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# A COMPARATIVE STUDY OF GREATER AURICULAR NERVE BLOCK VERSUS INTRAVENOUS FENTANYL FOR POSTOPERATIVE PAIN RELIEF FOLLOWING TYMPANOMASTOID SURGERIES

Anaesthesiology

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## ABSTRACT

In this comparative study of greater auricular nerve block (Group G) versus intravenous fentanyl (Group F) for postoperative pain relief following tympanomastoid surgeries, 70 patients were analyzed. Group G exhibited consistently lower Visual Analogue Scale (VAS) scores at all intervals (P value<0.05) compared to Group F, indicating superior pain relief. The need for rescue analgesia was also reduced in Group G. Only two cases of postoperative nausea and vomiting occurred in Group G. The study concludes that greater auricular nerve block is more effective in providing superior pain relief compared to conventional methods.

## KEYWORDS

Greater auricular nerve block, Intravenous fentanyl, Postoperative Pain, Tympanomastoid surgeries

## INTRODUCTION

Pain is always present in the postoperative period with any surgery, the severity of which varies with the type of surgery[1-3]. So management of pain in the post operative period is an essential one in the postoperative care, inadequate relief of which has adverse effects contributing to morbidity and mortality, resulting in delay of patient recovery and return of daily activities. Poor postoperative pain control contributes to patient dissatisfaction and adds on to adverse psychological consequences[4]. Because proper management of postoperative pain is beneficial the Joint Commission on Accreditation of Health Care has declared pain as "fifth vital sign". Mastoidectomy surgeries causes pain in the postoperative period, in addition to associated nausea and vomiting[5,6]. Failure of management of this pain would increase the recovery time.

The options available for management of pain in the postoperative period include Opioids, however they come with they come with their own set of problems like nausea, vomiting, constipation, respiratory depression[7,8]. Non Steroidal Anti-Inflammatory Drugs(NSAIDS) and regional anaesthesia techniques avoid these adverse effects associated with opioids. Opioids and NSAIDS has been the mainstay of management of postsurgical pain but various regional anaesthesia techniques are now emerging to avoid complications associated with opioid use[9-11]. This study is aimed at comparing the analgesic efficacy provided by that of a regional anaesthesia technique and intravenous opioid.

## MATERIALS AND METHODS

70 Patients undergoing tympanomastoid surgeries under general anaesthesia at K.D Medical College Hospital and Research Center, Mathura from JUNE 2023 – DECEMBER 2024 was assessed for inclusion and exclusion criteria and was included in the study after obtaining informed written consent.

### Inclusion criteria

- Patients undergoing elective tympanomastoid and tympanoplasty surgery
- Age between 18-55 years
- Males and females
- ASA class 1 and 2
- Patients who have given valid informed consent

### Exclusion criteria

- Patients not satisfying inclusion criteria.
- ASA PS 3 and above
- Patients with an allergy or sensitivity to local anesthetics.
- Patients with bleeding disorders.
- Patient refusal
- Facial or other nerve palsy
- Scar or sinuses at the site of block
- Pregnant and lactating women
- Patients unable to speak or understand the verbal command and Visual Analog Score (VAS)

### Methodology

This prospective randomized study was conducted in the ENT theatre of the K.D Medical College Hospital and Research Center, Mathura after obtaining institutional ethical committee approval. Written informed consent was obtained from all participants before enrolment in the study. The study included patients aged between 18 and 55 years who underwent elective tympanomastoid surgeries under General Anaesthesia.

70 Patients selected based on the above-mentioned inclusion criteria was counselled about the risks and benefits involved in the study. After getting consent, patients who were willing to be included in the study were enrolled and analyzed. Patients was divided into two groups of 35 patients in each group as Group G: Greater Auricular Nerve Block using 5ml of 0.25% Inj. Bupivacaine Group F: Intravenous Inj. Fentanyl 2mcg/kg

Preanaesthetic assessment of all patients was done the day before surgery. Patients was premedicated with Tab. Diazepam 5mg and proton pump inhibitors on day of surgery. On arrival in the operating room, baseline vitals was obtained and premedicated with glycopyrrolate (10mcg/kg) and midazolam (0.03 mg/ kg). Patients was monitored by three-lead ECG, automated non-invasive blood pressure monitoring, and pulse oximetry. All patients will be induced with propofol (3mg/Kg) IV. Tracheal intubation was facilitated with Inj. Atracurium (0.5mg/kg) and the patients was intubated with appropriate size cuffed endotracheal tube orally. Anaesthesia will be maintained with nitrous oxide and oxygen(70/30) and an inhalational anaesthetics for maintaining adequate depth in anesthesia and controlled ventilation was done throughout surgery with Inj. atracurium besylate (100mcg/kg) in titrated doses.

Towards the end of surgery to avoid postoperative nausea and vomiting associated with middle ear surgeries Inj. ondansetron (0.1mg/kg) was given. At 30mins prior to reversal of neuromuscular blockade, patients in Group G was administered Greater Auricular Block. Patient's head was turned towards the side opposite to the side block was given. After all aseptic precautions, two reference marks was identified, first mastoid process and second posterior border of sternocleidomastoid muscle on cricoid level. . The puncture will be done using a 25G hypodermic needle over second mark (which was confirmed by ultrasound), a wheal was then raised by Infradermic Injection and 5ml of 0.25% Inj. Bupivacaine anesthetic solution after negative aspiration test. The needle was then advanced towards the mastoid in the infradermic plane and anaesthetic solution administered after negative aspiration test, while gradually withdrawing the needle. A discrete massage was given towards mastoid to ease the diffusion of the solution. Whereas Patients in Group F received an intravenous injection of Inj. Fentanyl 2mcg/kg 30minutes prior to reversal of neuromuscular blockade.

After complete recovery patients was reversed with injection neostigmine (50mcg/kg) and Inj. Glycopyrrolate (10mcg/kg) and after thorough oral suctioning patients was extubated. Effectiveness of sensory block was assessed by pinprick test in comparison with the contralateral area.

The following parameters was monitored: Vitals including heart rate, mean arterial pressure,Spo2- baseline, on induction, 15minutes prior to administration of block/drug, 7minutes post administration of block/drug, 10minutes,20minutes, 30minutes post extubation. Visual Analogue Scale at 1st ,2nd, 3rd,4th,6th,8th, 12th,18th,24th hours, Duration of postoperative analgesia, Incidence of nausea and vomiting and other complications if any. Post operatively patients was give Inj. Diclofenac 1mg/kg I/M at VAS>4 as rescue analgesic.

## RESULTS

As shown in Table 1, demographic data were comparable between Group G and Group F. Tables 2 and 3 show intra- and postoperative changes in Hear rate, mean arterial pressure and SpO2. No significant difference was observed in hemodynamics and changes remained within the clinically normal ranges. Other parameters such as SpO2 and respiratory rate also remained stable.

**Table 1: Demographic data**

| Parameter | Group G | Group F | p-value |
|---|---|---|---|
| Number of patients | 35 | 35 | 0.14 |
| Age (Years) | 32.25 ± 3.96 | 33.74 ± 5.58 | 0.24 |
| Sex (Male : Female) | 29 : 6 | 30 : 5 | 0.17 |
| Weight (Kg) | 58.63 ± 5.74 | 59.85 6.74 | 0.27 |
| ASA I | 7 (20 %) | 6 (17.14 %) | 0.11 |
| ASA II | 22(62.86%) | 21(60 %) | 0.32 |
| ASA III | 6 (17.14 %) | 8 (22.86 %) | 0.28 |
| Duration of Surgery (Minutes) | 90.74 ± 15.63 | 100.41 ± 16.39 | 0.17 |

**Table 2: Intraoperative changes in mean HR, MAP and SpO2**

| Time (minutes) | HR | | | MAP | | | SpO2 % | | |
|---|---|---|---|---|---|---|---|---|---|
| | Group G | Group F | P -value | Group G | Group F | P -value | Group G | Group F | p -value |
| At baseline | 103 ± 3.85 | 108 ± 2.74 | > 0.05 | 100.11 ± 1.99 | 102.4 ± 2.22 | > 0.05 | 98.13 ± 0.96 | 99.13 ± 0.57 | >0.05 |
| After incision | 92.46 ± 5.96 | 92.2 ± 3.18 | > 0.05 | 84.42 ± 3.69 | 84.15 ± 2.14 | > 0.05 | 98.96 ± 0.22 | 99.3 ± 0.46 | >0.05 |
| 10 | 89.2 ± 2.96 | 81.73 ± 2.66 | > 0.05 | 86.02 ± 3.74 | 81.75 ± 2.74 | > 0.05 | 98.55 ± 0.19 | 99.11 ± 0.37 | >0.05 |
| 20 | 89.13 ± 4.69 | 82.33 ± 3.74 | > 0.05 | 86.44 ± 2.85 | 84.82 ± 3.44 | > 0.05 | 98.51 ± 0.39 | 99.12 ± 0.24 | >0.05 |
| 30 | 80.6 ± 1.99 | 79.8 ± 2.25 | > 0.05 | 81.6 ± 2.61 | 84.51 ± 2.28 | > 0.05 | 99.59 ± 0.21 | 99.46 ± 0.19 | >0.05 |

**Table 3. Postoperative changes in mean Heart rate, MAP and SpO2**

| Duration min | Pulse rate | | | MAP | | | SpO2 % | | |
|---|---|---|---|---|---|---|---|---|---|
| | Group G | Group F | P -value | Group G | Group F | P -Value | Group G | Group F | P -value |
| Immediate p. | 103.93 ± 4.63 | 102.93 ± 6.35 | >0.05 | 100.42 ± 1.74 | 99.2 ± 3.74 | >0.05 | 99.4 ± 0.44 | 99.7 ± 0.49 | >0.05 |
| 10min | 86.93 ± 4.12 | 83.46 ± 5.71 | >0.05 | 93.24 ± 2.61 | 95.02 ± 2.67 | >0.05 | 99.5 ± 0.45 | 99.6 ± 0.36 | >0.05 |
| 20min | 82.86 ± 3.96 | 81.13 ± 4.18 | >0.05 | 93.11 ± 3.17 | 93.91 ± 2.84 | >0.05 | 99.4 ± 0.61 | 99.6 ± 0.66 | >0.05 |
| 30min | 86.86 ± 5.74 | 78.26 ± 3.64 | >0.05 | 92.46 ± 2.96 | 92.42 ± 3.99 | >0.05 | 99.56 ± 0.47 | 99.46 ± 0.40 | >0.05 |

**Table 4. VAS SCORE**

| | 1st HR | 2nd HR | 3rd HR | 4th HR | 6th HR | 8th HR | 12th HR | 18th HR | 24th HR |
|---|---|---|---|---|---|---|---|---|---|
| Group G | 0.15± 0.03 | 0.91± 07 | 1.22 0.33 | 2.11± 0.41 | 2.51± 0.41 | 3.82± 0.33 | 3.71± 0.46 | 0.99± 0.14 | 0.17± 0.06 |
| Group F | 1.88± 0.61 | 4.58± 0.87 | 3.91± 0.67 | 3.99± 0.33 | 4.78± 0.55 | 5.77± 0.41 | 5.63± 1.80 | 2.85± 0.22 | 1.43 1.38 |
| P value | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 | 0.001 |

Patients were evaluated after surgery using the Visual Analogue Score (VAS) at regular intervals for 24 hours after the reversal procedure, and the need for further pain relief was determined. An intramuscular injection of Diclofenac at a dosage of 1mg per kilogram was administered as a rescue analgesic when the Visual Analogue Scale (VAS) score was more than 4. The comparison between the two groups revealed that the average VAS ratings were consistently lower in group G than in group F at all intervals examined (P value<0.05), demonstrating that postoperative pain relief was superior with the addition of larger auricular nerve block compared to conventional treatments alone. Lower pain ratings indicate a reduced need for more pain medication, hence preventing the occurrence of their adverse effects. Both groups did not have any significant perioperative problems, except for two instances of postoperative nausea and vomiting (PONV) in Group G, which consisted of patients who received tympanomastoid surgery.

**Table 5. Rescue analgesic in 24 hours**

| Rescue analgesics in 24 hrs (no of times required) | Group G | | Group F | | P Value |
|---|---|---|---|---|---|
| | Frequency | % | Frequency | % | |
| 0 | 3 | 8.57 | 0 | 0 | 0.001 |
| 1 | 17 | 48.57 | 0 | 0 | |
| 2 | 14 | 40 | 9 | 25.71 | |
| 3 | 1 | 2.86 | 20 | 57.14 | |
| 4 | 0 | 0 | 6 | 17.14 | |
| Total | 35 | 100 | 35 | 100 | |

The effectiveness of postoperative pain relief was evaluated based on the need for further pain medication during the first 24 hours after the surgery. The need for additional pain relief medication was significantly higher in group F compared to group G (p value<0.001). This demonstrates that the use of larger auricular nerve block effectively reduces the need for postoperative pain relief during the first 24-hour period after surgery, resulting in superior analgesia compared to traditional methods. The majority of patients in group G needed diclofenac once or twice during a 24-hour period, whereas 3 patients (8.57%) in this group did not need any postoperative pain relief. By contrast, the majority of patients in group B needed to take diclofenac at least three times over a 24-hour period, with six patients (17.14%) needing diclofenac four times.

## DISCUSSION

Peripheral nerve blocks are now often used as part of a multimodal strategy to offer pain relief during and after surgery. The Greater auricular nerve (GAN) innervates the skin covering the parotid gland, a portion of the external ear, and the posterior auricular area, which includes the mastoid. Therefore, the GAN block may be used to provide pain relief during and after procedures that include the external ear and mastoid, such as otoplasty, mastoid exploration, cochlear implant surgery, and treatment of external ear diseases and lacerations [12-17]. Neuromodulation of the greater auricular nerve may be used as a treatment for post-traumatic headache[18]. Nevertheless, delivering the block prophylactically does not provide greater efficacy

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compared to its postoperative administration[17]. It is vital to consider postoperative pain and nausea and vomiting as significant factors in the anaesthesia management of patients following tympanomastoid surgery. The use of GAN block in these patients can provide several benefits. It can effectively decrease postoperative pain and minimise the need for postoperative analgesics, including opioids and Nonsteroidal Anti-inflammatory agents (NSAIDs) like Diclofenac. Consequently, this can help reduce the associated side effects such as nausea, vomiting (opioids), and potential risks of bleeding, renal dysfunction, and gastric ulcer formation (NSAIDs). The block may be easily performed owing to the nerve's anatomic placement, without causing any significant increase in the overall treatment duration[13] Possible complications of GAN block include unintentional injection into blood vessels due to the neck's high vascularity and the close proximity of GAN to major vessels. Other complications include the formation of a blood clot (haematoma), blockage of the superficial cervical plexus, potential blockage of the phrenic nerve, blockage of the recurrent laryngeal nerve, and blockage of the sympathetic ganglion, which can lead to Horner's syndrome [12,15].

The majority of research using GAN block for analgesia before or after surgery has focused on young patients, specifically comparing the effectiveness of the block with opioids. Our literature search yielded no trials that compared the efficacy of GAN block with NSAIDs for postoperative analgesia.

We enrolled a total of 70 individuals in our investigation. The effectiveness of pain relief was evaluated using the Visual Analogue Score (VAS) over the 24-hour postoperative period at different time intervals. From a statistical standpoint, both cohorts consisting of 35 individuals exhibited similarities in terms of age, gender, and initial data. The results of our study were similar to a previous study conducted in the USA in 2002, which compared the use of greater auricular nerve block with pharmacological analgesics for postoperative pain relief in tympanomastoid surgery. In that study, 70 patients who were undergoing tympanomastoid surgery were divided into two groups. One group received the greater auricular nerve block, while the other group received intravenous morphine (0.1 mg/kg) one hour before the end of the procedure. The children's pain levels were assessed using an objective pain score (OPS). The patients underwent assessment using the Visual Analogue Scale (VAS), which was explained to them before to the surgery. Group G patients who underwent GAN block had significantly lower VAS ratings compared to group F patients who received diclofenac at all measured intervals (p value<0.05 for all intervals). This demonstrated the effectiveness of GAN block compared to the exclusive use of traditional pain management treatments. The findings of this research vary somewhat from those of another author's study. The second study revealed that both groups of patients exhibited significant variances in pain levels, with no statistically significant difference in the treatments required for each group of patients. The authors attributed the greater pain levels in the GAN group to factors such as partial blockage of the region or additional causes of pain, such as mouth discomfort caused by the endotracheal tube or irritation during urine catheterization. The average age of the patients in our research was higher, and we compared it with the use of diclofenac. Furthermore, in their research, the block was provided 1 hour before closure, but in our case, it was given 15 minutes before closure. In the research stated above, it was shown that a greater number of patients in the GAN group needed additional pain relief compared to the group that received morphine, but this difference was not statistically significant. Generally, there was considerable heterogeneity in pain levels, but the length of stay in the Post-Anesthesia Care Unit (PACU) and the average pain scores were same in both groups. Our research found significant variances in pain levels, with group G showing higher results on the Visual Analogue Scale (VAS) compared to group F. As a result, the need for rescue analgesics was much lower in group A [19,20]. People who get a GAN block have a longer duration of pain relief compared to people who receive diclofenac immediately after surgery. The aforementioned research did not include a comparison of this parameter. In the research conducted by a different author, it was shown that the occurrence of postoperative nausea and vomiting was decreased in the GAN group (p value= 0.017). However, it should be noted that both groups had postoperative nausea and vomiting. None of the patients in either group reported experiencing nausea, vomiting, or any other adverse effects from the rescue analgesic in our trial. This discrepancy might be attributed to the variation in the selection of rescue analgesics in the respective investigations.

## CONCLUSION

The use of greater auricular nerve block is more effective than standard approaches in terms of providing superior pain relief, as seen by improved VAS score, decreased need for further pain medication, and delayed onset of the first rescue analgesic after surgery.

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