. Post-burn contracture neck with extreme microstomia and fibrosed obliterated nose: a unique airway challenge. *Natl Med J India*. 2010;23(5):281–282.
20. Kaur KP, Taxak S, Hooda S, et al. Airway management of post burn contracture neck – an anaesthesiologist's challenge. *Egypt J Anaesth*. 2012;28:233–236.
21. Brimacombe J. Laryngeal mask anesthesia: principles and practice. 2nd ed. Philadelphia: WB Saunders; 2005:166.
22. Komatsu R, Nagata O, Kamata K, et al. The intubating laryngeal mask airway allows tracheal intubation when the cervical spine is immobilized by a rigid collar. *Br J Anaesth*. 2004;93:655–659.
23. Ferson DZ, Rosenblatt WH, Johansen MJ, et al. Use of the intubating LMA-Fastrach in 254 patients with difficult-to-manage airways. *Anesthesiology*. 2001;95:1175–1181.
24. Kumar R, Prashast, Wadhwa A, et al. The upside down intubating laryngeal mask airway: a technique of cases of fixed flexed neck deformity. *Anesth Analg*. 2002;95(5):1454–1458.
25. Jeong IM, Seo WG, Woo CH, et al. Prediction of difficult intubation in patients with postburn sternomental contractures: modified Onah class. *Korean J Anesthesiol*. 2009;57(3):290–295.
26. Han TH, Teissler H, Han RJ, et al. Managing difficult airway in patients with post-burn mentosternal and circumoral scar contractures. *Int J Burn Trauma*. 2012;2(2):80–85.
27. Hagberg CA, Johnson S, Pillai D. Effective use of the esophageal tracheal Combitube following severe burn injury. *J Clin Anesth*. 2003;15(6):463–466.
28. Prakash S, Arora D, Prakash S, et al. A combination of fentanyl-midazolam-propofol provides better intubating conditions than fentanyl-lignocaine-propofol in the absence of neuromuscular blocking agents. *Acta Anaesthesiol Scand*. 2006;50(8):999–1004.
29. Park CD, Lee HK, Yim JY, et al. Anesthetic management for a patient with severe mentosternal contracture: difficult airway and scarce venous access – a case report. *Korean J Anesthesiol*. 2013;64:61–64.
30. Chong-Doo Park, Hye-Kyoung Lee, Ji-Yeon Yim, et al. Anesthetic management for a patient with severe mento-sternal contracture: difficult airway and scarce venous access -A case report-, *Korean J Anesthesiol*. 2013;64(1):61–64.
31. American Society for Dermatological Surgery. Guiding principles for liposuction. *Dermatol Surg*. 1997;23:1127–1129.
32. Saraf S, Goyal P, Ranka P. Tumescence anaesthesia; a useful technique for harvesting split-thickness skin graft. *Indian J Dermatol*. 2004;49:184–186.
33. Tanzer R. Burn contracture of the neck. *Plast Reconstr Surg*. 1964;33:207–212.
34. Barraza-Espinoza V. Propanidido en México: mitos y realidades. *Revista Mexicana de Anestesiología*. 2017;40(1).