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Use of Intravenous Infusion of Dexmedetomidine As an Adjuvant To Local Anesthesia in Middle Ear Surgery

KEYWORDS: Dexem infusion, ear surgery

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ABSTRACT *The new selective α -2 adrenergic agonist dexmedetomidine (dex) has sedative, analgesic and anxiolytic properties. we hypothesized that dex, when administered intravenously during ear surgery with local anesthesia, provides awake sedation, hemodynamic stability, better post operative analgesia and thus improves patient comfort and surgeon satisfaction.Asa grade i and ii patients of either sex aged 18-60 were randomly allocated into 2 equal groups of 20 each. patients in group 'd' received intravenous(i.v.) loading dose of 1µg/kg dex over 10 minutes and maintenance dose of 0.5 µg/kg/hr given till closure of surgery. patients in group 'c' (control group) received normal saline at similar rate to group d. the level of sedation was assessed by ramsey'score, per operative hemodynamic changes, surgical field in term of visual blood loss and duration of post operative analgesia was recorded.Group 'd' achieved good sedation than control group. Dex also reduced the requirement of anagesic drug post operatively. both group patients were hemodynamicaly stable.Intravenous dexmedetomidine administration provides good sedation peri operatively with hemodynamic stability and better post operative analgesia.*

Introduction

Middle ear surgery under local anesthesia presents a number of challenges to the anesthesiologist. Adequate anxiolysis, sedation, analgesia and proper maintenance of intra operative hemodynamics is required, so as to avoid blood loss & provide bloodless field for the surgeons operating under microscopes. Along with this patient's comfort under local anesthesia is also to be sought for. Dexmedetomidine (Dex) is one of such drug which provides anxiolysis, hypnosis, analgesia, sympatholysis without significant respiratory depression by its highly selective alpha-2 adrenoreceptor agonistic effect. The rationale for performing this study is to assess the effect of Dex as analgesic and sedative in middle ear surgery under local anesthesia. In view of the above observations, present study was conducted as randomized, double blinded, parallel group, placebo controlled and open label manner.

Aims of study

To study sedative, hypnotic and analgesic effect of Dex.

To study sympatholytic effect of Dex on hemodynamic stability.

To provide bloodless surgical field for surgeon's comfort.

Methods and Materials

After obtaining the institutional ethics committee clearance and written informed consent from each patient, 40 adult patients of American Society of Anesthesiologists (ASA) grade I & II aged 18-55 years undergoing elective middle ear surgery under local anesthesia were included in this study. All study patients were randomly allocated in to 2 equal groups of 20 each (group C= control group and group D = Dex group)

Exclusion criteria

Patients above 55 years.

Patients with higher degree AV block.

Patients with obesity and obstructive sleep apnea.

Patients on Non Steroidal Anti Inflammatory Drugs, opioid analgesics, Mono Amine Oxidase inhibitors.

Patients having renal, hepatic, psychiatric, respiratory and cardiac disorders.

Pre study evaluation

Pre anesthetic evaluation of all patients consists of detailed history, clinical examination and routine investigations. All patients were kept nil by mouth 6 hour prior to surgery considering the possibility of local anaesthesia converting into general anaesthesia. Vital signs recorded in pre-operative room was considered as baseline values. All patients were explained about Visual Analogue Scale (VAS).

Preparation of solution

Infusion for group D was prepared by adding 2 ml (200 mcg) of Dex to 48 ml of normal saline, thus preparing a 50 ml solution with concentration of 4mcg/ml. Infusion for group C was 50 ml of plain 0.9% normal saline.

Premedication

After securing an IV line with 20G cannula, Injection Ringer Lactate 500ml started slowly. All the patients received injection i.v. ondansetron 0.08 mg/kg and injection i.v. glycopyrrolate 0.004 mg/kg 10 minutes before surgery. Simultaneously, Infusion of the study or control solution was started for patients of group D or group C respectively, initially at a rate of 1 mcg/kg/hr over 10 min (bolus dose)

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followed by infusion of 0.5 mcg/kg/hr (maintenance dose) till end of surgery. Same rate of infusion was maintained for control group.

After completion of bolus dose of Dex, painting and draping were allowed. Surgeons infiltrated Xylocaine with Adrenaline 2% 5-8 ml post aurally and in ear canal at the junction of bony and septal cartilage for local anesthesia. 4% Xylocaine wick was placed at tympanic membrane.

Monitoring

During the period of infusion of study/control solutions Heart Rate(HR), Saturation of peripheral oxygen(SpO2), Systolic Blood Pressure(SBP), Diastolic Blood Pressure(DBP), Mean Arterial Pressure(MAP), Electrocardiogram(ECG), Sedation level by Ramsay Sedation Scale(RSS) were closely monitored in all the patients. Oxygen was given to all patients through nasal cannula at rate of 4 liters/min.

Comparison of MAP and HR were done in two groups- baseline (before receiving control or study solution- MAP_0 HR_0), after completion of bolus solution (MAP_1 HR_1), after local infiltration (MAP_2 HR_2), at the time of skin incision (MAP_3 HR_3) and intra-op period at regular interval of 10 min till end of surgery & thereafter in Post Anesthetic Care Unit (PACU) every 30 min for 2 hours.

Sedation level was assessed with Ramsay Sedation Scale (RSS) at regular intervals same as hemodynamic parameters. RSS was the first scale to be defined and was designed as a test of arousability. The RSS scores sedation at six different levels, according to how arousable the patient is.

Ramsay Sedation Scale

1 Patient is anxious and agitated or restless, or both

2 Patient is co-operative, oriented, and tranquil

3 Patient responds to commands only

4 Patient exhibits brisk response to light glabellar tap or loud auditory stimulus

5 Patient exhibits a sluggish response to light glabellar tap or loud auditory stimulus

6 Patient exhibits no response

Surgical field in term of visual blood loss estimation as reported by surgeons was recorded.

Grade I – blood less field not hampering surgery

Grade II – mild bleeding requiring occasional suctioning

Grade III – excessive bleeding hampering surgery despite suctioning

Visual Analogue Scale

The Visual Analogue Scale (VAS) is designed to present to the respondent a rating scale with minimum constraints. Respondents mark the location on the 10-centimeter line corresponding to the amount of pain they experienced. This gives them the greatest freedom to choose their pain's exact intensity. It also gives the maximum opportunity for each respondent to express a personal response style. VAS data of this type is recorded as the number of millimeters from the left of the line with the range 0-100. Post op analgesia was assessed by Visual Analog Scale (VAS). Patients having VAS score >3 were given supplemental analgesia in form of injection diclofenac 75mg IV.

Patients were observed throughout the surgery for bardycardia (HR<45/m) and hypotension (MAP<20% of baseline value or SBP<90 mmHg). Bradycardia was treated with injection i.v. Atropine 0.6mg & hypotension with fluid challenge and vasoactive agents as and when required. Additional boluses of injection i.v. Fentanyl 0.5mcg/kg given in agitated patients intermittently to maintain MAP & HR within 20% of their baseline values.

All the patients were shifted to PACU and observed for 2 hours and then shifted to respected wards.

Observations & Results

Table 1: DEMOGRAPHIC DATA

	GROUP D	GROUP C
AGE	40±20	40±20
SEX(M:F)	11:9	12:8
ASA(1:2)	12:8	13:7
WEIGHT	55±10	57±10

Table 2: PER OP SEQUELE, ADVERSE REACTION AND TREATMENT

	GROUP D	GROUP C
Additive analgesia	1/19	7/16
Nausea and vomiting	1/19	1/19
Bradycardia	2/19	0/20
Atropine(IV 0.6 mg)	1/19	0/20
General Anesthesia Required	0/20	1/19

In our study, our both groups (C & D) were comparable in respect of demographic data such as age, sex, weight & ASA physical status. There was no difference in mean duration of surgery between both groups.

MAP and HR were significantly decreased in group D after administration of loading dose of Dex. i.e. MAP_1 & HR_1 in group D were significantly lower when compared with MAP_0 & HR_0 ($p<0.001$), whereas there was no statistical significance in above two parameters in group C. MAP & HR after local infiltration & skin incision rose in both groups, but the rise was more in group C. Maximum fall in MAP & HR was seen at 60 min of skin incision in group D. Though there was decrease in MAP, patients were hemodynamically stable throughout the duration of surgery. Out of 20 patients in group D, 2 patients were reported to have significant bradycardia peroperatively, 1 of them required injection Atropine 0.6mg IV to overcome bradycardia. Only 1 patient in group D required additional analgesia as compared to 7 in group C. Duration of post op analgesia was prolonged in group D as compared to group C. In one patient from group C, intra operative supplementation with general anesthesia was required.

According to RSS, most patients in group D showed score of 3-4 as compared to group C which showed score of 1-2 indicating higher patient comfort in study group without respiratory depression. In group D majority of patients had grade I surgical field, whereas none of the patients had grade III surgical field. Thus it is evident that patients receiving Dex had a better surgical field as compared to pa-

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tients receiving placebo (group C).

Discussion

A number of techniques/agents have been advocated to achieve hypotension during middle ear surgery. Amongst the pharmacological agents, Dex is the most recently introduced drug to provide hypotension during middle ear surgery under local anesthesia. Dex, along with providing controlled hypotension, has sedative, hypnotic, anxiolytic & analgesic property which is needed in surgery performed under local anesthesia to improve patient's & surgeon's comfort level. Its sympatholytic action had shown to decrease MAP & HR by reducing Norepinephrine release.

Few recently done studies have found definite role of Dex in reducing supplemental dose of analgesics & anesthetics perioperatively. The result of our study indicates that use of Dex infusion, during middle ear surgery under local anesthesia, reduced the requirement of supplementation with general anesthesia as compared to group C.

In present study, it is evident that patients receiving Dex (group D) had a better surgical field as compared to patients receiving placebo (group C). The probable mechanism of reducing blood pressure by Dex is attributed to stimulation of peripheral alpha2 adrenoreceptors of vascular smooth muscles. This results in decrease in blood pressure& heart rate secondary to inhibition of central sympathetic outflow. This in turn helps by reducing blood loss at the surgical site & improving quality of surgical field and surgeon's comfort.

In our study, patients in group D showed RSS score 3-4 as compared to group C showing score of 1-2. Patients in group D are more comfortable than placebo group during surgery. Though patients in group D are sedated, they are easily arousable, a unique feature not observed with other sedative & inhalational agents.

During study only 1 patient in group D required injection atropine to treat bradycardia. All the patients were hemodynamically stable& none of them required vasopressor agent or bolus administration of fluids to maintain hemodynamic status. None of patients showed respiratory depression perioperatively.

Requirement of analgesia during post operative period was also one of the prime motives to carry out this study. Duration of analgesia (from bolus of Dex to first requirement of analgesics- VAS>3) was prolonged in group D as compared to placebo group.

Chart 1: Per operative Heart Rate (HR)

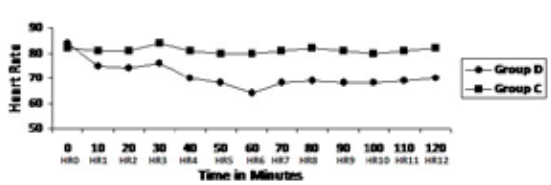


Chart 2: Per operative Mean Arterial Pressure (MAP)

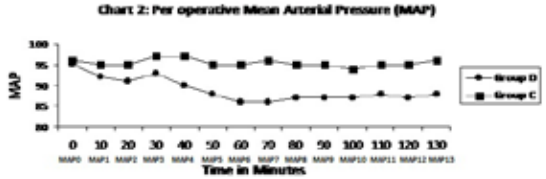


Chart 3: Per operative sedation level assessed by Ramsay's score

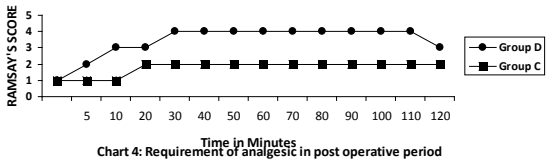


Chart 4: Requirement of analgesic in post operative period

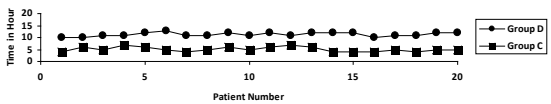
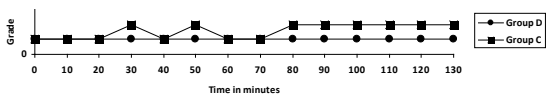


Chart 5: Surgical Field in terms of visual blood loss



Conclusion

Dexmedetomidine infusion peroperatively as an adjuvant to local anesthesia in middle ear surgery provides good sedation, analgesia & hemodynamic stability without significant complications. Thus it adds to patient's comfort both intraoperatively & postoperatively as well as to surgeon's satisfaction.

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