



STUDY OF POSTOPERATIVE PAIN RELIEF FOLLOWING GREATER AURICULAR NERVE BLOCK IN TYMPANOMASTOID SURGERY

Anesthesiology

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ABSTRACT

Introduction: Postoperative pain can be mitigated by using a combination of drugs as well as peripheral nerve blocks. Use of peripheral nerve blocks helps reduce the requirement of other analgesic agents reducing their side effects. The objectives of this study were:

1. to study postoperative pain relief following Greater Auricular Nerve Block in patients undergoing tympanomastoid surgery
2. comparison of postoperative pain relief following greater auricular nerve block with conventional means of pain relief using NSAIDs (Non-steroidal anti-inflammatory agents)

Materials And Methods: In this prospective randomized study 70 ASA I patients undergoing tympanomastoid surgery were selected to examine the efficacy of greater auricular nerve block to provide postop analgesia in comparison to that provided by Diclofenac. Apart from requirement of postop rescue analgesic requirement any side effects of the interventions used were also studied. Patients were randomly assigned to any of the two groups and informed consent was taken preop. General anaesthesia with endotracheal intubation was used in all patients with intravenous fentanyl used as intraop analgesic. 15 minutes prior to completion of surgery Group A patients received Greater Auricular Nerve Block while Group B patients received i.v. diclofenac 1mg/kg. Patients were extubated and pain relief assessed with Visual Analogue Score (VAS) at predetermined intervals for a period of 24 hours. i.v. Paracetamol 15 mg/kg was used as rescue analgesic if VAS>4. Any side effects were also recorded.

Results: The requirement of rescue analgesia was lesser in Group A than Group B and the difference was statistically significant (p value <0.001). No side effects were noted postoperatively in either groups. This study concluded that Greater auricular nerve block provided effective analgesia in patients undergoing tympanomastoid surgery and reduced the requirement of rescue analgesia postop.

Conclusion: Greater auricular nerve block provides better pain relief than conventional methods in terms of better VAS score, reduced requirement of rescue analgesia as well as delay in the requirement of first rescue analgesic postop.

KEYWORDS

greater auricular nerve block, NSAIDS, VAS score, Tympanomastoid surgery, postoperative analgesia

INTRODUCTION:

Multimodal analgesia captures the effectiveness of individual agents in optimal dosages that maximize the efficacy and attempts to minimise the effects of one analgesic^[1]. The importance of neuronal blocks comes from the fact that they have no systemic effects which occur with the use of pharmacological agents. Regional anaesthesia can be applied in a variety of surgical procedures in the head and neck.^[2] Greater auricular nerve is a superficial branch of cervical plexus (C2,C3) providing sensory innervation to skin overlying parotid gland, external ear and posterior auricular region.^[2-6] It can therefore be used to provide analgesia in mastoidectomy for chronic suppurative otitis media. ENT surgeries have a higher risk of postop nausea vomiting which is compounded by the use of drugs such as opioids.^[3] GAN block reduces the requirement of opioids as rescue analgesic hence reducing their side effects.^[3]

This study is a prospective randomised study aimed to study postop analgesia provided by GAN block and comparing it with that provided by Diclofenac. Intravenous paracetamol was used as rescue analgesic as it is an effective and safer alternative to opioids with fewer side effects.^[1,11-17]

METHODS:

After obtaining approval from institute ethics committee 9CTRI No.—CTRI/2018/04/012972, 70 ASA I patients aged between 10-45 years scheduled to undergo unilateral tympanomastoid surgery were enrolled in the study after taking written informed consent. Patients with known allergy to local anaesthetics and infection at the site of needle insertion were excluded from the study. Patients were randomly allocated into one of the two groups:

Group A: received GAN block 15 minutes prior to completion of surgery

Group B: received Diclofenac 1 mg/kg i.v. 15 minutes prior to completion of surgery.

All patients received balanced general anaesthesia and airway was protected using endotracheal intubation. Anaesthesia was maintained with oxygen, nitrous oxide and inhalational agents (isoflurane/sevoflurane). Fentanyl 2 microgram/kg was initially given at induction and repeated at a dose of 1 microgram/kg 1 hour after initial dose or if hemodynamic parameters (heart rate, blood pressure) were 20% above the baseline.

Group A:

15 minutes prior to closure greater auricular nerve block was given with 2-3 ml 0.5% bupivacaine, injected subcutaneously in the area defined by a line joining posterior border of the clavicular head of sternocleidomastoid and cricoid using a 24G needle under all aseptic precautions.^[2-3,5-10]

Group B:

Group B patients received injection diclofenac 1mg/kg i.v. 15 minutes prior to closure.

Postoperatively both groups were assessed for postop pain using visual analogue score at following intervals:
5 minutes after reversal

Every 30 minutes till 2 hours and then 6 hourly till 24 hours postop.

If at any interval VAS>4, injection paracetamol i.v. was given at 15 mg/kg as rescue analgesic.

The requirement of paracetamol in the 24hour period, time between closure and requirement of first rescue analgesic, any side effect of the drugs/ block used were noted.

Statistical testing was conducted with the latest available version of SPSS. The comparison of normally distributed continuous variables between the groups was done Student's t-test. Nominal categorical data was compared with Chi-square test or Fisher's exact test. P value <0.05

was considered significant.

RESULTS:

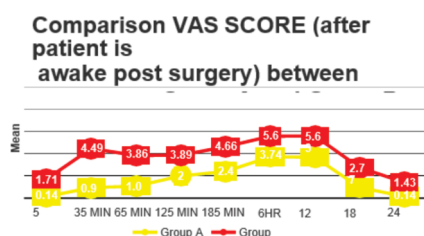
Visual Analogue Scores:

Patients were assessed postoperatively using VAS (Visual Analogue Score) at regular intervals following reversal for 24 hours and the need for rescue analgesic assessed. Rescue analgesic was given as intravenous paracetamol 15 mg/ kg for first 24 hours when VAS>4. Comparison between the 2 groups showed that mean VAS scores were lower in group A compared to group B at all intervals assessed (p value<0.05) indicating better postop analgesia with greater auricular nerve block compared to conventional methods alone. Lower pain scores imply lesser requirement of rescue analgesic hence avoiding their side effects

Comparison Of VAS Between 2 Groups At Various Time Intervals Post Surgery

VAS SCORE (after patient is awake post surgery)	Group A (n=35)		Group B (n=35)		P Value
	Mean $\pm$ SD	Min - Max	Mean $\pm$ SD	Min - Max	
5 min	0.14 $\pm$ 0.36	0 - 1	1.71 $\pm$ 2.22	0 - 7	<0.001
35 min	0.94 $\pm$ 1.37	0 - 7	4.49 $\pm$ 2.51	1 - 8	<0.001
65 min	1.09 $\pm$ 1.40	0 - 7	3.86 $\pm$ 1.83	1 - 7	<0.001
125 min	2.00 $\pm$ 2.18	0 - 8	3.89 $\pm$ 1.21	1 - 6	<0.001
185 min	2.40 $\pm$ 1.99	0 - 7	4.66 $\pm$ 2.11	2 - 8	<0.001
6hrs	3.74 $\pm$ 2.61	0 - 7	5.60 $\pm$ 1.96	1 - 8	0.002
12 hrs	3.69 $\pm$ 2.86	0 - 8	5.63 $\pm$ 1.80	2 - 8	0.006
18 hrs	0.97 $\pm$ 1.52	0 - 6	2.77 $\pm$ 1.63	1 - 7	<0.001
24 hrs	0.14 $\pm$ 0.36	0 - 1	1.43 $\pm$ 1.38	0 - 6	<0.001

Comparison of VAS between 2 groups at various intervals post surgery

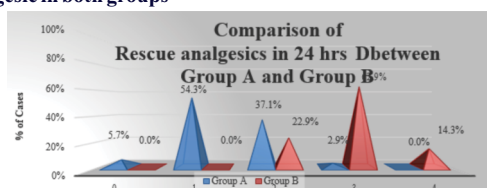


RESCUE ANALGESIC IN 24 HOURS:

Rescue analgesics in 24 hrs (no of times required)	Group A		Group B		P Value
	Frequency	%	Frequency	%	
0	2	5.7%	0	0.0%	<0.001
1	19	54.3%	0	0.0%	
2	13	37.1%	8	22.9%	
3	1	2.9%	22	62.9%	
4	0	0.0%	5	14.3%	
Total	35	100%	35	100%	

The efficacy of post operative analgesia was assessed by the requirement of rescue analgesic in first 24 hours of postop period. The requirement of rescue analgesic was significantly more in group B compared to group A (p value<0.001). This shows that use of greater auricular nerve block significantly decreases the requirement of postop analgesia in the first 24 hours after surgery providing better analgesia than conventional techniques. Most patients in group A required paracetamol once or twice in 24 hours with 2 patients (5.7%) in this group not requiring any post op analgesia. In comparison, most patients in group B required paracetamol at least thrice in 24 hours with 5 patients (14.3%) requiring paracetamol 4 times.

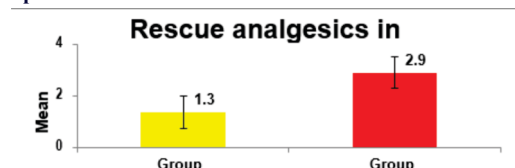
Table 2: comparison of the frequency of requirement of rescue analgesic in both groups



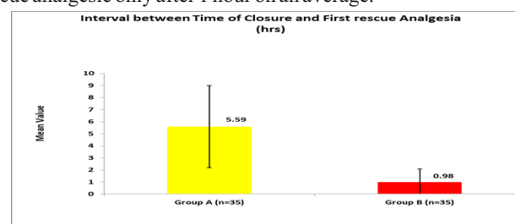
Requirement Of Rescue Analgesic In 24 Hours

	Group A		Group B		P Value
	Frequency	%	Frequency	%	
Rescue analgesics in 24 hrs	1.37 $\pm$ 0.65	0 - 3	2.91 $\pm$ 0.61	2 - 4	<0.001

Mean Frequency Of Rescue Analgesic Requirement Across Both Groups



Also the requirement of rescue analgesic in the 1st hour post surgery was significantly more in group B compared to group A (p value<0.001) again reflecting the efficacy of the block. As shown in group A patients required rescue analgesic only after 6 hours post surgery on an average as compared to group B where patients required rescue analgesic only after 1 hour on an average.



DISCUSSION:

Use of peripheral nerve blocks has become a part of the multimodal approach to provide intraoperative and postoperative analgesia. Greater auricular nerve (GAN) supplies the skin over parotid gland, part of external ear and posterior auricular region including mastoid. Thus, GAN block may be used to provide intraoperative and postoperative analgesia in patients undergoing surgeries involving external ear and mastoid such as otoplasty, mastoid exploration, cochlear implant surgery, external ear lesions and laceration.^[2-3,8-9,18-19]

neuromodulation of greater auricular nerve can be used for post-traumatic headache.^[20] However, administering the block pre-emptively is not more effective than when given postoperatively.^[19]

Of note, postoperative pain and nausea and vomiting are important anaesthetic considerations in patients undergoing tympanomastoid surgery. GAN block may be of advantage in these patients as it may reduce the postoperative pain as well as the requirement of postoperative analgesics such as opioids and Non steroidal Anti inflammatory agents (NSAIDs) such as Diclofenac and Paracetamol hence reducing their respective side effects such as nausea and vomiting (opioids)^[21] and potential increase in risk of bleeding, renal dysfunction and gastric ulcer formation (NSAIDs). The ease of performing the block due to anatomic location of the nerve does not prolong the total procedure time.

Complications associated with GAN block include accidental intravascular injection particularly because the neck is a highly vascular area and GAN lies in close proximity to major vessels, haematoma formation, superficial cervical plexus block, potential phrenic nerve block, recurrent laryngeal nerve block & sympathetic ganglion block causing Horner's syndrome.^[2-9]

Most studies on GAN block for intraoperative or postoperative analgesia have been done on paediatric population comparing the block with opioids. In our search through literature we did not find any studies comparing GAN block with NSAIDs for postoperative analgesia.

In our study on 70 ASA I patients in the age group of 10 – 45 years we compared the postoperative analgesia provided by the block to that by NSAIDs (Diclofenac) both of which were administered 15 minutes before skin closure in the respective groups. The efficacy of analgesia was assessed using Visual Analog Score (VAS) in the postoperative period at various intervals for 24 hours.

Both the groups of 35 patients each were comparable statistically with regard to age, sex and baseline parameters.

Our results were comparable with the only study comparing greater auricular nerve block with pharmacological analgesics for postoperative analgesia in tympanomastoid surgery, published in 2002^[6] in USA, where 40 patients in the age group 2-18 years undergoing tympanomastoid surgery were enrolled with one group receiving GAN block and the other receiving i.v. morphine (0.1 mg/kg) 1 hour before the end of the procedure, assessing children using objective pain score (OPS).

PAIN SCORES:

Patients were assessed using VAS which was explained to the patients preoperatively. It was found that VAS scores were lesser in group A patients who received GAN block compared to group B patients who received diclofenac at all intervals assessed (p value<0.05 for all intervals). This showed the efficacy of GAN block over using conventional methods of pain relief alone.

These results are slightly different from those found in a study by another author, they found that patients in both the groups of patients had wide variations in pain scores with no statistical difference in interventions needed for both group of patients. The higher pain scores in GAN group were explained by the authors to be due to incomplete block of the area, or other sources of pain such as oral pain from endotracheal tube or irritation from urinary catheterization. In our study the mean age of the patients was more and comparison was made with diclofenac. Also the block was given 15 minutes prior to closure compared to their study where it was given 1 hour prior to closure.

All these factors could possibly explain the differences in the results of the 2 studies.

REQUIREMENT OF RESCUE ANALGESIC IN 24 HOURS

In the aforementioned study, although not statistically significant more patients in GAN group required rescue analgesic compared to the group receiving morphine. Overall, there was wide variation in pain scores but the duration of stay in PACU and mean pain scores were the same in both groups. In our study there were wide variations in pain scores as well but VAS was better in group A than group B thus the requirement of rescue analgesic was significantly less in group A.

FIRST RESCUE ANALGESIC:

Patients receiving GAN block stay pain free for longer duration compared to patients receiving diclofenac in the immediate postoperative period. This parameter was not compared in the above study.

SIDE EFFECTS:

In the aforementioned study by another author the incidence of postoperative nausea and vomiting was lower in the GAN group (p value= 0.026) but postoperative nausea and vomiting was reported in both groups. In our study none of the patients in either groups complained of nausea and vomiting or any other side effects of rescue analgesic. This may be explained by the difference in choice of rescue analgesic in both studies. In our study paracetamol was used as rescue analgesic compared to their study where morphine was used which by itself increases the risk of postoperative nausea and vomiting. Paracetamol being a relatively safer drug has fewer side effects than morphine.^[11-17]

CONCLUSION:

The conclusions drawn from our study were as follows:

1. The mean VAS scores in patients receiving GAN block were lesser compared to those receiving Diclofenac (p value<0.001). This was seen at all time intervals of the postoperative period assessed till 24 hours showing the superiority of the block in providing postoperative analgesia compared to NSAIDs (Diclofenac).
2. The requirement of rescue analgesic was lesser in patients who received GAN block compared to those who received Diclofenac corresponding to the lower VAS scores observed with group A compared with group B (p value<0.001). This again reflects the efficacy of GAN block compared to conventional methods of pain relief.
3. In group A the requirement of rescue analgesics was once or twice in 24 hour period in most patients while in group B it was thrice in 24 hour period in most patients. Mean frequency of requirement in

group A being 1.37 while in group B was 2.91 (p value<0.001).

4. The mean interval between end of surgery and requirement of first rescue analgesic was 5.59 hours in group A compared to 0.98 hours in group B indicating the duration of action of the block.
5. No side effects of rescue analgesic (paracetamol) were noted in either groups.

REFERENCES:

1. Buvanendran A. Multimodal Analgesia for Perioperative Pain Management
2. Voronova P, Suresh S. Head and neck blocks in children. *Curr Opin Anaesthesiol*;2008 21:317– 322.
3. Suresh S, Barcelona LS, Young MN, Seligman I, Heffner LC, Cote JC. Postoperative pain relief in children undergoing tympanomastoid surgery: is a regional block better than opioids? *Anesth Analg* 2002;94:859-62
4. Association of Paediatric Anaesthetists of Great Britain and Ireland. Good Practice in Postoperative and Procedural Pain. *Paediatr Anaesth* 2012;22 (suppl. 1):1-79
5. Lawrence E Ginsberg, Susan A Eicher. Great Auricular Nerve: Anatomy and Imaging in a case of perineural tumor spread. *AJNR Am J Neuroradiol* 2000; 21:568–571
6. Liaquat S, Ehsan A, Bukhari AS. *Pakistan Oral and Dental Journal* 2011;31:252-4
7. Steven D. Waldman. *Atlas Of Pain Management*. 4th ed. Philadelphia: Elsevier Saunders; 2015
8. R Ravi, Howell T. Anaesthesia for paediatric ear, nose, and throat surgery. *CEACCP* 2007;7:33-37
9. Suresh S, Voronov P. Head and neck blocks in children: an anatomical and procedural review. *Paediatr Anaesth* 2006;16:910-18
10. Braun BE, Scarlett JA, Schwedt TJ, Swann RA. *Cummings Otorhinolaryngology* 4th ed. Elsevier; 2010
11. Göröcs TS, Lambert M, Rinne T, et al. Efficacy and tolerability of ready-to-use intravenous paracetamol solution as monotherapy or as adjunct analgesic therapy for postoperative pain in patients undergoing elective ambulatory surgery: open, prospective study. *International Journal of Clinical Practice* 2009; 63: 112–120.
12. Salihoglu Z, Yildirim M, Demiroglu S, et al. Evaluation of intravenous paracetamol administration on postoperative pain and recovery characteristics in patients undergoing laparoscopic cholecystectomy. *Surgical Laparoscopy, Endoscopy, and Percutaneous Techniques* 2009; 19:321–323.
13. Wininger SJ, Miller H, Minkowitz HS, et al: A randomized, double-blind, placebo-controlled, repeated dose study of two intravenous acetaminophen dosing regimens for the treatment of pain after abdominal laparoscopic surgery. *Clin Ther* 2010; 32: 2348-69.
14. Sinatra RS, Jahr JS, Reynolds LW et al: Efficacy and safety of single and repeated administration of 1 gram of intravenous acetaminophen injection (paracetamol) for pain management after major orthopedic surgery. *Anesthesiology* 2005; 102: 822-831.
15. Ong CK, Seymour RA, Lirk P, Merry AF. Combining paracetamol (acetaminophen) with nonsteroidal anti-inflammatory drugs: a qualitative systematic review of analgesic efficacy for acute postoperative pain. *Anesthesia & Analgesia* 2010; 110:1170–1179.
16. Korpela R, Korvenoja P, Meretoja. Morphine-sparing Effect of Acetaminophen in Pediatric Day- case Surgery. *Anesthesiology* 1999; 442-7.
17. Maund E, McDaid C, Rice S, Wright K, Jenkins B, Woolacott N. Paracetamol and selective and non-selective non-steroidal anti-inflammatory drugs for the reduction in morphine-related side- effects after major surgery: a systematic review. *Br J Anaesth*. 2011 Mar;106(3):292-7
18. Cregg N, Conway F, Casey W. Analgesia after otoplasty: regional nerve blockade vs local anaesthetic infiltration of the ear. *Can J Anaesth* 1996;43:141-7
19. Suresh S, Barcelona LS, Young MN, Heffner LC, Cote JC. Does a pre-emptive block of the greater auricular nerve improve postoperative analgesia in children undergoing tympanomastoid surgery? *Anesth Analg* 2004;98:330-3
20. Foad E, Reddy C. Neuromodulation of greater auricular nerve block for persistent post-traumatic headache. *Pain Physician* 2014;17: 531-36