ORIGINAL ARTICLE

Clonidine as an adjuvant in monitored anesthesia care for ENT surgeries: A prospective, randomized, double blind placebo controlled study

Indira Kumari, MD[1], Udita Naithani, MD[2], Harsha, MD[3], Yogendra Singhal, MD[4], Khemraj Meena, MD[2], Madhan Mohan. C, MBBS[5]

[1]Sr. Professor and Head; [2]Associate Professor; [3]Ex PG student; [4]Assistant Professor; [5]Junior Registrar
Department of Anesthesiology, Rabindra Nath Tagore (RNT) Medical College, Near Collectorate, Hospital Rd, Court Chouraha, Madhuban, Udaipur, Rajasthan 313001, (India)

Correspondence: Dr. Indira Kumari, MD, 101, Jai Lakshmi Apartments, New Bhopalpura, Udaipur, Rajasthan, (India); Phone: 9414176760; E-mail: dr_ikumari@hotmail.com

ABSTRACT

Objective: Alpha-2 adrenoceptors have recently been used perioperatively for their sedative, analgesic, sympatholytic and cardiovascular stabilizing effects. The efficacy of clonidine as an adjuvant in providing monitored anesthesia care (MAC) for ear, nose and throat (ENT) surgeries has not been much investigated, so we conducted this study.

Methodology: In this prospective double blind randomized placebo controlled study, 90 patients posted for elective ENT surgeries under local anesthesia with MAC were included and divided into 3 groups of 30 each. In Group C_{BI} patients received clonidine 3 μg/kg intravenous bolus followed by clonidine infusion at 0.3 μg/kg/hr. Patients of Group C_B received clonidine 3 μg/kg bolus followed by placebo infusion and in Group P patients received placebo bolus followed by placebo infusion. All three Groups received similar premedication of intravenous midazolam 0.03 mg/kg and fentanyl 2 μg/kg. Demographic data, intraoperative vital parameters, observer's assessment and alertness scale (OAAS) score for sedation, bleeding score, patient and surgeon satisfaction score, postoperative Aldrete score, visual analogue scale (VAS) score for analgesia, rescue sedative and analgesic consumption and complications were noted.

Results: OAAS score (0-noresponse to 5-awake), 10 min after infusion of study drug was significantly lower in Groups C_{BI} (2.06 ± 0.61) and C_B (2.83 ± 0.70) signifying superior sedation as compared to placebo Group (4.80 ± 0.40), (p=0.000). Intraoperative rescue sedative and analgesic consumption were significantly lower in Groups C_{BI} and C_B, as compared to placebo group (p = 0.000). Mean heart rate (HR) and mean arterial pressure (MAP) were significantly lower in Groups C_{BI} and C_B as compared to Group P (p = 0.000). Intraoperative bleeding score (0-Nolbleeding to 4-modearte bleeding) was significantly lower in Group C_{BI} (0.86 ± 0.68) and C_B (1.36 ± 0.76) as compared to placebo (3.10 ± 0.54), p = 0.000. Surgeons and patients were more satisfied in clonidine Groups C_{BI} and C_B, (p = 0.000). Patients of Group C_{BI} demonstrated better sedation profile, less bleeding score and higher satisfaction scores as compared to Group C_B ($p<0.05$).

Conclusion: Being a safe, well tolerated, cheap and effective regime, our study favors the use of clonidine 3 μg/kg IV bolus followed by infusion of 0.3 μg/kg/hr as an adjunct to conventional MAC regime of midazolam and fentanyl in ENT surgeries as it provides effective sedation and bloodless surgical field.

Key words: Clonidine; Imidazole: Imidazolines; Adrenergic alpha-2 Receptor Agonists; Intraoperative Monitoring; Monitoring, Physiological; Patient Monitoring; Otolaryngology; Pain Measurement; Analogue Pain Scale; Assessment, Pain; Visual Analog Pain Scale

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INTRODUCTION

Monitored anesthesia care (MAC) typically involves administration of local anesthesia in combination with IV sedatives, anxiolytic and/or analgesic drugs.[1] Today it is the first choice in 10-30% of all the surgical procedures.[2] MAC is being applied for various ear, nose, throat (ENT) surgeries in which an adequate sedation and analgesia without respiratory depression are desired for comfort of both the patient and the surgeon.[3] It is important to have a surgical field that is free of blood as far as possible to improve visibility and so as to reduce the incidence of complications.[4] Local anesthetic techniques have many advantages like, early recovery, less postoperative pain, and of great importance is the surgeon's ability to test hearing while in surgery.[5]

Several drugs have been used for MAC such as, midazolam, propofol and fentanyl.[6] The most commonly reported adverse effects of midazolam are variability of patient response and respiratory complications.[7] Combining midazolam with fentanyl or other opioids increases the risk of hypoxemia and apnea and addition of propofol may further exacerbate respiratory depression.[8]

Recently alpha-2 adrenoceptor agonists i.e. clonidine and dexmedetomidine have been used as an alternative to other IV sedatives. Dexmedetomidine is becoming more popular as MAC anesthetic,[6] but justification of its use may be difficult as it is more costly.[9] Clonidine, comparatively cheaper agent also produces dose dependent sedation, analgesia, anxiolysis without relevant respiratory depression, provides hemodynamic stability and decreases sympathetic outflow resulting in significantly reduced bleeding during ENT surgeries.[10,11] The efficacy of clonidine in MAC is sparsely studied.[12] The present study was designed to evaluate the role of clonidine as an adjuvant in MAC for ENT surgeries.

METHODOLOGY

After approval of the institutional ethical committee, this prospective, randomized double blind placebo controlled study was conducted at M. B. hospital attached to RNT Medical College, Udaipur (India). Informed consent was taken from each patient.

All consecutive adult cooperative patients of ASA physical status I-II, of both sexes, between 18 to 60 years of age, scheduled for elective ENT surgery under local anesthesia during period of one year (Jan 2014 to Dec 2014) were included in the study and were the basis of sample size. Exclusion criteria were patients having uncontrolled hypertension, cardiovascular/ hepatic/ renal/ endocrine diseases, coagulation disorder or taking drugs for systemic illness, any allergy to the study drug, on anticoagulation treatment, morbid obesity etc.

Ninety patients who fulfilled the above inclusion criteria were the study population. They were divided into 3 groups of 30 each using serial number technique. In Group C_{BI} patients received clonidine 3 μg/kg bolus followed by clonidine infusion at 0.3 μg/kg/hr. Patients of Group C_B received clonidine 3 μg/kg bolus followed by placebo infusion and in Group P patients received placebo bolus followed by placebo infusion.

Patients were instructed to keep fasting for 6-8 hours. All the resuscitation and monitoring equipment and emergency drugs were kept ready for management of any adverse reactions. On the morning of surgery, standard monitors e.g. ECG, noninvasive BP, and pulse oximetry, were applied to the patient and baseline values were recorded. Two peripheral IV cannulas were inserted at different sites on the same arm (opposite to the side of surgery), one for infusion of clonidine or placebo and the other for administration of fluid and other drugs. Ringer lactate 500 ml was infused before premedication.

All the three groups received similar conventional sedation regime of IV midazolam 0.03 mg/ kg and fentanyl 2 μg/kg, which was followed by bolus study drug administration over 10 min as per group allocation. Immediately after this, the infusion of study drug was started and the surgeon administered local anesthesia using lidocaine 2% with 1:200000 adrenaline. After 10 min of start of infusion patients were assessed for level of sedation using Observers Assessment of Alertness Sedation scale[13] (OAAS, 0-5); a score $\leq$ 4 was considered acceptable to allow the start of surgery and any patients having score > 4, received IV propofol 0.5 mg/kg bolus as rescue sedative and was repeated until OAAS score was $\leq$ 4 to allow the surgery to start. Infusion of the study drug was continued throughout the surgery and stopped 10 min before anticipated conclusion of surgery. Intraoperatively, propofol 0.5 mg/kg IV bolus was used as rescue sedative (if OAAS > 4) and fentanyl 25 μg IV bolus was used as rescue analgesic (on complaint of pain). Heart rate (HR), mean arterial pressure (MAP), respiratory rate (RR), oxygen saturation (SpO_2) were recorded immediately after bolus, 10 min after infusion and then every 15 min till completion of surgery.

After surgery patients were shifted to recovery room. Aldrete score[14] (0-10) was assessed in recovery room every 5 min, till score of 10 was achieved, which was the criteria to shift the patient to ward. Postoperative pain in post anesthesia recovery room was noted on visual analogue scale (VAS, 0-10), and VAS score of > 3 was treated with tramadol 100 mg IV. Episodes of vomiting were noted and treated with ondansetron 4 mg IV.

Intraoperative bleeding was assessed by the surgeon using bleeding score[15] (0-4) at conclusion of surgery; acceptable bleeding score being 0-2. Patients were asked to rate their experience with the sedation (or analgesia) they have received during surgery using a 7-point Likert verbal rating scale. This assessment of patient's satisfaction with sedation and analgesia was performed just before shifting to ward to minimize the effects of sedation on patients judgment. Surgeons were also asked to rate their satisfaction with operative conditions and patient sedation, using the same scale at the end of surgery, acceptable satisfaction score of both the patient and surgeon being.[5-7]

Intraoperatively, hypotension (SBP < 90 mmHg) was treated with fluid bolus and inj. mephentermine 6 mg bolus, bradycardia (HR < 60/ min) was treated with atropine 0.4 mg IV boluses, hypoxia (SpO_2 < 92% on air) was treated with supplemental oxygen by venturi mask. If these effects persisted, clonidine infusion was stopped. Various scores used in the study are shown in Appendix 1.

The primary efficacy end point was the percentage of patients not requiring propofol for rescue sedation based on achieving and/or maintaining an OAAS score ≤ 4. Secondary end points were total amount of rescue propofol and rescue fentanyl, hemodynamic stability, bleeding score, overall patient and surgeon satisfaction and recovery and readiness for discharge. Continuous variables were presented as mean ± SD and compared using student's t test and ANOVA, whereas categorical data were presented as number (proportion) and compared using chi square test. Data were analyzed using SPSS version 16.0, with $P < 0.05$ considered as statistically significant.

RESULTS

All the three groups were comparable regarding mean age, mean weight, sex, ASA grade, diagnosis, type of surgery, duration of surgery and baseline vital parameters ($P > 0.05$) (Table 1).

Mean OAAS score 10 min after study drug was significantly lower in Group C_{BI} (2.06 ± 0.61) and C_B (2.83 ± 0.70) as compared to Group P (4.80 ± 0.40), ($p = 0.000$). Difference between Group C_{BI} and C_B was also significant ($p = 0.010$) (Table 2). In Group P, 27 (90%) patients required intraoperative rescue sedation (propofol 0.5 mg/kg) to keep them sedated (OAAS ≤ 4), with number of doses ranging from 1 - 4 times, leading to a total of 63 rescue sedative doses. Whereas in Group C_B 6 (20%) and in Group C_{BI} only 1 (3.33%) patient required a single dose of rescue sedative. Intraoperative

Table 1: Demographic characteristics in three groups

Variables	Group C_{BI}	Group C_B	Group P	P value		
				C_{BI}/ C_B	C_B/P	P/ C_{BI}
Age (yr)	34.03 ± 13.61	30.03 ± 10.20	31.33 ± 11.02	0.220	0.634	0.420
Weight (kg)	52.23 ± 8.15	53.80 ± 6.54	54.33 ± 6.38	0.437	0.773	0.205
Sex(male/female)(n)	11/19	16/14	16/14	0.991	0.993	0.999
ASA (I/II) (n)	25/5	27/3	26/4	0.999	0.999	0.999
Type of surgery n (%)						
Tympanoplasty	21 (70%)	16(53.33%)	15 (50%)			
Septoplasty	3 (10%)	8 (26.67%)	8 (26.67%)			
Myringoplasty	4 (13.33%)	5 (16.67%)	7 (23.33%)			
Tympanotomy	2 (6.67%)	0 (0%)	0 (0%)			
Polypectomy	0 (0%)	1 (3.33%)	0 (0%)			
Duration of susurgery(min)	109.17 ± 22.82	103.67 ± 27.72	103.00 ± 26.44	0.309	0.925	0.357

Data are presented as Mean ± SD or number (proportion)

rescue analgesic (fentanyl 25 μg) was required by 26 (86.67%) patients in Group P, with number of doses ranging from 1–4 times, leading to total of 62 rescue analgesic doses. Whereas in Group C_B 6 patients (20%) and in Group C_{BI} only 1 patient (3.33%) required a single dose of rescue analgesic. Intraoperative rescue sedative and analgesic requirement was significantly higher in placebo group as compared to clonidine Groups, p=0.000. However, it was comparable in both clonidine groups (Table 3).

Incidence of postoperative pain (VAS >3) in PACU was significantly higher in Group P (n = 23, 76.67%) as compared to Group C_B (n = 4, 13.33%) and Group C_{BI} (n = 0) (p = 0.000), who were given IV tramadol. Mean postoperative VAS score in PACU was in the order of Group P (4.46 ± 1.35) > Group C_B (2.20 ± 1.31) ≈ Group C_{BI} (1.70 ± 1.29).

Mean heart rate showed significant fall from baseline at all time intervals in Groups C_{BI} and C_B ($p < 0.05$) with maximum fall at 30 min after starting surgery and it was 23.91% in Group C_{BI} and 14.09% in Group C_B. There was no significant variation from baseline in Group P with respect to heart rate ($p > 0.05$). On inter-group comparison, mean heart rate was significantly lower in Group C_{BI} and C_B as compared to Group P throughout the surgery. Mean heart rate was significantly lower in Group C_{BI} as compared to Group C_B from 15 min to 75 min of surgery ($p<0.05$). However, bradycardia (HR <60/min) was seen in only one patient (3.33%) of Group C_{BI}. (Figure 1).

MAP in Group C_{BI} showed significant fall from baseline at all time intervals ($p<0.05$), whereas in Group C_B it was from 10 min after infusion to conclusion of surgery ($p<0.05$). Maximum fall in MAP was observed at 30 min after starting surgery, and it was 20.45% in Group C_{BI} and 15.38% in Group C_B. There was no significant variation from baseline in Group P with respect to MAP ($p > 0.05$). On inter-group comparison, MAP was significantly lower in Group C_{BI} and C_B as compared to Group P from administration of bolus dose of study drug to conclusion of surgery ($p < 0.05$). It was significantly lower in Group C_{BI} as compared to Group C_B from 15 min to 105 min of surgery ($p < 0.05$). However, hypotension (SBP < 90 mmHg) was seen in only 2 (6.66%) patients of Group C_{BI} (Figure 2).

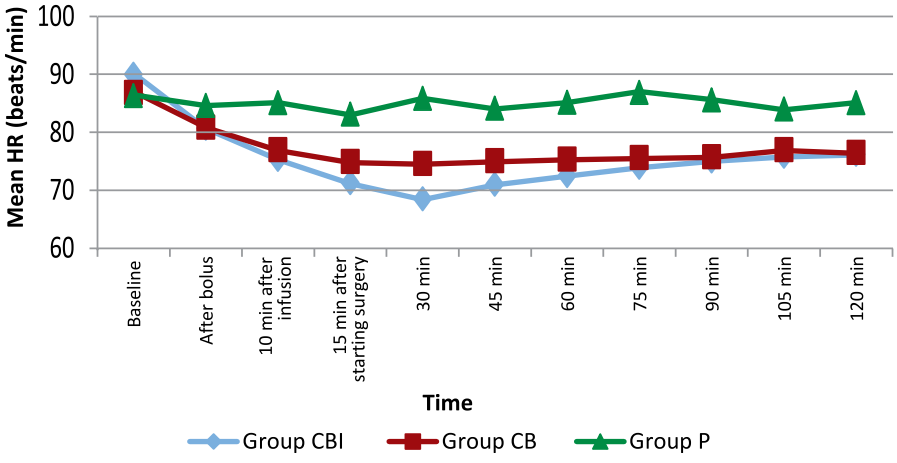

Fig 1: Comparison of mean heart rate (HR) during intraoperative period

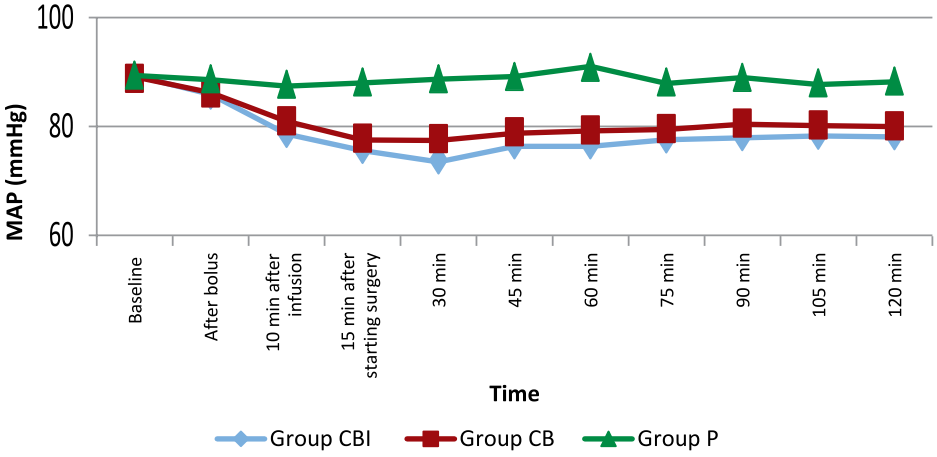

Fig 2: Comparison of mean arterial pressure (MAP) during intraoperative period

Mean bleeding score was significantly higher in Group P (3.10 ± 0.54) as compared to Group C_B (1.36 ± 0.76) and Group C_{BI} (0.86 ± 0.68), (p = 0.000). The difference was also significant between Group C_B and C_{BI} (p = 0.014). Acceptable bleeding score of ≤ 2 was achieved by significantly higher number of patients in

Table 2: Comparison of OAAS score, bleeding score, of patient satisfaction score (PSS) and surgeon satisfaction score (SSS)

Scores	Group C_{BI}	Group C_B	Group P	P value		
				C_{BI}/C_B	C_B/P	P/C_{BI}
OAAS score						
Mean ± SD (range)	2.06 ± 0.61 (1-5)	2.83 ± 0.70 (2-5)	4.80 ± 0.40 (4-5)	**0.010**	**0.000**	**0.000**
≤ 4 (acceptable)	30 (100%)	29(96.67%)	6 (20.00%)	0.990	**0.000**	**0.000**
>4 (unacceptable)	0 (0%)	1 (3.33%)	24(80.00%)	0.980	0.000	0.000
Bleeding score						
Mean ± SD (range)	0.86 ± 0.68 (0-2)	1.36 ± 0.76 (0-3)	3.10 ± 0.54 (2-4)	0.014	**0.000**	**0.000**
≤ 2 (acceptable)	30 (100%)	29 (96.67%)	3 (10%)	0.990	**0.000**	**0.000**
>2 (unacceptable)	0 (0%)	1 (3.33%)	27 (90%)	0.950	**0.000**	**0.000**
PSS						
Mean ± SD (range)	6.23 ± 0.56 (5-7)	5.53 ± 0.49 (5-6)	3.80 ± 0.46 (3-5)	**0.013**	**0.000**	**0.000**
≥ 5 (acceptable)	30 (100%)	30 (100%)	2 (6.67%)	**1.000**	**0.000**	**0.000**
<5 (unacceptable)	**0 (0%)**	**0 (%)**	**28 (93.33%)**		**0.000**	**0.000**
SSS						
Mean ± SD (range)	6.33 ± 0.54 (5-7)	5.46 ± 0.50 (5-6)	3.86 ± 0.57 (3-5)	**0.010**	**0.000**	**0.000**
≥ 5 (acceptable)	30 (100%)	30 (100%)	2 (6.67%)	**1.000**	**0.000**	**0.000**
<5 (unacceptable)	**0 (0%)**	**0 (%)**	**27 (90%)**		**0.000**	**0.000**

Patient distribution according to different scores is presented as number (proportion)

Table 3: Comparison of rescue sedative and analgesic consumption

Scores	Group C_{BI}	Group C_B	Group P	P value		
				C_{BI}/C_B	C_B/P	P/C_{BI}
Rescue sedative requirement						
No. of patients requiring rescue sedative	1	6	27	0.060	0.000	0.000
No. of doses	1	6	63	0.060	0.000	0.000
Mean no. of doses (range)	0.03 ± 0.18 (0-1)	0.20 ± 0.40 (0-1)	2.10 ± 1.24 (0-4)	0.057	0.000	0.000
Rescue analgesic requirement						
No. of patients requiring rescue analgesia	1	6	26	0.062	0.000	0.000
No. of doses	1	6	62	0.062	0.000	0.000
Mean no. of doses (range)	0.03 ± 0.18 (0-1)	0.20 ± 0.40 (0-1)	2.07 ± 1.28 (0-4)	0.057	0.000	0.000

Group C_{BI} (n = 30, 100%) and Group C_B (n = 29, 96.67%) as compared to Group P (n = 3, 10%), (p = 0.000). Group C_{BI} and C_B were comparable (p = 0.990). Thus incidence of achievement of acceptable bleeding score (≤ 2) was in order of Group $C_{BI} \approx$ Group C_B > Group P (Table 2).

All the three Groups were statistically comparable regarding changes in respiratory rate and oxygen saturation at different time intervals intraoperatively (P>0.05).

Acceptable surgeon satisfaction score (SSS) of ≥ 5 was achieved by all of the patients in Group C_{BI} and C_B (n = 30, 100%) as compared to only 3 (10%) patients in Group P. The difference was highly significant (p = 0.000). Group C_{BI} and C_B were comparable regarding incidence of achievement of acceptable SSS (P = 1.000). Mean SSS was significantly higher in Group C_{BI} (6.33 ± 0.54) and Group C_B (5.46 ±

0.50) as compared to Group P (3.86 ± 0.57), (p = 0.000). Mean SSS was significantly higher in Group C_{BI} as compared to Group C_B (p = 0.010). Acceptable patient satisfaction score (PSS) of ≥ 5 was achieved by all of the patients in Group C_{BI} and Group C_B (n = 30, 100%) as compared to only 2 patients (6.67%) in Group P and this difference was highly significant (p = 0.000). Group C_{BI} and C_B were comparable regarding incidence of achievement of acceptable PSS (P = 1.000). Mean PSS was significantly higher in Group C_{BI} (6.23 ± 0.56) and Group C_B (5.53 ± 0.49) as compared to Group P (3.80 ± 0.46), (p = 0.000). Mean PSS was significantly higher in Group C_{BI} as compared to Group C_B (p = 0.013) (Table 2).

Mean time taken to achieve Aldrete score of 10 was significantly shorter in Group C_{BI} (6.83 ± 2.45) min and Group C_B (7.16 ± 2.52) min as compared to Group P (14.33 ± 3.65) min (p = 0.000), while Group C_{BI} and C_B were comparable (p = 0.573).

Adverse effects during the intraoperative period were comparable with no significant difference among the groups (P > 0.05). In Group C_{BI}, a single episode of hypotension (SBP < 90 mmHg) was observed in 2 (6.66%) patients and bradycardia (HR < 60 / min) in 1 patient (3.33%). In Group P, 2 (6.66%) patients had hypoxia due to supplemental sedative and analgesic drug.

DISCUSSION

Monitored Anesthesia Care (MAC) is a technique where local anesthetics are combined with intravenous sedative drugs for sedation and analgesia. To achieve calm and pain free patient, giving sedative drugs in large doses is the common practice, although the risk of losing airway control, hypoxia and hypotension with higher doses has to be weighed.

MAC may be useful for various ENT surgeries in which, bloodless surgical field is of paramount importance. Bleeding control is usually attained with local application of epinephrine[4]. Sympathetic stimulation caused by pain during surgery may lead to tachycardia and hypertension and consequently increased bleeding in the surgical field. Commonly used drugs in MAC e.g. benzodiazepines, propofol and opioids have many untoward effects which may hamper patient's cooperation during surgery and would make these agents less than ideal for the intraoperative management of sedation in MAC.[16]

With the development of highly specific α2 agonists, clonidine (α2/α1 is 200:1) and dexmedetomidine (α2/α1 is 1600:1), there has been a renewed interest in this class of drugs for use in perioperative period since they offer both sedation, analgesia without significant respiratory depression and can provide induced hypotension with a bloodless surgical field.[12]

In our study when clonidine was used in MAC; sedation and analgesia were significantly superior as compared to control group. Sedation and analgesic effects of clonidine have been reported in previous studies in which it was used with general anesthesia.[11,17,18] The locus ceruleus, the largest noradrenergic cell Group in the brain and an important modulator of wakefulness, has been indicated to be the major site for the sedative-hypnotic action of alpha-2 adrenoceptor agonists like clonidine via stimulation of the alpha-2a adrenoceptors.[19] The quality of sedation produced by clonidine differs from that of midazolam. Clonidine lacks the psychotropic quality of benzodiazepines and will cause a state of sedation more similar to normal tiredness-sleepiness where the patient can easily be awaken to perform tests. The result is a calm patient who can be easily aroused to full consciousness.[20] Clonidine interacts with α-2 adrenoceptors of substantia gelatinosa in the dorsal horn of spinal cord normally responsible for endogenous pain modulation and inhibits the firing of nociceptive neurons stimulated by peripheral A and C fibers.[21]

In the present study, it was observed that mean arterial pressure and heart rate were significantly lower leading to significantly less bleeding scores in clonidine groups as compared to control groups, which was in concordance to previous studies.[12,22,23] Clonidine stimulates α2 adrenergic inhibitory neurons in the medullary vasomotor center resulting in decreased sympathetic nervous system outflow from the central nervous system to the peripheral tissues. It reduces heart rate by a presynaptically mediated inhibition of sympathetic tone caused by a reduction of noradrenaline release, peripheral vasodilatation and by a direct vagomimetic effect.[24] Clonidine not only lowers the baseline blood pressure values but also lowers the set point around which arterial blood pressure is regulated. Clonidine neither alters catecholamine metabolism nor does it blocks ganglion transmission or adrenergic receptors. Thus, the protective reflexes triggered by a reduction in blood pressure are still functional and vasoactive and inotropic drugs still remain effective[25]. Hemodynamic effects of clonidine on intravenous administration

occur within 30 min[26] approximately which was observed in our study also. Controlled hypotension effectively reduces surgical blood loss and improves surgical conditions. Clonidine facilitates controlled hypotension by decreasing the heart rate, systolic, diastolic and mean blood pressure.[27] Clonidine[17] and dexmedetomidine[14,28] both are found effective in reducing bleeding in ENT surgeries.

Raghuvanshi et al (2014)[29] studied the effect of clonidine (30 μg) as an adjuvant with local anesthetic (12 ml of 2% Xylocaine with 1:200000 adrenaline) for infiltration anesthesia in tympanoplasty surgeries. They reported that addition of clonidine to local anesthetic in block was associated with significantly less bleeding in the operative bleeding, improved quality of intraoperative anesthesia and prolonged duration of postoperative analgesia without significant side effects.

We observed that patient and surgeon satisfaction scores were significantly higher in clonidine Groups which could be attributed to superior sedation, analgesia and bloodless surgical field provided by clonidine. Clonidine produces calm patient that can be easily aroused to full consciousness.[20] Additional analgesic property of α2 agonists also contributes to higher patient satisfaction rate in clonidine Group. Surgeons were more satisfied in clonidine Group since α2 agonists have the ability to provide bloodless surgical field[10,14] and interruption of surgery by patient's complaint of pain requiring rescue analgesic was also less with clonidine. Many authors have reported better satisfaction profile of patient and surgeon when clonidine was used as adjuvant.[12,22]

Intravenous clonidine and midazolam were compared for MAC in ENT surgeries in our previous study (Kumari et al 2012).[12] Better analgesia, bloodless surgical field and superior satisfaction scores were found in clonidine group, while mean sedation scores were higher in midazolam group. Midazolam causes sedation by GABA receptor activation. Alpha-2 receptors are found densely in the pontine locus ceruleus which is an important source of sympathetic nervous system innervations of the forebrain and a vital modulator of vigilance. The sedation effects evoked by α2 agonists most likely reflects inhibition of this nucleus.[12] Results of that study showed that clonidine can't be an alternative to midazolam in MAC. One more limitation of the study being, clonidine bolus was not followed by infusion.

Taking note of results of previous study, two regimes of clonidine (bolus alone or bolus followed by infusion) were used as an adjunct to conventional MAC regime of midazolam and fentanyl in the present study. When two clonidine regimes were compared, patients receiving clonidine bolus and infusion demonstrated better sedation profile, less bleeding score and higher satisfaction scores as compared to patients receiving clonidine bolus alone. Previous studies[12,30] have also recommended that clonidine bolus should be followed by infusion as with dexemeditomidine.[6]

Despite the sedative properties, clonidine is associated with faster recovery from anesthesia and less postoperative sedation, as it lacks the psychotropic quality and will cause a state of sedation more similar to normal tiredness sleepiness where the patient can easily be awoken[20] and also because of the reduced needs for both sedatives as well as opioids. We observed no difference regarding time from the end of surgery to discharge readiness from PACU.

Clonidine in therapeutic doses is devoid of significant adverse effects as supported by our study. Clonidine in higher doses can cause respiratory depression, hypotension and bradycardia.[31] It should be avoided in cases of prolonged P-R interval and spontaneous bradycardia. Clinically important complications with clonidine though few, needs to be kept in mind.[12]

LIMITATIONS

There were certain limitations with the study due to resource constraints at our institute like, inability to measure sedation level with bi spectral index, therapeutic plasma concentrations of clonidine, noradrenaline.

CONCLUSION

We conclude that clonidine 3 μg/kg IV bolus followed by infusion of 0.3 μg/kg/hr may be used as an adjunct to conventional MAC regime of midazolam and fentanyl for variety of ENT procedures. It provides superior sedation, analgesia and bloodless surgical field leading to better satisfaction of both patient and surgeon. Being a safe, well tolerated, cheap and effective regime, our study favors its use in routine for MAC in ENT surgeries.

Conflict of interest: None declared by the authors.

Appendix 1: Various scores used in the study

A. Observer's Assessment of Alertness/Sedation score:

OAAS score 5—awake and responds readily to name spoken in normal tone.

OAAS score 4—lethargic responses to name in normal tone.

OAAS score 3—responds only after name is called loudly and/or repeatedly.

OAAS score 2—responds only after name called loudly and mild shaking.

OAAS score 1—does not respond when name is called loudly and mild shaking or prodding.

OAAS score 0—does not respond to noxious stimulation.

Score≤4: Acceptable

B. Intraoperative bleeding scale

0 - No bleeding

1 - Slight bleeding; no suctioning of blood required

2 - Slight bleeding; occasional suctioning required. Surgical field not threatened.

3- Slight bleeding; frequent suctioning required. Bleeding threatened surgical field a few seconds after suction was removed.

4 - Moderate bleeding; frequent suctioning required. Bleeding threatened surgical field directly after suction was removed.

Score 0,1,2: Acceptable

C. **Likert Scale for satisfaction**[24] (for patient and surgeon)

1 Extremely dissatisfied	2 Dissatisfied	3 Somewhat dissatisfied	4 Undecided	*5* *Somewhat satisfied*	*6* *Satisfied*	*7* *Extremely satisfied*

Score 5,6,7: Acceptable

D. **Post Anaesthesia Recovery Score (Modified Aldrete Score)**

Parameter	Score		
	2	1	0
Activity	Moves all extremities voluntarily or on command	Moves two extremities voluntarily or on command	Unable to move extremities
Respiration	Breathes deeply and coughs freely	Dyspneic, shallow or limited breathing	Apneic
Circulation	BP ± 20 mm of preanaesthetic level	Bp ± 20-50 mm of preanaesthetic level	BP ± 50 mm of preanaesthetic level
Consciousness	Fully awake	Arousable on calling	Not responding
Oxygen saturation	SpO_2>92% on room air	Supplemental O_2 required to maintain SpO_2>90%	SpO_2<90% with O_2 supplementation

Total score: 10, score of ≥9 is required for discharge

E. Visual Analogue Scale VAS (0-10)

0 *No pain*	*2*	4	6	8	10 Worst pain

VAS >3 is pain

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