

Effect Of LMA-Classic And LMA-Proseal Insertion On Intraocular Pressure In Adult Patients.

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Citation

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Abstract

Background: One of the primary aims of anaesthetic management during ophthalmic surgery is to provide optimal control of intraocular pressure (IOP). Laryngeal mask airway (LMA)-classic and LMA-ProSeal have been compared on many aspects but we could not locate any trials comparing the effect of their insertion on IOP. Present study compared effect of LMA-classic and LMA-ProSeal insertion on the IOP. **Methods:** 100 patients requiring general anaesthesia for elective surgical procedures were divided into two groups (LMA-classic in 50 patients and LMA-ProSeal in 50 patients). Baseline IOP was recorded and after induction, LMA insertion was performed. Anaesthesia was maintained with nitrous oxide and halothane in oxygen. IOP was measured just before LMA insertion, just after LMA insertion and thereafter at intervals of 1, 3 and 5 minutes. **Results:** IOP decreased in both groups after induction with propofol ($p > 0.05$). It rose just after the insertion of airway device in both the groups ($p > 0.05$). At one minute after the device insertion IOP started decreasing ($p > 0.05$). At 3 minutes and 5 minutes after the insertion of airway device the IOP was still decreasing in both the groups and was not significantly different. **Conclusion:** Results of the present study show that IOP always remains below baseline with the use of LMA-classic as well as LMA-ProSeal. The study showed similar profile of two devices as far as IOP is concerned.

INTRODUCTION

The aims of anaesthetic management during ophthalmic surgery are to provide optimal control of intraocular pressure (IOP), an immobile, uncongested operative field combined with adequate level of anaesthesia with cardiovascular stability. Open eye injuries, strabismus surgeries, posterior chamber surgeries, surgeries of more than two hours duration and surgeries in anxious patients should be done under general anaesthesia even in adult patients. When eyeball is opened, intraocular pressure equals atmospheric pressure. If IOP is very high before opening the eyeball then sudden decrease in IOP may cause serious complications such as iris prolapse, vitreous loss, retinal detachment, or expulsive choroidal hemorrhage. Maintaining a low or normal IOP under anaesthesia is challenging and especially very important in patients with open globe injuries where any increase in IOP can lead to loss of intraocular contents.^{1,2,3}

Various anaesthetic drugs and techniques have been studied in the past to keep intraocular pressure low with varying degree of success. Induction agents like thiopental, propofol and phenobarbital significantly decrease IOP.⁴ All modern

volatile agents decrease IOP in a dose dependent manner.⁵

Non-depolarizing muscle relaxants decrease IOP significantly below the baseline, however, suxamethonium, a depolarizing muscle relaxant, has been shown to increase IOP.^{6,7,8}

Endotracheal intubation (ETI), a potent noxious stimulus, is associated with an increase in IOP. Laryngeal mask airway-classic (LMA-classic) has been used for intraocular surgeries and has been compared with ETI. A number of studies showed better control of IOP with LMA-classic as compared to ETI in patient undergoing surgery.¹³⁻¹⁹

A newer version of LMA-classic, named as LMA-ProSeal™, is available and is being used extensively in anaesthetic practice.⁹ As compared to LMA-classic, LMA-ProSeal has better airway seal pressure and better protection against aspiration, apart from provision for easy insertion of orogastric tube, which may be helpful in patients who have not fasted adequately before urgent and emergent eye surgeries. LMA-classic and LMA-ProSeal have been compared on many aspects but we could not locate any trials comparing the effect of their insertion on IOP. LMA-ProSeal

as compared to LMA classic has a bulkier cuff with double cuff arrangement. Metal introducer tool, on which the LMA-ProSeal is loaded, reaches up to patient's base of tongue and may be act as an irritant. These differences in design and insertion technique may have different impact on IOP.

Therefore, in this study we planned to compare effects of LMA-classic insertion and LMA-ProSeal insertion on IOP in adult patients undergoing any surgical procedure requiring general anaesthesia.

METHODS

After approval from institutional ethics committee, this prospective study was conducted on 100 patients (aged 20-50 years) ASA (American society of anaesthesiologists) physical status I or II, requiring general anaesthesia for elective surgical procedures. Exclusion criteria included presence of glaucoma, hypertension, previous intraocular surgery, high risk of aspiration and difficulty in insertion of airway device.

Patients were premedicated with tablet alprazolam (0.25mg) and tablet ranitidine (150mg) at night and two hours before surgery. Patients were kept fasting for six hours prior to scheduled time of surgery. On arrival in operation theatre an IV line was established and continuous monitoring of ECG, heart rate, non-invasive blood pressure and pulse oximetry was done. Baseline IOP was recorded under topical anaesthesia using 4% lignocaine eye drops with hand-held Schiotz's tonometer using aseptic technique in right eye.^{10,11} All patients were pre-oxygenated for three minutes as per the departmental protocol. Induction of anaesthesia was achieved by injection propofol 2.5 mg kg⁻¹. Vecuronium 0.1 mg kg⁻¹ was given intravenously to facilitate insertion of LMA. Patients were ventilated with 1% halothane in a mixture of nitrous oxide and oxygen in a ratio of 1:1 for 3 minutes. Patients were allocated to two groups of 50 patients each. In group I, LMA-classic was used, while LMA-ProSeal was used in group II. Size of device was chosen according to weight of the patient.^{9,12} Standard insertion technique with introducer tool was used in group II.⁹

After induction, LMA insertion was performed and LMA cuff was inflated with recommended volume of air. It was connected with breathing circuit. Patients were ventilated with 1% halothane in a mixture of nitrous oxide and oxygen in a ratio of 2:1. IOP was measured (mean of three readings) just before LMA insertion, just after LMA insertion and thereafter at intervals of 1, 3 and 5 minutes in the right eye. Surgery commenced at the end of study. At the completion

of surgery residual neuromuscular blockade was reversed using appropriate dosage of neostigmine and glycopyrrolate.

All patients were examined post-operatively for any complications of IOP measurement. Data thus collected was compiled and analyzed using appropriate statistical test.

STATISTICAL ANALYSIS

IOP values have been expressed as mean and standard deviation. Sample size was calculated in consultation with statistician using previous studies comparing Endotracheal intubation and LMA-classic. The minimal sample size required to detect a difference of 2.0 mmHg in two groups assuming a standard deviation of 3.5, type I error $\alpha = 0.05$ with the power of 0.8 was 49. Mean IOP of two groups was compared at baseline and at different stages of study. Mean IOP at different stages of study in the same group was also compared. IOP in two groups as was compared using "Unpaired student's T Test". Intragroup analysis was done using "paired T test". (For intragroup analysis bonferroni correction was applied.)

RESULTS

Demographic data was comparable in both the groups. Table-1 depicts the baseline IOP and changes in IOP during various stages of study. All the patients in the study had smooth airway device placement.

Figure 1

Table-1 (Changes in intraocular pressure at various stages in two groups)

Intraocular Pressure(mmHg)	Group I (Mean±S.D.)	Group II (Mean±S.D.)
Baseline	16.77±2.28	16.44±2.83§
Just before airway device placement	12.36±1.79*	12.31±2.41§*
Just after airway device placement	14.09±2.08*	14.55±2.61§*
1 minutes after airway device placement	13.57±1.89†	13.92±2.54§†
3 minutes after airway device placement	13.24±1.99†	13.56±2.66§†
5 minutes after airway device placement	13.06±2.00†	13.3±2.73§†

* p Value<0.0001 as compared to previous reading in the group.

† p value>0.05 as compared to previous reading in the group

§ p Value>0.05 as compared to reading in the group I.

After induction with propofol, IOP decreased significantly as compared to baseline in both the groups. Just after the airway device placement, it rose significantly as compared to the previous levels but remained below the baseline values.

At one minute after the device placement, the IOP again

started decreasing but was not significantly less as compared to the values just after the device insertion (Table-1) and then it continued to decrease upto five minutes after the device placement.

These trends were similar for both the groups. There was no significant difference in IOP at any time between the two groups (Table-1).

All patients were followed upto 24 hours after the surgery. No complication pertaining to IOP measurement was noticed in any of the subjects.

DISCUSSION

We could not find any study in the English literature till date that has compared the effect of LMA-classic and LMA-ProSeal on IOP. Several studies in the past have compared the effect of ETI and LMA-classic insertion on IOP and have observed that LMA insertion is associated with lesser increase in IOP as compared to ETI. It has been shown that IOP decreased after induction of anaesthesia but increased after LMA insertion upto 3 minutes and then stabilized. Despite increase in IOP with LMA, the post-insertion values always remained below the baseline.^{13,14,15,16,17} Similar pattern of sequential changes in IOP were observed in present study in both the groups. No statistically significant difference was seen between two groups.

Although a rise in IOP following LMA insertion has been reported but it didn't reach significant levels. The absence of significant difference in IOP has been attributed to use of propofol as an induction agent,¹⁸ which may also be true for our similar findings.

Various studies have compared LMA-classic and LMA-ProSeal on different aspects and have found that LMA-classic is easier and quicker to insert in anaesthetized, non-paralyzed patients.¹⁹ Better airway seal with LMA-ProSeal scores an advantage over LMA-classic and moreover, an orogastric tube preventing aspiration (which remains an important concern for anaesthetist) can be inserted through the drainage tube. Assessing the ease of insertion of was not the aim of the study, nevertheless, no difference in ease of insertion was observed between the two groups. Difficulty in insertion and multiple attempts can cause increase in IOP and this constituted one of the exclusion criteria in our study protocol.

Factors which may increase IOP include carbon dioxide retention, use of suxamethonium and high systemic venous

pressure which may occur during coughing and straining.^{1,2} In this study, we did not use suxamethonium, induction was smooth and none of the patients had cough, straining or movement during device insertion.

One limitation of our study was that we placed LMA-ProSeal only by standard introducer technique whereas in literature some other techniques such as digital, boogie guided etc. have been described. These different techniques may have variable effect on IOP. However, further studies are required to ascertain that. Another limitation of our study was that we did not measure the intracuff pressure. After LMA insertion, more than recommended (60cmH₂O) intracuff pressure may be associated with increase in IOP. We inflated LMA cuff with recommended volume so any difference that could have been in intracuff pressure was common to both groups.

In conclusion, present study shows that IOP always remains below baseline with the use of LMA-classic as well as LMA-ProSeal. The study showed similar profile of two devices as far as IOP is concerned.

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