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Effect of Intravenous Dexmedetomidine for Intranasal Surgeries under General Anesthesia

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Abstract

Background and Objectives: Controlled hypotension has been used to reduce bleeding and to optimize visualization of surgical field during intranasal surgeries. Dexmedetomidine, an alpha-2 agonist can be an effective agent to provide controlled hypotension and it also provides sedation and analgesia with minimal side effects. The present study was undertaken to evaluate the effect of intravenous dexmedetomidine for intranasal surgeries under general anesthesia. *Materials and Methods:* Sixty patients aged 20 to 60 *years*, belonging to ASA I & II and undergoing elective intranasal surgeries under general anesthesia were included in the study. Patients were randomly allocated to two Groups (30 each), Group D and Group P. Patients in Group D received intravenous dexmedetomidine 1 *mcg/kg* in 10 *ml* of normal saline and Group P received placebo. Data obtained were subjected to analysis using statistical software SPSS vs 24. *Results:* Bleeding score was significantly lower in Group D (86.7% with bleeding Score 1) vs in Group P (46.7% with bleeding Score 3 and 40% with a Score 2) with a p value < 0.001. The Mean arterial pressure was significantly lower in Group D than Group P throughout the surgery with p value 0.035. The Heart rate was also lower throughout surgery in Group D than Group P significant with p value < 0.001. *Conclusion:* Intravenous dexmedetomidine for intranasal surgeries under general anesthesia reduces bleeding at surgical site and provides better visibility of operative field and helps achieve controlled hypotension with minimal side effects.

Keywords: Dexmedetomidine; Controlled hypotension; Placebo; Bleeding score.

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Introduction

During intranasal surgeries, bleeding in the surgical site is a major problem due to increased vascularity of nasal mucosa. General anesthesia with controlled hypotension is the preferred technique to achieve good visualization of surgical field with reduced blood loss.[1]

Dexmedetomidine is a centrally acting alpha-2 agonist and can be effectively used to achieve controlled hypotension with general anesthesia during intranasal surgeries. An ideal hypotensive agent for controlled hypotension must be easy to administer, have shorter onset time, has an effect that disappears quickly on discontinuation of the drug, rapid elimination without toxic metabolites, negligible adverse effects and predictable dose dependent effect.[2,3]

Dexmedetomidine is a highly specific and selective, potent alpha-2 adrenergic agonist and

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it inhibits the release of nor epinephrine[4,5,6] at presynaptic levels at the alpha-2 receptors in the brain and spinal cord. Dexmedetomidine also cause sedation and analgesia acting at alpha-2A, 2B & 2C receptors in the brain and spinal cord.[7,8]

Dexmedetomidine causes minimal respiratory depression[9] and sedation produced is more akin to natural sleep and patients are easy to arouse.[10,11,12] It is used to provide controlled hypotension with better hemodynamic and cardiovascular stability as it does not cause reflex tachycardia and also avoids rebound hypertension on discontinuation of the drug.[13,14]

This study was designed to evaluate the effect of intravenous dexmedetomidine for intranasal surgeries under general anesthesia, intraoperative and postoperative hemodynamic stability, intraoperative blood loss and perioperative adverse effects.

Materials and Methods

This study was conducted as a prospective randomized controlled study at the department of anesthesiology, Rajah Muthiah Medical College and Hospital, Annamalainagar.

Approval for study was obtained from the ethics committee for human experiments and informed consent obtained from the willing patients before study. The study was conducted during the period august 2018 to July 2019.

Sixty patients belonging to ASA Grade I & II, aged 20 to *60 years* undergoing elective intranasal surgery under General anesthesia were included in the study. Patients with hypertension, cardiovascular disease, hematological disorder, pregnant and lactating mothers, patients on chronic medications, with systemic illness and those who refused were excluded from the study.

The sixty patients were randomly allocated into two Groups, Group D and Group P. A preoperative assessment was carried out and informed written consent obtained.

In the operation theatre, the baseline heart rate, blood pressure (systolic, diastolic, mean arterial), SpO_2 were recorded. Two separate intravenous lines secured with *18 gauge* canula.

Group D patients received IV Dexmedetomidine *1 mcg/kg* in *10 ml* normal saline over *15 minutes* before induction of General Anesthesia. Group P patients received placebo with IV normal saline (*10 ml*) over *15 minutes* before induction of General Anesthesia.

Patients in both the Groups were premedicated with IV fentanyl *1 mcg/kg* and preoxygenated with 100% O_2 for *5 minutes*. Patients were induced with Inj Thiopental *5 mg/kg* IV and Inj Succinylcholine *2 mg/kg* IV and intubated. Anesthesia was maintained with 65% N_2O in O_2 and Inj Vecuronium *0.08 mg/kg* IV was used as muscle relaxant.

Intraoperative monitoring of Heart rate, Systolic BP, Diastolic BP and Mean Arterial Pressure was done at *2, 4, 6, 8, 10, 15, 20, 25, 30, 45, 60 minutes* and every *15 minutes* thereafter till the end of surgery.

Bleeding at the surgical site was assessed with a bleeding score (Grade 0 no bleeding, Grade 1 minor bleeding with no suctioning, Grade 2 minor bleeding requiring suctioning, Grade 3 minor bleeding requiring frequent suctioning, Grade 4 moderate bleeding with surgical field visible only with suctioning and Grade 5 severe bleeding requiring very frequent suctioning for surgery to proceed).

At the end of surgery, residual neuromuscular block was antagonized with Inj Glycopyrrolate *0.008 mg/kg* IV and Inj neostigmine *0.05 mg/kg* IV and after adequate motor recovery, trachea was extubated.

At the end of the study, data were compiled and statistical analysis done using student's *t* - test, Chi-square test, Repeat Measures ANOVA and two factor repeated measures ANOVA. SPSS version 24 was used for analysis. A statistical value of $p < 0.05$ was considered significant.

Results

Both the Groups were comparable with respect to demographic variables (age, weight, sex) (Tables 1,2,3) and ASA status (Table 4) did not vary significantly between the two Groups.

Table 1: Comparison of the Two Groups in Terms of Age

	Group				Student's *t* - test	
	Group D		Group P			
	Mean	SD	Mean	SD	t	p value
Age (Years)	31.37	9.70	31.07	9.42	0.122	0.904

In the Group D, 86.7% patients had Bleeding Score 1 (No Suctioning Required). In the Group P, 40% patients had Bleeding Score 2 (Suctioning required) and 46.7% patients in the Group P had Bleeding Score 3 (Frequent Suctioning Required). There was a significant difference in the two Groups in terms of Bleeding Score ($\chi^2 = 34.133$, $p < 0.001$), (Fig. 2).

There was a significantly greater decrease in Heart Rate in the Group D as compared to the Group P ($p < 0.001$), (Fig. 3). There was a significantly greater decrease in SBP (*mm Hg*) in the Group D as compared to the Group P ($p < 0.001$), (Fig. 4). There was a significantly greater decrease in DBP (*mm Hg*) in the Group D as compared to the Group P ($p < 0.001$), (Fig. 5). There was a significantly greater decrease in MAP (*mm Hg*) in the Group D as compared to the Group P ($p < 0.001$), (Fig. 6).

Table 2: Comparison of the Two Groups in Terms of Gender

Gender	Group				Total		Chi-Square Test	
	Group D		Group P					
	n	%	n	%	n	%	χ^2	*p* - Value
Male	13	43.3%	17	56.7%	30	50.0%	1.067	0.439
Female	17	56.7%	13	43.3%	30	50.0%		
Total	30	100.0%	30	100.0%	60	100.0%		

Table 3: Comparison of the Two Groups in Terms of Weight

	Group				Student's *t* - test	
	Group D		Group P			
	Mean	SD	Mean	SD	t	*p* - value
Weight (Kgs)	55.37	6.43	57.13	5.19	-1.171	0.246

Table 4: Comparison of the Two Groups in Terms of ASA

ASA	Group				Total		Chi-Square Test	
	Group D		Group P					
	n	%	n	%	n	%	χ^2	*p* - Value
I	21	70.0%	23	76.7%	44	73.3%	0.341	0.771
II	9	30.0%	7	23.3%	16	26.7%		
Total	30	100.0%	30	100.0%	60	100.0%		

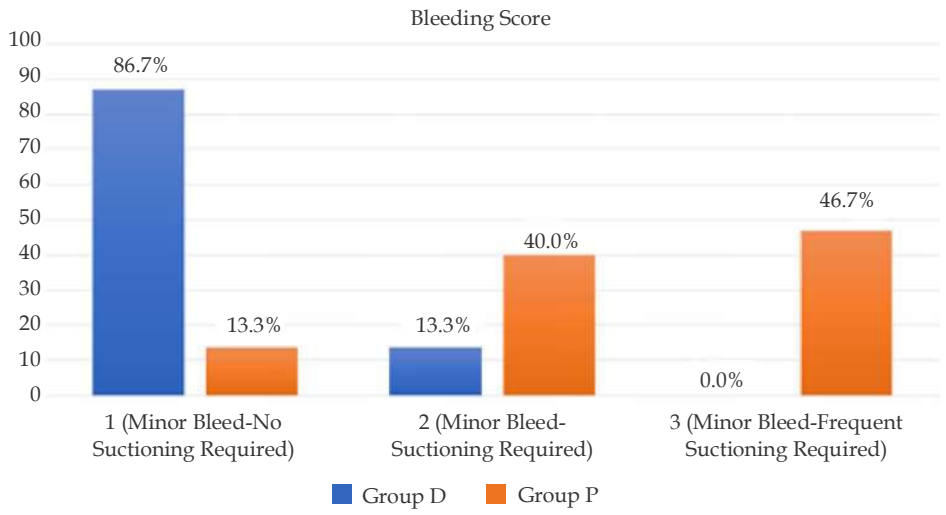

Fig. 2: Bleeding Score Bleeding

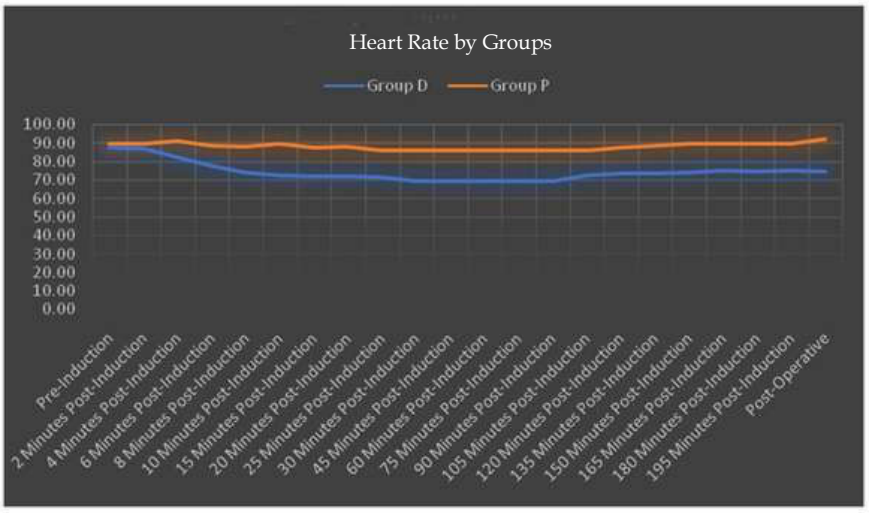

Fig. 3: Comparison of Heart rate between Two Groups

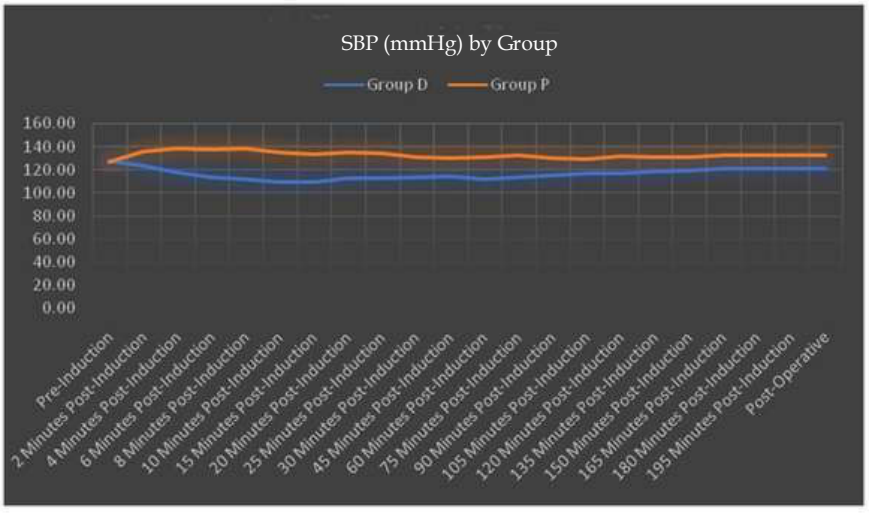

Fig. 4: Comparison of Systolic Blood Pressure between Two Groups

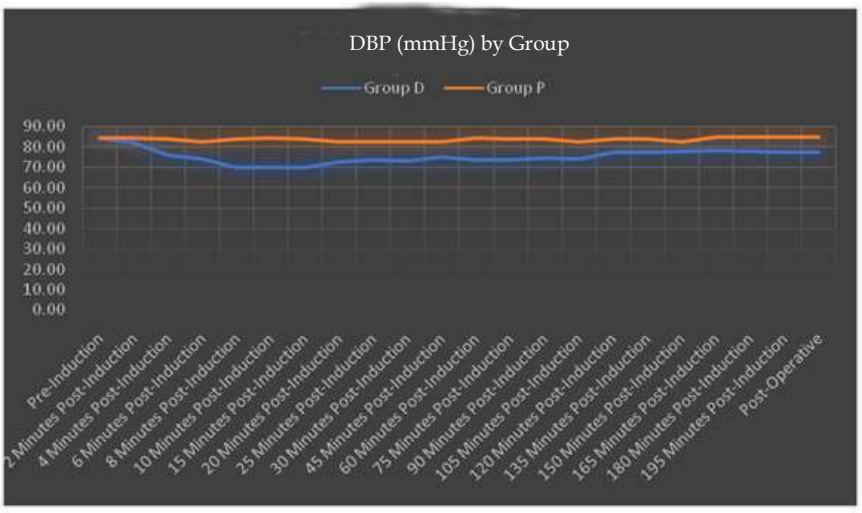

Fig. 5: Comparison of Diastolic Blood Pressure between Two Groups

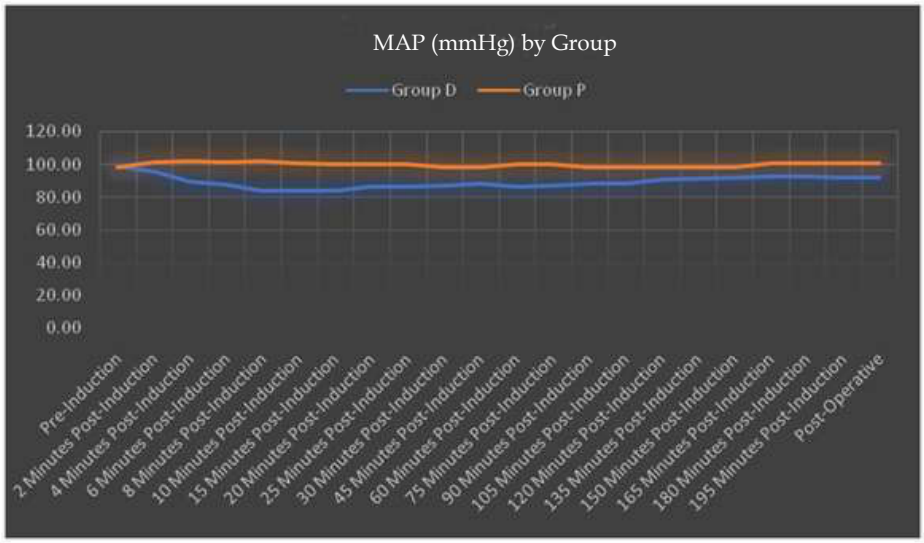

Fig. 6: Comparison of Mean Arterial Pressure between Two Groups

Discussion

Intranasal surgeries require better visualization of surgical field and it can be achieved by controlled hypotension under general anesthesia, using Dexmedetomidine, alpha-2 agonist with minimal side effects. In a study by Gupta *et al*.[15] intravenous dexmedetomidine was shown to reduce the blood loss with minimal adverse effects in intranasal surgeries, which is in concurrence with our study. Harick shah *et al*.[16] compared the blood loss, hemodynamic and operative field visibility between Dexmedetomidine infusion and propofol infusion used for maintenance of anesthesia during Functional endoscopic sinus surgery. As dexmedetomidine causes postsynaptic activation of alpha-2 receptors in CNS and inhibits sympathetic activity decreasing nor epinephrine levels, it can decrease both blood pressure and heart rate. Whereas propofol resets or inhibits the baroreceptor reflex mechanism reducing tachycardia response to hypotension.[16,17]

The study concluded that dexmedetomidine is better in controlling heart rate and was assosciated with lesser blood loss and better operative field visibility. In a study by Vineela *et al*.[18] Dexmedetomidine Group had reduced blood loss compared to nitroglycerine Group during functional endoscopic sinus surgeries. The patients in nitroglycerine Group also had reflex tachycardia and increased blood loss, while those in dexmedetomidine Group had reduced heart rates and less blood loss during surgery, which is similar and in concurrence with our study.

Ahmed Z Mohamed *et al*.[19] compared the effects of dexmedetomidine and $MgSO_4$ on surgical Field visualization in middle ear surgeries. This study concluded that Dexmedetomidine provided better quality of surgical field vision and less bleeding compared to $MgSO_4$.

Shams *et al*.[20] conducted a comparative study of dexmedetomidine *vs* esmolol for induced hypotension for functional endoscopic sinus surgery. It was concluded that dexmedetomidine or esmolol with sevoflurane are safe agents for controlled hypotension and both are effective in providing ideal surgical field during FESS and that dexmedetomidine offers the advantage of inherent analgesic, sedative and anesthetic sparing effect than esmolol.

DK Bharathwaj *et al*.[21] found in their study that the mean heart rate was lower in Dexmedetomidine Group patients compared with propofol Group patients and also dexmedetomidine Group patients had no episodes of significant bradycardia. They concluded that dexmedetomidine is better than propofol in controlling heart rate, mean arterial pressure and blood loss throughout the intranasal surgeries, which is also in concurrence with our study.

In our study, the duration of surgery, shows as (Fig. 1) was significantly lesser in dexmedetomidine Group compared to placebo Group, which could have been due to lesser bleeding in dexmedetomidine Group. No significant adverse effects were observed in any of the patients in our study.

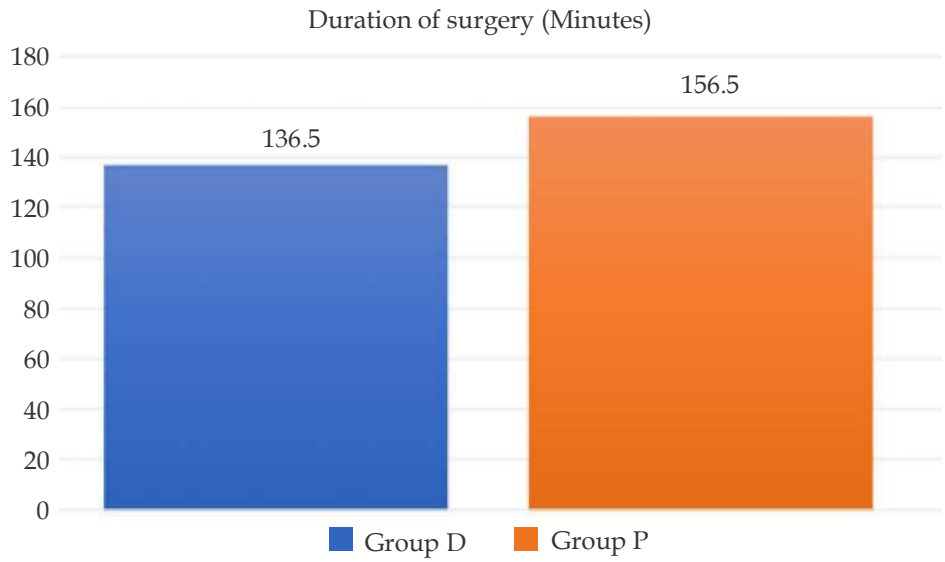

Fig. 1: Duration of Surgery.

Intraoperative bleeding score was significantly lower in dexmedetomidine Group with *p* value < 0.001 in our study, (Fig. 2). There was statistically significant reduction in heart rate, systolic blood pressure, diastolic and mean blood pressure in dexmedetomidine Group compared to placebo Group with *p* value < 0.001.

Conclusion

From our study we concluded that intravenous dexmedetomidine at *1 mcg/kg* during general anesthesia in intranasal surgeries reduces bleeding at surgical site and provides better visibility of the operative field than placebo. Intravenous Dexmedetomidine helps to achieve controlled hypotension with minimal side effects.

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