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Use of acupuncture to optimize piriformis muscle injection

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Keypoints

Use of the BL54 acupoint to optimize the piriformis muscle injection technique.

Abstract

Piriformis syndrome is an entrapment neuropathy in which the sciatic nerve is compressed or irritated by the piriformis muscle. Ultrasound guidance is essential for the injection technique; however, it can prove challenging in certain contexts (such as obesity or pronounced muscle hypertrophy). Locating the BL54 (Bladder 54 or Zhibian) acupoint can facilitate the ultrasound identification of the injection site in adult and pediatric patients.

Keywords

Piriformis muscle, piriformis syndrome, acupuncture, piriformis injection, BL54 (Bladder 54) acupoint.

Introduction[1-10]

The piriformis is a paired, symmetrical muscle, approximately triangular or pyramidal in shape. It originates proximally from the anterior surface of the sacrum (adjacent to the margins of the 2nd to 4th sacral foramina), the sacrotuberous ligament, and the capsule of the sacroiliac joint; it courses laterally and obliquely, and inserts distally onto the superomedial margin of the greater trochanter (Figure 1).

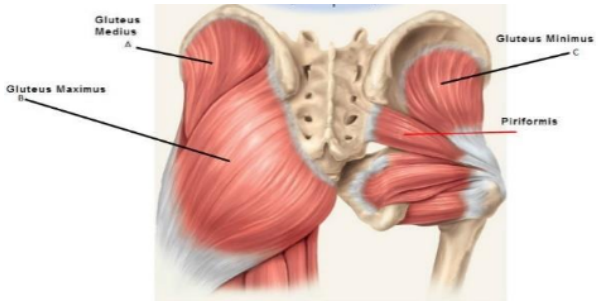

Figure 1. Anatomy of the piriformis muscle

The **Beaton and Anson classification** describes the six main anatomical variations defining the spatial relationship between the sciatic nerve and the piriformis muscle as they exit the pelvis:

- **Type A (Normal):** the undivided sciatic nerve passes entirely inferior to the piriformis muscle. This represents the most common anatomical pattern (85–90% of cases);

- **Type B:** The common peroneal division of the sciatic nerve pierces the piriformis muscle, while the tibial division passes inferiorly to it;
- **Type C:** The common peroneal division passes superiorly to the piriformis muscle, while the tibial division passes inferiorly;
- **Type D:** The undivided sciatic nerve pierces directly through the muscle belly of the piriformis;
- **Type E:** The common peroneal division passes superiorly to the piriformis muscle, while the tibial division pierces through the muscle belly;
- **Type F:** The undivided sciatic nerve passes superiorly to the piriformis muscle.

The mechanical functions of the piriformis muscle are strictly dependent on the position of the hip joint (Table 1).

Position of the hip joint	Piriformis action
Extended or neutral	External rotation
Flexed (>60-90°)	Abduction and slight internal rotation
Any	Articular stabilization

Table 1. Piriformis action related to the hip joint's movements

Methods

Thirty patients (15 females e 15 males) aged between 16 and 45 years underwent piriformis muscle injection for the treatment of piriformis syndrome, using the Bladder 54 acupoint as a landmark.

The BL54 acupoint is located approximately 3 cun lateral to the posterior midline, at the level of the sacral hiatus (the hiatus is situated about 5 cm above the tip of the coccyx).

1. The patient's measurement of 3 cuns was converted into centimeters (Figure 2);

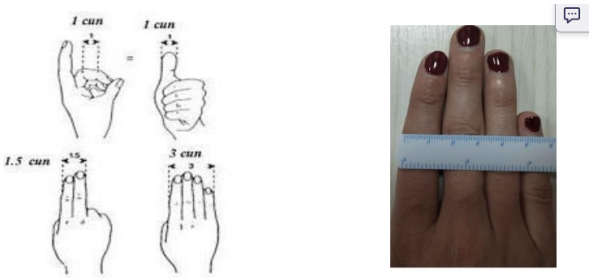

Figure 2. Cuns conversion to centimeters

2. The patient was placed in prone position;
3. The sacral hiatus was identified using ultrasonography with a convex ultrasound probe placed transversely to the body's midline (Figures 3 and 4);

Figure 3. Ultrasound research of the sacral hiatus

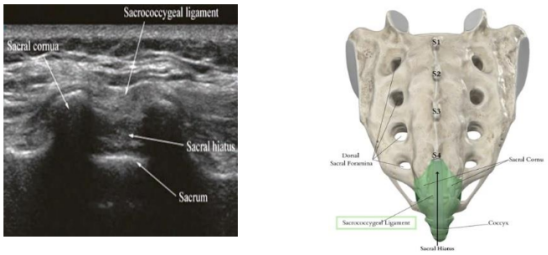

Figure 4. Ultrasound anatomical landmarks (image from "Nysora, Ultrasound-guided central neuraxial blocks")

4. The patient's measurement of 3 cuns in centimeters was marked laterally to the posterior midline (at the level of the sacral hiatus identified with ultrasound) to identify the BL54 acupoint (Figure 5);

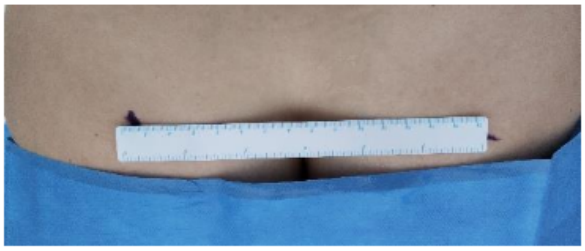

Figure 5. Location of the BL54 acupoint

5. An ultrasound evalutation of the target area was performed (using a convex probe) to identify the underlying piriformis muscle and adjacent anatomical structures (Figure 6);

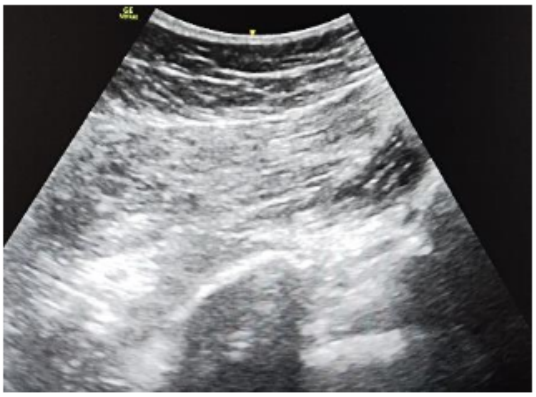

Figure 6. Sonographic identification of the piriformis muscle on the BL54 acupoint

6. Finally the piriformis muscle was injected under ultrasound control.

Discussion[1-10]

Piriformis syndrome is an entrapment neuropathy in which the sciatic nerve is compressed or irritated by the piriformis muscle, often due to hypertrophy, spasms or anatomical variations along its course.

The piriformis syndrome classification includes two main forms of the condition:

- **Primary**: due to intrinsic anatomical anomalies, such as division of the muscle or the sciatic nerve (e.g., nerve course passing through the muscle belly);
- **Secondary (Piriformis Myofascial Syndrome)**: caused by extrapelvic conditions, such as trauma (direct macrotrauma), repetitive microtrauma (e.g., sitting neuropathy or "wallet syndrome"), or biomechanical alterations secondary to sacroiliac or hip joint dysfunction.

Piriformis syndrome, also referred to as pseudo-sciatica, is characterized by a dull or burning pain in the gluteal region radiating along the posterior aspect of the thigh, which rarely extends distal to the knee. The pain worsens with prolonged hip flexion, sitting (e.g., while driving), and walking uphill.

Physical examination may reveal:

- **Positive Pace test:** pain or weakness during resisted hip abduction and external rotation;
- **Positive Freiberg test:** pain upon passive internal rotation of the extended hip;
- **Positive Fair test**: pain and paresthesia elicited by flexing, adducting, and internally rotating the hip;
- **Deep palpation:** sharp pain digitally evoked at the intersection between the piriformis muscle and the sciatic nerve.

Ultrasound-guided injection therapy serves as a valuable tool in treatment. The procedure can be complicated by the patient's constitutional characteristics (severe obesity, hypertrophic muscle mass, abnormal posture, osteoarticular anomalies, etc.), which may hinder proper visualization of the muscle layers, anatomical landmarks, and consequently the piriformis muscle itself.

Furthermore, this purely ultrasound-based technique is highly operator-dependent, relying on the clinician's expertise in interventional procedures and sonographic skills.

Locating the BL54 acupuncture point by converting the 3 cun measurement into centimeters undoubtedly allowed for:

- personalizing point localization;
- objectifying point localization;
- facilitating the ultrasound search.

In our cohort, ultrasound performed at the BL54 acupuncture point allowed for rapid identification of the piriformis muscle in all patients, regardless of their constitutional characteristics. Furthermore, in 100% of patients, this anatomical landmark corresponded to the thickest portion of the piriformis muscle, representing a distinct advantage for performing intra-muscular injections.

Ultrasound remains an essential tool to ensure the safety of the injection procedure, especially given the close anatomical relationship between the muscular structure and the sciatic nerve.

Conclusion

The use of the BL54 acupuncture point, in combination with ultrasound guidance, represents a valuable approach to facilitate the identification of the optimal injection site for the piriformis muscle, personalize the procedure, and reduce operator dependency, thereby enhancing clinical efficacy and optimizing overall treatment outcomes.

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