Pain management in patients with knee osteoarthritis by ultrasound-guided genicular nerve block. Case reports

Manejo de dor em pacientes com osteoartrite de joelho por bloqueio dos nervos geniculares guiado por ultrassonografia. Relato de casos

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ABSTRACT

BACKGROUND AND OBJECTIVES: Knee osteoarthritis is a chronic disease that tends to affect elderly people and is characterized by severe pain, joint stiffness and limited function. In more advanced cases, the initial approach of knee osteoarthritis performed with traditional conservative pharmacological or non-pharmacological treatment may not present satisfactory results. There are alternatives for pain intervention with favorable results, with longer analgesia and that can help rehabilitation, such as analgesic peripheral nerve blocks, including the genicular nerve block, and radiofrequency ablation. The objective of this study is to report cases of genicular nerve block guided by ultrasonography, with favorable results in relation to analgesia and return of functional capacity.

CASE REPORTS: Four elderly patients diagnosed with advanced knee osteoarthritis, with limited range of motion, and with severe chronic pain (mean visual numeric scale - VNS=7.75) were submitted to ultrasound-guided genicular nerve block, presenting significant pain improvement (mean VNS after 1 month of block=2.25) and regain of functional capacity. There were no cases of complications.

CONCLUSION: Genicular nerve block guided by ultrasonography is a technique that can be performed as an intervention measure in pain. It presents satisfactory results of analgesia and regain of functional capacity, facilitating the rehabilitation process, and can be adopted in an outpatient clinic context.

Keywords: Knee osteoarthritis, Nerve block, Pain, Ultrasonography.

RESUMO

JUSTIFICATIVA E OBJETIVOS: A osteoartrite do joelho é uma doença crônica que tende a afetar pessoas idosas e é caracterizada por dor intensa, rigidez articular e limitação da mobilidade. Em casos mais avançados, a abordagem da osteoartrite do joelho com o tratamento conservador convencional farmacológico e não farmacológico pode não apresentar resultados satisfatórios. Nesse sentido, existem alternativas de intervenção em dor com resultados favoráveis, com maior tempo de analgesia e que auxiliam a reabilitação, como a realização de bloqueios analgésicos em nervos periféricos, como bloqueio dos nervos geniculares e a ablação por radiofrequência. Este estudo teve como objetivo relatar casos de bloqueios dos nervos geniculares guiados por ultrassonografia, com resultados favoráveis em relação à analgesia e retorno da capacidade funcional.

RELATO DOS CASOS: Quatro pacientes idosos diagnosticados com osteoartrite de joelho em grau avançado, com limitação da amplitude de movimento e com dor crônica, com intensidade média de 7,75 pela escala visual numérica, foram submetidos ao bloqueio de nervos geniculares guiado por ultrassonografia, apresentando melhora importante da dor após um mês do bloqueio, com intensidade média de 2,25 e reganho da capacidade funcional, não havendo casos de complicações relacionadas aos bloqueios.

CONCLUSÃO: O bloqueio dos nervos geniculares guiado por ultrassonografia é uma técnica que promoveu analgesia satisfatória e ganho da capacidade funcional, além de facilitar o processo de reabilitação, podendo ser realizada em caráter ambulatorial.

Descritores: Bloqueio nervoso, Dor, Osteoartrite do joelho, Ultrassonografia.

INTRODUCTION

Knee osteoarthritis (KOA) is a chronic disease that tends to affect elderly people and is characterized by severe pain, joint stiffness and limited function[1-3]. The therapeutic approach to KOA includes pharmacological and non-pharmacological techniques[4,5]. Despite these treatments, however, many patients continue to suffer with refractory knee pain[6].

In that regard, there are pain intervention alternatives that produce significant reduction of pain and aid the rehabilitation through the improvement of the functional capacity, like peripheral nerve block and the use of radiofrequency (RF) ablation[10-12].

The peripheral nerve blocks of the inferior limbs are techniques already well described in the literature. The not so frequent use of

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these techniques in outpatient clinics may be due to, in some cases, the necessity of a high volume of anesthesia, several injections, a potential secondary motor block, which limits the outpatient patient treatment, the necessity of a complete anatomical review, but, more than anything, the lack of knowledge about the benefits that peripheral nerve blocks can bring for the patient[7-9]. The ultrasound (US) guided nerve block techniques are based on the direct view of the structures and needle, enabling the real time monitoring of the local anesthetic, resulting in a more efficient block, with lower latency, anatomical references dependency and anesthetic solution volume, as well as being safer[13].

The innervation of the knee joint is provided by several joint branches, divided into anterior and posterior compartments. The nerve branches of the anterior compartment come from the femoral, common fibular and saphenous nerves. The branches of the posterior compartment come from the tibial, obturator and sciatic nerves. The combination and organization of these anterior branches generate the genicular nerves, which are responsible for most of the sensory innervation of the anterior area of the knee joint[14-19], therefore, they are targets for sensory blocks[7-9] and RF ablation[10-12]. The superomedial (SM), superolateral (SL) and inferomedial (IM) genicular branches can be achieved with great accuracy under US guidance, with direct visualization or visualization of reference points that determine the location by proximity[15,16].

The genicular nerve block (GNB) guided by US is based on anatomy studies that demonstrate that the genicular nerves are accompanied by genicular arteries and are located close to bone, muscle and tendinous structures[14-19] that allow better visualization and accuracy with US[15,16]. Punctures close to the location of each nerve meant to be blocked are performed around the knee, allowing the infiltration of local anesthetic and corticosteroid solution[7-9]. The present study's objective was to report a series of cases evaluating the efficacy of the US block technique regarding time of analgesia and return of functional capacity.

CASE REPORTS

This series of reports included patients seen in the Chronic Pain Outpatient Clinic of the University Hospital of the *Universidade Federal do Maranhão* between October 2019 and January 2020. The presented patients were elderly (60-79 years, mean=69 years) with chronic knee pain and radiological findings revealing advanced KOA (Kellgren-Lawrence grade ≥3). In these patients, conservative treatment for pain relief was not being satisfactory. They did not present connective tissue diseases, nor previous neurological deficits or psychiatric diseases (Table 1).

The GNB was performed in the proceedings room of the chronic pain outpatient clinic under aseptic technique and blood pressure, cardioscope and arterial oxygen saturation monitoring. No sedatives or premedication were administered. Each patient was placed in supine position with a pillow under the popliteal fossa to relieve discomfort and position the slightly flexed knees. The 12MHz high frequency linear transducer was positioned for a flat approach, first SM, then SL and finally IM, along the epiphysis of the femur or tibia, being moved up or down to identify the epicondyles of the referred bones. The genicular arteries were identified near the periosteum, at the junctions of the epicondyle with the epiphyses of the femur and tibia, confirmed by the presence of pulsatility. Therefore, the target points of the GNB should have been close to each genicular artery, because the SL, SM, and IM genicular arteries run alongside their respective genicular nerves, or femoral and tibial cortical surfaces, due to their topographic relationship with the genicular neurovascular bundles (Figures 1, 2, and 3).

After confirming the positioning of the Pajunk® 22Gx100mm UniPlex NanoLine needle tip near a genicular artery, 5mL of a solution containing 4mL of bupivacaine without vasoconstrictor at 0.5% and 1mL (2mg) of dexamethasone at each target site (SL, SM and IM), totaling 15mL of solution, were administered.

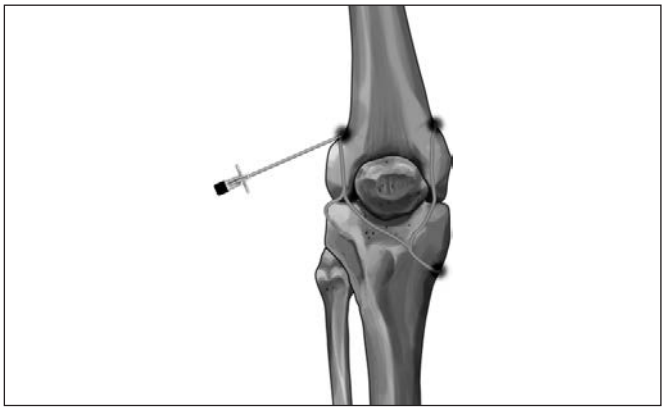

Figure 1. Genicular nerve block.
Source: https://calvinjohnsonmd.com/geni-cular-block

Table 1. Patients diagnosed with KOA submitted to genicular block guided by US

Cases	Gender	Age (years)	Comorbidities	Function limitation.	Treatment	Rehabilitation	Genicular block	VNS before	VNS one month after block
1	M	79	SAH/CAD/DM2/OP	45°	Glucosamine+ condroitin	PST Analgesic	Bilateral	8	3
2	F	60	OA/OP	45°	Glucosamine+ condroitin/duloxetine	PST Analgesic	Bilateral	7	2
3	M	71	SAH/OP	45°	Glucosamine+ condroitin/codeine	PST Analgesic	Bilateral	8	1
4	F	66	OA/OP/SAH/DM2 Glaucoma	45°	Dipyrone/ alendronate/codeine	PST Analgesic	Left	8	3

CAD = coronary artery disease; DM2 = diabetes mellitus type 2. SAH = systemic arterial hypertension; OA = Osteoarthritis; OP = Osteoporosis; PST = physiotherapy; VNS: visual numeric scale; M = male; F = female.

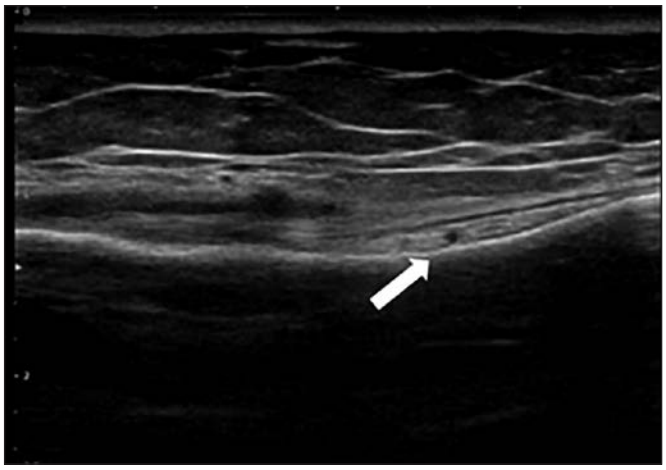

Figure 2. Genicular superolateral nerve and artery

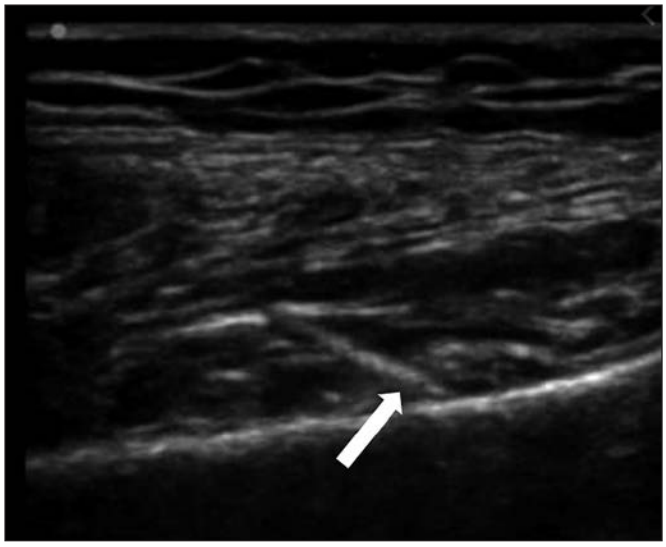

Figure 3. Genicular superolateral nerve block using the relation between artery and nerve to guide the positioning of the needle

In cases of bilateral block, these were performed with one-week interval for each knee.

The patients were monitored for 2 hours in the recovery room and then released. During these 2 hours, the patients were evaluated in relation to the range of motion and ability to walk without the help of orthotics. Pain was assessed using VNS before the block and after 1 month of the procedure. The mean VNS before the procedure was 7.75 and, after 1 month, 2.25. All patients presented significant improvement of pain and range of motion, achieving rehabilitation more easily. No complications in relation to the technique were observed.

DISCUSSION

The conservative treatment approach of the KOA encompasses, beyond pharmacological therapy, the prescription of physiotherapy, hydrotherapy, acupuncture, viscosupplementation, intra-articular corticosteroid infiltrations, orthotics and lifestyle changes, such as weight reduction and exercise[4,5]. Although there are several modalities of conservative treatment, they may not be able to achieve good results in more advanced cases, which present higher levels of pain and function decrease, resulting in the occurrence of treatment refractory pain[6]. Making use of minimally invasive techniques, like peripheral blocks, may be of great benefit for the pain management of such patients. In that context, GNB is a valid therapeutic option, as reported in the present series of cases.

The GNB technique under US guidance included the SM, SL and IM genicular nerves for sensory block. The lateral inferus branch is not included due to its proximity to the common fibular nerve, responsible for the motor innervation of the leg and foot[16,18]. Genicular arteries and bone surfaces were used as reference points in the US, a method already reported in other studies, to perform block by dispersion of the solution close to the nerve and providing greater safety during the procedure[7,8,11]. Since these nerve structures are difficult to visualize due to their small size and the arteries that follow their paths, the reference points for the GNB should be close to each genicular artery or to the cortical surface of the bone, regardless of the visualization of the respective nerves, since they are easier to locate under US guidance due to the pulsatility of the arteries and hyperechogenicity of the bones[7,8,11]. However, in elderly and advanced peripheral vascular disease patients, these arteries may not be visible or may have very small diameters, which is an obstacle for visualization. Thus, other important reference points are the femoral and tibial cortical surfaces, due to their close topographic relation with the genicular neurovascular bundles.

The use of US makes it easier to reach the genicular nerves by dispersing larger volumes of the solution containing local anesthetic and corticosteroids, using these structures as reference, in case of imprecise location[15,16]. The chosen dosage was based on previously published data, which present a variation in relation to the solution volume, varying from 2 to 6mL, according to the local anesthetics and corticosteroids utilized, as well as their concentration[7-9,20]. It is worth noting that GNB can also be performed with radioscopy, which requires a larger structure and a surgical setting, and does not allow the visualization of vascular structures without the use of contrast[16,18]. GNB associated with corticosteroids may present efficacy similar to the RF ablation[9], an emergent technique, generally preceded by a diagnosis GNB with local anesthetic, which seems to be effective in the treatment of pain that is hard to control in cases of KOA[10-12]. Thus, GNB associated with corticosteroids was the choice for this study due to the benefit in the management of these kinds of pain, momentarily improving the pain scenario, enabling more adherence to the rehabilitation adjuvant therapies for patients with KOA, as well as presenting the possibility of a continuous improvement over time. Using US to guide the procedure enhances safety, avoiding complications related to the vascular puncutre[19,21] or mishaps when performing the block and allowing the procedure to be done in an outpatient setting without further difficulties.

GNB can be an intervention that facilitates the rehabilitation process, and more studies are needed so that more concrete and precise indications are established. Its action on the sensitive innervation of the knee is an option to be considered when joint infiltration and total knee prosthesis cannot be performed, or when there is associated comorbidity that contraindicates infil-

tration due to the risk of hematoma or septic arthritis. It may also be an option when joint infiltration is no longer effective or in cases where the patient is waiting for a knee arthroplasty.

CONCLUSION

In these case reports, GNB reveals itself as an effective treatment for chronic pain related to KOA, in which US facilitated and improved results, also being useful in cases of imprecise location caused by vascular involvement resulting from the use of larger volumes of anesthetic solution.

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