

## The efficacy of intravenous Paracetamol versus Tramadol for postoperative analgesia after elective surgery

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### ABSTRACT

**Background:** Pain is an unpleasant sensory or emotional experience usually occurs due to potential tissue damage associated with surgical trauma. Opioids and Non steroidal anti-inflammatory drugs are commonly used to alleviate pain but both have their own limitations in clinical use.

**Objectives:** This prospective randomized clinical trial was undertaken to evaluate the efficacy and quality of recovery with intravenous paracetamol versus tramadol for post operative analgesia after elective surgery.

**Material and Methods:** 40 ASA I&II patients of age group 15-40 years scheduled for elective surgery under general anaesthesia were enrolled in the study. After premedication, patients were randomized into two groups. Following induction of general anaesthesia patients of group 1 [n=20] received 15mg/kg of IV paracetamol and group 2 [n=20] received 1.0 mg/kg of IV tramadol over 15 minutes. During measurements, modified hanallah pain observation scores, Aldret scores [readiness for discharge], Sedation scores and Time to first rescue analgesia were recorded every 5 minutes during the first 30 minutes, then every 10 minutes for the remaining 30 minutes of the PACUs stay and upto first 2 hours in the ward. Statistical Analysis was done using SPSS Software Ver. 17.

**Results:** Results reveals there is statistically significant difference in mean postoperative observational pain score, aldret score and time to first rescue analgesia though the mean post operative nausea & vomiting incidence and sedation score between two groups are statistically non significant .

**Conclusion:** Clinically intravenous paracetamol offers better analgesic benefits to the patients than that of tramadol and due to early recovery characteristics in paracetamol group, patients are discharged early in case of paracetamol group and thus are economically effective in day care surgeries.

**Key Words:** Post operative, analgesia, paracetamol, tramadol, intravenous

### Introduction

Pain has been defined as an unpleasant sensory or emotional experience associated with actual or potential tissue damage. Opioids and Nonsteroidal anti-inflammatory drugs [NSAIDs] are commonly used for postoperative analgesia but they have their own advantage and disadvantages. NSAIDs are commonly used for reducing postoperative pain due to their lower risk of postoperative nausea and vomiting [PONV] but due to their antiplatelet activity they result in increased incidence of bleeding. [1, 2] Traditional Opioids are also

commonly used for Postoperative analgesia but prolonged sedation and increased incidence of [PONV] results in delayed discharge from the hospital especially in case of day care surgeries. [3] The efficacy of tramadol in relieving post tonsillectomy pain has been well demonstrated. [4, 5] So, tramadol may be preferable to traditional opioids due to lesser incidence of respiratory depression and PONV. [2]

Paracetamol is a non-opioid analgesic and having little antiplatelet activity and does not affect bleeding time unlike NSAIDs. [7] Its analgesic action is

assumed to be mediated by serotonergic mechanism and the antipyretic action is via inhibition of cyclooxygenase-3 in the hypothalamus. [6] An intravenous [IV] formulation of paracetamol recently has become available, and it achieves target plasma concentration more rapidly with reduced variability compared with the rectal and oral formulations. [10-11]

This randomized clinical study was undertaken to evaluate the effectiveness of IV paracetamol on postoperative pain and its effect on the quality of recovery versus IV tramadol in patients after elective surgery.

### **Materials and methods**

The study protocol was approved by the Institutional Ethics Committee of our Hospital. A Written, informed consent were obtained from the patients. A total of 40 healthy, ASA physical status I and II patients, aged between 15-40 years and scheduled for elective surgery under general anaesthesia were enrolled in the study. Exclusion criteria were a known history of allergy to the study drug, any active renal, hepatic, respiratory, or cardiac disease; and neurological or neuromuscular disorders.

Patients were fasted from solids for 6 hours before the procedure; clear liquids were permitted until four hours prior to surgery. All study patients were premedicated with oral diazepam 0.2 mg/kg 90 minutes before surgery. In the operating room: electrocardiography [ECG], non-invasive blood pressure, and pulse oximetry monitors were attached. Anesthesia was induced with O<sub>2</sub>+ IV propofol 2.0 to 3.0 mg/kg. Vecuronium bromide 0.1 mg/kg was given for muscle relaxation. After tracheal intubation, the lungs were mechanically ventilated on volume controlled ventilation at peak airway pressure of 25 cm H<sub>2</sub>O, and end-tidal carbon dioxide (ETCO<sub>2</sub>) tension was

maintained at 30-35 mmHg. Intravenous fluid management included administration of lactated Ringer's solution. Fluid deficit was calculated to be replaced over three hours, and maintenance fluid was calculated according to patient's weights. After induction of anesthesia and before the surgical incision, the patients were randomized to one of the two groups, 20 patients in each group. Patients in the paracetamol group [Group 1] received 15 mg/kg of IV paracetamol and the tramadol group [Group 2] patients received 1.0 mg/kg of IV tramadol over 15 minutes. The medications were diluted with saline to a total volume of 100ml.

Anesthesia was maintained with 1-1.5% isoflurane and 50% nitrous oxide in oxygen at a total fresh gas flow of 2.0 L/min. No additional opioids were given intraoperatively. At the end of the operation, residual neuromuscular block was reversed with neostigmine 0.05 mg/kg and atropine 0.02 mg/kg, and the endotracheal tube was removed when respiration was regular and adequate in rate and depth. Heart rate (HR), systolic (SBP) and diastolic blood pressures (DBP), oxygen saturation [SpO<sub>2</sub>], and ETCO<sub>2</sub> were monitored continuously during the procedure.

After patient arrival at the Post Anaesthesia Care unit [PACU], postoperative observational pain scores, [13] Aldrete scores, [12] Heart rate, and blood pressure were recorded every 5 minutes during the first 30 minutes, then every 10 minutes for the remaining 30 minutes of the PACUs stay. Patients were then transferred to the ward. At the ward, observational pain scores, Heart rate, sedation score and blood pressure were recorded for first 2 hours postoperatively. Pain was assessed using a modification of the pain score scale originally described by Hannallah et al. [13] This assessment

allowed for a maximum score of 10 [untolerable pain] and a minimum of 0 [no pain]. Patients with a pain score of 4 or more received rescue analgesia with IV meperidine 0.5 mg/kg, to a total dose of 1.0 mg/kg until the pain score was <4. At the same time points, adverse effects such as Post operative nausea & vomiting (PONV), sedation, were recorded. Ramsay Sedation was assessed using a 4-point scale,

- 0 = fully awake
- 1 = awake but drowsy
- 2 = sleeping, but arousable by light touch or speech
- 3 = sleeping, not arousable

#### **Aldrete Scoring System** <sup>[12]</sup>

Aldrete Score is a medical scoring system for the measurement of recovery after anesthesia [post anesthesia] which includes activity, respiration, consciousness, blood circulation and color.

#### **Activity - Score**

- Able to move 4 extremities voluntarily or on command - 2
- Able to move 2 extremities voluntarily or on command - 1
- Able to move 0 extremities voluntarily or on command - 0

#### **Respiration - Score**

- Able to breath deeply and cough freely - 2
- Dyspnea or limited breathing - 1
- Apneic - 0

#### **Consciousness - Score**

- Fully awake - 2
- Arousable on calling - 1
- Not responding - 0

#### **Circulation - Score**

- B/P  $\pm$  20% of preanesthetic level - 2

- B/P  $\pm$  20% to 50% of preanesthetic level - 1
- B/P  $\pm$  50% of preanesthetic level - 0

#### **Color - Score**

- Normal - 2
- Pale, dusky, blotchy, jaundiced - 1
- Cyanotic - 0

The Statistical Analysis was done using SPSS Software Ver. 17. Quantitative variables were presented as Means  $\pm$  SD and Qualitative variables as frequencies with percentages. Quantitative variables were compared using either Student t-test or Mann Whitney U test [based on distribution of data]. Fisher's Exact test was used for comparing qualitative variables. P value < 0.05 was considered statistically significant.

#### **Results**

**Patient characteristics:** No statistical differences in age, weight, duration of surgery, duration of anaesthesia. [Table 1]

**Observational pain scoring:** Mean observational pain score is less in paracetamol group than tramadol group and on intergroup comparison values are statistically significant. [Table 2]

**Recovery and analgesic requirements:** The mean time to administration of rescue meperidine analgesia was  $43 \pm 6.5$  minutes in the paracetamol group and  $36 \pm 6.8$  minutes in the tramadol group and the difference was statistically significant [ $P < 0.05$ ]. [Table 1] Mean aldret score was 8.80 in the paracetamol group as compared to 7.30 in the tramadol group and on intergroup comparison was statistically significant. [ $P < 0.05$ ][Table 3] Sedation scores did not change significantly over the course of the assessment period in any group [ $P > 0.05$ ]. No differences in mean Heart rate or Mean arterial blood pressure were noted between the two groups during the study

period. [ $P > 0.05$ ] The frequency of nausea / vomiting and sex distribution was not significantly different between the two

groups 40% in the paracetamol group and 70% in the tramadol group. [ $P = 0.171$ ] [Table 4]

**Table 1 : Mean and standard deviation of patients characteristics**

Variables	Group	N	Mean $\pm$ SD	p- value
Age (years)	1	20	25.10 $\pm$ 6.64	0.84
	2	20	28.75 $\pm$ 6.38	
Weight (Kg)	1	20	49.00 $\pm$ 8.06	0.78
	2	20	48.35 $\pm$ 6.45	
Duration of Anaesthesia(mins.)	1	20	52.50 $\pm$ 5.83	0.69
	2	20	55.50 $\pm$ 5.83	
Duration of Surgery (mins.)	1	20	49.50 $\pm$ 5.36	0.82
	2	20	48.00 $\pm$ 8.21	
Time to first rescue Analgesia (mins.)	1	20	43.00 $\pm$ 6.57	<0.05
	2	20	36.00 $\pm$ 6.81	

**Table 2: Mean observational pain score among groups**

Time (Mins.)	Group	Mean	Median	p- value
0	1	2.6	2.5	< 0.05
	2	3.5	3.5	
5	1	2.9	3.0	< 0.05
	2	3.5	3.5	
10	1	3.7	4.0	< 0.05
	2	4.5	4.5	
15	1	3.7	4.0	0.07
	2	4.5	4.5	
20	1	4.5	5.0	< 0.05
	2	5.0	5.0	
25	1	4.5	5.0	0.13
	2	5.3	5.0	
30	1	5.5	5.0	< 0.05
	2	5.9	6.0	
40	1	5.5	6.0	< 0.05
	2	6.3	6.5	
50	1	6.1	6.0	< 0.05
	2	6.8	6.4	
60	1	6.3	7.0	< 0.05
	2	7.3	7.5	
120	1	7.1	7.0	< 0.05
	2	7.5	8.0	
180	1	7.1	7.0	< 0.05
	2	7.5	8.0	

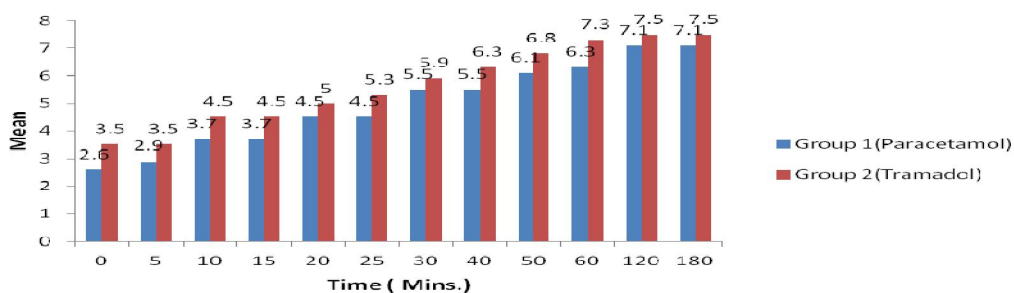


Fig. 1 Comparison of mean observational pain scores among groups

Table 3: Mean Aldret score and Sedation score among groups

Mann Whitney U test						
Variables	Group	N	Mean	Median	Mean Rank	P- value
Aldret Score	1	20	8.80	10	22.40	< 0.05
	2	20	7.30	8	18.60	
Sedation Score	1	20	1.80	2	16.60	> 0.05
	2	20	2.0	2	18.40	

Table 4: Frequency of nausea /vomiting and sex distribution among groups

Variable	Group		Total	P- value	
	1	2			
Sex	Female (%)	8(40%)	6 (30%)	14 (35%)	0.74
	Male (%)	12 (60%)	14 (70%)	26 (65%)	
Complications (Nausea/Vomiting)	Yes (%)	8 (40%)	14 (70%)	22 (55%)	0.057
	No (%)	12 (60%)	6 (30%)	18 (45%)	

**Discussion**

The analgesic efficacy of IV paracetamol 15 mg/kg and tramadol 1.0 mg/kg in patients undergoing elective surgery under general anaesthesia was evaluated, and statistical difference was found between groups regarding postoperative pain scores, aldret scores , rescue analgesic consumption.

According to Pendeville et al, IV proparacetamol 30 mg/kg have contributed to higher postoperative pain scores than did IV tramadol 3.0 mg/kg given before surgical incision.<sup>[15]</sup> Administration of high doses of tramadol 3.0 mg/kg may have resulted in the pronounced low postoperative pain scores in their study. However, in another

study, Alhashemi and Daghistani reported that IV paracetamol 15 mg/kg was an efficient analgesic similar to intramuscular [IM] meperidine 1.0 mg/kg for children undergoing tonsillectomy. <sup>[16]</sup>

Evaluation of recovery characteristics and rescue analgesic medication were the other objectives of our study. Alhashemi and Daghistani found earlier readiness for recovery room discharge in pediatric patients undergoing dental restoration with IV paracetamol when compared with IM meperidine. <sup>[14]</sup> Similarly, in the present study, statistically significant difference was detected in recovery characteristics of both drugs, the mean [SD] of Aldret score [readiness for discharge] was 8.80 in the paracetamol group vs 7.30 in the tramadol group. Early readiness for PACU discharge was clinically as well as statistically suggesting that IV paracetamol may offer the advantage of early recovery and early discharge from hospital, which leads to beneficial economic aspects for day-case surgeries in patients.

The mean time to first rescue analgesia was 43±6.5 mins in paracetamol group as compared to 36±6.8 mins in tramadol group and the results were statistically significant. Vomiting occurred in 40% to 65% of patients in operations especially after tonsillectomy due to swallowed blood and oropharyngeal irritation. <sup>[17]</sup> Tracheal intubation and use of opioids and nitrous oxide all have been implicated as anesthetic factors in increasing the rate of post operative nausea & vomiting. <sup>[18]</sup> The administration of tramadol for postoperative analgesia also may have an additive effect on the incidence of post operative nausea & vomiting. <sup>[19-20]</sup> In our study, there is no statistically significant difference in incidence of frequency of nausea & vomiting. This discrepancy in vomiting data may be due to the intraoperative

administration of tramadol as an IV infusion over 15 minutes, which reduces the frequency of PONV compared with bolus administration.

In conclusion, the postoperative analgesia provided by intravenous paracetamol is better than IV tramadol and even IV paracetamol results in early readiness for discharge from the post-anaesthesia care unit.

### References

1. Marret E, Flahault A, Samama CM, Bonnet F. Effects of postoperative, nonsteroidal, antiinflammatory drugs on needing risk after tonsillectomy: meta-analysis of randomized, controlled trials. *Anesthesiology* 2003; 98:1497-502.
2. Lundeberg S, Lonnqvist PA. Update on systemic postoperative analgesia in children. *Paediatr Anaesth* 2004;14:394-7.
3. Viitanen H, Annila P. Analgesic efficacy of tramadol 2mg/ kg [ for paediatric day-case adenoidectomy. *Br J Anaesth* 2001;86:572-5.
4. Courtney Mi, Cabraal D. Tramadol vs. diclofenac for posttonsillectomy analgesia. *Arch Otolaryngol Head Neck Surg* 2001;127:385-8.
5. Engelhardt T, Steel E, Johnston G, Veitch DY. Tramadol for pain relief in children undergoing tonsillectomy: a comparison with morphine. *Paediatr Anaesth* 2003;13:249-52.
6. Pickering G, Lorient MA, Libert F, Eschalier A, Beaune P, Dubray C. Analgesic effect of acetaminophen in humans: first evidence of a central serotonergic mechanism. *Clin Pharmacol Ther* 2006;79:371-8.
7. Graham G, Scott KF. Mechanism of action of paracetamol. *Am J Ther* 2005;12:46-55.
8. Viitanen H, Tuominen N, Vaaranieniemi H, Nikanne E, Annila P. Analgesic

- efficacy of rectal acetaminophen and ibuprofen alone or in combination for paediatric day-case adenoidectomy. *Br J Anaesth* 2003;91:363-7.
9. Pappas AL, Fluder EM, Creech S, Hotaling A, Park A. Postoperative analgesia in children undergoing myringotomy and placement equalization tubes in ambulatory surgery. *Anesth Analg* 2003;96:1621-4.
  10. Wurthwein G, Kolling S, Reich A. Pharmacokinetics of intravenous paracetamol in children and adolescents under major surgery. *Eur J Clin Pharmacol* 2005;60:883-8.
  11. Anderson BJ, Pons G, Autret-Leca E, Allegaert K, Boccard E. Paediatric Intravenous paracetamol [propacetamol] pharmacokinetics: a population analysis. *Paediatr Anaesth* 2005;15:282-92.
  12. Aldrete JA. The post-anesthesia recovery score revisited. *J Clin Anesth* 1995;7:89-91.
  13. Hannallah RS, Broadman LM, Belman AD, Abramowitz MD, Epstein BS. Comparison of caudal and ilioinguinal/iliohypogastric nerve blocks for control of post-orchidopexy pain in pediatric ambulatory surgery. *Anesthesiology* 1987;66:832-4.
  14. Alhashemi JA, Daghistani MF. Effect of intraoperative intravenous acetaminophen vs. intramuscular meperidine on pain and discharge time after paediatric dental restoration. *Eur J Anaesthesiol* 2007;24:128-33.
  15. Pendeville PE, Von Montigny S, Don JP, Veyckemans F. Double-blind randomized study of tramadol vs. paracetamol in analgesia after day-case tonsillectomy in children. *Eur J Anaesthesiol* 2000;17: 576-82.
  16. Alhashemi JA, Daghistani MF. Effects of intraoperative i.v acetaminophen vs i.m meperidine on post-tonsillectomy pain in children. *Br J Anaesth* 2006;96:790-5.
  17. Kokki H, Salonen A. Comparison of pre- and postoperative administration of ketoprofen for analgesia after tonsillectomy in children. *Paediatr Anaesth* 2002;12:162-7.
  18. Ewah BN, Robb PJ, Raw M. Postoperative pain, nausea and vomiting following paediatric day-case tonsillectomy. *Anaesthesia* 2006;61: 116-22.
  19. Van den Berg AA, Halliday E, Lule EK, Baloch MS. The effects of tramadol on postoperative nausea, vomiting and headache after ENT surgery. A placebo-controlled comparison with equipotent doses of nalbuphine and pethidine. *Acta Anaesthesiol Scand* 1999;43:28-33.
  20. Pang WW, Mok MS, Huang S, Hung CP, Huang MH. Intraoperative loading attenuates nausea and vomiting of tramadol patient-controlled analgesia. *Can J Anaesth* 2000;47:968-73.

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