

# A comparison of the postoperative analgesic efficacy of three in one block with intravenous injection tramadol

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## \*Article History:

**Received:** 22/01/2017

**Revised:** 26/01/2017

**Accepted:** 29/01/2017

**DOI:** <https://dx.doi.org/10.7439/ijbar.v8i1.3927>

## Abstract

**Aim and objective:** Aim of the present study was to compare the efficacy of Three – In – One block with intravenous injection tramadol used for postoperative analgesia.

**Methods:** The study enrolling 60 patients of either sex (age 20-60 years), ASA grade I and II were randomly allocated into two groups of thirty each. Group I (Three – In – One block group) received 2.5 mg/kg of 0.5% bupivacaine + 25µg fentanyl which was diluted with distilled water to make total volume of 40 ml, group 2 (intravenous tramadol group) received 2 mg/kg tramadol postoperatively. Hemodynamic parameters, respiratory rate, duration of postoperative analgesia and any complications were recorded.

**Results:** Group I had better hemodynamic stability as compared to group II. The postoperative analgesia in group I was significantly better than group II. Three – In – One block was associated with fewer incidences of complications than intravenous tramadol.

**Conclusion:** Three – In – One block is better alternative to intravenous tramadol for postoperative analgesia.

**Keywords:** Three – In – One block, Postoperative analgesia, Bupivacaine, Fentanyl, Tramadol.

## 1. Introduction

Apart from saving the life of the patient, the second most important aim of an anaesthesiologist is to relieve the pain of the patient and to achieve patient's comfort in postoperative period. Orthopaedic procedures are very painful which increases the morbidity of the patients and requires aggressive management. Poorly treated pain can have negative impact on recovery especially owing to disruption in physiotherapy resulting in stiffness of joints and slow progress in mobility. Postoperative pain relief can be achieved by a variety of techniques including parenteral NSAIDS, epidural analgesia [1] and patient controlled IV analgesia with opioids [1,2] Peripheral nerve blocks are suitable substitutes for analgesia after lower limb surgery.

The inguinal perivascular technique of lumbar plexus block commonly known as "3 in 1" block has been

shown to provide effective analgesia following hip [3] and knee surgery [4]. Three – in- one block is a technique in which femoral nerve, lateral cutaneous nerve of thigh, obturator nerve are blocked in a single injection. Three in one block offers a practical alternative to epidural analgesia as epidural catheter needs special care which if we fail, epidural catheter may get displaced, broken or can lead to infection. However this technique is proved to be safe and effective and can benefit wide range of patients who are in agony of pain. The primary purpose of three in one block is to provide postoperative analgesia, performing the block postoperatively, rather preoperatively has the obvious advantage of maximizing the duration of sensory analgesia. Also this technique reduces the postoperative morbidity and help in early mobilization.

Injection 0.5% bupivacaine is widely used, effective, longer acting, local anaesthetic. The dose to be given in three in one block is within acceptable safe limits. Injection fentanyl is lipophilic opioid and proves excellent analgesic with cardiovascular and haemodynamic stability. So the combination of these two drugs might synergize each other's analgesic effect with reduction in dose and may reduce the complications associated with pain and benefit large number of patients. Tramadol, a synthetic opioid of the aminocyclohexanol group, is a centrally acting analgesic with weak opioid agonist properties, and effects on noradrenergic and serotonergic neurotransmission. In addition, these opioids and nonopioids modes of action appear to act synergistically [5]. Tramadol is not recommended as a supplement to general anaesthesia because of its insufficient sedative activity; it has been shown to provide effective analgesia after IV administration for the treatment of postoperative pain. Therefore present study was carried out with an objective to study the effectiveness of three – in – one block with injection 0.5% bupivacaine and injection fentanyl in patients who underwent lower limb surgeries under spinal anaesthesia as against IV tramadol as a sole analgesic agent.

## 2. Material and Methods

After obtaining institutional ethics committee approval and written informed consent from all patients, study was conducted in 60 patients of either sex, ASA grade I and II, aged between 20-60 years who underwent lower limb surgeries such as skin grafting, operative correction of fracture of femur under spinal anaesthesia. Patients refusing to participate in the study, having age <20 years and >60 years, patients with coagulation abnormality and bleeding diathesis, active infection at the site of block, patients with known hypersensitivity to local anaesthetic agents, psychologically unstable patients, patients with pre-existing femoral nerve injury or with any nerve deficit, major systemic disorders, particularly kidney diseases and ASA Grade III, IV and V patients were excluded from the study. Patients were randomly allocated into two groups of thirty patients each. Group I (Three – In – One block group) received 2.5 mg/kg of 0.5% bupivacaine + 25µg fentanyl which was diluted with distilled water to make total volume of 40 ml, group II (intravenous tramadol group) received 2 mg/kg tramadol postoperatively. A detailed pre-anaesthetic evaluation including history and a thorough general and clinical examination and all relevant investigations were done for all the patients. Routine monitoring was done with pulse oximeter, continuous ECG and non invasive blood pressure. The '3 in 1' block was given using the technique described by Winnie et al (1973).<sup>8</sup> After identifying the site 3 in 1 block is given using 23 G, 1.5 inch needle. The onset

of block requires 20-30 minutes with pin prick test confirmed by postoperative analgesia typically lasts up to 10-12 hour.

### 2.1 Technique

The patient lies supine with the leg extended, lying flat on the bed. The operator stands on the side of the patient that is to be blocked. Firstly, identify the point of injection, using the surface landmarks. Palpate both the anterior superior iliac spine and the pubic tubercle. The line between these two overlies the inguinal ligament. The femoral artery should lie at the midpoint of the inguinal ligament and it is necessary to locate this by feeling for the pulse at this point. The site for injection is 1 cm lateral to the uppermost pulsations of the femoral artery and 1-2 cm below the line of the inguinal ligament. An ordinary needle of length 3-4 cm and 21-23 G in width is suitable for performing this block. It should be inserted perpendicular to the skin, but aiming slightly towards the head of the patient. The femoral nerve lies adjacent to but slightly deeper than the structures contained within the femoral sheath. This is because the nerve lies deep to the fascia iliaca, while the contents of the femoral sheath lie on top of it. The site for injection is the same as already described. However, the needle is inserted directly perpendicular to the skin. If the needle is held gently between thumb and forefinger, then a slight resistance is encountered at the fascia lata, followed by a definite loss of resistance, or "pop" as the needle penetrates this layer. The same thing is felt as the needle penetrates the fascia iliaca and comes into the proximity of the femoral nerve. Therefore, immediately on feeling this second loss of resistance or "pop", the tip of the needle should be in the correct position. The needle is then fixed in position with one hand, the other hand again being used to connect a syringe, aspirate to check for blood and inject 40 ml of drug. Having aspirated on the needle to check that the tip is not intravascular, the hand is then moved to apply firm pressure on the thigh (with the thumb) about 2-4 cm. below the insertion point of the needle. The injection is then performed, all the while maintaining the pressure. The pressure can be released about thirty seconds after the injection has been completed. This procedure encourages spread of the local anaesthetic upwards, towards the lumbar nerve roots.

In the postoperative period, pulse rate, systolic blood pressure, diastolic blood pressure, respiratory rate, VAS score, first demand of analgesia and any side effects were recorded. The data were summarized as mean  $\pm$  SD or median for both groups and were analyzed using two sample t test as required. A p value < 0.05 considered significant.

### 3. Observations and results

Sixty patients were selected for the study, divided into Group 'I' and Group 'II'. In both the groups male: female ratio was same. The mean age of patients in group I and in group II was  $31 \pm 9.6$  years and  $30.36 \pm 14.4$  years respectively. Maximum number of patients in the present study belonged to age group of 20-30 years. The mean weight of patients in group I was  $50 \pm 5$  kg and in group II was  $50.83 \pm 4.74$  kg. The demographic profiles of the patients were comparable in both the groups and difference was statistically not significant, (Table 1).

**Table 1: Demographic profile of patients**

Parameters	Group I	Group II	P value
Age (years)	$31 \pm 9.6$	$30.36 \pm 14.4$	0.827
Weight (kg)	$50 \pm 5$	$50.83 \pm 4.74$	0.531
Sex (Male/Female)	15/15	15/15	-

The most common surgery performed in both the groups was nailing of femur, (Group 'I'= 40% and Group 'II'= 43.3%). Other types of surgery performed were skin grafting and interlocking nailing of femur (Table 2).

**Table 2: Types of Surgery**

Type of Surgery	Group I	Group II
Skin grafting	9 (30%)	10 (33.3%)
Interlocking nailing of femur	9 (30%)	7 (23.3%)
Nailing of femur	12 (40%)	13 (43.3%)

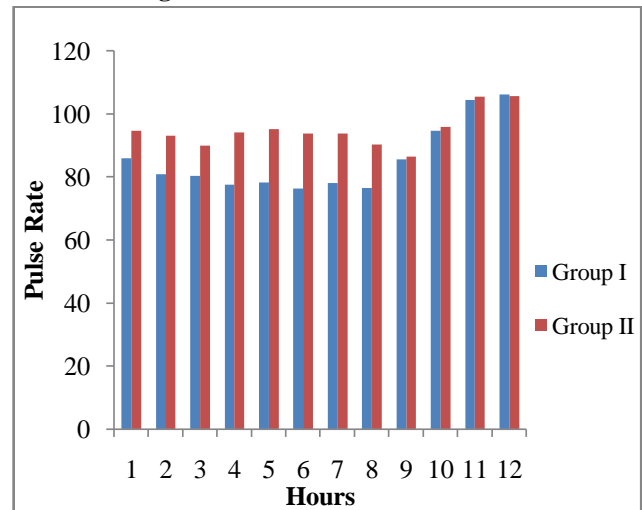
Baseline vital parameters were comparable between two groups and difference was found to be statistically insignificant, (Table 3).

**Table 3: Baseline Haemodynamic Parameters**

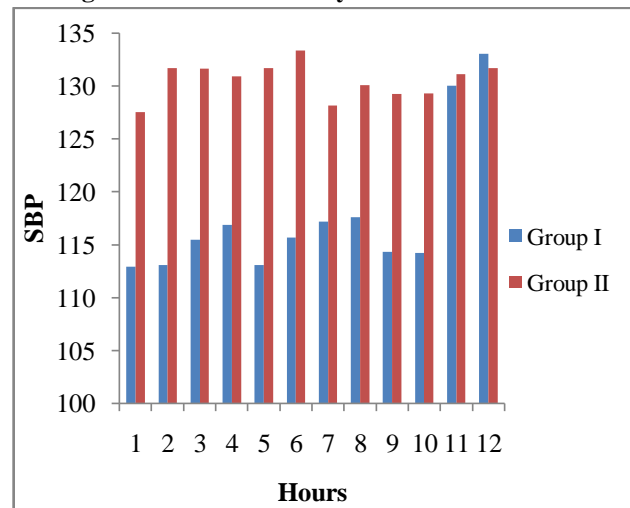
Parameters	Group I	Group II	P value
Pulse Rate	$99.76 \pm 7.71$	$102.17 \pm 3.44$	<0.000.1
Systolic Blood Pressure	$136.27 \pm 3.85$	$129.2 \pm 7.76$	0.473
Diastolic Blood Pressure	$85.73 \pm 2.61$	$84.2 \pm 5.64$	0.879

When comparing haemodynamic parameters of patients after 1,2,3,4,5,6,7,8,9,10,11,12 hours of performing the Three – In – One block, we found significant difference in both the groups with respect to pulse rate up to 8 hours (Figure 1), systolic blood pressure (Figure 2) and diastolic blood pressure (Figure 3) up to 10 hours ( $p < 0.001$ ). But afterwards difference was statistically insignificant ( $p > 0.05$ ) suggesting veining effect of Three – In – One block.

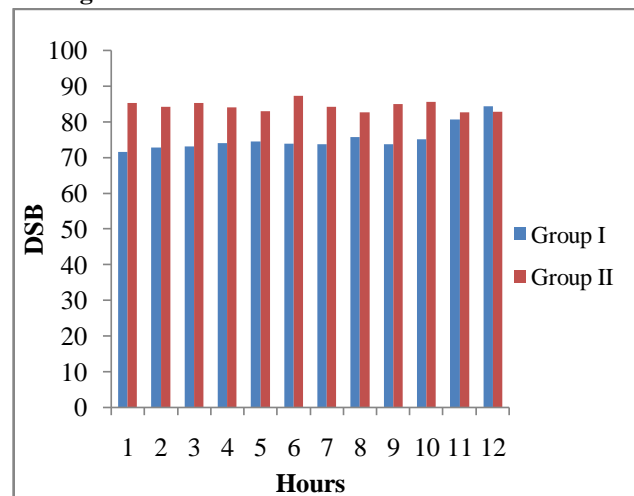
**Figure 1: Alteration in Pulse Rate**



**Figure 2: Alteration in Systolic Blood Pressure**

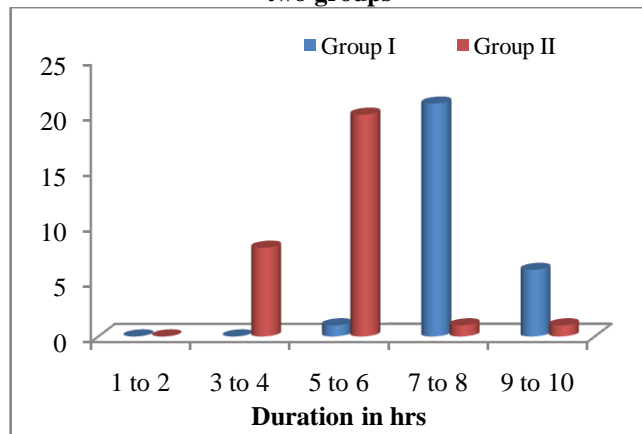


**Figure 3: Alteration in Diastolic Blood Pressure**



The mean duration of analgesia in Three – In – One block was  $8.03 \pm 0.76$  hours while in intravenous tramadol group was  $5.3 \pm 1.17$  hours ( $p < 0.001$ ) (Figure 4). Maximum number of patients in 3 in 1 block with postoperative analgesia ranges between 7 to 8 hours and in intravenous tramadol group was less than 6 hours. So, 3 in 1 block provides much better pain relief than intravenous tramadol group in post operative period.

**Figure 4: Comparison of Duration of Analgesia between two groups**



17 (51%) patients in intravenous tramadol group had nausea and vomiting whereas no patient in “Three – In – One” block group had nausea or vomiting.

#### 4. Discussion

Various peripheral nerve blocks have been tried to combat postoperative pain. Also peripheral nerve block improves analgesia and reduces the analgesic requirement after many orthopaedic surgeries. Amongst the various peripheral nerve blocks studied for lower limb surgeries “Three – In – One” block is simple to perform and very effective in providing excellent analgesia. Till now various drugs have been tried in “Three – In – One” block for postoperative analgesia. Hood G et al [6] used prilocaine in “Three – In – One” block, Capdevila et al [7] used lidocaine, morphine and clonidine in bilateral continuous Three – In – One block and Ng HP et al [4] used 0.25% ropivacaine 30 ml, 0.5% ropivacaine 30 ml and 0.25% bupivacaine 30 ml. More other studies used various drugs in “Three – In – One” block for postoperative analgesia [8-10]. In our study, we used injection 0.5 % bupivacaine 2.5 mg/kg and injection fentanyl 25 micrograms diluted with water to make 40 ml of volume. Amount of bupivacaine used (2.5 mg/kg) was much lower than the prescribed limit for dosage of bupivacaine in peripheral nerve blocks which is 175 mg. We could study the combined effects of injection fentanyl with injection bupivacaine in “Three – In – One block”. Tramadol is widely used analgesic; it is used in

moderate pain, It was non-opioid receptor mediated analgesic effect and devoid of respiratory depression. So we compared postoperative analgesia of Three – In – One block with intravenous tramadol in dose of 2 mg/kg as control group.

The demographic parameters i.e. age, sex, weight of the patients were comparable in both the groups and difference was statistically not significant, this was comparable to other studies [1,4,6,8,11]. We recorded haemodynamic parameters and respiratory rate of both the groups before block or before giving intravenous tramadol and then at 1,2,3,4,5,6,7,8,9,10,11,12 hours after block. Both the groups were comparable with each other for baseline vital parameters i.e. baseline pulse rate, systolic blood pressure, diastolic blood pressure and respiratory rate. There was significant difference in both the groups with respect to pulse rate before block and up to 8 hours ( $p < 0.001$ ). But afterwards difference was found to be statistically insignificant ( $p > 0.05$ ) suggesting the veining effect of “Three – In – One” block. Both the groups were comparable with respect to systolic and diastolic blood pressure before block and before giving intravenous tramadol but postoperatively difference was statistically significant up to 10 hours. ( $p < 0.05$ ). But no difference was observed after 10 hours due to veining effect of “Three – In – One” block. Postoperatively we found that the patients receiving “Three – In – One” block had better hemodynamic stability as compared to intravenous tramadol group.

Both the groups were comparable with respect to respiratory rate ( $p < 0.001$ ) before block and before giving intravenous tramadol. Also we did not found any significant difference in respiratory rate in both groups up to 12 hours postoperatively. Thus it is conclude that using fentanyl in dose of 25 micrograms in Three – In – One block and using tramadol intravenously in dose of 2 mg/kg does not affect respiratory rate of the patients. However further, study in the above respect can be done.

Visual analogue scale was used for assessing the analgesia every hourly up to 12 hours. The mean duration of analgesia in group I was  $8.26 \pm 0.44$  hours while in group II was  $5.3 \pm 1.05$  hours which was significantly prolonged. By applying Mann-Whitney-U test, we got p value less than 0.001. Hence there was significant difference in analgesia of group I and group II.

Three – In – One block can be associated with certain complications such as transient femoral nerve palsy, local anaesthetic toxicity if inadvertent intravascular injection of local anaesthetic is given or if local anaesthetic agents are given above toxic levels, haematoma formation if the drug is given subcutaneously. None of the patients have complained of pruritus. In our study 17 (51%) patients of

intravenous tramadol group had nausea and vomiting for which injection ondansetron 4 mg IV was given, however none of the patient of Three – In – One block group complained of nausea and vomiting. The incidence of nausea and vomiting was found to be higher in intravenous tramadol group as compared to Three – In – One block group. Our finding compare with different studies [1,9,11,12]. When comparing postoperative analgesia between two groups, we found longer duration of analgesia and less complaint of nausea and vomiting in group I as compared to group II. Hence Three – In – One block provides superior analgesics effect than intravenous tramadol with less side effects. These findings were agreement with different studies [4,10,11].

## 5. Conclusion

From the observations of the present study, it may be concluded that Three – In – One block is better alternative to intravenous tramadol for postoperative analgesia.

## Acknowledgement

The authors would like to thank the department of anaesthesiology, orthopedic surgery department, other staff of operation theatre and administration of Government Medical College, Aurangabad, Maharashtra, for permission to study and providing facility to carry out the work.

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