

# Airway Rescue using the LMA Supreme™ in the prone position: a case report

Case report

Massimiliano Sorbello<sup>1</sup>, Ivana Zdravkovic<sup>2</sup>, Massimiliano Veroux<sup>3</sup>, Ruggero Massimo Corso<sup>4</sup>

## Abstract

*Surgery in prone positioning may pose considerable challenges to Anesthesiologists because of general accessibility to the patient; this is particularly true if referring to airway management, because the airway could be relatively inaccessible while the patient is lying prone.*

*We report a case of an obese women scheduled for lower limbs surgery in the prone position in which the initial anesthetic choice for spinal anesthesia needed to be switched to general anesthesia during the procedure both for the occurrence of surgical complications and because the patient began to become uncooperative. We successfully managed this problem by inserting a LMA Supreme™ leaving the patient in the same prone position, and maintaining anesthesia in mechanical ventilation, thus allowing surgical procedure to be completed uneventfully. The possible options in similar cases and the specific features of LMA Supreme™ which allowed such a choice are discussed.*

**Keywords:** Airway Rescue; LMA Supreme™; Prone position; Anesthesia  
*Salvataggio delle vie aeree mediante LMA Supreme™ in posizione prona: un caso clinico*  
CMI 2015; 9(3): 79–85  
<http://dx.doi.org/10.7175/cmi.v9i3.1186>

- <sup>1</sup> Department of Anesthesia and Intensive Care Unit, AOU Policlinico-Vittorio Emanuele, Catania, Italy  
<sup>2</sup> Department of Anesthesia and Reanimation, Zvezdara Hospital, Belgrade, Serbia  
<sup>3</sup> Department of Surgery, Transplantation and Advanced Technologies; Vascular Surgery and Organ Transplant Unit, University Hospital of Catania, Catania, Italy  
<sup>4</sup> Department of Emergency, Anesthesia and Intensive Care Section “G.B. Morgagni-Pierantoni” Hospital, Forli, Italy

## INTRODUCTION

The LMA (Laryngeal Mask Airway) Supreme™ (Teleflex, USA) is a recently developed laryngeal mask which might be considered not simply a disposable version of LMA ProSeal™ (Laryngeal Mask Company, Singapore), but rather its single use evolution. It offers features coming from LMA Unique™ (as it is medical PVC made and disposable), from LMA Fastrach™ (because of shape, mimicking human airway anatomy, curvature and stiffness) and from LMA ProSeal™ (double-cuff design allowing higher sealing despite a lower intracuff pressure and gastric access opportunity) [1]. At the same time, LMA Supreme™ offers a large number of innovations such as an elliptical shaped airway conduit (more resembling to human upper airways anatomy), a stiffer, coaxial and pre-formed gastric tube

conduit (which allows an easier insertion of the gastric tube maintaining the possibility to perform the “drain tube leak test”), a totally redesigned cuff (allowing lower cuff pressure with a maximal sealing and a greater tolerance in terms of filling volume) with

### *Why we describe this case*

*Airway management in prone position could be challenging, yet in elective conditions and more when it is unexpectedly and urgently needed. We report a case in which a second generation extraglottic device was used to rescue a critical airway, assessing its safety and efficacy, thus suggesting a further option for similar cases when urgent airway control might be needed*

**Corresponding author**  
Dr Massimiliano Sorbello  
Department of Anesthesia and Intensive Care Unit, AOU Policlinico-Vittorio Emanuele, Via del Plebiscito 628, 95127 Catania, Italy  
Phone: +39 349 6277107  
massorbello@gmail.com

**Disclosure**  
No external funding and no competing interests declared

new features in the perilaryngeal side of the cuff itself, such as two small wings surrounding the gastric tube channel designed to prevent epiglottis down-folding and to maintain airway conduit patency (Figure 1).

Its inflated-deflated ratio is absolutely favorable, which, together with device rigidity and airway-like shape, make insertion easier and smoother.

It has been used for many procedures in elective setting, either in patients in supine position and in prone position, while we report a case of emergency use of the LMA Supreme™ as airway rescue technique in a patient receiving lower limbs surgery in the prone position.

**CASE DESCRIPTION**

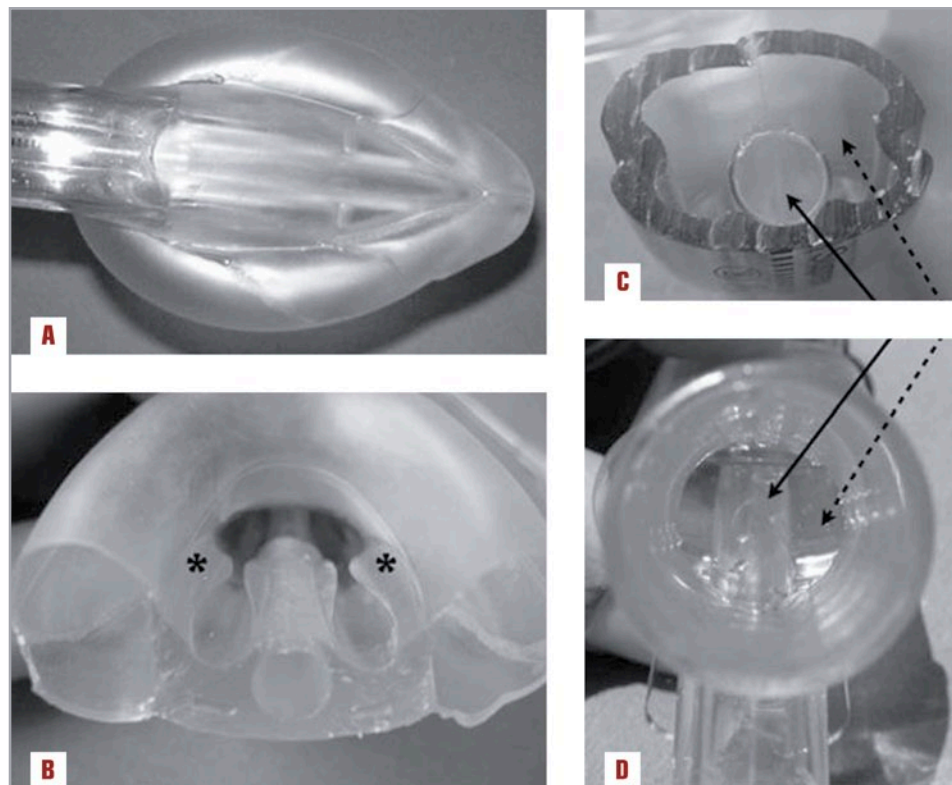
A 118 kg/163 cm obese (BMI = 44.6) female patient was scheduled for a lower limb neoplasm (suspected as lipoma and surrounding hematoma) resection; such a neoplasm was located in posterior part of left lower limb, approximately 15 cm above popliteal fossa, thus scheduled surgery required prone positioning for optimal surgical access.

After evaluation of laboratory tests, clinical history and patient consent was obtained, spinal anesthesia was scheduled. Also airway

evaluation was carefully considered for exclusion of severe difficult intubation and difficult mask ventilation criteria accordingly to Italian difficult airway management guidelines [2]. The patient presented a Mallampati II grade, normal thyro-mental and sterno-mental distances, normal mouth opening and inter-incisors distance more than 4 cm, no history of snoring or Obstructive Sleep Apnea (OSA) and less than 42 cm neck circumference, the only factor suspect for potential Difficult Mask Ventilation (DMV) being represented by obesity (BMI = 44.6).

Spinal anesthesia was performed uneventfully using 0.5% levobupivacaine 13 mg + morphine 0.1 mg at L2-L3 level with 25G Whitacre pencil point needle, and once the surgical anesthesia was achieved the patient was pronated and surgery started. Patient was given crystalloids infusion 500 ml prior to anesthesia via a 18G peripheral intravenous line, and vital signs were monitored. All parameters during surgery were stable, without significant hypotension or hemodynamic impairment and normal patient's compliance. 1 mg of intravenous midazolam was given immediately before surgery started.

The neoplasm not only appeared to be wider than expected, partly covered by hematoma, but macroscopic appearance was suggestive for different diagnosis than li-



**Figure 1.** LMA Supreme™ functional details: (a) posterior view of the "second seal" designed cuff; (b) cross sectional view of LMA Supreme™, note epiglottis "anti-down-folding" fins; (c) and (d) cross sectional view of airway (dashed arrows) and gastric (solid arrows) conduits and relative diameters

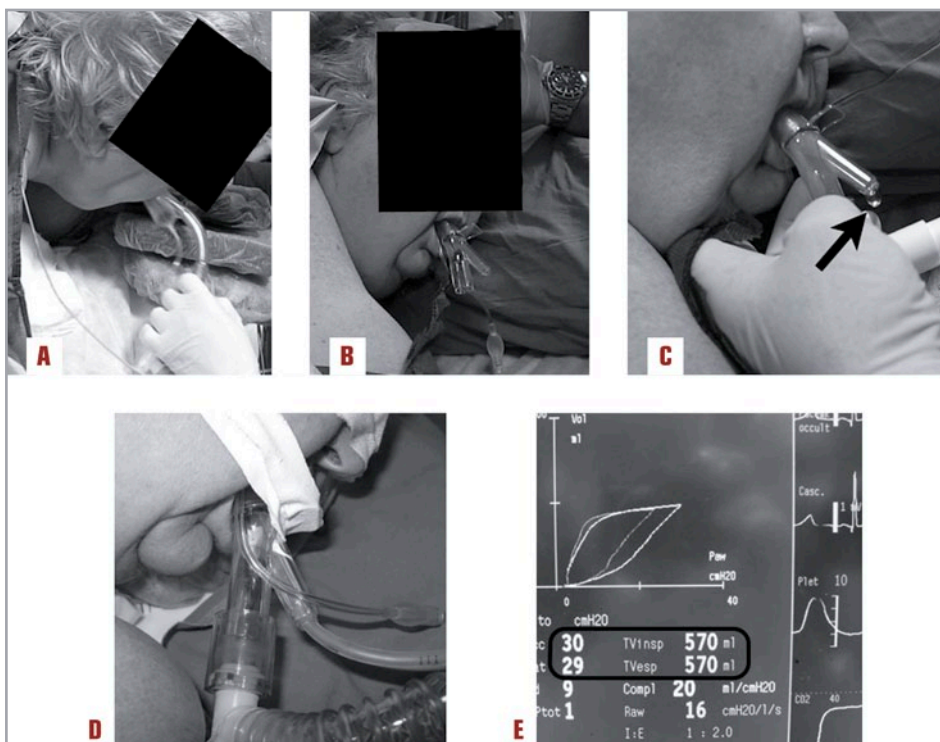
poma (postoperative histological finding confirmed diagnosis of rhabdomyosarcoma of limb muscles), thus wider resection was started, changing scheduled surgical approach.

This choice resulted in a major than expected blood loss (about 800 ml), and in a longer procedure: therefore, 125 minutes after beginning of surgery, the patient started complaining and became poorly cooperative, for positional discomfort and mild agitation appeared, despite 2 mg more midazolam was intravenously given. The surgeon was asked about the possibility of turning the patient to provide deep sedation with extraglottic airway control or general anesthesia via conventional tracheal intubation, but a difficult control on blood vessels had requested provisional clamping of superficial and deep femoral arteries, and more than 15 Klemmer forceps were left in position to grant provisional hemostasis during surgical procedures. In any case, turning the patient would have meant high risk of contamination of surgical field and could result challenging due to dimensions of the patient.

For these reasons, the patient was left prone and after ventilation check, preoxygenation in 100% O<sub>2</sub> was given for three minutes via face mask before administration of propofol 2 mg/kg of ideal body weight, and in any case titrated to loss of consciousness and airway reflexes. A number 4 LMA

Supreme™ was then placed smoothly and uneventfully in the prone position after gentle rotation of the head positioned on a soft head support. After inflation of the cuff with 30 ml of air and check of cuff pressure with dedicated manometer, ventilation was excellent, with maintenance of 100% SpO<sub>2</sub> and airway pressures not exceeding 20–24 cm H<sub>2</sub>O, if not for isolated values of higher pressures in any case not compromising ventilation and seal. Drain tube leak test was performed and negative, and a 16Fr gastric tube was easily placed, with intraoperative drainage of small amount of clear fluid. The different procedure phases are showed in Figure 2.

Ventilation was then turned to Pressure Control Ventilation (PC = 18 cm H<sub>2</sub>O for a tidal volume of about 600 ml, positive end expiratory pressure—PEEP = 5 cm H<sub>2</sub>O) on Aestiva SA5 ventilator (General Electric, Helsinki, Finland) and anesthesia was maintained with sevoflurane 1 MAC (minimal alveolar concentration) until recovery of spontaneous triggering, so that ventilatory support was turned to PSV-Pro® mode. Continuous monitoring of vital parameters, including end tidal carbon dioxide (EtCO<sub>2</sub>) suggested a regular course of anesthesia. Surgery finished uneventfully 95 minutes after LMA Supreme™ positioning, due to need for reconstruction of femoral vessels. Mask was removed slightly uncuffed



**Figure 2.** Positioning of LMA Supreme™: (a) positioning with patient in prone position and head slightly lifted and turned; (b) LMA Supreme™ in position; (c) performance of drain tube leak test (note lubricant drop, arrow); (d) positioning of gastric tube and connection to mechanical ventilator; (e) mechanical ventilation loops: note perfect seal despite peak airway pressures

*What should the clinician ask himself in similar situations?*

- *Despite regional anesthesia is planned, did I perform anyway a careful airway assessment?*
- *Shall obese patient be difficult to intubate, to ventilate or both?*
- *Do I have a rescue plan B if something goes wrong?*
- *Am I able to use confidently extraglottic devices?*

after eyes opening and partial consciousness recovery, always leaving the patient in prone position. No adverse events occurred postoperatively, and no sore-throat or other signs of pharyngo-laryngeal morbidity were reported by the patient.

## DISCUSSION

Spinal anesthesia allows the patient to self-position and avoid neurological injury that may occur with prone positioning of unconscious patient in general anesthesia. Spinal anesthesia also reduces intraoperative surgical blood loss (due to orthosympatic blockade effect), improves perioperative hemodynamic stability and reduces pain in the immediate postoperative period [3]. Combination anesthetic techniques, using both subarachnoid and epidural dosing schemes, may be beneficial for improving postoperative pain control and add further to the benefit of spinal anesthesia [4].

However, our case highlights the need for a “plan B” to manage the airway during loco-regional anesthesia. As recommended also in Italian guidelines for airway management, regional anesthesia should never be chosen as alternative to a difficult airway, especially if troubles could be expected not with laryngoscopy and intubation but with either facial or extraglottic ventilation. In such circumstances, the safest pathway is always airway control, better on spontaneous breathing technique, before and independently on eventual performance of loco-regional technique [2]. Loss of airway control in an anesthetized patient placed prone is a life-threatening complication, because this position obviously limits airway access and instrumentation. Should this situation occur, the accepted procedure is to turn the patient to a lateral or supine position and re-intubate the trachea without delay with conventional technique. In the case we report, we were facing a dilemma because changing the patient’s position could be extremely challenging: at the stage of surgery when agitation occurred, position changing could cause

severe bleeding for displacement of hemostatic forceps, with additional complication of being time-consuming and potentially delaying continuation of surgery in a very delicate phase, with further risk of surgical field contamination. Last but not least, due to weight of the patient, the maneuver would have not been easy and could result in further risks and complications, because in any case, after turning supine to control the airway, the patient needed to be back turned prone to go on with surgery.

At this point, different options were considered: general anesthesia could have been induced providing tracheal intubation using a direct laryngoscopy technique in supine ramped position, but we thought that the risks involved were too high to justify this solution, so it was kept as plan B. Fiberoptic tracheal intubation in the prone position, as reported by Neal and colleagues in a patient who presented with a severe facial trauma [5] or by Hung and colleagues in neurosurgical patient in prone position with fixed neck [6], was considered as a viable solution, but in our case the patient was not perfectly conscious and certainly not cooperative, so it should have been performed asleep or sedated with all implication on ventilation and saturation, or via an extraglottic airway. The last given option was to insert an extraglottic device such as LMA Supreme™ in the prone position, which was supported by large experience with use of this device in elective surgery in both supine and prone positioning.

Placement of LMA classic, ProSeal™ and Supreme™ in prone position seems to be challenging, more than placement in regular supine position. But before coming to this conclusion, a series of factors should be considered: if the device is some stiffer (which is case of LMA Supreme™) and anatomically shaped, insertion is *per se* easier. When positioning these devices in supine position, manufacturer’s instructions suggest to insert them pushing firmly and gently not in vertical direction, but always keeping contact with hard palate. This indication comes

firstly by the presence of the tongue, which could be some obstacle in LMA insertion and advancement toward final position in hypopharynx (Figure 3).

LMA Supreme™ feature which is in common with Fastrach™, due to its anatomical shape and stiffness, is *per se* easier to insert if compared with other LMAs [7,8].

Starting from this consideration, we could say that paradoxically, positioning of LMA, especially if stiffer, curved and anatomically shaped as LMA Supreme™, is even easier in prone position, as gravity moves the tongue anteriorly leaving more room in oral cavity, oropharynx and hypopharynx, making insertion smoother and easier.

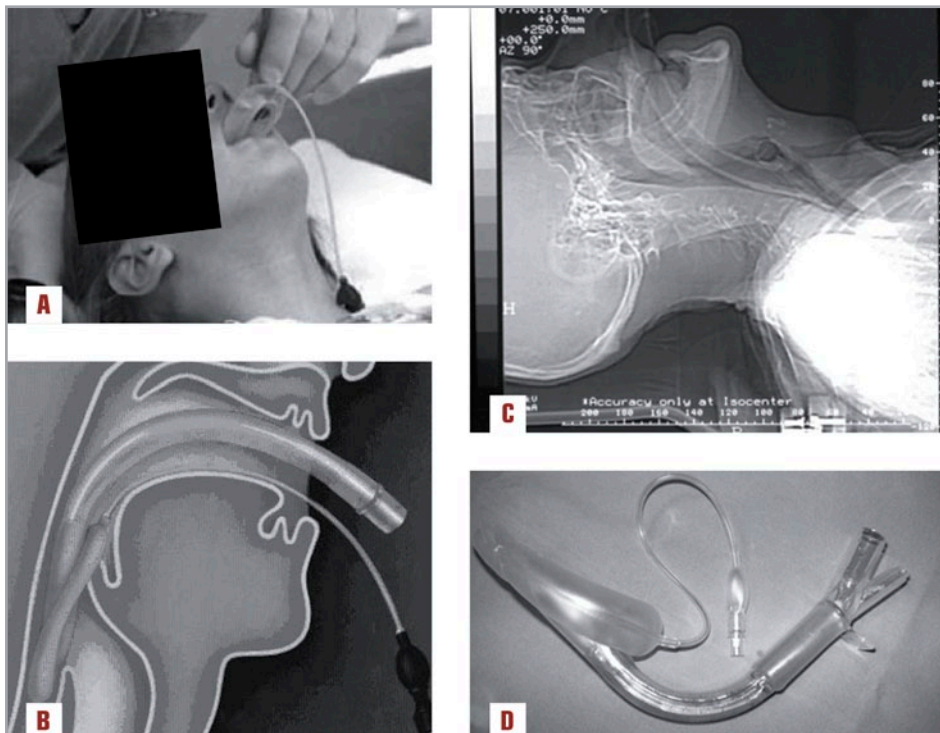
The use of the laryngeal mask airway device in the prone position as airway rescue was the subject of different case reports in adults (classic LMA used as airway rescue technique for accidental extubation in a neurosurgical case) [9] and children (airway rescue with classic LMA for accidental extubation in Arnold Chiari child undergoing neurosurgical procedure) [10], and of elegant review [11], showing evidence of the feasibility of the use of LMA devices in the prone position in the elective setting, confirmed also in another interesting and recent meta-analysis [8].

In 2011, a comparison for use of iGel™ and Supreme™ in prone position for elective cases has been published [12]. A study

on 40 patients [13] and the largest audit of LMA Supreme™ insertion in adult patients undergoing elective orthopedic surgery in the prone position both demonstrated high success rate, feasibility, safety, and satisfactory high sealing pressure. This audit, particularly, included obese patients and showed that the LMA Supreme™ can be inserted in this cohort of patients without an increase in the incidence of complications of airway management [14]. To our knowledge, no papers report use of LMA Supreme™ in prone position for airway rescue in obese patients.

In the present case, we felt that the only reasonable solution to the problem of airway control was to attempt insertion of an LMA Supreme™, basing on personal confidence with the device and relying upon its peculiar features. In case of failure, we would have rotated the patient supine (everything was ready for this operation) relying on time offered by preoxygenation before desaturation might have occurred in case of LMA Supreme™ positioning failure.

One of the criticisms of our airway management strategy could be that we did not try to insert a tracheal tube through the LMA Supreme™ using a fiberoptic bronchoscope for the remaining of the surgery. Main reason to exclude this possibility was that fiberoptic intubation through LMA Supreme™ is well known to be challenging and technically difficult: only a small diameter



**Figure 3.** LMAs positioning technique: (a) note head position and pushing of the mask against hard palate; (b) classic LMA in definitive position in hypopharynx; (c) LMA classic position as seen in CT scan; (d) LMA Supreme: note handle and curved anatomical shape

fiberoptic bronchoscope is allowed to enter the LMA Supreme™ airway conduit and a combined Aintree technique [15] should have been used, due to the poor space surrounding the gastric channel of the LMA Supreme™ (see Figure 1 c-d) [16]. On the other hand, there was no problem of oxygenation or ventilation and the expected remaining duration of the surgery was relatively short, therefore we decided to proceed only with the LMA Supreme™, starting from observation that position confirmation tests were satisfactory and ventilation performance on pressure controlled/pressure supported ventilation was excellent.

After surgery was finished, patient was left in prone position, and LMA Supreme™ was removed after patient was completely recovered and fully awake. This choice was preferred to allow spontaneous drainage of eventual secretions far away from airway thanks to gravity. Patient did not complain sore throat or other side effects, and when second surgery was scheduled to enlarge resection margins and lymph nodes exeresis, LMA Supreme™ in prone position was first anesthetic choice to perform surgery.

Role of extraglottic devices has recently been underlined and clarified by important evidence, such as data coming from the National Audit Project 4 [17], suggesting that standards of safety for “second generation extraglottic airways” are higher than first generation, and their use is safe in elective conditions and recommended for rescue maneuvers during difficult airway management, as suggested also in Italian guidelines for airway management [2].

As a general point of view, other possible criticism to our case report is that we could

have considered a different anesthetic option before choosing for regional anesthesia: if on the one hand we did not perform spinal anesthesia as alternative to expected difficult airway (and we would not have chosen if it was), on the other hand we must admit we probably underestimated surgical requirements, whereas the surgical team preoperative diagnosis was for lipoma rather than for vascular tumor. Another important warning which could come after our case report is that preoperative evaluation should always be performed as teamwork. If so, probably, being aware of some preoperative doubts on tumor nature, we would have chosen general anesthesia with intubation since beginning.

In conclusion, in our experience, LMA Supreme™ was a useful airway management technique in airway management experts hands, to rescue the “lost airway”, in obese patient undergoing surgery in the prone position, including need for mechanical ventilation. We do recommend to approach this technique only after development of sufficient experience and expertise with LMA Supreme™ (and in general with any other extraglottic device) so to rely on it as rescue technique only if physicians are familiar with prone positioning in elective and calm situations, with airway plan B clear in mind and carefully defining indications preoperatively, considering extended surgical and anesthetic teamwork. Accordingly to latin motto *si vis pacem, para bellum*.

## ACKNOWLEDGEMENTS

This case report has been published with the written consent of the patient.

## REFERENCES

1. Van Zundert A, Brimacombe J. The LMA Supreme™ – a pilot study. *Anesthesia* 2008; 63: 209-10; <http://dx.doi.org/10.1111/j.1365-2044.2007.05421.x>
2. SIAARTI Difficult Airways Study Group. Task Force: Petrini F, Guarino A, Merli G, et al. Recommendations for airway control and difficult airway management. *Minerva Anestesiologica* 2005; 71: 617-56
3. Attari MA, Mirhosseini SA, Honarmand A, et al. Spinal anesthesia versus general anesthesia for elective lumbar spine surgery: A randomized clinical trial. *J Res Med Sci* 2011; 16: 524-9
4. Jellish WS, Shea JF. Spinal anesthesia for spinal surgery. *Best Pract Res Clin Anaesthesiol* 2003; 17: 323-34; [http://dx.doi.org/10.1016/S1521-6896\(02\)00115-5](http://dx.doi.org/10.1016/S1521-6896(02)00115-5)
5. Neal MR, Groves J, Gell IR. Awake fiberoptic intubation in the semi-prone position following facial trauma. *Anesthesia* 1996; 51: 1053-4; <http://dx.doi.org/10.1111/j.1365-2044.1996.tb15004.x>

6. Hung MH, Fan SZ, Lin CP, et al. Emergency airway management with fiberoptic intubation in the prone position with a fixed flexed neck. *Anesth Analg* 2008; 107: 1704-6; <http://dx.doi.org/10.1213/ane.0b013e3181831e2e>
7. Maitra S, Khanna P, Baidya DK. Comparison of laryngeal mask airway Supreme and laryngeal mask airway Pro-Seal for controlled ventilation during general anaesthesia in adult patients: systematic review with meta-analysis. *Eur J Anaesthesiol* 2014; 31: 266-73; <http://dx.doi.org/10.1097/01.EJA.0000435015.89651.3d>
8. Whitacre W, Dieckmann L, Austin PN. An update: use of laryngeal mask airway devices in patients in the prone position. *AANA J* 2014; 82: 101-7
9. Raphael J, Rosenthal-Ganon T, Gozal Y. Emergency airway management with a laryngeal mask airway in a patient placed in the prone position. *J Clin Anesth* 2004; 16: 560-1; <http://dx.doi.org/10.1016/j.jclinane.2004.03.004>
10. Dingeman RS, Goumnerova LC, Goobie SM. The use of a laryngeal mask airway for emergent airway management in a prone child. *Anesth Analg* 2005; 100: 670-1; <http://dx.doi.org/10.1213/01.ANE.0000146512.48688.FA>
11. Abrishami A, Zilberman P, Chung F. Brief review: Airway rescue with insertion of laryngeal mask airway devices with patients in the prone position. *Can J Anaesth* 2010; 57: 1014-20; <http://dx.doi.org/10.1007/s12630-010-9378-1>
12. López AM, Valero R, Hurtado P, et al. Comparison of the LMA Supreme™ with the LMA Proseal™ for airway management in patients anaesthetized in prone position. *Br J Anaesth* 2011; 107: 265-71; <http://dx.doi.org/10.1093/bja/aer104>
13. López AM, Valero R, Brimacombe J. Insertion and use of the LMA Supreme in the prone position. *Anaesthesia* 2010; 65: 154-7; <http://dx.doi.org/10.1111/j.1365-2044.2009.06185.x>
14. Sharma V, Verghese C, McKenna PJ. Prospective audit on the use of the LMA-Supreme for airway management of adult patients undergoing elective orthopedic surgery in prone position. *Br J Anaesth* 2010; 105: 228-32; <http://dx.doi.org/10.1093/bja/aeq118>
15. Charters P, O'Sullivan E. The 'dedicated airway': a review of the concept and an update of current practice. *Anaesthesia* 1999; 54: 778-86; <http://dx.doi.org/10.1046/j.1365-2044.1999.00888.x>
16. Mathes AM, Wrobel M, Reus E, et al. Fiberoptic-guided intubation via the Laryngeal Mask Airway Supreme. *J Clin Anesth* 2008; 20: 322-3; <http://dx.doi.org/10.1016/j.jclinane.2008.03.002>
17. Woodall NM, Cook TM. National census of airway management techniques used for anaesthesia in the UK: first phase of the Fourth National Audit Project at the Royal College of Anaesthetists. *Br J Anaesth* 2011; 106: 266-71; <http://dx.doi.org/10.1093/bja/aeq339>