Role of Hypotensive Anaesthesia in Functional Endoscopic Sinus Surgery in Private Practice

Md. Nurullah[1], Md. Arif Hossain Bhuyan[2], S. Ariful Islam[3], Md. Shah Alam[4]

Abstract

Background: Functional endoscopic sinus surgery (FESS), effective control of bleeding is essential to maintain a clear operative field and to minimize complications. Intraoperative bleeding is one of the major problems in endoscopic surgery of sinuses. Controlled hypotension is a technique used to limit intraoperative blood loss to provide the best possible field for surgery.

Objective: The objective of study was role of Hypotensive Anaesthesia in Functional Endoscopic Sinus Surgery and designed to compare intraoperative hemorrhage and the visibility of the operative field during normotension and hypotension anesthesia.

Methods: Prospective randomized study includes a total of 60 ASA I-II patients who underwent elective FESS surgery. Patients randomly assigned in two groups the hypotension group (Group A) and the normotension group (Group B). Intraoperative mean arterial pressure (MAP), heart rate (HR) were recorded.

Results : This study shows the mean ages of the patients of group A group B were 33.36±7.61 and 32.46±7.73 years respectively. No statistically significant difference was observed among groups at 0.05 level in term of age. The mean heart rate pre-anaesthesia and preoperative among the patients of different groups in different follows up period. Significance differences were observed among groups in term of heart rate at 5 minute, 15 minute, 30 minute, 45 minute and 60 minute. The mean arterial mean blood pressure before pre-anaesthesia and preoperative estimation among the patients of different groups in different follows up period. Significance differences were observed among groups at 5 minute, 15 minute, 30 minute, 45 minute and 60 minute.

Conclusion: This study demonstrated that Controlled hypotension can be achieved equally and effectively by nitroglycerin and labetalol reduced significantly intraoperative hemorrhage and produce hypotensive anesthesia. Both are equally effective in providing ideal surgical field during functional endoscopic sinus surgery (FESS).

Keywords: Anaesthesia, FESS, Hypotensive anaesthesia, Intraoperative bleeding.

1. Dr. Md. Nurullah
Assistant Professor, Department of Anaesthesiology
IBN Sina Medical College & Hospital, Dhaka

2. Prof. Dr. Md.Arif Hossain Bhuyan
Department of ENT
IBN Sina Medical College & Hospital, Dhaka

3. Dr. Syed Ariful Islam
Consultant, Department of Anaesthesiology
National Institute of ENT, Dhaka.

4. Professor Dr. Md. Shah Alam
HOD, Department of Anaesthesiology
IBN Sina Medical College & Hospital, Dhaka.

Correspondence author: md.nurullah10@yahoo.com

Introduction

Anaesthesia influences intraoperative bleeding in several ways, both physiological & pharmacological - by changes in ventilatory pattern, positive end expiratory pressure (PEEP), posture & pharmacologically by induced alteration in myocardial contractility & peripheral vascular tone.[1]

Functional endoscopic sinus surgery (FESS) is a surgical procedure done with a fibreoptic camera inserted through nasal cavity, which is extremely well supplied with blood to moisten & warm inspired air.[2] So even small amount of bleeding may completely obstruct vision, leading to increased risk of dangerous vascular, orbital & intracranial complications, prolonged duration of surgery & reduced quality of intervention.[3]
Reduction of bleeding from nasal mucosa is accomplished by local vasoconstrictors, posture, pharmacological cardio-depression & preoperative steroids.[2]

Controlled hypotension is defined as pharmacologically induced reduction in mean arterial blood pressure to 50-70 mm of Hg either by inducing changes in myocardial contractility (inhalational anesthetic agents, beta blockers) or by peripheral vasodilatation (regional anaesthesia, sodium nitroprusside, nitroglycerine,)[2,4,5]

Nitroglycerine chiefly used to treat angina, has also been used for controlled hypotension. It is direct acting peripheral vasodilator, which primarily dilates capacitance vessels, reducing venous return, with concomitant reduction in stroke volume and cardiac output.[4] It also improves perioperative hemodynamic stability causes controlled hypotension by its central & peripheral sympatholytic action.[6] But its role in induced hypotension and bloodless surgical field during FESS has yet to be fully evaluated. The aim of our study is to compare intraoperative hemorrhage and the visibility of the operative field during normotension and hypotension anesthesia.

Methods

This is a prospective, randomized, double-blind study on the who underwent endoscopic sinus surgeries (FESS), were examined with polyposis of acessory nasal sinuses. Patients were grouped into two groups: the hypotension group (Group A) and the normotension group (Group B). The age of the patients was between 16 and 61 years and physical health state 1-2 according to ASA. Patients with kidney or liver dysfunctions, as well as anemia (Hb<10g/dl) were not included, as well. All patients on the eve of the operation were premedicated with 3 mg lexotanil. Preliminary anesthesia was carried out with fentanyl 1-2 mg/kg and propofol 1-2 mg/kg intravenous injections. Patients were intubated after intravenous injection of muscle relaxants Vecuronium 0.1 mg/kg or succinylcholine 1.5 mg/kg. Anesthesia was maintained with halothane steam (up to 1.0 MAC) in the 50:50 percent of oxygen and Nitrous Oxide, with additional fentanyl and sometimes muscle relaxant doses. For patients of Group A glyceryl trinitrate (nitroglycerin) infusions were started right after intubation, maintained mean arterial BP between 50-70 mmHg, Inj. labetalol used I.V incrementally if necessary surgical intervention was started. All patients had their lateral nasal walls infiltrated with 0.5-2.0 ml 1% lidocaine with adrenaline 1/100 000–200000 solution before cutting. Nitroglycerine infusions were discontinued and quantities of anesthetics were reduced 15-20 minutes before end of surgeries.

Patients after surgery, upon their muscular tonus and sufficient natural breathing restored, were extubated and transferred to a wake-up ward for further monitoring. Before surgeries hemoglobin (Hgb), hematocrit (Ht), serum, urea, creatinine, RBS, analyses were made for patents. ECG was done for all patients. These analyses were repeatedly performed during the post-surgical time period. During anesthesia arterial blood pressure was measured every 3 minutes in non-invasive oscillometric way, and its systolic, diastolic and average values were recorded.

Frequency of heart contractions was recorded at the same rate. Hemorrhage was measured by collecting blood with the pump graded with the precision of 25 ml. All data will be presented as mean (standard deviation) unless otherwise indicated. Statistical Analysis of variance (ANOVA) and chi-square test will be used to detect the demographic data among the two groups. Chi-square test, with any correction needed (e.g., Yate's continuity correction), will be used to analyze the collected data. Data will be collected on a pre-designed data collection sheet and later on will be compiled on a master chart. A *P* value of <0.05 will be accepted as statistically significant. Statistical analysis will be carried out using Statistical Package for Social Science (SPSS) for Windows version 20.0.

Result

Table 1 : Distribution of age by group

Age (in year)	Group A	Group B	p value *
≤30	10 (33.33)	13 (43.33)	0.651
31-40	13 (43.33)	12 (40.0)	
>40	7 (23.33)	5 (16.67)	
Total	30 (100.0)	30 (100.0)	
Mean ± SD	33.36±7.61	32.46±7.73	

Table II: Distribution of sex by group

Sex	Group A	Group B	P value
Male	12 (40.0)	7 (23.3)	0.165
Female	18 (60.0)	23 (76.7)	
Total	30 (100.0)	30 (100.0)	

Table III : Comparison of groups in term of heart rate

Heart rate	Group A	Group B	p value
Pre-anesthetic	91.93 ± 7.87	90.63 ± 12.39	0.348
Preoperative value	88.557 ±24.18	88.77 ± 25.49	0.456
5 minute	84.18±13.15	90.96±13.18	0.001
15 minute	82.60 ± 17.52	94.17±16.99	0.001
30 minute	81.73 ± 12.86	91.17 ± 12.10	0.001
45 minute	80.80 ± 11.73	88.60 ± 11.77	0.001
60 minute	74.55 ± 8.58	83.88 ± 8.71	0.001

Table IV : Comparison of groups in term of systolic blood pressure

Systolic BP	Group-A	Group-B	p value
Pre-anesthetic	125.47 ± 8.74	122.13 ± 8.11	0.447
Preoperative value	105.13 ±13.58	130.17 ± 13.65	0.001
5 minute	104.07 ± 9.90	129.90 ± 9.73	0.001
15 minute	103.13 ± 11.50	126.93 ± 11.02	0.001
30 minute	101.13 ± 13.58	123.87 ± 13.65	0.001
45 minute	94.07 ± 9.90	117.90 ± 9.73	0.001
60 minute	92.50 ± 12.12	110.97 ± 11.90	0.001

Table V: Comparison of groups in term of diastolic blood pressure

Diastolic BP	Group-A	Group-B	p value
Pre-anesthetic	77.83 ± 9.40	75.50 ± 7.39	0.981
Preoperative value	80.83 ± 9.40	80.50 ± 7.39	0.981
5 minute	60.60 ± 14.55	80.30 ± 14.85	0.001
15 minute	54.43 ± 15.68	63.87 ± 15.27	0.001
30 minute	51.63 ± 12.79	60.90 ± 12.73	0.001
45 minute	48.53±11.24	57.36±12.89	0.001
60 minute	42.53 ± 9.73	51.91 ± 9.83	0.001

Table VI: Comparison of groups in term of mean arterial pressure

Mean arterial pressure	Group-A	Group-B	p value
Pre-anesthetic	85.71± 7.63	84.62± 5.11	0.837
Preoperative value	95.71± 7.63	94.62± 5.11	0.531
5 minute	70.71± 7.63	100.92± 7.11	0.001
15 minute	66.70 ± 12.51	86.44 ± 12.64	0.001
30 minute	67.98 ± 12.87	87.04 ± 12.74	0.001
45 minute	64.80 ± 12.78	84.23 ± 12.86	0.001
60 minute	62.19 ± 8.63	83.88 ± 8.38	0.001

Discussion

Advances in the field of anaesthesiology have led to greater patient safety. Induced hypotension has been widely advocated to control bleeding during FESS to improve the quality of surgical field.[7] Theoretically ideal pharmaceutical agents for inducing controlled hypotension should meet the following requirements: easy and safe to use, predictable and controlled action, fast onset of action and decline, fast elimination without any tendency to accumulate. However, in practice this is not fully achieved due to the absence of ideal pharmacological agents. Hypotensive episodes are common during anesthesia, and controlled hypotension was once even a popular technique for reducing blood loss during surgery. However, because of the unpredictability of cerebral and other organ damage resulting from hypotension, most modern anesthesiologists employ controlled hypotension very carefully.[8]

In this prospective study sixty patients have been randomly selected into two groups by a computer generated random number table and by card sampling. Each patient has been given cards to take any one blindly from two groups. There were no significant differences between three groups in age, gender and ASA grading. Pre-anesthesia heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP) and mean arterial pressure (MAP) were not statistically significant($p < 0.05$) in two groups. They also found gradual return of these parameters to pre-anaesthesia deepened. Our study demonstrated highly reduction in HR,SBP, DBP and MAP in groups A and B at 5, 15, 30, 45 and 60 minutes. The reduction of HR, SBP, DBP and MAP were significantly group A group than group B. There are fewer publications on induce hypotension (IH) application in endoscopic sinus surgery. K.E. Jacobi et al.[9] applied average (IH) (mean arterial pressure values – 65-75 mmHg) caused by nitroprusside for endoscopic sinus surgery. Andre P. Boezaartt[10] used nitroprusside and esmolol to develop deep IH (average arterial blood pressure values–50-60 mmHg) during FESS. Compared to nitroglycerin, nitroprusside is more often opted for to cause IH due to better hemodynamics control. During the research we applied deep IH caused by nitroglycerin with captopril. Nitroglycerin is more advantageous compared to nitroprusside because of its lower negative impact on perfusion of the most important organs and lower risk of the medication overdose.[11] According to sources, when nitroglycerin is used, lower venous bleeding is observed. But application of this medication is limited by a number of shortcomings: longer activity starting time, frequent reflectory tachycardia. When using nitroglycerine the planned arterial blood pressure value is not always achieved.[12] Various sources state high resistance to nitroglycerine (16-25%).[13]

Blood pressure falls down, but the heart rhythm is not reflexively increased. The peripheral blood vessel resistance reduces, but the volume of blood pumped out by the heart does not change obviously. Voodside et al[14] and Jacobi[9], having performed IH with nitroprusside, state that captopril used before anesthesia reduces the need for the vasodilator dosing twice. There is data that ACE inhibitors reduce the dose of nitroglycerine used for IH, as well.[15] According to our data the average quantity of nitroglycerine used in the research (0.79±0.34mg/kg/ min) is significantly below the recommended by K. Praveen and co-authors (2-8mg/kg/min.).[16] In the hypotensive group in all cases the required

average arterial blood pressure (AABP) was smoothly achieved. We did not observe any reflectory tachycardia. Nitroglycerin infusion activates renin-angiotensin system.[14,17] Angiotenzine- 2 counteracts the vasodilating effect of nitroglycerin. Halothane used during anesthesia, having an inotropic-negative effect, reduced the heart volume per minute– thus potentiating the nitroglycerin blood pressure-reducing effect.

The article analyses efficiency of hypotensive anesthesia application in large-scale endoscopic surgery of accessory nasal sinuses. We used available materials, which are relatively inexpensive. Based on the research results we may state that deep IH caused by nitroglycerine and labetolol significantly improved surgical conditions. Though all patients examined by us had good tolerance for hypotension, we think that the risk of the method application must never exceed benefits for the patient. Thorough selection of patients, reasonable monitoring and sufficient qualifications of the anesthetist allow avoiding anesthesia complications. IH is the means to achieve the target – lower bleeding, and the anesthetist together with the operating surgeon should make decisions on the necessity to apply the method, having fully evaluated the state of the patient and the planned scope of the surgery before

Conclusion

So it may be concluded from the study that hypotension during anaesthesia can be induced arterial hypotension caused by labetolol and nitroglycerin application during general anesthesia in endoscopic rhinosurgery reduces bleeding and improves the operative field visibility. The method of it's administration is simple. It too produces excellent operating condition for FESS procedure, hence can be routinely practiced without any extra arrangement of intra-arterial line or infusion pump.

References

1. Simpson P. Perioperative blood loss and its reduction: The role of anaesthetist. British J of Anaesth. 1992; 69: 498-507.
2. Drozdowski A, Sieskiewicz A, Siemiatkowski A. Reduction of intraoperative bleeding during functional endoscopic sinus surgery. Anaesth Intensive Therapy. 2011; XLIII, 1; 43-47.
3. Cincikas D, Ivaskevicius J, Martinkenas JL, Balseris S. A role of anesthesiologist in reducing surgical bleeding in endoscopic sinus surgery. Medicina (Kaunas). 2010; 46(11): 730-4.
4. Testa LD, Tobias JD. Pharmacologic drugs for controlled hypotension. J of Clin Anesth. 1995; 7: 326-337.
5. Morgan GE, Mikhail MS, Murray MJ, editors. Hypotensive agents. In: Clinical Anesthesiology. Chapter 13. 4th ed. Tata McGraw-Hill; New Delhi: 2012; p. 255-262.
6. Kaur M, Singh PM. Current role of dexmedetomidine in clinical anesthesia and intensive care. Anesthesia: Essays and Res. 2011; 5(2): 128-133.
7. Eberhart LH, FolzBJ, Wulf H, Geldner G. Intravenous anesthesia provides optimal surgical conditions during microscopic and endoscopic sinus surgery. Laryngoscope 2003; 113:1369-73.
8. 12. Darius Činčikas1, Juozas Ivaškevičius1, Jonas Laimutis Martinkėnas2, Svajūnas Balseris2.A role of anesthesiologist in reducing surgical bleeding in endoscopic sinus surgery. Medicina (Kaunas) 2010;46(11):730-4.
9. Boezaart AP, Merwe J, Coetzee A. Comparison of sodium nitroprusside and esmolol induced controlled hypotension for functional endoscopic sinus surgery. Can J Anaesth 1995;42:373-6.
10. Jacobi KE, Bohm BE, Rickauer AJ, Jacobi C, Hemmerling TM. Moderate controlled hypotension with sodium nitroprusside does not improve surgical conditions or decrease blood loss in endoscopic sinus surgery. J Clin Anesth 2000; 12:202-7.
11. Habler O. Kontrollierte Hypotension. Anaesthesist 2000; 49:687-9.

12. Lis VN. Our experience in general anesthesia for endoscopic sinus surgery in cases of extended polyposis. Rossijskaja rinologija 2000;1:13-5.
13. Mac Rae WR, Wildschmidt JAW, editors. Monographs in anaesthesiology: induced hypotension. Amsterdam; 1991.
14. Woodside J Jr, Garner L, Bedford RF, et al. Captopril reduces the dose requirement for sodium nitroprusside-induced hypotension. Anesthesiology 1984;60:413-7.
15. Rodrigo CH. Induced hypotension during anesthesia, with special reference to orthognathic surgery. Anesth Prog 1995; 42:41-58.
16. Praveen K, Narayanan V, Muthusekhar MR, Baig MF. Hypotensive anaesthesia and blood loos in orthognathic surgery: a clinical study. Br J Oral Maxill Surg 2001;39:138-40.
17. Miller ED, Ackerly JA, Vaughan D, Peach MJ, Epstein RM. The renin-angiotensin system during controlled hypotension with sodium nitroprusside. Anesthesiology 1977;47:257-62.