Anesthesia and postoperative analgesia after percutaneous hallux valgus repair in ambulatory patients

Anesthésie et analgésie postopératoire après chirurgie de l’hallux valgus par voie percutanée en ambulatoire

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Aims. – Postoperative pain is often severe after hallux valgus repair. Sciatic nerve blocks with long-acting local anesthetics have been recommended for surgical anesthesia and postoperative analgesia. However, a novel percutaneous approach may require less analgesia and make the procedure suitable for ambulatory care. We thus tested the hypothesis that mid-foot block and sciatic nerve blocks provide comparable surgical analgesia and postoperative analgesia, but that patients ambulate independently sooner after mid-foot block.

Methods. – Forty patients scheduled for ambulatory percutaneous hallux valgus repair were randomly assigned to two anesthesia and analgesia blocks: foot infiltration achieved by a mild foot block, or sciatic nerve block (30 mL of 7.5% ropivacaine for each block). Surgery was performed without sedation or additional analgesia. Both groups were given oral paracetamol/codeine and ketoprofene systemically; tramadol was added if necessary. Walking ability and pain scores were assessed for 48 postoperative hours.

Results. – Demographic and morphometric characteristics, and duration of surgery were similar in each group. Pain scores were comparable and low in each group at rest and while walking. The time to ambulation without assistance was significantly less for patients in the infiltration group (3.8 ± 1.4 hours) than patients in the sciatic group (19.2 ± 9.5 hours; P < 0.0001).

Conclusion. – After percutaneous hallux valgus repair, mid-foot block and sciatic nerve block provided comparable postoperative analgesia. However, mid-foot block seems preferable since the time to ambulation without assistance is much reduced.

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Mots clés:
Chirurgie ambulatoire
Douleur postopératoire
Hallux valgus
Bloc sciatique poplité
Bloc métatarsien

RÉSUMÉ

Objectifs. – Ce travail visait à évaluer l’analgésie postopératoire du bloc sciatique versus des blocs métatarsiens dans la chirurgie de l’hallux valgus par voie percutanée en ambulatoire.

Type d’étude. – Étude prospective et randomisée.

Patients et méthodes. – Après accord du comité d’éthique et consentement éclairé écrit, 40 patients devant être opérés d’un hallux valgus par voie percutanée sous anesthésie locorégionale périphérique ont été inclus dans cette étude. Après randomisation, 20 patients ont été opérés sous blocs métatarsiens et 20 patients sous bloc sciatique. Dans les deux groupes un volume de 30 mL de ropivacaine à 7.5 % a été utilisé. L’analgésie postopératoire comportait du paracétamol codéiné et du biphénid en prise systématique, et du tramadol en traitement de secours. La douleur, la reprise de la marche, la qualité du...
1. Introduction

Postoperative pain due to conventional open hallux valgus repair can be severe and difficult to control with oral analgesics. Consequently, large doses of parenteral opioids are often required [1]. Regional anesthesia, particularly sciatic nerve blocks, provides good postoperative pain relief after foot surgery [2]. Thus, sciatic nerve blocks with long-acting local anesthetics (with or without a peri-neural catheter) has been recommended [2–5].

Hallux valgus repairs can now be done percutaneously, which provokes a smaller inflammatory response and thus generates less postoperative pain [6,7]. In this surgical technique, also called “mini-invasive hallux valgus repair”, osteotomies are performed through 3 to 5 mm incisions, and no internal fixation is required. Simpler alternatives to sciatic nerve blocks such as foot infiltration may thus be suitable for this newer surgical approach [8].

However, sciatic nerve blocks and foot infiltration have not been directly compared for percutaneous hallux valgus repair, and especially not in day-surgery patients in whom safe ambulation is a priority. We thus tested the hypothesis that sciatic nerve block and mid-foot block provide comparable surgical anesthesia and postoperative analgesia, but that patients ambulate independently sooner after foot infiltration.

2. Patients and methods

With approval by the ethics committee of the Ambroise-Paré Hospital and written informed consent from each patient, we enrolled 40 ASA physical status I or II ambulatory patients who were scheduled for elective percutaneous hallux valgus repair. Exclusion criteria included age less than 18 or more than 75 years; obesity (more than 130% of ideal body weight); anticipated general anesthesia; history of chronic pain; routine use of analgesics or analgesic consumption within 24 hours of surgery; drug or alcohol abuse; psychiatric disorders or contraindications to ketoprofene, tramadol, or paracetamol/codeine.

On the day of surgery, patients were randomly assigned to receive mid-foot block with 30 mL of 7.5% ropivacaine (infiltration group) or a posterior popliteal sciatic nerve block with 30 mL of 7.5% ropivacaine (sciatic group). Computer-generated, randomized assignments were maintained in sequentially-numbered opaque envelopes.

As needle penetration and local anesthetic infiltration are painful steps of digital nerve block [9], patients assigned to mid-foot block were given propofol sedation (1–2 mg/kg) for the procedure. To reduce the risk of iatrogenic nerve injury, infiltration was performed with a 22-gauge, short-bevel needle (5-cm long, Stimuplex A, Braun), and ropivacaine was injected after an initial aspiration test was negative. A mid-foot field block was performed by the surgeon and consisted in four punctures. The saphenous, medial dorsal cutaneous, and hallucal plantar nerves were addressed at the first metatarsocuneiform joint (dot A in Fig. 1; 9 mL). The deep peroneal nerve was addressed in the first web space (dot B in Fig. 1; 9 mL). And finally, at the level of the first metatarsophalangeal joint on each side, 12 mL of ropivacaine was injected (dots C and D in Fig. 1).

Patients assigned to preoperative sciatic nerve block were positioned prone and double-injections were made in the posterior popliteal region. The block was realized by experienced practitioner. We used a short-bevel, insulated needle (10-cm long, 22-gauge, Stimuplex A, Braun), and the block was facilitated by a nerve stimulator (Stimuplex HNS 11, Braun, Germany). Stimulation frequency was set at 2 Hz with an initial stimulating current of 1.5 mA, and gradually decreased to 0.5 mA. Ropivacaine was injected when eversion or dorsiflexion was provoked by stimulation of the peroneal nerve (15 mL), and the plantar flexion evoked by tibial nerve stimulation (15 mL). No propofol sedation was performed in the sciatic group.

Surgery was performed with the designed anesthesia (sciatic nerve block or mid-foot block), in case of inadequate block, a rescue light sedation by infusion of 1.0 to 1.5 mg/kg per hour of propofol was used. Postoperative analgesia was provided by paracetamol/codeine (1000 mg and 60 mg, three times daily) and ketoprofene...
LP (150 mg twice daily) systematically, and tramadol LP (100 mg twice daily) if necessary.

Patients recorded pain intensity twice on the first postoperative day and twice on the second day using on a visual analog scale (VAS) consisting of a 100-mm long horizontal line with the two end points labeled "no pain" and "the worst imaginable pain". Patients also recorded the number of tablets of tramadol used during the study, comments regarding frequency and severity of side effects (nausea, vomiting and constipation), and about sleep quality (patient had to state yes or no to the question: "did you have a good sleep for the first postoperative night?"). A diary was given to the patient at hospital discharge to record all these data at home. One week after surgery, patients were questioned by the surgeon during the control visit, about their satisfaction, pain score, and about the occurrence of neurological complications if any. Our primary outcome was the time required for patients to safely ambulate, with safe ambulation defined by the ability to walk without the assistance of another person or crutches.

Demographic data and clinical variables were analyzed by using unpaired, two-tailed Student’s t tests. VAS pain intensity scores were analyzed with two-way repeated measures analysis of variance. Because walking ability and tramadol consumption did not follow a normal distribution, Mann-Whitney U tests were used to compare these two outcomes. The $\chi^2$ test compared the incidence of side effects, sex distribution, and global satisfaction. Results are expressed as means ± SD or median as appropriate; with $P < 0.05$ considered statistically significant.

A previous study at our institution, using sciatic nerve blocks for the same surgical procedure (unpublished results), indicated that patients could ambulate without assistance 17 ± 9 hours (mean ± SD) after surgery. Eighteen patients per group thus provided an 80% power for detecting a 50% reduction in the time to walk safely after foot block. We thus made an a priori decision to evaluate 20 patients per group.

3. Results

Twenty patients in each group completed the study. The two groups were comparable with respect to demographic and morphometric characteristics, and to surgery duration (Table 1). All patients tolerated surgery without sedation or supplemental analgesia.

There were no statistically-significant differences between the two groups in the recorded VAS scores at discharge and within the first 48 hours following surgery (Fig. 2). The percentage of patients requiring tramadol (sciatic group 42% versus infiltration group 30%) and the cumulative dose of tramadol used by these patients at home (median 100 mg in the two groups) were not different between the two groups. The time to first oral rescue analgesic was comparable in the two groups: mid-foot block 8.5 ± 9.7 hours, sciatic group 13.1 ± 7.9 hours.

The time required to ambulate without assistance was significantly shorter with mid-foot block (3.8 ± 1.4 hours versus 19.2 ± 9.5 hours; $P < 0.001$). Most patients in the sciatic group needed to walk with crutches because of the motor-block persistence.

![Visual analog pain scores (VAS) at the time of hospital discharge and during the initial 48 postoperative hours. Results are presented as means ± SD.](image)

In contrast, patients who had foot infiltration were able to walk normally without pain, and without assistance, immediately after surgery. VAS pain scores while walking during the first 48 hours after surgery were similar in the sciatic group (40 ± 30 mm at day 1 and 32 ± 23 mm at day 2) and in the mid-foot block group (27 ± 20 mm at day 1 and 25 ± 15 mm at day 2).

Sleep quality during the first postoperative night was better in patients who had mid-foot block than in those given a sciatic block: 5% in the mid-foot block group did not sleep the first night versus 35% in the sciatic group ($P = 0.01$). Satisfaction 1 week after surgery was rated high in both groups without any statistically-significant difference: infiltration 97 ± 5, sciatic 92 ± 10. Side effects such as nausea, vomiting, and constipation were comparable in the two groups, with each symptom occurring in only 1 to 5 of the 20 patients who received each treatment.

4. Discussion

Foot or ankle surgery is often performed in an ambulatory care setting. Ideal anesthesia for these procedures would provide rapid patient recovery, minimal nursing care requirements in the post-anesthesia care unit, and an earlier hospital discharge. It must also provide reliable postoperative analgesia, particularly in foot surgery, which is known to induce moderate-to-severe pain that can account for readmission rates up to 50% [10]. Thus, regional anesthesia, particularly popliteal sciatic nerve blocks have been used for such procedures. With a long-acting local anesthetic, popliteal sciatic nerve block provides effective and prolonged postoperative analgesia. For example, 11 to 15 hours of analgesia are reported with 0.5% or 0.75% ropivacaine [11,12] and 10 to 20 hours of analgesia are reported with 0.5% bupivacaine [13,14]. However, the duration of sciatic blocks depends on both local anesthetic volume and concentration [15]. The ankle block anesthesia is also commonly used for hallux valgus repair [16]. However, their benefit on postoperative pain has not been studied by controlled study.

Our results indicate that mid-foot block and sciatic nerve blocks provide comparable surgical anesthesia and postoperative analgesia for percutaneous hallux valgus repair. Our findings of reliable analgesia during the first 48 hours with mid-foot block differ somewhat from previous reports. Tiberia et al. [17] demonstrated that, when 0.5% bupivacaine and the steroid hexadrol were injected, most patients required no analgesia during the immediate postoperative period. However, only 44% and 28% of them remained pain free 8 and 12 hours later, and fewer than 20%

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<tr>
<th>Table 1</th>
<th>Patient characteristics and intraoperative data.</th>
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<tr>
<td></td>
<td>Sciatic nerve block</td>
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<tr>
<td></td>
<td>n = 20</td>
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<tr>
<td>Gender (M/F)</td>
<td>1/19</td>
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<tr>
<td>Age (y)</td>
<td>56 ± 9</td>
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<tr>
<td>Weight (kg)</td>
<td>61 ± 9.4</td>
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<td>Height (cm)</td>
<td>164 ± 5</td>
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<tr>
<td>Duration of surgery (min)</td>
<td>25 ± 5</td>
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Except for male and female ratio, values are means ± SD.
remained pain free and comfortable during the entire postoperative period. Others have shown that postoperative analgesia produced by mid-foot block was similar to postoperative analgesia produced by lateral popliteal sciatic nerve block [18]. However, analgesia in that study lasted only 6 hours for foot infiltration versus 18 hours for sciatic nerve block.

Postoperative pain depends on the nature of a surgery; but even for a given procedure, the level of pain depends on the surgical approach and on the surgical technique. For example, laparoscopic inguinal hernia repair or laparoscopic nephrectomy leads to a faster recovery and less postoperative pain compared with laparotomy [19,20]. Presumably, the disparity between previous results and ours is that the less-invasive percutaneous technique—which is assumed to be less painful [21]—was used in our patients.

Continuous popliteal sciatic nerve blocks have been successfully used in outpatients [22]. However, the advisability of discharging patients with such a long-acting sciatic blocks remains controversial. Particularly in the elderly people who may have difficulty to get about on crutches [23]. Because of the loss of proprioception and the protective pain reflex, outpatients are at risk of falls, trauma, inability to ambulate, and accidental injury of the limb at the surgical site [24]. None of our patients suffered trauma at home, but our study was in no way powered for this sort of presumably rare (although potentially serious) complication. In contrast, patients who had mid-foot block were able to walk normally without pain, and without assistance, immediately after surgery. Recovery to safe ambulation was thus considerably faster after mid-foot block. Percutaneous hallucal valgus repair, combined with mid-foot block analgesia and analgesia has changed our practice to allow nearly all patients to return home on the day of surgery—whereas this was previously mostly an in-patient procedure.

Another advantage of mid-foot block is the better quality of sleep the first night. Sleep disturbances in the sciatic group most likely resulted from the block wearing off during the night, with the returning pain being unpleasant and awakening patients. In contrast, side effects such as nausea, vomiting, and constipation were comparable in the two groups and relatively uncommon. In summary, after percutaneous hallucal valgus repair, mid-foot block and sciatic nerve block provided comparable postoperative analgesia. However, mid-foot block seems preferable since the time to safe ambulation is much reduced.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References