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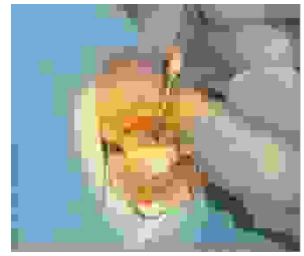

INTRA OCULAR PRESSURE;

EFFECTS OF LARYNGEAL MASK AIRWAY AND TRACHEAL INTUBATION DURING CATARACT SURGERY UNDER GENERAL ANAESTHESIA

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ABSTRACT... Objective: To compare the effects of Laryngeal Mask Airway (LMA) and tracheal intubation on Intra Ocular Pressure (IOP) with concomitant haemodynamic changes during cataract extraction and intra ocular lens (IOL) implant surgery under general anaesthesia. **Design:** Comparative study. **Place and Duration of Study:** The study was conducted at department of Anaesthesiology Combined Military Hospital Jhelum from April 2003 to December 2003. **Subjects and Methods:** 40 ASA I and II patients of both sexes aged 40-68 years, undergoing surgical cataract extraction were studied. 20 patients were intubated endotrachealy while LMA was inserted in other 20 patients. Ventilation was controlled in both groups. IOP was measured preoperatively in non-operated eye. **Results:** Intra ocular pressure (IOP) decreased below the base line after induction of anaesthesia but it markedly increased after intubation in tracheal tube (TT) group whilst there was less increase in LMA group. During operation IOP decreased to near pre-induction value in both groups. At the end of surgery, before extubation . IOP increased significantly in TT group with a small rise in LMA group and extubation was followed by a further rise in IOP in TT group. while removal of LMA was not accompanied by increase in IOP. Heart rate (HR) and arterial blood pressure (BP) changes followed the same pattern as IOP. **Conclusion:** General anaesthetics decrease IOP in general. Laryngoscopy and intubation are anaesthesia-related events, which cause rise in IOP. In appropriate patients LMA is an acceptable technique for intra ocular surgery offering advantages in terms of intra ocular pressure and cardiovascular stability compared to tracheal intubation.

Key Words: Anaesthesia, general: Ophthalmic. Cataract extraction, INTRA OCULAR pressure, Laryngeal Mask Airway. Tracheal intubation.

INTRODUCTION

The goal of anaesthetic management during ophthalmic surgery is to provide good control of intra ocular pressure (IOP), an immobile, uncongested operative field and cardiovascular stability. Combined with an adequate level of anaesthesia. The choice of ventilation, whether spontaneous or controlled is controversial.[1]

Regardless of the method of implantation employed, the one basic principle of IOL, implant surgery, common to all methods, is the maintenance of a soft eye and orbit to reduce trauma caused by insertion. Therefore absolute akinesia and good anaesthesia are necessary. General anaesthesia (GA) provides suitable operating conditions, especially in apprehensive and uncooperative patients. The Europeans almost universally use general anaesthesia to have their patients completely relaxed.[2]

The eye can be considered a hollow space with a rigid wall. If the contents of the space increase, the IOP (normal 12-20 mm Hg) must rise. A rise in venous pressure and extreme changes in arterial blood pressure and ventilation can affect IOP. Any anaesthetic event that alters these parameters (e.g laryngoscopy, intubation, airway obstruction, coughing, Trendelenburg position) can affect IOP.[3]

So the essential features of general anaesthesia for ophthalmic surgery are a straight-forward smooth anaesthetic with no hypoxia or hypercarbia, smooth recovery without coughing, straining or vomiting and for intra ocular surgery, particularly if lens implant is to be inserted, the tension in the eye must be as normal as possible.[4] The purpose of this study was to compare the effects of laryngeal mask airway versus tracheal intubation on IOP with concomitant haemodynamic changes during cataract surgery under general anaesthesia.

PATIENTS & METHODS

This study was carried out in department of Anaesthesiology at Combined Military Hospital Jhelum from April 2003 to December 2003.

Forty ASA I and II patients of both sexes aged 68 years or less (range 40 to 68 years). Undergoing surgical cataract extraction and intra ocular lens (IOL) implantation were studied. Any patient with esophageal reflux and respiratory or cardiac disease was excluded from the study. Patients were randomly selected and divided into two equal groups:

A: Tracheal tube (TT) group (N = 20)
B: Laryngeal mask airway (LMA) group (n = 20)

The patients were admitted to the hospital 1 or 2 days prior to the scheduled surgery. Routine clinical chemistry tests, ECG and chest X-ray were performed. Written informed consent was obtained from all patients. Surgery was performed between 0800 hours and 1300 hours. In Operation theatre an intravenous (I.V.) cannula was inserted to each patient for I.V. infusion (Lactated Ringer's Solution) and administration of drugs.

Table -I Time period when measurements of intraocular pressure, cardiovascular variables and end tidal carbon dioxide (ETCO2) were obtained.

	Pre-induction	Post induction	Post intubation		During operation	Pre-extubation	Post extubation
			1 min	5 min			
Intra ocular pressure	+	+	+	+	+	+	+
Heart rate	+	+	+	+	+	+	+
Arterial pressure	+	+	+	+	+	+	+
End tidal CO2	-	-	+	+	+	+	-

KEY: += variable monitored, - = variable not monitored

Before induction of anaesthesia intra ocular pressure was measured in the non-operated eye using Schiotz after instillation of 0.4% benoxinate hydrochloride drops. Data were recorded at all the times (Table- I).

Peri-operative monitoring consisted of continuous ECG, non-invasive arterial blood pressure (Dinamap), end–tidal carbon dioxide partial pressure and pulse oximetry (Oxicap).

After determination of base line data, midazolam 2.5 mg was administered I.V.[5] and a minute later, anaesthesia was induced with slow I.V. injection of thiopentone (sufficient to abolish the eyelash reflex).[6] Post induction data were recorded. Suxamethonium 1 mg/kg was given[6] and the lungs ventilated using a face mask, with 60% nitrous oxide in oxygen and 1% halothane. When fasciculation ceased and jaw became relaxed, the airway was secured using cuffed orotraheal tube (TT) or a laryngeal mask airway (LMA). The patients were given vecuronium 0.04mg/kg I.V[7]. and mechanical ventilation of the lungs (Pulmovent) was commenced with a tidal volume of 10 ml/kg at a rate sufficient to maintain the end-tidal carbon dioxide partial pressure at 4.0 to 4.5 kpa and anaesthesia was maintained with halothane 0.5% and 60% nitrous oxide in oxygen. Supplementary vecuronium 0.01mg/kg given when required to maintain the paralysis (according to the train of four response). Injection metochlopramide 10 mg was given I.V before conclusion of the surgery to prevent post operative nausea and vomiting.[3] At the conclusion of the surgery, neuromuscular block was antagonized with neostgmine 2.5 mg and atropine 0.5 mg I.V. Patients then spontaneously breathed 100% oxygen.[3] Lignocaine 1.5 mg/kg I.V. was given about 2 mins prior to extubation to blunt cough reflexes temporarily.[3] Pre-extubation data was obtained and halothane was turned off. Gentle pharyngeal toilet was then performed followed by extubation. After extubation, intra ocular pressure and cardiovascular data were recorded and later on patients were shifted to recovery ward.

RESULTS

Patients characteristics are summarized in Table II. There were no significant differences between two groups. Time sequences of measurements were not significantly different between groups. Tracheal intubation and laryngeal mask placements were accomplished without difficulty in all patients. It was easy to ventilate the lungs of patients of both groups to an end-tidal carbon dioxide partial pressure of less than 4.5 kPa. And airway leaks were not a problem in LMA group.

Intra ocular pressure (IOP) decreased below the base line after induction but it increased significantly in tracheal tube (TT) group after intubation whilst there was less increase in IOP in LMA group. IOP decreased to near pre-induction value in TT group at 5 mins after intubation. There was a further decrease in IOP in LMA group at this time (Table-III).

At the end of surgery, IOP was significantly greater in TT group than LMA group before extubation, and extubation was followed by a further increase in IOP in TT group.

Table-II Patients characteristics

Characteristics	A (TT)	B (LMA)
Age (year)	54 (42-48)	51 (40-61)
Weight (Kg)	74 (9.5)	67 (8.0)
Sex (Male: Female)	4:6	5:5
Systolic arterial pressure (mm Hg)	145 (11.2)	156 (3.5)
Diastolic arterial pressure (mm Hg)	85 (8.0)	84 (3.5)
Heart rate (beats /min)	73 (4.7)	68 (4.4)
Intra ocular pressure (mm Hg)	16.1 (2.1)	15.7 (2.9)

Key: TT = Tracheal tube, LMA = Laryngeal Mask airway (Note : All the values are mean (SD).

In LMA group IOP was significantly less than pre-induction pressure, from 5 min after insertion onwards and did not increase with removal of LMA.The increase in heart rate with intubation, from pre-induction values was significantly different between the groups; with heart rate increasing more in TT group and less in LMA group (Table – IV).

Table-III Peri operative intra ocular pressure		
Time interval	A (TT)	B (LMA)
Pre induction	15.2 (2.7)	15.4 (2.1)
Post induction	14.1 (2.5	14.2 (2.7)
Post induction		
1 min	22.4 (3.6)	18.2 (3.1)
5 min	13.6 (2.9)	12.6 (2.7)
During operation	12.1 (2.4)	10.4 (2.8)
Pre-extubation	15.8(3.2)	12.2 (2.4)
Post extubation	22.6 (3.3)	12.4 (2.8)
KEY: TT = Tracheal Tube, LMA = Laryngeal Mask Airway [Note: All the values are Mean (SD)]		

Table - IV Peri-operative Heart Rate		
TIME INTERVAL	**A(TT)**	**B (LMA)**
Pre Induction	75 (5.2)	76 (5.4)
Post Induction	91 (6.0)	93 (6.7)
Post Induction		
1 min	110 (7.8)	96 (6.2)
5 min	88 (5.7)	81 (5.8)
During Operation	74 (5.3)	70 (5.2)
Pre-extubation	82 (5.4)	74 (5.2)
Post-extubation	112 (7.9)	84 (5.2)
KEY: TT = Tracheal Tube, LMA = Laryngeal Mask Artery, [Note: All the values are Mean (SD)]		

This effect was brief and the difference did not persist at 5 min after intubation . However, immediately after extubation, there was increase in heart rate in TT group, which was significantly greater than that in LMA group.

Table-V Peri-operative Systolic Arterial Pressure		
TIME INTERVAL	**A (TT)**	**B (LMA)**
Pre-induction	142 (9.7)	144 (11.2)
Post-induction	136 (11.7)	132 (12.2)
Post-induction		
1 min	162 (12.9)	136 (9.6)
5 min	148 (12.1)	130 (9.9)
During Operation	138 (11.7)	125 (9.6)
Pre-extubation	144 (9.7)	130 (9.0)
Post-extubation	160 (9.2)	136 (9.6)
KEY: TT = Tracheal Tube, LMA = Laryngeal Mask Artery, [Note: All the values are Mean (SD)]		

Table-VI Peri-operative Diastolic Pressure		
TIME INTERVAL	**A (TT)**	**B (LMA)**
Pre-induction	85 (8.0)	82 (7.6)
Post-induction	80 (7.6)	78 (6.3)
Post-induction		
1 min	108 (10.3)	92 (7.1)
5 min	92 (7.2)	85 (6.0)
During operation	74 (6.7)	70 (6.9)
Pre-extubation	84 (6.0)	78 (6.3)
Post-extubation	106 (8.4)	80 (7.4)
KEY: TT = Tracheal Tube, LMA = Laryngeal Mask Artery [Note: All values are Mean (SD)]		

Systolic arterial pressure slightly decreased in both groups at induction but increased in TT group and decreased in LMA group immediately after intubation.

Later on during surgery systolic pressure remained stable, with no significant difference between the groups.

Systolic pressure increased in TT group but not in LMA group afer extubation (Table-V). Diastolic arterial pressure also followed almost the similar changes (Table-VI).

DISCUSSION

Intra ocular pressure (IOP) is determined by extra ocular muscle tone, scleral rigidity, vascularity of the orbit and production and out flow of aqueous humor.[8.9.] The changes in IOP at time of indirection, laryngoscopy and intubation conform with those reported in previous studies.[6.10]. The rise in IOP with concomitant rise in arterial pressure and heart rate is the result of sympathetic adrenergic response to laryngoscopy and tracheal intubation.[11,12,13]

The intubation-induced increase in IOP was transient. Five minutes after incubation, the IOP decreased below the pre-intubation value and there was no significant difference between the groups. Thiopentone reduces IOP mainly via its depressant effect on central diencephalic controlling areas for TOP, although increased aqueous drainage has also been shown to occur.[6,8,14,15,16] Suxamethonium causes a transient increase in IOP for 4–6 minutes. [17,18] Studies on the non-depolarizing neuromuscular blocking drug, vecuronium have revealed either no effect or a decrease in IOP. [7] The effect of nitrous oxide on IOP has received little attention.[8] but it has been well established that all the volatile inhalation agents decrease IOP in a dose-dependent manner, [8,9,19] However, these inhalation agents may cause excessive cardiovascular depression, particularly in elderly patients, if concentrations are increased in an attempt to improve the ocular conditions for surgery.

The values of IOP before extubation were surprising. IOP increased more in TT group than that in the LMA group. It is possible that lightening of anaesthesia in both groups resulted in stimulation of sympathetic pathways, by the presence of the tracheal tube (TT) in group A but not in group B because of +better tolerance of the airway in the LMA group at this depth of anaesthesia[20].

The most marked increase in IOP was seen in the TT group after extubation. The weaning of anaesthetic effects at this time probably caused his exaggerated increase in intra ocular pressure. This result implies that, where tracheal incubation is performed in patients with raised IOP, steps should be taken to control IOP during extubation.[11,21] These peri-extubation changes in IOP are in conformation with the previous study.[13]

Haemodynamic (arterial pressure and heart rate) changes after incubation, during surgery and at extubation were in conformation with previous studies.[10,13] There was a significant increase in arterial pressure and heart rate in TT group. The differences in arterial pressure and heart rate between LMA and TT groups, at these times agree with previous comparisons.[13]

CONCLUSIONS

This study has shown that the general anaesthetics decrease the intra ocular pressure (IOP) in general, Laryngoscopy and tracheal incubation are anaesthesia-related events, which cause rise in IOP. In appropriate patients, the laryngeal mask airway (LMA) is an acceptable technique for intra ocular surgery, offering advantages in terms of intra ocular pressure and cardiovascular stability, compared with tracheal incubation.

The principal theoretical disadvantage of the technique is that the airway may be compromised unexpectedly during the procedure whilst the eye is open.

This has not been reported, and the potential risk of loss of airway control during anaesthesia with the LMA requires evaluation in much larger study.

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