

# Comparison of Tramadol with Bupivacaine as Local Anaesthetic in Postoperative Pain Control

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## ABSTRACT

**Objective** To determine the effectiveness and duration of postoperative pain relief after local infiltration of tramadol in comparison with bupivacaine, in adult hernia surgery.

**Study design** Quasi experimental study

**Place & Duration of study** Department of Surgery, Combined Military Hospital Rawalpindi.

**Methodology** Study was conducted on 60 patients aged between 20-60 years with elective mesh repair of inguinal hernia. Patients were divided into two groups of 30 patients for 0.25% bupivacaine (group A) and tramadol (group B). Patients were assessed for pain at 1, 6, 12, 18 and 24 hours following surgery using visual analogue pain score (VAPS). Patients with score  $\geq 5$  were given rescue analgesia in the form of 75 mg intramuscular diclofenac sodium. Comparison of first analgesia requirement time and the VAPS between the two groups was done using "t" test taking a p-value of  $<0.05$  as significant.

**Results** Patients in group A had a mean age of  $46 \pm 11.03$  years whereas in group B the mean age was  $46 \pm 11.39$  years. Mean visual analogue pain score after 1 and 6 hours of operation was 2.73 and 4.7 respectively in group A while it was 1.43 and 3.43 in group B. VAPS after 24 hours of operation was 3.47 in group A and 2.53 in group B. Mean time when 1st dose of rescue analgesic used was 8.20 hours in group A and 11.60 hours in group B. Independent sample t-test for VAPS between the 2 groups revealed a highly significant difference (p-value  $<0.05$ ) at 1, 6, 12 and 24 hours but no significant difference was seen at 18 hours. Independent sample t-test for time required for rescue analgesia and total number of doses required was also highly significant (p-value  $<0.05$ ) between the two groups.

**Conclusion** Locally infiltrated tramadol provided an improved postoperative analgesia in comparison to bupivacaine and decreased the requirement of postoperative analgesics with early patient mobility and discharge.

**Key words** Postoperative pain, Tramadol, Bupivacaine, Local anaesthetic.

## INTRODUCTION:

Postoperative pain management has acquired a central role in the ambulatory surgery in order to facilitate earlier hospital discharge.<sup>1</sup> Suitability of patient discharge from the inpatient facility depends upon adequacy of postoperative pain control.<sup>2</sup> Inadequate analgesia during the postoperative period

may have various short and long term consequences.<sup>3</sup> Beneficial effects of bupivacaine have been found in postoperative analgesia by instillation into the wound following herniorrhaphy.<sup>2</sup> Direct local wound perfusion of 0.5% bupivacaine provides satisfactory pain relief and is a safe and feasible alternative to parenteral opioids.<sup>4</sup>

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Local anaesthetic effects of opioids have been demonstrated in both clinical and laboratory studies.<sup>5</sup> Tramadol is a weak opioid and is effective local anaesthetic in minor surgeries.<sup>6</sup> It has selective effect on the N receptors with local anaesthetic action on

peripheral nerves.<sup>2</sup> Studies in children have shown longer postoperative analgesia achieved by wound infiltration with tramadol as compared to bupivacaine injection.<sup>2</sup>

The number of day case surgeries are rising in our hospitals because of cost-effectiveness, short in-hospital stay and lesser burden on patient care facilities. Staff workload and resident's follow up in the wards is also reduced. However no guidelines are available for the postoperative analgesia in such patients. The objective of our study was to compare the effectiveness and the duration of postoperative pain relief in adult hernia surgery after local infiltration of tramadol compared to the local infiltration of bupivacaine. This study was planned to help formulate guidelines for effective postoperative pain management of patients.

#### METHODOLOGY:

This study was conducted at the Department of Surgery, Combined Military Hospital Rawalpindi from July 2007 to February 2008. This Quasi experimental study was conducted on 60 patients of inguinal hernia by simple random sampling. Patients aged between 20-60 years with elective hernia repair were included while obstructed or strangulated hernias and those who had associated systemic comorbidities like diabetes mellitus etc were excluded. Allocation of patients was done with the help of scientific random number table into two groups (Group A and B) of 30 patients each depending upon whether 0.25% bupivacaine or tramadol infiltrated into wound respectively.

Informed written consent was taken. Patients were briefed about the use of visual analogue scale (VAS) pain scoring chart before surgery.<sup>7,8</sup> Standard mesh repair was done in all the patients. Patients in group 'A' were given local wound infiltration of 0.25% bupivacaine 0.2 ml/kg body weight at the end of surgery while group 'B' patients were infiltrated with tramadol at the dose of 2 mg/kg body weight. Patients were assessed for pain at 1, 6, 12, 18 and 24 hours of surgery using VAS pain score. Patients with score =5 were given rescue analgesia in the form of 75mg intramuscular diclofenac sodium.

Data was entered in SPSS version 10.0, and descriptive statistics were used to calculate mean and standard deviation for age, first analgesia requirement time and the visual analog scale pain score in the two groups. Frequencies of gender and type of operation were calculated into percentages. Comparison of first analgesia requirement time and the VAPS between the two groups was done using

"t" test taking a p-value of <0.05 as significant.

#### RESULTS:

All patients were males. Patients in group A had a mean age of  $46 \pm 11.03$  years whereas in group B the mean age was  $46 \pm 11.39$  years. Both the groups were comparable with respect to age. Mean VAPS after 1 and 6 hours of operation was 2.73 and 4.7 in group A while it was 1.43 and 3.43 in group B. VAPS after 12 and 18 hours of operation was 5.53 and 4.20 respectively in group A and 4.90 and 3.97 in group B. VAPS after 24 hours of operation was 3.47 in group A and 2.53 in group B.

Mean time when 1st dose of rescue analgesic (diclofenac sodium) was used was 8.20 hour in group A and 11.60 hour in group B. Nineteen patients from group A required rescue analgesic after 6 hours of operation while remaining 11 required it after 12 hours. Six patients from group B required rescue analgesic after 6 hours of operation, 20 after 12 hours while remaining 4 required it after 18 hours. Eight patients from group A required only one dose of rescue analgesic, 15 required two while remaining 7 required three doses in all. Twenty five patients from group B required only one dose of rescue analgesic while remaining 5 required two (table I).

Independent sample t-test for VAPS between the 2 groups revealed a highly significant difference ( $p < 0.05$ ) after 1, 6, 12 and 24 hours but no significant difference was seen at 18 hours. Independent sample t-test for time required for rescue analgesia and total number of doses required were also highly significant ( $p < 0.05$ ) between the two groups.

#### DISCUSSION:

Postoperative pain is an inevitable consequence of any surgery. This issue has been the centre of attention of all clinicians and the modern day research has been continuing in achieving a pain-free postoperative period. Given the increasing trend of day case surgery and early hospital discharge vis-à-vis the financial burdens over the patients/institutions, role of pain relief via local wound infiltration is increasingly getting common. As part of research for postoperative pain control, instillation of surgical wounds with local anesthetic has now been found to be effective in many studies.<sup>2,5,6,9,10</sup> Tramadol has local anaesthetic effects with minimal sedation and no cardiovascular compromise.<sup>11,12</sup>

Subcutaneous tramadol infiltration can provide effective analgesia and anti inflammatory effects.<sup>11</sup> Tramadol has been shown to have potent local anaesthetic effects.<sup>13,14</sup> Tramadol exerts its sensory

**Table 1: Two Groups of Patients with Post-operative Time in Hours for Rescues Analgesia after Hernia Surgery.**

Postoperative Time in Hours for Rescue Analgesia	Type of Anaesthetic given (Number of Patients)		p-value
	Tramadol	Bupivacaine	
6	6	19	<0.05
12	20	11	
18	4	0	

blocking action by a mechanism similar to that of local anaesthetics in the form of blocking the voltage dependent sodium channels.<sup>9</sup> Moreover calcium concentration in the test solution enhances the conduction blocking activity of tramadol and reduces it in the presence of lidocaine.<sup>10</sup> Tramadol applied to rat sciatic nerve blocks the Na<sup>+</sup> channel in a manner similar to lidocaine and blocks potassium channels more than lidocaine.<sup>15</sup> The depolarization time of the compound action potential (CAP) is extended equally by applying both lidocaine and tramadol, while tramadol extends half the width of the CAP more than lidocaine due to its K channel blocking activity.<sup>12</sup>

Local wound infiltration with tramadol prior to wound closure in hernia repair provided significant postoperative analgesia when compared to bupivacaine in our study (onset of postoperative pain  $11.60 \pm 3.49$  hours vs  $8.20 \pm 2.94$  hours for tramadol and bupivacaine respectively). Altunkaya et al observed that subcutaneous 2 mg/kg tramadol had a local anesthetic action similar to 1 mg/kg lidocaine and they correlated that to its antinociceptive effect, which might be extended into the postoperative period.<sup>6</sup> The duration of analgesia provided by subcutaneous tramadol with adrenaline was significantly longer than that of lidocaine plus adrenaline (tramadol  $4.9 \pm 0.3$ , lidocaine  $4.4 \pm 0.7$  hours). Demiraran and colleagues demonstrated the same postoperative pain relief among postherniotomy paediatric patients. They used 2mg/kg tramadol in comparison to 0.2 ml/kg of 0.25% bupivacaine and reached the same conclusion.<sup>2</sup>

The elimination pharmacokinetics of tramadol are appropriately described by a two compartment model, with a reported elimination half life of  $5.1 \pm 0.8$  hours,<sup>16</sup> while parenteral tramadol administered at the time of wound closure relieved postoperative pain for the limited time of 60-90 minutes,<sup>17,18</sup> locally infiltrated tramadol achieved a longer analgesic time than the reported elimination half life of parenteral tramadol, which might be related to its local effect rather than to systemic absorption.<sup>19</sup> As in the study

by Demiraran et al<sup>2</sup>, there was no significant difference between the study groups in nausea, vomiting and sedation, which might be related to the dose, the route of administration, the timing of infiltration or the small sample size. To our knowledge, the pharmacokinetics of locally infiltrated tramadol has not been studied as yet by other studies so far.

### CONCLUSIONS:

Tramadol is a suitable and acceptable alternative to bupivacaine as a local anaesthetic for wound infiltration after hernia surgery because of its prolonged sustained effects and lesser need for the postoperative analgesic requirement, and is recommended as a local anaesthetic after hernia repair for wound infiltration. Further research is required to uncover its benefits in various other procedures as well.

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