Original Research Article

Efficacy of dexmedetomidine infusion in patients undergoing tympanoplasty surgery under local anaesthesia

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Abstract

Background: Tympanoplasty is done under local anaesthesia using a microscope and require good surgical field visibility. Dexmedetomidine is a highly selective α2 adrenergic agonist used for analgesia and sedation, sympatholytic and hemodynamically stabilizing properties.In the present study, the dexmedetomidine infusion was used to evaluate the efficacyin patients undergoing tympanoplasty surgery under local anaesthesia. **Material and Methods:** 32 adult patients of ASA physical status I and II of both genders scheduled for elective middle ear surgery were enrolled for this prospective study. Dexmedetomidine bolus dose was 1 µg/kg diluted in normal saline solution and the maintenance dose 0.5 µg/kg/h was used. Local anesthesia was given using 10–15 ml of lidocaine 2% with adrenaline 1/200,000 to block auricular and auriculotemporal nerves. Pentazocine was used as rescue analgesic. During procedure the bleeding at surgical site and quality of anaesthesia was assessed. **Results:** Grade I minimum bleeding at surgical site was observed in 26 patients and none of the patients had bleeding of Grade III troublesome bleeding. Rescue LA infiltration was required only in 2 patients and rescue analgesics in intraoperative period was required in only 3 patients. Mean VAS Score in postoperative period was found to be 7.212±0.59. Hypotension (8/32), bradycardia (6/32) and dry mouth (3/32) were observed as complications. Quality of anaesthesia was excellent in 26 patients. **Discussion:** Dexmedetomidine infusion was safe to provide oligaemic surgical field for better visualization under operating microscope for tympanoplasty surgery under local anaesthesia.

Key Words: Tympanoplasty, Dexmedetomidine, local anaesthesia, bleeding.

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INTRODUCTION

Tympanoplasty is a surgical technique of reconstruction of perforated tympanic membrane with or without ossiculoplasty[1]. It is usually done under local anesthesia with sedation under monitored anesthesia care or general anesthesia[2-4]. It is a fine surgical procedure done under a microscope and require good surgical field visibility without post-operative nausea and vomiting. Sympathetic stimulation and movements of an anxious patient may cause increased bleeding and disturb the microscopic surgery which may even lead to graft failure. Thus, it poses a different set of challenges for the patient, surgeons and anesthesiologists. These techniques are revolutionized with the introduction of hypotensive anaesthesia that provides a relatively bloodless field while using an operating microscope. Even small amount of blood can obscure the microscopic operating field and decreasing the extravasation of blood may improve the results of surgical procedures. Different techniques and drugsare used to minimize intra-operative blood loss during middle ear surgery. Dexmedetomidine is a highly selective α2 adrenergic agonist approved by FDA in 1999 for use in humans for analgesia and sedation[5-7],

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sympatholytic and hemodynamically stabilizing properties[8]. It is increasingly being used as a sedative for monitored anaesthesia care. It regulates the autonomic and cardiovascular systems by acting on blood vessels and inhibiting norepinephrine release at sympathetic terminals, thereby attenuating the heart rate and blood pressure responses to intra-operative stressful events of anaesthesia. It effectively minimizes the surgical blood loss and improves the surgical field visibility. In the present study, the dexmedetomidine infusion was used to produce oligaemic surgical field during middle ear surgery using operating microscope and was aimed to evaluate the efficacy of dexmedetomidine infusion in patients undergoing tympanoplasty surgery under local anaesthesia.

MATERIAL AND METHODS

After approval from institutional Ethical Committee and written informed consent, 32 adult patients of American Society of Anaesthesiologists (ASA) physical status I and II of both genders scheduled for elective middle ear surgery were enrolled for this prospective study. Patients less than 18 years and above 55 years and with cardiac or respiratory disease, hypertension, obesity (body mass index > 26 kg/m^2), hepatic or renal dysfunction, bleeding or coagulation disorders were excluded. Patients with a history of anticipated difficult airway, those on sedatives, hypnotics or antihypertensive medication or allergy to any anaesthetic medications were also excluded from the study. On arrival to the operation theatre, the baseline systemic blood pressure, heart rate, peripheral oxygen saturation (SpO_2) and ECG were recorded. After establishing the intravenous line, lactate Ringer solution was started. Initial sedation bolus of dexmedetomidine should be given over 10 min. The bolus and infusion doses were calculated according to patient weight. Patients received IV Dexmedetomidine 1mcg/kg; diluted in 10ml normal saline over 10 minutes; followed by infusion of dexmedetomidine and normal saline at 0.5mcg/kg/hr using an infusion pump. Local anesthesia was given using 10–15 ml of lidocaine 2% with adrenaline 1/200,000 to block auricular and auriculotemporal nerves. The time from start of bolus drug injection till patient achieve adequate sedation was recorded. Patients were asked to rate the VRS (Verbal Rating Scale; 0 = no pain, 10 = maximal pain) for pain on local anesthesia injections. Duration of operation was calculated from the start of local anesthesia injection till skin closure. The same surgeon performed all operations. Intraoperatively Mean Arterial Pressure (MAP) and Heart Rate (HR) were continuously monitored throughout surgery and recorded every 5 min. Intravenous bolus of pentazocine hydrochloride 300 mcg slowly over 10 min through an intravenous line which was secured preoperatively (diluted in 100 ml of normal saline with infusion rate of 10 ml/min) was given if patient was still complaining of pain or discomfort during operation. During procedure the bleeding at surgical site was assessed by the surgeon as Grade 0-no bleeding-excellent surgical conditions; Grade I-minimum bleeding, sporadic suction needed; Grade II-diffuse bleeding, repeated suction needed; and Grade III-considerable, troublesome bleeding, and continuous suction was needed. Patients were transferred to post-anaesthesia care unit for observation of any respiratory depression, haemodynamic changes, nausea/vomiting or any other drug-induced side-effects or complications.

RESULTS

The present study evaluated the efficacy of dexmedetomidine infusion in 32 patients undergoing tympanoplasty surgery using operating microscope under local anaesthesia. The demographic data of age, sex, weight, ASA physical status and duration of surgery are shown in table 1.

Table 1: Patient demographic characteristics

Variables	Total Patients (n=32)
Age (years)	29.7±9.6
Sex (Male/ Female)	17/15
Weight (kgs)	62.4±5
ASA grade (I/II)	14/18
Duration of surgery (min)	69.2 ± 15.75

The operating microscope was used throughout the surgery and surgeons observed Grade I bleeding (minimum bleeding with sporadic suction) at surgical site in 26 patients and none of the patients had bleeding of Grade III troublesome bleeding. All patients were able to obey the commands, and the duration of awakening time and recovery was within normal limits. Post-operative respiratory rate and peripheral SpO_2 were normal with no episode of desaturation at any time. There was fall in heart rate and mean arterial pressure, which provides an additional advantage of controlled hypotension with good visibility in the surgical field and less graft failure. Requirement of Rescue LA infiltration was required only in 2 patients and rescue analgesics in intraoperative period was required in only 3 patients. Mean VAS Score in postoperative period was found to be 7.212±0.59. Hypotension (8/32), bradycardia (6/32) and dry mouth (3/32) were observed as complications which were easily treatable. Quality of Anaesthesia was assessed by asking operating surgeon. It was found that Quality of anaesthesia was excellent in 26/32 patients, better in 5/32 patients and poor in one out of 32 patients.

DISCUSSION

Dexmedetomidine provides effective anaesthesia and analgesia in intraoperative and postoperative period. Procedures like tympanoplasty, can safely and effectively be done using dexmedetomidine as a sole anaesthetic agent. Dexmedetomidine also provides hypotensive anaesthesia leading to oligaemic surgical field and reduced requirement of analgesicsin intraoperative as well as postoperative period.It has a short distribution half-life of 5 minmaking it mandatory to administer dexmedetomidine via infusion to give maintenance dose of 0.2-0.7mcg/kg/hr following bolus dose of 1mcg/kg. We chose a loading dose of 1 µg/kg of dexmedetomidine and a maintenance dose of 0.5 µg/kg/hrbased on previous literature[9,10] and studies[11,12]. Reports suggest that on administration of low or moderate doses and slow rates of infusion of dexmedetomidine, α_2 agonist effects are observed but not α_1 effect[13,14]. In the study of Bekker *et al*[15], patients received an initial loading dose of 1 µg/kg of dexmedetomidine over 10 min, followed by a continuous infusion of 0.5 µg/kg/h and they concluded that intra-operative dexmedetomidine infusion was effective for blunting the perioperative haemodynamic responses with no incidence of hypotension or bradycardia. In present study 8 patients had hypotension and was corrected with bolus administration of fluid to maintain haemodynamic status without any major consequences. A meta-analysis of previous studies showed that the incidence of bradycardia requiring intervention was increased when maintenance dosages of dexmedetomidine were used in excess of 0.7 µg/kg/h. Parikh *et al*[16] compared the efficacy of dexmedetomidine concentration (0.2microgram/ kg/ hr) and concluded that dexmedetomidine group had a significant fall in HR (15-20%) ($p<0.001$) from 2min after start of infusion till end of surgery in comparison to control group. In our study, six patients suffered from bradycardia as dexmedetomidine infusion was given in loading dose of 1 µg/kg dose and maintenance dose of 0.5 µg/kg/h was given. The lower heart rate and mean arterial pressure 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. Aho and Erkola[17] have studied the effects of dexmedetomidine infusion in a concentration of 0.2 µg/kg/ hr and concluded that good sedation levels were achieved with dexmedetomidine. Parikh *et al*[16] compared the sedative properties of dexmedetomidine vs midazolam – fentanyl in patients undergoing tympanoplasty. They concluded that Dexmedetomidine in doses of 0.2 µg/kg/ hr gave higher satisfaction scores. In present study, hypotension (8/32), bradycardia (6/32) and dry mouth (3/32) were observed as complications which were easily treatable. Dexmedetomidine was well tolerated, and none of the patients developed any drug-related major side-effects in the perioperative period.Dexmedetomidine is unique in that it does not cause respiratory depression because its effects are not mediated by the gamma aminobutyric system[18]. These findings are similar to other studies[12,19]. The present study demonstrated significantly higher patient and surgeon satisfaction scores with dexmedetomidine suggesting a better quality of sedation of the drug[11]. To conclude, Dexmedetomidine infusion was safe to provide oligaemic surgical field for better visualization under operating microscope for tympanoplasty surgery under local anaesthesia.

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