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Ultrasound-Guided Superior Gluteal Nerve Hydrodissection in the Treatment of Deep Gluteal Syndrome

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Abstract

Background: Deep gluteal syndrome is a common cause of posterior hip pain. It results from peripheral nerves, such as the sciatic or superior gluteal nerve, being compressed in the deep gluteal space. Hydrodissection is a novel technique for the treatment of nerve pain due to entrapment. The use of hydrodissection for the treatment of deep gluteal syndrome has not been reported. **Methods**: A case report involved a 42-year-old female presenting with deep gluteal syndrome. **Case report**: We report, with patient consent, an ultrasound-guided superior gluteal nerve hydrodissection method used for treating the deep gluteal syndrome. A previously healthy 42-year-old female patient sought medical attention due to persistent left gluteal pain. Trials of joint injections, physiotherapy, and epidural blocks were unsuccessful. Hydrodissection under ultrasound-guidance allowed separation of the fascial plane in areas with significant neural innervation. We targeted the superior gluteal nerve with hydrodissection offering the patient immediate and persistent relief from her symptoms. **Conclusion**: Ultrasound-guided hydrodissection of the superior gluteal nerve offers an effective and novel diagnostic and treatment option for deep gluteal syndrome.

Keywords

Superior Gluteal Nerve, Deep Gluteal Syndrome, Lower Limb Radicular Pain, Deep Gluteal Space, Hydrodissection, Ultrasound

1. Introduction

Deep gluteal syndrome is a common cause of posterior hip pain [1] [2]. The

deep gluteal syndrome is defined as compression of a peripheral nerve in the deep gluteal space [1] [2]. The compressed nerve can either be sciatic, femoral, inferior gluteal, or in this particular case, the superior gluteal nerve.

The deep gluteal space, also known as the subgluteal space, is anterior to the gluteus maximus muscle and posterior to the posterior border of the femoral neck [2]. The lineaaspera and the sacrotuberous ligament make up the lateral and medial borders respectively. Superiorly it is demarcated by the inferior margin of the greater sciatic notch, while inferiorly is the distal border of the ischial tuberosity. Fourteen structures occupy this space: inferior gluteal artery, medial circumflex femoral artery, superior gluteal nerve, inferior gluteal nerve, ischium, sacrotuberous ligament, sacrospinous ligament, sciatic nerve, piriformis muscle, obturator internus, obturator externus, gemelli, quadratus femoris, and the hamstrings [2]. Notably, the piriformis muscle sits centrally in this space which is an important point of reference for neurovascular structures and aids in guiding dissections safely and cautiously.

The superior gluteal nerve which originates from the dorsal divisions of the L4, L5 and S1 sacral plexus nerve roots, is responsible for innervating the two gluteus muscles as well as the tensor fasciae latae muscles [3]. As it passes superiorly to the piriformis muscle through the greater sciatic foramen, it is accompanied by the superior gluteal artery and vein. Due to the superior gluteal nerves' separate course above the piriformis, injuries to this nerve may occur in isolation from other nerves in this area as they course inferior to the piriformis muscle. Superior gluteal nerve entrapment can be commonly misdiagnosed as a lumbar disc herniation. This nerve facilitates hip abduction and gait stabilization. When it becomes entrapped from compression, patients can experience an aching claudication type of pain in the buttock region with tenderness to palpation, weak abduction of the hip, and a waddling gait [4]. This phenomenon is known as Trendelenburg gait.

Hydrodissection is a novel technique for the treatment of nerve pain and entrapment. The evidence began when researchers studied carpal tunnel syndrome and identified new ways to release the flexor retinaculum that was trapping the median nerve [5]. Under ultrasound guidance, physicians are able to inject fluid to separate nerves from surrounding fascia or structures that previously were irritating the nerve, whether that be during movement or at rest. Usually, an anaesthetic solution such as 5% dextrose or saline is injected. This fluid releases the pressure off the nerve, restoring its normal function, and significantly reducing pain.

Under ultrasound guidance in hydrodissection, the needle and probe are generally perpendicular to the nerve while the needle lies in-plane with the transducer. The bevel of the needle may be pointed upward or downwards altering the direction the fluid travels when injected. If the bevel is pointed upwards, the fluid flows upwards while the tracking of the needle is downwards [6]. If the bevel is pointed down, the opposite takes place.

When identifying the entrapped nerves, physicians look for nerves that are usually more swollen, up to triple the size of their healthy counterparts [6]. To confirm you are targeting the correct nerve, palpation will reproduce the pain experienced by the patient. The fluid is then injected, and you are able to sonographically visualize the fluid entering the space and releasing the nerve from its entrapment.

The aim of this study was to assess the treatment of superior gluteal nerve entrapment in deep gluteal syndrome using ultrasound-guided hydrodissection.

2. Case Report

A 42-year-old female presented to University Hospital Limerick's Department of Pain Medicine. The patient was experiencing left gluteal pain that was unrelieved with rest or medication. She was unable to continue at work. The patient had no previous medical or surgical history. She reported difficulties lying in bed, going up and down the stairs, and with dressing herself into her shoes and socks. Additionally, she noticed she was extremely stiff when waking in the morning. She underwent Magnetic Resonance Imaging (MRI) of the lumbar spine, which showed an L5 S1 disc protrusion to the left. Additionally, she had an MRI of her pelvis which showed some degenerative changeson the left side but no bursitis.

The patient trialed various joint injections into the hip and epidural blocks for the pain but ultimately, they were all unsuccessful at relieving her pain. Specifically, left gluteus medius and left piriformis muscle injections were trialed without significant pain relief. An epidural lumbar injection and hip joint injection were also used for pain relief but were not successful. There were times she would achieve momentary relief, but then it would return. The patient began physiotherapy two years after beginning her injection journey which offered some relief, but nothing ever lasted long enough. The pain was affecting her daily activities.

Ultrasound guided hydrodissection was performed using a solution consisting of 9 mL of normal saline, 1 mL of 1% lidocaine, and 1 mL of 40 mg/mL Triamcinolone. The fluid was injected into the deep gluteal space where the superior gluteal nerve sits and allowed release of the piriformis off the nerve. The patient reported immediate reduction in pain that has continued to last without further treatment. The patient was reviewed at three and six months. No vessel or nerve puncture was observed. **Figure 1** depicts the ultrasound image that was taken when the needle was in place. The arrows on the image demonstrate the needle being inserted from lateral to medial. Additionally, you are able to see the fluid from the hydrodissection, which is superior to the piriformis muscle. This is highlighted with a star.

3. Discussion

To the best of our knowledge, this is the first ever successful treatment of superior gluteal nerve entrapment in deep gluteal syndrome using ultrasound guided

hydrodissection. When patients are unresponsive to conservative measures, hydrodissection could become the next treatment for deep gluteal syndrome.

Deep gluteal syndrome is used to describe the presence ofpain in the buttock caused from non-discogenic andextrapelvic entrapment of the sciatic nerve [1] [2]. The structures that can be involved in sciatic nerve entrapmentwithin gluteal space include the piriformis muscle, fibrous bands containing blood vessels, gluteal muscles, hamstring muscles, the gemelli-obturator internuscomplex, vascular abnormalities and space occupying lesions [1] [2].

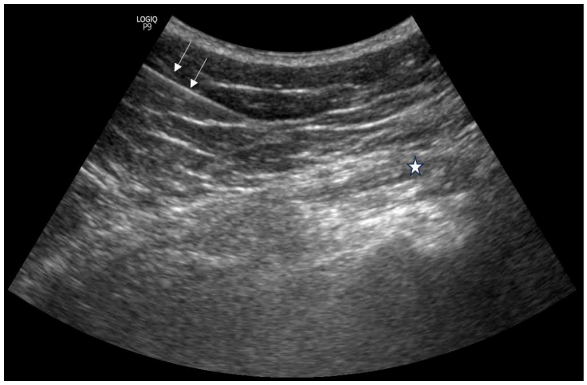

Figure 1. Arrows demonstrate needle insertion from lateral to medial. Hydrodissection superior to the piriformis muscle injectate highlighted with a star.

The first-line treatment for deep gluteal syndrome and nerve entrapment consists of conservative measures such as anti-inflammatory medications, muscle relaxants, physical therapy, and rest for at least 6 weeks [2]. If unresponsive to conservative measures, more invasive treatments can be tried such as ultrasound guided botox infiltration or endoscopic decompression of the deep gluteal space. However, conservative measures should always be offered first and given adequate time to work.

Ultrasound techniques are cost-effective ways to visualize underlyinganatomical structures in patients without exposing them to radiation or contrast-dyes. Additionally, ultrasound guided procedures have the ability to adjust to specific patient requirements. Whether patients be limited by pain or stiffness, ultrasound techniques can accommodate for different patient positions. For example, if a patient is bed bound or wheelchair bound, ultrasound gives physicians the ability to adapt to their circumstances without compromising the integrity of the scan or image. When the nerve is released from the pressure it was under, it is able to restore the function of the nerve and the surrounding muscles or joints. A potential contraindication would be local infection.

Peripheral nerve entrapments are a common but under recognized cause of pain and disability for patients [7]. The mechanical irritation from impingement alters the normal transmission of the nerve, affecting the movement specific to the innervated joint [7]. Hydrodissection aids in both diagnosis and treatment as physicians are able to visualize the entrapment and wash away the inflammatory

mediators that have built up around the site of impingement. This technique requires the ability to identify the nerves and safely manipulate the ultrasound guided needle to reach the side of the nerve but not penetrate through the nerve [7]. The nerve should ultimately be seen moving away from the needle as the injected fluid creates a separation.

4. Conclusion

Deep gluteal syndrome is a condition causing radicular pain in the buttock, hip, or thigh due to a nerve being entrapped in the deep gluteal space. The superior gluteal nerve is one of many nerves that run through this space, but uniquely coursing superior to the piriformis muscle. This nerve innervates important muscles that work to coordinate the gait cycle and hip abduction such as the gluteus muscles and tensor fasciae latae. When this nerve becomes compressed, patients may experience chronic pain, a Trendelenburg gait, and a shift toward the unaffected leg. Conservatively, deep gluteal syndrome can be treated pharmacologically, through physiotherapy, and with rest. However, ultrasound-guided superior gluteal nerve hydrodissection offers a safe and effective way to treat lower limb radicular pain from deep gluteal syndrome.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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