

**ORIGINAL ARTICLE****Dexmedetomidine infusion as anaesthetic adjuvant during middle ear surgery in children**<sup>1</sup>Shivali Bandhu, <sup>2</sup>Radha Rani Singh<sup>1</sup>Associate Professor, Department of Paediatrics, Major S D Singh Medical College & Hospital, Farukhabad, Uttar Pradesh, India<sup>2</sup>Associate Professor, Department of Anaesthesiology, Major S D Singh Medical College & Hospital, Farukhabad, Uttar Pradesh, India**ABSTRACT:**

**Background:** Middle ear surgery under general anaesthesia is revolutionised with the introduction of hypotensive anaesthesia. The present study evaluated the role of dexmedetomidine infusion as anaesthetic adjuvant during middle ear surgery in children. **Materials & Methods:** 60 Pediatric patients aged ranged 12-17 years of both genders selected for elective middle ear surgery. Group I patients received infusion of dexmedetomidine 0.5 µg/kg/hour and group II patients received placebo infusion of normal saline during middle ear surgery after induction of anaesthesia till 20 minutes before completion of surgery. All patients were assessed intra-operatively for bleeding at surgical field and haemodynamic changes. **Results:** Group I had 16 males and 14 females and group II had 13 males and 17 females. The mean surgical time in group I was 98.2 minutes and in group II was 102.4 minutes, heart rate was at baseline in group I was 95.1 beats/min and in group II was 93.8 beats/min, after induction was 72.3 beats/min in group I and 73.0 beats/min in group II, after intubation 5 min was 78.6 beats/min in group I and 76.4 beats/min in group II, 30 min was 74.6 beats/min in group I and 79.8 beats/min in group II, at 60 min was 70.7 beats/min in group I and 88.2 beats/min in group II and after extubation was 85.5 beats/min in group I and 96.3 beats/min in group II. The difference was significant (P< 0.05). There was mean percentage of isoflurane requirement of 0.87% in group I and 1.45 % in group II. The difference was significant (P< 0.05). **Conclusion:** Dexmedetomidine infusion provided oligoemic surgical field for better visualisation for middle ear surgery under operating microscope.

**Key words:** Dexmedetomidine, Middle ear surgery, Tympanoplasty**Corresponding author:** Radha Rani Singh, Associate Professor, Department of Anaesthesiology, Major S D Singh Medical College & Hospital, Farukhabad, Uttar Pradesh, India**This article may be cited as:** Bandhu S, Singh RR. Dexmedetomidine infusion as anaesthetic adjuvant during middle ear surgery in children. J Adv Med Dent Sci Res 2015;3(2):282-285.**INTRODUCTION**

Middle ear surgery under general anaesthesia is revolutionised with the introduction of hypotensive anaesthesia that provides a relatively bloodless field while using an operating microscope.<sup>1</sup> The primary methods to minimise blood loss during middle ear surgery included mild head elevation of 15°, and infiltration or topical application of epinephrine (1: 50,000 or 1: 200,000). Currently, many inhalational or intravenous anaesthesia techniques were evaluated to offer ideal intra-operative conditions for middle ear surgery with their advantages and disadvantages.<sup>2</sup> Tympanoplasty can be done both under local or general anesthesia. Some surgeons prefer using local anesthesia for middle ear surgery owing to various advantages such as less bleeding and being able to test hearing during the surgery itself. However, local anesthesia alone has been reported to be associated with anxiety, dizziness, claustrophobia, and earache; hence, there is always a quest to find out an anesthetic drug, which can be used with local anesthetic block with maximum benefit and with minimum associated disadvantages.<sup>3</sup> Dexmedetomidine (dexM), is a centrally acting α-2 receptor agonist with analgesic

and conscious sedative effect without respiratory depression. It has been reported to significantly reduce the opioid requirements both during and after surgery. It is valuable because of its anaesthetic and analgesic-sparing effects with predictable and dose-dependent haemodynamic effects.<sup>4</sup> The present study evaluated the role of dexmedetomidine infusion as anaesthetic adjuvant during middle ear surgery in children.

**MATERIALS & METHODS**

The present study consisted of 60 Pediatric patients aged ranged 12-17 years of both genders selected for elective middle ear surgery. A written consent was obtained from parents.

Data such as name, age, gender etc. was recorded. Patients were randomly divided into two groups of 30 patients each. Group I patients received infusion of dexmedetomidine 0.5 µg/kg/hour and group II patients received placebo infusion of normal saline during middle ear surgery after induction of anaesthesia till 20 minutes before completion of surgery. Parameters such as bleeding at surgical field, haemodynamic changes, awakening time and post-operative recovery were recorded. Results thus

obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

**RESULTS**

**Table I: Distribution of patients**

Groups	Group I	Group II
Agent	Dexmedetomidine	Placebo
M:F	16:14	13:17

Table I shows that group I had 16 males and 14 females and group II had 13 males and 17 females.

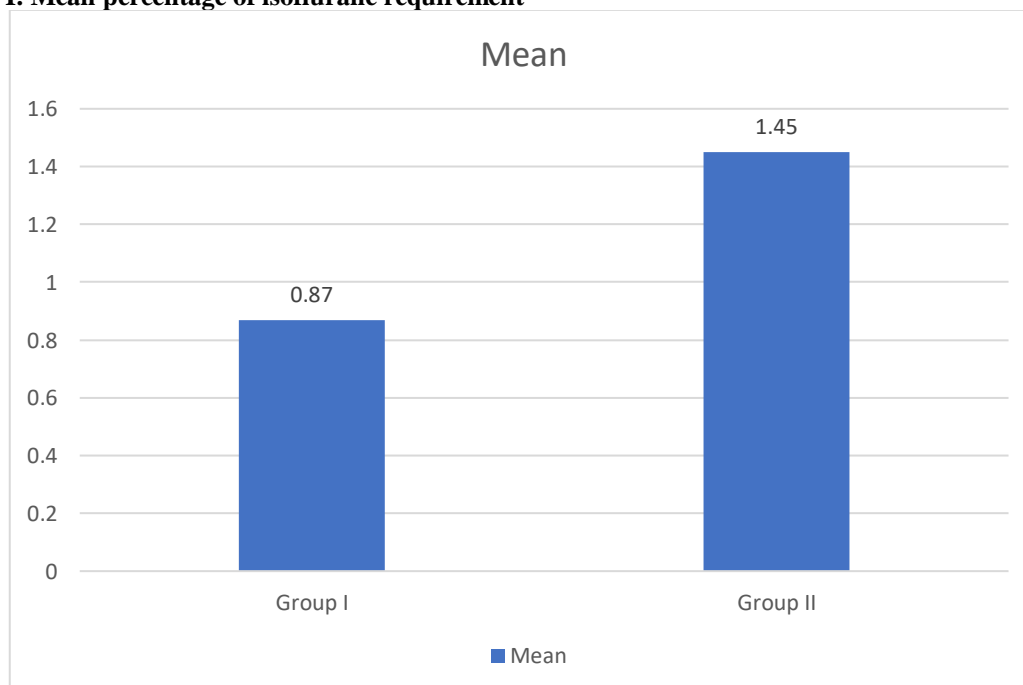
**Table II: Comparison of parameters**

Parameters	Variables	Group I	Group II	P value
Surgical time (minutes)		98.2	102.4	0.04
Heart rate (beats/min)	Baseline	95.1	93.8	0.05
	After induction	72.3	73.0	
	After intubation 5 min	78.6	76.4	
	30 min	74.6	79.8	
	60 min	70.7	88.2	
	After extubation	85.5	96.3	
Intra- operative bleeding	0	0	0	0.02
	1	20	5	
	2	10	20	
	3	0	5	

Table II shows that mean surgical time in group I was 98.2 minutes and in group II was 102.4 minutes, heart rate was at baseline in group I was 95.1beats/min and in group II was 93.8beats/min, after induction was 72.3beats/min in group I and 73.0 beats/min in group II, after intubation 5 min was 78.6beats/min in group I

and 76.4beats/min in group II, 30 min was 74.6beats/min in group I and 79.8beats/min in group II, at 60 min was 70.7beats/min in group I and 88.2beats/min in group II and after extubation was 85.5beats/min in group I and 96.3beats/min in group II. The difference was significant (P< 0.05).

**Graph I: Mean percentage of isoflurane requirement**



Graph I shows that there was mean percentage of isoflurane requirement of 0.87% in group I and 1.45 % in group II. The difference was significant (P< 0.05).

**DISCUSSION**

The primary methods to minimise blood loss during middle ear surgery included mild head elevation of 15°, and infiltration or topical application of epinephrine (1: 50,000 or 1: 200,000). Currently, many inhalational or intravenous anaesthesia techniques were evaluated to offer ideal

intra-operative conditions for middle ear surgery with their advantages and disadvantages.<sup>5</sup> A variety of drugs are being used viz., propofol, benzodiazepines and opioids have been used for hypnosis, sedation and analgesia in the middle ear surgery in order to enhance the patient and surgical comfort; however, none has been completely complication free. Among various complications reported are - over-sedation, respiratory depression, disorientation and hampered patient's cooperation during surgery.<sup>6</sup> There have been several reports on the successful use of dexM as the primary sedative drug for orthopedic, ophthalmic, dental, and plastic surgery, and for diagnostic procedures.<sup>8</sup> Due to its analgesic properties, cooperative sedation and lack of respiratory depression, dexM is increasingly being used as a sedative for monitored anesthesia care, dexM has a sympatholytic effect that can attenuate the stress response to surgery (tachycardia and hypertension) and maintains hemodynamic stability.<sup>7</sup> As dexM inhibits the central sympathetic outflow and inhibits the norepinephrine release by stimulation of  $\alpha$ -2 adrenoceptor, it is expected to decrease MAP.<sup>8</sup> The present study evaluated the role of dexmedetomidine infusion as anaesthetic adjuvant during middle ear surgery in children.

We found that group I had 16 males and 14 females and group II had 13 males and 17 females. Bekker et al<sup>9</sup> patients received an initial loading dose of 1  $\mu$ g/kg of dexmedetomidine over 10 min, followed by a continuous infusion of 0.5  $\mu$ g/kg/h and they determined that intra-operative dexmedetomidine infusion was effective for blunting the perioperative haemodynamic responses with no incidence of hypotension or bradycardia.

We found that mean surgical time in group I was 98.2 minutes and in group II was 102.4 minutes, heart rate was at baseline in group I was 95.1 beats/min and in group II was 93.8 beats/min, after induction was 72.3 beats/min in group I and 73.0 beats/min in group II, after intubation 5 min was 78.6 beats/min in group I and 76.4 beats/min in group II, 30 min was 74.6 beats/min in group I and 79.8 beats/min in group II, at 60 min was 70.7 beats/min in group I and 88.2 beats/min in group II and after extubation was 85.5 beats/min in group I and 96.3 beats/min in group II. Patel et al<sup>10</sup> compared an intraoperative dexmedetomidine infusion with bolus fentanyl to reduce perioperative opioid use and decrease emergence agitation in children with obstructive sleep apnea syndrome undergoing adenotonsillectomy (T&A). One hundred twenty-two patients with obstructive sleep apnea syndrome undergoing T&A, ages 2 to 10 years. After mask induction with sevoflurane, group D received IV dexmedetomidine 2  $\mu$ g  $\cdot$  kg(-1) over 10 minutes, followed by 0.7  $\mu$ g  $\cdot$  kg(-1)  $\cdot$  h(-1), and group F received IV fentanyl bolus 1  $\mu$ g  $\cdot$  kg(-1). Pain was evaluated using the objective pain score in the PACU on arrival, at 5 minutes, at 15 minutes, then every 15 minutes for 120 minutes.

Emergence agitation was evaluated at the same intervals by 2 scales: the Pediatric Anesthesia Emergence Delirium scale and a 5-point scale described by Cole. Morphine (0.05 to 0.1 mg  $\cdot$  kg(-1)) was given for pain (score >4) or severe agitation (score 4 or 5) lasting more than 5 minutes. In group D, 9.8% patients needed intraoperative rescue fentanyl in comparison with 36% in group F. Mean systolic blood pressure and heart rate were significantly lower in group D. Minimum alveolar concentration values were significantly different between the 2 groups. The median objective pain score was 3 for group D and 5 for group F. In group D, 10 (16.3%) patients required rescue morphine, in comparison with 29 (47.5%) in group F. The frequency of severe emergence agitation on arrival in the PACU was 18% in group D and 45.9% in group F; at 5 minutes and at 15 minutes, it was lower in group D. The duration of agitation on the Cole scale was statistically lower in group D. In group D, 18% of patients and 40.9% in group F had an episode of Spo2 below 95%.

We found that there was mean percentage of isoflurane requirement of 0.87% in group I and 1.45 % in group II. Ear surgery may cause post-operative dizziness (vertigo), nausea and vomiting as inner ear is intimately involved with a sense of balance. Induction with propofol decreases the post-operative nausea and vomiting in patients undergoing middle ear surgery. Prophylaxis with palonosetron, a 5-hydroxytryptamine 3 receptor blocker in premedication may be considered.<sup>11</sup>

## CONCLUSION

Authors found that dexmedetomidine infusion provided oligoemic surgical field for better visualisation for middle ear surgery under operating microscope.

## REFERENCES

- Hall JE, Uhrich TD, Barney JA, Arain SR, Ebert TJ. Sedative, amnestic, and analgesic properties of small-dose dexmedetomidine infusions. *Anesth Analg* 2000;90:699-705.
- Lee YY, Wong SM, Hung CT. Dexmedetomidine infusion as a supplement to isoflurane anaesthesia for vitreoretinal surgery. *Br J Anaesth* 2007;98:477-83.
- Tanskanen PE, Kytta JV, Randell TT, Aantaa RE. Dexmedetomidine as an anaesthetic adjuvant in patients undergoing intracranial tumour surgery: A double-blind, randomized and placebo-controlled study. *Br J Anaesth* 2006;97:658-65.
- Yildiz M, Tavlan A, Tuncer S, Reisli R, Yosunkaya A, Otelcioglu S. Effect of dexmedetomidine on haemodynamic responses to laryngoscopy and intubation: Perioperative haemodynamics and anaesthetic requirements. *Drugs R D* 2006;7:43-52.
- Jellish WS, Owen K, Edelstein S, Fluder E, Leonetti JP. Standard anesthetic technique for middle ear surgical procedures: A comparison of desflurane and sevoflurane. *Otolaryngol Head Neck Surg* 2005;133:269-74.
- Ayoglu H, Yapakci O, Ugur MB, Uzeen L, Altunkaya H, Ozer Y, et al. Effectiveness of dexmedetomidine in

- reducing bleeding during septoplasty and tympanoplasty operations. *J Clin Anaesth* 2006;53:646-52.
7. Sudheesh K, Harsoor S. Dexmedetomidine in anaesthesia practice: A wonder drug? *Indian J Anaesth* 2011;55:323-4.
  8. Marchal JM, Gómez-Luque A, Martos-Crespo F, Sánchez De La Cuesta F, Martínez-López MC, Delgado-Martínez AD. Clonidine decreases intraoperative bleeding in middle ear microsurgery. *Acta Anaesthesiol Scand* 2001;45:627-33.
  9. Bekker A, Sturaitis M, Bloom M, Moric M, Golfinos J, Parker E, et al. The effect of dexmedetomidine on perioperative hemodynamics in patients undergoing craniotomy. *Anesth Analg* 2008;107:1340-7.
  10. Patel A, Davidson M, Tran MC, Quraishi H, Schoenberg C, Sant M, Lin A, Sun X. Dexmedetomidine infusion for analgesia and prevention of emergence agitation in children with obstructive sleep apnea syndrome undergoing tonsillectomy and adenoidectomy. *Anesthesia & Analgesia*. 2010 Oct 1;111(4):1004-10.
  11. Firat Y, Kizilay A, Akarcay M, Yucel A, But K, Yologlu S. The effect of dexmedetomidine on middle ear pressure. *Otolaryngol Head Neck Surg* 2007;137:218-23.