Abstract

Objective: To analyze the effectiveness of peripheral nerve blocks in the ankle in percutaneous forefoot surgery and their potential complications.

Methods: Retrospective study with a survey of the medical records of patients who underwent percutaneous orthopedic surgery on the forefoot between 2009 and 2015, performed by the orthopedic foot and ankle surgery group of our hospital, in which 4-in-1 and 5-in-1 anesthetic nerve blocks were used. We evaluated 239 cases, consisting of 222 female and 17 male subjects with a mean age of 61.2 years, seeking to observe the effectiveness and potential complications of the anesthetic technique.

Results: Complications were observed in 3.34% of the 239 patients, with seven cases of neuritis and one case of tachycardia. Regarding the anesthetic technique, there were nine cases of block failure (3.76%), with four cases requiring supplementary local anesthetic, one case spinal anesthesia, and four cases general anesthesia.

Conclusion: Having observed the low rate of complications and the almost complete success of 5-in-1 blocks in percutaneous forefoot surgery, we concluded that it is a safe and effective anesthetic technique.

Level of Evidence IV, Therapeutic Study; Case Series.

Keywords: Anesthesia; Nerve block; Peripheral nerves; Forefoot; Minimally invasive surgical procedures.
Retrospective study with survey of medical records of patients in which we indicated 5-in-1 anesthetic nerve block at ankle level, who underwent percutaneous orthopedic surgery on the forefoot between 2009 and 2015, performed by the orthopedic foot and ankle surgery group of our hospital and at a private clinic owned by one of the authors. We evaluated 239 patients, 222 of whom were female and 17 male, with a mean age of 61.2 years, a minimum age of 14 years and a maximum age of 84 years, seeking to observe the effectiveness and potential complications of the anesthetic technique and its adverse effects. For the anesthetic doses commonly administered in this study, there are no absolute contraindications for the use of this technique except for a history of hypersensitivity to one of its components. However, we emphasize the following relative contraindications: skin infections or wounds at the nerve block sites; patient's inability to cooperate during the procedure.

The anesthetic technique was used to perform percutaneous forefoot surgery, as follows: 185 cases of hallux valgus, seven cases of hallux rigidus, four cases of hallux valgus interphalangeus, 138 claw toes, 10 bunions, four cases of Morton's neuroma, one of Freiberg's disease, and 109 patients with metatarsalgia, distributed as follows (48 of the second metatarsal, 40 of the third, 25 of the fourth, and one of the fifth): 17 rheumatoid feet, five neurological feet, one case of shortening of the second and third toes and one case of digital callus. In those cases where we operated only on the first and second rays of the foot, we used a 4-in-1 block without sural nerve block. When the condition affected the third and/or fourth and/or fifth ray, we supplemented the anesthesia with sural nerve block, thereby performing a 5-in-1 block.

The anesthetics used for the blocks were 10ml of 2% lidocaine combined with 10ml of 7.5mg/ml ropivacaine, both without a vasoconstrictor, thus preventing complications arising from their use. The anesthetic infusion material consisted of a 5ml syringe attached to a long, thin, flexible needle with a 27Gx1.5” blunt tip. In the first 50 blocks we used a conventional 30x0.7mm needle.

All patients were prepared before the anesthetic procedure, placing them in the horizontal supine position, with the limb to be operated on extended over the operating table. The other limb was placed off the side of the operating table on a rest, keeping it at 90 degrees of knee flexion. From this point on, the surgical team performed a surgical skin prep on the foot and ankle, followed by asepsis and antisepsis, then marked the topography of the nerves to be blocked before administering the anesthetic drug infusion. Having established the effectiveness of the anesthesia, we commenced the surgery.

To identify specific nerve block landmarks we made use of previous anatomical knowledge and anatomical reference points inherent to the target nerve.

The tibial nerve block was performed after positioning the patient’s ankle in external rotation, followed by palpation of the medial malleolus in the posteroinferior direction until the posterior tibial artery pulse was palpated, located 0.5 to 1cm posterior to the artery. The needle was then introduced at an angle of 45 degrees in the mediolateral plane, distributing the anesthetic in a fanwise manner (Figure 1).

To perform the deep fibular nerve block, we placed the patient’s ankle in neutral position. First, we requested the patient to actively extend the toes. Then, we palpated the extensor hallucis longus and extensor digitorum longus. Locating the deep fibular nerve in the lateral part of the extensor hallucis longus, over the proximal segment of the first and second ray, the surgeon was able to palpate the dorsalis pedis artery of the neurovascular bundle (Figure 2) as a reference, and create a bleb of local anesthetic.
In order to identify the saphenous nerve block landmark, the patient’s ankle was positioned in slight external rotation. We palpated the medial malleolus and the saphenous vein. We then inserted the needle about 1.5cm anterior and proximal to the medial malleolus in the direction of the anterior tibial tendon, forming a subcutaneous ring with the anesthetic solution between these reference points.

The superficial fibular nerve block was marked while positioning the patient’s ankle in internal rotation, identifying an imaginary line joining the lateral to the medial malleolus. We identified the superficial fibular nerve between the lateral malleolus and the tibialis anterior. We inserted the needle in the region anterior to the lateral malleolus and proceeded towards the medial malleolus with infiltration, forming a subcutaneous ring up to 4cm from the medial malleolus (Figure 3).

The sural nerve block was performed using a bleb of local anesthetic, with internal rotation of the ankle, after marking and identifying a 1.5cm retromalleolar space lateral to the fibular tendons in the distal direction (Figure 4).

In all the blocks performed, aspiration was undertaken prior to infusion to avoid accidental intravenous infiltration. In cases where the patient reported an electric shock-like sensation when the needle was inserted, we retracted the needle 3 to 5mm and resumed the block procedure.

All surgeries started only after the patients confirmed the success of the anesthesia in the areas stimulated by the orthopedic team. In cases where insufficient anesthesia was observed, we combined other techniques such as reinforcement of the locoregional block, spinal anesthesia, or general anesthesia.

All participating patients were apprised of the objectives of the study and were asked to sign an informed consent form.

Results

In the 239 blocks performed, we observed eight cases of complications (3.34%), including seven cases of neuritis (six of the tibial nerve and one of the deep fibular nerve), which progressed to full recovery after the use of neuroprotectors. There was also one case of intraoperative tachycardia, promptly reversed by the anesthetist present. Of the seven cases in which traumatic neuritis occurred, we used conventional needles in five and blunt-tipped needles in two. We did not observe any complications such as infection, hemorrhage, or inadvertent intravascular infusion.

Regarding the anesthetic technique, the anesthesia was effective in 96.26% of the blocks, enabling us to perform the proposed surgical procedures. Failure of the anesthetic block only occurred in nine cases (3.76%), necessitating supplementation with local anesthetic in four cases, spinal anesthesia in one case, and general anesthesia in four cases.

Discussion

A number of recent authors advocate the percutaneous surgical approach to correct forefoot deformities, due to the good results shown with this technique (3-5).

Since the mean age of these patients is usually high (as shown in our sample: 61.2 years) and sometimes accompanied by comorbidities, peripheral nerve blocks of the ankle are a good option for interventions in these cases, due to the lower risks to the patient (6-9) and as they are easy and safe to execute when the technique described in this study is respected.

Peripheral blocks are widely used for surgical anesthesia, as well as for postoperative analgesia (3). There has been significant growth in the use of this technique in surgeries in
Peripheral nerve blocks used in percutaneous forefoot surgery have proven to be highly effective with low complication rates.

**Authors’ contributions:** Each author contributed individually and significantly to the development of this article: CLO *(https://orcid.org/0000-0002-9723-5302) wrote the article, interpreted the results of the study, participated in the review process, approved the final version; LCATF *(https://orcid.org/0000-0002-0778-2506) interpreted the results of the study, participated in the review process, approved the final version; LCRL *(https://orcid.org/0000-0002-0778-2506) interpreted the results of the study, participated in the review process, approved the final version; LFL *(https://orcid.org/0000-0003-1048-7134) wrote the article, interpreted the results of the study, participated in the review process, approved the final version; GLFC *(https://orcid.org/0000-0001-5470-8379) interpreted the results of the study, participated in the review process, approved the final version; LCRC *(https://orcid.org/0000-0002-0778-2506) conceived and planned the activities that led to the study, wrote the article, participated in the review process, approved the final version; LCATF *(https://orcid.org/0000-0002-0778-2506) interpreted the results of the study, participated in the review process, approved the final version; LFL *(https://orcid.org/0000-0003-1048-7134) wrote the article, interpreted the results of the study, participated in the review process, approved the final version; ORCID (Open Researcher and Contributor ID) 10.
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