Original Research Article

Efficacy of dexmedetomidine as an anaesthetic adjuvant for functional endoscopic sinus surgery under general anaesthesia: A randomized controlled study (of 50 cases)

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Abstract

Functional endoscopic sinus surgery (FESS) is one of the commonly performed Surgeries for acute and chronic sinus pathologies and nasal polyps. Dexmedetomidine is highly selective Alpha 2 agonist acts by central mechanism and reduces bleeding. Fifty Patients coming for elective surgery under general anesthesia ASA grade I, II, were divided in to two groups Dexmedetomidine and Control Group. Study drug was Injected 10 minutes before induction in group D and surgical field assessed – surgical time, emergence time and recovery time. During the procedure, hemodynamic changes, intraoperative surgical grade of bleeding based on Fromme–Boezaart scale, propofol induction dose and intraoperative fentanyl consumption, emergence time, and total recovery from anaesthesia were recorded. Group D showed better surgical field and the surgical time was also reduced compared to Group C with intraoperative fentanyl consumption indicating Dexmedetomidine was effective and safe to provide an oligemic surgical field and hemodyanamic stability during FESS.

Key Word: FESS, dexmedetomidine, propofol, emergence time

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INTRODUCTION

Functional endoscopic sinus surgery (FESS) is one of the commonly performed Surgeries for acute and chronic sinus pathologies and nasal polyps. There are many benefits of a well-performed endoscopic sinus surgery with appropriate indications, but major complications of orbital hematoma, injury to the optic nerve, cerebrospinal fluid fistula, and intracranial injuries could occur as bleeding reduces the visibility of the operative field. To minimize these complications, effective control of bleeding at the surgical site is required. Induced hypotension[1,2] is a method employed in FESS surgery to reduce the blood loss and to improve visibility of the surgical field. Dexmedetomidine[3,4] is highly selective Alpha 2 agonist acts by central mechanism and reduces bleeding. Dexmedetomidine is a α2-adrenoceptor agonist with sedative, anxiolytic, sympatholytic, analgesic-sparing effects, and minimal depression of respiratory function. In blood vessels, these receptors cause vasoconstriction, inhibit the release of norepinephrine[5]. The main benefits include the creation of analgesia, sedation, cardiovascular stability, reduces the need for anaesthetic and narcotic drugs, minimum alveolar concentration (MAC) by inhaled anaesthetics. Its common side effects are hypotension and bradycardia. Intra operative infusion of dexmedetomidine reduces the

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perioperative analgesic requirements[6,7] and helps in reducing intraoperative blood pressure and provide satisfactory surgical field conditions[8,9]. With above background, the current study was undertaken to evaluate the efficacy of dexmedetomidine as an anesthetic adjuvant for functional endoscopic sinus surgery under general anaesthesia.

MATERIAL AND METHODS

This prospective Randomized double blinded controlled study was conducted at Anesthesiology department of GMERS Medical College and Civil Hospital, Gandhinagar, and Gujarat, India. Informed written consent was obtained from each patients and procedure was explained. 50 Patients coming for elective surgery under general anesthesia ASA grade I, II, aged 18 to 58 years were divided in two groups.

Group D (Dexmedetomidine): Dexmedetomidine 1µg/kg body weight over 10 minute followed by an infusion of 0.4 µg/kg /hr.

Group C (control group): Infusion of Normal saline similar to amount to dexmedetomidine group.

Exclusion criteria are Patients with ASA grade III, IV**,** difficult airway **(**mallampati class III, IV), k/c/o Hypertension, obesity (BMI>26 kg/m2), cerebrovascular diseases, ischemic heart disease, respiratory disease. Preoperative assessment was done day before planned surgery. Any significant past, family and personal history, physical examination, vitals were noted. Routine blood investigation were done.

Collected data was reported as Mean ± SD. Group comparison for normally distributed variables were tested by using chi-square and unpaired student t test. 42 A P value of 0.05 or less than was considered as statistically significant for all statistical tests.

OBSERVATIONS AND RESULTS

Table 1: demographic data and hemodynamic variables distribution in both the study groups

Variable	Group D (M ± SD)	Group S (M ± SD)	P value
Age (Yrs)	36.6 ± 11.8	38.4 ± 13.5	>0.05
Weight (kg)	57.1 ± 7.5	59.3 ± 8.6	>0.05
ASA Grade (I/II)			>0.05
Sex	10/15	18/7	>0.05

TABLE – I shows there were no significant difference between two groups regarding to Age, sex, weight and ASA grade.

Table 2: Hemodynamic variables distribution in both groups

Variable	Group D (M ± SD)	Group S (M ± SD)	P value
Pulse rate	71.2±5.9	80.4±11.0	0.001
MBP	76.8±9.3	91.4±11.2	0.001
SpO2	99.5±0.7	99.5±0.7	>0.05
Total Fentanyl consumption (µg)	32.9±0.9	61.4±2.2.	0.001
Duration of surgery (min)	92.5±5.2	103.8±5.1	0.001
emergence time in (mins)	8.8±0.4	5.8±0.3	0.001
Time to achieve modified Aldrete score	11.4±1.8	9.5±1.6	0.003

Table 2: shows statistically significant difference in hemodynamic parameters, total fentanyl and propofol consumption during surgery, emergence time and time to achieve modified adrere score between groups.

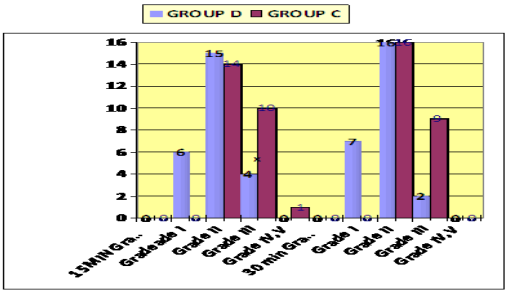

Figure 11: Evaluation of surgical field (Fromme–Boezaart scale)

DISCUSSION

Functional endoscopic sinus surgery is one of the routinely performed surgeries. The use of hypotensive anesthesia during endoscopic sinus surgery has greatly reduced blood loss, improved visibility and quality of surgical field. During the procedure, hemodynamic changes, intraoperative surgical grade of bleeding (on the basis of the Fromme–Boezaart scale), propofol induction dose and intraoperative fentanyl consumption, emergence time, and total recovery from anaesthesia (Aldrete's score ≥9) were recorded. Both the study groups were matched in age, weight, and gender and ASA status. In dexmedetomidine group HR, SBP, DBP, MAP shows significant fall after injecting drug and throughout surgery. Propofol induction dose, intraoperative fentanyl consumption showed significant reduction than group C. Group D showed better surgical field and the surgical time was also reduced. Emergence time and time to achieve aldrete score >9 or more which indicates recovery of the patient was more than group C.

Hemodynamic Parameters: In our study, there was a statistically significant reduction in HR, SBP, DBP and MAP at various time interval in group D as compared to group C. This finding concurred with the results of the study by Guldem Turan *et al*[11]and Durmus M *et al.*[10] They found that the heart rate was lower in dexmedetomidine group. Khan ZP, Ajanta R *et al*[13,12] studies investigated the effects of dexmedetomidine before induction of anesthesia and reported a significant reduction in blood pressure. Gupta K *et al*[1] reported that the baseline mean systolic blood pressure group D 123.4±17.3 mm Hg and group C 127.2±11.5 mm Hg) was comparable81 between the groups. Sunil chiruvella et[2] al in their study, baseline MAP group C was 86.6±12.4mm Hg and in group D 85.8±11.4 mm Hg.MAP dropped significantly (p<0.01) Yacout *et al*[14] in their study of patients undergoing major surgery with intravenous dexmedetomidine infusion 1 µg/kg bolus dose followed by 0.5 µg/kg/hr intravenous infusion reported that mean arterial pressure was significantly lower along with the significantly less post-operative pain in the dexmedetomidine group. There was no significant change in SpO2 at any time in both the groups (p>0.05 in all intervals). Gupta K *et al*[1] reported that peripheral oxygen saturation (SpO2) were comparable in both the study groups with no episode of desaturation at any time. Somavaji *et al*[15] found that mean SpO2 was found to be maintained well throughout the procedure (mean of 99%) in both dexmedetomidine and control group.

intra-operative fentanyl and propofol consumption: in the present study, Patients of group D required significantly lesser (p=0.001) amount of mean fentanyl during surgery (32.9±0.9 µg) as compared to patients in group C (61.4±2.2 µg) which was statistically significant.(p=0.001). Mean propofol consumption during induction was significantly lower (p=0.001) in group D (1.6 mg/kg) as compared to group C (2.1 mg/kg). A study done by Gupta K *et al*[1] also reported significantly lesser requirement of fentanyl during surgery in dexmedetomidine group (32.8±3.2µg) than normal saline group(65.3±5.7 µg) which is statistically significant.(p<0.01). 87 In a similar study done by Ding DF *et al*[16], it was observed that in the dexmedetomidine group, the mean infusion rates of propofol (101.5±8.2 mg in experimental group and 117.9±4.3 mg in control group)(p=0.001) were significantly lower than the control group.

Evaluation of surgical field: In the present study, evaluation of surgical field by Fromme Boezaart scale during FESS at 15 minutes, surgeons experienced an ideal surgical site of grades I and II (minimum bleeding with sporadic suction) in 21 (84%) patients of group D, whereas in group C, 14 patients (56%) were graded II and 10 patients (40%) were graded III (minimum bleeding with repeated suctions). The difference in bleeding at the surgical site was statistically significant between the two groups (p=0.04). A similar study by Gupta K *et al*[1], where patients in dexmedetomidine group had significantly lower surgical grades (mostly I and II) as compared to patients in control group which had higher surgical grades (II and III). Guven *et al.* [18] and Goksu *et al.* [17] reported better hemodynamic stability, visual analog scale for pain, clear surgical feld, and few side effects when dexmedetomidine was administered for FESS.

Surgical time: In the present study it was observed that mean duration of surgery was significantly lower in group D (92.5± 5.2 minutes) as compared to group C (103.8± 5.1 minutes) (p=0.001) which was statistically significant. Gupta K *et al*[1] reported comparable duration of surgery in both dexmedetomidine group(96.8± 23.7)and control group(105±18.4) minutes. However, in a similar study done by Chiruvella S *et al*[2], The duration of surgery was significantly higher in group C(103±13.1) patients compared to group D(78.3±16.7) minutes.(p<0.05)

Emergence time and Recovery time using Modified Aldrete Score: In the present study, mean emergence time in group D was 8.8±0.4 minutes, whereas in group C it was 5.8± 0.3 minutes. The difference was statistically significant (p=0.001). In a study Gupta K *et al*[1] reported that Dexmedetomidine was associated with significantly longer emergence time. Richa *et al.* [20] reported a significantly slower extubation time in patients receiving dexmedetomidine compared with those receiving remifentanil for controlled hypotension. In study of turan G *et al*[19] patients of the dexmedetomidine group had

slower but smooth emergence from anesthesia compared with the control group. Abdulla aydin ozcan *et al*[21] used dexmedetomidine for controlled hypotension in patients undergoing endoscopic sinus surgery and found that recovery time was prolonged in dexmedetomidine group. Our study was comparable to Abdulla aydin ozcan *et al*[21], tarun G,[19] and Gupta *et al*[1] in emergence time. Gousheh SM *et al*[22] reported that the median awakening time after FESS surgery in patients receiving dexmedetomidine was significantly higher than that of the group receiving intravenous normal saline.(p=0.001)

Recovery time using Modified Aldrete Score: In our study, the time needed to achieve modified Aldrete score was significantly longer in group D patients (11.4 minutes) as compared to group C patients (9.5 minutes) (p=0.003) which was statistically significant. Gupta K *et al*[1] reported that time needed to achieve 9 or more of a modified Aldrete's score (8.9 ± 3.29 vs. 10.6±3.74 min) were significantly shorter in patients of the control group than dexmedetomidine group. Koi io *et al*[23] made a comparative study between esmolol and dexmedetomidine combined with desflurane for controlled hypotension during 92 tympanoplasty in adults and found that esmolol group had shorter recovery time than dexmedetomidine group which wa 5.9 [2.1] vs 7.9 [2.3] repectively(p=0.001). The results for time to achieve aldrete score 9 or greater than 9 in our study was comparable to Gupta K *et al*,[1] and Koi io *et al*[23].

Side effects: In our study, 2 patients of group D developed bradycardia at 30th and 45th min but did not need inj atropine. None of the patients in both the groups had respiratory depression.[24]

CONCLUSION

Dexmedetomidine was effective and safe to provide an oligemic surgical field and hemodyanamic stability during FESS. This hemodynamic stability leads not only to better patient outcome but also increased surgeon satisfaction. Dexmedetomidine was associated with longer but smoother recovery time from anaesthesia and offer advantages of analgesia, sedation, and anesthetic-sparing effect. [14]

REFERENCES

1. Gupta K, Gupta PK, Bhatia KS, Rastogi B, Pandey MN, Agrawal S. Efficacy of dexmedetomidine as an aesthetic adjuvant for functional endoscopic sinus surgery under general anesthesia: a randomized–controlled study. Ain-Shams J Anesthesiol 9:207–211.
2. Chiruvella S, Donthu B, Siva JV, Babu DS. Controlled Hypotensive Anaesthesia with Dexmedetomidine for Functional Endoscopic Sinus Surgery: A Prospective Randomized Double Blind Study. Journal of Evolution of Medical and Dental Sciences 2014;3(37):9556-9563
3. Maroof M, Khan RM, Bhatti TH. Clonidine premedication for induced hypotension with total intravenous anaesthesia for middle ear microsurgery. Can J Anaesth 1994; 41: 164-5.
4. Woodcock TE, Millard RK, Dixon J, Prys-Roberts C. Clonidine premedication for isoflurane-induced hypotension. Sympathoadrenal responses and controlled assessment of the vapour requirement. Br J Anaesth 1988; 60: 388-94.
5. Taghipour Anvari Z, Afshar-Fereydouniyan N, Imani F, Sakhaei M, Alijani B, Mohseni M. Effect of clonidine premedication on blood loss in spine surgery. Anesth Pain Med. 2012; **1**(4):252–6.
6. Gurbet A, Basagan-Mogol E, Turker G, Ugun F, Kaya FN, Ozcan B. Intraoperative infusion of dexmedetomidine reduces perioperative analgesic requirements. Can J Anaesth 2006; 53:646–652.
7. Ayoglu H, Yapakci O, Ugur MB, Uzun L, Altunkaya H, Ozer Y, *et al*. Effectiveness of dexmedetomidine in reducing bleeding during septoplasty and tympanoplasty operations. J Clin Anesth 2008; 20: 437-41.
8. Ohtani N, Yasui Y, Watanabe D, Kitamuraa M, Shoji K, Masaki E. Perioperative infusion of dexmedetomidine at high dose reduces postoperative analgesic requirements; a randomized controlled trial. J Anesth 2011; 25(6); 872-8.
9. Aboushanab OH, El-Shaarawy AM, Omar AM, Abdelwahab HH. A Comparative study between magnesium sulphate and dexmedetomidine for deliberate hypotension during middle ear surgery .Egypt J Anaesth 2011; 27: 227-32.
10. Durmus M, But AK, Dogan Z,Yucel A, Miman MC,Ersoy MO. Effect of dexmedetomidine on bleeding during tympanoplasty or septoplasty. Eur J Anaesthesio.2007; 24: 447-53.
11. Guldem Turan M.D., Emine Dincer M.D., Asu Ozgultekin MD, Celil Uslu, Filiz Ormanci, Nur Akgun,Department of II. Anesthesiology and reanimation. Comparison Of Dexmedetomidine, Remifentanil And EsmololIn Controlled Hypotensive Anaesthesia. The Internet Journal of Anesthesiology. 2008 Volume 17 Number 2
12. Aantaa R, Jaakola ML, Kallio A, Kanto J.Reduction of the minimum alveolar concentration of isoflurane by dexmedetomidine. Anesthesiology.1997 May; 86(5):1055-60.
13. Khan ZP, Munday IT, Jones RM, Thornton C, Mant TG, Amin D. Effects of dexmedetomidine on isoflurane requirement in healthy volunteers 1: Pharmacodynamics and pharmacokinetic interactions. Br J Anaesth. 1999; 83; 372- 80.
14. Ahmed G. Yacouta,*, Hasan A. Osman a, Mamdouh H. Abdel-Daema,Saleh A. Hammoudaa, Mohamed M. Elsawy. Effect of intravenous dexmedetomidine infusion on some proinflammatory cytokines, stress hormonesand recovery profile in major abdominal surgery.Alexandria Journal of Medicine.2012; 48: 3–8.
15. Darnell C, Steiner J, Szmuk P, Sheerun P. Withdrawal from multiple sedative agent therapy in an infant; Is dexmedetomidine the cause or the cure? Pediatric Crit Care Med. 2010; 11: e1-e3.

16. Ding DF, Wu LF, Wang P, Jiang YX, Luo YW, Dai ZL, Zhang XP, Li YL. Target-controlled infusion of propofol and remifentanil combined with dexmedetomidine reduces functional endoscopic sinus surgery bleeding. Experimental and therapeutic medicine. 2017 Nov 1; 14(5):4521-6. 109
17. Goksu S, Arik H, Demiryurek S, Mumbuc S, Oner U, Demiryurek AT. Effects of dexmedetomidine infusion in patients under going functional endoscopic sinus surgery under local anaesthesia.Eur J Anaesthiol 2008; 25: 22-8.
18. Guven DG ,Demikaran Y,Sezen G,Kepek O,Iskender A.Evaluation of outcomes in patients given dexmedetomedine given in functional endoscopic sinus surgery.Ann Otol Rhinol Laryngol 2011;120:586-92.
19. Turan G, Ozgultekin A, Turan C, Dincer E, Yuksel G. Advantageous effect of dexmedetomidine on hemodynamic and recovery responses during extubation for intracranial surgery. Eur J Anaesthesiol 2008; 25:816–820.
20. Khan ZP, Munday IT, Jones RM, Thornton C, Mant TG, Amin D. Effects of dexmedetomidine on isoflurane requirements in healthy volunteers. 1: Pharmacodynamic and pharmacokinetic interactions. Br J Anaesth. 1999 Sep; 83(3):372-80. 100
21. Abdullah AO, Yaman O, Ayten S, Hakan E, Hiisnti S, Giilten A. Dexmedetomidine versus remifentanil for controlled hypotensive anesthesia in functional endoscopic sinus surgery. Turk J Anaesth Reanim 2012; 40:257–261.
22. Gousheh SMR, Olapour AR, Nesioonpour S, Rashidi M. The Effect of Intravenous Infusion of Dexmedetomidine to Prevent Bleeding During Functional Endoscopic Sinus Surgery: A Clinical Trial. Anesth Pain Med. 2017 August; 7(4):e12682.
23. Kol IO, Kaygusuz K, Yildirim A, Dogan M, Gursoy S, Yucel E, Mimaroglu C. Controlled hypotension with desflurane combined with esmolol or dexmedetomidine 101during tympanoplasty in adults: A double-blind, randomized, controlled trial. Current Therapeutic research. 2009; 70(3):197-208.
24. Sudhesh K Hassoor SS. Dexmedetomidine in anesthesia practice: a wonder drug? Indian J Anaesth 2011; 55:323–324.

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