Supramalleolar Ankle Block for Foot and Ankle Surgery

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ABSTRACT

Background: We present the description of a supramalleolar ankle block technique and our experience using this technique in foot and ankle surgery. **Materials and Methods:** We performed a retrospective observational study of the past 5 years of patients with foot and ankle pathology that had undergone the supramalleolar ankle block. We excluded patients with a history of previous foot surgery, bilateral surgeries, vascular disease, peripheral neuropathy, diabetes, smoking, or active surgical site infection. The supramalleolar ankle block was guided by anatomic landmarks and we used a solution of lidocaine 2% and bupivacaine 0.5%. We evaluated the duration of the ankle block, the visual analog scale (VAS) for pain 24 hrs after surgery, the time until the first analgesic dose, and the level of patient satisfaction. **Results:** 771 patients were included in this study, all of whom had complete analgesia for at least 12 hrs (mean 18 hrs) after surgery. The mean value on the VAS for pain after 24 hrs was 1.4. On average, the first analgesic dose was administered 16 hrs after surgery. The level of satisfaction about the pain perceived in the first 24 hrs after surgery was: very satisfied (89%), satisfied (10%), and dissatisfied (1%). There were no reports of permanent neurological sequelae, systemic toxicity, or surgical site infections. **Conclusion:** We consider the supramalleolar ankle block a simple, effective, and safe procedure to obtain long-lasting postoperative analgesia.

Keywords: peripheral nerve block, foot, and ankle surgery
Level of Evidence: IV

Bloqueo supramaleolar de tobillo para cirugía de pie y tobillo. Estudio retrospectivo de casos de los últimos cinco años

RESUMEN

Objetivo: Describir la técnica de bloqueo supramaleolar de tobillo y nuestra experiencia con este bloqueo en la cirugía de tobillo y pie. **Materiales y Métodos:** Se llevó a cabo un estudio observacional, retrospectivo de los últimos 5 años en pacientes con enfermedad de tobillo y pie, sometidos a un bloqueo supramaleolar de tobillo. Se excluyó a pacientes con cirugía previa, cirugías bilaterales, neuropatía periférica o enfermedad vascular, diabetes, infección activa o tabaquistas. Se realizó el bloqueo supramaleolar de tobillo con lidocaína al 2% y bupivacaína al 0,5%, teniendo en cuenta las referencias anatómicas. Se evaluaron la duración del bloqueo, la escala analógica visual de dolor a las 24 h de la cirugía, el tiempo hasta la toma del primer analgésico y el grado de satisfacción del paciente. **Resultados:** Se incluyó a 771 pacientes operados, todos tuvieron una analgesia completa por, al menos, 12 h (duración promedio 18 h). El puntaje promedio de la escala para dolor a las 24 h fue de 1,4. El tiempo promedio hasta la toma del primer analgésico fue de 16 h. El grado de satisfacción del paciente con el bloqueo y el dolor percibido en las primeras 24 h fue: muy satisfecho (89%), satisfecho (10) y poco satisfecho (1%). No hubo casos de secuela neurológica permanente, toxicidad sistémica ni infección. **Conclusiones:** El bloqueo supramaleolar de tobillo es un método simple, eficaz y seguro que puede realizar el traumatólogo para obtener una analgesia posquirúrgica prolongada.

Palabras clave: Bloqueo periférico; cirugía de tobillo y pie.
Nivel de Evidencia: IV

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INTRODUCTION

Peripheral block is a modality of anesthesia in which a local anesthetic is injected around a nerve, blocking its sensory and motor function. It allows performing surgeries in high-risk patients by reducing the possible complications of general anesthesia. It is a low-risk procedure, very effective in managing pain after an outpatient procedure and avoids hospitalization or reduces its duration.

Most studies on peripheral blocks for foot and ankle surgery refer to blocks proximal to the popliteal fossa or distal to the ankle, performed by anesthesiologists.[1-3] In 1992, Myerson et al. publish a series of patients who underwent an ankle block for foot and ankle surgery, and the success rate was 95%.[4] The advantages of this technique include control of acute postoperative pain, rapid ambulation, the absence of adverse effects from opioids and nonsteroidal anti-inflammatory drugs,[5] and providing better postoperative analgesia than opioids.[6] In addition, it could improve functional outcomes in the short and medium term.[1]

Our main objective was to describe the supramalleolar ankle block technique performed by a trauma surgeon and the secondary objective was to evaluate our experience with this technique in the last five years.

MATERIALS AND METHODS

A retrospective observational study of the last five years was carried out. In this period, we operated on 1,714 patients with ankle-foot pathologies, and 1,286 (75%) underwent a supramalleolar ankle block.

Patients with previous surgery, bilateral surgeries, peripheral neuropathy, diabetes, vascular disease or active infection in the area where the local anesthetic injections were applied, and smokers were excluded from the sample. The sample included 771 patients (60%) who had undergone a supramalleolar ankle block before surgery.

Supramalleolar ankle block technique

The articular and skin sensory innervation of the foot and ankle is given by branches of the femoral nerve and the sciatic nerve, there are five nerves, three of them are superficial: the sural (Figure 1), superficial fibular (Figure 2) and saphenous nerves (Figure 3); and two of them are deep: the anterior (Figure 4) and posterior tibial nerves (Figure 5).[7-9]

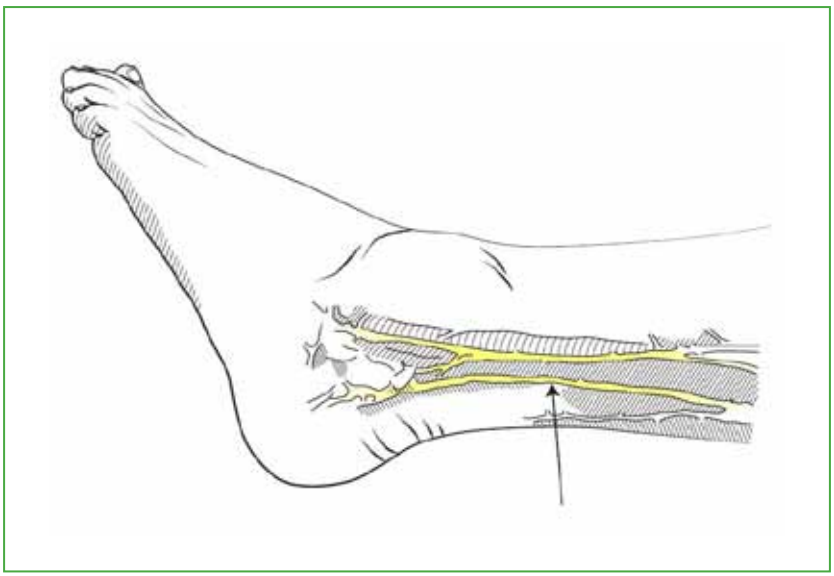

Figure 1. Sural nerve.

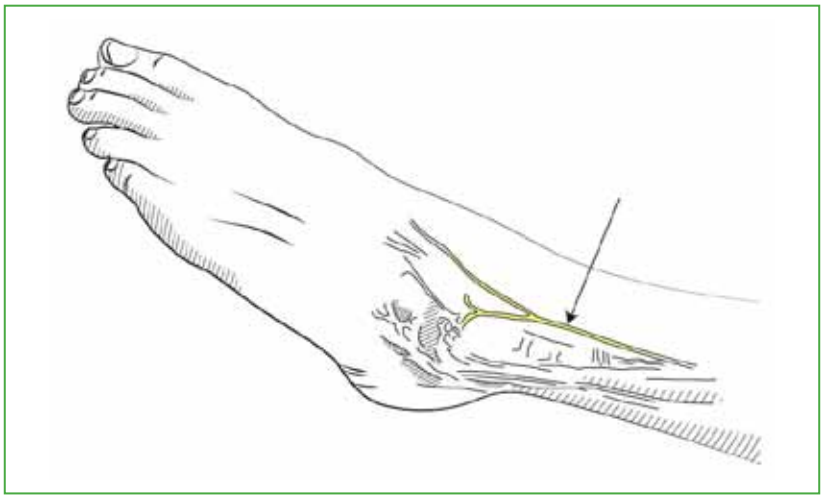

Figure 2. Superficial fibular nerve.

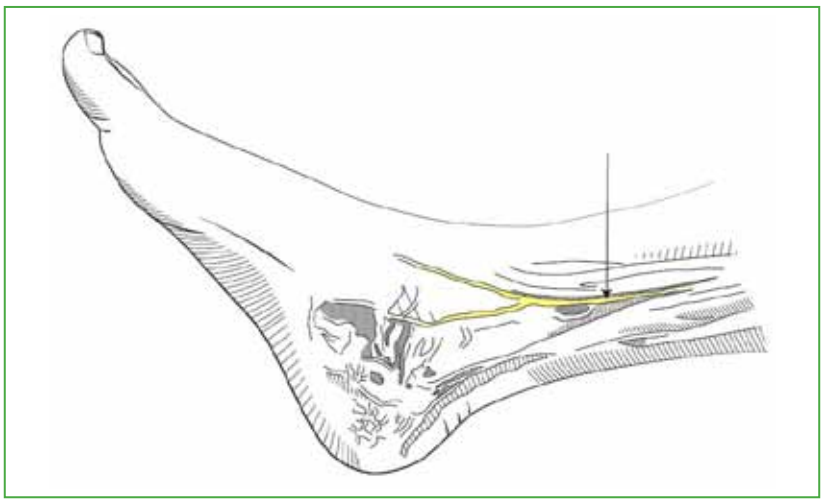

Figure 3. Saphenous nerve.

The block is performed with the patient under mild sedation (midazolam) and before placing the tourniquet. The anatomical landmarks are taken into account and it is carried out from medial to lateral: posterior tibial, saphenous, anterior tibial, superficial fibular and sural nerves.

Before injecting the local anesthetic agents, the ankle is washed and disinfected with a 2% chlorhexidine gluconate and 70% isopropyl alcohol solution, and drapes are placed using a sterile technique.

The block is performed at the supramalleolar level, but if it is an ankle arthroscopy, it is more proximal. A combination of 2% lidocaine with 0.5% bupivacaine is administered in equal parts for a final volume of 40 ml. 15 ml are instilled into the posterior tibial nerve, 10 ml into the anterior tibial nerve, and 5 ml into the saphenous, superficial fibular, and sural nerves. The instillation is carried out in a precise way, adjacent to the nerve to be blocked, previously aspirating.

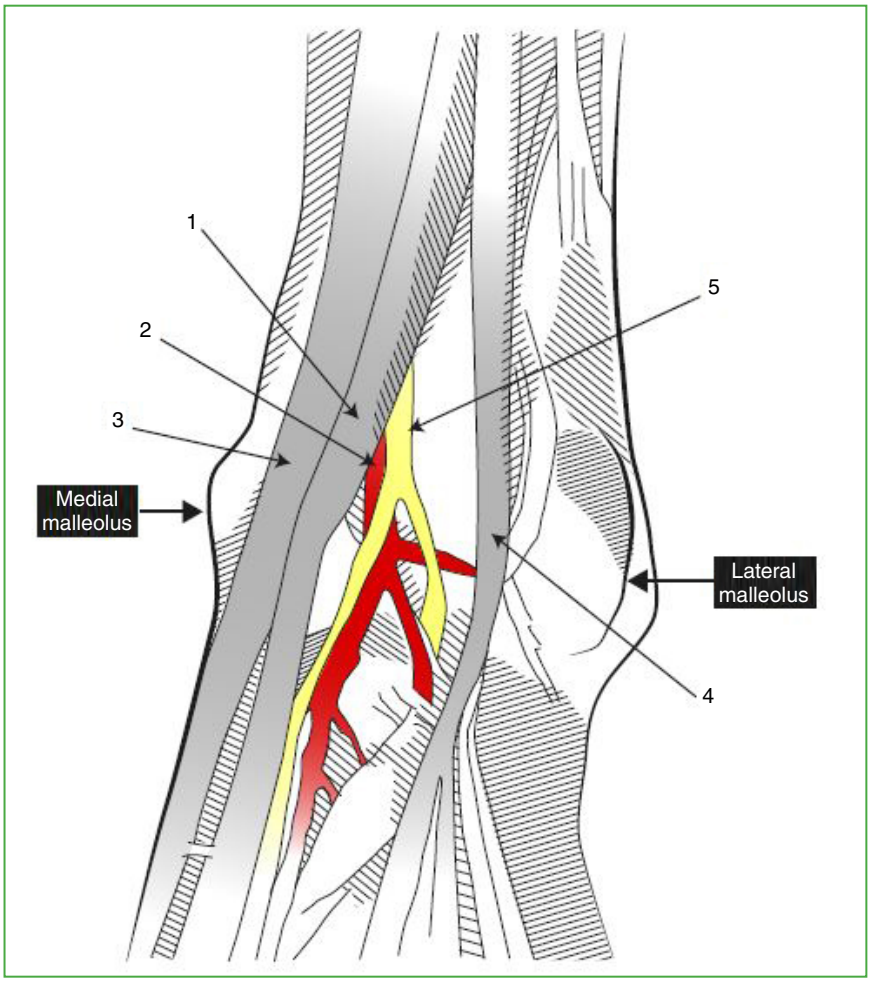

Figure 4. Anterior tibial nerve. 1. Extensor hallucis longus; 2. anterior tibial artery; 3. anterior tibial tendon; 4. extensor digitorum longus; 5. anterior tibial nerve.

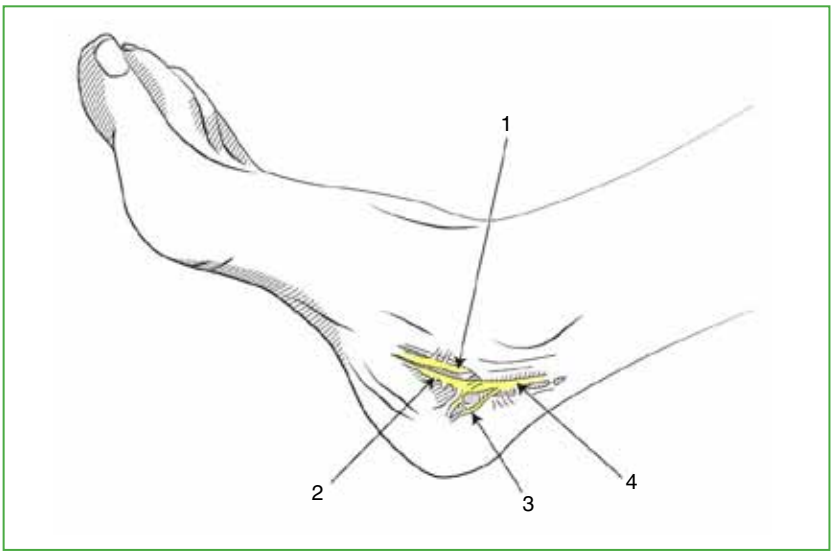

Figure 5. Posterior tibial nerve. 1. Medial plantar nerve; 2. Lateral plantar nerve; 3. Calcaneal branches; 4. Posterior tibial nerve.

The patient is placed in the supine position, initially in external rotation, then internal rotation is achieved as all the nerves in the ankle are successively blocked. For the posterior tibial nerve block (15 ml), the leg is rotated externally, the pulse of the posterior tibial artery is taken as reference, and the nerve is located posterior to it (Figure 6). The saphenous nerve (5 ml) is located subcutaneously adjacent to the saphenous vein (Figure 7); the anterior tibial nerve (10 ml) is located deep in the anterior aspect of the tibia between the extensor hallucis longus tendon and the tibialis anterior (Figure 8). The superficial fibular nerve (5 ml) can be visualized directly, at the subcutaneous level, by inverting the foot (Figure 9). The sural nerve (5 ml) is blocked subcutaneously, immediately anterior to the Achilles tendon (Figure 10).

Figure 6. Posterior tibial nerve block.

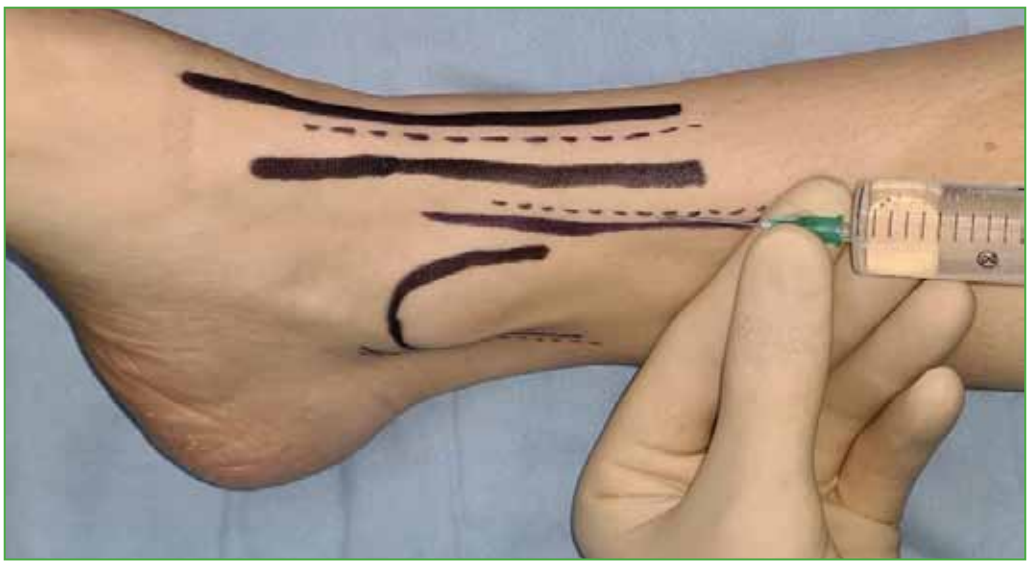

Figure 7. Saphenous nerve block.

Figure 8. Anterior tibial nerve block.

Figure 9. Superficial common fibular nerve block.

Figure 10. Sural nerve block.

To start surgery, peripheral vasodilation accompanied by erythema is taken as a reference for the beginning of the action of anesthetic agents, which ensures correct anesthesia and tolerance to the tourniquet placed on the ankle.

The duration of the block was evaluated using pain perception expressed in hours as a marker of its end, along with the visual analog scale (VAS) of pain 24 h after surgery (min. 0 and max. 10), the time until taking the first analgesic (hours) and the degree of patient satisfaction (very satisfied, satisfied, not very satisfied).

Each patient was given a form before surgery and reminded, via phone call, to complete it. The complete forms with the data of each patient were collected in the first postoperative control.

RESULTS

Of the 771 patients included in this study, 418 were women and 353 men. The average age was 47 years (min. 17, max. 88). The Table details the diseases treated and the procedures performed with this blocking technique.

Table. Conditions treated and procedures performed.

Forefoot	Bunionette	17
	Metatarsalgia	30
	Hallux valgus	205
	Hallux rigidus	21
	Hallux varus	7
	Hallux arthroplasty	9
	Lesser toe surgery	34
	Fractures	16
	Brachymetatarsia	3
	Soft tissue	2
	Total	**344**
Midfoot	Arthrodesis	18
	Fractures	38
	Soft tissue	7
	Accessory navicular	6
	Flatfoot	19
	Total	**88**
Hindfoot	Haglund's syndrome	14
	Fractures	41
	Arthrodesis	32
	Tarsal coalition	7
	Soft tissue	2
	Total	**96**
Ankle	Arthroscopy	43
	Fracture	96
	Arthrodesis	29
	Arthroplasty	6
	OATS	7
	Total	**181**
Tumors	**Total**	**35**
ROM	**Total**	**27**

OATS = osteochondral autograft transfer system, ROM = removal of osteosynthesis material.

All had complete analgesia for at least 12 h (mean duration: 18 hrs., min. 12 hrs, max. 24 hrs) (Figure 11), the average score in the VAS after 24 hrs was 1.4 (min. 0, max. 3), the average time until taking the first analgesic was 16 h after surgery (min. 13 h, max. 26 h) (Figure 12).

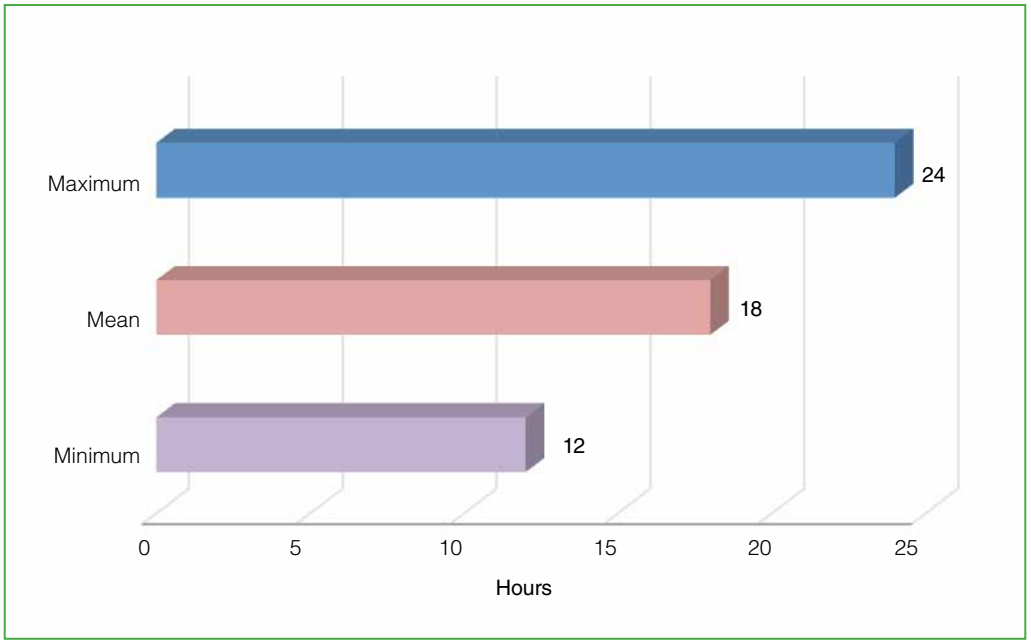

Figure 11. Block duration (hours).

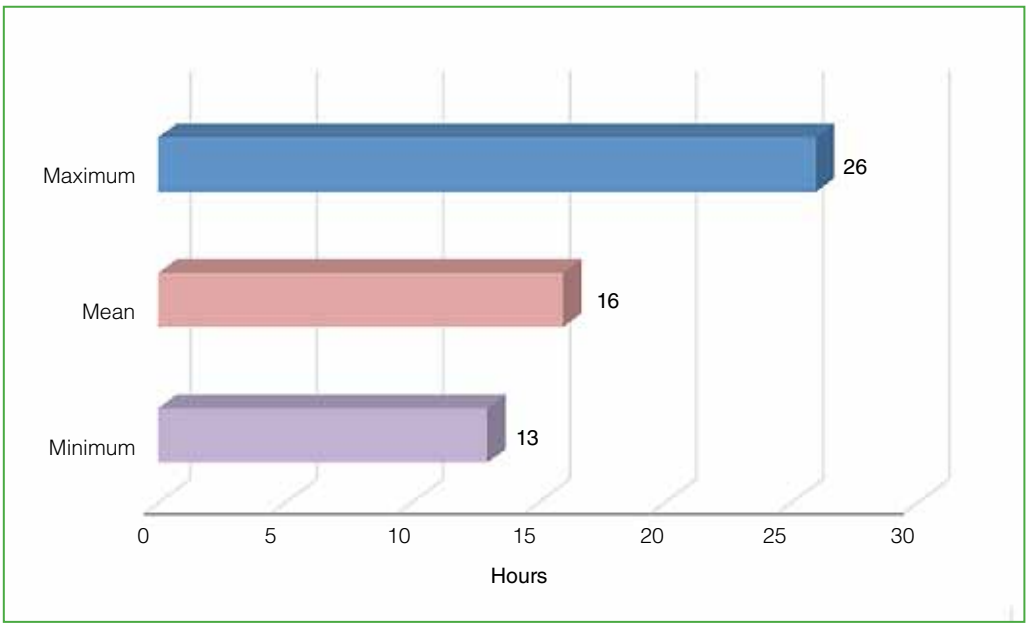

Figure 12. Time until administration of the first analgesic dose (hours).

Regarding the degree of satisfaction with the block and the pain perceived in the first 24 h, 89% were very satisfied; 10% satisfied and 1% not very satisfied.

One patient had paresthesia in the region of the anterior tibial nerve (first interdigital space), which persisted for six weeks, and did not require pharmacological or surgical treatment. There were no cases of systemic toxicity from local anesthetics, or infection at the infiltration site.

DISCUSSION

Peripheral block allows surgery to be performed in high-risk patients and thus reduces the possible complications of general anesthesia. The advantages of the ankle block include control of acute post-surgical pain, rapid ambulation and mobilization,[1,2,5] and providing better post-surgical analgesia than opioids.[6] In addition, it could improve functional outcomes in the short and medium term.[1]

The ankle block inhibits the acute pain signal from the surgical site to the spinal cord and decreases central nervous system sensitization.[10] In this way, it contributes to extending the time until postoperative analgesics are taken, reducing the required dose, and preventing side effects associated with their use.[1,2]

Likewise, they improve the scores of postoperative pain and patient satisfaction. Inadequate management of postoperative pain is a risk factor for the development of chronic pain and may influence the appearance of poor functional outcomes.[11]

In 1983, Sarrafian et al. published a series of 50 cases of distal peripheral ankle block with bupivacaine administered by an anesthesiologist. They reported an onset of action of approximately 20-25 min and a duration of 10-25 hours.[5] Myerson et al. described a series of 1,295 patients who were administered a combination of lidocaine and bupivacaine for the block. The average duration of the block was 9 hrs (min. 6 hrs, max. 28 hrs) and the rate of patient satisfaction with the procedure was 87%.[4]

Kir et al. carried out a study in 60 patients to compare the VAS score and the time until taking the first analgesic in patients who underwent general anesthesia alone and in those who received, in addition to general anesthesia, an ankle block with bupivacaine in charge of an anesthesiologist. They recorded the VAS score at 24 h and the average result was 1.3 for patients with block . They also reported a longer delay before taking the first analgesic in this same group, although they did not quantify the record.[1]

In our study of 771 patients, complete analgesia lasted an average of 18 hours and the average VAS score 24 hours after surgery was 1.4, with a patient satisfaction rate of more than 90% with respect to the perceived pain in the first 24 hours. When comparing our results with those of other case series, ours coincide with all the determined parameters.[1,4,5]

Peripheral block is performed under minimal sedation, the American Society of Regional Anesthesia and Pain Medicine (ASRA) does not recommend it with deep sedation, since possible signs of nerve damage are absent,[12] and recommends its administration before placing the tourniquet.

For the ankle block, we administered a combination of 2% lidocaine with 0.5% bupivacaine in a total volume of 40 ml. This combination of anesthetic agents, added to the volume, allowed us to block the nerves through imbibition and thus avoid traumatic injuries. We also did not seek to generate paresthesia to locate the nerves, as this would increase the chances of neurovascular damage.[5] The incidence of long-term nerve injury symptoms is 0.7%.[2,13,14]

Other described complications include systemic toxicity from local anesthetics, whose incidence ranges from 7.5% to 20% per 10,000 blocks[2,13,14] and infection at the injection site, an infrequent complication and, to a large extent, associated with continuous infusion catheters in hospitalized patients (incidence 0-3.2%).[2,12,14]

When performing the ankle block with the combination of anesthetic agents before surgery, rapid-onset anesthesia is achieved; lidocaine has a latency time of between 3 and 10 min[13,14] and the duration is long, because the action time of bupivacaine is between 400 and 450 min,[13,14] which makes it possible to perform outpatient surgeries with greater comfort for the patient, reduce the consumption of analgesics in the postoperative period, prolonging the time until taking the first analgesic and thus avoiding its possible complications. The degree of satisfaction with analgesia during the first 24 h of the postoperative period is high.

CONCLUSION

Supramalleolar ankle block is an effective and safe method that can be performed by the orthopedic surgeon in charge of surgery to obtain prolonged postoperative analgesia with a high degree of patient satisfaction.

Conflict of interest: The authors declare no conflicts of interest.

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