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Postoperative Analgesia in Tympanomastoid Surgery with Great Auricular Nerve Block

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Abstract

Background: Great auricular nerve block provides better postoperative analgesia than systemic analgesics in tympanomastoid surgery, henceforth reduces chances of systemic side effects like nausea and vomiting as systemic analgesics used being minimized. This prospective randomized clinical study was carried out to evaluate the efficacy of great auricular nerve block, to compare the total number of analgesics required in 24 hours period postoperatively and to look for complications if any. *Methods:* In this prospective randomized clinical study, 60 patients of ASA Grade I or II, aged 18 to 65 years, undergoing tympanomastoid surgery were randomly allocated in Two groups. Group G (n = 30) patients received great auricular nerve block, and Group C (n = 30) as control Group. All patients were premedicated with Inj. Nalbuphine (0.15 mg/kg), and general anesthesia was given using conventional method. In Group G great auricular nerve block was given using 0.25% Inj. bupivacaine 7 ml with Injection Epinephrine 5 µg/ml 1:200000 prior to reversal of general anesthesia.and Group C (Control Group) didn't receive the block. *Results:* Duration of postoperative analgesia was 20.67 ± 4.54 hours in Group G and 2.13 ± 4.18 hours in Group C ($p < 0.001$). Total number of rescue analgesics required in 24 hours in postoperative period less in Group G compared to Group C. *Conclusions:* The Great auricular nerve block provides prolonged duration of action and decreased number of rescue analgesic in postoperative period for patients posted for mastoidectomy.

Keywords: Bupivacaine; Great auricular nerve block; Postoperative analgesia; Tympanomastoid surgery.

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Introduction

The great auricular nerve block has been used in patients for all acts on external ear, in cosmetic surgeries, emergency wound repair and other painful procedures of the ear.[1–5] Systemic analgesics are routinely used for postoperative analgesia in tympanomastoid surgeries,[9] which adds to nausea and vomiting, that generally follows middle ear surgeries.[8] There have been nominal studies of the particular block as a sole modality for postoperative analgesia in tympanomastoid surgery.[1] In children, the use of block as analgesic in tympanomastoid surgery has been studied and found comparable

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to systemic analgesics and incidence of vomiting events was found less.[1,5] Our aim of study was to evaluate the efficacy of the Great auricular nerve block for postoperative analgesia following tympanomastoid surgery in adults and observe for any complications.

Materials and Methods

The present study was carried out in the Department of Anesthesiology, tertiary care hospital from October 2011 to October 2012. It was a prospective randomized controlled study of total 60 patients. Sample size was calculated using *n*-master 2.0 software, and total duration of analgesia as main parameter and minimum 26 per group patients required so, we have studied 30 patients in each of the group.[1]

We have included 60 patients between the ages of 18 and 65 year; with American Society of Anesthesiologists (ASA) physical status I & II of either gender; who were scheduled to have tympanomastoid surgery in this prospective randomized comparative clinical study. Patients on anticoagulant drugs or with bleeding disorders; facial or other nerve palsy; infection, trauma, scar or sinuses at the site of block; patient with known hypersensitivity to local anesthetic drug; pregnant and lactating women; patients unable to speak or understand the verbal command and Visual Analog Score (VAS); patients unwilling to participate in the study; patient with any psychiatric illness were excluded from the study.

All the patients underwent a thorough preanesthesia check-up and routine investigations were carried out for all patients. Special investigations like ECG, Chest *X*-Ray or others were done depending upon the history and examination. Patients were explained in detail about the objective of study, methodology, advantage and likely complications. Written informed consent was taken from those patients who were ready to participate in the study. In the preoperative room, they were explained about VAS score and to request pain relief as and when required following anesthesia. All the patients were kept nil by mouth for at least six hours. All patients received oral Ranitidine 150 mg and oral Diazepam 10 mg orally on night prior to surgery. Injection Glycopyrrolate 5 mcg/kg intramuscularly was given 45 min before induction and Injection Nalbuphine 0.15 mg/kg was given intravenously three min before induction. After giving Injection Ranitidine 50 mg intravenously and Injecton Ondansentron 4 mg intravenously, conventional general anesthesia was given.

The anesthetic technique was standardized for both the groups. After preoxygenation with 100% oxygen for 5 min, general anesthesia was induced with injection Propofol 2 mg/kg intravenously, injection Suxamethonium 1.5 mg/kg intravenously. Anesthesia was maintained with 50% N_2O in O_2 with Isoflurane and Inj. Vecuronium Bromide. Patients were randomly allocated in Two Groups. Group G (n = 30) patients received great auricular nerve block with 0.25% Inj. Bupivacaine 7 ml with Injection Epinephrine 5 mcg/ml 1:200000, using distilled water as diluent whereas Group C (n = 30) Control Group did not receive block.

The block was performed at the end of surgery prior to reversal of general anesthesia. Distilled water was taken as diluent. Patient's head was turned towards the side opposite to the block to be given. After all aseptic and antiseptic precautions, two reference marks were identified first mastoid process and second lateral edge of sternocleidomastoid muscle on cricoid level. The block was given on the line joining the two marks. The puncture was done with 24G 1.5 inch needle over second mark, a wheal was raised by Infradermic Injection of 1 ml anesthetic solution (as mentioned above) after negative aspiration test. The needle was then advanced towards mastoid in the infradermic plane; and anesthetic solution was administered after negative aspiration test while gradually withdrawing the needle, very slowly. A discrete massage was then given towards mastoid to support the diffusion of the solution.[6] After arrival of respiratory effort, Injection Neostigmine 50 mcg/kg and Injection Glycopyrrolate10 mcg/kg were given intravenously. Patients were extubated after fulfillment of criteria for extubation.

Vital parameters including pulse rate, blood pressure and SpO_2 measured at basal, at induction, intraoperative, before block and after block in Group G), before extubation, after extubation every 5 min upto 30 minutes, were observed. Effectiveness of sensory block was assessed by pinprick test in comparison with the contralateral area. Visual analog score was noted every hourly up to 8 hours, then 2 hourly for the first 24 hours postoperatively. When VAS was more than or equal to 4, Injection Diclofenac sodium 1.5 mg/kg intravenously was given as rescue analgesic. Time interval from extubation to the time at which VAS 4 or more, being considered as total duration of postoperative analgesia and also total number of analgesics required within 24 hours were noted. Patients were observed for complications if any.

The results of the study were statistically analyzed by using Fischer test, Manu whitney test, Chi-square test (for qualitative data-Gender, ASA Grade) , paired *t*-test (for quantitative Data-Heart-rate, Blood pressure, SpO_2, Respiratory-rate) and unpaired *t*-test for rest of quantitative data. Results were expressed as Mean ± SD. ($p > 0.05$ not significant, $p < 0.05$ significant and $p < 0.001$ is highly significant).

Results

The present study was carried out in the Department of Anesthesiology, Medical College and SSG Hospital, Vadodara from March 2011 to January 2012 to evaluate postoperative analgesia in tympanomastoid surgery with great auricular nerve block.

The numbers of patient in either group were 30. The mean age of patients was 26.7 ± 10.04 years in Group G and 27.8 ± 12.74 years in Group C. The ratio of Male to Female was 17:13 in Group G and 18:12 in Group C. The mean weight of patients was 56.43 ± 7.6 kg in Group G and 59.03 ± 6.91 kg in Group C. 76.66% of patients in Group G and 70%in Group C were of ASA class I while rest of the patients were of ASA II. Thus, both the groups were comparable to each other with regards to the demographic data of the patient. ($p > 0.05$), (Table 1).

On intragroup comparison, fall in mean blood pressure was statistically highly significant intraoperatively in both the groups and showed no significant change before or after block in Group G. The rise in mean blood pressure was statistically highly significant after extubation and statistically significant at 5 and 10 min after extubation & statistically insignificant after 20 min of extubation in both the groups, thus, attained near preoperative values in both the groups 15 minutes after extubation. On intergroup comparison, a change in mean blood pressure was statistically insignificant perioperatively.

On intragroup comparison, fall in mean pulse rate was statistically highly significant intraoperatively in both the groups and showed no significant change before or after block in Group G. The rise in mean pulse rate was statistically highly significant after extubation and statistically significant at 5 and 10 min after extubation & statistically insignificant after 15 min of extubation in both the groups, thus attained near preoperative values in both the groups 15 minutes after extubation. On intergroup comparison, a change in mean pulse rate was statistically insignificant perioperatively.

The mean duration of tympanomastoid surgery was 182.16 ± 32.10 minutes in Group G and 194.33 ± 33.34 minutes in Group C. Thus, nature and duration of surgery was comparable amongst both the groups. There was no significant inter or intragroup difference in mean oxygen saturation perioperatively ($p > 0.05$).

The mean duration of postoperative analgesia was 20.67 ± 4.55 hours in Group G and 2.126 ± 4.18 hours in Group C as checked using pinprick method, the *p* - value being < 0.001, shown in Table 2. Thus, total duration of postoperative analgesia was significantly longer in Group G patients compared to Group C patients ($p < 0.001$). Requirement of rescue analgesic was much earlier in Group C compared to Group G. In Group G, 15 patients required no analgesics 24 hours postoperatively while 12 patients required 1 analgesic, 2 patients required 2 & 1 patient required 3 analgesics postoperatively. In Group C, 17 patients required 2 analgesics and 13 patients required 3 analgesics, (Fig. 1).

In Group G, mean VAS score continued to be low up to 16 to 20 hours postoperatively. While in Group C, mean VAS score gradually increased

Table 1: Demographic data

Parameters	Group G	Group C	*p* - Value
Number of patients	30 (100%)	30 (100%)	$p > 0.05$
Age (in years, Mean ± SD)	26.7 ± 10.04	27.8 ± 12.74	$p > 0.05$
Sex (Male : Female)	17:13	18:12	$p > 0.05$
Weight (in kg, Mean ± SD)	56.43 ± 7.6	59.03 ± 6.91	$p > 0.05$
ASA (I : II)	23 (76.66%):07 (23.33%)	21 (70%):09 (30%)	$p > 0.05$

Table 2: Postoperative analgesia

Parameters	Group G	Group C	*p* - value
Duration of analgesia (Mean ± SD) (hrs)	20.67 ± 4.55	2.12 ± 4.18	< 0.001

up to 1 to 2 hours postoperatively and gradually decreased at 3 to 4 hours and continued to be low up to 8 to 10 hours, then gradually increased up to 20 hours.

On comparing the mean VAS score between two groups, shown in Fig. 2, the mean VAS score were significantly lower in Group G compared to Group C ($p < 0.001$) up to 18 hours postoperatively. And later the mean VAS score difference between two groups was not significant ($p > 0.05$). One patient in Group G failed to achieve analgesia, as evidenced by presence of pin prick sensation at the area of block. There was no other block related complications in any patients. Nausea and vomiting was reported in 2 cases in each of group, which was comparable.

Discussion

Controlling pain after tympanomastoid surgeries is important for patient comfort and well-being,

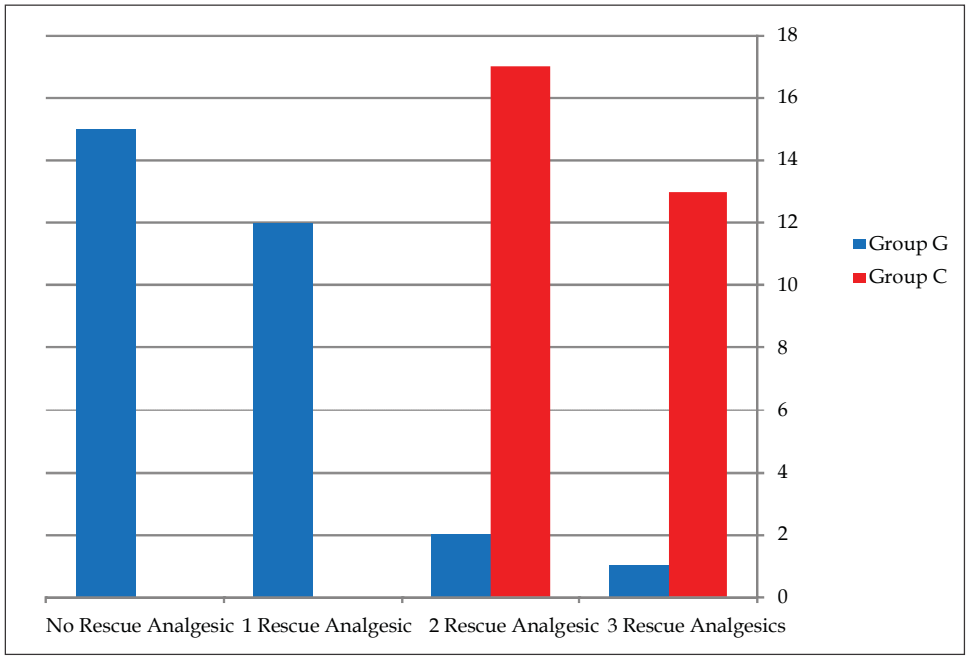

Fig. 1: Total number of rescue analgesics needed in total number of patients postoperatively

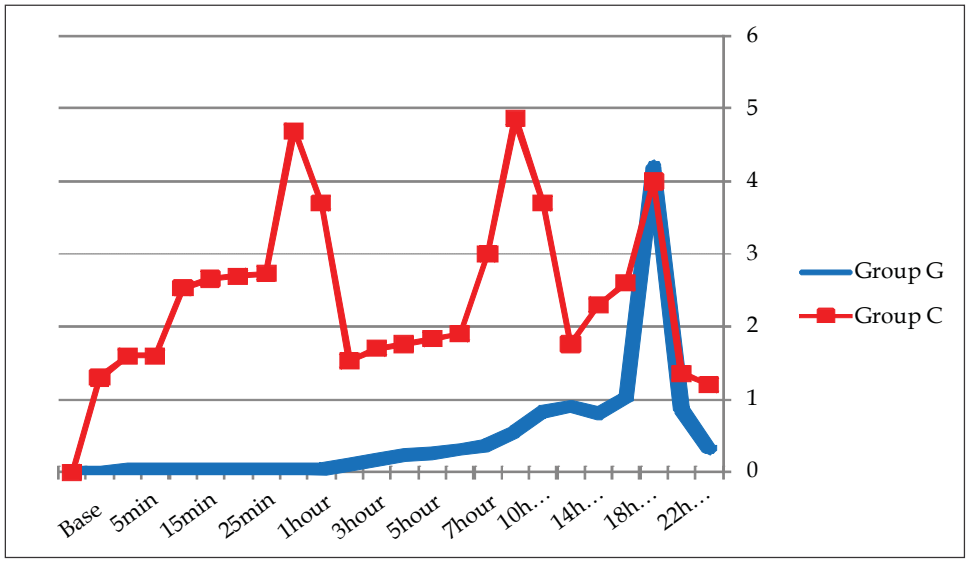

Fig. 2: Mean VAS (Visual Analogue Scale) score at different time intervals postoperatively

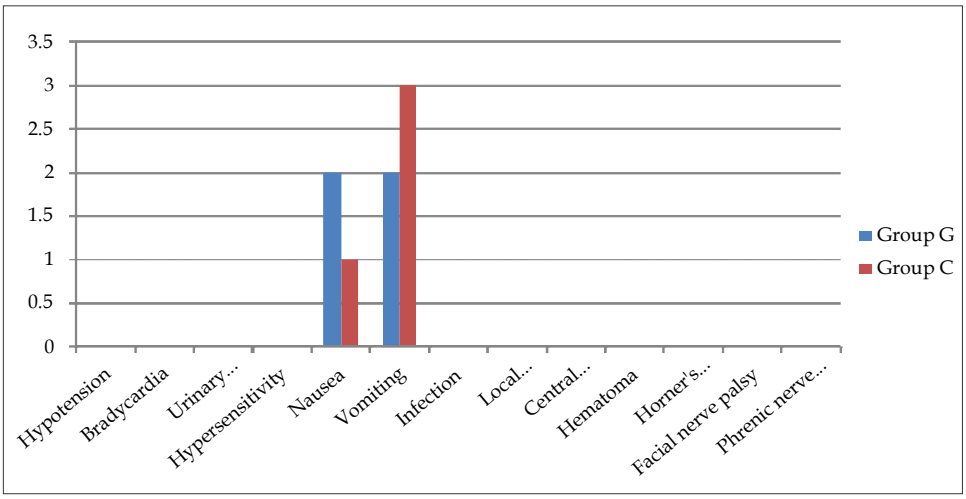

Fig. 3: Incidence of perioperative complications

especially in successful day care surgeries where one of the key elements is effectiveness of control of postoperative pain along with minimizing postoperative nausea-vomiting. Regional anesthetic techniques score over systemic medication by abolishing primary hyperalgesia due to tissue damage thus blocking central sensitization which prevents secondary hyperalgesia altogether. They block the volley of nerve impulses conducted by the unmyelinated C and Aδ fibers which carry it from peripheral somatic and visceral nociceptors to the dorsal horn of spinal cord. Peripheral nerve blocks has always been skillfully applied as part of analgesics with general anesthesia and has expanded its role from operating suite into the area of postoperative and chronic pain management.[11–14] Great auricular nerve a branch of superior cervical plexus supplies the sensory innervation to the mastoid area and the external ear.[7] Postoperative pain hampers the daily activity of patient and may cause embarrassment. Great auricular nerve block for analgesia following tympanomastoid surgery is now-a-days found to be one of the most effective means of perioperative pain relief.

In this study, 60 patients (30 in each group), aged between 18 and 60 years, of either sex were included. The mean age and sex of patients was comparable in both the groups. Elderly patients being more vulnerable to adverse effects of drug were excluded. Pediatric patients were excluded due to difficulty in assessing pain. The mean weight and ASA physical status was also comparable in both the groups. Patients were randomly allocated in two groups.

Group G patients received great auricular nerve block with 0.25% Inj. Bupivacaine 7 ml with Inj. Epinephrine 1:200000 (n = 30) . The block was performed at the end of surgery prior to reversal of general anesthesia. Group C was considered Control Group, whom block was not given (n = 30). We preferred the use of block prior to extubation so, as to prevent the onset of pain, which helps in psychological well-being, comfort and improvement in the general condition of the patient.[6,11,12] Technique of great auricular nerve block used in our study was by classical method.[1,5,6] Santhanam Suresh et al. also stated that the anatomic location of this nerve and the ease with which this nerve block can be performed does not significantly increase the procedure time.[15,16] In our study, we have used Bupivacaine 0.25%, as it has a long-duration of action and low-tissue toxicity. At this concentration sensory effects are seen predominantly. We have added Adrenaline 5 µg/ml (1:200000) to Inj. Bupivacaine so, as to decrease the peak plasma levels of bupivacaine.[1,5] The volume of drug used in our study was 7 ml 0.25% Inj. Bupivacaine HCl.[6] Rescue analgesia was given when VAS ≥ 4, in the form of Injection Diclofenac sodium 1.5 mg/kg. Failure of procedure in one case was observed. Nausea and vomiting were seen in 2 cases in both the groups, (Fig. 3).

On comparing the mean VAS score between two groups, the mean VAS score were significantly lower in Group G compared to Group C ($p < 0.001$) until 18 hours postoperatively, and later the mean VAS score between two groups was not significant. ($p > 0.05$). The mean duration of postoperative analgesia was 20.67 ± 4.55 hours in Group G and 2.12 ± 4.18 hours in group C ($p< 0.001$). Thus

total duration of post operative analgesia was significantly longer in Group G patients compared to Group C patients. A study by A Pulcini and JP Guerin also mentioned that a local anesthetic of long duration, with an additive drug, allows a very good quality of postoperative analgesia during at least ten hours. The mean duration of postoperative analgesia in the control group was around 2.12 ± 4.18 hour which might be due to long elimination half life of Inj. Nalbuphine (5 hours) given as premedication.

In Group G, patients required 0 to 1 dose of rescue analgesia in 24 hours postoperatively, while in Group C all patients required two to three doses of rescue analgesia.

Because the neck is very vascular, intravascular Injection of local anesthetic solution may occur, care should be taken while performing nerve block. Likely complications with great auricular nerve block include local anesthetic toxicity, hypersensitivity, inadvertent arterial puncture, hematoma, horner's syndrome, transitory facial nerve palsy, ipsilateral phrenic nerve paresis or central neuraaxial block.[7] All these complications can be avoided if injection of anesthetic solution is being done strictly in infradermal plane, that too, very slowly after aspiration.[6] Addition of Adrenaline to Bupivacaine decreases the peak plasma concentration of Bupivacaine thus decreases the chances of potential adverse effects.[1] The recurrent laryngeal nerve can sometimes be blocked during cervical plexus blockade. This usually occurs if the injection is performed deep at the posterior border of the sternocleidomastoid. Deep injection should be avoided as it can block the cervical sympathetic ganglia leading to Horner's syndrome (ptosis, miosis, and anhydrosis) or phrenic nerve paresis. Failure of procedure in one case was observed. Nausea and vomiting were seen in 2 cases in both the groups. Shown in Fig. 3, Rescue analgesia was given when VAS ≥ 4, Injection Diclofenac sodium 1.5 mg/kg and inspite of injection if patient does not have pain relief Inj. Tramadol 1 mg/kg intravenously was given.

Conclusion

We conclude that *The Great auricular nerve block* provides prolonged duration of action and decreased number of rescue analgesic in postoperative period for patients posted for mastoidectomy. We have not observed any complications.

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