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Research Article

A prospective randomized double blind study to compare dexmedetomidine and midazolam in ear nose and throat surgery for monitored anesthesia care

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ABSTRACT

Background: Analgesia and sedation are usually required for the comfort of the patient during ear, nose and throat surgery done under local anesthesia as a part of monitored anesthesia care (MAC). In this study, patients satisfaction scores and effectiveness of sedation and analgesia with dexmedetomidine were compared with midazolam.
Methods: Thirty patients received intravenous dexmedetomidine 1µg/kg bolus for 10 minutes followed by continuous infusion at 0.5 µg/kg/hr (group D). Thirty patients received intravenous midazolam 40 µg/kg bolus for 10 minutes followed by infusion at 50 µg/kg/hr (group M). Intravenous fentanyl (2ug/kg) was administered in both the groups. Vital parameters such as heart rate, mean blood pressure (MBP), respiratory rate (RR), SpO_2, ramsay sedation score (RSS) and visual analog scale (VAS) was observed and recorded throughout the operation and then three times in the recovery room i.e. at arrival 30 and 60 min. After achieving RSS = 3, local infiltration at surgical site was given.
Results: The drop in HR and MBP from pre-operative value was observed at various intervals during the surgery and also in the recovery in both the groups but it was significant in group D ($P<0.005$). Patient satisfaction was significantly better with dexmedetomidine compared to midazolam ($p=0.0001$). There were no side effects in both of the groups except for bradycardia in group D which was reversed easily with injection atropine.
Conclusions: Dexmedetomidine promises to be a suitable alternative to midazolam with added advantage of better patient satisfaction and faster recovery, but with close monitoring of hemodynamics.

Keywords: Dexmedetomidine, Midazolam, Sedation, Monitored anaesthesia care, Otorhinolaryngology, Surgery

INTRODUCTION

There was an era when anesthesiologists were asked to be present on a "stand-by" basis1 to provide sedation and monitoring during palliative surgical procedures in high-risk patients for a general anaesthetic. With the advent of newer anaesthetic agents, anesthetic adjuvants and equipment's for precise drug delivery and monitoring vital parameters, the old concept of anesthesia services on standby basis has gained new dimension of monitored anesthesia care (MAC). ENT surgeries viz. tympanoplasty, septoplasty, functional endoscopic sinus surgery and dacrocystorhinostomy are superficial, less invasive and can be done under local or local with sedation in co-operative and well counselled patients. Local anesthesia is cost effective but better pre-operative counseling is needed and at times may cause patient discomfort if it is used as sole technique. Therefore MAC is an attractive option as it invokes less physiological disturbance, allow a more rapid recovery than general anesthesia and cost effective. Thus the primary objective in providing MAC is to

ensure patient comfort, safety, and satisfaction during surgery.[2]

Dexmedetomidine is the most selective central α2adrenoceptor agonist providing dose- dependent sedation, analgesia, sympatholysis and anxiolysis without respiratory depression.[3-6] The sedative effect is rapid, stable and maintains patient arousability.

Midazolam is the short acting benzodiazepine produces sedation, anxiolysis and amnesia. Although short acting it has the potential for respiratory depression and prolonged psychomotor impairment.

This study was undertaken to compare dexmedetomidine and midazolam as sedative in ear nose throat surgery with primary end point being patient satisfaction score.

METHODS

This prospective randomized double blind study was undertaken after institutional ethics committee approval June 2013 to May 2014. Sixty adult ASA I/II patients of either sex between the age of 18-60 years undergoing Ear Nose and Throat surgery under local anesthesia were included and written informed consent was obtained from all the participants. Patients with known sensitivity to local anaesthetic drug lignocaine, allergy to study drugs, pregnant and lactating females were excluded from the study. Patients on pain perception modifying drugs and those with history of use of any opioid or sedative medications in the week prior to surgery were also excluded. All the patients were examined a day before surgery and were thoroughly investigated according to the institute protocol. They were counseled with regards to sedation, local anaesthesia as well as the operative procedure. The visual analogue scale (VAS) (0-10, where 0 indicated no pain while 10 corresponded to maximum pain), was explained to the patient during the preoperative visit. Thirty patients planned to receive inj. dexmedetomidine and thirty patients planned to receive inj. midazolam in monitored anesthesia care scheduled for elective ear nose and throat surgery. Primary outcome measure was taken as patient satisfaction score using NRS score ranging from 0 to 10. Calculated sample size was 57 participants so to round up total 60 participants need to be enrolled. In each group 30 participants will be enrolled.

On arrival of patients to operation theatre; the identity, NBM status, consent was confirmed. The procedure was once again explained to reduce anxiety. The baseline heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), oxygen saturation and rate of respiration (RR) was recorded. A 20 G IV cannula was secured in the dorsum of the hand. Preloading was done with Ringer lactate solution 8-10 ml/kg and injection ondansetron 0.1 mg/kg was given as premedication to every patient in both the groups. Group D patients received IV injection dexmedetomidine1 µg/kg bolus for 10 minutes followed by continuous infusion at the rate of 0.5 µg/kg/hr till the end of surgery. Group M patients received IV Inj. midazolam 40 µg/kg bolus for 10 minutes followed by infusion at the rate of 50 µg/kg/hr till the end of surgery. After completion of 10 minutes bolus dose of study drugs, IV Inj. Fentanyl (2ug/kg) over 1 minute was administered in both the groups. The vital parameters such as heart rate, systolic blood pressure (SBP), diastolic blood pressure (DBP), mean blood pressure (MBP), respiratory rate (RR), SpO_2, Ramsay sedation score (RSS) and visual analog scale (VAS) was observed and recorded at 5 - minute intervals for first 20 min of starting infusion and afterwards at 10 minute interval throughout the operation, and then three times in the recovery room i.e. at arrival, 30 and 60 min.

After achieving (RSS = 3) local infiltration at surgical site was given with Inj. Lignocaine 2% plus adrenaline 1:200000. If patients complained of pain (with VAS score ≥4) intra operatively, additional local infiltration of Inj. Lignocaine 2% plus Adrenaline 1:200000; 5cc was given. The total dose of Lignocaine 2% plus Adrenaline 1:200000 would not exceed 7mg/kg. If the pain still persisted additional dose of fentanyl 1mcg/kg was administered. In post-operative period if patients complained of pain (VAS score ≥4), Inj. Diclofenac 75 mg IV was given as additional analgesic.

During intra-operative period, bradycardia (HR <50bpm) was treated with Inj. Atropine sulfate in titrated doses, Hypotension (SBP <30% of pre-operative value or MBP <60 mmHg) was treated with Inj. Ephedrine 5 mg incremental doses. The total duration of surgery was noted. After the completion of surgery patients were shifted to the PACU and were monitored for hemodynamic parameters, RSS, VAS score, degree of analgesia and adverse events, on arrival, 30 and 60 min. Patients were asked to grade their overall satisfaction with the procedure on a numerical scale (NRS 0-10) on postoperative day one in the surgical ward.

The study was evaluated with respect to sedation and analgesia offered by both the drugs , total requirement of analgesic, time of additional analgesic requirement, time of recovery from sedation (i.e. time required for recovery from RSS 3 to RSS 2), haemodynamic stability, side effects like bradycardia, hypertension, hypotension, postoperative nausea and vomiting and dryness of mouth.

Statistical analysis

Data was expressed as mean±standard deviation. Demographic data and complications were analyzed using Chi square test and hemodynamic variables were analyzed using paired "t" test within groups and unpaired "t" test between the groups. P value of ≤0.05 will be considered significant.

RESULTS

Sixty patients underwent procedure. All patients were comparable in both groups with respect to age, sex, duration of surgery, ASA grade, time of surgery (Table 1) and type of surgery (Table 2). There were no differences in baseline measurements of HR between the two groups, but Group D had significant fall in heart rate ($p \leq 0.05$) from 5 min after start of infusion till the end of surgery and in post-op recovery period for 1 hour (Figure 1). The MAP at different intervals from 0 min until 90 min was statistically significant between both the groups. Further in the post-operative period at arrival of the patient in the recovery room, the MAP was 83.3±6.64 mm Hg in Group D compared to 88.75±7.5 mm Hg in group M which was statistically significant (p=0.012) and this statistical significance was observed till 60 min in recovery room (Figure 2). Respiratory changes and SPO_2 changes was not significant in both groups. Additional analgesic requirement was not significant between two groups but analgesic requirement was lower in group D i.e. 5 patients than group M i.e. 11 patients. The RSS at the end of 5 min of bolus drug infusion increased to 2.03±0.18 in Group D and at 2.40±0.50 in Group M. The difference between RSS was statistically significant (p = 0.00063). The RSS did not show any statistical difference throughout the duration of surgery. In recovery room at 30 min and 60 min interval the difference in RSS was statistically significant ($p<0.05$). Mean time of recovery from sedation (i.e. the time required for recovery from RSS 3 to RSS 2) was 20.67±10.15 min in Group D than 41.67±26.92 min in Group M. and the difference was found to be significant ($p<0.05$) (Table 3). Four patients in group D had bradycardia compared to none in Group M. This was statistically significant (p =0.038) and was reversed easily with Inj. Atropine. Patient satisfaction score was compared between Group D and Group M in post-op period. There was statistically significant difference found between two groups (p=0.0001) with higher satisfaction reported in Group D (Table 3).

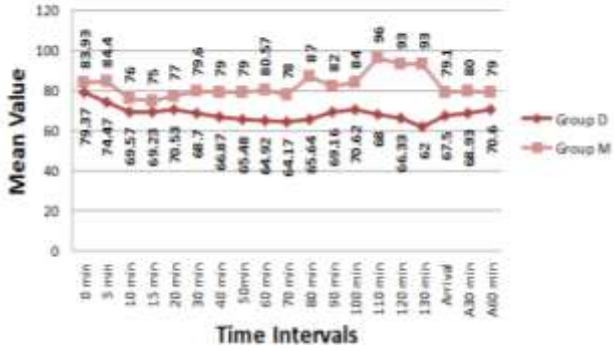

Figure 1: Changes in heart rate over a period of time

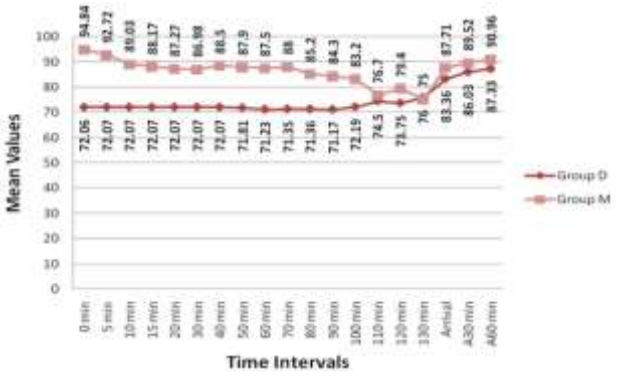

Figure 2: Changes in mean arterial pressure over a period of time.

Table 1: Patients characteristics and operative data (data presented in Mean±SD or number).

Variables	Group D	Group M	p value
Age (years)	30.90±10.93	31.57±13.12	0.830
Weight (kg)	55.23±7.93	52.5±7.07	0.164
Duration of surgery (min)	81.0±22.49	77.0±28.18	0.545
Transit time (min)	10.12±1.627	10.4±1.734	0.646
Sex (M/F/ Total)	17/13/30	16/14/30	0.795
ASA Grade (I/II/Total)	26/4/30	25/5/30	0.718

Table 2: Type of surgery (data expressed as number (proportion)).

Surgery	Group D	Group M	p value
Tympanoplasty	21 (70%)	17 (56.6%)	0.442
Septoplasty	7 (23.3%)	8 (26.7%)	
FESS	2 (6.7%)	3 (10%)	
DCR	1 (3.2%)	1 (3.2%)	

Table 3: Patient satisfaction score and time to recovery (data expressed as Mean±S.D).

Variable	Group D	Group M	p value
Time to recovery(min)	20.67±10.15	41.67±26.92	0.003*
Patient satisfaction score(0-10)	8.76±0.93	7.13±1.5	0.0001*

*p<0.05 significant.

DISCUSSION

In this study, 60 patients of ASA Grade I & II, aged between 16 - 60 years, undergoing various ENT surgeries such as septoplasty, tympanoplasty, functional endoscopic sinus surgery and dacrocystorhinostomy were included. All these patients were operated for respective ENT lesions under Monitored Anaesthesia Care with local infiltration of operative site with 2% Lignocaine plus adrenaline 1:200000 and sedation with infusion of either Dexmedetomidine or Midazolam. Dexmedetomidine proved better in terms of quality of sedation, lesser rescue analgesics and better patient satisfaction.

We found that even though sedation score was similar in both the groups but recovery from sedation was faster in the patients receiving dexmedetomidine compared to midazolam. This may be in view of the shorter elimination half-life of dexmedetomidine. In our study the mean time of recovery from sedation (i.e. the time required for recovery from RSS 3 to RSS 2) was lower with dexmedetomidine. Berkenbosch JW, Wankum PC et al found mean recovery time was 84±42 mins and was significantly longer in the rescue group(117±41 mins) vs. primary (69±34 mins) group (p<0.0001).[7] As in rescue group, patients received dexmedetomidine along with other agents such as benzodiazepine or barbiturates, so they have prolonged recovery time compared with primary group.

Koroglu A et al studied and compared the sedative, hemodynamic and respiratory effects of dexmedetomidine with midazolam in children undergoing MRI examination.[8] They found the quality of MRI was significantly better and the rate of adequate sedation was higher in group D than in group M (P<0.001). In group D, the requirement for rescue drugs was lower and the onset of sedation time was shorter than in group M (P<0.001).

Alhashemi JA et al in the year 2006 compared the use of dexmedetomidine and midazolam for monitored anaesthesia care in patients undergoing cataract surgery. He found that Group D patients had slightly higher satisfaction with sedation [median (IQR): 6 (6 - 7) vs. 6 (5 - 7), P<0.05], but delayed readiness for discharge [45 (36 - 54) vs. 21 (10 - 32) min, P<0.01] compared with patients in Group M.[9] In this study dexmedetomidine was given as infusion like our study but midazolam was given as boluses as and when required. This explained the delayed recovery in the Group D.

Kazim Karaaslan, Fahrettin Yilmaz, et al in the year 2007 did comparison of dexmedetomidine and midazolam for monitored anesthesia care combined with tramadol via patient-controlled analgesia in endoscopic nasal surgery.[10] They found pain and sedation scores were similar in both groups.

Demiraran Y, Korkut E, Tame A et al in the year 2007 compared use of dexmedetomidine and midazolam for sedation of patients during upper endoscopy.[11] They found after the procedure, full recovery time, HR, MBP, RR and SpO_2 levels were similar in both groups.

Comparing the HR between the two groups, the difference between the HR from values at pre-operative and corresponding values at various intra operative and post-operative were statistically significant. In Group D overall HR was on lower side than the pre-operative value, almost at all the intervals. Where as in Group M, the HR almost remained same, at all the intervals except at 10 min, 15 min and 20 min intra operatively. In Group D overall MAP was lower than that of group Midazolam. This reflects better pain control and reduced anxiety level in dexmedetomidine group of patients. The patients' satisfaction score in the current study was better in patients receiving dexmedetomidine compared to midazolam. Ustün Y et al also compared dexmedetomidine versus midazolam in outpatient third molar surgery.[12] They observed that mean heart rate and blood pressure measurements were significantly lower in group D.

Even though our study had statistically comparable rescue analgesic requirement, many studies have shown lesser analgesic requirement in dexmedetomidine treated patients. This could be mainly because apart from IV drugs, local anesthesia was administered. The IV drugs dexmedetomidine and midazolam were mainly administered to allay the anxiety of the patient and make them comfortable. Moreover we had added Fentanyl to both the groups

Our study demonstrated significantly higher patient and surgeon satisfaction scores with dexmedetomidine suggesting a difference in the quality of sedation of both the drugs. The lower HR and MAP in these patients could have probably resulted in a better surgical field thus attributing to better surgeon satisfaction. Moreover,

surgeons are satisfied if there is no patient movement during surgery. Similar findings have been reported by K. Karaaslan et al where Group dexmedetomidine used significantly less rescue tramadol in comparison to Group midazolam when both the drugs were compared in FESS and nasal septoplasties.[13] Analgesic property of α 2 agonists like dexmedetomidine with its opiate-sparing properties has been documented, and has been reported in studies conducted in general anesthesia with dexmedetomidine.[14,15] Other studies have also reported better satisfaction scores with dexmedetomidine.[9,11,16,17] However, Zeyneloglu et al have reported better satisfaction scores with midazolam-fentanyl combination as compared to dexmedetomidine in extracorporeal shock wave lithotripsy (ESWL) when used alone.[18] The authors also concluded that probably it was not effective as a sole agent in ESWL. In our study in spite of higher satisfaction scores in the dexmedetomidine group, both the drugs were comparable in terms of sedation as none of the patients in either group required additional sedation with propofol or any alternative anesthesia technique.

CONCLUSION

From present study it was concluded that dexmedetomidine promises to be a suitable alternative to midazolam with added advantage of better patient satisfaction and faster recovery, but with close monitoring of hemodynamics.

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Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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