A Comparison of Spinal Anesthesia Versus Lateral Approach of Popliteal Nerve Block for Diabetic Foot Surgeries

ZEINAB I. EL HOSSARY, M.D.; HALA A. EL ATTAR, M.D.; OLFAT A.I. AMIN, M.D. and SHERIF M.S. MOWAFY, M.D.

The Department of Anesthesia and Surgical Intensive Care, Faculty of Medicine, Zagazig University

Abstract

**Background:** Providing anesthesia for diabetic patients is a frequent challenge because of serious comorbidities. Spinal anesthesia may impair hemodynamic stability; peripheral nerve blocks targeting the sciatic nerve may be a useful alternative.

**Objective:** To compare Unilateral Spinal Anesthesia versus Popliteal Block in diabetic patients undergoing elective foot surgery to determine the method of better outcome.

**Patients and Methods:** This randomized comparative study was carried out on sixty co-operative diabetic patients of both sexes who were scheduled for elective foot surgeries. According to the used method of regional anesthesia, patients were divided into: (F) group unilateral intrathecal block with low-dose (5mg) of hyperbaric bupivacaine plus intrathecal fentanyl (25pg), (M) group unilateral intrathecal block group with low-dose (5mg) of hyperbaric bupivacaine plus intrathecal midazolam (2.5mg), and (P) group in which the sciatic nerve at the popliteal fossa was blocked via lateral approach by injecting 30ml 0.5% bupivacaine (150mg) under ultrasound guidance and peripheral nerve stimulation assistance. The difficulty of the block performance, level of patient discomfort, block performance time, onset of sensory and motor blocks, postoperative pain intensity, time in hours to the first request for supplemental systemic analgesia postoperatively, its total consumption for 24 hours postoperatively and associated side effects were recorded in each group.

**Results:** Statistically, it was found no significant differences between the demographic characteristics as well as the duration of surgery among the three groups. The groups did not differ significantly in the difficulty of the block performance. However, a longer duration for performing the block was observed in the P group. The level of patient discomfort was significantly lesser in the P group. The onsets of complete sensory and motor blocks were highly significant longer in the P group. Hemodynamic profiles of our patients were found to be remarkably stable throughout the intraoperative period. In the P group, postoperative VAS values were significant lesser and the time to first pain medication was significant longer. Moreover, the total dosage of analgesics during the first 24 hours postoperatively in group P was highly significant lesser compared to the other groups.

**Conclusion:** The lateral approach for popliteal nerve block is an ideal alternative where it is preferable to avoid spinal anesthesia for foot surgeries in diabetic patients.

**Key Words:** Popliteal sciatic nerve block – Spinal anesthesia – Diabetic foot surgeries.

Introduction

SURGERY for diabetic foot is a relatively minor operation with negligible blood loss, but providing anesthesia for these patients is a frequent challenge because of serious comorbidities. Complications of diabetes that may alter the outcome of surgery and determine the peri-operative support required include: Cardiovascular disease, autonomic neuropathy, joint collagen tissue disorders, and immune deficiency. Hence, anesthetists should be vigilant about treating these coexisting conditions to ensure optimal peri-operative management of diabetic patients [1].

The peripheral location of the surgical site in foot and ankle surgery and the possibility to block the pain pathways at multiple levels present a clear advantage of regional anesthesia in this setting [1,2]. When spinal anesthesia is planned, limiting the block to lower dermatomal levels and avoiding the occurrence of hypotension is important because fluid loading and vasopressor administration may not be ideal methods to treat hypotension since end-stage renal disease and coronary artery occlusive disease are common in these patients. Single shot unilateral spinal anesthesia can be utilized for such operative procedures [1]. The block of the sciatic nerve at level of popliteal fossa is quite suitable for diabetic foot surgeries. This technique does not affect the treatment of the systemic diseases of these patients [3,4]. Lateral approach to the sciatic nerve through the popliteal fossa provides adequate anesthesia and postoperative analgesia for foot and ankle surgery [3,5,6].
The aim of this study: Is to do a comparison between Unilateral Spinal Anesthesia and lateral Popliteal Block in diabetic patients undergoing elective foot surgery to determine the method of better outcome and lesser side effects and to find out whether the lateral popliteal block could replace the intrathecal block completely for diabetic foot surgeries.

Patients and Methods

This study was carried out at Zagazig University hospitals over a period of two years from first of January 2011 to the end of December 2012. It was done after approval of the local ethics committee and the patient's written informed consent was obtained. This randomized comparative study was conducted on sixty ASA physical status class II and III co-operative diabetic patients of both sexes who were scheduled for various types of elective diabetic foot operations including forefoot debridements (drainage and excision of infected and necrotic tissues), and amputations.

These patients were divided into three equal groups according to the used method of regional anesthesia (20 patients in each group). These groups were: F group in which unilateral spinal anesthesia was achieved by low-dose (5mg) of hyperbaric bupivacaine combined with intrathecal fentanyl (25 µg), M group in which unilateral spinal anesthesia was achieved by low-dose (5mg) of hyperbaric bupivacaine combined with intrathecal midazolam (2.5mg), and P group in which the sciatic nerve at the popliteal fossa was blocked via lateral approach by injecting 30ml 0.5% bupivacaine under ultrasound guidance and peripheral nerve stimulation assistance.

Patients with any neurological, psychiatric or muscular disorder, history of allergy to local anesthetics used, infection at the site of injection coagulopathy, severe renal and hepatic impairment, and patients receiving chronic analgesic therapy were excluded from the study.

Preoperative management:

- Preoperative evaluation and preparation of the patient by history taking, general examination as well as laboratory investigations.
- The anesthetic procedure was explained to the patient and then informed written consent was obtained from all patients.
- All patients were instructed about the visual analogue scale for pain. (0- no pain and 10- worst pain).
- An intravenous line was established before any injection of local anesthetic and all patients were premedicated with IV midazolam 10 µg/kg O2 supplementation (4-6 L/min) was administered via nasal cannula.
- Adequate resuscitation equipments and emergency drugs were available and near hand before starting the block.

Intraoperative management:

The standard intraoperative monitoring: ECG, pulse oximeter and non invasive blood pressure (NIBP) was used.

The skin at the site of the block was prepared using a solution of povidone iodine, and the site of needle insertion was infiltrated with 2mL of lidocaine 2% by a 25 gauge needle.

Performing unilateral spinal anesthesia: Unilateral spinal anesthesia was achieved with the patients in lateral decubitus position with the operative side is the lower one. Under strict aseptic precautions Lumber Puncture was done using 25 gauge disposable Quinke spinal needle at L3 – L4 or L4 – L5 spinal intervertebral space by midline approach. Following free flow of CSF the drugs were injected. The patient was kept in this position with the operative side is the lower one for at least 15min. to achieve selective unilateral spinal anesthesia. According to the drug injected into the subarachnoid space, the patients under spinal anesthesia were equally divided into two groups.

Group F: Intrathecal block with addition of 25 µg fentanyl to 5mg hyperbaric bupivacaine (n=20).

Group M: Intrathecal block with addition of 2.5mg midazolam to 5mg hyperbaric bupivacaine (n=20).

The drug mixture was prepared freshly at time of procedure.

Performing popliteal sciatic nerve block in group P: The lateral approach to popliteal block was performed with patients in the supine position and their leg extended at the knee joint and elevated. The nerve localization was achieved using insulated needle connected to a nerve stimulator (NS ML-100) and under ultrasound guidance using ultrasound apparatus Honda with a linear 7-12 MHz probe.

The ultrasound probe was placed 7cm above popliteal fossa crease and parallel to it such that sciatic nerve was visualized on axial section. After visualization of sciatic nerve a 100mm long, 22G
insulated stimulating short beveled needle attached to the nerve stimulator was inserted in a horizontal plane 7cm above the most prominent point of the lateral femoral epicondyle, in the groove between the biceps femoris and the vastus lateralis muscles inplane along the longitudinal axis of the ultrasound beam (Fig. 1). The stimulating current is set at 0.5mA. The needle was observed until it just contacts the nearest aspect of the nerve. At this point, the patient demonstrated subtle planterflexion or dorsiflexion of the ankle.

Localization of the nerve was considered successful when the response of either tibial nerve (plantar flexion), or common peroneal nerve (lateral inversion-dorsal flexion) was obtained. Following negative aspiration, 30ml of 0.5% bupivacaine (150mg) was injected and visualized circumferentially spreading around the sciatic nerve.

The following parameters were detected and recorded in each group. Data collection and analysis were conducted by an anesthetist not involved in block performance technique.

- Difficulty of the block performance: The number of attempts to localize the popliteal nerve or subarachnoid space defined as the number of skin punctures.
- Block performance time (min.): It is the time from the beginning of the needle insertion till injection of local anesthetic.
- The level of patient discomfort during the block performance: Patients were asked to grade discomfort during performance of the block by using a three-level scale: 0=No discomfort; 1=Mild discomfort (feeling of minor stimulations without withdrawal movement); and 2=Moderate discomfort (feeling of moderate stimulations associated with withdrawal movement).
- The onset of action:
  a- The onset of sensory block (min.): The time from the moment of local anesthetic injection to the moment of loss of sensation to pin-prick in the area required to be blocked. Sensory block was tested by pin prick method every 5min. after injection of local anesthetic for up to 30min.
  b- The onset of motor block (min.): The time from the moment of local anesthetic injection to the moment of complete inability to move the foot.
- The associated side effects:
  a- Cardiovascular system: Heart Rate (HR), systolic (SBP), and diastolic (DBP) blood pressure were noted before doing the block (baseline), at skin incision, every 5 minutes intraoperatively, and at skin closure. Hypotension was defined as decrease in blood pressure more than 20% of baseline and was treated with IV fluids and injecting Ephedrine increments IV. Injection of Atropine was given when HR decreases less than 50 beat/ min.
  b- The incidence of each of the following side effects was noted during the peri-operative period and recorded in each group.
  I- Puncture of blood vessels.
  II- Nausea, vomiting, pruritis,and shivering.
  III- Local anesthetic toxicity: throughout the procedure, if any sign of local anesthetic toxicity had occurred as (circumoral numbness (earliest), tongue paresthesia, dizziness, restlessness and agitation ..... etc), it had been recorded and promptly treated.
- The postoperative pain intensity was evaluated by a visual analogue scale (VAS) immediately postoperative and at 2, 4, 6, 12, 18 and 24 hours postoperatively. VAS consists of a 10cm straight line with verbal anchors at both ends that define the boundaries of the measured pain, zero = “no pain” and 10 = “worst pain imaginable.
- The time in hours to the first request for supplemental systemic analgesia and its total consumption for 24 hours postoperatively: During the post-operative period opioids were not given until demanded by the patients due to pain. The time at which supplementation given was recorded. This point corresponded to poor analgesia on the scale. VAS of more than 3/10 means that the patient needs supplemental analgesia. 0.1mg/kg
of morphine was given IV for these patients. Total dose of analgesics administered in the first 24 hours postoperatively was noted.

**Statistical analysis:**

Data were collected, tabulated and finally analyzed statistically using SPSS version 19 statistical program. Descriptive statistics were used such as percentage, arithmetic mean, standard deviation and range. Statistical tests of significance were used to compare between the studied groups as Chi-square test, F test (ANOVA) and Kruskal-Wallis (KW) test. \( p \)-value (<0.05) was considered significant difference and \( p \)-value (<0.01) was considered high significant difference.

**Results**

Statistically, there were no significant differences between the demographic characteristics (age, sex, weight and height) as well as the duration of surgery in the three groups (Table 1).

Statistically, the three groups did not differ significantly in the difficulty of the block performance. While, the mean block performance time of the P group was highly significant longer than that of the other groups (Table 2). The majority of the patients in the three groups needed only one or two attempts for either subarachnoid space identification or sciatic nerve localization while, the number of those who needed three attempts were 1 and 2 patients in group F and P respectively. There was only one patient who needed more than three attempts to localize the popliteal nerve in group P (Table 3).

The mean discomfort score value of the P group was statistically significantly lesser than that of the other two groups (Table 4). The number of patients who felt no discomfort was significantly higher in the P group than in F and M groups (Table 5).

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>55.5±6.6</td>
<td>55.6±6.4</td>
<td>55.9±6.6</td>
<td>0.9</td>
</tr>
<tr>
<td>Sex (m/f)</td>
<td>11/9</td>
<td>13/7</td>
<td>12/8</td>
<td>0.81</td>
</tr>
<tr>
<td>Weight (Kg)</td>
<td>84±9.1</td>
<td>82.7±9.3</td>
<td>85±6.2</td>
<td>0.53</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>166±6.5</td>
<td>165.6±6.7</td>
<td>161.2±6.5</td>
<td>0.94</td>
</tr>
<tr>
<td>Duration of surgery (min.)</td>
<td>26±7.9</td>
<td>28.1±5.8</td>
<td>27±5.9</td>
<td>1.0</td>
</tr>
</tbody>
</table>

Data expressed as Mean ± SD.

\( n. = \) Total number of patients in each group.

\( m/f = \) male/female.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>( F ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of attempts to reach a satisfactory endpoint</td>
<td>1.4±1.0</td>
<td>1.2±0.5</td>
<td>1.2±1.0</td>
<td>0.50 0.61</td>
</tr>
<tr>
<td>Block performance time (min)</td>
<td>8.9±1.8*</td>
<td>5.0±0.97</td>
<td>5.3±1.3</td>
<td>48.7 0.001</td>
</tr>
</tbody>
</table>

\( F \)-test (ANOVA = Analysis of variance)

Data expressed as Mean ± SD.

\( * \) \( p \)-value <0.01 means highly significant difference.

<table>
<thead>
<tr>
<th>No. of attempts</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>( \chi^2 ) Test</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>One attempt</td>
<td>13</td>
<td>65</td>
<td>17</td>
<td>85</td>
<td>18</td>
<td>90</td>
<td>4.38 0.11</td>
<td></td>
</tr>
<tr>
<td>Two attempts</td>
<td>4</td>
<td>20</td>
<td>2</td>
<td>10</td>
<td>2</td>
<td>10</td>
<td>1.15 0.56</td>
<td></td>
</tr>
<tr>
<td>Three attempts</td>
<td>2</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>2.11 0.35</td>
<td></td>
</tr>
<tr>
<td>More than 3</td>
<td>1</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>2.03 0.36</td>
<td></td>
</tr>
</tbody>
</table>

\( \chi^2 \) (chi square test).

Data expressed as number and percentage.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>( F ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient discomfort levels during block performance</td>
<td>0.9±0.7*</td>
<td>1.5±0.5</td>
<td>1.4±0.5</td>
<td>5.40 0.001</td>
</tr>
</tbody>
</table>

Data expressed as Mean ± SD.

\( * \) \( p \)-value <0.01 means highly significant difference.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>( \chi^2 ) Test</th>
<th>( p ) value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discomfort score level</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>No discomfort</td>
<td>6</td>
<td>30*</td>
<td>1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Mild discomfort</td>
<td>10</td>
<td>50</td>
<td>10</td>
<td>50</td>
<td>12</td>
</tr>
<tr>
<td>Moderate discomfort</td>
<td>4</td>
<td>20</td>
<td>9</td>
<td>45</td>
<td>8</td>
</tr>
</tbody>
</table>

Data expressed as number and percentage.

\( * \) \( p \)-value <0.01 means highly significant difference.
Statistically, the onsets of complete sensory and motor block of P group were highly significant longer in comparison to the spinal groups (Table 6).

There were no significant differences between the mean values of the heart rate (b/m), systolic (SBP) and diastolic (DBP) blood pressure readings in the studied groups at various times of measurements (Figs. 2,3,4).

Table (6): Onsets of complete sensory and motor blocks (min.) in the studied groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onset of complete sensory block (min)</td>
<td>8.9±2.6*</td>
<td>4.7±1.7</td>
<td>5.6±1.4</td>
<td>26.29</td>
<td>0.001</td>
</tr>
<tr>
<td>Onset of complete motor block (min)</td>
<td>10.2±2.3*</td>
<td>6±2.3</td>
<td>7.5±1.3</td>
<td>21.84</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Data expressed as Mean ± SD.
*p-value <0.01 means highly significant difference.

The incidence of vascular puncture during the block as well as the incidence of shivering did not differ significantly in the studied groups (Table 7). There were no reported cases of nausea, vomiting, pruritis or local anesthetic toxicity in any group.

The postoperative VAS values at 6 hours in P group were highly significant lower than that in F and M groups, but no significant difference between the groups at other times of measurements (Table 8).

The time in hours to the first pain medication postoperatively was highly significant longer and its total consumption in mg/patients was highly significant lesser in P group than in F and M groups (Table 9).

Table (7): Incidence of associated vascular puncture and shivering in the studied groups.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>X2</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Puncture of blood vessels</td>
<td>0</td>
<td>2</td>
<td>10</td>
<td>0.75</td>
<td>0.77</td>
</tr>
<tr>
<td>Shivering</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>2.11</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Data expressed as number & percentage (No. & %). No. = Number of patients with the corresponding side effects.

Table (8): Postoperative Visual Analogue Scale (VAS) values at various times of measurements.

<table>
<thead>
<tr>
<th>Time/hour (Immediately postoperative)</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>K W</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 hours</td>
<td>0.6±0.7</td>
<td>0.4±0.7</td>
<td>0.5±0.7</td>
<td>0.75</td>
<td>0.69</td>
</tr>
<tr>
<td>2 hours</td>
<td>1.4±1.3</td>
<td>0.9±1.2</td>
<td>1.6±1.6</td>
<td>2.47</td>
<td>0.29</td>
</tr>
<tr>
<td>4 hours</td>
<td>1.5±1.2</td>
<td>1.25±1.4</td>
<td>1.7±1.6</td>
<td>0.96</td>
<td>0.62</td>
</tr>
<tr>
<td>6 hours</td>
<td>1.9±1.4*</td>
<td>3.5±2.1</td>
<td>3.2±2.1</td>
<td>11.15</td>
<td>0.004</td>
</tr>
<tr>
<td>12 hours</td>
<td>3.9±1.7</td>
<td>3.15±2.2</td>
<td>3.5±2.3</td>
<td>0.89</td>
<td>0.61</td>
</tr>
<tr>
<td>18 hours</td>
<td>1.8±0.7</td>
<td>2.3±1.3</td>
<td>2.2±1.3</td>
<td>1.43</td>
<td>0.49</td>
</tr>
<tr>
<td>24 hours</td>
<td>1.9±0.8</td>
<td>2±0.8</td>
<td>2.3±1.3</td>
<td>0.88</td>
<td>0.65</td>
</tr>
</tbody>
</table>

K W (Kruskal-Wallis test). Data expressed as Mean ± SD.
*p-value <0.01 means highly significant difference.
Table (9): Time in hours to the first request for systemic supplemental analgesia postoperatively and its total consumption in the first 24 hours postoperatively in the studied groups.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Group P (n=20)</th>
<th>Group F (n=20)</th>
<th>Group M (n=20)</th>
<th>KW</th>
<th>P</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time in hours to the first request for systemic supplemental analgesia (hours)</td>
<td>7.8±1.0*</td>
<td>5.7±0.8</td>
<td>5.3±0.7</td>
<td>5.99</td>
<td>&lt;0.001</td>
<td></td>
</tr>
<tr>
<td>Total consumption of supplemental analgesia (mg/patient)</td>
<td>12.3±4.5*</td>
<td>16.3±2.6</td>
<td>16.5±2.7</td>
<td>9.85</td>
<td>&lt;0.001</td>
<td></td>
</tr>
</tbody>
</table>

Data expressed as Mean ± SD. * p-value <0.01 means highly significant difference.

Discussion

Surgery of the foot in patients with diabetes mellitus should not be considered taboo but it requires specific criteria that must be strictly followed. The diabetic patient provides several challenges to the anesthetist, most of which can be predicted with good preoperative evaluation, careful monitoring and understanding of the relevant pathophysiological features [7,8].

Regional anesthesia may reduce some of the associated risks but it necessitates similar vigilance. While limiting the anesthesia to the very periphery of the extremity has obvious advantages over general anesthesia, occasionally local factors (infection, swelling) may not permit use of ankle or mid-tarsal blocks. Fortunately, the advantageous anatomy of the lower extremity allows use of neuronal blockade at different levels, as one ascends in the neuronal axis (knee level, hip level, and the spinal/epidural level) [3].

Spinal anesthesia is the current trend of anesthetic technique for lower extremity surgeries, but there is a need to broaden the horizon of options available and it is possible to use peripheral nerve blocks alone and achieve adequate pain relief without any form of neuraxial analgesia.

In this study, we investigated the effects of addition of fentanyl or midazolam to bupivacaine to find out the best additive among them. We found that the addition of intrathecal fentanyl or midazolam to bupivacaine had no significant difference between both of them as regard the onset of sensory and motor blocks, hemodynamic stability and postoperative analgesia.

The findings in this study are somewhat different from the findings of the study conducted by Talwar et al., [9] to compare intrathecal midazolam and fentanyl added to bupivacaine on the duration and quality of spinal blockade. They concluded that intrathecal fentanyl in combination with bupivacaine provides a longer duration of sensory and motor blockade as compared to midazolam for elective lower limb surgery, with greater possibility of an associated mild sedative effect. This could be attributed to the effects of different doses of subarachnoid midazolam or fentanyl. In their study, the patients were randomly divided into two groups midazolam group (13mg hyperbaric bupivacaine with 1mg preservative free midazolam) and fentanyl group (13mg hyperbaric bupivacaine with 20µg fentanyl) while in the present study, diabetic patients scheduled to undergo elective foot operations under spinal anesthesia were randomly divided into midazolam group (5mg hyperbaric bupivacaine with 2.5mg preservative free midazolam) and fentanyl group (5mg hyperbaric bupivacaine with 25µg fentanyl).

Various studies have demonstrated that subarachnoid injection of fentanyl or midazolam to bupivacaine could increase the duration of sensory block. The duration of postoperative analgesia with fentanyl was 5.7±0.8 hours and with midazolam was 5.3±0.7 hours in the present study. This is in line with earlier studies by, Belzarena, [10] Biswas et al., [11] and Bhure et al., [12]. In Belzarena, [10] study 25µg fentanyl produced analgesia that lasted for 305±89 minutes (5.08±1.4 hours) while Biswas et al., [11] noted that 12.5µg fentanyl produced analgesia that lasted for 248±11 minutes (4.1±0.2 hours). In the study conducted by Bhure et al., [12] the duration of analgesia with 25µg fentanyl was noted to last 284.67±30.19 minutes (4.7±0.5 hours) while, that with 2.5mg midazolam lasted 270.54±36.22 minutes (4.5±0.6 hours).

The results of the present study are in agreement with that reported by Khanna and Singh, [13] who evaluated the risks and benefits of the administration of fentanyl during spinal anesthesia in elderly patients undergoing hip replacement or dynamic hip screw. They concluded that in elderly patients premedicated with benzodiazepines, 25µg fentanyl during spinal anesthesia does not alter characteristics of motor block; prolongs the sensory block; and preserves the cognitive function and they believed that these factors would justify the use of spinal fentanyl in the elderly patients.

Our results were found to be inconsistent with Safari et al., [14] who found that in opium abusers undergoing lower limb orthopedic surgery intrathecal injection of midazolam or fentanyl to plain...
bupivacaine 0.5% increases the duration of sensory block; the effect of midazolam was more pronounced than fentanyl. However, the effects of intrathecal midazolam or fentanyl in non-abuser patients may demonstrate different results.

In this study, longer duration for performing the block was observed in the popliteal block group relative to the spinal anesthesia groups. However, the groups did not differ significantly in the difficulty of the block performance as shown by the number of attempts to reach a satisfactory end point to inject the local anesthetic. This is in accordance with Jeon et al., [18] who conducted a study comparing clinical properties and patient satisfaction between spinal anesthesia and popliteal nerve block for hallux valgus surgery and found that the time taken for the nerve block in the popliteal block (PB) group was longer than that taken for the spinal anesthesia group.

In our study, the time taken for the complete popliteal block was long despite using combined nerve stimulator and ultrasound technique. This is in line with Dufour et al., [16] who reported that combined ultrasound and neurostimulation guidance does not decrease the popliteal block time.

Results of the present study showed that despite the long time taken for performing the block, popliteal nerve block provides an adequate level of anesthesia, and significantly lesser patient discomfort relative to the spinal groups. This could be attributed to the lateral technique allowed performance of the PB with patients in the supine position. In support with this, the findings of Jeon et al., [15] in their study reported that the popliteal block had a relatively high patients’ satisfaction compared with spinal anesthesia. Palaniappan et al., [5] also, concluded that the comfort level of the patient (i.e. less pain) favored the popliteal block using the lateral approach over the conventional posterior approach for diabetic foot surgeries.

The cardiovascular profile of our patients was found to be remarkably stable throughout the intraoperative period. In all groups, the mean HR values were comparable. Similarly, there was no difference in the systolic and diastolic BP between the three groups. In a similar study, Krobot et al., [17] compared hemodynamic data of unilateral spinal anesthesia and popliteal block in elderly patients undergoing transmetatarsal amputation. They performed the study on thirty ASA II and III randomly assigned patients (70-86 years) received either unilateral spinal anesthesia by intrathecal injection of 6mg of hyperbaric bupivacaine (0.5%) in the lateral position with operative side down maintained for 15 minutes or popliteal block (posterior approach), using peripheral nerve stimulator and 10ml of lidocaine (2%) and 30ml of levobupivacaine (0.5%) were administered following sciatic nerve localization. They concluded that popliteal block provided more stable hemodynamic data than unilateral spinal anesthesia in elderly patients.

Effective pain control is essential for optimum care of patients in the postoperative period. In our study, the popliteal nerve block via the lateral approach provided excellent results on postoperative pain control. The postoperative VAS values were significant lesser and the time to first pain medication was highly significant longer in popliteal group relative to the spinal groups. Moreover, the total dosage of analgesics during the first 24 hours postoperatively were highly significant lesser in P group compared to the spinal groups.

Our results are consistent with Hansen et al., [18] who evaluated a regional anesthetic technique, which blocks the sciatic nerve in the popliteal fossa and the saphenous nerve block at the knee as the sole anesthetic technique for outpatient foot and ankle surgery. They concluded that this technique appears to have several advantages:

- Excellent anesthesia during the operation and for about ten hours postoperatively, in our study the postoperative analgesia time was about 7.8 ± 1.0 hours in the popliteal group.
- Absence of systemic or local complications as might be seen with general, spinal or epidural anesthesia.

This is in keeping with the findings of other studies by Provenzano et al., [19] who observed a significant reduction in post-operative opioid requirements in patients with a successful popliteal fossa block, Akra et al., [20] who found that popliteal block is a safe and effective technique for postoperative analgesia in ankle arthrodesis, and Sinardi et al., [21] who reported prolongation of postoperative analgesia in the popliteal block patients.

Our results confirmed that the lateral popliteal nerve block limits the postoperative pain and minimize systemic narcotics requirements, which maximize patients’ comfort. This is in line with Grosser et al., [22] who evaluated the effectiveness of popliteal block in 25 consecutive patients undergoing a variety of foot and ankle procedures and suggested that the lateral popliteal block decreases patient discomfort, provides good postoperative pain control, and has high patient satisfaction with no significant complications and Krobot et al., [17]
who compared pain scores and side effects of unilateral spinal anesthesia and popliteal block in elderly patients and reported that popliteal block provided better postoperative analgesia than unilateral spinal anesthesia.

The common side effects of peripheral nerve blocks are incomplete block, direct nerve injury, hematoma, infection, and the risk of intravenous administration of local anesthetic [23]. There were no side effects in the popliteal group in our study, but Hajek et al., [24] reported superficial peroneal nerve and sural nerve injury in three patients (1.91%) out of 157 patients who were anesthetized with continuous popliteal nerve block. Despite the small chance, patients should be informed about such side effects.

Our study demonstrated that, even though performing a popliteal nerve block took slightly longer time than spinal anesthesia and the time required to achieve surgical anesthesia was longer compared to spinal groups, the popliteal nerve block resulted in a more favorable recovery, fewer complications, and better patient comfort than spinal anesthesia in diabetic patients undergoing foot surgery.

These results are consistent with Provenzano et al., [19] who concluded that the performance of the popliteal fossa nerve block with the guidance of a peripheral nerve stimulator is a safe and effective anesthetic technique for foot and ankle surgery. Also, Donohue et al., [25] found that combined popliteal and saphenous nerve blocks at the knee can offer a desirable alternative to general and spinal anesthesia for foot and ankle surgery.

In the present study, the lateral popliteal block gave nearly the same results obtained by Jeon et al., [15] who demonstrated that in hallux valgus surgery, the time taken for the procedure and nerve block in the popliteal nerve block group was longer than that taken for the spinal anesthesia group. However, PB was determined as relatively safe, provided an appropriate level of anesthesia, reduced possible side effects from the spinal anesthesia, and showed excellent results on postoperative pain control. The authors suggested that PB to be considered as the anesthetic procedure for hallux valgus surgery and for postoperative pain control, especially in patients for whom spinal anesthesia is not feasible.

Conclusion:

Despite performing a popliteal nerve block took slightly longer time than spinal anesthesia and the time required to achieve surgical anesthesia was longer, the popliteal nerve block resulted in a more favorable recovery, and better patient comfort than spinal anesthesia. We hence concluded that the lateral popliteal approach is an ideal alternative where it is preferable to avoid spinal anesthesia for foot surgeries in diabetic patients.

References


21- SINARDI D., MARINO A., CHILLEMI S., SILIOTTI R. and MONDELLO E.: Sciatic nerve block with lateral popliteal approach for hallux valgus correction between 0.5% bupivacaine and 0.75% ropivacaine. Minerva Anesthiol., 70: 625-629, 2004.


A Comparison of Spinal Anesthesia Versus Lateral Approach