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Radiofrequency of genicular nerves to relieve osteoarthritis knee pain

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Introduction

Gonalgia is one of the most common pathologies in pain units, both non-surgical and post-surgical, even more frequent. The usual treatment, starting with anti-inflammatory drugs in a high percentage is not enough for the treatment of this. We present an alternative interventional treatment when conventional treatments are not sufficient. In our Unit of Pain is not uncommon patients with knee pain because of Osteoarthritis (OA) refractory to treatment.

Methods

Literature review

The review of this topic was conducted including the following sources PubMed, Medline, Scholar Google, Wiley online library search using the following terms: radiofrequency, genicular nerve, knee, anatomy, osteoarthritis. We selected those articles written in English and perform the review of the last 5 years.

Osteoarthritis (OA) is one of the most common musculoskeletal diseases of elderly people.[1] In the elderly population, approximately 13% of women and 10% of men experience symptomatic knee OA. Knee OA is the leading cause of chronic disability among community-dwelling older adults, primarily due to knee pain.[2] There is no cure for OA.[3] Recently, radiofrequency (RF) neurotomy of sensory branches to the anterior knee capsule has been proposed by Choi et al for treating pain and disability caused by chronic OA of the knee.[4] Anatomical targets for Radiofrequency (RF) procedures on the knee consist of sensory innervation of the knee from the periarticular or intraarticular branches of major nerves.[5]

Knee sensory innervation

The sensory innervation of the knee is basically divided into two groups of nerves, the posterior group and the anterior group.[6] The posterior group originates from the sciatic nerve, mainly by its posterior tibial branch (upper medial geniculate nerves, lower and middle) and the posterior branch of the obturator nerve (geniculate nerve). The anterior group originates from the articular branches of the femoral through the muscular branches of the vast medial, lateral and intermediate, the saphenous nerve (infrapatellar branch) and the common peroneal nerve by its lateral retinacular branch. The innervation of the medial part of the knee originates from the infrapatellar branch of the saphenous nerve and the muscle nerve of the vast medial, as well as from the anterior branch of the obturator nerve.[7] The innervation of the lateral part is given by the nerve of the vast lateral and the vast intermediate, the peroneal nerve and the lateral retinaculum.

Guild III and collaborators[8] found that the Retinaculum, the patellar ligament and the ligaments of Wrisberg and Humphry had the greatest number of free nerve endings, and where there was less was in the anterior cruciate ligament. The anterior face of the joint (patella anterior face of the femoral condyles and anterior part of the tibial plateau) is innervated by the internal saphenous nerve. The posterolateral face is innervated by the upper and lower lateral geniculate nerves (branches of the common peroneal nerve) and the posteromedial face by the upper and lower medial geniculate nerves (branches of the posterior tibial).

Identified 8 zones:[8]

1. Suprapatellar bursa/quadriceps tendon:

The saphenous nerve, the femoral branch is a sensory nerve that gives innervation to the anteromedial part of the knee at the foot, passing through the adductor canal and migrates through the sartorius muscle. Provides innervation to the quadriceps tendon.

2. The medial retinaculum

The medial retinaculum nerve, a terminal branch of the vast medial nerve, innervates the medial retinaculum.

3. Patellar tendon and fat pad infrapatellar fat is a highly innervated structure, which receives its innervation from the saphenous (the medial part), the tibial and the common peroneal (the lateral part).
4. Medial collateral ligament and the joint of the capsule of the medial meniscus the branch of the saphenous provides innervation to the medial and anteroinferior side of the knee as well as the joint capsule, medial collateral ligament and joint of the meniscus capsule.
5. Tibial insertion of the posterior cruciate ligament.
6. Femoral insertion of the anterior cruciate ligament the sciatic nerve is formed by the nerve roots of L4-S3 and it's common peroneal and tibial branches are divided into the popliteal hollow. Collateral branches of the tibial include the posterior articular branch that innervates the anterior and posterior cruciate ligaments.
7. Lateral collateral ligament and capsular insertion of the lateral meniscus.
8. Lateral Retinaculum

The tibial nerve innervates the lateral posterior capsule, the common peroneal nerve innervates the anterolateral face of the lateral retinaculum, the lateral cruciate ligament and the lateral meniscus, and contributes to the innervation of the patellar tendon, infrapatellar tendon and fat pillow.

Radiofrequency procedure

The procedure involves ablation of the lateral superior, medial superior and medial inferior genicular nerves utilizing radiofrequency.

The inferior lateral is not target due to its close proximity to the common peroneal nerve.[9] With the patient placed in supine position, the knee slightly flexed (20 degrees) with a pillow under the knee, and sterile technique; under fluoroscopic guidance, anteroposterior view, identify the union of the epicondyle with the diaphysis femoral on lateral and medial sides. At the same way, identifies the union of the condyle and the diaphysis of the tibia in the medial side. Previous local anaesthetic introduces radiofrequency needle 10 cm long and 23 gauge wide, with active tip 2 mm in tunnel view contacting with the periosteum. In lateral view, the needles must cross the centre of the femur diaphysis and in the tibia near to the posterior cortical. Here, the sensory stimulation is performed to produce paresthesia around the knee with 50 Hz and O,6 Volts, then, a motor stimulation to confirm the absence of fasciculation at 2Hz and 2 Volts. The impedance must be between 300 and 700 Ω. Previous administration of bupivacaine 0,25% 2ml in each needle, performed conventional radiofrequency 80ºC, 90 seconds at 20 V.

Data synthesis

The excluded publication after screening was: an animal study, not written in English, a conference abstract, not related to knee pain or knee OA.

Discussion

There are several alternatives for the treatment of osteoarthritis of the knee. From oral medication to rehabilitation and interventional therapy. Within this broad arsenal, the application of RF on geniculate nerves is widely studied in recent years. Genicular nerve RF denervation is described infrequently in the orthopaedic medical literature and is rarely prescribed by orthopaedic surgeons for the treatment of symptomatic knee OA.[3] The preponderance of evidence suggests that RF denervation can be a safe and effective treatment for chronic knee pain, with the duration of benefit like that targeting other joints, ranging between 3 and 12 months.[10] When the oral and conventional treatments fail, can indicate in patients as step prior into the surgery and even is a useful alternative to surgery for patients who suffer from chronic knee OA pain,[9] patients who are not candidates for total knee arthroplasty because of comorbidities may find RF to be a suitable alternative to surgery.[3] Radiofrequency of genicular nerves, is not the first choice of treatment but could be an alternative for patients with grade 3 to 4 gonarthrosis who did not respond to conservative treatment and when surgical approach is not feasible for example, because of cardiovascular comorbidity.[4]

The Hakeim as well as Karaman, Sari et al.,[1] Masala et al., Bellini et al., concluded that RF can be considered as a safe and effective modality for pain relief and functional improvement in patients with chronic knee OA, with no need for supplementary analgesia.[11] As RF of genicular nerves to relieve osteoarthritis knee pain, still is a relative novel intervention, long-term efficacy and adverse events are still largely lacking at this time. It is possible that geniculate vascular injuries do exist in patients receiving RF like local vesel thrombosis because the higher temperatures,[9] but have not been reported at present. It is necessary to do more studies to evaluate the safety and efficacy of this technique in order to avoid any possible vascular complication and includes in future research pulsed radiofrequency which may decrease the risk because no tissue damage occurs as the temperature is set. It warrants further study.[12,13]

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