

Genicular Nerve Radiofrequency Ablation Before Meniscal Transplant - A Case Report

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Abstract

Case Description: A 47-year-old male with left knee pain after partial medial meniscectomy and arthroscopic chondral microfractures, was proposed for meniscal transplantation in 2019. Patient's knee pain was described as a moderate constant pain (6/10 in Visual Numeric Scale, VNS), with major interference in daily activity. Previous conservative treatment (physical therapy and oral analgesic medication) showed no substantial result. An intra-articular injection with hyaluronic acid and intra-articular of autologous platelet-rich plasma had also been performed without long term pain relief.

Results: The patient underwent genicular nerve radiofrequency ablation (RFA), which resulted in long lasting pain relief. At six months of follow-up, patient reported a pain reduction, with VNS 0/10.

Discussion: Genicular nerve RFA shows promising results in both pain reduction and functional improvement in patients with knee osteoarthritis. There is no data evaluating the efficacy of pain control before meniscal transplantation, with genicular nerve RFA. In our case, patient reported no pain after treatment and no need for analgesic treatment during this follow-up.

Conclusion: Genicular nerve RFA seems to be a treatment option to fill the gap between conservative treatment and invasive surgery, even in patients with non-osteoarthritis related chronic knee pain.

Keywords: Radiofrequency ablation, genicular nerve, meniscal transplantation, knee pain.

Introduction

Menisci is critical for mechanical function of the knee because it improves joint congruence through increasing contact surface area. [1,2] Damage to the menisci causes a loss of structural integrity and function, resulting in loss of knee stability and function, pain, and early-onset arthrosis. [2,3]

Knee osteoarthritis is one of the most common joint diseases occurring in adults, with prevalence of 10% in men and 13% in women aged 60 years or above. [4,5] Overall, the prevalence of knee pain, not regarding age and bone mass index, has increased over the past few decades. [6]

Meniscal allograft transplantation is a possible treatment option in a few groups of patients with meniscal injuries.[2] Patients waiting for transplantation should try conservative treatment for pain management. Conservative treatment consists in physical therapy, pain medication with analgesics, opioids and antidepressants or local infiltrations with platelet-rich plasma (PRP) injections or hyaluronic acid. [4,7] Despite these options, many patients complaint from refractory knee pain.

Genicular nerve radiofrequency ablation (RFA) is a minimally invasive procedure used to treat patients with intractable knee pain secondary to knee osteoarthritis and persistent pain after knee replacement. [1,8]

To our knowledge, this is the only reported case of pain control until meniscal transplantation managed with genicular nerve RFA.

Case Report

A 47 years-old man with previous partial internal meniscectomy of the left knee in 2014 was referred to an Interventional Physiatry Unit by knee pain. In April 2019, he was submitted an arthroscopic chondral microfractures, due to grade IV chondral injury in medial compartment of left knee with no satisfactory improvement, so, a meniscal transplantation was proposed.

After last surgery, patient complains of persistent mechanical knee pain, localized mainly in medial compartment. He rates his pain at 6 in 10 in Visual Numeric Scale (VNS). Physical examination showed normal aligned knees, complete active range of motion and maintained strength in the lower extremities. Pain emerged in maximal flexion and palpation over medial joint line, without crepitus or effusion. Radiographs revealed post-surgical changes, with mild signs of arthritis in the medial compartment.

Multidisciplinary follow-up team (Orthopedics and Physiatry) agreed on a trial of physical therapy and non-steroidal inflammatory drugs (NSAIDs), however without any substantial relief. He performed viscosupplementation with hyaluronic in August 2019 and intra-articular injection of autologous PRPs in October 2019. Between these interventions and for two months, patient described some benefits – less pain, increased activity and decrease in analgesic medication. But after this, he had resurgence to baseline pain level (VNS 6/10) with sport avoidance and need for daily analgesia.

In September 2020, he was submitted to conventional (thermal) RFA of the superomedial and inferomedial geniculate nerves and infrapatellar branch of saphenous nerve, 80° at 2min, for sensory denervation of the medial femorotibial compartment of the left knee. Immediately after the procedure, patient reported no pain (VNS 0/10). At 6 months follow up, this effect persisted with pain relief, without the need of additional oral analgesia. Eight months follow-up, he was resurgence of complaints (VAS 6/10) and he repeated the geniculate nerves RFA, with the same benefits as the first ablation (VAS 0/10).

In July 2021, he was submitted to meniscal allograft transplantation of medial meniscus. The allograft was prepared, and a suture fixation was performed – all inside suture, suture reinforcement and fixation with endobutton (Figure 1). He immediately started rehabilitation. Now, one year after transplantation, without pain (VNS 0/10), no blocking or flare, no limitations in work or physical activity, no need analgesic medication. The magnetic resonance imaging shows good meniscus integration with some anterior horn degeneration.

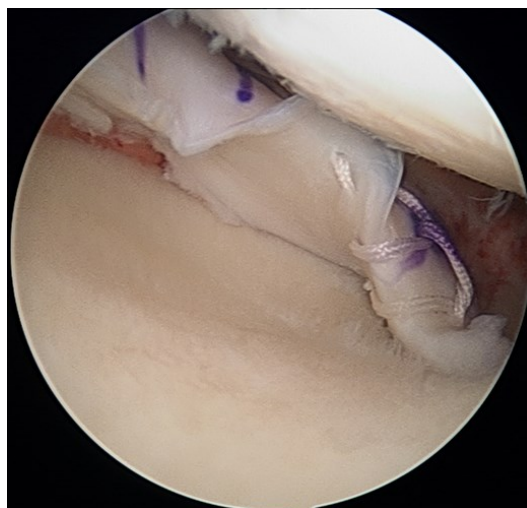


Figure 1. Arthroscopic image of meniscal allograft transplantation of medial meniscus of our patient.

Results & Discussions

The meniscal allograft transplantation (MAT) has become the state-of-the-art treatment for symptomatic subtotal or total meniscectomy patients, especially in the young population.[2] This technique aims restore the normal contact pressures of the knee joint and the goal of delaying the progression of degenerative arthritis. [2,3] Classical indications for MAT are patients with a symptomatic meniscal deficiency, without the presence of advanced degenerative changes. Nevertheless, the latest publication, advocate that a decision to perform a MAT should be a case-by-case basis, especially in young patients.[2] In this case, our patient had chondral lesion and was older than 35 years, so he was warned for higher risk of failure.

There are no published studies on the benefits of RFA in patients with symptomatic meniscal deficiency, but its benefit in knee pain for osteoarthritis has been proven.

The sensory innervation to the knee is relayed through the superior lateral, superior medial, inferior medial and inferior lateral genicular nerves, recurrent fibular nerve, and infrapatellar branch of the saphenous nerve.[4,5,8-10] The RFA involves sensitive denervation of the joint capsule through targeted delivery of radiofrequency energy to the genicular nerves, causing tissue heating and neural denaturation, thereby decreasing nociceptive signaling.[8,11-12] Due to our patient's complaints – pain in medial compartment of knee –, the targeted nerves were superior and inferior medial genicular nerves and infrapatellar branch of saphenous, for sensory denervation of the medial compartment of knee (Figure 2).

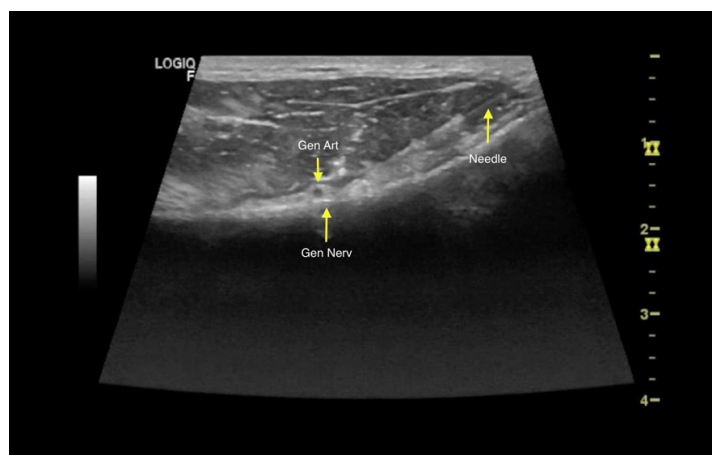


Figure 2. *Ultrasound-guided identification of genicular nerve, genicular artery and the needle to perform a genicular conventional radiofrequency ablation.]*

The RFA is most applied in patients with symptomatic knee osteoarthritis recalcitrant to conservative modalities, patients' persistent pain after knee replacement or patients who were not accepted for surgical intervention due to medical comorbidities. [8,9]

RFA can be guided under ultrasonography or fluoroscopy. [7,13] Some anatomical studies demonstrate that genicular nerves are accompanied by genicular arteries or are located near the adductor tubercle and medial collateral ligament. [7,12-14] However, RFA under ultrasonography provides more accurate visualization of neurovascular structures, and so, a safer and more accurate intervention. Other benefits of ultrasound are low logistic barriers to use and application and does not involve exposure to radiation, when compared with fluoroscopy.[4] However, the studies show there is still not clear and adequate evidence indicating the superiority of ultrasonography to fluoroscopy. [4,13,14]

Genicular nerves RFA was performed with the patient in supine position with a pillow under the popliteal fossa to minimize discomfort. The ground pad was applied on the contralateral side.

After nerve identification, we inserted the radiofrequency injection electrode, using the long-axis view of the ultrasound probe, targeting the nerves. Electrode placement confirmation is made when it's positioned near the genicular nerves with sensory and motor testing. Sensory testing is completed once patient experiences pain or pressure that may be consistent with his usual knee pain. Motor stimulation ensure the absence of undesired motor fiber activity such as fasciculations and avoid lesion of motor nerves.[9] After proper placement, we injected 1 mL of 2% lidocaine before ablation through each cannula and waited. Then, we proceed to thermal radiofrequency– increasing temperature to 80°C for 2min. Following, we injected 1ml of 2mg/ml ropivacaine through each injection electrode, remove them and apply a bandage.

A review of the literature showed that genicular nerve RFA may be an effective alternative for people with symptomatic knee osteoarthritis, with improvement of 60% from the baseline knee pain for at least six months.[5,9,12] Choi *et al.* published that genicular RFA treated patients had significantly lower VAS pain scores at four and twelve weeks than the control group.[5,7,8,12] And recently, Carrier *et al.* was found that genicular RFA was also effective in knee pain after trauma.[6]

The use of analgesic medication is one of the main cornerstones of conservative treatment in pain relief. A recent retrospective study of patients with knee osteoarthritis treated with RFA showed that 79% of the patients taking opioids for knee pain had discontinued those medications by six months after RFA.[8] Konya *et al.* showed that at one, three and six months after treatment, patients had decreased in their opioid use, higher percentage of opioid discontinuation, with statistically significant changes ($p < 0.001$), and results were similar with NSAIDs.[4,8] In parallel to satisfactory analgesia obtained with RFA, also quality of life increased significantly and the clinical effects were maintained for up to one year.[4]

There are no data on pain reduction in patients undergoing RFA while waiting for a meniscal transplant, but our patient reported pain decrease for 0/10 (VAS), what is promising, but is necessary more studies. In our case, he also was able to leave the analgesic medication for more than six months.

For knee osteoarthritis, in a review of systematic studies, genicular RFA was favored over intra-articular hyaluronic acid, intra-articular corticosteroid injection and combination intra-articular platelet-rich plasma and hyaluronic acid, in terms of pain and functional improvement between one and six months after treatment. [4,8,15,16]

Genicular nerve RFA is a safe procedure with minimal complications. [7,12] The most common adverse effects reported are knee swelling, subcutaneous bruising, and sensitive alterations.[4,7,8]

Conclusion

Genicular nerve RFA may be a viable treatment option to fill the gap between conservative treatment and invasive surgery, as part of a multimodal approach to pain control, providing functional improvement with satisfactory and adequate analgesia, increasing quality of life, decreasing dependence on analgesic medication, with high patient satisfaction and without major side effects.

Conflict of Interest

The authors declare no conflict of interest.

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