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ORIGINAL ARTICLE

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Assessment of pain levels in patients undergoing foot surgery

Análise do nível de dor em pacientes submetidos à cirurgia do pé

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ABSTRACT

Objective: To analyze the use of an anesthetic ankle block in the immediate postoperative period in patients undergoing foot surgery to evaluate the quality of postoperative recovery and in-hospital opioid use.

Methods: Presentation of the preliminary results of a randomized, placebo-controlled, double-blind trial conducted from May 2016 to January 2017, with 16 patients undergoing surgery to correct foot pathologies. The patients in the intervention group were treated with an additional ankle block and compared to a control group.

Results: The intervention group included eleven patients, of whom ten had mild pain, with a mean visual analog pain scale (VAS) score of 3 and a mean quality of post-surgical recovery (QoR-40) of 194; none of these patients required the use of opioids. The control group included five patients. Of these, one patient had severe pain and two showed moderate pain. The mean VAS score in this group was 4, and the mean QoR-40 was 190. Three patients from this group required opioids.

Conclusion: The use of an ankle block in the 24 h immediately post-surgery reduced pain scores and the need for opioid use and improved postoperative recovery.

Level of Evidence I; Therapeutic Studies; Randomized Clinical Study.

Keywords: Pain, postoperative; Foot diseases; Nerve block; Analgesia.

RESUMO

Objetivo: Analisar o uso do pentabloqueio no pós-operatório imediato de pacientes submetidos às cirurgias do pé, com intuito de avaliar a qualidade da recuperação pós-cirúrgica e o consumo de opioides no intra-hospitalar.

Métodos: Apresentação dos resultados preliminares de um ensaio clínico randomizado, uso de placebo controlado, duplo-cego, realizado no período de maio de 2016 a janeiro de 2017, com um total de dezesseis pacientes, submetidos à cirurgia para correção de patologias do pé. Os pacientes do Grupo Estudo foram submetidos a pentabloqueio e comparados com o Grupo Controle.

Resultados: O Grupo Estudo foi formado por onze pacientes, sendo que dez apresentaram dor leve, escala visual analógica de dor (EVA) média de 3, nenhum paciente necessitou de opioides, e a qualidade de recuperação pós-cirúrgica (QoR-40) média foi de 194. Já no Grupo Controle, formado por cinco pacientes, um apresentou dor intensa, dois apresentaram dor moderada, EVA média de 4, três necessitaram de opioides, e a QoR-40 média de 190.

Conclusão: A utilização de pentabloqueio, em 24h de pós-operatório, reduziu os escores de dor, diminuiu a necessidade de utilização de opioide e apresentou uma melhor recuperação pós-cirúrgica.

Nível de Evidência I; Estudos Terapêuticos; Estudo Clínico Randomizado.

Descritores: Dor pós-operatória; Doenças do pé; Bloqueio nervoso; Analgesia.

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INTRODUCTION

Surgeries of the foot and ankle are usually associated with postoperative pain, which is often difficult to manage with oral analgesics and may persist for long periods and consequently require high doses of opioid treatment[1-3]. In turn, such treatment may cause nausea, vomiting, and delays in hospital discharge[2]. The approaches that are used in postoperative pain control include multimodal analgesia, patient-controlled morphine analgesia, regional blocks, and continuous peripheral nerve blocks[4].

Multimodal postoperative analgesia has been widely used since it was first proposed in 1993 by Kehlet and Dahl and is based on the administration of multiple drugs that block the generation and perception of pain at different sites of the nociceptive pathway. The primary goal of therapy is to improve patient recovery, reduce the need for opioids, and reduce adverse effects, including nausea, vomiting, sedation, and respiratory depression[5].

Patient-controlled morphine analgesia has gained prominence in postoperative pain management in foot and ankle surgeries[4-6] and involves the intermittent intravenous administration of opioids, preferably morphine, according to the patient's need. Although effective, this type of analgesia has increased the rates of opioid use[4] and other adverse side effects[6].

Among regional blocks commonly used for foot surgery, the popliteal block, first described by Labat in 1923, has a well-documented safety profile and high efficacy in managing postoperative pain in the lower extremities[1], particularly in surgeries of the foot and ankle[6,7]. Similar to the popliteal block, local anesthesia is effective in delaying the onset of postoperative pain and alleviating pain[2].

However, although effective for managing pain and decreasing the use of opioids, the regional block has a short analgesic effect, hindering the quality of postoperative recovery. This problem is being overcome by the increasing use of a continuous peripheral nerve block in foot and ankle surgeries, and this approach is also effective for pain management[8,9].

The objective of this study was to analyze the use of an ankle block in the immediate postoperative period in patients undergoing foot surgeries to evaluate the quality of postoperative recovery and the rate of in-hospital opioid use.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 87677318.0.0000.5032.

This study reports preliminary results of a randomized, double-blind, placebo-controlled clinical trial conducted from May 2016 to January 2017, with 16 eligible patients who underwent surgery to correct foot pathologies.

Patients aged between 18 and 65 years and those with American Society of Anesthesiology (ASA) scores of 1 or 2 were included, whereas patients allergic to anesthetic components or to any of the components of the postoperative analgesia protocol, those with diabetes or peripheral neuropathies, and those who underwent surgical treatment of foot fractures were excluded. This study was approved by the institutional Research Ethics Committee, and all participants who agreed to participate in the study were asked to sign an informed consent form (Figure 1).

Patients were randomized into two groups at the beginning of the study using a random number table, and group allocation was concealed. The intervention group received an ankle block with 10mL of 0.5% bupivacaine without a vasoconstrictor diluted in 10mL of 0.9% saline, and the total volume was divided into equal doses (4mL) for infusion into five nerves of the foot-tibial, saphenous, superficial fibular, deep fibular, and sural-respecting the maximum dose of 3mg/kg in the immediate postoperative period. The control group underwent the same block procedure, but the anesthetic agent was replaced with 20mL of 0.9% saline; this volume was divided into equal doses for infusion into the same nerves. The research team and patients both were blinded to patient allocation.

The patients were monitored in the intraoperative period with a monitoring protocol established by the ASA, sedated with midazolam (0.03mg/kg IV) and fentanyl (1mcg/kg IV), and received subarachnoid anesthesia in L3-L4 or L4-L5 with 0.5% hyperbaric bupivacaine.

Patient data were collected by an examiner blinded to patient allocation. At the end of the surgical procedure, 4mg of ondansetron was given to each patient to prevent nausea and vomiting, and 100mg of the anti-inflammatory agent ketoprofen was administered intravenously to manage pain until hospital discharge.

The postoperative use of opioids and pain scores were recorded immediately after surgery and at 30 min, 1h, and 24h after surgery, with the patient at rest. The pain was assessed with the visual analog scale (VAS) and the verbal response scale according to five pain levels: none, mild, moderate, severe, and very severe. The quality of post-surgical recovery (QoR-40) questionnaire was used to evaluate the quality of anesthesia recovery and patient care.

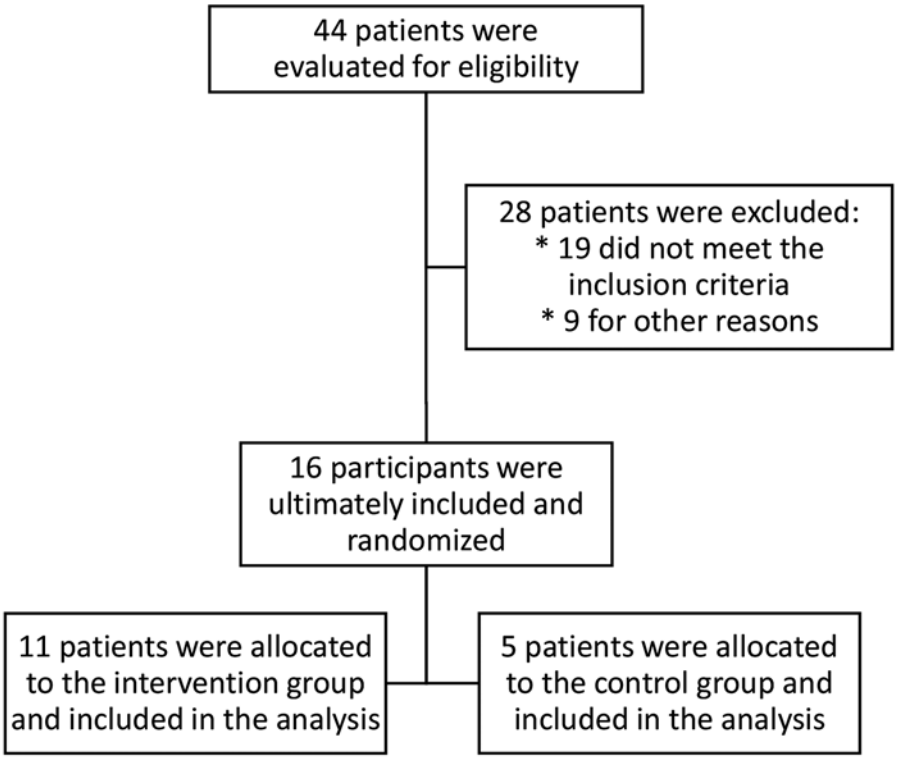

Figure 1. Flowchart of patient selection.
Source: Author's personal archive.

The QoR-40 is a questionnaire containing 40 questions graded on a scale of 1 to 5 and assesses emotional state, physical comfort, psychological support, physical independence, and pain. It has a minimum score of 40 and a maximum of 200.

The VAS and QoR-40 scores are presented as the means and standard deviations. The level of pain, use of opioids, and nausea/vomiting were expressed as percentages. The Mann-Whitney U test was used to analyze the VAS and QoR-40 scores between the intervention and control groups at a level of significance of 5%. Fisher's exact test was used to analyze the level of pain, opioid use, and nausea/vomiting between the groups. Statistical analyses were conducted using Statistical Package for Social Sciences (SPSS) version 22.0 (USA) and R version 3.3.1 software.

RESULTS

Of the 16 patients recruited in this preliminary study, 31% were men and 69% were women. The mean patient age was 44 years (18-65 years), and the patients all underwent moderate surgeries, including correction of hallux valgus deformities, Weil osteotomies, and resection of plantar fascia tumors (Table 1). There was intergroup homogeneity in age, height, weight, and ASA score, and heterogeneity for gender distribution (45% men and 55% women in the intervention group, and 100% women in the control group) (Table 2).

Eleven patients were randomly allocated to the intervention group and subjected to an ankle block with 10mL of 0.5% bupivacaine and 10mL of 0.9% saline; none of the patients in this group complained of pain and nausea or vomiting up to 1h after the end of the surgical procedure. At 24h after surgery, only one patient complained of moderate pain, with a VAS score of 6. The other ten patients showed mild pain, with VAS scores of 0 (two patients), 1 (one patient), 3 (five patients), and 4 (two patients). Two patients complained of one episode of nausea, which was managed with antiemetics, and none of the patients vomited. The mean QoR-40 score was 194.09 (180-199). Only two patients had a QoR-40 score less than 193; one patient progressed with severe postoperative headaches and a QoR-40 score of 180, while the other patient had moderate pain associated with nausea and a QoR-40 score of 187. None of the patients in the intervention group required opioids for pain management.

None of the patients in the control group reported pain and nausea or vomiting within 1h after the surgical

Table 1. Type of surgery

	0.5% Bupivacaine (11)	0.9% Saline (5)
Midtarsal arthrodesis	0	20%
Talocalcaneal arthrodesis	9%	0
Correction of hallux valgus deformity	36%	60%
Weil osteotomy	18%	0
Tumor resection	27%	20%
Repair of the extensor hallucis longus tendon	9%	0

Source: Prepared by the author based on the results of the study.

Table 2. Demographic data

	0.5% Bupivacaine (11)	0.9% Saline (5)
Age (yrs)	42.2±13.48	47.4±14.43
Female	55%	100%
Height (m)	1.68 (DP 0.12)	1.64 (DP 0.07)
Weight (kg)	74.36 (DP 22.06)	69.2 (DP 14.87)
ASA		
I	64%	60%
II	36%	40%

Source: Prepared by the author based on the results of the study.

procedure. At 24h, two patients complained of mild pain (VAS scores of 1 and 3), two patients complained of moderate pain (VAS scores of 3 and 6), and one patient reported severe pain (VAS score of 8). Patients who developed moderate and severe pain made use of available opioids. However, none of these patients developed postoperative nausea or vomiting. There was a significant association (p=0.018) only for the use of opioids to manage postoperative pain in patients not treated with an ankle block. The mean QoR-40 score of the control patients was 189.8 (173.0-199.0) (Table 3).

Table 3. Patient assessment at 24 h after surgery

	0.5% Bupivacaine (11)	0.9% Saline (5)	p-value
VAS score	2.73±1.79	4.2±2.77	0.22[a]
Pain level			
Mild	91%	40%	0.063[b]
Moderate/Intense	9%	60%	
QoR-40 score	194.09±5.74	189.8±11.82	0.413[a]
Use of opioids	0%	60%	0.018[b]
Nausea/Vomiting	18%	0%	-*

[a]: Mann-Whitney test; [b]: Fisher's exact test.
*It was not possible to calculate the p-value for nausea/vomiting.
Source: Prepared by the author based on the results of the study.

DISCUSSION

This study investigated the use of a regional block in five peripheral nerves of the foot as a complement to spinal anesthesia to relieve postoperative pain and reduce the postoperative use of opioids. Patients were monitored in the immediate postoperative period and after hospital discharge at 24h after the surgical procedure.

At 24h after the procedure, the patients in the intervention group had lower pain scores compared to those in the control group. In contrast, Needoff et al. evaluated 40 patients and found that ankle block treatment significantly alleviated pain only in the first 6 h after surgery, whereas the pain scores were similar between the intervention and control groups at 24h [10].

A previous study reported that an ankle block in combination with general anesthesia significantly reduced the initial perception of pain in the first 12h (on average); however, there was little difference in pain relief after this period[11]. Another study indicated that there was no significant difference in pain scores in the first 6 h after forefoot surgery when the popliteal block was combined with an ankle block; however, at 24h postoperatively, this combination significantly alleviated pain [2].

In the literature, the popliteal block is a well-documented regional block used in foot and ankle surgeries. Both the popliteal block and local infiltration (in the midfoot) reportedly achieve similar results for postoperative pain control in percutaneous surgery of the hallux valgus; however, the popliteal block had a longer analgesic effect (13h on average)[12]. Furthermore, compared with spinal anesthesia, the popliteal block produced significantly lower VAS scores in the first 12h, although pain scores were similar at 24h[13].

Continuous peripheral nerve blocks have also been used in foot and ankle surgeries, and patients managed with this approach reportedly use opioids significantly less compared with those treated with a popliteal block[8]. Continuous peripheral nerve block also performs better than patient-controlled morphine analgesia and multimodal analgesia, allowing better management of pain, reducing the use of opioids[4,6,9], and causing fewer side effects, including nausea, vomiting, urinary retention, and sedation[6].

In the study period, 60% of patients in the control group required opioids to control pain, indicating that their pain levels were higher than those on the patients in the inter-

vention group. The association between the use of an ankle block and opioids was statistically significant.

In addition to assessing the level of pain and the use of opioids and their adverse effects at 24h after the surgical procedure, the QoR-40 scoring system was used. This 40-item questionnaire was developed and validated by Myles et al. as a suitable tool for evaluating post-surgical recovery and the quality of patient care[14,15].

The patients from both groups presented, on average, high QoR-40 scores, although the scores were slightly higher in the intervention group. However, this difference was not statistically significant, and a larger sample is necessary to more definitively evaluate the quality of post-surgical recovery. Clough et al. performed a prospective study with 39 patients and observed that combining an ankle block with general anesthesia did not improve the degree of postoperative satisfaction in the patients studied[11].

CONCLUSION

Our preliminary results indicate that the use of an ankle block in the first 24 h of the postoperative period significantly alleviated pain and achieved superior postoperative recovery. Furthermore, this procedure significantly decreased the use of opiates. Further studies with a larger sample size are necessary to confirm the superiority of ankle block use in postoperative pain management of foot and ankle surgeries.

Authors' contributions: Each author contributed individually and significantly to the development of this article: GSA *(https://orcid.org/0000-0001-5678-1350) conceived and planned the study activities that led to the study, wrote the article, participated in the review process and approved the final version; MBT *(https://orcid.org/0000-0003-3043-5577) conceived and planned the study activities that led to the study, wrote the article, participated in the review process and approved the final version; MLJ *(https://orcid.org/0000-0002-8833-5408) interpreted the study results and participated in the review process; DGAM *(https://orcid.org/0000-0003-0848-5121) interpreted the study results and participated in the review process; LJSCA *(https://orcid.org/0000-0003-3461-2868) conceived and planned the study activities that led to the study and interpreted the study results; MVMGM *(https://orcid.org/0000-0002-7320-9628) conceived and planned the study activities that led to the study, wrote the article, participated in the review process and approved the final version. *ORCID (Open Researcher and Contributor ID).

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