



Comparison of Laryngeal Mask Airway Supreme™ Versus Unique™ in Edentulous Geriatric Patients

Dişsiz Geriyatrik Hastalarda Laringeal Maske Unique™ ile Supreme™'in Karşılaştırılması

Tangül Beydeş¹, Semih Küçükgüçlü², Şule Özbilgin², Bahar Kuvaki², Meltem Ademoğlu³, Melek Sarı⁴

¹Department of Anaesthesiology and Reanimation, Medical Park Hospital, Ordu, Turkey

²Department of Anaesthesiology and Reanimation, Dokuz Eylül University School of Medicine, İzmir, Turkey

³Department of Anaesthesiology and Reanimation, Marmaris State Hospital, Marmaris, Turkey

⁴Department of Anaesthesiology and Reanimation, Ardahan State Hospital, Ardahan, Turkey

Objective: It is more difficult to perform bag-mask ventilation in edentulous patients than in patients with intact dentition. The laryngeal mask airway (LMA) provides a better alternative to the standard face mask if the facial contours of the patient are not suited for the standard face mask. We aimed to compare these two different LMAs in edentulous geriatric patients.

Methods: Edentulous patients aged ≥ 65 years of American Society of Anesthesiologists physical status I-III were included in the study. They were randomly assigned to Supreme group (n=30) and Unique group (n=30). Success of first insertion attempt, ease and time of insertion and oropharyngeal leak pressure were recorded.

Results: The success rate of the first insertion attempt was higher in the Supreme group than in the Unique group (86.6 and 73.3%, respectively; $p=0.04$). Time of insertion was similar (10.04 s and 11.87 s, respectively) and insertion was easy in 90% and 100% of patients, respectively. Oropharyngeal leak pressures were measured as 20.56-cm H₂O and 17.10-cm H₂O for LMA Supreme™ and LMA Unique™, respectively.

Conclusion: The efficacy and safety in both groups were comparable in edentulous geriatric patients during short surgical procedures. Even the success rate of insertion with both was lower than that mentioned in the literature; the success of insertion at the first attempt was superior with the LMA Supreme™ in our edentulous study group.

Keywords: Laryngeal mask, edentulous, geriatrics

Amaç: Dişsiz hastaların maske ile ventilasyonu dişi olan hastalara göre daha zor olur. Laringeal Maske (LMA) standart yüz maskesinin uygun olmadığı yanakları çökük hastalarda daha iyi bir alternatif sağlayabilir. Biz, dişsiz geriyatrik hastalarda iki farklı laringeal maskeyi karşılaştırmayı amaçladık.

Yöntemler: Bu çalışmaya American Society of Anesthesiologists (ASA) I-II I,65 yaş ve üzeri elektif cerrahi geçirecek hastalar dahil edildi. Hastalar randomize olarak grup LMA Supreme™ (n=30) ve grup LMA Unique™ (n=30) olarak ikiye ayrıldı. İlk deneme başarısı, yerleştirme süresi ve kolaylığı ve orofaringeal kaçak basınçları kaydedildi.

Bulgular: İlk denemede yerleştirme başarı oranı LMA Supreme grubunda LMA Unique grubuna göre daha yüksek bulundu (86,6 karşı %73,3, $p=0,04$). Yerleştirme süresi benzerdi (10,04 s ve 11,87 s), yerleştirme kolaylığı %90 ve %100 olarak bulundu. Orofaringeal kaçak basıncı LMA Unique'in 17,10 cm H₂O, LMA Supreme'in 20,56 cm H₂O olarak ölçüldü.

Sonuç: Her iki gerecin de kısa süreli cerrahi girişimlerde ve dişsiz geriyatrik hastalarda etkinliği ve havayolu güvenirliliği açısından benzerdir. Laringeal maske Supreme'in bu olgularda ilk denemede yerleştirme başarısının daha yüksek olduğu bulunmuştur.

Anahtar kelimeler: Laringeal maske, dişsiz, geriyatri

Introduction

In an aging population, the prevalence of edentulous patients increased above 60% among individuals aged ≥ 65 years (1). Face mask ventilation of these edentulous patients is often difficult because of the inadequate fitting of the standard mask to the face (2). In addition, because of a reduction in muscle tone under general anaesthesia, the air space in the oropharynx is reduced, and the posterior displacement of the tongue, soft palate and epiglottis tend to close the airway (3). The laryngeal mask airway (LMA) provides a better alternative to the standard face mask if the facial contours of the patient are not suited to the standard face mask (4). Although Baraka (5) noted that LMA proved to maintain a better seal in edentulous patients, there is no study supporting his observation. According to our clinical observations, the insertion of LMA and

its correct positioning in edentulous geriatric patients is not as easy as in patients with teeth. However, this is just a hypothesis, and we could not find any study investigating this topic.

We aimed to compare routinely used LMAs, the *LMA Unique*[™] with the newly released *LMA Supreme*[™], in edentulous elderly patients for the success in first attempt insertion, ease and time of insertion and oropharyngeal leak pressure (OLP). For *LMA Supreme*[™], we also assessed the ease of gastric tube placement.

Material and Methods

This study initiated after obtaining the IRB approval (Dokuz Eylül University School of Medicine, University Ethics Committee for Clinical Research, no:178/2009, İzmir, Turkey) and written informed consent from sixty edentulous patients with American Society of Anesthesiologists physical (ASA) status grade I–III, aged over 65 years, undergoing elective surgery were included in the study. The study was performed in the Dokuz Eylül University School of Medicine Hospital in 2010. Patients with dentures had to remove their dentures before surgery at the ward. The supraglottic airway device was inserted into each patient in a random order. A statistician independent of the clinical investigators generated the randomization sequence using a computerized program. Patients were excluded if they had a known or predicted difficult airway, body mass index of >35 kg m² or were at risk of aspiration. All cases were treated by anaesthetists who had an experience of LMA insertion for over 5 years.

Demographic parameters, Mallampati classification and duration of surgery were recorded. Patients were routinely monitored using electrocardiography, non-invasive blood pressure measurement, pulse oximetry and end-tidal carbon dioxide tension. Depth of anaesthesia was monitored with the bispectral index (BIS).

Patients were pre-medicated with 0.02 mg kg⁻¹ midazolam when venous access was obtained. After 3 min of preoxygenation with 100% oxygen via the face mask, anaesthesia was induced with 1–2 µg kg⁻¹ fentanyl and 1–2 mg kg⁻¹ propofol (6). When the BIS value was 40–60 (7), the predetermined supraglottic airway device was inserted according to the manufacturer's recommendations. The supraglottic airway devices were completely deflated before insertion. Size 4 LMA was used for those with a weight of 50–70 kg and size 5 LMA for those between 70 and 100 kg. After insertion, each device was inflated with a hand-held airway manometer (Rüsch, Germany) to a cuff pressure of 60-cm H₂O.

An effective airway was defined as the presence of normal thoracoabdominal movement and a square wave end-tidal carbon dioxide trace. General anaesthesia was maintained with sevoflurane, O₂ and N₂O.

Insertion time was defined as the time from picking up the airway device until connection to the airway circuit (8). Ease of

insertion was graded by the attending anaesthesiologist as easy, fair or difficult (9). If after three attempts, insertion was still not successful, the other device was used. If insertion of the other device also failed, the patient was endotracheally intubated.

Before the oropharyngeal leak test (OLT) was carried out, the face of the patient was covered so that the observer was blinded to the airway device. OLP was determined by transiently discontinuing ventilation and closing the adjustable pressure-limiting valve with a fresh gas flow of 3 L min⁻¹ until the airway pressure reached a steady state and the leakage sound was heard. The airway pressure was not allowed to exceed 40-cm H₂O (9).

After successful placement of *LMA Supreme*[™], a 12-FG gastric catheter was inserted via the gastric channel.

Any episode of hypoxaemia (SpO₂, <90%), aspiration or regurgitation, bronchospasm and airway obstruction were documented. After removal of LMA, it was examined for the presence of visible blood.

In the post-anaesthesia care unit, a research assistant, who was blinded to the group allocation, interviewed the patients using a predetermined questionnaire to collect data regarding the postoperative pharyngolaryngeal adverse events. The presence or absence of sore throat, dysphonia and dysphagia was postoperatively assessed at 1 and 24 h. Cases discharged early from the ward had 24th hour evaluation completed by telephone communication.

Statistical analysis

We calculated the sample size to detect at least a 35% difference between devices for OLP with an α error of 0.05 and a power of 0.8. Non-parametric data between groups were analysed with the χ^2 test, while parametric data were compared with unpaired t-test. Data are presented as percent (%), mean \pm SD and number. For all tests, a p value of <0.05 was considered significant. All statistics were performed using Statistical Package for the Social Sciences (SPSS Inc., Chicago, IL, USA) version 15.0.

Results

A total of 60 edentulous elderly patients were recruited (Figure 1). Three patients exhibited oxygen desaturation after *LMA Supreme*[™] insertion, which was removed to insert a *LMA Unique*[™] for ventilation maintenance. These patients were excluded from further analysis.

The patients' age, gender, ASA and Mallampati classification, height, weight and duration of anaesthesia were comparable in both groups (Table 1).

The ease of insertion was similar in the two groups (Table 2). In three patients in Supreme group, we failed to insert the device within three attempts, but in the remaining 27 patients, only one required two attempts. In Unique group, all devices

Table 1. Demographic data as mean±SD and numbers

Group	<i>LMA Unique</i> [™] (n=30)	<i>LMA Supreme</i> [™] (n=27)
Age (Years)	72.4±7.6	70.9±5.9
Gender (f/m)	9/21	11/16
ASA (I/II/III)	2/25/3	5/19/3
Height (cm)	166.2±8.5	164.6±7.4
Weight (kg)	70.3±11.6	69.5±9.4
Mallampati (1/2/3)	16/9/5	15/11/1
Duration of anaesthesia (min)	61.4±35.1	65.9±35.8

Data presented as mean±SD. *p<0.05, unpaired t-test and χ^2 test
SD: standard deviation; ASA: American Society of Anesthesiologists; LMA: laryngeal mask airway

Table 2. Insertion success, insertion time, ease of insertion and oropharyngeal leak pressure among devices. Data are presents as percent (%), mean±SD and number

Group	<i>LMA Unique</i> [™] (n=30)	<i>LMA Supreme</i> [™] (n=27)	p
First attempt success rate (%)	73.3	86.6	0.04
Insertion time	11.8±3.4	10.0±3.6	0.059
Ease of insertion (easy/fair/difficult)	30/0	27/0/0	0.083
Oropharyngeal leak pressure (cm H ₂ O)	17.1±6.3	20.56±8.2	0.084

SD: standard deviation. Unpaired t-test and χ^2 test

could be inserted; however, two attempts were required in seven patients and three attempts in one patient. The success rate of the first attempt insertion was higher in Supreme group than in Unique group (86.6 and 73.3%, respectively; p=0.04). There was no difference in the mean insertion time in Supreme versus Unique groups, i.e. 10.04 s and 11.87 s, respectively. The mean OLP with *LMA Supreme*[™] was 20.6-cm H₂O and that with *LMA Unique*[™] was 17.3-cm H₂O; there was no significant difference between OLPs (Table 2).

Gastric catheter placement was successful in all patients in Supreme group. None of the patients developed pharyngolaryngeal adverse events. Bleeding was noted after the removal of the airway device in one of the 27 patients in Supreme group versus two of 30 patients in Unique group. No major adverse events occurred during the intra- and postoperative period in any groups.

Discussion

This is the first study that investigated LMA use in edentulous geriatric patients.

Our findings demonstrated that the success rate in first insertion attempt was higher in Supreme group than in Unique group, but the ease of insertion and OLP were similar. These observations can have important implications to anaesthesiologists managing edentulous geriatric patients with supra-glottic airway devices.

First insertion attempt was found to be successful in 86.6% and 73.3% of patients with *LMA Supreme*[™] and *LMA Unique*[™], respectively. The first attempt success rate for *LMA Supreme*[™] in the literature is between 88.5%–98% (10-12). The variance in the success rate is explained with the experience of the user and the relative stiff nature of the device (11, 12). In the literature, there is a wide range of first attempt success rate for *LMA Unique*[™]. The first attempt success rate of *LMA Unique*[™] differs from 73.3% to 100% (13-15). Verghese et al. (13) reported that relative stiffness of the tubular portion combined with the hardness of the backplate tip might contribute to difficulty in insertion. In our study, the first insertion attempt success rate was superior in Supreme group; however, it was lower when compared with the literature regarding *LMA Supreme*[™] in other patient groups. The difference with the literature may be because our study group comprised selected edentulous patients aged ≥65 years. Another reason may be our limited experience with *LMA Supreme*[™] insertion, but according to Timmermann et al. (12), inexperienced medical students revealed a success rate of 90%; therefore, we can postulate that our lower success is because of the edentulous patient population. We could not record any significant difference between *LMA Supreme*[™] and *LMA Unique*[™] with respect to the ease of insertion. However, in three patients, the *LMA Supreme*[™] could not be successfully inserted, and thus, *LMA Unique*[™] was used instead. In a case report, Brueggeny et al. (16) stated that the inflated *LMA Supreme*[™] cuff medially displaced the cuneiform and corniculate cartilages, thereby narrowing the laryngeal inlet and hindering successful ventilation. They proved this event with fiberoptic evaluation through LMA. The lack of fiberoptic bronchoscopy is a limitation in our study; therefore, we can just guess the theoretical reason for the failure to ventilate with *LMA Supreme*[™] in three patients. Another reason for impossible insertion may be lack of proper preparation. The manufacturer's recommended technique for preparation involves deflating the cuff and stretching at the inflation line while compressing the cuff tip. However, this manoeuvre may increase the chance of an obstructing ridge forming and may lead to difficulty in ventilation (17).

The insertion time for *LMA Unique*[™] is reported between 15 s and 30 s and for *LMA Supreme*[™] between 15 s and 26 s (14, 15, 18). In one study, the insertion time was reported as 8 s for *LMA Supreme*[™], but the authors did not explain how they measured the insertion time. The short insertion times in our study for both LMA may be explained with the lack of teeth, and thus, easier and faster manipulation of the device in the mouth.

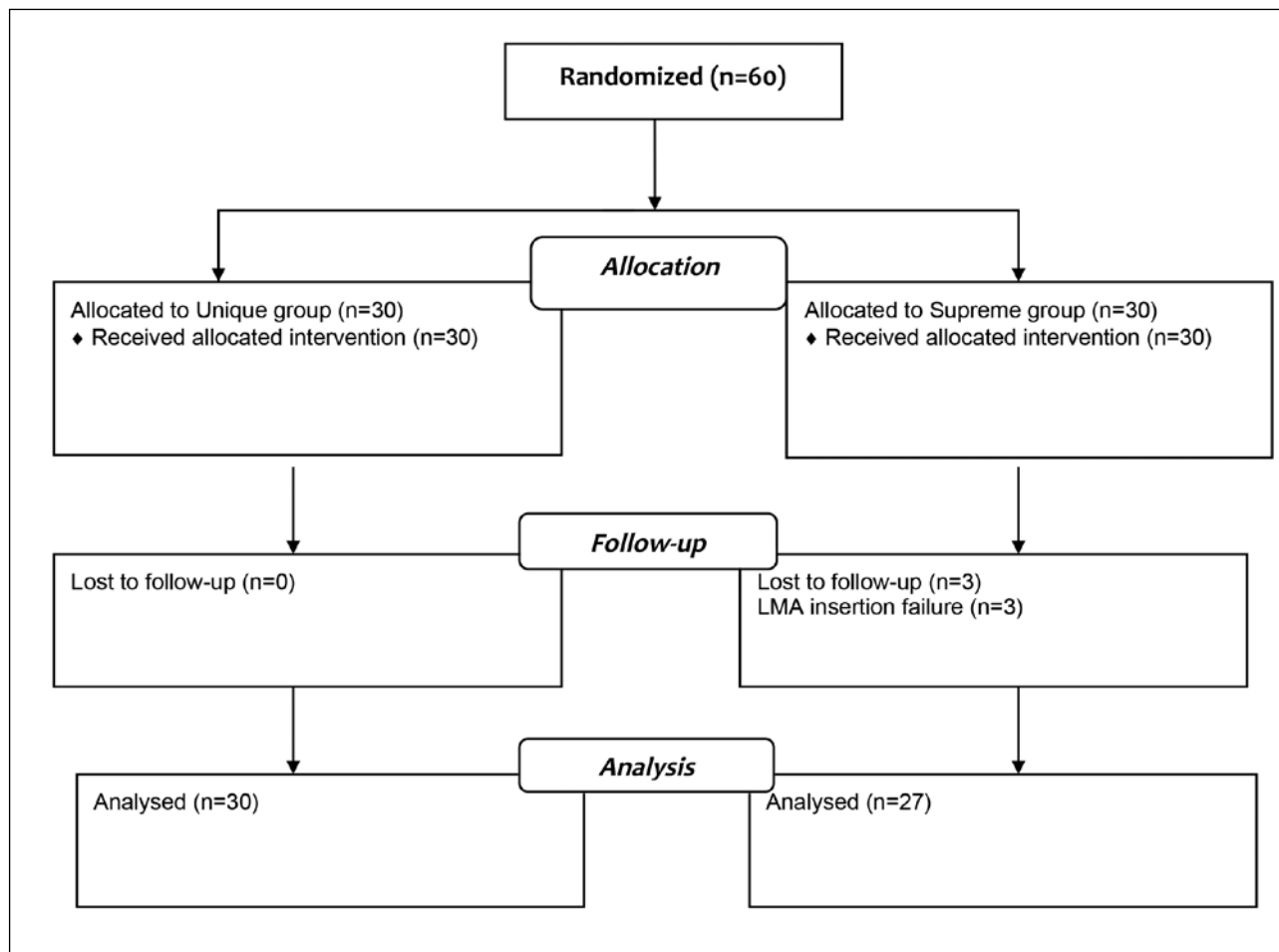


Figure 1. CONSORT flow diagram

OLPs are commonly measured to indicate the degree of airway protection and success of the supraglottic airway device placement. Knowing OLP may be important to anaesthesiologist using the LMA for airway management (10). The findings of our study in edentulous geriatric patients revealed that OLP with *LMA Supreme™* and *LMA Unique™* was similar. For *LMA Unique™*, OLP is reported between 20- and 27-cm H₂O (14, 15, 18). Our results for Unique group were, however, low with a mean of 17.1-cm H₂O. OLP with *LMA Supreme™* varies in different studies from 19.6- to 39.0-cm H₂O (10, 11, 19-22). Except the study of Tham et al. (11) (19.6-cm H₂O), OLP values in our Supreme group were lower (mean, 20.56-cm H₂O) than those reported in other studies. Tham et al. (11) explained this because of inappropriate size of *LMA Supreme™* for the majority of male patients in their study groups and postulated that a size 5 *LMA Supreme™* would provide a better supraglottic fit and higher OLP values in Asian men. Another explanation for low OLP in their study is the use of neuromuscular blocking agent. We did not provide neuromuscular blockade for the patients in our study, and our low OLP results in comparison with the literature may be because of the edentulous geriatric population. We postulate that the less elastic cuff of *LMA Supreme™* and *LMA Unique™* may hinder a proper fit in the oropharyngeal anatomy of geriatric edentulous patients.

The number of elderly patients is increasing with advances in medicine and public healthcare (23). However, an adequate depth of anaesthesia is required for successful insertion of LMA to prevent untoward events such as coughing and laryngospasm (24). We provided the depth of anaesthesia with BIS values. The passage of a gastric tube was easily performed in all cases in Supreme group. The use of LMA with a gastric channel is an important point for the geriatric population because increasing age may cause the development of dysphagia and aspiration in the elderly (25).

This study has several limitations. We did not evaluate the positioning of LMA with fibreoptic endoscopy or ultrasonography; therefore, we could not compare the placement of the two different airway devices, and we could not clearly explain why we failed in three patients in Supreme group. Furthermore, we did not directly measure the ventilator capability; if we had performed this, more precise comments regarding ventilation in this unique patient group could be made. Another limitation of our study is that we only could extrapolate some results because of the edentulous or the geriatric age of the patient; therefore, we have started a study comparing the differences in LMA use between geriatric and young patients.

Conclusion

In summary, the efficacy and safety of *LMA Supreme™* and *LMA Unique™* are similar in edentulous geriatric patients. However, *LMA Supreme™* is superior to *LMA Unique™* because of its success of insertion in the first attempt. In contrast to previous studies, the success rate of insertion at the first attempt and the insertion time was found to be less than in the literature for both devices. These patients, the reason for this may be the selected edentulous geriatric age group. Further studies on the use of supraglottic airway devices in edentulous geriatric patients are required to clarify this hypothesis.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Dokuz Eylül University School of Medicine.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

Author Contributions: Concept - S.K.; Design - S.K., B.K.; Supervision - S.K.; Funding - T.B., Ş.Ö., B.K.; Materials - T.B., M.S., M.A.; Data Collection and/or Processing - T.B., M.S., M.A.; Analysis and/or Interpretation - S.K., B.K.; Literature Review - B.K., T.B., Ş.Ö., V.H.; Writer - T.B.; Critical Review - S.K.; Other - B.K., Ş.Ö.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Komite Onayı: Bu çalışma için etik komite onayı Dokuz Eylül Üniversitesi Tıp Fakültesi'nden alınmıştır.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

Hakem değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - S.K.; Tasarım - S.K., B.K.; Denetleme - S.K.; Kaynaklar - T.B., Ş.Ö., B.K.; Malzemeler - T.B., M.A., M.S.; Veri toplanması ve/veya işlemesi - T.B., M.S., M.A.; Analiz ve/veya yorum - S.K., B.K.; Literatür taraması - B.K., T.B., Ş.Ö.; Yazıyı yazan - T.B.; Eleştirel İnceleme - S.K.; Diğer - B.K., S.Ö.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

References

- Conlon NP, Sullivan R. The effect of leaving dentures in place on bag-mask ventilation at induction of general anesthesia. *Anesth Analg* 2007; 105: 370-3. [CrossRef]
- Kubota Y, Toyoda Y, Kubota H. Face mask fitting for edentulous patients. *Anesth Analg* 1993; 76: 450.
- Nandi PR, Charlesworth CH, Taylor SJ, Nunn JF, Doré CJ. Effect of general anaesthesia on the pharynx. *Br J Anaesth* 1991; 66: 157-62. [CrossRef]
- Fisher JA, Ananthanarayan C, Edelist G. Role of the laryngeal mask in airway management. *Can J Anaesth* 1992; 39: 1-3. [CrossRef]
- Baraka A. Laryngeal mask airway for edentulous patients. *Can J Anaesth* 1994; 41: 78-9. [CrossRef]
- Dundee JW, Robinson FP, Mc Collum JS, Patterson CC. Sensitivity to propofol in the elderly. *Anaesthesia* 1986; 41: 482-5. [CrossRef]
- Arnold G, Kluger M, Voss L, Sleight J. BIS and Entropy in the elderly. *Anaesthesia* 2007; 62: 907-12. [CrossRef]
- Verghese C, Ramaswamy B. LMA-Supreme a new single-use LMA with gastric access: a report on its clinical efficacy. *Br J Anaesth* 2008; 101: 405-10. [CrossRef]
- Keller C, Brimacombe JR, Keller K, Morris R. Comparison of four methods for assessing airway sealing pressure with the laryngeal mask airway in adult patients. *Br J Anaesth* 1999; 82: 286-7. [CrossRef]
- Seet E, Rajeev S, Firoz T, Yousof F, Wong J, Wong DT, et al. Safety and efficacy of laryngeal mask airway Supreme versus laryngeal mask airway ProSeal: a randomized controlled trial. *Eur J Anaesthesiol* 2010; 27: 602-7. [CrossRef]
- Tham HM, Tan SM, Woon KL, Zhao YD. A comparison of the Supreme laryngeal mask airway with the ProSeal laryngeal mask airway in anesthetized paralyzed adult patients: a randomized crossover study. *Can J Anesth* 2010; 57: 672-8. [CrossRef]
- Timmermann A, Cremer S, Heuer J, Braun U, Graf BM, Russo SG. Laryngeal mask LMA Supreme. Application by medical personnel inexperienced in airway management. *Anaesthesist* 2008; 57: 970-5. [CrossRef]
- Verghese C, Berlet J, Kapila A, Pollard R. Clinical assessment of the single use laryngeal mask airway- the LMA-unique. *Br J Anaesth* 1998; 80: 677-9. [CrossRef]
- Francksen H, Renner J, Hanss R, Scholz J, Doerges V, Bein B. A comparison of the i-gel with the LMA Unique in non paralyzed anaesthetised adult patients. *Anaesthesia* 2009; 64: 1118-24. [CrossRef]
- Uppal V, Gangaiah S, Fletcher G, Kinsella J. Randomized crossover comparison between the i-gel and the LMA Unique in anesthetised, paralyzed adults. *Br J Anaesth* 2009; 103: 882-5. [CrossRef]
- Kleine-Brueggene M, Theiler LG, Luyet C, Greif R. Acute airway obstruction caused by the new single use Laryngeal Mask Airway Supreme. *Anesthesiology* 2009; 110: 189-90. [CrossRef]
- Riley RH, Williams M, Ferguson C. Preparation of Supreme laryngeal mask airway affects insertion. *Anaesth Intens Care* 2010; 38: 211-2.
- Cattano D, Ferrario L, Maddukuri V, Sridhar S, Khalil Y, Haggberg CA. A randomized clinical comparison of the Intersurgical i-gel and LMA Unique in non-obese adults during general surgery. *Minerva Anesthesiol* 2011; 77: 292-7.
- Timmermann A, Cremer S, Eich C, Kazmaier S, Bräuer A, Graf BM, et al. Prospective clinical and fiberoptic evaluation of the supreme laryngeal mask airway. *Anesthesiology* 2009; 110: 262-5. [CrossRef]
- Strube PJ. The LMA-Supreme and LMA ProSeal. *Anaesthesia* 2009; 64: 687-97. [CrossRef]
- Ali A, Canturk S, Turkmen A, Turgut N, Altan A. Comparison of the laryngeal mask airway Supreme and laryngeal mask airway Classic in adults. *Eur J Anaesthesiol* 2009; 26: 1010-4. [CrossRef]
- Ali A, Türkmen A, Kaya M, Cantürk S, Turgut N, Altan A. Comparison of Supreme LMA, ProSeal LMA and Cobra PLA in Adult Patients Undergoing Minor Surgery. *Turk J Anaesth Reanim* 2013; 41: 70-4. [CrossRef]
- Rivera R, Antognini JF. Perioperative drug therapy in elderly patients. *Anesthesiology* 2009; 110: 1176-81. [CrossRef]
- Mishra SK, Nawaz M, Satyaprakash MV, Parida S, Bidkar PU, Hemavathy B, et al. Influence of Head and Neck Position on Oropharyngeal Leak Pressure and Cuff Position with the ProSeal Laryngeal Mask Airway and the I-Gel: A Randomized Clinical Trial. *Anesthesiol Res Pract* 2015; 2015: 705869. [CrossRef]
- Avis EJ. Effects of aging on sensitivity of the pharyngeal and supraglottic areas. *Am J Med* 1997; 103: 74S-6S.