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Effect of Intraoperative Esmolol Infusion on Haemodynamics and Surgical Field in FESS Under General Anaesthesia

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Abstract

Introduction: Functional endoscopic sinus surgery (FESS) is a commonly performed operation. Endoscopic sinus surgery allows enhanced illumination and visualization and it has dramatically improved surgical dissection. However major complications such as excess bleeding and poor visibility can arise do to work in a confined space.Due to poor visibility longer time to perform the surgery may arise.

Material and Methods: This study was performed on randomly selected 60 patients, in a randomized placebo controlled double blind prospective study. We evaluated the hypotensive efficacy of intravenous Esmolol in FESS, reduction in blood pressure and Quality of surgical field and complications under general anaesthesia.

Conclusions: Esmolol produces a lower surgical bleeding scores and better quality of operative field for the surgeon as well as less adverse effects.

Keywords: FESS (Functional endoscopic sinus surgery); Controlled hypotension.

Introduction

FESS is minimal invasive surgical treatment which uses nasal endoscopes to enlarge nasal drainage pathways to improve sinus ventilation. Nasal epithelium is highly vascular area and control of intra-operative bleeding assumes a lot more importance during the anaesthetic management of FESS, where general anaesthesia is the technique of choice. Bleeding impairs the visibility of the surgical field and increases operation risk and time.[1,2]

In controlled hypotension during anaesthesia, the blood pressure of the patient is reduced such that the mean arterial pressure (MAP) is lowered by 30% from baseline or at 60–70 mm Hg, whichever is greater.[5,6] Esmolol is an ultra short acting adrenergic antagonist and causes hypotension and bradycardia on infusion due to its sympatholytic and vagomimetic properties.[7-9]

It has rapid onset of action and on termination of infusion gradual recovery of arterial blood pressure to the pre infusion level occurs without development of rebound hypertension.[3,4]

Objective

To evaluate the hypotensive efficacy of intravenous Esmolol in FESS under general anaesthesia. Effect of Esmolol infusion with regard to reduction in blood pressure and Quality of surgical field and Complications, if any.

Material and Methods

60 patients of either gender between age 18 to 55 were randomly selected for this study and were divided into two groups - Group N and Group E. Group E received Loading esmolol 1 mg/kg Diluted upto 10 ml 5 min before induction and then 0.5 mg/kg/hr(in 50 ml NS) for duration of surgery. Group N received 10 ml NS followed by 50 ml infusion for duration of surgery.

The patients with ASA score of III and more, patients on beta blockers, chronic hypertension, coronary artery disease, arrhythmias, chronic obstructive pulmonary disease, chronic renal or hepatic failure, history of cerebrovascular disease, diabetes, severe anemia (less than 7g/dL), coagulopathy, history of allergy to one of the study drug, pregnant or lactating were excluded from the study.

On arrival in the Operating Room, standard monitors Including 5-Electrode Electrocardiogram Monitoring, Noninvasive Blood Pressure, And Pulse Oximetry were Connected and Vitals were recorded. Two IV access were secured and infusion of Ringer's lactate started. Thereafter, each case received esmolol or normal saline as per allocation. Following administration of study drug, pre-oxygenation was done for 3 minutes during which pre-medications were given in the form of IV ondansetron 0.1mg/kg, 2mc/kg fentanyl and glycopyrrolate 0.01 mg/kg. Patients were then induced with IV propofol 2.5 mg/ kg. Atracurium 0.5 mg/kg was then given to facilitate laryngoscopy and intubation. After successful intubation, the patient were maintained using 33% oxygen in 66% nitrous oxide with isoflurane and intermittent boluses of IV atracurium 5 mg as and when needed.

Heart rate, Systolic and Diastolic blood pressures, Mean arterial pressure (MAP), Blood loss, Quality of surgical field were noted. Parameters were monitored every 10 minutes from the onset of the drug administration till the end of surgery. Blood pressure monitored every 10 minutes using the automatic cuff method (NIBP). At the end of the surgery, blood loss was estimated using by measuring amount of blood collected in the suction jar (Table 7). The quality of surgical field was evaluated every 20 minutes using the Surgical Field Rating scale proposed by Fromme et al[5]:

5- Massive uncontrollable bleeding.

4-Heavy but controllable bleeding that significantly interferes with dissection.

3-Moderate bleeding that moderately compromised surgical dissection. All the collected data parameters were analysed statistically using-

2- Moderate bleeding – a nuisance but without interference with accurate dissection.

1- Bleeding, mild it is not a surgical nuisance.

0- No bleeding and virtually bloodless field.

Results were analysed using One-Way ANOVA Calculator for Repeated Measures, Chi square test.'P' value less than 0.05 was considered significant.

A SFR (Surgical Field Rating) score of more than 3 ,4 was considered significant.

Results

Table 1: Demographics.

	Esmolol (n=30) (Mean, SD)	NS (N=30)) (Mean, SD)	Pvalue
Age	35+_12	40+_13	0.1
Sex (M:F)	18:12	16:14	0.6
Weight (kg)	60+_10	58+_15	0.5
ASA (I/II)	25/5	26/4	0.1

Table 2: Mean Blood Pressure.

	Esmolol(N=30) (Mean+_SD)	NS(N=30) (Mean+_SD)	Pvalue
Preoperative	89.1+_2.7	89.8+_2.3	NS
After Loading	69.2+_1.4	83.7+_3.2	0.0001
10 Min After Infusion	67.5+_2.9	81.1+_3.6	0.0001
Average Intraoperatively	66.4+_2.4	80.2+_3.8	0.0001
After Extubation	78.8+_5.3	80.3+_4.5	0.0001

Table 3: Heart Rate.

	Esmolol(N=30) (Mean+_SD)	NS(N=30) Mean+_SD)	Pvalue
Preoperative	81.1+_4	82.4+_2.1	0.2(NS)
After Loading	72.4+_4.7	76.4+_4.3	0.0011
10 Min After Infusion	69.3+_3	73.5+_4.8	0.0001
Average Intraoperatively	66.3+_2.3	71+_3.5	< 0.0001
After Extubation	70.4+_3.9	72.4+_2.5	0.02

Table 4: Quality of Surgical Field.

	Esmolol(N=30)	NS(N=30)	Pvalue
Surgeon Score(3,4)	2	10	< 0.00001

Table 5: Adverse Event.

	Esmolol(N=30)	NS(N=30)	Pvalue
Bradicardia	3	1	0.5(NS)

Table 6: Extubation Time.

	Esmolol(N=30) (Mean,SD)	NS(N=30) (Mean, SD)	Pvalue
Min	5.4+–2	4+–3	0.07

Table 7: Intraoperative Blood Loss.

	Esmolol(N=30)	NS(N=30)	Pvalue
ML	75+_10	142+–20	.0001

The demographic information and baseline characteristics (age, sex, ASA status were not statistically different between the two drug groups (Table 1). Intraoperative mean blood pressure and heart rate measures were significantly lower in patients of group Esmolol as compared to patients of group (NS). After loading dose of esmolol there was significant difference between the haemodynamic parameters of the two groups (p value .00011). Details of hemodynamic findings are shown in (Table 2,3). There were no statistically significant differences in the duration of extubation time between the drug groups (pvalue .07) (Table 6). There were no episodes of excessive hypotension (MAP <50 mm Hg), arrhythmias or reflex tachycardia and rebound hypertension in esmolol group. The quality of the surgical field was significantly better in esmolol group as determined by from me rating compared to the control group (Table 4).

Disscussion

Bleeding during surgery can be reduced by ensuring a controlled hypotension.[10-11] Improved surgical field during FESS with beta blockers is probably attributable to vasoconstriction of the mucous membrane arterioles and the precapillary sphincters that results from unopposed α-adrenergic effects of endogenous catecholamine and the increased sympathetic tone.[12] Guney et al found that esmolol provides hemodynamic stability and good surgical field visibility and should be considered as an alternative to nitroglycerin.[13] Unopposed alpha adrenergic activity causes vasoconstriction at the mucus membrane level resulting in better surgical field in esmolol groups.

Shen et al[14] in a placebo controlled trial found that esmolol not only produces relative hypotension and bradycardia but also improves the surgical field and reduces the average blood loss.[14]

Pilli et al[15] showed the efficacy and safety of esmolol for controlled hypotension. In our study esmolol provided effective controlled hypotension and stable haemodynamics. The safety of perioperative esmolol has been studied by Yu SK et al[16] and concluded that titration of esmolol to haemodynamic end point can be a safe and effective method. There was no statistically significant adverse effect with esmolol infusion except bradicardia (heart rate less than 60) in 3 patients.

The effect of b blocker premedication on surgical field during endoscopic sinus surgery was studied by Nair Salil[17] et all and found optimum conditions in patients receiving b blockers (Table 5).

Conclusion

Esmolol produced controlled hypotension with a better operative field for the surgeon and produced lesser adverse effects.

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