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TO STUDY THE EFFECT OF PROSEAL LMA INSERTION AND CONVENTIONAL TRACHEAL INTUBATION ON IOP IN PAEDIATRIC PATIENTS UNDERGOING CATARACT SURGERY

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ABSTRACT

To study of effect of Proseal LMA insertion and conventional Tracheal intubation on Intraocular pressure in pediatric patients undergoing cataract surgery.

Objective: To assess the influence of proseal laryngeal mask airway (PLMA) insertion on intraocular pressure (IOP).

Aim: We compared the effects of PLMA insertion and laryngoscopic guided intubation on IOP and hemodynamic response in pediatric patients.

Background: Previous studies have shown that there is no hemodynamic response to PLMA insertion similar to classic LMA insertion, but there is no published report about the influence of PLMA insertion on IOP. Conventional laryngoscopic tracheal intubation evokes a rise in IOP and cardiovascular response and has traditionally been used to secure the airway in pediatric patients undergoing ophthalmic surgery.

Materials and Methods: 60 patients, less than 14 years of age, scheduled for elective ophthalmic surgery were randomly divided into two groups, group P, in which the patient's airway was secured with PLMA (using introducer tool technique), and group T, in which the airway was secured with laryngoscopy-guided endotracheal intubation. Heart rate, blood pressure, and IOP were measured just before insertion of the airway device and subsequently 1 ,2,3 min. after insertion of the airway device.

Results: In group T, there was a significant rise in IOP as well as recorded hemodynamic parameters . In group P also rise in hemodynamic parameters and IOP was found , though this rise was significantly less than in group T.

Conclusion: We conclude that the PLMA use is associated with lesser cardiovascular response and rise in IOP as compared to tracheal intubation.

KEYWORDS

Endotracheal intubation, intraocular pressure, proseal laryngeal mask airway

INTRODUCTION

Cataract surgeries are usually performed under local anaesthesia in elderly patients but paediatric cataract surgery necessitates the use of GA with control of airway. The primary objective of anaesthesiologist is to provide optimal IOP with minimum change in haemodynamics along with airway control. Endotracheal intubation is gold standard for airway management but even in trained hands, it results in stress response to laryngoscopic manipulations.[1]

The new supraglotticdevices (LMA) forms a seal around the larynx and permits ventilation[2]. This has been extensively used and studied with respect to haemodynamic parameters as well as IOP. Several refinements of original prototype have been developed. PLMA is one such SGD which provides a better oropharyngeal seal and ventilation at higher pressures. There is a drain tube to protect the lungs from aspiration and stomach from gastric deflation.[3]

Studies proving better efficacy of PLMA over CLMA have been done with regards to haemodynamic changes, oropharyngeal leak but there is lack of data regarding the changes in IOP. Studies have been conducted with the use of I-Gel – CLMA and ETT in adult patients to compare the IOP although there is no available literature of the same in paediatric age group[4].

Our study compares the effect of insertion of proseal LMA and conventional tracheal intubation on intraocular pressure in paediatric patients undergoing cataract surgery.

MATERIAL AND METHODS:

After permission from institutional ethics committee and review board, the study was conducted in SMS medical college & attached hospitals. Written informed consent was taken from guardians. This was a hospital based interventional randomized comparative study. Sample size was calculated as 29 in each group at alpha error 0.05 and power 80% assuming difference in means to be detected 3±4 of postintubation. For the study, we took 30 in each group randomly allocated by chit in box method.

Patients with ASA grade 1 and 2 and age <14 years of both sexes undergoing cataract surgery under GA were included in the study. Patient refusal, on medication interfering with IOP, with anticipated difficult intubation or LMA insertion, GERD, ASA grade 3,4&5 were excluded from the study.

On arrival in OT, all patients were secured with 22G /24G iv cannula and dextrose 5% started. Following oxygenation, anaesthesia was induced with thiopentone till loss of eyelash reflex. Neuromuscular blockade was achieved with Inj. vecuronium 0.08 mg/kgi.v. .The induction parameters were noted and when adequate paralysis achieved, corresponding airway as randomly allocated will be inserted.

In group P, appropriate size of PLMA using introducer was inserted. One attempt was allowed for placement otherwise ET was placed. Appropriate size of the drain tube was inserted. Singleattempt was allowed for NG placement but if it was a failure, then repositioning of PLMA was done.

In group T patients, ETT of appropriate size was inserted.

All patients were maintained on 33% O_2 & 66% N_2O with 0.5% halothane and were ventilated such that $EtCO_2$ maintained between 35 to 45 mmHg. Following placement, immediate parameters were recorded at 1,2,3 min interval after PLMA and ET placement in terms of IOP and haemodynamic variables.

At the end of surgery, anaesthetic agents were discontinued and patient was kept on 100% O_2. Inj. Glycopyrolate 0.01 mg/kg iv. followed by Inj. Neostigmine 0.05 mg/kg iv. given. Adequate muscle power and respiration achieved .In T group, pt. extubated following oral suction and cuff deflation. In group P, when patient spontaneously breathed, cuff deflated and PLMA removed, the patients were observed post-operatively for any complication.

RESULTS

Statistical analysis was done using computer software (SPSS trial version 20 and primer). The qualitative data was expressed in proportion and percentage. The quantitative data was expressed as mean and standard deviation. The difference in proportion was analysed by using chi square test and the difference in means were analysed by using student T test. Significance level for tests was determined as 95%(pvalue<0.05).

	Group P(N=30)	Group T(n=30)	p-value
AGE(mean)	7.53	9.20	0.054(NS)
SEX(M:F)	15:15	16:14	1.00(NS)
WEIGHT(mean)	24.80	26.93	0.176(NS)

2. PREINDUCTION PARAMETERS

IOP

GROUP	Pre Induction	IOP-Pre Insertion	Postinserti on-1min	2 min	3 min
Group P	30	30	30	30	30
N	13.38	13.30	15.08	14.41	13.71
Mean	3.29	2.92	2.85	2.64	2.54
SD					
Group	30	30	30	30	30
TN	13.74	14.17	19.03	18.20	15.25
Mean	3.21	2.95	7.91	8.16	2.29
SD					
P value	.670	.257	.013	.019	.017
Significance	NS	NS	S	S	S
MEAN ARTERIAL PRESSURE(mm of Hg)					
Group	Pre induction	Pre insertion	1 min	2 min	3 min
Group P	30	30	30	30	30
N	88.33	90.90	96.52	92.97	90.73
Mean	9.045	8.142	7.458	7.928	6.762
SD					
Group T	30	30	30	30	30
N	88.60	90.13	100.71	98.03	96.93
Mean	6.806	6.257	4.895	4.694	5.278
SD					
P value	.898	.684	.013	.004	<0.001
Significance	NS	NS	S	S	S

EtCO2					
Group	Pre Induction	Pre Insertion	1 min	2 min	3 min
Group P	30	30	30	30	30
N	28.93	29.33	30.83	30.23	29.90
Mean	2.10	1.63	1.56	1.524	1.47
SD					
Group T	30	30	30	30	30
N	28.67	29.47	30.97	30.23	29.87
Mean	1.77	1.76	1.47	1.165	1.36
SD					
P value	.597	.761	.734	1.0	.928
Significance	NS	NS	NS	NS	NS

SpO2(%)					
Group	Pre Induction	Pre Insertion	1 min	2 min	3 min
Group P	30	30	30	30	30
N	100.00	100.00		100.00	100.00
Mean	0.000	0.000	100.00	0.000	0.000
SD			0.000		
Group T	30	30	30	30	30
N	100.00	100.00	100.00	100.00	100.00
Mean	0.000	0.000	0.000	0.000	0.000
SD					
P value LS	NA	NA	NA	NA	NA

Percentage increase in mean arterial pressure as compared to pre insertion levels

	1st MIN	2ND MIN	3RD MIN
GROUP P	6.18%	2.27%	0.18%
GROUP T	11.7%	8.76%	7.54%

IOP				
TIME	PRE INSERTION		PRE INDUCTION	
	P- group	T- group	P- Group	T-Group
1 min	13.35%	34.29%	12.7%	38.50%
2 min	8.34%	28.44%	7.62%	32.45%
3 min	3.08%	7.62%	2.46%	10.98%

DISCUSSION

The study was conducted in paediatric patients undergoing cataract surgery under general anaesthesia to clinically evaluate the response of Proseal Laryngeal Mask Airway (PLMA) versus endotracheal tube (ETT) insertion on intraocular pressure. There is till date no study conducted to evaluate Intraocular pressure (IOP) with PLMA insertion in peadriatic cataract surgery: so our study was designed to evaluate changes in IOP with PLMA versus ETT in cataract surgery in children. We concluded that:

- There was relatively stable haemodynamics with PLMA insertion but IOP was raised significantly from baseline.
- The rise of mean arterial pressure(MAP), systolic blood pressure(SBP), heart rate(HR) as well as IOP was significantly more with laryngoscopic guided ETT insertion, p-value being 0.13, 0.04, 0.001 respectively at 1,2,3 minutes.
- The study concluded that PLMA insertion in cataract paediatric patients provides an edge over laryngoscopic guided ETT insertion in terms of rise in IOP and recommends its use over ETT wherever possible.
- The PLMA should be used cautiously in patients with glaucoma and hypertension.

There are number of studies concluding that laryngoscopic guided ETT insertion increases sympathoadrenal activity due to oropharyngeal and laryngotracheal manipulations leading to afferent nerve stimulation due to distortion of supraglottic structures[5]. This adrenergic stress response leads to rise in haemodynamic parameters(MAP,SBP,DBP,HR)[6]. The IOP rises in concordance with rise in SBP as 14.60%, 14.01% and 12.80% following 1,2,3 minutes of intubation respectively. This was reflected as mean rise of 19.03, 8.16, 2.29 in IOP. The DBP was not much raised following laryngoscopy and intubation. As it has been well established that rise in arterial blood pressure plays a role in control of intraocular pressure which forms a reason for rise in IOP with ETT[7].

In P-group with PLMA insertion, the rise of IOP was 13.35%, 8.34%,3.08% where as the rise in MAP was only 6.18%, 2.27%, 0.18% at 1,2,3 min.respectively. This rise of IOP was out of proportion to rise in MAP. The directly measured mucosal pressure with PLMA in situ rarely exceeds 34cm H2O which implies that mucosal injury is uncommon. There is no published data about the influence of PLMA on carotid artery and internal jugular vein but its larger cuff may distort or compress the surrounding great vessels wich in turn may lead to rise in IOP[8].

Thus it was observed that despite of stable haemodynamics after PLMA insertion there was significant rise in IOP from baseline values.

The demographic profile, SpO2, EtCO2 in both the groups were statistically insignificant. We ensured normocapnia throughout the operative period as IOP increases with rise in PaCO2 because of choroidal vasodilatation or elevation of central venous pressure or possibly a combination of both the mechanisms.

The other parameter affecting IOP is central venous pressure [9]but we did not Study the correlation of IOP with central venous pressure as invasive monitoring was unwarranted in cataract surgery. There are studies correlating central venous pressure and IOP in non-opthalmic surgical procedures[10].

CONCLUSION:

We conclude that PLMA has an advantage over laryngoscopic tracheal intubation in minimizing the rise in IOP and hemodynamic response in patients with normal baseline IOPs. However, caution should be exercised when using PLMA in patients with glaucoma or hypertension in who even a minimal rise in IOP may prove harmful for the eye.

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