

Peripheral Nerve Radiofrequency Neurotomy: Hip and Knee Joints



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KEYWORDS

• Genicular • Radiofrequency • Neurotomy • Hip pain • Knee pain • Osteoarthritis

KEY POINTS

- Osteoarthritis in the hip and knee joints is associated with joint pain, stiffness, weakness, and limited ambulation, which leads to significant psychosocial and physical disability.
- Intra-articular causes of hip pain can be successfully treated with radiofrequency neurotomy of the articular branches of the femoral and obturator nerves with minimal complications.
- Radiofrequency neurotomy of the knee can improve pain and function in patients with knee osteoarthritis.

INTRODUCTION

Osteoarthritis (OA) is the most common joint disorder in the general population.¹⁻³ Multiple modifiable and nonmodifiable risk factors play a role in its development and progression, particularly in the weight-bearing joints. These factors include old age, female gender, obesity, previous knee injury, repetitive overload, muscle weakness, joint laxity, effusion, and synovitis, among others.³⁻⁶ It is associated with joint pain, stiffness, quadriceps weakness, impaired ambulation, and sleep disturbances, leading to significant psychosocial and physical disability.⁷⁻¹²

Nonsurgical treatment alternatives recommended for the management of hip and knee OA include education, exercise, physical therapy, topical agents, acetaminophen, nonsteroidal anti-inflammatory drugs, intra-articular injection with corticosteroids, hyaluronic acid, regenerative medicine and acupuncture, among others.¹³⁻¹⁵ Some patients with severe incapacitating disease, however, may not respond to these alternatives due to either low efficacy, increased adverse effects, or severity of

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disease. Even though surgical management is an alternative, some patients may not be candidates due to increased risk of surgery secondary to their comorbid diseases or simply may not wish to undergo surgery.

Radiofrequency (RF) neurotomy has been described as a treatment alternative for chronic peripheral joint pain.^{16–18} RF has been extensively studied for the treatment of chronic pain conditions, such as spinal facet joint-mediated pain, sacroiliac joint pain, radiculopathy, and trigeminal neuralgia, among others.^{19,20} It may be performed by different lesioning methods, including conventional RF (CRF), pulsed RF (PRF), and cooled RF, described later. RF neurotomy might be considered a successful alternative treatment with few complications for patients with chronic knee or hip OA who have a poor response to conservative management or are not candidates for surgery.

HIP JOINT PAIN

Anatomy

The hip joint is a true synovial, ball-and-socket joint between the acetabulum and the head of the femur. Its static stability originates mostly from its bony configuration and soft tissue attachments, especially on the anterior aspect of the joint capsule. It has a multiplanar range of motion facilitated by the activation of adjacent muscles.

The sensory innervation of the hip joint capsule originates primarily from the lumbosacral plexus and peripheral nerve branches, including the femoral, obturator, sciatic, and superior gluteal nerves. Based on anatomic and radiologic studies, it has a complex innervation divided into anterior and posterior aspects.^{21–23} The anterior hip joint is predominantly innervated by articular branches of the obturator nerve anteromedially and the femoral nerve anterolaterally. Significant anatomic variations have been found on the obturator nerve, including an accessory nerve, variable number of articular branches, and width of distribution.^{21–23} On its posterior aspect, it has major contributions from the sciatic nerve and nerve to quadratus femoris posteromedially, and superior gluteal nerve posterolaterally²¹ (Fig. 1).

Microscopically, studies have found that the highest areas of free sensory nerve endings are located at the anterior and superior aspects of the hip joint capsule, especially at its anteromedial aspect.²² Other studies evaluating the innervation of the human acetabular labrum have found more abundant free nerve endings on its superficial anterior-superior and posterior-superior zones.²⁴ Fewer studies have evaluated the presence of sensory nerve endings and mechanoreceptors on the posterior hip joint and have described a minimal amount of sensory nerve fibers in this area.^{25,26} These findings may explain the variable pain referral patterns of patients with hip pathology predominantly reported to the groin and anteromedial thigh but also buttock, knee, and distal lower leg.^{27,28}

Indications

Hip pain is a common complaint in the general population and causes may vary with age. Potential pain generators include intra-articular and extra-articular structures, such as the joint capsule ligaments, labrum, synovium, bone, bursae, tendons, and nerves. A specific pathoanatomic diagnosis of hip pain is sometimes difficult to establish due to multiple pain generators and variable hip pain referral patterns (groin, trochanteric, thigh, and buttock pain) as well as referred pain from other anatomic locations (low back, pelvic viscera, and peripheral nerves).^{27,28} For these reasons, some studies have suggested the use of intra-articular injections^{29–33} and/or diagnostic blocks of the articular branches of the obturator and femoral nerves to differentiate intra-articular causes of hip pain from extra-articular causes, including hip pain of

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