COMBINED BLOCK OF THE FEMORAL AND LATERAL FEMORAL CUTANEOUS NERVES UNDER ULTRASOUND FOR POST-OPERATIVE ANALGESIA IN PATIENTS UNDERGOING HIP SURGERY: A DOUBLE BLIND RANDOMIZED TRIAL

MAROUN BADWI GHABACH¹, JAMIL MARWAN ELMAWIEH², MAY SEMAAN MATTA³ AND MAY RADY HEOU⁴

Background: Inadequate pain management of post-operative pain of patients undergoing hip surgery can result in morbidity and mortality complications. Anatomically, pain resulted from the incision site innervation (Lateral femoral cutaneous nerve) and the hip joint innervation mainly the femoral nerve. Adding femoral nerve blockade to the multimodal regimen for postoperative pain control after hip surgery has been described.

Methods: all 31 patients included in the study received preoperatively combined FN and LFCN block with Normal Saline 0, 9% (group I) or bupivacaine 0.5% (group II) randomly by using a previously generated continuous randomization list kept in a closed envelope. Pain control regimen consisted of Perfalgan 1g IV every 6 hours systematically and Dolosal 50 mg IM every 6 hours if needed (i.e. VAS > 4). Pain level was measured by using Visual Analogue Scale (VAS) for the first 24 hours. Time to the first request of analgesia and the total dose of dolosal were calculated.

Results: The number of patients who requested narcotics was significantly higher in group I (8) than group II (3), P=0.044; the total dose of dolosal used was significantly higher in group I (50 mg) than group II (9,375mg), P=0.0058. Time to the first request for analgesia was significantly lower in group I (6hrs ± 5.12) as compared to Group II (21.3 hrs ± 23.1), P=0.043.

Conclusion: In conclusion, FN and LFCN block when added to the standard regimen for postoperative pain management after hip surgery had a benefit in decreasing pain scores as well as opioid consumption.

Keywords: Femoral Nerve, Lateral Femoral Cutaneous Nerve, Nerve Block, Postoperative Analgesia, Ultrasound.

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Introduction

Post-operative pain of hip surgery is a significant issue; it affects early mobilization, joint range of motion and length of hospital stay\(^1\). An inadequate pain management can lead to secondary medical morbidities as venous thromboembolism and cardiac events\(^1-3\).

Post-operative analgesia, depending on the institution regimen for pain treatment, is either parenteral opioids, epidural or multimodal analgesia with or without peripheral nerve block\(^4\). Opioids provide efficient pain relief but are associated with serious side effects especially in the elderly including respiratory depression, sedation, hallucination, nausea, bladder dysfunction and pruritus\(^5\). Epidural analgesia is efficient but also had side effects including hypotension, bladder dysfunction and epidural hematoma\(^6\). Femoral nerve, lumbar plexus and fascia iliaca blocks had been demonstrated to improve pain scores and to reduce morphine consumption in the post-operative period. Posterior lumbar plexus block is more effective than femoral nerve block\(^7\) but its use is limited because of more serious complications as epidural hematoma, total spinal, renal puncture and others\(^8\). The clinical success rate of fascia iliaca block is variable due to highly variable anatomical course of the lateral femoral cutaneous nerve besides the need of high volume of local anesthetic\(^9\).

In our study we tested the hypothesis that a combined block of the femoral nerve (FN) and lateral femoral cutaneous nerve (LFCN) under ultrasound preoperatively has a positive impact on the post-operative analgesia. The end-point was the decrease in the percentage of patient who rescue narcotics in the first 24 hours period post-operatively and the total dose of narcotics needed.

Patients and Methods

The clinical study was performed after receiving institutional review board and informed consent from the patients. Thirty one consecutive patients scheduled for unilateral hip arthroplasty or osteosynthesis between September 1\(^{st}\) and December 30\(^{th}\) 2014, were included in the study. Inclusion criteria were age above 18 years, ASA I-III, and weight above 50 kg. Exclusion criteria were peripheral neuropathy, communication failure, bleeding disorders, allergy to local anesthetics, and use of chronic pain medications.

The surgical procedure was performed with a standardized spinal anesthesia regimen. The patients presented to the operating room without premedication. The monitoring consisted of noninvasive blood pressure measurements, electrocardiography, pulse oximetry, and qualitative ETCO2. An infusion of Ringer’s solution was started, O2 was supplied via a face mask (6L/min) and 5 µg sufentanil (Janssen-Cilag, Switzerland) was given intravenously. All patients received combined FN and LFCN block with Normal Saline 0, 9% (group I) or bupivacaine 0.5% (group II) randomly by using a previously generated continuous randomization list kept in a closed envelope. This envelope handed to an anesthesia technician not involved in the study who prepared identical syringes either containing 20 mL of NaCl 0.9% or 20 mL of bupivacaine (Astra-Zeneca, USA) 0.5% according to the randomization number on the list. In the supine position and at the side of surgery, the block area was disinfected. With a linear array probe (4-12 MHZ, GE LOGIC e ultrasound), the FN block was performed at the inguinal cease level, the LFCN blocked immediately inferior to the anterior superior iliac spine. 15 mL of the solution (bupivacaine or NaCl 0.9%) were injected around the FN, while 5mL around the LFCN. Standard spinal anesthesia was then performed to all patients in the sitting position by intrathecal injection of 13 mg of heavy bupivacaine 0.5% at the L3-L4 or L4-L5 level. Postoperatively, pain level was measured by using Visual Analogue Scale (VAS), no pain = 0 and worst pain = 10, at rest and at lower limb spontaneous movement of the operated side every six hours after spinal anesthesia has resolved (spontaneous lower limb movement in the recovery room) for the first 24 hours (H0, H6, H12, H18, H24). Pain control regimen consisted of Perfalgan 1g IV every 6 hours systematically and Dolosal 50 mg IM every 6 hours if needed (i.e. VAS > 4). Time to the first request of analgesia, and the total dose of dolosal used for every patient in the first 24 hours postoperatively were calculated. Demographic data were collected for all patients including age, sex, physical status classification according to the American Society of Anesthesiologists (ASA), type of
surgery and operative time.

Main postoperative anesthesia related complications including nausea, vomiting and drowsiness were measured.

Parametric variables were described as ± SD, qualitative variables were described as number (percentage) and as median range. Student’s t-test, chi square test or Fisher exact test was used as appropriate to compare the two groups. P < 0.05 was considered statistically significant.

**Results**

Demographic according to the patient age, sex, ASA physical status, operating time and type of surgery were not significantly different between the two groups (Table 1), as well as postoperative anesthesia related complications (Table 2).

In the first 24 hours postoperatively: The number of patients who requested narcotics was significantly higher in group I (8/15) than group II (3/16), P=0.044;

### Table 1

<table>
<thead>
<tr>
<th>Demographic characteristics of patients and type of surgery in Group I (Normal Saline) and Group II (Femoral nerve and Lateral Femoral cutaneous Nerve Block).</th>
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<tbody>
<tr>
<td><strong>Normal Saline Group I, n=15</strong></td>
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<tr>
<td>Age, y, mean ± SD</td>
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<tr>
<td>Sex, male/female</td>
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<tr>
<td>ASA physical Status, number of patients, I/II/III</td>
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<tr>
<td>Operation Time in min, (mean ± SD)</td>
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<td>Arthrosis/fracture</td>
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Abbreviations: y = years, m = minutes, NS = Non-Significant.

### Table 2

<table>
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<tr>
<th>Comparison of anesthesia related complications in the 2 groups.</th>
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<tbody>
<tr>
<td><strong>Normal Saline Group I, n=15</strong></td>
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<tr>
<td>Nausea</td>
</tr>
<tr>
<td>Vomiting</td>
</tr>
<tr>
<td>drowsiness</td>
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Abbreviations: NS = Non-Significant.

### Table 3

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<th>Dolosal consumption and time to first request for analgesia in the 2 groups.</th>
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<td><strong>Normal Saline Group I, n=15</strong></td>
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<tr>
<td>Nbr of patients who requested recue dolosal in first 48 hrs post-op</td>
</tr>
<tr>
<td>Dolosal consumption in 48 hours, mg, average</td>
</tr>
<tr>
<td>Time to the first request for analgesia when needed</td>
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Abbreviation: hrs=hours, S=Significant.
The total dose of dolosal used was significantly higher in group I (50 mg) than group II (9.375 mg), P=0.0058. Time to the first request for analgesia was significantly lower in group I (6hrs ± 5.12) as compared to Group II (21.3 hrs ± 23.1), P =0.043. (Table 3).

The visual analogue pain score in Group I (Normal Saline) at rest and at movement of the operated lower limb shows a sea-saw shape (Figure I). In group II (FN+LFCN Block) the visual analogue pain score graphs at rest and at movement of the operated limb shows a stable level of analgesia. (Figure I).

**Discussion**

Pain after hip surgery consists of pain located at the site of the incision, the femoral shaft and pain due to a reflexogenic contracture of the quadriceps musculature. Patients characterize this pain as moderate to severe during the first day after surgery. Improvement in management of this pain had a major impact on morbidity and mortality. Anatomically, the hip joint is innervated by several nerves, including the femoral nerve, the obturator nerve, the sciatic nerve and the superior gluteal nerve; also to note that the incisional site is innervated by the lateral femoral cutaneous nerve. As a result, performing peripheral nerve blockades for anaesthesia in hip surgery is complex. However, femoral nerve blockade alone have been shown to reduce postoperative pain and morphine consumption in previous studies. Its blockade had attracted interest based on the fact of the high success rate, its simplicity and the low risk of complications. The advantage of LFCN blockade to cover the surgical site-incision inducing pain added to the FN block blockade has not been examined before in a prospective randomized study.

One retrospective study, reported by Vanderbroek et al with multiple limitations concluded that patients undergoing primary hip arthroplasty had lower pain scores and consequently less opioid use when they have received FN and LFCN block added to the standard protocol for postoperative pain control regimen.

In our double blind randomized study, a combined single shot FN block (15 mL of bupivacaine 0.5%) with LFCN block (5 ml of bupivacaine 0.5 %) was added to a standard protocol of postoperative analgesia.

**Fig. 1**

*Visual analogue pain score in Group I (Normal Saline) and Group II (Femoral nerve and Lateral Femoral cutaneous Nerve Block) in the first 24 hours postoperatively at rest and on moving the operated lower limb.*

Abbreviation: VAS=Visual Analogue Score.
FEMORAL AND LATERAL CUTANEOUS NERVE BLOCK FOR HIP SURGERY

(Perfalgan 1g IV every 6 hours systematically and Dolosal 50 mg IM every 6 hours if needed). It resulted in a significant decrease in the number of patient who requested narcotic (dolosal) by 65 % (8 patients versus 3) as well as the consumption of dolosal in the first 24 hours postoperatively by 80 % (50mg versus 9,375mg) as compared to the control group. The time to the first request for a rescue narcotic is significantly prolonged in block group (6hrs versus 21 hrs) as compared to the control group. The results demonstrated the efficacy of FN and LFCN blockade in improving postoperative analgesia.

The VAS pain score was evaluated at rest and at movement of the surgical lower limb. At rest, patients of block group had a stable VAS score over the time, in contrast to the control group who showed a seasaw profile due to the need for rescue analgesia over the time. This demonstrated the efficacy of LFCN blockade in providing postoperative analgesia of the incisional area.

In our standard protocol, the single shot regimen and not the continuous nerve block with catheter, was adopted to permit an early rehabilitation without possible falls due to muscle weakness secondary to FN block. Moreover the use of ultrasound guidance allows a precise block with an amount of anesthetic solution (bupivacaine 0.5%, total of 20 mL) that does not produce systemic toxicity. To note that the type of hip surgery (osteosynthesis or arthroplasty) had no influence on the pain score or the total amount of narcotics used.

A limitation of this study was the performance of the block in the preoperative period and an impossibility to evaluate the success of the block due to the shortness of the time to start the surgery in the operating theater.

In conclusion, FN and LFCN block when added to the standard regimen for postoperative pain management after hip surgery had a benefit in decreasing pain scores as well as opioid consumption.
References:

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- 97% of BRIDION patients recovered to a TOF* ratio of 0.9 from 1 to 2 PTCs* within 5 minutes1

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