

Use of intravenous dexmedetomidine in modified radical mastoidectomy under general anesthesia

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Received: April 18, 2018; Accepted: May 03, 2018

ABSTRACT

Background: Modified radical mastoidectomy is a microscopic ENT procedure which when performed under general anesthesia (GA) required nitroglycerin for control of intraoperative bleeding at the surgical site. When dexmedetomidine used as an adjuvant to anesthetic drugs, nitroglycerin is rarely used. **Objective:** The aim of this study is to evaluate the efficacy of dexmedetomidine on the reduction of intraoperative bleeding in modified radical mastoidectomy under GA. **Materials and Methods:** This study was conducted on 100 adult ASA Grade I/II patients of either sex, scheduled for modified radical mastoidectomy under GA. Grading of bleeding at the surgical site, a number of patients required nitroglycerin for control of bleeding were recorded. **Results:** No patient in Group D required nitroglycerin for reduction of bleeding, but 40 patients in Group C required nitroglycerin for reduction of bleeding. The overall incidence of significant bleeding which required frequent suctioning in control group was 40 (80%) compared with 0 (0%) in the dexmedetomidine group. **Conclusion:** Infusion of dexmedetomidine in perioperative period significantly reduced the requirement of nitroglycerin for controlled hypotension.

KEY WORDS: α_2 -Adrenoceptor, Dexmedetomidine, Heart Rate, Mean Arterial Blood Pressure

INTRODUCTION

Modified radical mastoidectomy is the surgery of choice in most patients suffering from chronic suppurative otitis media. It is usually done under general anesthesia. Patient and surgeon both are comfortable under general anesthesia. It has been observed that bleeding is more at the surgical site under general anesthesia. The pressor response, which is part of the huge spectrum of stress response, results from the increase in sympathetic and sympathoadrenal activity, as evidenced by increased plasma catecholamines concentration in patients undergoing surgery under general


anesthesia (GA).^[1-5] Sometimes blood loss is troublesome, interfere with surgical field so controlled hypotension is requested by surgeon. Generally, nitroglycerine is used for controlled hypotension.

Dexmedetomidine is the most recently released intravenous (i.v.) Anesthetic. It is a highly selective α_2 -adrenoceptor agonist that produces sedation, sympatholysis, hypnosis, and analgesia. It has minimal effect on respiration. Heart rate (HR) and cardiac output show a concentration-dependent decrease.^[6]

The aim of this study is to evaluate the efficacy of dexmedetomidine on the reduction of intraoperative bleeding in modified radical mastoidectomy under general anesthesia.

MATERIALS AND METHODS

This prospective, randomized; double-blind controlled trial was approved by hospital ethical committee. After taking

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| Website: http://www.ijmsph.com | Quick Response code |
| DOI: 10.5455/ijmsph.2018.0413403052018 |  |

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informed consent, 100 patients of ASA Grade I and II aged between 20 and 50 years, scheduled for modified radical mastoidectomy under general anesthesia were selected. Pregnant and nursing women are not included in this study. Patients with a history of cardiovascular disease and history of allergy to any of the study medication are also not included.

The research methodology was prospectively randomized with the help of computer-generated coded envelopes and patients were divided into two groups ($n = 50$); Group D and Group C. Dexmedetomidine was administered to Group D first as a loading dose of 1 $\mu\text{g}/\text{kg}$ and then intraoperative maintenance with dexmedetomidine 0.5 $\mu\text{g}/\text{kg}/\text{hr}$. Group C (control group) was given the identical amount of saline. All drugs were prepared by an anesthesiologists not involved with the study to keep the study investigator blinded.

All patients were fasted for 8 h in the pre-operative room; glycopyrrolate 0.2 mg i.m. was administered as premedication. A good i.v. access was secured, and baseline parameters were observed and recorded, which included HR, mean arterial blood pressure (MAP), electrocardiogram, respiratory rate, and pulse oximetry. Thereafter, Group C received 100 ml of normal saline for 20 min. While Group D received 1 $\mu\text{g}/\text{kg}$ of dexmedetomidine in 100 ml of normal saline over 20 min and 2 $\mu\text{g}/\text{kg}$ of Fentanyl 3 min before the induction of anesthesia. The patient was preoxygenated with 100% O_2 for 3 min, and anesthesia was induced by propofol 2 mg/kg Succinylcholine 100 mg i.v. was administered as the muscle relaxant for intubation and orotracheal intubation done with appropriate size ETT. Anesthesia was maintained with isoflurane 0.8–1% and nitrous oxide 70% in O_2 30%. Muscle relaxation was achieved by injection atracurium 0.4 mg/kg i.v. and maintained by injection atracurium 0.08 mg/kg i.v. Group C received normal saline, and Group D received dexmedetomidine 0.5 $\mu\text{m}/\text{kg}/\text{h}$ for maintenance.

The heart rate and MAP were recorded at 3 min intervals during the surgery. The bleeding during the operation was observed by the surgeon and intraoperative grading as follows:

- 0 = No bleeding - excellent surgical condition;
- 1 = Minimum bleeding and sporadic suction;
- 2 = Diffuse bleeding and repeated suction;
- 3 = Considerable, troublesome bleeding, and continuous suction.

When there is diffuse bleeding and repeated suction is required, surgeon is requested of controlled hypotension, then we use nitroglycerin for controlled hypotension. In each group, how much patients are required nitroglycerin, is noted.

At the end of the surgical procedure, reversal had done with neostigmine 2.5 mg and glycopyrrolate 0.5 mg intravenously. Extubation was carried out as routine procedure and patients were shifted to the recovery ward for further observation.

Unpaired student *t*-test and Chi-square test were used for analyzing the data. $P < 0.05$ was considered statistically significant.

RESULTS

Patient's age, weight, and ASA physical status are presented in Table 1. There were no significant differences in patient's characteristics among the groups.

The number of patients who required nitroglycerin for reduction of bleeding in each group is shown in Table 2.

No patient in Group D required nitroglycerin for reduction of bleeding, but 40 patients in Group C required nitroglycerin for reduction of bleeding.

Bleeding during the operation as assessed by the surgeon is shown in Table 3.

The overall incidence of significant bleeding which required frequent suctioning in control group was 40 (80%) compared with 0 (0%) in the Group D.

Table 1: Demographic data (Mean \pm SD)

| Parameter | Control group | Group D |
|-------------|---------------|--------------|
| Age (years) | 30 \pm 8.1 | 31 \pm 7.7 |
| Weight (kg) | 50 \pm 7.2 | 52 \pm 7.2 |
| ASA I/II | 35/15 | 36/14 |

SD: Standard deviation

Table 2: Number of patients required nitroglycerin

| Group | Number of patients required nitroglycerin |
|---------|---|
| Group C | 40 |
| Group D | 00 |

$n=50$

Table 3: Grading of bleeding

| Grading | Bleeding | Group C | Group D |
|---------|------------------------------------|---------|---------|
| 0 | No bleeding | 0 | 10 |
| 1 | Minimum bleeding | 10 | 40 |
| 2 | Diffuse bleeding | 30 | 0 |
| 3 | Considerable, troublesome bleeding | 10 | 0 |

$n=50$

DISCUSSION

Our investigation indicates that use of i.v. dexmedetomidine reduces intraoperative bleeding at the surgical site in modified radical mastoidectomy under general anesthesia. In control group, most of the patients require nitroglycerin for reduction of bleeding, but no patients in Group D require nitroglycerin.

In our study, no patients in dexmedetomidine group required nitroglycerin for controlled hypotension while 40 patients in control gp required nitroglycerin for controlled hypotension. Another study was carried out by Durmus *et al.* for evaluating the efficacy of dexmedetomidine on bleeding during tympanoplasty or septoplasty.^[6] They concluded that dexmedetomidine is a useful adjuvant to decrease bleeding when a bloodless surgical is requested.

A study conducted by Ayoglu *et al.* concluded that dexmedetomidine reduces bleeding, bleeding scores, and intraoperative fentanyl consumption during GA in septoplasty operation.^[7] In our study also patients of dexmedetomidine group are having no and minimum bleeding and patients of the control group are having diffuse and considerable bleeding.

In our study, we used dexmedetomidine for controlled hypotension. In another study conducted by Tobias and Berkenbosch also concluded that dexmedetomidine can be used for controlled hypotension in spinal surgery.^[8]

In the present study, surgical field is better in Group D. This result is supported by various other studies conducted by Nasreen *et al.*,^[9] Gupta *et al.*,^[10] and Chiruvella *et al.*^[11] they concluded that patients receiving dexmedetomidine infusion had a better surgical field. These findings can be attributed to the fact that dexmedetomidine is the highly selective α_2 -adrenoceptor agonist that produces sedation, sympatholysis, hypnosis, and analgesia. Heart rate and cardiac output show a concentration-dependent decrease^[12] so that providing better surgical field.

Only few studies are carried out on use of dexmedetomidine infusion for control of intraoperative bleeding. Hence, this study having large number of patients provides useful data for guiding future studies. Limitation of this study is that we just observed bleeding at the surgical site and depends on surgeons for scoring.

Due to its central sympatholytic effect, dexmedetomidine is useful in blunting hemodynamic responses in perioperative period. It is successfully used in i.v. doses varying from 0.25 to 1 mcg/kg for attenuating intubation response.^[13-16] The optimal dose for attenuating pressor response seemed to be 1 mcg/kg with lesser doses not being effective.^[16] Infusion

continued into the post-operative period has been associated with reduced hemodynamic fluctuations and decrease in plasma catecholamines.^[14] Different characteristics of the dexmedetomidine provide better hemodynamic profile thus reduces intraoperative bleeding.

CONCLUSION

Infusion of dexmedetomidine in a perioperative period significantly reduced the requirement of nitroglycerin for controlled hypotension. The dexmedetomidine is a useful adjuvant to decrease bleeding when a bloodless surgical field is requested by surgeons.

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How to cite this article: Gohiya S, Gohiya VK. Use of intravenous dexmedetomidine in modified radical mastoidectomy under general anesthesia. *Int J Med Sci Public Health* 2018;7(8):647-650.

Source of Support: Nil, **Conflict of Interest:** None declared.