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# Comparative Study between Intrathecal (Bupivacaine Tramadol Mixture) versus Intrathecal (Bupivacaine Fentanyl Mixture) for Postoperative Analgesia in Patients Undergoing Infra-Umbilical Surgeries: Prospective Controlled Study

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## ABSTRACT

**Background:** Several adjuvants have been given via the central neuraxial pathway to lengthen the duration of analgesia brought on by local anesthetic (LA). After a range of surgical procedures, it has been shown that intrathecal opioid injection effectively provides postoperative analgesia.

**Objectives:** The primary outcome was to compare the duration and the quality of postoperative analgesia, secondary outcomes included intraoperative haemodynamic effects and operative side effects.

**Methods:** 120 patients (ASA I- II) undergoing infraumblical surgeries under spinal anesthesia were randomly allocated into 3 groups (n =40)**: Group (BF)** that received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) + 30µg fentanyl. Group (BT), which received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) + 30 mg tramadol hydrochloride. Group (BS) control that received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) alone. Hemodynamic variables, sensory and motor block characteristics, VAS and complications were recorded.

**Results:** The MBP was significantly lower in tramadol group compared to fentanyl and control groups only in the first 30 minutes. Heart rate (HR), $SPO_2$ showed non-significant difference. Pruritus was most common in the tramadol group followed by the fentanyl. Nausea and vomiting were more common in opioid groups than control group. VAS was significantly higher in the control group immediately and till 12 hours postoperatively compared to opioid groups.

**Conclusion:** Both tramadol and fentanyl, when used as intrathecal adjuvants to bupivacaine, offered excellent postoperative analgesia for patients having infraumbilical operations compared to bupivacaine alone. Side effect profiles between the two opioid groups were similar.

**Keywords:** Spinal anesthesia, Tramadol, Fentanyl, Bupivacaine, Postoperative analgesia.

## INTRODUCTION

Spinal anesthesia (SA) is crucial technique in the anesthetic practice particularly in infraumblical surgeries [(1)]**.** Effective postoperative pain management following SA is essential for patients comfort and early in the ambulation [(2)]**.**

Several adjuvants have been given via the central neuraxial pathway to lengthen the duration of analgesia brought on by LA [(3)]. Effective postoperative analgesia is provided by intrathecal opioid injection, although there are adverse complications like pruritus, nausea, vomiting, urine retention, and the danger of unanticipated respiratory depression [(4, 5)].

After a number of significant surgeries, tramadol has been utilized for postoperative analgesia [(6)]. With little chance of respiratory depression following central neuraxial injection, tramadol may offer efficient postoperative analgesia [(7)]. Compared to intrathecal morphine, pethidine and alfentanyl, intrathecal fentanyl had a stronger analgesic effect [(8)]. Intrathecal fentanyl has the benefit of having a very quick beginning of effect. According to reports, analgesia takes place in 5–10 min. [(9)].

Fentanyl provides rapid onset, potent analgesia and a safer alternative to morphine [(10)]**.**

This study aimed to compare between intrathecal bupivacaine tramadol mixture and intrathecal bupivacaine fentanyl mixture.

## PATIENTS AND METHODS

This prospective controlled study was conducted at Sohag University from March 2024 to June 2025. 120 patients aged 20–60 years with ASA physical status (I–II) were scheduled for infra-umbilical surgeries under SA were enrolled.

**Exclusion criteria:** Patients hypersensitive to amide LAs or study drugs, contraindications to SA, peripheral neuropathy, morbid obesity (BMI > 40) and patients' refusal.

**The patients were randomly allocated into three groups (n =40 each):**

- **Group (BF):** received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) + 30µg fentanyl.
- **Group (BT):** received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) + 30 mg tramadol hydrochloride.
- **Group (BS) control** received hyperbaric 0.5% bupivacaine (0.25: 0.30 mg/kg) alone

**Monitoring;** standard monitoring **(**ECG, HR, NIBP, Pulse oximetry) was applied and baseline values were recorded.

Before the SA was performed under aseptic circumstances, a venous access was established using a 16 or 18 gauge cannula, and the patient was preloaded with lactated ringer solution (10 ml/kg). The SA was



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performed while the patient was seated, using a 25G Quincke spinal needle at (L2-3 or L3-4). Each patient was given one of the coded spinal solutions (BT, BF, or BS) upon confirmation of a free flow of cerebrospinal fluid. The patients were placed in the supine posture as soon as the medication was administered.

The pinprick test was used to evaluate sensory blockage, while a modified Bromage scale was used to evaluate motor blockade: Grade 0: Was able to bend an extended leg at the hip, no paralysis. Grade 1: Could flex their knees but not their entire legs. Grade 2: Only moved their foot, and grade 3: is incapable of moving their foot. These tests were conducted every five minutes for a maximum of thirty minutes following SA, and then every thirty minutes after surgery until the motor and sensory variables return to baseline.

Patients were asked to rate their degree of pain in the post-anesthesia care unit (PACU) using a visual analogue score (VAS), which goes from 0 (no pain) to 10 (maximal pain).

The protocol was changed to general anesthesia if the analgesic level was insufficient. Lactated Ringer solution (10 mL/Kg) was administered intraoperatively to the patients. Prior starting SA, the hemodynamic variables and oxygen saturation were recorded every 5 minutes for 30 minutes, and subsequently every 30 minutes until the operation was finished.

The period between intrathecal delivery and the greatest spread of the sensory block, or a Bromage score of 3 was the start time of either motor or sensory blockade. The time between intrathecal delivery and the patient's ability to perceive pain in the S1 dermatome, or until the Bromage score returns to zero, represents the duration of sensory or motor blockage.

**Postoperative care:** To measure pain, the VAS (Zero – Ten) was used. The duration of the pain-free period was determined by measuring the interval between the spinal solution injection and the first rescue analgesic (nalbufin 0.15: 0.2mg/kg) that was given when VAS score was 3 or higher.

**Complications:** Such as nausea, vomiting, pruritus, shivering, respiratory depression (RR<10), hypotension, desaturation or hypoxemia ($SpO_2$<90%), and hypotension were observed and addressed appropriately. Hypotension, which is defined as a 20% drop in MAP from baseline was treated with a 6 mg ephedrine bolus. Atropine 0.01 mg/kg was used to treat bradycardia, which is defined as a HR of 60 b pm or below. Hypoxia was identified as a drop in oxygen saturation of 90%, and additional 60% oxygen was administered via a face mask.

**Sample size calculation:** Based on a pilot research that randomly was selected and separated 25 patients into equal groups in order to examine the effectiveness of SA between fentanyl and tramadol. With a 5 percent permitted error, the study's power was 120 and the mean difference between the two groups' results was 0.55. Each group's 0.40 was determined using open EPI [(11)].

**Ethical approval: Sohag Faculty of Medicine's Ethics Committee approved this work. After receiving all the information, each participant signed a permission. The Helsinki Declaration was followed throughout the course of the investigation.**

***Statistical analysis***

SPSS version 26.0 was used for the statistical analysis. Shapiro-Wilks test and histograms were employed to determine the normality of the data distribution. Quantitative data were given as mean ± SD and range and evaluated using paired t-test. Qualitative data were provided as frequency and percentage (%) and evaluated using the $X^2$- test and one-way ANOVA test as applicable. A two-tailed P value ≤ 0.05 indicated statistical significance.

## RESULTS

Table (1) showed the age of the patients, although group C age was somewhat lower than groups A or B but the difference was statistically non-significant.

**Table (1):** Age of study groups

| Group | Mean age (years) | Std. Deviation |
|---|---|---|
| A | 40.23 | 12.811 |
| B | 39.08 | 12.207 |
| C | 36.55 | 11.793 |
| Total | 38.60 | 12.266 |
| ANOVA = 0.932, P value = 0.397 (NS) | | |

Most of the cases in the three groups were females, and the three groups were sex-matched, with statistically non-significant differences either among the three groups or between each two individual groups (Figure 1).

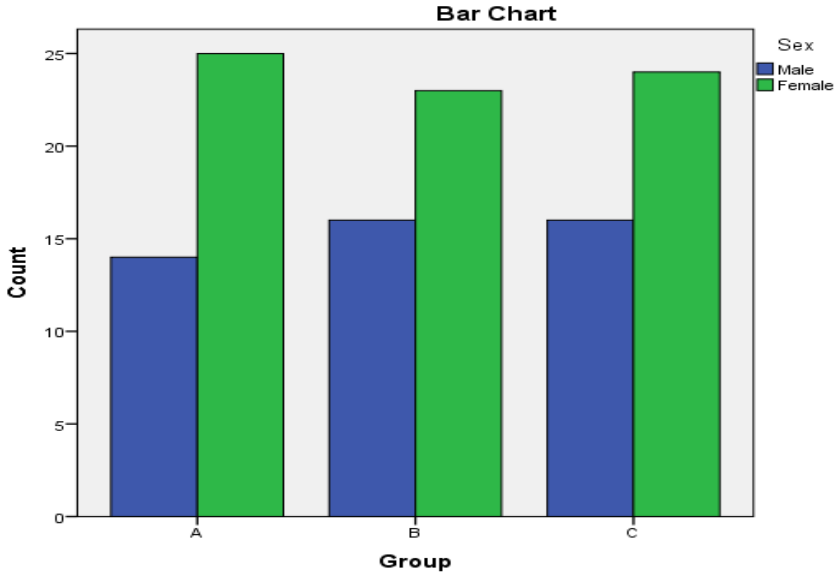


**Figure (1):** Sex distribution of study groups

**INTRA-OPERATIVE DATA**

Intraoperative HR measured every 5 min interval till 30 min and then every 30 min till the end of the study, showed that HR was statistically non-significant either among all groups or between each two individual groups (Table 2).

**Tables (2):** Intra-operative HR comparison between the three groups

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| Heart Rate (Intra) 0 min (beat/min) | 80.350 | 11.6807 | 79.325 | 10.9436 | 81.050 | 10.5319 | 0.246 | 0.782 |
| Heart Rate (Intra) 5 min | 78.900 | 10.7675 | 78.800 | 9.6721 | 79.200 | 10.6029 | 0.016 | 0.984 |
| Heart Rate (Intra) 10 min | 79.025 | 10.1084 | 78.200 | 9.2382 | 79.950 | 9.7137 | 0.326 | 0.722 |
| Heart Rate (Intra) 15 min | 77.900 | 9.5724 | 77.625 | 8.9548 | 79.050 | 8.7177 | 0.277 | 0.759 |
| Heart Rate (Intra) 20 min | 78.400 | 10.1875 | 78.200 | 9.9181 | 78.800 | 10.0184 | 0.037 | 0.964 |
| Heart Rate (Intra) 25 min | 77.425 | 10.5560 | 76.375 | 11.0144 | 78.000 | 9.9718 | 0.245 | 0.783 |
| Heart Rate (Intra) 30 min | 74.925 | 9.5203 | 75.300 | 9.7117 | 75.850 | 10.3591 | 0.089 | 0.915 |
| Heart Rate (Intra) 60 min | 74.575 | 8.9525 | 75.179 | 8.2490 | 75.250 | 9.0064 | 0.072 | 0.931 |
| Heart Rate (Intra) 90 min | 73.97 | 9.669 | 76.20 | 9.704 | 74.75 | 9.425 | 0.419 | 0.659 |
| Heart Rate (Intra) 120 min | 73.37 | 10.895 | 74.46 | 9.360 | 74.17 | 10.103 | 0.083 | 0.920 |
| Heart Rate (Intra) 150 min | 75.14 | 13.329 | 72.86 | 12.536 | 75.60 | 14.447 | 0.094 | 0.911 |
| Heart Rate (Intra) 180 min | 74.000 | 14.8862 | 70.800 | 15.2053 | 71.500 | 10.0712 | 0.129 | 0.880 |

Intra-operative mean blood pressure (MBP) measured every 5 min interval till 30 min and then every 30 min till the end of the study. MBP was highest among **group B** cases, followed by **group A** and lastly **group C**. This was maintained all over the intra-operation time, but was statistically significant only during the first 30 minutes, and then became non-significant. This was seen either among all the groups or between each two individual groups (Table 3).

**Tables (3):** Intra-operative MBP comparison between the three groups

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| MBP (Intra) 0 min (mmHg) | 83.625 | 11.2516 | 86.925 | 9.4608 | 80.825 | 10.8884 | 3.343 | 0.039 |
| MBP (Intra) 5 min | 83.100 | 9.9455 | 83.750 | 15.4733 | 80.850 | 8.8334 | 0.667 | 0.515 |
| MBP (Intra) 10 min | 82.425 | 11.5999 | 87.975 | 9.2971 | 80.050 | 12.2494 | 5.350 | **0.006** |
| MBP (Intra) 15 min | 82.300 | 10.2136 | 87.025 | 10.1286 | 76.825 | 7.8802 | 11.624 | **<0.001** |
| MBP (Intra) 20 min | 80.825 | 10.4780 | 86.250 | 8.7141 | 76.000 | 8.7852 | 12.002 | **<0.001** |
| MBP (Intra) 25 min | 79.325 | 11.1847 | 84.900 | 11.1948 | 74.500 | 9.5488 | 9.515 | **<0.001** |
| MBP (Intra) 30 min | 80.975 | 10.2294 | 85.625 | 9.0488 | 76.500 | 8.2088 | 9.839 | **<0.001** |
| MBP (Intra) 60 min | 82.575 | 10.8884 | 84.725 | 8.4033 | 82.225 | 12.8312 | 0.622 | 0.539 |
| MBP (Intra) 90 min | 81.500 | 9.4239 | 85.567 | 9.8740 | 80.031 | 9.3791 | 2.759 | 0.069 |
| MBP (Intra) 120 min | 80.500 | 10.9316 | 83.231 | 7.6958 | 80.200 | 12.5324 | 0.663 | 0.518 |
| MBP (Intra) 150 min | 82.833 | 7.5899 | 86.500 | 9.1183 | 80.600 | 6.5862 | 1.310 | 0.287 |
| MBP (Intra) 180 min | 86.636 | 8.5003 | 88.500 | 6.3166 | 84.250 | 11.4611 | 0.382 | 0.687 |

Intraoperative arterial oxygen saturation measured every 5 min interval till 30 min and then every 30 min till the end of the study between the study groups. Table (4) showed that $SaO_2$% was statistically non-significant either among all groups or between each two individual groups.

**Table (4):** Comparison between the three groups as regard to intraoperative SaO2%

| | P value | | |
|---|---|---|---|
| | A vs B | A vs C | B vs C |
| $SaO_2$ 0 min | 0.487 | 0.033 | 0.005 |
| $SaO_2$ 5 min | 0.756 | 0.669 | 0.941 |
| $SaO_2$ 10 min | 0.147 | 1.000 | 0.162 |
| $SaO_2$ 15 min | 0.726 | 0.396 | 0.726 |
| $SaO_2$ 20 min | 0.992 | 0.812 | 0.957 |
| $SaO_2$ 25 min | 0.364 | 0.924 | 0.375 |
| $SaO_2$ 30 min | 0.752 | 0.536 | 0.407 |
| $SaO_2$ 60 min | 1.000 | 1.000 | 1.000 |
| $SaO_2$ 90 min | 0.484 | 0.446 | 0.220 |
| $SaO_2$ 120 min | 1.000 | 1.000 | 1.000 |
| $SaO_2$ 150 min | 0.354 | 0.938 | 0.357 |
| $SaO_2$ 180 min | 0.726 | 0.396 | 0.726 |

There was non-significant statistical difference among the three groups or between each two individual groups as regards the occurrence of complications (Table 5).

**Tables (5):** Comparison between study groups as regard to complications

| **Complication** | **Group** | | | **Chi square** | **P value** |
|---|---|---|---|---|---|
| | **A** | **B** | **C** | | |
| **Respiratory depression** | 0 | 0 | 0 | - | - |
| **Pruritis** | 10 | 10 | 12 | 0.341 | 0.843 |
| **Itching** | 0 | 0 | 0 | - | - |
| **Shivering** | 0 | 0 | 0 | - | - |
| **Nausea** | 9 | 9 | 10 | 0.093 | 0.954 |
| **Vomiting** | 11 | 7 | 9 | 1.147 | 0.564 |
| **Desaturation** | 0 | 0 | 0 | - | - |
| **Hypotension** | 0 | 0 | 0 | - | - |
| **Bradycardia** | 0 | 0 | 0 | - | - |

**POSTOPERATIVE DATA:**

Postoperative analgesia expressed by VAS showed statistical significance in **group A** immediately and till 12 hours postoperatively compared to its values in both **(Groups B and C)**. VAS values were statically non-significant between **Groups B and C** all over the study period. However, at 24 hours post-operatively, all the groups showed non-significant statistical differences between all of them (Table 6).

**Tables (6):** Comparison of VAS between the study groups

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| VAS (Post) immediately | 0.225 | 0.4797 | 0.000 | 0.0000 | 0.000 | 0.0000 | 8.799 | **<0.001** |
| VAS (Post) 2 Hours | 1.550 | 1.2800 | 0.500 | 0.9608 | 0.375 | 0.8679 | 15.077 | **<0.001** |
| VAS (Post) 4 Hours | 2.550 | 1.4133 | 1.300 | 1.8145 | 1.475 | 2.2302 | 5.356 | **0.006** |
| VAS (Post) 6 Hours | 3.500 | 1.4322 | 2.350 | 2.2251 | 1.675 | 2.4007 | 8.004 | **0.001** |
| VAS (Post) 12 Hours | 3.675 | 1.1851 | 2.400 | 1.5981 | 2.250 | 1.7650 | 10.401 | **<0.001** |
| VAS (Post) 24 Hours | 3.025 | 1.2907 | 2.700 | 1.2649 | 2.700 | 1.3996 | 0.809 | 0.448 |

HR values post-operatively measured every 2 hours till 6 hours and then every 6 hours till the end of the study. HR in the three groups had non-significant statistical differences either among all the groups or between each two individual groups (Table 7).

**Table (7):** Comparison of Post-operative HR between study groups

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| HR (post) immediately (beat/min) | 74.350 | 9.5851 | 74.450 | 8.5394 | 74.700 | 9.3650 | 0.015 | 0.985 |
| Heart rate (post) 2 Hours | 75.100 | 7.7519 | 76.500 | 7.8805 | 75.000 | 7.6995 | 0.465 | 0.629 |
| Heart rate (post) 4 Hours | 74.900 | 8.2269 | 77.150 | 8.4718 | 74.850 | 8.0751 | 1.012 | 0.367 |
| Heart rate (post) 6 Hours | 76.750 | 8.6728 | 78.150 | 8.4293 | 76.300 | 8.1341 | 0.526 | 0.592 |
| Heart rate (post) 12 Hours | 77.725 | 7.5277 | 79.850 | 8.8072 | 78.200 | 7.6968 | 0.772 | 0.465 |
| Heart rate (post) 24 Hours | 79.250 | 7.8012 | 79.600 | 6.9901 | 79.850 | 6.9487 | 0.069 | 0.933 |

MBP values post-operatively measured every 2 hours till 6 hours and then every 6 hours till the end of the study. MBP was highest among **group B** cases, followed by **group A** and lastly **group C**. This was maintained all over the post-operative time, and was significant especially at 4, 12 and 24 hours among all the groups, and nearly at all the post-operative time between **groups B and C**. The only exception is the MBP at 6 hours, which showed non-significant statistical difference either among all the three groups or between each two individual groups (Table 8).

**Table (8):** Comparison of Post-operative MBP between study groups

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| MBP (Post) immediately (mmHg) | 81.250 | 9.2674 | 83.975 | 8.8506 | 79.550 | 10.2105 | 2.227 | 0.112 |
| MBP (Post) 2 Hours | 80.525 | 9.6103 | 83.250 | 8.6284 | 77.950 | 10.4193 | 3.061 | 0.051 |
| MBP (Post) 4 Hours | 85.300 | 10.9198 | 86.525 | 9.4326 | 80.950 | 10.9145 | 3.147 | **0.047** |
| MBP (Post) 6 Hours | 83.575 | 10.2679 | 82.949 | 10.1462 | 79.200 | 9.5332 | 2.240 | 0.111 |
| MBP (Post) 12 Hours | 82.950 | 8.5063 | 86.925 | 6.8365 | 80.600 | 8.7113 | 6.291 | **0.003** |
| MBP (Post) 24 Hours | 84.825 | 8.8691 | 87.350 | 7.6378 | 82.050 | 8.2523 | 4.112 | **0.019** |

The initial analgesic request resulted in a pain-free time of 2.44 ± 0.61 hours for group A, 5.06 ± 1.13 hours for group B and 3.97 ± 0.02 hours for group C. The difference in pain relief duration was extremely significant whether comparing group A and group C (P = 0.001), group B and group C (P = 0.001), or group B and group A (P = 0.001). This indicated that group B experienced the longest period of pain alleviation when compared to group C and group A. However, group C had a much longer pain-free period than group A (Table 9).

**Table (9):** Comparison between the study groups as regard to time of rescue analgesia

| | Group | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | A | | B | | C | | Significance | |
| | Mean | SD | Mean | SD | Mean | SD | ANOVA | P value |
| Time of first rescue analgesia | 2.44 | 0.61 | 5.06 | 1.13 | 3.97 | .02 | 2.589 | 0.086 |

## DISCUSSION

To improve the quality and duration of analgesia, a variety of adjuvants have been added to intrathecal local anesthetic drugs. Following a range of surgical procedures, it has been shown that intrathecal opioid injection effectively provides postoperative analgesia [12]. These drugs include Morphine, hydromorphone, diamorphine, sufentanil, meperidine, nalbuphine, clonidine, magnesium sulfate, ketorolac, ketamine, neostigmine, fentanyl and Tramadol [13, 14, 15, 16, 17].

**Alhashemi and Kaki** [6] determined that 25 mg of intrathecal tramadol was appropriate and safe for SA. **Chakraborty *et al.*** [18] used 20 mg of tramadol in their studies, **Parthasarathy *et al.*** [19] used a lower dose of 10 mg of tramadol and in our study we used a recent dose of 30 mg of tramadol for evaluating its efficacy, analgesic duration of action and associated side effects. **Carvalho *et al.*** [20] studied a wide range as of 2.5 up to 50 µg of fentanyl. **Hunt *et al.*** [21] evaluated 0, 2.5, 5, 12.5, 25 & 50 µg of fentanyl added to spinal hyperbaric bupivacaine, **Choi *et al.*** [22] used 10 µg of fentanyl and in our investigation we used a recent dose of 30 mg of fentanyl.

In our study, tramadol group showed statistically significant decrease in MBP in the first 30 minutes compared to the control group. This difference was non-significant for the remainder of surgery. These findings are consistent with **Alhashemi and Kaki** [6] who also observed a significant reduction in the first 75 min then return to normal with no statistically significance till the end of surgery. In contrast **Vickers *et al.*** [23] demonstrated that adding of tramadol 20 mg did not produce clinically relevant effects on blood pressure all over the study time. In contrast with our study **Choi *et al.*** [22] found that adding 10 µg of fentanyl to LAs had no effect on hemodynamics throughout the research period**.** Also on the contrary to our study, **Bano *et al.*** [24] reported that addition of fentanyl 25µg can lead to increase in incidence of hypotension.

In our study there was no statistically significant differences were observed in intraoperative HR between the three groups. In agreement with our study **Alhashemi and Kaki** [6] showed that intrathecal tramadol 25 mg had no statistically significant difference in HR all over the study time. Also **Arai *et al.*** [25] showed that adding fentanyl 20 µg to LAs did not alter significantly hemodynamic parameters in 40 parturient undergoing C-section compared to bupivacaine alone.

In our study as regards $SaO_2$%, we discovered no statistically significant changes during the study period. This is consistent with study **Martyr and Clark** [26] who stated that intrathecal fentanyl in conjunction with modest doses of intravenous midazolam can be safely delivered to elderly individuals if they are given supplementary oxygen and continuously monitored.

While, **Yerasi and Reddy** [27] found that administering 25 mg fentanyl intrathecally did not alter the $SaO_2$ all over the study time provided that the patients were not pre-medicated by midazolam. In contrast with our study **Karaman *et al.*** [28] demonstrated that adding fentanyl to intrathecal anesthetics significantly decreases the $SaO_2$% in elderly patients.

In our study as regards $SaO_2$%, we found that addition of tramadol 30 mg had no statistically significant changes all over the study period. In agreement with our study **Alhashemi and Kaki** [6], **Parthasarathy *et al.*** [19] and **Vickers *et al.*** [23] found that there was no statistically significant changes in the $SaO_2$% in their studies.

As regards complications in our study, pruritus was the most prevalent adverse effect among the fentanyl group, occurring in 10 patients (25%). In agreement with our study **Kuusniemi *et al.*** [29] found that 22.5% of the patients administered intrathecal fentanyl 25 µg suffered from pruritus. In contrast with our study **Kjellberg and Tramer** [30] who used 10 µg fentanyl reported that the incidence of pruritus was in the range of 60%-80%. **Liu *et al.*** [31] discovered that all patients had pruritus after receiving 20 ug of fentanyl intrathecally. Also in our investigation, in the tramadol group pruritus occurred in 12 patients (30%). In agreement with our study **Chakraborty *et al.*** [18] reported that pruritus was also found to be (28%) when tramadol 20 mg was injected intrathecally.

Our study showed that there were no statistically sig. changes between the three groups as regards postoperative nausea and vomiting. In our study the incidence was 22.5% (nausea) and 27.5% experienced

(vomiting) in the **control group,** and 22.5% and 17.5% in the **fentanyl group**, and 25% and 22.5% in the **tramadol group**. In agreement with our study **Carvalho *et al.*** [20] found that intrathecal fentanyl could exacerbate nausea and vomiting even when used at low dose regimens 15 µg. In agreement with our study **Alhashemi and Kaki** [6] showed that 18% of the patients expressed nausea and vomiting after using 25 mg of tramadol in patients undergoing TURP. Also, **Subedi *et al.*** [32] used 10 mg tramadol and 10 µg fentanyl intrathecally for patients undergoing Caesarean section (CS) and they found that 18% of the patients experienced nausea and vomiting in tramadol group and 13% in fentanyl group.

As regards shivering, our study found that the addition of fentanyl or tramadol to bupivacaine decrease the incidence of shivering during SA. In agreement with our study **Obara *et al.*** [33] in patients undergoing CS also found that adding fentanyl 5 µg intrathecally to the LAs decreases the incidence of shivering.

In our study none of the patient suffered from respiratory depression, but **Liu and McDonald** [34] showed a case report of life threatening respiratory depression when intrathecal fentanyl have been used for analgesia, which might be explained by higher dose used (50 µg) and the high sensory level reached T6.

Our study showed that the control group had the highest VAS score postoperatively. There was statistical significance between control & tramadol groups and control & fentanyl groups and there was no statistically significant differences between tramadol and fentanyl groups.

In our investigation, the addition of tramadol 30 mg somewhat increased the duration of bupivacaine-induced surgical analgesia and thereby reduced postoperative analgesic requirements.

This support the findings of **Parthasarathy *et al.*** [19] showed that the administration of 10 mg tramadol intrathecally shows clear analgesic advantages. Tramadol affects opioid receptors in the spinal cord and inhibits the absorption of norepinephrine and serotonin, resulting in non-opioid analgesia. Our study coincide with **Subedi *et al.*** [32] who proved that intrathecal tramadol 10 mg, fentanyl 10 µg and CS subarachnoid block with bupivacaine as an adjuvant demonstrated a prolonged duration of analgesia with little therapeutic value. In contrast with our study **Alhashemi and Kaki** [6] showed that patients having TURP surgery did not benefit from an intrathecal dosage of 25 mg of tramadol in terms of reducing their need for analgesics following the procedure.

In our study the combination of bupivacaine and fentanyl 30 µg intrathecally provided satisfactory postoperative analgesia. This is consistent with studies by **Craig *et al.*** [35] who demonstrated that adding 25 ug fentanyl to isobaric bupivacaine intrathecally prolong the duration of effective analgesia. Also in agreement with our study results, **Roussel and Heindel** [36] found that adding 10 µg of fentanyl to bupivacaine greatly increased the duration of analgesia.

In our study from 12 - 24 hours post-operatively, all the groups showed similar VAS with no statistically significant differences between the three groups. In agreement with our study results **Liu *et al.*** [31] proved that there were no statistically significant difference between fentanyl 20 µg plus bupivacaine and bupivacaine alone groups as regards VAS scoring from 6-24 hours duration post-operatively.

## CONCLUSION

The addition of either tramadol (30 mg) or fentanyl (30 ug) to bupivacaine provided effective postoperative analgesia for patients undergoing infraumblical surgeries superior to bupivacaine alone. Regarding MBP, the fentanyl group had highest values, followed by the control group and lastly the tramadol group. The reduction was statistically significant only during the first 30 minutes when comparing between the tramadol & the control groups and the fentanyl & the control groups, but these differences were not significant thereafter.

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