



Comparative Study between Two Techniques for Insertion and another Two for Removal of LMA; The Risks and Benefits

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Keywords: Laryngeal mask airway; Propofol; Sevoflurane; Awake; Dysphagia.

Abstract

Most of previous literatures compared drugs; which one saved a favorable condition for LMA insertion (depress airway reflexes, had antiemetic properties and had least side effects e.g. hypotension and myoclonus). Others compared complications of LMA during removal in awake versus deeply anaesthetized patients. Our study was different as it compared technique complications (spontaneous respiration vs relaxed patients during insertion and awake vs asleep during removal of LMA). The (LMA) is an acceptable alternative to mask anesthesia in the operating room. LMA is an effective alternative to the endotracheal tube for securing the airway in short surgical procedures. Propofol is a widely used anesthetic agent for the insertion of laryngeal mask airway. Sevoflurane is a volatile anaesthetic agent, which provides rapid induction and recovery conditions. LMA use may involve some important complications. After failed intubation, the LMA can be used as a rescue device. In the case of the patient who cannot be intubated but can be ventilated, the LMA is a good alternative to continued bag-valve-mask ventilation because LMA is easier to maintain over time and it has been shown to decrease, though not eliminate, aspiration risk.

Purpose of the study: LMA is safe for use but not free of complications.

Objectives In this study we compared the complications of LMA; cough, vomiting, O₂ desaturation, pharyngeal haematoma, lingual nerve injury, haemodynamic changes, sore throat, tongue swelling, tongue cyanosis, laryngeal spasm, misplacement of LMA and abdominal distension during insertion in spontaneously breathing vs relaxed patients and during removal of LMA in awake vs still anaesthetised patients.



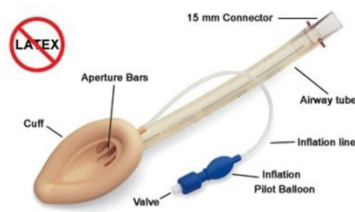
Background and methods: we use large sample size (200) patients divided into 2 groups GA =100 patients and GB =100 patients.

Results: The study revealed that insertion of LMA in deeply anaesthetised relaxed patients and removal while patients were still in a deep level of anaesthesia has less complications than insertion of LMA in spontaneous breathing patients and removed while patients were fully awake.

Conclusions: In spite of the validity of the two techniques for insertion and removal of LMAs; our study revealed that insertion of LMA in deeply anaesthetised relaxed patients and removed while patients were in a deep level of anaesthesia has less complications than insertion of LMA in spontaneous breathing patients and removed while patients were fully awake.

Introduction

The Laryngeal Mask Airway (LMA), created by Archie J. I Brain in 1980 is an alternative airway device used for anaesthesia and airway support. It consists of an inflatable silicone mask and rubber connecting tube. It is inserted blindly into the pharynx, forming a low-pressure seal around the laryngeal inlet and allowing gentle positive pressure ventilation or spontaneous respiration. All parts are latex-free. The laryngeal mask was first introduced in the U.K. in 1988 and in the U.S. in 1992 as an alternative to the face mask [7,8].



It is used in prehospital setting, where emergency medical technicians typically have less experience with intubation and lower success rates [3,14].

The LMA can be used as a conduit for intubation, particularly when direct laryngoscopy is unsuccessful. ETT can be passed directly through the LMA or ILMA.

The LMA is useful in the prehospital setting not only for patients in cardiac arrest but also for managing a difficult airway.

In patients in whom positioning not allow for endotracheal intubation, the LMA can be used inserted and allow for successful airway management until a definitive airway established.

The widespread use of LMA in the prehospital setting in Japan for cardiac arrest has shown it to be an effective and relied upon method for establishing emergency airways. Laryngeal mask airways are available in a range of adult and pediatric sizes.

Laryngeal Mask Airway is Absolute contraindicated in patient who; cannot open mouth, with complete upper airway obstruction.

It is relatively contraindicated in; Increased risk of aspiration Prolonged bag valve mask ventilation, morbid obesity second or third trimester of pregnancy Patients who have not fasted

before ventilation, upper gastrointestinal bleeding abnormalities in supraglottic anatomy need for high airway pressures (we cannot exceed 20 mm H₂ O.) [17, 20,13].

The rate of complications was 0.15% in a large study, but the rate is likely to be higher in the emergency setting. Such complications include the following aspiration of gastric contents, irritation upper airway trauma, pressure-induced lesions, nerve palsies and mild sympathetic response [45,33]. The most important Complications associated with improper placement are; obstruction, laryngospasm. Complications associated with positive pressure ventilation: Pneumothorax, pulmonary edema.

As endotracheal intubation is associated with haemodynamic stress response. This stress response might not be of concern in young healthy patients, but in patients with limited cardiovascular reserves, this can be totally unacceptable. LMA is a good alternative to endotracheal intubation in such patients to minimize this response [24,45].

The most probable cause for cranial nerve injuries associated with LMA is a pressure neuropraxia from the tube (Lingual) or cuff (hypoglossal and recurrent laryngeal) [6,16,22]. Neuropraxis of the lingual nerve can result from damage anywhere along the nerve, but it is more common between the lateral pterygoid muscle and the jaw.

The patient presented initially with decreased sensation and pain in the throat and anterior two thirds of the tongue evolving, over hours, to partial loss of taste, which is compatible with lingual nerve damage Lesion of the hypoglossal nerve leads to dysphagia; and the lesion of the recurrent laryngeal nerve to postoperative dysarthria, stridor, and aspiration. LMA complications include sore throat, laryngeal nerve palsy, lingual nerve palsy, alteration of taste/swallowing/ speech, [43,61] rarely tongue cyanosis or tongue cyanosis with swelling.

The venous drainage of the tongue is via two main routes – dorsal lingual and deep lingual vein. The dorsal lingual vein drains the dorsum and lateral aspects of the tongue and joins the lingual vein along side the lingual artery and finally drains into the internal jugular vein at or near the greater cornu of the hyoid bone. The deep lingual vein commences at the tip of the tongue passes along the ventral surface just beneath the mucosa. This then joins the sublingual vein and passes with the hypoglossal nerve between hypoglossus and mylohyoid muscles to drain into the internal jugular, facial, or lingual vein. Cyanosis was thought to be due to compression and occlusion of both lingual vessels [40,52,63].

Table 1: A table showing laryngeal mask airway size based on patient weight is included below.

Weight, kg	Mask Size	Max Cuff Volume, mL	LMA Models
< 5	1	4	Classic, Unique
5-10	1.5	7	Classic, Unique
10-20	2	10	Classic, Unique
20-30	2.5	14	Classic, Unique
30-50	3	20	Classic, Unique, Fastrach
50-70	4	30	Classic, Unique, Fastrach
70-100	5	40	Classic, Unique, Fastrach
>100	6	50	Classic

Despite the popularity of Laryngeal Masks (LMA) for airway maintenance during general anaesthesia, there is still no optimal induction technique that guarantees good insertion conditions whilst maintaining cardiovascular stability, decreases complications and rapid onset of respiration. SO: This is the aim of our study to investigate two techniques for insertion and another two for removal of LMA; the risks and benefits. The most popular induction agent for LMA insertion continues to be propofol as this agent best obtunds oropharyngeal reflexes. However, its use in doses which allow adequate jaw relaxation and prevent patient reaction to LMA insertion i.e., movement & laryngospasm commonly results in hypotension and prolonged apnoea. Although probably inconsequential in a fit patient, these side effects are undesirable in the elderly or those with cardiovascular disease. Sevoflurane is an alternative anesthetic induction agent to propofol as it has a pleasant odour, does not irritate the airways, provides a rapid induction, easy titration and has fewer side effects. If sevoflurane provided better haemodynamic stability than propofol, then it can be used for LMA placement especially in cardiac patients where even a little haemodynamic instability can not be accepted [13,17,30].

Patients and methods

The study was conducted in Kasr Al-Ainy hospital during the period from March 2015 till April 2017. The study followed the principles of the Declaration of Helsinki, and the Medical Research involving Human subjects ACT (WHO). The purpose of the study was clearly explained in Arabic language to all subjects before the study. This research did not receive any specific grant or fund from any agency in public, commercial or not for profit sector.

After approval of local ethics committee (anaesthesia and intensive care medicine unit – Kasr Al-Ainy faculty of medicine – Cairo university – Egypt), patients written consent, review of investigations, full monitoring (ECG, pulse oximeter, BIS, capnography and NIBP. HR and SPO₂) will be traced all through the procedures and recorded from the time of induction up to 5 min of induction (At time of induction, 1min, 3 min, 5 min post induction). 200 patients of ASA class I and II scheduled for minor elective surgery that expected to last less than 90 minutes. They are classified into 2 groups each group 100 patients n=100. Group A (spontaneous breathing insertion and awake removal of LMA) and group B (relaxed patients during insertion and deep removal of LMA). Proper sized LMA was selected for each patient. Inclusion criteria; 20-40 year, BMI less than 30, fastig 8 hours, opening mouth well and moving neck normally and no neck, oral or pharyngeal masses. The exclusion criteria include patients cannot open mouth or With complete upper airway obstruction, increased risk of aspiration, prolonged bag-valve-mask ventilation, morbid obesity, second or third trimester pregnancy, patients, upper gastrointestinal bleeding, suspected or known abnormalities in supraglottic anatomy and need for high airway pressures (more than 20mm H₂O for effective ventilation). Patients with clinically significant cardiovascular, respiratory, hepatic, renal, neurologic, metabolic disease. Reflux or hiatus hernia, Intra-abdominal pathology recent major trauma or administration of opiates, autonomic dysfunction associated with diabetes.

Those adults having reactive airway disease or signs of upper respiratory infection, abnormal liver and kidney function tests were excluded from the study.

Technique

A preanaesthetic evaluation will be done on the previous day. An informed written consent will be taken from all patients. Nil per oral status of at least 8 hours will be maintained. Patients will be premedicated with oral ranitidine 150mg on the previous night and morning 2 mg midazolam I.V after insertion of IV access. Glycopyrrolate 0.2mg i.v and ondansetron 4mg i.v. will be given in preparation room.

On arrival to the operation room, standard monitors were connected; ECG, NIBP, and pulse oximetry, capnography and BIS. All patients will be preoxygenated for 3mins with 100% oxygen using fresh gas flow of 6 L/min. The patients baseline heart rate, NIBP CO₂ and SPO₂ were recorded. All patient had fentanyl 1 microgram/kg prior to induction. To optimize proper positioning, we made sure the mask is completely deflated, with a smooth, well-lubricated surface. When the initial Laryngeal Mask Airway (LMA) placed did not result in a good seal, we attempted the next larger size. In general, if a patient is between sizes, we chose the larger size.

Airway was evaluated using either flexible fiberoptic laryngoscopy (awake patients) or direct laryngoscopy (in anaesthetized patients) to estimate pharyngeal or epiglottic redness or haematoma, tongue swelling and cyanosis early after LMA removal. After recovery of patients; they were asked to protrude tongue and to taste some salty and sugary solutions to evaluate lingual nerve injury. They were asked postoperatively in PACU about sore throat, dysphagia and nausea, Colour of the tongue to be observed. Lingual nerve was evaluated by asking the patients about tongue numbness and by putting some normal saline or dextrose (Taste) or deviation while protruded.

Limitations: Any patient who experienced any degree of hypoxemia to have the best chance to correct it through increasing FIO₂, repositioning of LMA or PEEP and CPAP if needed. The sample size to be increased in future studies in bigger institutes.

Anesthesia: Group A patients were induced using low dose propofol 1 mg / kg and fentanyl 1 microgram / kg. Then induction was completed using sevoflurane to avoid apnea; we used both tidal volume and vital capacity induction for sevoflurane. In tidal volume induction, we encouraged patient to breath in the face mask with a mixture of 6% sevoflurane, and 100% oxygen and induction achieved in less than three minutes in most of cases. In vital capacity induction, patients were asked to expire fully and then inhaled a mixture of 8% of sevoflurane and 100% oxygen through face mask to full extent and then hold breath which induces induction. Tidal volume inhalation induction with high concentration sevoflurane could provide better haemodynamic stability when compared to propofol for LMA insertion in adults. Group A patients were extubated while awake. In group B, patients were induced using propofol 2 mg/kg, fentanyl 2 microgram / kg and 0.5 mg/kg suxamethonium. LMA insertion then assisted ventilation till return of spontaneous ventilation. Group B patients were extubated while in a deep level of anaesthesia mastered by BIS. Both groups were maintained with sevoflurane 2-4 %, and oxygen. Nitrous oxide was avoided not to hyperinflate LMA cuffs. Recorded parameters were; Vomiting, laryngeal spasm, misplacement, pulse rate, BP, O₂ saturation, abdominal distension and coughing upon insertion. During removal and early after of LMA removal; coughing, sore throat, pharyngeal redness or hematoma, O₂ saturation, tongue swelling, tongue cyanosis, dysphagia, lingual nerve injury, pulse and BP changes were recorded. BIS from 30-50 value

considered deep level of anaesthesia and above 70 considered awake [16].

Positioning: We used the optimal head position for insertion of the Laryngeal Mask Airway (LMA); sniffing position. We chose the appropriate size of Laryngeal Mask Airway (LMA) checked the LMA cuff for leaks, deflate the cuff of the LMA completely against a flat surface, applied a water-soluble lubricant generously to the posterior surface of the mask. Cricoid pressure is intended to reduce the risk of aspiration. We used cricoids pressure in 59 cases in both group for proper positioning of LMA .



LMAs were held like a pen, with the index finger of the dominant hand at the junction of the mask and the tube,. we Slide the LMA along the hard palate, pushing it back against the palate as it is advanced toward the hypopharynx,. This prevents the tip from folding over on itself and reduces interference from the tongue.



We advanced with gentle pressure until resistance is met.

If necessary, we continued pressure on the tube with the nondominant hand to fully advance the LMA to its proper position. Once in place, the cuff inflated without holding the LMA to allow it to acquire its natural position. We tried to reduce the frequency of nerve injuries by avoiding insertion trauma, using appropriate sizes, minimizing cuff volume, and early identification and correction of malposition. Potential predisposing factors for nerve injuries included use of nitrous oxide, using an LMA that was too small, the lateral position, extreme head side rotation, anticoagulants rheumatoid arthritis, ankylosing spondylitis, calcinosis, Raynaud phenomenon, over inflation of the cuff, lidocaine lubricant and difficult insertion.

Confirming placement

We confirmed the position of the LMA by auscultating bilateral breath sounds and an absence of sounds over the epigastrium, observing chest rise with respiration or ventilation, and reading an ET CO₂.

We ensured that the vertical black line on the tube is at the patient's midline. Assess for ability to generate up to 20 cm of water pressure without a leak.

Results

Statistical analysis

Sample size was done considering the primary outcome and according to the study done by Mathew PJ, et al. Calculation done comparing 2 proportions from independent samples using Chi test, the alpha error level was fixed to 0.005, the power was set at 99%. Accordingly 100 patients per group was optimum considering 10% dropout to conduct our study. It is done using G power software version 3.1.2. for MS windows, Franz, Kiel University, Germany. Statistical analysis has been carried out by entering all the data in Statistical Package of Social Sciences (SPSS 20) version. Mean and standard deviation of different variables were calculated, Independent t- test was applied to compare means. P- value <0.005 was considered statistically significant. Analysis of Variance (ANOVA) was used for analysis of demographic data. The Pearson Chi-Square test was used to compare some data between groups. The Kruskal-Wallis test was used to overall insertion conditions, vomiting, cough and incidence of sore throat and dysphagia etc.

Thus, the Wilcoxon rank sum test was used to study the cardiovascular variables and the Mann-Whitney U test was used to compare some measured data. All continuous data was presented as median and range. Some data were expressed as a percentage from original number group e.g. cough and laryngeal spasm.

Study variables were; analyzed with chi-square test (fisher exact test), Kruskal-Wallis test and Mann-Whitney). Bonferroni correction was performed for multiple testing.

There was no significant difference between groups regarding demographic data; age, sex, weight and height. The operative time was insignificant between the two groups. The mean age of the patients in group A was 30.5 ± 4.8 years while in group B was 28.4 ± 5.2 years. Mean weight in group A and B was 60.5 ± 5.8 and 62.2 ± 4.7 kilograms respectively (p> 0.005).

One hundred two patients were ASA I and 98 were classified as ASA II. (p>0.005). Both groups had predominantly female patients 52% in group A and 64% in group B.

120 cases were simple urological procedures and 80 cases were minor gynaecological procedures.

The average time of the procedures was 75± 9 and 69± 11 minutes in group A and B respectively (p > 0.005) which was not significant.

During removal of LMA, tongue cyanosis and lingual nerve injury was absent in both groups (p=0). (16,17)

Insertion misplacement was significantly higher in patients of group B (10 cases) (p value <0.005) – significant) compared with 2 cases of misplacement in group A [4] . Regarding haemodynamics; In group B, MAP was recorded to be 90 ± 5.3 mmHg before induction and 79.9 ± 7.5 mmHg after LMA placement following propofol induction (Table1 B group) (Figure. 5,6,18,19). Whereas MAP in Group A (SEVOFLURANE) before induction of anaesthesia and after LMA placement were 90 ± 4.8 and 84.2 ± 7.03 mmHg respectively. (Table 2 A group).

Table 1: B Group

	Base Line	Induction	1 Min	3 Min	5 Min
Heart Rate	79.1 ± 4.3	82.2 ± 8	82.2 ± 8	82.2 ± 8	82.2 ± 8
Blood Pressure	90 ± 5.3	79.9 ± 7.5	79.9 ± 7.1	79.9 ± 7.0	79.9 ± 7.2
Spo2	99	96	97	98	98

The fall in MAP was found to be significant in Group B when compared to Group A after induction and insertion of LMA (p value < .0005). In group B, mean HR was recorded to be 79.1 ± 4.3 before induction and 82.2 ± 8 one minute after LMA placement following propofol induction. While mean HR in Group A was 78.1 ± 7.8 before induction and 91.3 ± 3.0 one minute after LMA placement following sevoflurane induction. Hence, we found a significant difference in terms of change in mean HR between the two groups (p value < 0.04) after LMA insertion. The difference in fall in MAP in group B was found to be 8.7 ± 2.1 mmHg in group B and in group A was found to be 4.2 ± 1.4 mmHg. The fall in MAP was found to be significant in Group B when compared to Group A after induction and insertion of LMA (p value<.005). In the group B, mean HR before induction of anaesthesia was 79. 1 ± 4.3 per minute and after propofol induction and placement of LMA was recorded to be 82.2 ± 8 per minute. The mean change in heart rate was found to be 2.5 ± 1.1 beats per minute in group B while in group A it was calculated to be 8 ± 1 beats per minute. Hence, there was a significant difference in terms of mean HR between groups (p value <0.01) after induction of anaesthesia and LMA insertion (Figure 5,6,18,19).

Table 2: Group A

	Base Line	Induction	1 Min. after	3 Min. after	5 Min. after
Heart Rate	78.1 ± 7.8	91.3 ± 3.0	91.3 ± 3.0	91.3 ± 3.0	91.3 ± 3.0
Blood Pressure	90 ± 4.8	84.2 ± 7.03	84.2 ± 7.01	84.2 ± 7.03	84.2 ± 7.02
Spo2	98	95	95	95	96

Both groups exhibited stable haemodynamic profiles, although propofol produced a larger decrease in mean blood pressure compared with sevoflurane and a significant increase in HR IN SEVOFLURANE GROUOp COMPARED TO PROPOFOL GROUP. The pulse rate was significantly higher in group A during insertion and removal of LMA compared to group B. (Table 1,2).

During insertion of LMA; out of 100 patients, 7% of spontaneously breathing patient group A (SB G) and only 3% of the the group of relaxed patients B (RG) had vomiting of clear small amount of fluid that managed in proper way with no complications (Figure 1) while an 11 % in SBG and only 0% in RG had laryngeal spasm (Figure 2). Regarding coughing; 13% in SBG and only 0% in RG had coughing during insertion of LMA mostly due to incomplete suppression of airway reflexes (Figure 3). The incidence of misplacement was higher in relaxed patients group (9%) compared to spontnous breathing group (1%) as air column guided us in SBG (Figure 4). HR showed significant increase in group A compared to group B, while BP showed significant decrease in group B compared to group A. (Figure 5,6). O2 desaturation during insertion of LMA noted in 6 % in SBG and only 2% in RG with no significant hypoxemia (lowest SPO2 was 95%) in group B mostly due to apnea of propofol (Figure 7). 2% of SBG and 16% of RG had abdominal distension mostly, due to assisted

hand ventilation in RG (Figure 8). During removal of LMA; 33% of awake group A and 3% in deep group B had cough. (Figure 9). 19% in GA and 4% in GB patients had sore throa mostly due to fighting LMA during insertion and removal of LMA. (Figure 10). Regarding redness and haematoma of upper airway after LMA removal 3% in SBG awake (A) and only 1% in relaxed deep (B) group (Figure 11). 9% in awake and 1% in deep group had de-saturation during removal of LMA that managed in proper way with no residual effects [12]. Insignificant tongue swelling encountered in both groups 3% and 4% in RG and SBG respectively (Figure 13). vomiting during removal occurred in 9 and 2 cases in group A and B respectively that managed in proper way with no residual complications [14]. Dysphagia encountered in 6 and 1 cases of group A and B respectively (Figure15).

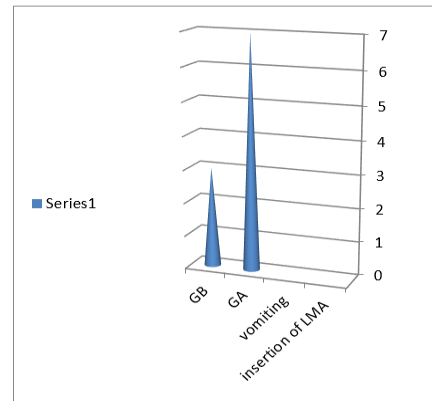


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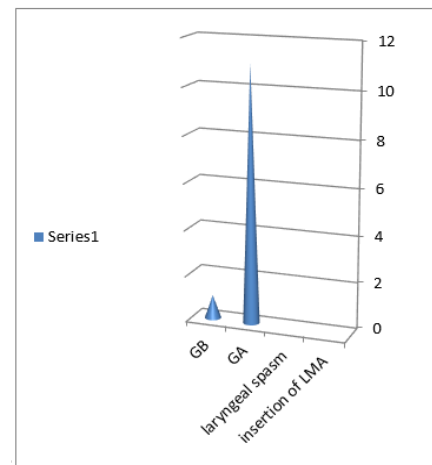


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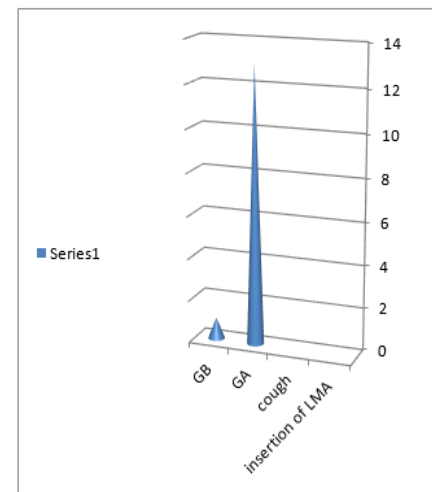


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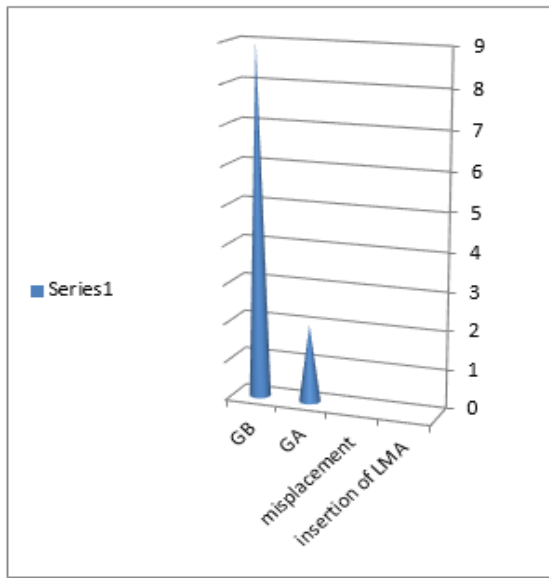


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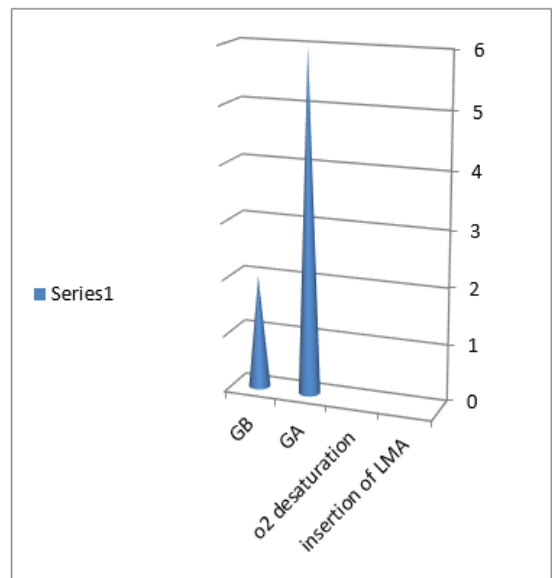


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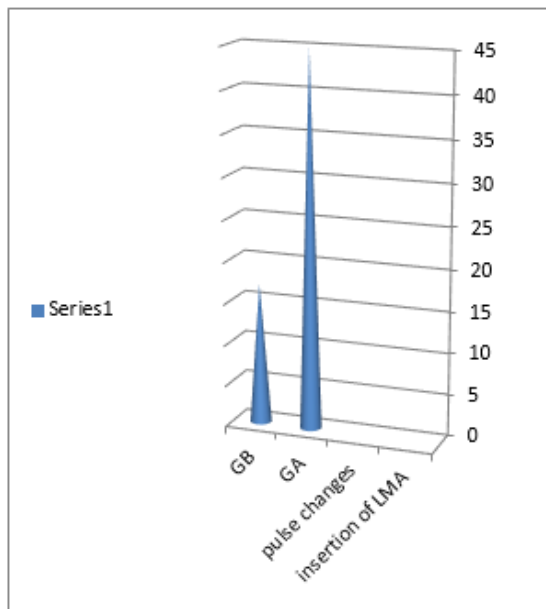


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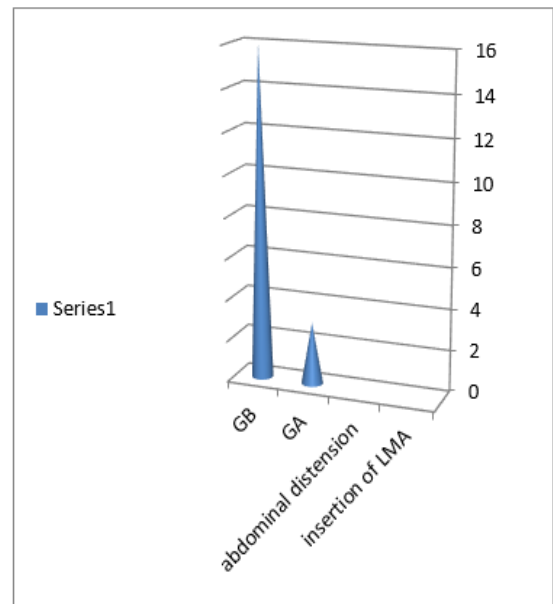


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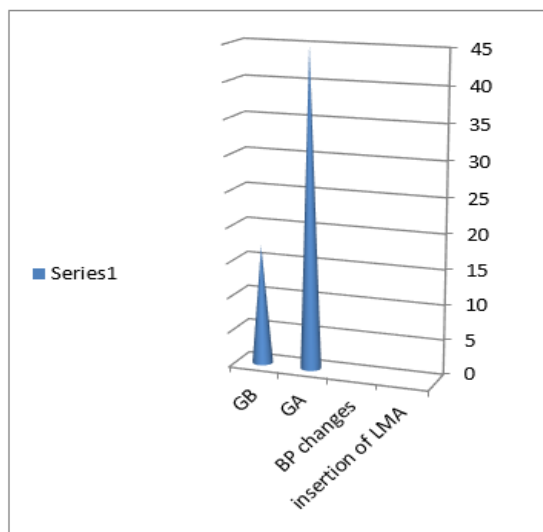


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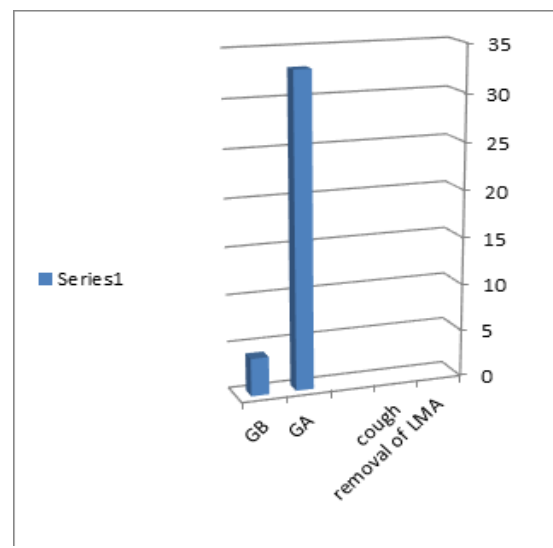


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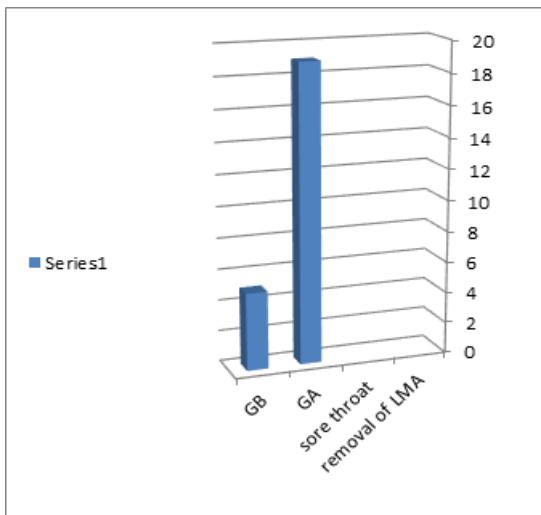


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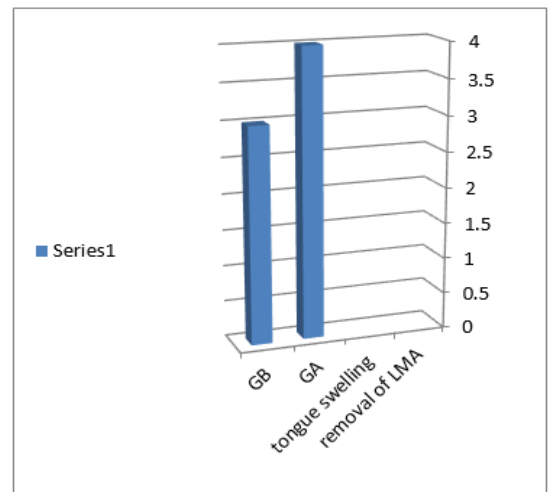


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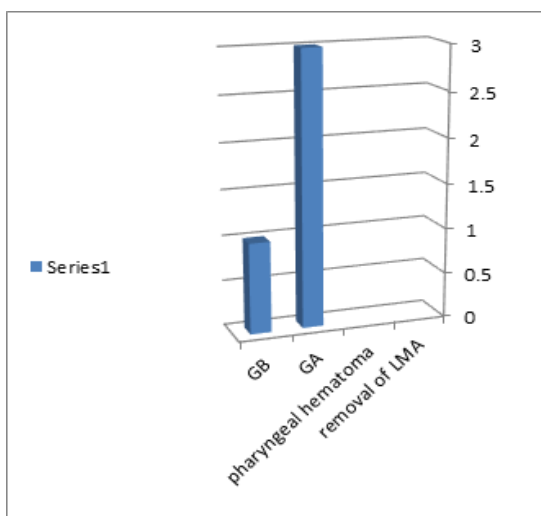


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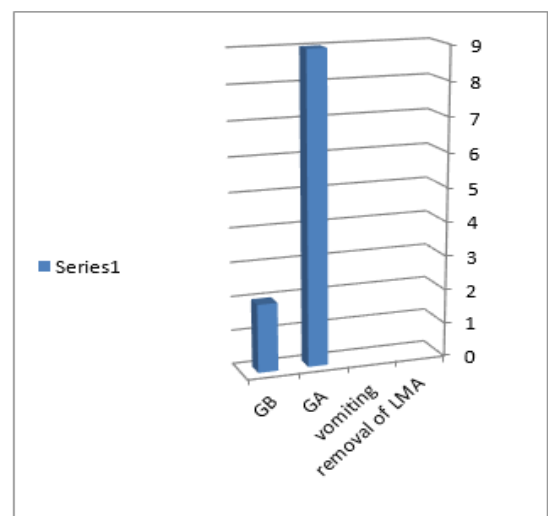


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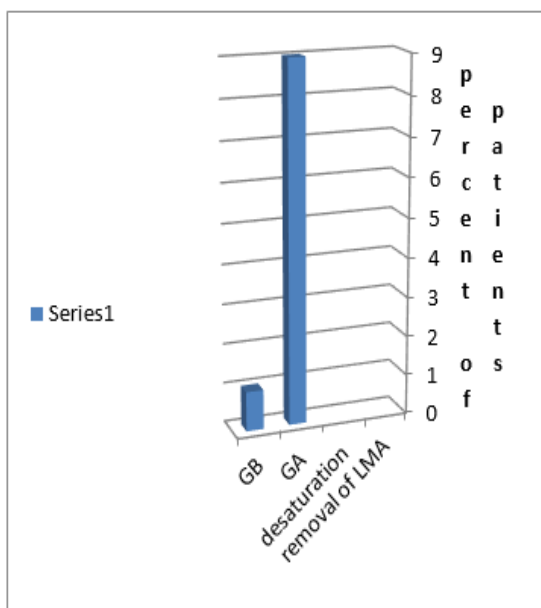


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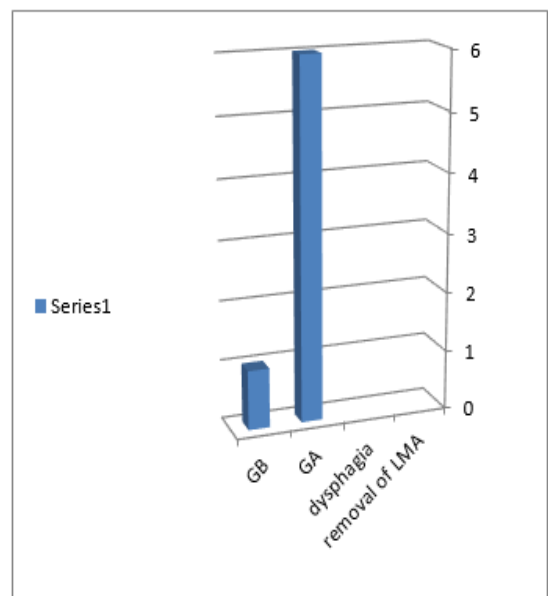


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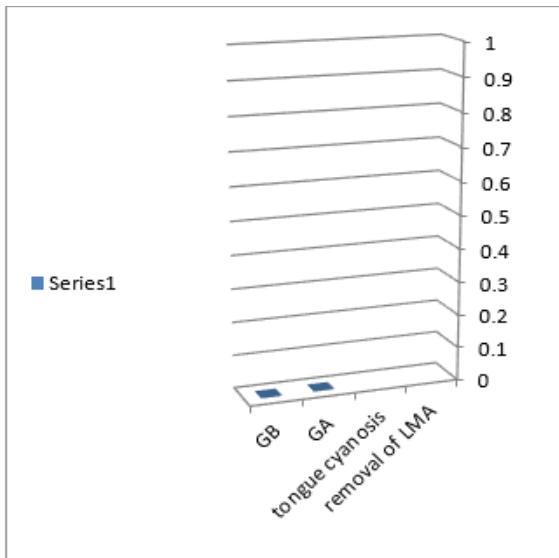


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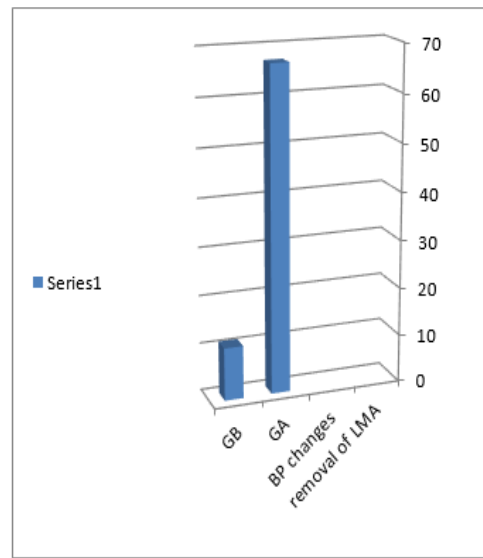


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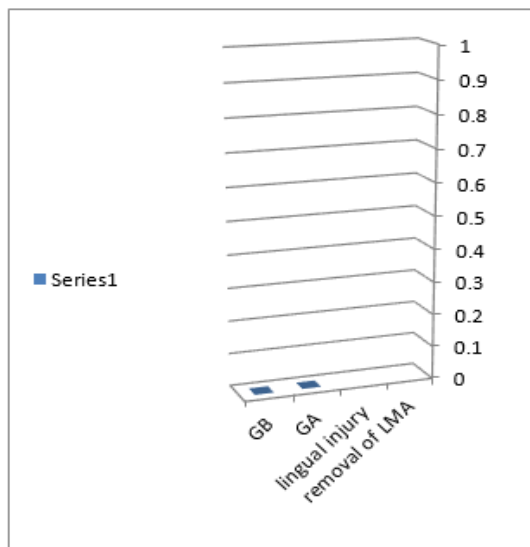


Figure 17:

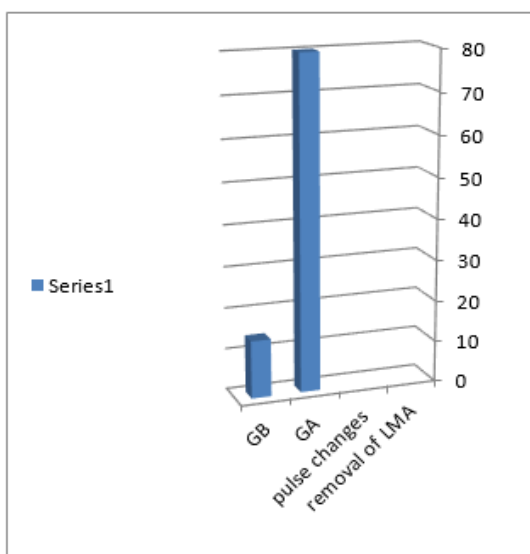


Figure 18:

There were significant difference in both groups regarding haemodynamic changes as HR changes were significant in group A and and hypotension was significant in group B [5,6,18,19]. There was no tongue cyanosis or lingual nerve injury in both groups [5,6,18,19].

Discussion

Most of previous literatures compared drugs; which one saved a favorable condition for LMA insertion

(depress airway reflexes, had antiemetic properties and had least side effects e.g. hypotension and myoclonus) [1,20,54]. Others compared complications of LMA during removal in awake and deeply anaesthetized patients. [5,15,23]. Our study is different as it compared techniques (spontaneous respiration vs relaxed patients during insertion and awake vs asleep during removal of LMA regarding complications and benefits. Baird et al compared the effect of removal of LMA in awaked patients vs deeply anesthetized patients and reported that incidence of oxygen desaturation in awaked patients was higher than deeply anesthetized patients [5]. This results matched the results of our study. Nunez et al recommended that LMA can be safely left placed until the patient has regained consciousness after emergence from the anesthesia but LMAs were clenched in some patients with gagging [44]. It is different regarding our results as the incidence LMA complications in our study during removal of LMAs were in awakened patients. Gataure et al concluded that it may be safer to remove the LMA while adult patients are deeply anesthetized to avoid stress response, coughing and sore throat that matched our results with a major difference as we measured more parameters [18,61]. Laffon et al studied the Complications associated with removal of the laryngeal mask airway: A comparison of removal in deeply anaesthetised versus awake patients (coughing, biting, retching, vomiting, excessive salivation and airway obstruction) associated with removal of the laryngeal mask airway. Laffon et al. reported a two-fold increased incidence of complications after removal of the LMA in awake compared to deeply anaesthetised paediatric patients [35]. Their results matched the results of our study with the difference that the parameters we measured were more and they studied paediatric group. So they suggested that it may be safer to remove the LMA while the patients are deeply anesthetized [35]. Heidari and Saeed Abbasi studied the influence of depth

of anesthesia (awake vs deep anesthesia) on the incidence and severity of airway hyper reactivity associated with (LMA) removal and concluded that, there were no significant differences in bronchospasm, laryngospasm, oxygen desaturation. Significant differences were in cough and straining, breath holding, vomiting. His results were not conclusive as there were some positive and some negative effects of his technique [23]. Jeong-Soo Park and Ki-Jun Kim LMA removal during adequate anesthesia and after awakening in children aged 2 to 6 years; They compared the frequency of airway complications during removal of the (LMA) In 2 to 6 year old pediatric patients, they concluded that an adequate anesthetic state is preferable to the awake state during LMA removal [15,29]. Their results supported our results. Others investigated removal of LMA in paediatric age; awake vs deep sleep, there was debate as deep removal had the problem of airway obstruction, laryngeal spasm and aspiration. Removal of LMA in awake paediatric patients had the problem of clenching of LMA and sometimes desaturation and laryngeal spasm [32,37,53].

Hong JY et al et al studied Deep vs. Awake Extubation and LMA Removal in Terms of Airway Complications and concluded that deep extubation in pediatric patients may reduce the risk of overall airway complications including cough and desaturation compared with awake extubation. However, deep extubation may increase airway obstruction. we agreed with their results as they supported our results [15 ,25,32].

The insertion of the LMA causes a smaller increase in MAP and HR than endotracheal tube in healthy normotensive adults. These results does not match our results as most of studies use thiopental as induction agent with minimal haemodynamic effects but our present study used propofol and sevoflurane [31,38,54,58]. Many studies conducted which have compared the number of parameters like ease of insertion, hiccupping, airway obstruction, laryngospasm and cough after LMA placement with propofol or sevoflurane. Propofol is considered to be the drug of choice for LMA insertion as it abolishes laryngeal reflexes and prevents laryngospasm also having some antiemetic quality. Sevoflurane is an alternative anesthetic induction agent to propofol as it has a pleasant odour, does not irritate the airways, provides a rapid induction, easy titration and has fewer side effects. If sevoflurane provided better haemodynamic stability than propofol, then it can be used for LMA placement especially in cardiac patients where even a little haemodynamic instability can not be accepted [65,45,26,17].

Findings in the that study was the significant fall in MAP after propofol induction as compared to sevoflurane, with an significant increase in heart rate in both groups. This result matched our study regarding BP but was different regarding HR changes as HR changes was significantly higher in group A of our study. Jellish et al, Thwaites et al, and Shao G et al had detected significant decrease in MAP and insignificant rise in heart rate after propofol induction as compared to sevoflurane group which matches our study regarding BP changes and differs regarding HR [26,54,58]. These results are similar to our study where the fall in MAP after propofol induction was significant (p value < 0.005) when compared with sevoflurane. But, there was no significant difference between two groups in terms of heart rate (p value >0.4). Our study is in contrast to Kati I et al who detected no significant difference between groups in terms of Mean Arterial Pressure (MAP) mostly due to dose difference. However within both groups there was a significant decline in MAP values after induction when compared to the pre-induction values

(p <.01). In the terms of heart rate they did not detect any significant difference between groups [31]; these results however do not match our study (Table 1). Similarly Fredman et al detected some different results. They deducted a decrease in MAP and HR in comparison to pre-induction values in both groups. Decrease in heart rate in sevoflurane group was more significant than propofol group whereas decrease in MAP in propofol group was more significant than sevoflurane group [17]. The fall in MAP was in accordance to our study but the results of the other parameter (heart rate) did not match our study (Table 1 and 2).

Although standard practice of using Propofol as a drug of choice in patients selected for LMA placement as for maintenance of anaesthesia, their recommendation would be to replace it with Sevoflurane as induction agent in patients who have limited cardiac reserve. They conclude that sevoflurane provided better haemodynamic stability than propofol for LMA insertion [17]. As our patients selected as ASA 1 and 2 so, they can tolerate mild reduction in BP.

Lian et al compared the quality and ease of insertion of laryngeal mask airway after either rapidly inhaled sevoflurane or iv propofol induction of anaesthesia and concluded that sevoflurane compares favorably with propofol, although prolonged jaw tightness may delay laryngeal mask airway insertion. Sevoflurane induction resulted in a stable hemodynamic profile during induction of anaesthesia [38]. Our study completed some missed issues not discussed by the previous studies as it studied most of LMA complications during insertion and removal e.g. cough, laryngeal spasm, abdominal distension, sore throat etc.

Thwaites A et al did a study of 8% sevoflurane and propofol as induction agents for day care cystoscopy. They concluded that induction with sevoflurane was significantly slower compared with propofol, but was associated with lower incidence of apnea and shorter time to establish spontaneous ventilation. They concluded that inhalational induction with 8% sevoflurane would appear to be more advantageous when compared with induction with propofol [58]. This result matched our results regarding haemodynamics. Priya v et al concluded that propofol is superior to sevoflurane for insertion of the laryngeal mask airway, using loss of eye lash reflex [49], this result goes hand in hand with this present study. Many investigator studied mini-dose suxamethonium to facilitate the insertion of a laryngeal mask airway, following I.V with propofol. They concluded that the laryngeal mask was inserted after the first attempt in 87% of patients. Mini-dose suxamethonium improved the correct positioning of the laryngeal mask during the first attempt (93 %) [27,51,64]. In conclusion, mini-dose suxamethonium facilitates laryngeal mask insertion [27,63]. These results matched our result.

In our study, we used the apnea of full dose propofol and suxamethonium in group B to attenuated gagging, coughing and pressor response that explained significant difference in vomiting, cough sore throat,. Haemodynamics etc ..

Raman et al studied the use of Low-dose suxamethonium to facilitate LMA insertion under etomidate anaesthesia and to estimate haemodynamic response to LMA insertion [51].

The position of the LMA was verified by capnography, chest movement and the absence of gas leak around the cuff as we did in our study.

Heart Rate (HR) and mean Arterial Blood Pressure (MAP)

readings were taken pre-induction, 30 seconds post-induction, and 30 seconds post-LMA insertion. Ventilation was not assisted unless the patient's oxygen saturation fell below 95%. Incidence of sore throat was reported. Suxamethonium significantly increased the success rate of LMA insertion as compared to the control group, which matches our study. Jaw relaxation was significantly better in the patients given suxamethonium as compared to the control group. Insertion conditions were also significantly better in the patients who received suxamethonium. 39 of the 40 patients given suxamethonium had the LMA successfully inserted with excellent or good insertion conditions. The same noticed in our study as the incidence of most complications were less in the group received propofol suxamethonium compared to spontaneously breathing patients [51].

Yoshino et al compared different doses of suxamethonium with thiopentone for insertion of LMA showed significantly better insertion conditions with suxamethonium 0.5mg/kg [64].

R Inácio, I Bastard and C Azevedo studied lingual nerve injury as a complication associated with LMA. They had a case of lingual nerve injury that was associated with use of LMA during V.Vs stripping under GA [6,28].

Although this LMA has a lower rate of complications than the endotracheal tube, it is not devoid of morbidity. She was 55 years old, weighing 75 Kg, 165 cm, ASA I, admitted for VVs stripping under general.

Monitoring consisted of ECG, pulse oximetry, NIB, capnography.

Anesthesia induced with propofol; LMA, size 4, lubricated was easily inserted at the first attempt. The cuff was inflated with 20 ml of air. The proper positioning of the device was confirmed by capnography. Anesthesia was maintained with sevoflurane and oxygen under controlled mechanical ventilation, with a TV of 8 – 10 ml/kg and PIP 16 - 20 cm H₂O.

At the end of surgery; the LMA was removed with the cuff semi-inflated when the patient opened his mouth to verbal command. The LMA was in situ for a 2.5 h.

After one hour, she developed decreased sensation and pain in the anterior two third of the tongue that evolved, in 30 hours, to partial loss of taste. lingual nerve injury was diagnosed. After two weeks symptoms disappeared spontaneously.

Most of these injuries were thought to be related to suboptimal use of the LMA.

The onset of symptoms ranged from immediately after anaesthesia to 48 h after surgery. In this case, a number 4 mask was used, which could explain the neuropraxis, since using a laryngeal mask smaller than recommended makes it more difficult to obtain the proper seal and, consequently, the need to inject a greater volume of air in the balloon, leading to excessive compression of adjacent structures.

LMA use is associated with a very low incidence neuropraxis of the lingual nerve. Its diagnosis is clinical and it has a good prognosis, with resolution of the symptoms within a few weeks to months [6,28]. Although neuropraxis of the lingual nerve is a benign condition, it is important to notice that it can be avoided by using the laryngeal mask properly as we did in this current study by avoiding rough manipulations during insertion and removal of LMA and nitrous oxide. Fortunately we had no case of lingual nerve injury in our study as we avoided all precipitating

factors. Sore throat is the most common complaint after LMA use, with an incidence that varies from 10% to 40% in most studies that can be reduced by refined manipulations during insertion and removal of LMA [60,61]. In our study the incidence of sore throat is significantly higher in spontaneous breathing group during induction and fully awake during removal of LMA mostly due to fighting and swallowing and straining at the LMA in comparison of low incidence in group B (relaxed insertion and deep removal). It is supposed that most of LMA complications as tongue swelling, nerve injuries, sore throat are reduced with the use of cuff pressure transducer [9,11]. Dysphagia may be due to simple inflammatory response to LMA or airway injury [9,43]. In present study it was higher in group A.

Mishra et al reported a case of Cyanosis Of the tongue as a complication Of LMA

that resolved rapidly within one hour. LMA cuff was inflated with 20 ml air. Surgery lasted 3 hours. The LMA cuff was deflated and the LMA removed. Tongue cyanosis was noted at the time of removal of the LMA. The patient was hemodynamically stable and maintained a saturation of 100%. She was fully awake and followed commands. She was kept under observation for 2 hours in the postoperative period. The tongue became pink within one hour after surgery [42].

Fortunately, no cases of tongue cyanosis reported in our study mostly because it is rare complication and all precautions were taken to avoid it as low inflation pressure proper positioning, proper sized LMA, limited surgery time and reasonable timing for removal.

A group of investigator reported another case of laryngeal nerve injury caused by LMA use. Injury to recurrent laryngeal nerve, hypoglossal and lingual nerve may occur due to the use of LMA [10,12,19,33]. Very rarely neural problems following LMA use may cause alteration of taste, swallowing and speech [19,2,39,46]. LMA may occlude the patients lingual artery bilaterally. The cause of compression of the lingual artery may be due to mal positioning, size of LMA itself, or the cuff may also be a factor. Mal positioning can be ruled out as surgery lasted for 2.5 hours and there was no leak. The patient was hemodynamically stable and maintained saturation of 99- 100 % throughout the operation [39,21,36]. We believe that an increase in cuff pressure was the probable cause in that case, as we all know that LMA cuffs are highly permeable to nitrous oxide and cuff pressure increases during anaesthesia using nitrous oxide [39]. This mechanism may have contributed to the obstruction seen in this case. For this cause we excluded nitrous oxide in our study. If a significant leak occurs a larger LMA should be used. Although tongue swelling as consequence of LMA use appears to be a rare occurrence, we would recommend periodic checking of the tongue, device position and correct selection of mask size. In our study no cases of lingual nerve injury or tongue cyanosis were reported as we followed a proper way for selection the size of LMA, proper injecting volume of air and proper LMA positioning.

Conclusion

Many drugs and various techniques were tried during the use of LMA. Our study was different as it compared two different techniques during insertion and another two techniques during removal of LMA and concluded that insertion of LMA in a deeply anaesthetised, relaxed patients and its removal while the patient still in a deep level of anaesthesia is much better

than to be inserted in spontaneously breathing patients and removed in fully awake patients regarding ; cough, vomiting,, sore throat, laryngeal spasm, dysphagia and haemodynamics but the opposite happened regarding abdominal distension and misplacement as they were more in deeply anaesthetised, relaxed patients.

Limitations

Were large sample size, financial aspect and patient consent .

Recommendation for future studies

“To follow patients for longer time to assess dysphagia, sore throat and lingual nerve palsy as these complications may happened up to 48 hours postoperatively. To avoid the risk of an undetected increase in cuff pressure by using a monitoring transducer.

Recommendation

Readers to choose the relaxed technique for insertion and asleep technique for removal of LMA in spite of the other technique is accepted.

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