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Peripheral Nerve Stimulation of the Trochanteric Branches of the Femoral Nerve for Treating Greater Trochanteric Pain Syndrome

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Background: Greater trochanteric pain syndrome (GTPS) is a common cause of lateral hip pain that can be refractory to conservative therapy. Radiofrequency ablation (RFA) has shown efficacy, but reversible, minimally invasive alternatives are needed. Peripheral nerve stimulation (PNS) offers neuromodulatory analgesia while preserving nerve integrity.

Case Report: We report a patient with bilateral refractory GTPS treated with temporary PNS targeting the trochanteric branch of the femoral nerve. Bilateral lead placement was performed, resulting in rapid and substantial pain reduction, improved sleep and mobility, and decreased reliance on medications.

Conclusions: This case demonstrates that PNS of the trochanteric branch is a safe, minimally invasive, and reversible option for patients with refractory GTPS. It provides meaningful analgesia and functional improvement, supporting its role as a complementary or alternative intervention to RFA. Further studies are needed to assess long-term outcomes and comparative efficacy.

Key words: Peripheral nerve stimulator, greater trochanteric pain syndrome, PNS, GTPS, hip pain, trochanteric bursitis

BACKGROUND

Chronic musculoskeletal pain remains one of the leading causes of disability worldwide and contributes substantially to diminished quality of life, reduced mobility, and escalating health care expenditures. Among the various regional pain syndromes of the lower extremity, lateral hip pain, most commonly categorized under greater trochanteric pain syndrome (GTPS), represents a frequent yet underrecognized source of persistent functional impairment. GTPS has historically been described as "greater trochanteric bursitis"; however, contemporary understanding recognizes it as a multifactorial condition encompassing a spectrum of pathology, including trochanteric bursitis, gluteus medius and minimus tendinopathy, partial tendon tears, and peritrochanteric soft-tissue inflammation. This evolving pathoanatomic model highlights that symptoms are often driven not solely by isolated bursal inflammation but by a complex interplay of tendinopathy, mechanical overload, and nociceptive sensitization (1).

GTPS affects approximately 8% to 20% of the general population at some point in their lifetime and occurs more frequently in women and older adults. Risk factors include obesity, altered gait mechanics, lumbar spine pathology, leg-length discrepancy, and hip abductor weakness. Clinically, patients present with focal tenderness over the greater trochanter, pain with ambulation or stair climbing, and significant discomfort when lying

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on the affected side, often resulting in sleep disturbance and progressive limitations in daily activity. For many individuals, these symptoms become chronic and refractory, leading to long-term disability comparable to that seen with advanced hip osteoarthritis (2).

Conservative management remains the first-line treatment strategy and typically consists of activity modification, nonsteroidal anti-inflammatory drugs (NSAIDs), structured physical therapy emphasizing hip abductor strengthening, and image-guided corticosteroid injections. While these approaches may provide short-term relief, a considerable subset of patients experience only transient benefit. Repeated corticosteroid injections are associated with diminishing returns and potential adverse effects, including tendon degeneration, soft tissue atrophy, and local tissue weakening, raising concerns regarding long-term safety. Surgical interventions, including bursectomy or tendon repair, are reserved for refractory cases but are invasive and demonstrate variable outcomes, with prolonged recovery times and inconsistent pain relief (3).

Genth et al (4) described the trochanteric branch of the femoral nerve as a source of innervation of the greater trochanter. The nerve branches off the femoral nerve and travels with the medial circumflex artery from anterior to posterior. It travels just lateral to the pectineus muscles before emerging superiorly to the quadratus femoris tendon and inferior to the obturator and gemelli tendons, where it reaches the periosteum of the posterior greater trochanter and its bursae (4).

Image-guided diagnostic blocks of the trochanteric branch have demonstrated reproducible analgesia, supporting this branch as a clinically meaningful therapeutic target. Building upon this anatomic understanding, radiofrequency ablation (RFA) of the trochanteric branch has emerged as an effective treatment for refractory GTPS (5). Our previously published work (5) demonstrated that targeted RFA of this branch can provide substantial and durable pain reduction with favorable safety profiles, thereby validating the trochanteric branch of the femoral nerve as a reliable interventional target for chronic lateral hip pain. Although neuroablative techniques, such as RFA, can offer long-lasting relief, they are inherently destructive and may not be appropriate for all patients. Some individuals prefer reversible therapies, while others may benefit from neuromodulatory approaches that alter pain processing without permanent neural interruption (6).

Growing clinical evidence supports the use of peripheral nerve stimulation (PNS) across multiple peripheral pain syndromes, including postsurgical knee pain, shoulder pain, neuropathic pain, and focal mononeuropathies. Our group has previously reported favorable outcomes using PNS for several chronic peripheral neuralgias and postoperative pain states, demonstrating significant reductions in pain scores, improved function, and low complication rates (7-10). Given the established success of both RFA and PNS at analogous peripheral nerve targets, extending neuromodulation to the trochanteric branch of the femoral nerve represents a logical progression in the treatment paradigm for GTPS.

Despite this rationale, literature describing PNS specifically targeting the trochanteric branch for lateral hip pain remains limited. Here, we present a case of bilateral PNS of the trochanteric branches of the femoral nerve in a patient with chronic, refractory GTPS. This report builds upon our prior work with trochanteric branch interventions and further supports peripheral neuromodulation as a minimally invasive, reversible therapeutic option for patients who fail conservative management.

CASE PRESENTATION

The patient is a 65-year-old woman with bilateral GTPS resistant to conservative therapy, which included Tylenol, NSAIDs, transcutaneous electrical nerve stimulation, antidepressants, and greater trochanteric bursa injection with steroids. The patient presented to our clinic with 8/10 pain on the Visual Analog Scale (VAS) with limitation in daily activities associated with this pain. On exam, the patient had pain and tenderness over the greater trochanters bilaterally.

After discussing with the patient, we decided to proceed with a temporary PNS placement. The patient was brought to the procedure room, placed in the prone position, and the skin was anesthetized using lidocaine 1%. Then 2 stimulating needles were inserted (one on each side at the sites of the trochanteric branches of the femoral nerve) (Figs. 1 and 2 representing the left side). The patient felt stimulation in the painful areas on both sides. Then the leads were deployed and secured on the skin. The procedure was performed under fluoroscopic guidance.

At the 2-month follow-up after explant (4 months follow-up after implant), the patient reported 90% improvement in pain (VAS score of 1/10) and indicated she can exercise again, with improved sleep and mood.

DISCUSSION

GTPS remains a common yet frequently challenging condition to manage when symptoms persist beyond conservative therapy. Although traditionally labeled as isolated trochanteric bursitis, contemporary evidence suggests that the majority of chronic cases are multifactorial, involving gluteal tendinopathy, peritrochanteric inflammation, and regional nociceptive sensitization rather than simple bursal pathology alone. This broader understanding helps explain why treatments directed solely at inflammation, such as corticosteroid injections, often provide only transient benefit and fail to produce durable functional improvement in many patients (11).

For individuals with refractory GTPS, treatment options are limited. Repeated steroid injections may expose patients to cumulative risks, including tendon degeneration and local tissue atrophy, without consistent long-term analgesia. Long-term pharmacologic therapy, particularly NSAIDs or opioids, carries well-established systemic risks and does not address the underlying nociceptive driver. Surgical approaches, including bursectomy or tendon repair, are invasive and associated with variable outcomes, extended recovery, and potential complications. Consequently, there is a growing need for targeted, minimally invasive strategies that directly address the sensory pathways responsible for pain transmission (12).

Peripheral nerve-directed interventions have increasingly filled this therapeutic gap. Diagnostic anesthetic blocks have helped identify the trochanteric branch of the femoral nerve as a key contributor to lateral hip nociception. Building upon this anatomical and functional understanding, RFA of the trochanteric branch has demonstrated meaningful and durable analgesia in patients with chronic GTPS (13). Prior case series (5) have demonstrated that cooled RFA targeting the trochanteric branch of the femoral nerve can provide safe, meaningful, and durable pain relief in patients with refractory GTPS, with most patients experiencing sustained improvement after failure of conservative therapies.

Fig. 1. Placement of stimulating needle under fluoroscopic guidance.

Ultrasound-guided continuous RFA offers a minimally invasive, image-guided approach that enables precise lesioning and has demonstrated promising, durable pain relief in early clinical outcomes (14). PNS represents an attractive alternative. Rather than interrupting conduction, PNS modulates nociceptive signaling through both peripheral and central mechanisms, providing analgesia while preserving neural integrity (15).

The mechanisms of PNS are multifaceted. At the spinal level, stimulation of large-diameter afferent fibers engages inhibitory interneurons within the dorsal horn in accordance with the gate control theory, thereby reducing transmission of nociceptive signals carried by smaller C and A-delta fibers. PNS has also been shown to suppress hyperexcitability in wide-dynamic-range neurons and to attenuate central sensitization, a hallmark of chronic musculoskeletal pain. Peripherally, electrical stimulation may decrease ectopic discharges from injured nociceptors, improve local microcirculation, and modulate inflammatory mediators. Emerging evidence (16-18) further suggests that neuromodulation may influence neuroimmune interactions by downregulating proinflammatory cytokines, thereby addressing both neural and inflammatory contributors to pain. Collectively, these mechanisms support not only immediate

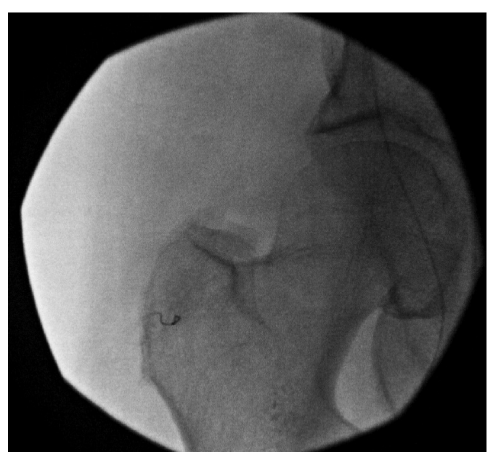

Fig. 2. Final lead placement under fluoroscopic guidance.

analgesia but also longer-term neuroplastic changes that may explain sustained benefit after temporary stimulation systems are removed (16-18).

Short-term percutaneous PNS systems, such as Sprint (SPR Therapeutics, LLC, Cleveland, OH), leverage these principles by providing stimulation for a defined treatment window, typically up to 60 days, without permanent implantation. This approach reduces hardware-related risks, avoids implanted pulse generators, and offers a minimally invasive option that may induce prolonged analgesia even after lead removal. Growing literature (8,9) supports this paradigm across multiple pain indications, including postsurgical knee pain, shoulder pain, neuropathic pain syndromes, and focal mononeuropathies. Our group has previously reported favorable outcomes with PNS in several peripheral neuralgias and postoperative pain conditions, demonstrating significant and durable reductions in pain with low complication rates (8,9).

The present case extends these findings to the trochanteric branch of the femoral nerve. Notably, the procedural approach mirrors techniques already familiar to clinicians performing trochanteric branch RFA. The same anatomical landmarks, imaging strategies, and fascial planes can be used to accurately place leads, facilitating the translation of existing interventional expertise into neuromodulation. In this patient, bilateral lead placement produced rapid and substantial pain reduction, improved sleep tolerance, increased ambulation capacity, and reduced reliance on medications. These functional improvements are particularly meaningful given that mobility limitation and sleep disturbance are among the most disabling aspects of GTPS.

From a practical standpoint, PNS may occupy several roles within the treatment algorithm for GTPS. It may serve as a primary interventional therapy for patients preferring a reversible option, as a step before or after neuroablation, or as an alternative for those who are not candidates for RFA. This flexibility aligns well with the broader shift toward individualized, minimally invasive pain management strategies (8,9,19).

CONCLUSIONS

GTPS is a multifactorial and often refractory condition in which conventional conservative therapies frequently fail to provide durable relief. This case demonstrates that PNS targeting the trochanteric branch of the femoral nerve is a safe, minimally invasive, and reversible approach capable of producing rapid and meaningful analgesia, while also improving function, sleep, and mobility.

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