



THE AGA KHAN UNIVERSITY

eCommons@AKU

Department of Anaesthesia

Medical College, Pakistan

May 2012

Rotational vs. standard smooth laryngeal mask airway insertion in adults

Dileep Kumar
Aga Khan University

Mueenullah Khan
King Saud University

Muhammad Ishaq
Aga Khan University

Follow this and additional works at: http://ecommons.aku.edu/pakistan_fhs_mc_anaesth

 Part of the [Anesthesiology Commons](#)

Recommended Citation

Kumar, D., Khan, M., Ishaq, M. (2012). Rotational vs. standard smooth laryngeal mask airway insertion in adults. *Journal of the College of Physicians and Surgeons Pakistan*, 22(5), 275-9.

Available at: http://ecommons.aku.edu/pakistan_fhs_mc_anaesth/8

Rotational vs. Standard Smooth Laryngeal Mask Airway Insertion in Adults

Dileep Kumar¹, Mueenullah Khan² and Muhammad Ishaq¹

ABSTRACT

Objective: To compare the ease of insertion between rotational laryngeal mask airway (LMA) insertion and Brain's LMA insertion technique in terms of number of LMA insertion attempts, time duration of LMA insertion and complications: trauma, laryngospasm, and hypoxaemia.

Study Design: Randomized control study.

Place and Duration of Study: The Aga Khan University Hospital, Karachi, from September 2006 to May 2007.

Methodology: One hundred ASA I and II adults undergoing short elective surgical procedures requiring general anaesthesia with spontaneous breathing were enrolled. Following pre-oxygenation, anaesthesia was induced with propofol 2 mg/kg and fentanyl 2 µg/kg. Patients were randomly assigned into one of the study groups: rotational-(R) and standard-(S). LMA insertion was performed when patients became apnoeic and adequate LMA insertion depth achieved. Successful placement was confirmed by chest expansion, reservoir bag movement and appearance of capnographic tracing in both spontaneously breathing patients and in apnoeic patients with assisted ventilation.

Results: Significant differences were not seen in patient's demographics, Mallampati score, ASA status and pre-operative vital signs. Statistically insignificant difference was found for the time duration and number of LMA insertion attempts. The incidence of trauma was significantly noted in standard insertion technique (28%) compared to (6%) in rotational insertion technique ($p = 0.003$). The hypoxaemia and laryngospasm was not reported among the groups.

Conclusion: The rotational technique was practically easy while negotiating the back of mouth and it requires little efforts with lowest complication rate. This technique can be considered in adults when encountering difficulty and repetitive failures with standard LMA insertion technique.

Key words: Laryngeal mask airway insertion. Anaesthesia. Adults. Standard and rotational technique. Brain's technique.

INTRODUCTION

Airway management is the most essential skill in Anaesthesiology and inability to secure the airway is one of the most common reasons for major anaesthesia related morbidities and mortalities.¹ Laryngeal mask airway (LMA) has established role in modern anaesthesia practice. It is frequently used for airway maintenance of spontaneously breathing patients undergoing elective short surgical procedures.² Controlled ventilation via LMA has been successfully used at modest level of airway pressures. LMA has gained popularity as a back-up device to provide the emergency ventilation in difficult airway scenarios.³

Correct placement of laryngeal mask airway requires some degree of skill and if LMA insertion is sub-optimal, it can cause partial or complete airway obstruction. Standard Brain's LMA insertion technique is somewhat difficult.⁴ Problems are usually encountered when getting the tip of LMA mask to deflect or buckle into back

of the mouth and requires excessive force to place LMA at proper position which results in multiple insertion attempts, prolonged insertion time, trauma to airway and failure of LMA insertion.

Various LMA insertion techniques have been tested with regard to ease of insertion in all age groups, but still none of them has been standardized to replace the Brain's insertion technique.^{5,6} However, there was a reduction in complications rate with alternative techniques compared to Brain's technique.^{7,8}

The reported first attempt success rate is between 67-90% with standard LMA insertion technique.^{7,8} With rotational insertion technique, it is 86% in adults⁹ and 99% in children.⁴

Rotational insertion technique has not been broadly investigated in adult populations with regard to success rate and ease of LMA insertion.^{9,10} However, the rotational technique was found to be effective because it avoided the anterior pharyngeal structures and slid along the posterior palatopharyngeal curve without deflecting or buckling the tip of LMA.⁴

The objective of this study was to evaluate and compare the ease of LMA insertion through the rotational and standard LMA insertion technique in terms of number of LMA insertion attempts, time duration of LMA insertion and occurrence of complications such as trauma, laryngospasm, and hypoxaemia ($SpO_2 < 90\%$).

¹ Department of Anaesthesia, The Aga Khan University Hospital, Karachi.

² Department of Anaesthesia, College of Medicine, King Saud University, Riyadh, KSA.

Correspondence: Dr. Dileep Kumar, Flat 503, Safety Pride Apartment, Daud Pota Road, Cantt Station, Karachi.
E-mail: dkhiloi@yahoo.com

Received September 27, 2011; accepted March 09, 2012.

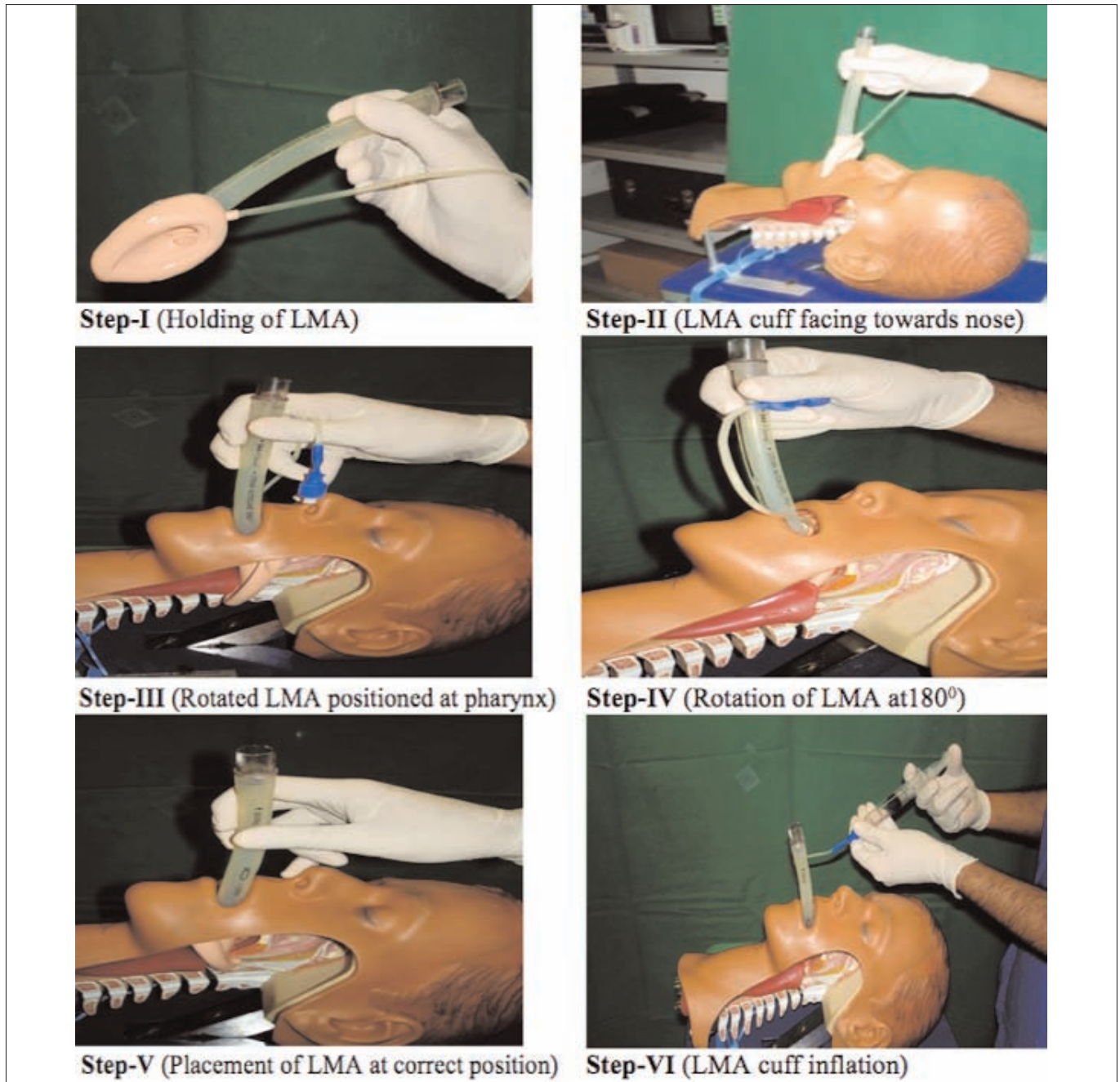


Figure 1: Photographs are showing the rotational LMA insertion technique.

METHODOLOGY

Following departmental research committee and institutional ethical board approval, written informed consent was obtained from 100 adult patients age above 16 years, ASA I and II, scheduled for elective short surgical procedures requiring general anaesthesia with spontaneous breathing were enrolled. Patients anticipated to have a difficult airway or at risk of aspiration, and those with a recent history of upper airway infection were excluded. Anaesthesia protocol was standardized and all patients were premedicated with 7.5 mg oral midazolam 45-60 minutes before

induction. Standard anaesthesia monitors were applied and baseline blood pressure, heart rate and peripheral O₂ saturation were recorded. Following pre-oxygenation, anaesthesia was induced with propofol 2 mg/kg and fentanyl 2 µg/kg. Once the patient became apnoeic and LMA insertion depth was achieved on the basis of clinical judgement, (i.e. jaw relaxation). The deflated classic (LMA North America, Inc.) size three LMA was inserted in females and size four LMA in males. The patients were randomly assigned to one of the two study groups using the computer generated random numbers table; i.e. standard and rotational insertion techniques.

In standard technique (group-S), LMA was placed using the Brain's insertion technique.¹¹ The patient's head was positioned with head extended at the atlanto-axial joint and flexed at the neck with non-dominant hand. The LMA was held like a pen and index finger was placed at the junction of LMA tube and cuff. Index finger was used to press the LMA against hard palate and posterior pharyngeal wall until definite resistance was felt at the base of the hypopharynx. LMA was then held with non-dominant hand and index finger was removed.

In rotational technique (group-R), LMA was inserted using the guedel airway insertion technique.^{4,9,10} Patient's head was positioned with head extended at the atlanto-axial joint and flexed at neck. LMA was proximally held close to anaesthesia circuit attachment. Insertion was conducted with LMA cuff facing towards the nose, hard palate and then advanced into the base of hypopharynx until resistance felt. At this point, LMA was rotated at 180° anti-clockwise and LMA tube black line was positioned and confirmed on the nasal side (Figure 1).

Following LMA insertion in both techniques, LMA was inflated with 20 ml of air in size 3 and 30 ml in size 4 LMA and seal was obtained. Successful placement was checked by chest expansion, reservoir bag movement and appearance of capnographic tracing in both spontaneously breathing patients and in apnoeic patients with assisted ventilation. The lungs were manually ventilated in apnoeic patients to maintain SpO₂ above 97% and P_ECO₂ between 40-50 mmHg until patient regained spontaneous ventilation.

LMA insertions were performed by primary investigators who had experience of more than 200 LMA insertions in adults. After third unsuccessful insertion attempt the other study technique was used as a rescue technique.

Anaesthesia was maintained with isoflurane, oxygen plus nitrous oxide and patients were allowed to breath spontaneously. Patients were intraoperatively monitored for heart rate, noninvasive blood pressure and SpO₂, P_ECO₂ and end tidal isoflurane concentration. All LMAs were removed in deep plane of anaesthesia.

The ease or smooth LMA insertion was the outcome of study and was recorded on the basis of number of LMA insertion attempts, LMA insertion time from removal of face mask to confirmation of chest expansion and capnographic appearance and development of laryngospasm, hypoxaemia (SpO₂ < 90%) during the induction of anaesthesia and the incidence of trauma (labelled as blood stained LMA on removal). All study variables were recorded by other anaesthesiologists who were neither involved in study nor aware of the nature of study.

Data was analyzed using Statistical Package for Social Sciences (SPSS) version 15. Sample size was calculated, 50 patients were required in each group,

based on the assumption that acceptable differences between the two techniques of 23% (67% vs. 90%),⁸ with the power of 80%, and the level of significance of 5%. The test of proportion was used to calculate the sample size.¹² The mean ± SD were computed for quantitative variables such as the age, body weight, height, systolic and diastolic blood pressure, heart rate and SpO₂ and they all were analyzed with student t-test after the testing of normality of numeric data by using the Kolmogorov-Smirnov test. Frequency and percentage were computed for gender, number of LMA insertion attempts, ASA level and Mallampati classification. Chi-square test was used to compare qualitative variables between the two groups. A p-value of less than 5% was considered statistically significant.

RESULTS

The total number of patients was 100. Fifty patients were assigned in each group. None of the patient dropped out from the study. Both the groups were well matched with regard to gender, age, body weight and height (Table I). The considerable differences were not seen in terms of American Society of Anaesthesiologists status, Mallampati score, base line heart rate, systolic and diastolic blood pressure and peripheral oxygen saturation between both the study groups (Table I). The frequency of LMA insertion attempts were observed at first attempt (84%), at second attempt (96%) and at third attempt (100%) with both the standard and rotational LMA insertion techniques (Table II). Statistically insignificant differences were detected for the time duration of LMA insertion among the study groups. However, the rotational LMA insert technique was found to be completed in less than 30 seconds duration in 86% compared to 78% with standard LMA insert technique (Table II). Statistically significant difference was observed (p = 0.003) for the incidence of trauma

Table I: Demographic characteristics and baseline vitals.

Parameters	Group-S (n = 50)	Group-R (n = 50)	p-value
Age (years) (mean ± SD)	41.68 ± 14.07	39.88 ± 14.24	0.529
Weight (kg) (mean ± SD)	66.09 ± 11.47	65.55 ± 10.48	0.806
Height (cm) (mean ± SD)	163.79 ± 12.14	161.73 ± 09.37	0.345
Heart rate (mean ± SD)	81.08 ± 14.05	80.54 ± 09.04	0.820
SBP* (mean ± SD)	124.82 ± 16.84	124.98 ± 15.66	0.961
DBP* (mean ± SD)	75.36 ± 11.67	76.52 ± 10.11	0.597
SpO ₂ (mean ± SD)	97.60 ± 0.80	97.50 ± 0.953	0.573
Sex			
Male	29 (58%)	24 (48%)	0.316
Female	21 (42%)	26 (52%)	
ASA			
I	26 (52%)	34 (68%)	0.102
II	24 (48%)	16 (32%)	
Mallampati grading			
I	33 (66%)	31 (62%)	0.677
II	17 (34%)	19 (38%)	

Data are presented as mean ± SD or number & (%); p < 0.05; * Systolic blood pressure; † Diastolic blood pressure; ‡ Peripheral oxygen saturation.

(blood stained LMA on removal) with standard LMA insertion technique 28% compared to 6% with rotational LMA insertion technique (Table II). The development of laryngospasm and hypoxaemia was not identified in both the study groups. The anaesthesia and surgery was uncomplicated in all study subjects.

Table II: Findings of LMA insertion with both insertion techniques.

Parameters	Group-S (n = 50)	Group-R (n = 50)	p-value
Number of attempts (%)			
1	43 (86)	43 (86)	1.00
2	05 (10)	05 (10)	
3	02 (04)	02 (04)	
LMA insertion time (%)			
< 30 seconds	39 (78)	43 (86)	0.456
30 seconds	05 (10)	02 (04)	
> 30 seconds	06 (12)	05 (10)	
Blood stained LMA: (Trauma %)	14 (28)	03 (06)	0.003*

Data are presented as frequency (%); * $p < 0.05$ s

List of abbreviations.

LMA	Laryngeal mask airway
ASA	American Society of Anaesthesiologists
kg	Kilograms
mg	Milligrams
µg	Micrograms
%	Percentage
mmHg	Millimeter of mercury
SpO ₂	Peripheral oxygen saturation
PECO ₂	Mixed expired carbon dioxide tension
>	Greater than
<	Less than
min	Minutes
O ₂	Oxygen
N ₂ O	Nitrous oxide
Group-S	Standard LMA insertion technique
Group-R	Rotational LMA insertion technique
180°	180 degree
mls	Milliliters
SPSS	Statistical Package for Social Sciences
cm H ₂ O	Centimeter of Water
Vs.	Versus
SBP	Systolic blood pressure
DBP	Diastolic blood pressure
cm	Centimeter

DISCUSSION

Laryngeal mask airway has proven to be safe for patients in whom endotracheal intubation can be avoided. It is easier to place face mask to maintain the patient's airway, especially in patients with edentulous, awkward jaw and in bearded men. LMA has shown to play a vital role in planned and unplanned difficult airway management scenarios. The friendly handling of LMA has gained the popularity among the airway management staff at in-hospital and pre-hospital settings. LMA insertion has convinced the less haemodynamic response, minimal respiratory physiological

disturbances and the better tolerance compared to endotracheal intubation. However, its insertion is associated with some of known complications like regurgitation and the aspiration, which is due to the possibility of stomach insufflation and the lack of tracheal seal with LMA.

LMA has been designed on the anatomical ground of adult cadaveric pharynx.¹³ This may be the cause of its placement difficulty and insertion failure because of the racial variations in the size of the epiglottis and the position of the larynx.

The standard Brain's LMA insertion technique is somewhat uneasy in adults. Nevertheless, the manufacturer's instructions is strictly followed, but still it is difficult to negotiate the LMA through the pharynx posteriorly. In consequence of that the number of failure insertion attempts, hypoxaemia, laryngospasm and oral trauma are frequently observed with the standard LMA insertion technique.⁴ Brodrik has mentioned the reason of placement difficulty and LMA insertion failure due to down-folding of epiglottis and backward rotation of LMA mask in 10% of his study population with recommended standard Brain's LMA insertion technique.¹⁴

The rotational LMA insertion technique has been extensively evaluated in paediatric age groups and it has been concluded that, the rotational technique is useful because of smoothly passing through the pharynx posteriorly with minimal resistance.^{4,6} However, very few studies have been done regarding the rotational LMA insertion as an alternative method of LMA insertion in adult population.^{9,10,15}

This study did not find the dissimilarity in term of number of insertion attempts and the LMA insertion time between both the study groups. In this study, the LMA insertion in first attempt success rate via standard Brain's insertion technique was 86%, which is relatively similar to McCirrick's¹⁶ finding of 84% and Howard⁸ and Haghighi's⁹ results of 80% of first-attempt success rate. The success rate of 86% with first attempt LMA insertion in the rotational technique has matched with the finding of Haghighi's.⁹ However, the Nakayama's finding of 99% first-attempt success rate in paediatric population is extremely different with the present result of rotational technique in adults population.⁴ The discrepancy was probably due to the anatomical variations of age groups and secondly Nakayama used partially inflated LMA cuff which could have favoured his results.

In this study, the most significant clinical finding was pharyngeal mucosal injury that was labelled as trauma (blood stained LMA on removal). The incidence of trauma in the rotational technique was remarkably lower compared to the standard Brain's technique. Dingley reported 22% trauma incidence,¹⁷ which is relatively lower than our 28% with standard technique. The trauma incidence with the present rotational technique was 6%, which was reasonably similar to Nakayama finding.⁴

The association of sore throat with pharyngeal trauma secondary to LMA insertion could not be ignored. However, the development of sore throat is not solely dependent on pharyngeal trauma. It is multifactorial such as the use of lubrication for LMA insertion, maintaining the LMA cuff pressure and the user's skill of LMA handling.¹⁸ Brimacombe had pointed out that there is least correlation between the LMA insertion techniques, blood stained LMA and the development of sore throat.¹⁰

In both study groups, LMA insertion were done by primary investigator, who had experience of more than 200 LMA insertions. All patients completed the study and none of patient developed the complications like regurgitation or aspiration.

Blinding remained the limitation in this study because it was unavoidable to conceal the insertion technique and the number of insertion attempts. However, the bias was tried to minimize through the involvement of other anaesthesiologists to collect the data and he or she was blinded with the patients grouping.

Use of fiberoptic to confirm proper LMA placement was the second limitation of this study. Rowbottom used fiberoptic and he found that the ideally placed LMA was only 49% with Brain's technique.¹⁹ Brimacombe had reported fiberoptic evaluation, that the rotationally inserted LMA was not fully rotated and failed to place properly.¹⁰ Although the both authors fiberoptic assessment were concluded a suboptimal LMA placement. However, they found clinically adequate airway patency because gases were insufflated into larynx through the lateral spaces on either side of LMA bars and the epiglottis. However, the clinical judgement has been considered enough to confirm correct LMA placement and fiberoptic evaluation is considered unnecessary in routine practice.^{7,20}

CONCLUSION

The rotational insertion technique was practically easy while negotiating the back of mouth and it requires little efforts that turn out to be the reason of lowest incidence of complications. This technique can be considered in adults when encountered difficulty and repetitive failures with standard LMA insertion technique.

Disclosure: This study is based on a dissertation written in partial fulfillment of FCPS and only the title has been modified.

REFERENCES

1. Rasanen J. The laryngeal mask airway--first class on difficult airways. *Finnaest* 2000; **33**:302-5.
2. Zia A, Chaudhry T, Hussain R, Ghalani T. A comparison of airway maintenance by cuffed Oropharyngeal airway (COPA) and laryngeal mask airway (LMA) in spontaneously breathing adult patients. *Ann KE Med Coll* 2005; **11**:279-81.
3. Henderson JJ, Popat MT, Latto IP and Pearce AC. Difficult Airway Society guidelines for management of the unanticipated difficult intubation. *Anaesthesia* 2004; **59**:675-94.
4. Nakayama S, Osaka Y, Yamashita M. The rotational technique with a partially inflated laryngeal mask airway improves the ease of insertion in children. *Paediatr Anaesth* 2002; **12**:416-9.
5. Koay CK, Yoong CS, Kok P. A randomized trial comparing two laryngeal mask airway insertion techniques. *Anaesth Intensive Care* 2001; **29**:613-5.
6. Soh CR, Ng ASB. Laryngeal mask airway insertion in paediatric anaesthesia: comparison between the reverse and standard techniques. *Anaesth Intense Care* 2001; **29**:515-519.
7. Matta BF, Marsh DS, Nevin M. Laryngeal mask airway: more successful method of insertion. *J Clin Anesth* 1995; **7**:132-5.
8. Wakeling HG, Butler PJ, Baxter PJ. The laryngeal mask airway: a comparison between two insertion techniques. *Anaesth Analg* 1997; **85**:687-90.
9. Haghighi M, Mohammadzadeh A, Naderi B, Seddighinejad A, Movahedi H. Comparing two methods of LMA insertion; classic versus simplified (airway). *MEJ Anesth* 2010; **20**:509-14.
10. Brimacombe J, Berry A. Insertion of the laryngeal mask airway. A prospective study of four techniques. *Anaesth Intense Care* 1993; **21**: 89-92.
11. LMA airway instruction manual [Internet]. 2005. [cited 2008 May 20]. Available from :http://www.lmana.com/docs/LMA_Airways_Manual.pdf
12. Dawson SB. Estimating and comparing proportions. In: Dawson SB, editor. Basic and clinical biostatistics. Norwalk (CT): *Appleton and Lange* 1990. p. 142-60.
13. Brain AIJ. The development of laryngeal mask--a brief history of the invention, early clinical studies and experimental work from which the laryngeal mask evolved. *Eur J Anaesth* 1991; **4**:5-17.
14. Brodrik PM, Webster NR, Nunn JF. The laryngeal mask airway. A study of 100 patients during spontaneous breathing. *Anesthesia* 1989; **44**:238-41.
15. Monem A, Khan F. Laryngeal mask airway insertion anaesthesia and insertion techniques. *J Pak Med Assoc* 2007; **57**:607-11.
16. McCrerrick A, Ramage DT, Pracilio JA, Hickman JA. Experience with the laryngeal mask airway in two hundred patients. *Anaesth Intense Care* 1991; **19**:256-60.
17. Dingley J, Whitehead MJ. A comparative study of the incidence of sore throat with the laryngeal mask airway. *Anesthesia* 1994; **49**:251-4.
18. Brimacombe J, Holyoake L, Keller C, Barry J, Mecklem D, Blinco A, et al. Emergence characteristics and postoperative laryngo-pharyngeal morbidity with the laryngeal mask airway: a comparison of high versus low initial cuff volume. *Anesthesia* 2000; **55**:338-43.
19. Rowbottom SJ, Simpson DL, Grubb D. The laryngeal mask airway in children. A fibreoptic assessment of positioning. *Anesthesia* 1991; **49**:489-91.
20. Joshi S, Sciacca RR, Solanki DR, Young WL, Mathru MM. A Prospective evaluation of clinical tests for placement of laryngeal mask airway. *Anesthesiology* 1998; **89**:1141-6.

.....★.....