Perisciatic Ultrasound-Guided Infiltration for Treatment of Deep Gluteal Syndrome

Description of Technique and Preliminary Results

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The objective of this study was to describe a perisciatic ultrasound-guided infiltration technique for treatment of deep gluteal syndrome and to report its preliminary clinical results. A mixture of saline (20 mL), a local anesthetic (4 mL), and a corticosteroid solution (1 mL) was infiltrated in the perisciatic region between the gluteus maximus and pelvitrochanteric muscles. Relative pain relief was achieved in 73.7% of the patients, with average preprocedural and postprocedural visual analog scale scores of 8.3 and 2.8, respectively. Fifty percent of patients reported recurrence of discomfort, and the average duration of the therapeutic effect in these patients was 5.3 weeks.

Key Words—interventional radiology; musculoskeletal ultrasound; piriformis syndrome; sciatic nerve; sciatica; ultrasound-guided infiltration

Deep gluteal syndrome is a term used to describe the symptoms and signs caused by entrapment of the sciatic nerve in the gluteal region.[1] In general, patients with this disease may present with a history of pain while sitting, inability to sit for greater than 30 minutes, lumbar radicular pain, and paresthesias of the affected lower limb.[2] They may also have buttock and thigh pain.[3] Traditionally, the term "piriformis syndrome" has been used for deep gluteal syndrome; however, it has been observed that the piriformis muscle is not the only cause of irritation or sciatic nerve entrapment due to anatomic muscle variations or overuse injury.[3] Other causes, such as blood vessel–containing fibrous bands[4] and gluteal[1] or hamstring[5] muscle disorders, can cause the same symptoms. Therefore, the term "deep gluteal syndrome" is more appropriate for describing this disease because any anatomic component of the gluteal region can potentially cause entrapment of the sciatic nerve at its respective level.[1] The term "nondiscogenic sciatica" has also been used[6] to differentiate deep gluteal syndrome from sciatica caused by nerve entrapment at the spine in intervertebral disk disorders, as both have a similar clinical presentation.

Anatomically, the sciatic nerve is located in the deep gluteal region covered by the gluteus maximus. It leaves the pelvic region through the greater sciatic foramen below the piriformis muscle and descends between the ischial tuberosity and greater trochanter while maintaining its relationship with the posterior portion of the hip joint capsule.[7] A cadaveric study[8] showed that the location of the sciatic nerve was on average 1.2 cm from the most lateral aspect of

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the ischial tuberosity. The sciatic nerve, covered by the gluteus maximus, descends distally and crosses posterior to the gemellus superior, obturator internus, gemellus inferior, and quadratus femoris muscles.[9] In the proximal portion of the thigh, it is supported by the posterior layer of the adductor magnus. Initially, it is located lateral to the long head of the biceps femoris tendon and is covered by the gluteus maximus. Distally, the long head of the biceps femoris muscle crosses the nerve mediolaterally; therefore, the nerve is then located in the gap between the long head of the biceps femoris laterally and the semimembranosus muscle medially.[9]

Clinically, deep gluteal syndrome is an infrequent disease (responsible for approximately 6%–8% of sciatic pain cases)[10,11] and is often a delayed diagnosis because of the lack of specific symptoms and diagnostic tests,[12] although it should be suspected anytime there are sciatic symptoms that do not localize to the lumbar spine. The differential diagnosis for deep gluteal pain is summarized on Table 1.[13,14]

The first therapeutic option in deep gluteal syndrome is conservative management with physical therapy, nonsteroidal anti-inflammatory drugs, and muscle relaxants.[3] In cases in which conservative management is not effective, multiple therapeutic options have been discussed. Some include local anesthetic and corticosteroid infiltration using electromyography and computed tomography as guidance for locating the region of greatest pain.[15] Other authors have described ultrasound-guided infiltration of the piriformis muscle[16] or perisciatic region.[17] The objective of these infiltrations was to reach the inflamed region with medications (local anesthetics or corticosteroids) to achieve an enhanced therapeutic effect. More invasive options, such as open release of the sciatic nerve[2] and endoscopy,[18,19] have also been described. The aim of this study was to describe a perisciatic ultrasound-guided infiltration technique for injecting a mixture of a saline solution, a local anesthetic, and corticosteroids to cause release of the entrapped sciatic nerve in cases of deep gluteal syndrome and to report the preliminary clinical results from a case series.

Table 1. Differential Diagnosis for Deep Gluteal Pain[13,14]

Lumbar disorder (herniated nucleus pulposus)
Trochanteric bursitis
Hamstring tendinopathy
Sacroiliac joint disorders
Pseudoaneurysm of the inferior gluteal artery after gynecologic surgery
Iliac vein thrombosis
Unrecognized pelvic fractures
Kidney stones

Materials and Methods

Patients

Forty-nine patients who were referred to the Clinica Meds Interventional Radiology Department between July 2011 and April 2014 from the Clinica Meds Orthopedic and Trauma Department and had a diagnosis of deep gluteal syndrome with an indication for perisciatic infiltration treatment were retrospectively evaluated. The following parameters were recorded: duration of symptoms, eventual treatment of concomitant disorders (lumbar and hip), quantification of pain using a visual analog scale (0–10) for pain before treatment and pain immediately after infiltration, duration of the effects of infiltration, and any subsequent medical events (new infiltrations and surgery). The average follow-up period was 18.6 months (range, 2–41 months).

The patients were provided detailed information about the procedure, and informed written consent was obtained. The study was approved by the Clinica Meds Ethics Committee.

Technique

The procedure was performed by a radiologist who specializes in ultrasound-guided musculoskeletal injections. An Aplio 500 ultrasound system (Toshiba America Medical Systems, Inc, Tustin, CA) equipped with a multifrequency linear transducer was used. A frequency between 10 and 12 MHz was chosen, depending on patient body habitus.

The patient was placed in the prone position on a flat table, with a pelvic cushion (≈50 cm thick) for overweight or obese patients to elevate the pelvis. First, ultrasound was used to locate the sciatic nerve. The nerve was initially observed at the back of the thigh between the long head of the biceps femoris muscle laterally and the semimembranosus muscle medially resting on the adductor magnus and was observed as a hyperechoic image. Subsequently, the nerve was followed proximally until it was observed to be in the anatomic plane between the gluteus maximus and pelvitrochanteric muscles (gemellus superior, obturator internus, gemellus inferior, and quadratus femoris; Figure 1). Once the nerve was located, the injection site was marked on the skin.

The infiltrating solution was prepared. The solution consisted of 1 mL of a corticosteroid solution (40 mg of methylprednisolone acetate; Depo-Medrol; Pfizer, New York, NY) diluted in 4 mL of a local anesthetic (2% lidocaine; Euro-Med Laboratories, Manila, Philippines) and 20 mL of a saline solution. Then, under strict aseptic conditions, the transducer was inserted into a sterile glove after application

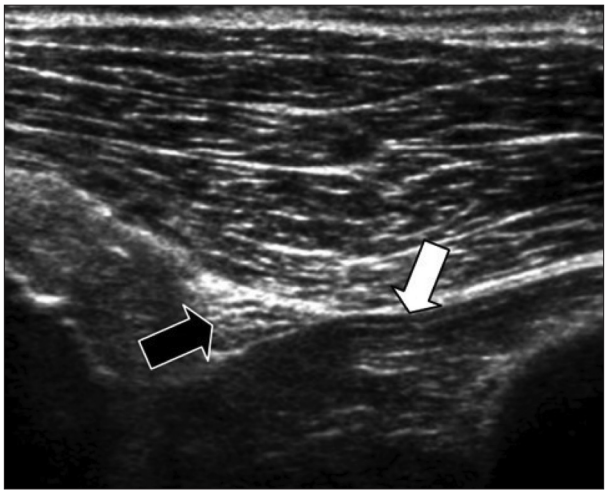
of ultrasound gel. Infiltration was performed in the perisciatic region using a spinal trocar (21 gauge) with the insertion made at a 45° angle relative to the skin in the longitudinal plane (Figure 2). The insertion was made with a needle inclination of 5° to lateral, getting a slight lateral-to-medial approach, until the trocar reached the area immediately medial to the sciatic nerve in the muscle-aponeurotic plane located between the gluteal maximus and pelvitrochanteric muscles. The prepared solution was then infiltrated, which caused debridement of the perisciatic fascial planes (Figure 3). A freehand technique was used for injection.[20] With this method, the transducer is held in one hand while the free hand pushes the needle toward the perisciatic region, as perpendicular as possible to the ultrasound beam to identify the route of the needle.

Results

The 49 patients included 28 men and 21 women with a mean age of 40.4 years. At the moment of infiltration, the patients were symptomatic for a mean duration of 2.8 years (range, 3 months–15 years). A total of 28.5% of the patients had concomitant lumbar spine disorders that had been treated before the procedure (facet block, herniated nucleus pulposus surgery, or moderate to severe facet arthropathy).

The procedure was performed in all patients without any incidents. No adverse effects were observed. The time taken for the procedure was approximately 30 minutes.

Figure 1. Transverse section of the anatomic plane of the gluteal region where the puncture site is located. The black arrow shows the sciatic nerve, and the white arrow shows the muscle-aponeurotic plane between the gluteus maximus muscle superficially and pelvitrochanteric muscles deeply.



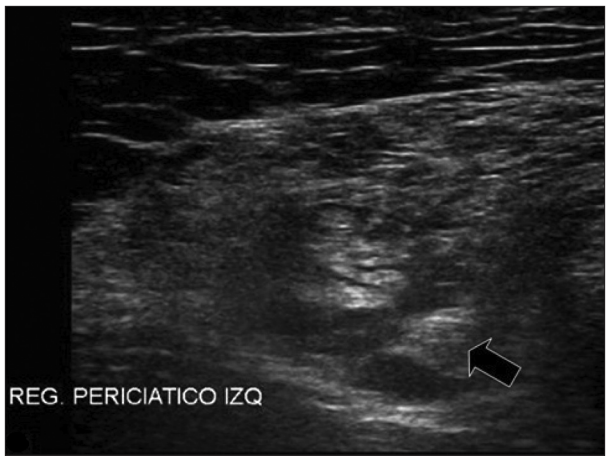
A total of 73.7% of the patients had pain relief relative to the pain level in the preinfiltration state. The average preprocedural visual analog scale score was 8.3, and the postprocedural score was 2.8. Fifty percent of the patients reported recurrence of discomfort, and the average duration of the effect in these patients was 5.3 weeks. In those patients with no recurrence of pain, the duration of symptom relief was greater than 2 years (average, 26.2 months) at the time of follow-up.

Discussion

The perisciatic ultrasound-guided technique described in this study provided pain relief in 73.7% of the patients who were refractory to conservative treatment for deep gluteal syndrome. Various protocols using ultrasound-

Figure 2. Patient positioning on the table (prone position with pelvic cushion), and needle inclination relative to skin (45° in the longitudinal plane).

Figure 3. Cross section showing the dissection caused by the saline solution injection into the perisciatic region and showing the sciatic nerve (black arrow) surrounded by the liquid solution.



guided infiltration have been described for these types of cases, which have mostly involved the piriformis muscle. Some authors have suggested using injections of local anesthetics and corticosteroids in the belly of the piriformis muscle, whereas others have recommended injections in the medial aspect of the muscle, presuming that hypertrophy and inflammation in the piriformis muscle result in compression of the sciatic nerve.[2,14,17] Perisciatic infiltration of local anesthetics and corticosteroids has also been described but always in a limited number of patients. Hanania and Kitain[15] performed corticosteroid infiltration in the perisciatic region by locating the sciatic nerve by electromyographic stimulation, after which they injected the area around the nerve without ultrasound guidance in 6 patients with deep gluteal syndrome that was refractory to medical treatment; they achieved some symptomatic relief in all study participants. Reus et al[17] described a protocol consisting of the injection of 1 mL of a corticosteroid solution combined with 1 mL of a local anesthetic in the perisciatic region with ultrasound guidance. The inferior gluteal artery was used as a reference to locate the nerve in the gluteal region. They described the results in 10 patients, who showed complete remission of symptoms at a 2-month follow-up. Almost all of these techniques emphasize infiltration of a local anesthetic solution, a corticosteroid solution, or both to control the inflammatory process in this disorder.

The infiltration technique, which uses high volumes of a local anesthetic and corticosteroid saline solution delivered to the perisciatic region, is based on the need to liberate the sciatic nerve from entrapment by any anatomic structure in the gluteal region, so it is not limited only to the piriformis muscle as the pathologic origin. In this regard, Martin et al[19] described an endoscopic treatment technique in 35 patients with deep gluteal syndrome. Intraoperatively, they observed thickening of the sciatic nerve associated with ischium adhesions and a hypovascular appearance or substantial entrapment by scar tissue. Other surgical findings were thickening of the trochanteric bursa in some patients, with fibrous bands extending to the sciatic nerve and nerve entrapment in the piriformis tendon, with abundant fibrovascular bands among other features. These intraoperative findings support the anatomic basis of our technique.

The volume of the saline solution used resulted from many observations made by one of the authors (J.R., who specializes in ultrasound-guided musculoskeletal injections). The volume was progressively increased in previous procedures until the amount was 20 mL (unpublished data), which gave a good rate of pain relief without adverse effects. In future studies, it could be interesting to change the volume to try to reach an amount that ensures the best rate of symptom relief while maintaining the absence of adverse effects.

The endoscopic technique described by Martin et al[19] for deep gluteal syndrome that is refractory to conservative treatment has the same objective as the perisciatic ultrasound-guided injection technique described above, which is to liberate the sciatic nerve from entrapment in the gluteal region. A comparison of clinical results shows that the decrease in pain is similar between the techniques. The average visual analog scale values before and after the endoscopic procedure were 6.9 and 2.4, respectively, whereas the average values for ultrasound-guided infiltration were 8.3 and 2.8. However, long-term outcomes were better for the endoscopic technique, which achieved pain relief in 83% of the patients at a 12-month follow-up, whereas 50% of the patients treated by ultrasound-guided infiltration had recurrence of discomfort at an average of 5.3 weeks after the procedure. The advantage of the ultrasound-guided infiltration technique described in here is that it is less expensive than the endoscopic technique; it is also fast and safe, with encouraging preliminary results for pain reduction. A disadvantage is that this technique shows variable progression compared to surgery. A possible explanation for this factor might be the incomplete visualization of the perisciatic region obtained with ultrasound imaging, compared to endoscopic surgery, so the pathologic alterations that could be responsible for the sciatic nerve entrapment may be only partially solved in some cases. Considering these findings, this ultrasound-guided technique can be a therapeutic alternative that can be considered before surgery, particularly in patients with no clear diagnosis. This procedure should also be considered as a diagnostic test, especially taking into account the fact that almost one-third of the patients evaluated in this series (28.5%) had concomitant disorders of the lumbar spine.

Some weaknesses of the study should be recognized. Only limited patient data were included, and there was a lack of long-term follow up, with the lack of a control group to compare outcomes. In addition, the diagnostic specificity of the injection should be limited by the large volume injected, because this volume should affect multiple structures.

In conclusion, ultrasound-guided perisciatic infiltration using a mixture of saline, a local anesthetic, and a corticosteroid solution in patients with deep gluteal syndrome refractory to conservative treatment is a safe procedure that gave good preliminary results for symptom relief. The procedure could be an alternative for management of the disease before surgery.

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