Original Research Paper

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An Effect of Dexmedetomidine on Intubation Conditions,Preoperative Heam Dynamics and Intra Operative Bleeding During Fuctional Endoscopic Sinus Surgeries in Chronic Sinusitis Patients

Medical Science

KEYWORDS :

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INTRODUCTION

Functional endoscopic sinus surgery is a minimally invasive technique used to restore sinus ventilation in chronic sinusitis patients when medical treatment has failed. The procedure can be performed under general anesthesia as well as monitored anesthesia care. Since general anesthesia may influence surgical bleeding in physiological and pharmacological pathway, the role of an anesthesiologist is extremely vital in reducing peri-operative bleeding. Reduction in visibility due to surgical site bleeding is one of the most commonly faced problems during endoscopic sinus surgery. It not only compromises quality of intervention, but can also lead to serious complications.

Controlled hypotension is a technique that is used to limit intraoperative blood loss to provide the best possible field for surgery (1.2). This technique has been used successfully for tympanoplasty.(3)

Dexmedetomidine, an a – 2 agonist offers various advantages such as a decrease in sympathetic tone and attenuation of stress responses to anesthesia and surgery. It augments the hypertensive action of anesthetic drugs and therefore reduces intraoperative bleeding.

MATERIALS AND METHODS

Fifty two patients scheduled for elective nasal surgery (Functional Endoscopic Sinus Surgery and Functional Endoscopic Nasal Surgery) were randomized into two groups using a computer based randomization programme.

Dexmedetomidine – group (D) and placebo or control group (C)

Inclusion criteria – ASA grade I and II patients aged 18 to 65 years.

Exclusion criteria – Uncontrolled hypertension and diabetes, cardiovascular disease (Congestive heart failure and coronary artery disease, cardiomyopathy, valvular heart disease), cerebrovascular insufficiency, coagulation defects, history of hepatic or renal insufficiency or hypersensitivity to any of the drugs used and BMI >30.

All patients were kept fasting for 6 – 8 hrs prior to induction of anesthesia.

After achieving intravenous access, the patients were premedicated with intravenous glycopyrrolate (0.005 – 0.01mg/kg), midazolam (0.07 – 0.15mg/kg) ondansetron (0.08mg/kg) and fontanel (1 ug/kg).

Standard monitorintg included electrocardiogram with ST segment analysis, noninvasive blood pressure, pulse oximetry, end tidal carbon dioxide measurement, temperature and neuromuscular monitoring.

Dexmedetomidine was administered to the D group at a bolus dose of 0.5ug/kg via an intravenous infusion pump over 10 min. intraoperative maintenance was supplied by a continuous infusion of 0.2 ug/kg/hr. infusion of dexmedetomidine was stopped when major surgical intervention was over.

Group C was given equal amounts of normal saline, instead of dexmedetomidine.

Anesthesia was induced with intravenous propofol (1.5 – 2.5 mg/kg) and vecuronium (0.1 mg/kg). End tracheal intubation was performed once train of four reading of neuromuscular monitor was zero.

Patients were maintained on N20 in 02 mixture (60:40) together with propofol infusion at 50 – 200 ugmkg/min: sevoflurane (0.25% - 2%) and vecuronium keeping mean arterial blood pressure (MAP) between 60 to 70mm of Hg.

In both groups, increases in arterial pressure greater than the targeted MAP were treated with additional fentanyl.

Intraoperative bleeding was determined using suction volumes (i.e, volume of blood and saline used for irrigation in suction bottle)

At the end of surgery, the amount of blood in the surgical field was rated by the same attending surgeon who performed all of the surgeries and was blinded to the treatment groups.

The use of an additional hypotensive agent (Esmolol, Diltiazem) was also recorded.

Operative field visibility during surgery was rated on a six point scale by Fromme and Boezaart et al.

0 = No bleeding
1 = Slight bleeding, blood evacuation not necessary.
2 = Slight bleeding, some blood evacuation required.
3 = Low bleeding frequent blood evacuations required as the operative field is visible only briefly after evacuation.
4 = Average bleeding, blood must be evacuated often as operative field is visible only immediately after evacuation.
5 = High bleeding, constant blood evacuation needed, often bleeding exceeds evacuation, rendering surgery nearly impossible.

Scores < 2 were considered to be optimal surgical conditions.

The extent of pre operative surgical lesion was classified as high –(>12) and low <12 according to Lund and Mackay (LM) score. These are based on CT findings of the Patient by the operating surgeon(6).

Statistical analysis

The number of patients enrolled in this study was determined based on our preliminary analysis and a desired power of 80%. Forty four patients in each arm of the study were needed. Assuming a dropout rate of 15% a total of 52 patients were enrolld.(8)

Statistical significance between different groups was evaluated by using appropriate statistical test. Intergroup difference between case & control group for continuous variables was evaluated by using independent 't' test while chi-square test was performed to differentiate categorical variables.

DISCUSSION

We evaluated the effects of Dexmedetomidine in combination with Sevoflurane and Propofol for providing controlled hypotension and improving surgical field exposure during endoscopic nasal surgery under general anesthesia.

Both the groups were homogenous with regard to age, sex, BMI, LBW, ASA status and LM score (predictor of disease severity) as p value was >0.05 for all these parameters.

The targeted MAP in all patients was between 65 to 70 mm Hg, which is controlled hypotension.

Controlled hypotension is associated with preoperative morbidity and mortality. The incidence of ischemic organ failure resulting in death was found to be 0.02% to 0.06% in surgeries involving controlled hypotension. Therefore, we avoided profound controlled hypotension (MAP<50 mm Hg), while maintaining a MAP of 65-70mm of Hg in both the groups so as to facilitate the surgical procedure. Using a high dose of inhalational anesthetics to decrease blood pressure is associated with many unfavourable metabolic effects and a prolonged recovery from anesthesia leading to delayed patient discharge. Another undesirable feature of inhalational anesthetics is peripheral vasodilatation which may further exacerbate surgical site bleeding. Hence, surgeries requiring hypotensive anesthesia mandate the use of additional hypotensive and anesthetic agents to achieve the desired hemodynamic effect and operative conditions.

In the present study, most patients in the D Group had bleeding scores between 0 – 2 indicating good surgical field. Group C, on the other hand had slightly higher bleeding scores though this difference has not been found to be statistically significant [p >0.05]. This was probably due to the lower dose of dexmedetomidine and sevoflurane used for maintenance of anesthesia.

Main arterial pressures achieved in both the groups were comparable to meet the target requirement. Heart rate was significantly lower in the D group as compared to the control group [p value <0.05]. The difference in blood loss, during surgery in both the groups was also not found to be significant [p>0.05]. An important observation was attainment of significantly lower heart rates in D group (p value <0.05) as compared to C group. With the heart rate reduced to 60 per min, excellent operative conditions could be achieved with moderate hypotension (MAP – 65mm of Hg) Altered microcirculation and a low cardiac output are the principal underlying mechanisms in these cases.

Intraoperative hemodynamics recorded a difference in the two groups. The stress response to intubation was attenuated to some extent by dexmedetomidine in the D Group as evident by lower heart rates in the D Group at the time of intubation as well as 1 min, 5 min and 10 min after intubation, while the difference in MAP (though lower in group D) at the time of intubation, has not been found to be significant [p value >0.05].

We found that the MAP of 65 – 70mm of Hg was more difficult to achieve in the control group even with high doses of anesthetic agents. Therefore, hypotensive agents including esmolol and nitroglycerine had to be supplemented in most patients in this group. On the other hand, no additional hypotensive agent was required in the D group.

We used a fixed dose of dexmedetomidine in all our cases with varying amounts of propofol and sevoflurane to achieve the desired mean arterial pressures.

No incidents such as bradycardia or profound hypotension necessitating any urgent intervention were observed in any of the patients throughout the intra-operative period. This couls be due to use of lower dose of dexmedetomidine in our study.

Post operative course of patients in both groups was also uneventful as we did not encounter bradycardia or hypotension in any patient. All patients had a smooth recovery without any emergence agitation/delirious phenomenon.

CONCLUSION

For endoscopic sinus surgeries where even a slight amount of bleeding may prove detrimental to the surgical outcome, anesthetic technique plays a very crucial role in providing optimum conditions for surgical intervention.Dexmedetomidine has been found to be an extremely useful drug with mul tifarious properties that are conducive to maintaining stable hemodynamics as well as providing a favorable surgical field. Dexmedetomidine minimizes surgical site bleeding by reducing the blood pressure and heart rate. It not only reduces the preoperative analgesic and anesthetic requirements, but also obviates post-operative nausea, vomiting and shivering thereby improving overall patient outcome in these procedures. Low dose dexmedetomidine has an additional advantage of a decreased incidence of bradycardia and hypotension as compared with the standard dose of dexmedetomidine.It has therefore been incorporated in the anesthetic armamentarium along with the inhalational, intravenous agents and analgesics.

Table I Demographic Characteristics In Both Groups:

	Group C (N = 26)	Group D (N = 26)	P value
Mean Age in Years	34.03 + 14.47	36.96 + 14.94	0.477
Mean Weight in kg	67.36 + 12.12	72.42 + 10.72	0.177
Mean height in cm	165.38 + 6.75	168.78 + 7.62	0.094
MeanLeanbody weight(LBW)	47.72 + 6.47	51.01 + 5.31	0.050
Mean Body mass index (BMI)	24.36 + 3.19	25.33 + 3.56	0.307

Table I shows that mean age, weight, height, lean body weight and BMI in the study group and the control group were comparable (p value > 0.05)

Table II Intraoperative variation in heart rate :

Time	Group C (N = 26)	Group C (N = 26)	P value
	Mean+SD HR(bpm)	Mean+SD HR(bpm)	
Before induction	83.73 + 9.64	75.19 + 12.32	0.0076
At intubation	98.57 + 15.58	79.23 + 12.01	< 0.0001

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10 min after intubation	96.30 + 15.68	78.92 + 11.44	< 0.0001
30 min after intubation	82.32 + 9.22	68.38 + 9.82	< 0.0001
1 hr after intubation	78.26 + 8.35	65.3 + 8.79	< 0.0001
2 hr after intubation	75.64 + 8.20	64.46 + 5.27	< 0.0001
5 min after extubation	91.34 + 14.56	76.42 + 11.55	0.000

Table II compares the mean, standard deviation and standard error mean for Heart Rate in beats per minute at various time intervals before, during and after surgery in beats per minute in both groups.

The difference in heart rate has been found to be statistically significant throughout (P value < 0.05)

Table III Comparison of Mean arterial pressure (MAP) between the two study groups at different time intervals:

Time	Group C (N = 26)	Group C (N = 26)	P value
	Mean +SD (mm of Hg)	Mean +SD (mm of Hg)	
Before induction	88.96 + 10.16	87.15 + 9.75	0.516
At intubation	85.42 + 14.35	84.5 + 16.12	0.828
10minafter intubation	100.07 + 0.392	99.92 + 0.392	0.390
30minafter intubation	68.30 + 10.02	64.23 + 6.39	0.087
1hrafte intubation	68.26 + 8.37	62.32 + 7.86	0.012
2hrafterintubation	64.92 + 13.11	65.26 + 10.71	0.940
5minafter extubation	88.23 + 14.15	79.96 + 12.52	0.03

Table IV Comparison of bleeding scores in both groups

Rating	Group D (N = 26) No. (%)	Group C (N = 26) No. (%)
No bleeding (0)	0 (0)	0 (0)
Slightbleeding (1)nosuction required	4 (15.38)	1 (3.84)
Slightbleeding (2)nosuction required	15 (57.69)	12 (46.15)
Low bleeding	5 (19.23)	10 (38.46)
Average bleeding	1 (3.84)	1 (3.84)
High bleeding	1 (3.84)	2 (7.69)

	Group C (N = 26) No. (%)	Group D (N = 26) No. (%)	P value
Mean Bleeding score	2.61 + 0.941	2.23 + 0.908	0.140

Although, the mean bleeding score in Group C was 2.61 + 0.94 and in Group D was 2.23 + 0.908, this difference was not statistically significant (p value >0.05) Lower bleeding scores of 1 and 2 were more in group D compared to group c.

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