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Case Report

Ultrasound-Guided Cryoablation of Genitofemoral Nerve for Chronic Inguinal Pain

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Background: Cryotechnology is a modality of renewed interest in pain management. It is safe and effective when used to treat neuropathies of sensory and mixed nerves. Cryoablation, in general, is devoid of the risk of neuroma formation and can provide several weeks to months of adequate pain relief. Traditionally, cryoablation was applied blindly to the target area. The use of ultrasound guidance may improve the efficacy and reduce morbidity. We report a case of a successful cryoablation of the femoral component of the genitofemoral nerve using ultrasound guidance in a patient with chronic inguinal pain.

A 47 year-old male (ASA Classification II for obesity, HLD, and OSA, 125kg, 69 in) presented to the Walter Reed Pain Clinic with the complaint of 4/10 VAS left sided groin pain of 3 month duration. The patient was diagnosed with a neuropathy of the femoral component of the left genitofemoral nerve. He received a diagnostic block with local anesthetic and reported immediate pain relief that lasted one week. The patient was counseled on the risks and benefits of cryoablation. The skin was anesthetized with 1% lidocaine and a 14 gauge angiocatheter needle was introduced using an in-plane technique to the target area. A Westco Cryoablation machine (San Diego, California) with a 14 gauge Lloyd Neurostat cryoprobe was then passed via the angiocatheter. The area was treated for two 3-minute intervals while the cryo probe was visualized under ultrasound.

Ultrasound is increasingly utilized for both acute and chronic pain procedures. Ultrasound offered several advantages in this case. It allowed a smaller gauge introducer and cryoablation probe to be used since there was better visualization of the target area. Ultrasound helped identify important vascular structures, allowing safe introduction of the introducer and cryoablation probe. The patient remains pain free at 2-month follow-up.

Key words: Chronic pain, ultrasound, cryoablation, pain management, neuropathic pain, nerve block

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The prevalence of chronic pelvic pain in both genders of the general population is not fully established. It is estimated that 15 – 20% of women ages 18 – 50 years are affected (1). Persistent pain after inguinal surgery represents a significant cause of disability, occurring in between 15%–35% of cases (2-4). The incidence of spontaneous groin pain is not known. Treatment options for chronic inguinal pain are limited and often fail (5,6). In addition to medical management, ultrasound-guided nerve blocks and cryoablation may offer therapeutic benefit. As the use of ultrasonography expands in chronic pain management, the ability to identify and treat specific neuralgias may improve. Ultrasound guidance has been successfully used in the treatment of trigeminal neuralgia, sacroiliitis, ilioinguinal and iliohypogastric,

pudendal , suprascapular, and intercostal neuropathies (7-16). Visualizing relevant anatomical structures (e.g. blood vessels), in addition to the target nerve, may improve success rate, reduce patient morbidity and lessen total procedural time. After a diagnostic block is performed with local anesthetic, neurolysis may be considered for longer lasting effect. Cryoanalgesia is suited for neuropathic pain that originates from relatively small, well-localized lesions such as neuromas, entrapment neuropathies, and postoperative pain (6). Sustained blockade of afferent impules with cryoanalgesia may reduce plasticity (windup) in the central nervous system and lead to long lasting analgesia. Permanent blockade does not usually occur, since the affected axons regenerate. Furthermore, cryoablation avoids the complication of causing or exacerbating deafferentation pain. This can occur with a neurotomy or non-pulsed thermocoagulation with radiofrequency (17). With cryoablation, the axons and myelin sheaths are lysed (Wallerian degeneration), but the epineurium and perineurium remain intact, which facilitates successful nerve regeneration. The affected axons are unlikely to form neuromas, often associated with traumatic, surgical, and thermal lesions that interrupt perineurium and epineurium (18). The contact surface area of a cryoablation probe on larger nerves provides more complete neurolysis than pulsed radio frequency (17). Furthermore, cryoablation provides immediate analgesia in the affected area while there is a delay of up to a week with radiofrequency. Pulsed radiofrequency can cause some minor changes such as endoneurial edema, thickened epineurium, increased cytoplasmic vacuolization, and enlarged endoplasmic reticulum. These effects are transient and not neurolytic (Table 1).

We report a case of a successful cryoablation of the femoral component of the genitofemoral nerve using ultrasound guidance in a patient with chronic inguinal pain. To our knowledge, this is the first description of this approach.

Case Report

A 47-year-old male (ASA Classification II for obesity HLD, and OSA, 125kg, 69 in) presented to the Walter Reed Pain Clinic with the complaint of 4/10 (VAS scale with 0 = no pain, 10 = worst imaginable pain) constant, left sided groin pain of 3 month duration. The pain was described as a constant dull ache with no alleviating factors. No inciting event or previous surgery was noted as the etiology. The patient's profession required a fair amount of manual labor, and his pain was preventing him from performing his duties. He was initially referred to general surgery for possible inguinal hernia, but this was ruled out. He had been followed by our Pain Clinic for low back pain and left hip pain for approximately 2 years. The patient had been on a medication regimen consisting of acetaminophen with codeine 30-300 mg every 4 hours as needed, tramadol 50 mg q6h as needed, transdermal lidocaine 5% every 12 hours, neuron-

Table 1. *Comparison of Cryoablation and Pulsed Radiofrequency.*

Cryoablation vs RF ablation	Cryoablation	Radiofrequency (pulsed)
Indications	Neurolysis of peripheral nerves	Neurolysis of peripheral nerves
Method of action	Cold (-60 to -70oC)	Heat (+60 to +80oC)
Electrode diameter	1.3–4mm	0.25–10mm
Treatment length	120–180 sec	60–90 sec
Lesion symmetry	Symmetric	Asymmetric in nonhomogenous medium (approaches ellipsoid)
Introducer size	12g, 14g, 16g	16g, 18g, 20g, 22g not necessary for most applications
Functional limitations	Large introducers	Poor neurolysis in poorly perfused areas and near bone
Length of neurolysis	++	+++
Ease of use	++	+++
Availability	+	+++
Safety (decreased collateral damage)	+++	++
Cost	+++	++

tin 1200mg 3 times daily, and pregabalin 300 mg nightly.

The patient was diagnosed with a peripheral neuropathy of the femoral component of the left genitofemoral nerve by history and physical exam. He received a diagnostic block using a 25-gauge spinal needle and 6 mg of betamethasone and 10 mL of 2% lidocaine. This was a blind field block using anatomical landmarks (i.e. femoral artery palpation). The patient reported immediate pain relief that lasted one week. The patient was then counseled on the risks and benefits of cryoablation. Cryoablation was chosen over radiofrequency ablation for several reasons, to include: the relative size of the peripheral nerve, its superficial location, the fact it was a sensory nerve, and cyroablation's intermediate duration of neurolysis. The patient was placed supine position and the skin was prepared in sterile fashion. Using the Micromaxx™ (SonoSite Inc., Bothell, WA) with high frequency probe (HFL38 13-6 MHz), the femoral vein, artery, and nerve were identified. The genitofemoral nerve originates from the upper part of the lumbar plexus and its roots are L1 and L2. It passes obliquely through the substance of the psoas major, and emerges from its medial border, close to the vertebral column, opposite the fibrocartilage between the third and fourth lumbar vertebræ. The femoral component of the genitofemoral nerve runs superficially outside the inguinal canal, eventually providing sensation to the anterior superior thigh and groin. Our target location was superficial and lateral to the femoral artery, caudal to the inguinal ligament, and approximately a third of the distance from the pubic tubercle to the anterior superior iliac spine. The skin was anesthetized with 1% lidocaine and a 14-gauge angiocatheter needle was introduced using an in-plane technique to the target area (Fig. 1). A Westco Cryoablation machine (San Diego, California) with a 14 gauge Lloyd Neurostat cryoprobe was then passed via the angiocatheter. The patient immediately felt reproduction of his usual pain when we reached our target location. We tested the area with sensory electrical stimulation at 2Hz and the patient again reported reproduction of his usual pain. We then tested the motor component with no apparent leg movement. The area was treated for 2 3-minute intervals while the cryo probe was visualized under ultrasound (Fig. 2). The patient tolerated the procedure well. There were no complications. After a 3-month follow up period, the patient reports satisfactory analgesia with a VAS of 2/10.

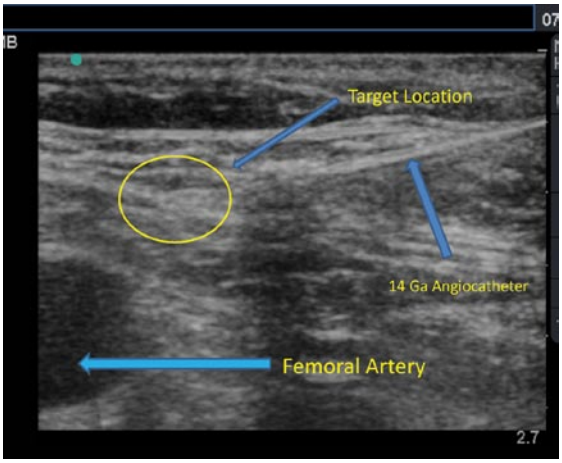

Fig. 1. *Image of 14-gauge angiocatheter needle introduced to target area.*

Conclusion

Ultrasound is increasingly utilized for both acute and chronic pain procedures. Several studies have shown increased peripheral nerve block efficacy, latency, and shorter procedure times using ultrasound over nerve stimulation (18-24). Using ultrasound in place of fluoroscopy or computed tomography can potentially decrease radiation exposure to both patient and practitioner (25). It may also help to decrease costs (less expensive equipment, less clinic space required), improve efficiency, and increase portability (25). To our knowledge, this is the first reported use of ultrasound for cryoablation of the femoral component of the genitofemoral nerve.

Ultrasound offered several advantages in this case. It allowed a smaller gauge introducer and cryoablation probe to be used since there was better visualization of the target area. Ultrasound helped identify important vascular structures, allowing safe introduction of the introducer and cryoablation probe. It should be noted, however, that the actual target nerve was not easily identified under ultrasound guidance. A detailed knowledge of anatomy was essential.

Cryotechnology is a modality of renewed interest in pain management. It is safe and effective when used to treat neuropathies of sensory and mixed nerves. Cryoablation, in general, is devoid of the risk of neuroma formation and can provide several weeks

to months of adequate pain relief. Our patient had lasting pain relief 3 months following his procedure. As the technology and portability increase, the cost of ultrasonography will decrease. Well trained anesthesia providers may help reduce patient morbidity through the use of ultrasound.

We are currently using ultrasound guidance for all our genitofemoral nerve blocks, as well exploring its use for occipital nerve blocks. Additional studies are warranted to more formally evaluate the role of ultrasonography in a chronic pain clinic.

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