TRAMADOL VERSUS MIDAZOLAM IN PSOAS COMPARTMENT BLOCK (LUMBAR PLEXUS BLOCK) WITH BUPIVACAINE FOR LOWER LIMB SURGERIES

By
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ABSTRACT

Background: The psoas compartment block (PCB) is a deep block of the lumbar plexus from a posterior approach. It was used to provide anesthesia for thigh surgery, for analgesia after total hip or knee arthroplasty. This study aimed to compare between the combined use of either tramadol or midazolam with bupivacaine in psoas compartment block as regard the onset of action, duration of the block and any recorded side effects. **Methods:** In a randomized double blind prospective study, 60 patients, ASA I & II, scheduled for knee surgery, with age range (20-60) years old received PCB guided by using standard nerve stimulator. Patients were divided into three groups; 20 patient each: group I received 0.5 ml/kg bupivacaine 0.5%, group II received 0.5 ml/kg bupivacaine 0.5% with 50 µ/kg midazolam and group III received 0.5 ml/kg bupivacaine 0.5% with 1mg/kg tramadol. The onset of sensory action, duration of the block, pain score every 2hs, degree of motor block, heamodynamic changes, amount of analgesic consumed in the first postoperative 24hs and any side effects were noticed and recorded. **Results:** Duration of the block in group II was significantly longer than the other two groups (P-value = 0.0016). There was significant decrease in pain score at 2 hours in group II and in group III in comparison with group I (P-value = 0.04). The amount of analgesic consumed in 24h in group II was the least among all groups and amount consumed in 24h in group III was less than group I (P-value <0.001). The incidence of occurrence of nausea was significantly high in group III when compared with group I or group II (P-value = 0.047). No significant differences between groups regarding onset of sensory block, degree of motor block, heamodynamic changes, shivering, pruritis, vomiting and respiratory depression. **Conclusion:** addition of midazolam (50µ/kg) to bupivacaine gives better results than addition of tramadol (1mg/kg) to bupivacaine in psoas compartment block regarding duration of sensory block, amount of analgesic needed in the first 24 hours and incidence of nausea. Both of midazolam and tramadol have the same effects as regard the other parameters of comparison.

Key wards: Psoas compartment block, midazolam, tramadol, bupivacaine.

INTRODUCTION

Psoas compartment block has been used to provide anesthesia for thigh surgery, for analgesia after total hip or knee arthroplasty as well as in the treatment of chronic hip pain [(1)]. Winnie first described a posterior approach for lumbar plexus block. Capdevila modified the approach to permit maintenance of a perpendicular needle direction [(2)]. Various adjuvants, including clonidine, epinephrine and opioids, are used with local anesthetics to enhance the duration and quality of anesthesia and postoperative analgesia [(3)]. Tramadol hydrochloride is a synthetic opioid analgesic with a relatively weak affinity to opioid receptors. Tramadol displays central analgesic effects as the result of its monoaminergic and mu-receptor agonistic activity and also it exhibits a non central analgesic effect that has led to its use as an adjunct to local anesthetics in the peripheral nervous system[(4)]. Midazolam, a water-soluble benzodiazepine, is known to produce antinociception and enhance the effect of local anesthetics Midazolam produces this effect by its action on gamma aminobutyric acid-A (GABA-A) receptors which have also been found in peripheral nerves[(5)]. The aim of this study was to compare between the combined use of Tramadol with Bupivacaine and Midazolam with Bupivacaine in psoas compartment block as regard the onset of action, duration of anesthesia and postoperative analgesia and recorded side effects.

PATIENT AND METHODS

This study was conducted in Zagazig University Hospitals. After obtaining approval from the hospital ethics committee, written informed consents were taken from sixty male patients ASA I and Π scheduled for knee surgery. Their age range was 20 – 60 years old.

Exclusion Criteria were: Patient refusal, history of allergy to local anesthetic used, preexisting neurological disease or deficit, severe cardiac or renal disease, infection at the site of injection and patients who had taken analgesic six hours before surgery.

Routine monitoring in the form of electrocardiography, pulse oximetry and non invasive arterial blood pressure set at 5 min interval. On arrival of the patient to anesthesia induction room, 16-18 G iv cannula was inserted and 500ml lactated ringer solution was administered. Premedication with midazolam 1-3 mg i.v. was given. The technique was explained to the patient and ensured that pain sensation would be abolished but he may expect short lived pressure sensation only.

Psoas compartment block was performed under complete aseptic condition. The patient placed on the operating table lying on his side with slight forward tilt with the limb to be operated up, so that twitches of the quadriceps muscle could be seen easily.

A line was drawn between the two iliac crests and the spinous processes of L3, L4 and L5 was identified. A line joining the spinous processes was drawn as a midline. The point of insertion was 4-5 cm lateral to midline and on the intercrestal line.

The skin was prepared with povidine–iodine 10% then lidocaine 3 ml 2% was infiltrated subcutaneously. An insulated 15cm needle was attached to nerve stimulator (stimuplex-Braun), current set at 2mA with impulse duration 0.1 m.sec for detection of quadriceps muscle contraction. The needle was inserted and redirected slightly superiorly and advanced until loss of resistance and twitches of quadriceps muscle continous at less than 0.6mA due to stimulation of lumbar plexus at the lumbar paravertebral space (psoas compartment).

Patients were assigned randomized to 1 of the 3 groups; group (I) received 0.5ml/kg Bupivacaine 0.5%., group (II) received 0.5ml/kg Bupivacaine 0.5% with midazolam 50 μ/kg and group (III) received 0.5ml/kg Bupivacaine 0.5% with 1 mg/kg Tramadol.

The following parameters were assessed:

- Onset of sensory block (sensory block of femoral nerve (anterior thigh) lateral cutaneous nerve (lateral side of the thigh).
- Motor block evaluated by obturator nerve block (adductors of the thigh) [(2)].
  Full adduction ……1
  Partial adduction …2
  No movement ……3
- Pain score every two hours by verbal rating scale (VRS) [(6)]
  Excellent (no pain) ……..0
  Good analgesia (mild pain)……...1
  Fair analgesia (moderate) ……....2
  Poor analgesia (severe pain)…….3
  Very poor analgesia (intolerable pain)...4
- • Duration of the block
- Amount of analgesic consumed in the first postoperative 24 hours. (Patients were received postoperative analgesics (in the form of intarvenous pethidine 50mg) when their pain score according to verbal rating scale was two or more).
- Hypotension or bradycardia during time of the block was considered with decrease in blood pressure or heart rate more than 20% from the base line.
- Recording of any side effects like respiratory depression, nausea, vomiting, shivering, pruritis or allergic reactions.

If intraoperative sedation was needed, patients received 10-50 μ/kg/min propofol.

Statistical analysis: was performed with ANOVA, chi square, paired-t test or Kruskal Wallis one way ANOVA. Data were expressed as mean±SD or median.

P<0.05 was considered as statistically significant.

RESULTS

The three groups were comparable regarding the patient characteristics in the term of demographic data of patients and surgery time (Table 1).

- Psoas compartment block was successful in all patients. There were no statistically significant differences between groups regarding onset of sensory block (Table 2).

From table (2) we noticed that duration of analgesia in group II was longer than other groups (P=0.0016).

The amount of analgesic consumed in 24h in group II was the least among groups and amount consumed in 24h in group III was less than group I (P< 0.001) (Table 2).

- From table (3) we noticed that there were no significant differences in degree of motor block between the three studied groups.
- There was significant decrease in pain score in group II and group III at 2 hours (P=0.04). Also there was significant increase of pain score at 4 hours and 6 hours in comparison with 2 hours within each of the three groups (P<0.05) (Figure1). After 6 hours, all patients had already received intravenous postoperative analgesics which would affect and interfere with our assessment of pain, so any differences between groups, after 6 hours, were considered non significant.
- There were statistically significant differences in heart rate among groups (Figure 2). There were no statistically significant differences among groups regarding systolic blood pressure and diastolic blood pressure. There were significant changes in systolic and diastolic blood pressure among time intervals within each group (Figure 3) and (Figure 4).

However, all differences were not clinically significant as all these changes were still within the physiological range (20% decrease or increase from the baseline).

Side effects (Table 4):

- There was statistically significant increase of nausea in group III (40%) when compared with group I (10%) and group II (15%) (P=0.047).
- The incidence of shivering was 40% in group I and in group II, but it was 50% group III. The incidence of pruritis was 10% in group III while 0% in group I and group II. No patients had developed vomiting or respiratory depression (RD) in the three studied groups.
- There were no statistically significant differences between the three studied groups regarding shivering, pruritis and vomiting and respiratory depression.

Table (1): Patients characteristics.

Variable	Group I (n = 20)	Group II (n = 20)	Group III (n = 20)	P
Age (yr)	40.4±3.2	39.6±3.4	40.1±3.7	>0.05
Weight (Kg)	78.4±15.5	79.8±14.3	80±14.4	>0.05
Height (Cm)	183.3±5.9	179.9±6.1	171.1±5.8	>0.05
Operative time (min)	95.3±15.5	90.7±14.3	91.9±14.4	>0.05
Surgery type (arthroscopy./open)	16/4	17/3	16/4	>0.05

*P < 0.05 (Significant)

Table (2): Onset of action, duration of the block and amount of analgesic consumed (mean ± SD).

Variable	Group I (n = 20)	Group II (n = 20)	Group III (n = 20)	P
Onset (min)	12.35±2.9	11±2.128	11.1±2.198	0.15
Duration of block (hour)	4.9±0.67	*5.8±0.7	5±1.0	0.0016
Analgesic consumed (mg)	187.5±55.9	*117.5±33.5	*155±35.9	<0.001

*P < 0.05 (Significant)

Table (3): Degree of motor block (adduction of the thigh by obturator nerve block (mean ± SD).

	Group I (n = 20)	Group II (n = 20)	Group III (n = 20)	P
Degree of motor block	2±0.8	2.35±0.7	2.5±0.5	0.06

*P < 0.05 (Significant)

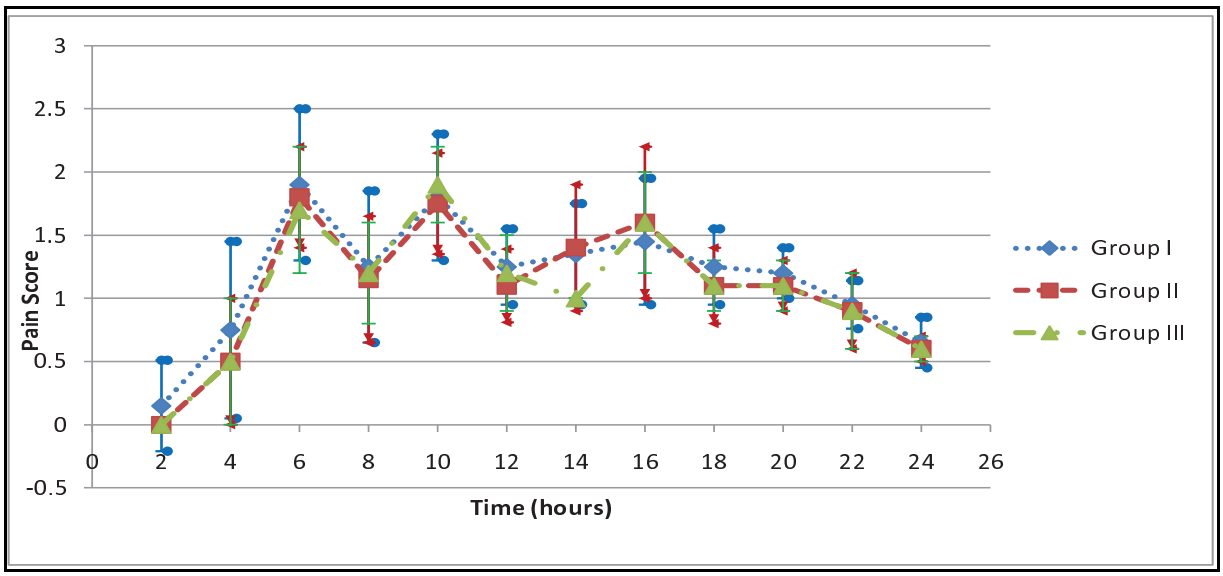

Figure (1): Pain score.

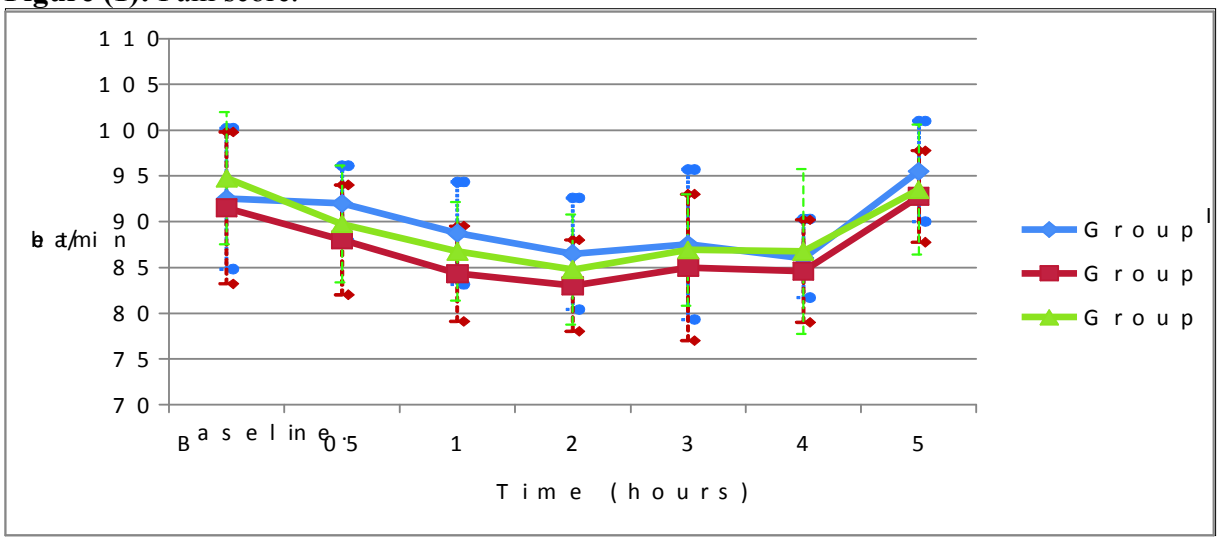

Figure (2): Changes in heart rate (beat/min) in the three studied groups.

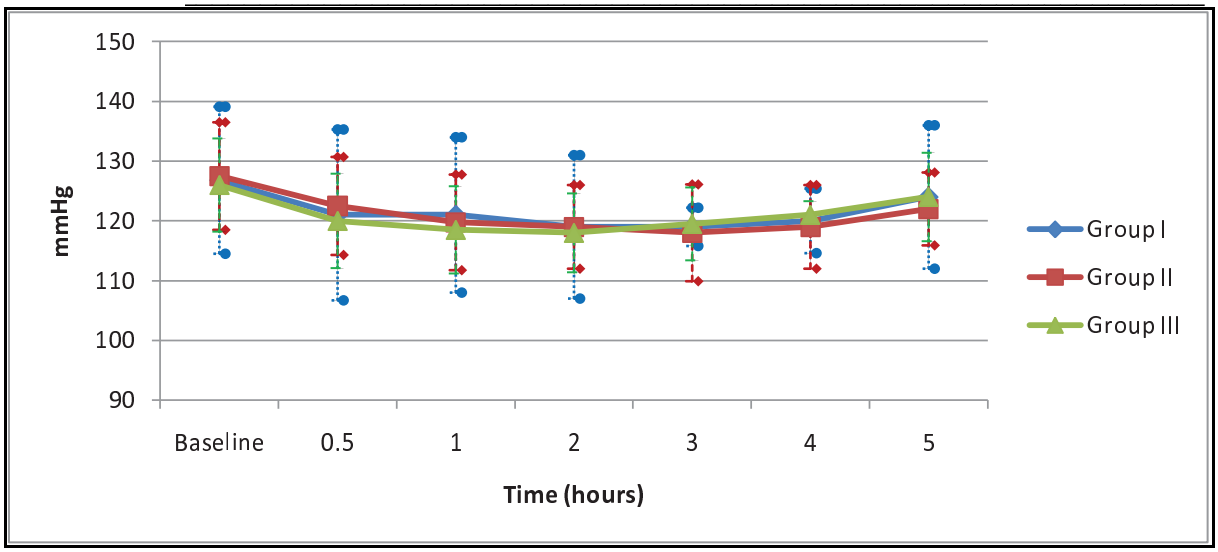

Figure (3): Changes in systolic blood pressure (mmHg) in the three studied groups.

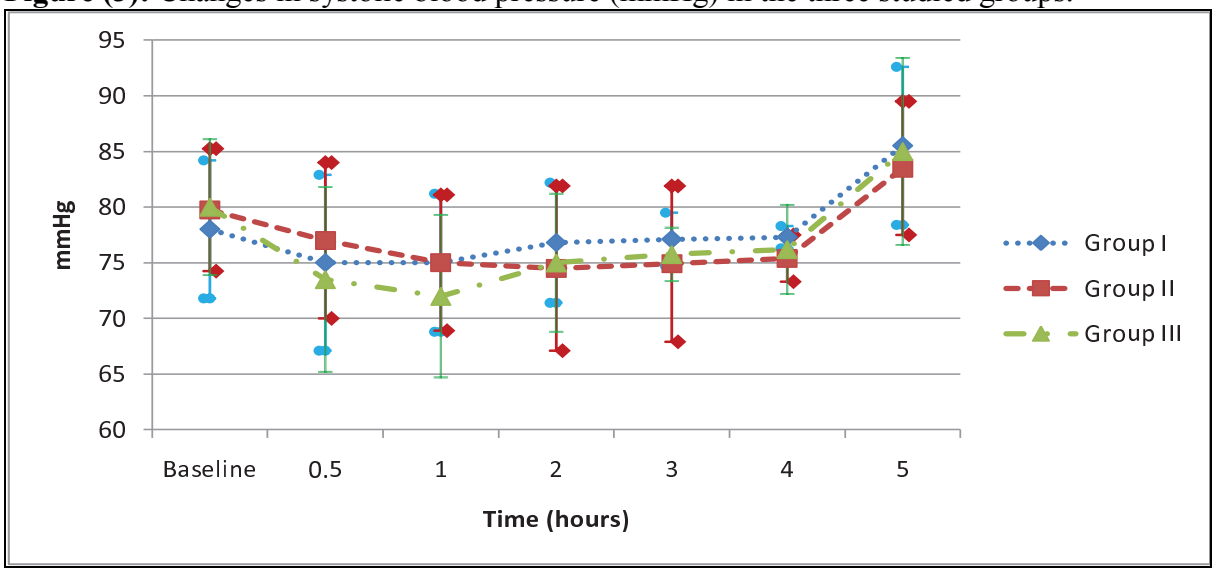

Figure (4): Changes in diastolic blood pressure (mmHg) in the three studied groups.

Table (4): Frequency of side effect. (%):

	Group I (n=20)	Group II (n=20)	Group III (n=20)	P
Nausea	2 = 10.0%	3 = 15.0%	8= 40.0%	*0.047
Shivering	8 = 40.0%	8 = 40.0%	10 = 50.0%	0.76
Pruritis	0	0	2 = 10.0%	0.12
RD	0	0	0	1.0
Vomiting	0	0	0	1.0

*P < 0.05 (Significant)
RD= respiratory depression

DISCUSSION

Posterior approach to the lumbar plexus (psoas compartment block) is considered to be more appropriate as it reliably produces blockade of the entire lumbar plexus, including femoral, lateral cutaneous and obturator nerves. Thus, psoas block may be suitable for upper thigh surgery and outpatient knee arthroscopy [7].The degree of block was evaluated by both sensory and motor block and by the amount of analgesic consumed in the first

postoperative 24hs [2,8,9]. The results of this study demonstrated that the addition of midazolam, unlike tramadol, prolongs the duration of bupivacaine induced sensory block of lumbar plexus while there was no significant difference in the onset of the block among the three groups. The amount of needed analgesics was decreased in midazolam group to more extent than in tramadol group. ***Kumar and co-workers*** [3] have reported that tramadol, as an adjunct to 0.25% bupivacaine in continous psoas compartment block for postoperative analgesia, neither improves the quality nor prolongs the duration of analgesia. This may be attributed to the use of lower concentration of bupivacaine. ***Jarbo and co-workers*** [5] have reported that midazolam (50 μ/kg) in combination with 30 mL of bupivacaine (0.5%) improved postoperative analgesia when used in brachial plexus block, they attributed the prolonged analgesia to the action of midazolam on GABA-A receptors present in the lumbar plexus and thus producing antinociception. Various authors have demonstrated the presence of GABA receptors in peripheral nerves. ***Brown and Marsh*** [10] demonstrated GABA receptors in mammalian peripheral nerve trunk. Also, ***Bhisitkul and co-workers*** [11] showed that axonal GABA receptors are present on both normal and regenerated sensory fibers in rat peripheral nerve.

This study demonstrated that there was statistically significant decrease in pain score after 2 hours in both tramadol and midazolam groups when compared with bupivacine group. This is in agreement with ***Jarbo and co-workers*** [5] who had observed lower pain scores in midazolam bupivacine group than in bupivacine group in brachial plexus block and in agreement with ***Robaux and co-workers*** [4] who had found that visual analogue scores were significantly reduced in tramadol groups when compared with the placebo group in brachial plexus block.

There was no statistically significant difference between groups as regards degree of motor block This coincides with the results obtained by ***Mannion and co-workers*** [12] who had found that addition of tramadol as adjunct to levobupivacaine in psoas compartment block had no effect on degree or duration of motor block and in agreement with ***Jarbo and co-workers*** [5] findings that addition of midazolam to bupivacaine had nothing to do with the motor brachial plexus block.

Concerning haemodynamic parameters, results of this study recorded that all haemodynamic changes are not clinically significant as they were still within the physiological range (20% decrease or increase from the baseline).

The results of this study coincide with that of ***Mannion and co-workers*** [12] who have demonstrated that the addition of tramadol to psoas compartment block with levobupivacaine 0.5% has no effect on blood pressure changes. In agreement with results of this study ***Jarbo and co-workers***[5] demonstrated that hemodynamic variables did not change significantly with using midazolam with bupivacaine in brachial plexus block.

Results of this study found that there was statistically significant increase in incidence of nausea in tramadol group. In agreement with our results ***Robaux and co-workers*** [4] declared that nausea and vomiting were increased with using tramadol as an adjuvant to mepivacaine in brachial plexus blockade. ***Williams and co-workers*** [13] had considered the technique of psoas compartment block as a risk factor for nausea and vomiting. This is because that the broad muscular surface area of the psoas and quadratus lumborum muscles is a very absorptive surface, so (PCB) may lead to central neurotoxicity which can be manifested by postoperative nausea and vomiting.

As regard other side effects; shivering, pruritis, vomiting and respiratory depression, statistically there was no significant difference in its percentage between the three groups.

In conclusion, this study concluded that addition of midazolam (50µ/kg) to bupivacaine gives better results than addition of tramadol (1mg/kg) to bupivacaine in psoas compartment block regarding duration of sensory block, amount of analgesic needed in the first 24 hours and incidence of nausea. Both of the two drugs have similar effects as regard the other parameters of comparison.

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