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Case Report
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Ischiofemoral Impingement Syndrome Leads to Alterations in the Quadratus Femoris Muscle: An Anatomical Description Based on a Single Case Report

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ABSTRACT

Introduction: the anatomy of the hip can exhibit certain characteristics in women, potentially resulting in impacts and friction between bone structures, leading to pain and often diagnostic challenges. One of these challenges, prone to confusion, is ischiofemoral impingement, sparsely described in clinical literature and more common in women. In this study, we describe alterations in the quadratus femoris muscle caused by ischiofemoral impingement syndrome, based on a clinical case of a 66-year-old woman, an amateur athlete in running and cycling. Imaging studies revealed an increase in the lesser trochanter of the femur and irregularities in the ischial tuberosity, which consequently led to streaks of fatty replacement in the muscle belly, as well as deep pain in the gluteal region radiating to the back of the knee. For an accurate diagnosis, avoiding confusion with other syndromes that cause hip pain, a solid understanding of anatomy and clinical presentation is essential, along with imaging studies, making the use of magnetic resonance imaging indispensable.

Keywords: Women; anatomy; musculoskeletal; amateur athlete.

Introduction

The anatomy of the hip can, in some situations, exhibit impingement between the bones that make up its joint. Among these possible conditions, there may be abnormal contact between the acetabulum and the femur, or between the ischium and the femur[2].

Sparsely addressed in the medical literature, ischiofemoral impingement is a diagnosis with imprecise definitions, as, in most cases, there is no clear triggering event. It is more prevalent in female patients who experience hip pain accompanied by signal alteration in the quadratus femoris muscle (QFM) on magnetic resonance imaging (MRI)[2]. Often, a reduction in the space between the ischial tuberosity and the lesser trochanter is observed, as initially described by Johnson *et al.* in the 1970s[3], linking ischiofemoral impingement to an increase in the size of the lesser trochanter and narrowing between the ischium and the femur[3].

Currently, changes in the MQF are reported as visible on MRI in patients with decreased 2 or unchanged ischiofemoral space, without a history of trauma or previous surgeries, supporting the imprecise pathogenesis of ischiofemoral impingement and the necessity of MRI for a detailed analysis of this condition[4].

The present case report aims to correlate the clinical and anatomical aspects of ischiofemoral impingement syndrome, considering the condition of hip pain without an evident cause related to changes in the MQF observed on MRI.

Case Report

Female patient, 66 years old, 161 cm tall, 54 kg, with no history of trauma or muscle strain, and no comorbidities or preexisting conditions. She runs four times a week, with three sessions of 10-12 km and one session of 20-25 km. The patient also cycles about 20-30 km and practices Pilates and weight training weekly. She regularly participates in marathons, with her last one occurring a year and a half before her first medical appointment. She reports a history of deep pain in the left gluteal region that radiates to the posterior thigh but does not extend below the knee, occurring during running at the beginning of the activity or when sitting for extended periods. She does not report pain while walking or cycling.

The patient sought care from an orthopedic physician due to the reported complaints. Upon physical examination, she exhibited mild tenderness upon palpation in the posterior region of the greater trochanter and tenderness in the left ischium. There

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was no pain during forced hip rotations, and hip joint mobility was preserved. Additionally, the strength of the hamstring muscles remained normal. The Freiberg and Lasègue tests yielded negative results. The normal anatomy of the region can be reviewed in Figure 1A-C.

Among the complementary examinations, the radiograph revealed, in addition to early osteoarthritis in the joint, which is consistent with the patient's age, an apparent increase in the left lesser trochanter and an irregularity in the ipsilateral ischium. This is the area where the patient experiences pain, suggesting a possible reduction in the ischiofemoral space.

Given the radiographic findings, an MRI of the left thigh was requested, revealing streaks of fatty replacement in the muscle belly of the QFM, with mild edema—findings that may be related to the impact and reduction of the ischiofemoral space. Additionally, there was evidence of trochanteric bursitis associated with inflammation of the gluteus medius muscle (Fig. 2A-D).

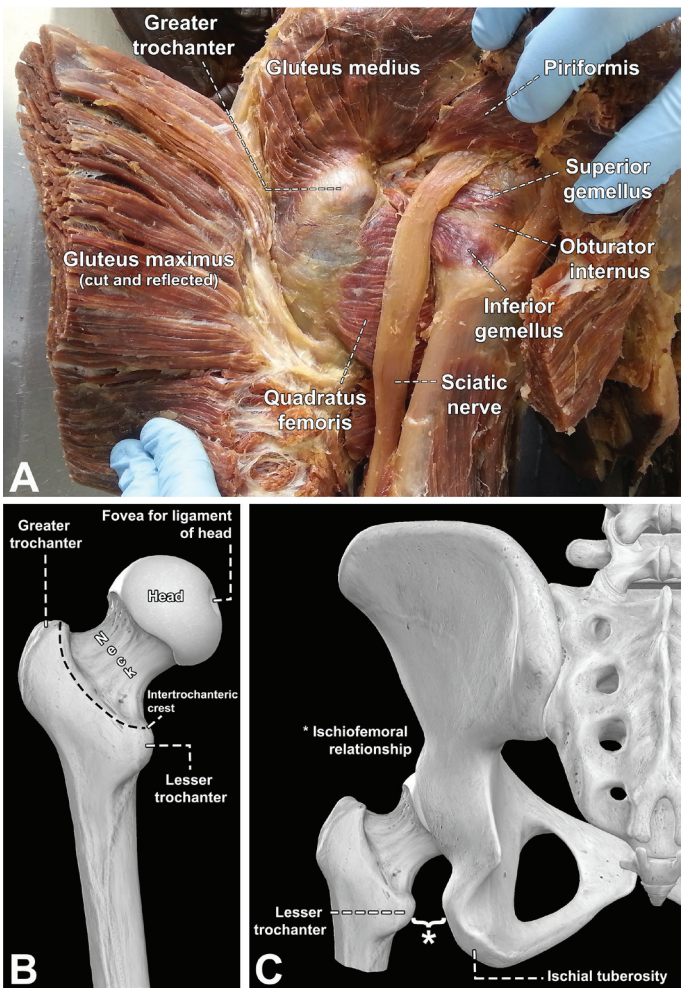

Figure 1. Dissection demonstrating the normal anatomy of the gluteal region (A) and illustrative images depicting the normal anatomy of the femur and hip (C-D). (A) Dissection performed by the authors with sectioning of the gluteus maximus muscle to highlight the muscles of the deeper layers and the sciatic nerve. (B) Image from the posterior view of the femur showing the greater and lesser trochanters and other anatomical structures. (C) Posterior view of the female pelvis demonstrating the relationship between the lesser trochanter and the ischial tuberosity. Images B and C were obtained through the Complete Anatomy software.

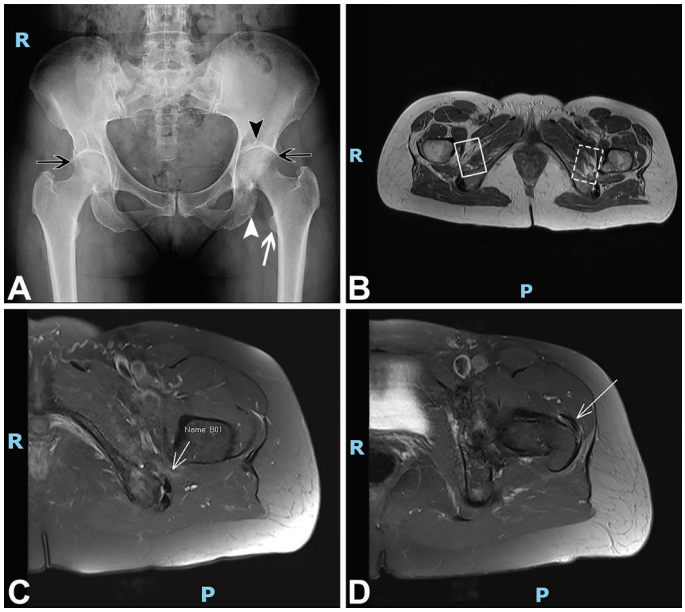

Figure 2. Radiographic image (A) and axial magnetic resonance images (B-D). Exams of the clinical case patient. (A) Shows an enlarged left lesser trochanter (white arrow), irregularity in the cortical bone of the left ischium (white arrowhead), as well as bilateral femoroacetabular degenerative changes with reduced joint spaces (black arrow), and a small subchondral cyst on the left acetabular margin (black arrowhead). (B-C) Highlights fatty replacement of the QFM (dotted rectangle and arrow). (D) Reveals a slight enlargement of the trochanteric bursa (arrow), a differential diagnosis for treatment. R = Right, P = Posterior.

In the initial treatment, unconventional and hormonal anti-inflammatories were used; however, there was no apparent improvement observed. Subsequently, a corticosteroid infiltration was chosen for the greater trochanter and the palpation-sensitive ischial region, aiming to assess the therapeutic response and distinguish between pain associated with trochanteric bursitis and ischiofemoral impingement.

The patient experienced a mild reduction in pain when attempting to run. However, during the follow-up consultation with the orthopedist, 20 days after the infiltration, no pain was identified on palpation in the greater trochanter area. The patient expressed discomfort only during deep palpation of the ischium, a crucial element for the diagnosis of ischiofemoral impingement.

Currently, the patient is adhering to a physical therapy program, which includes stretching and strengthening sessions in the region, supplemented by osteopathy sessions. She is experiencing continuous and gradual improvement, gradually resuming running training, able to run 2 to 3 km without experiencing pain. The patient continues her follow-up in physiotherapy treatment.

Discussion

Gross Anatomy

As can be observed in the magnetic resonance images, ischiofemoral impingement syndrome affects the QFM, which may appear broad and fasciculated at its origin along the ischium, and is most easily identified

at the ischial tuberosity, just anterior to the hamstring tendons. The QFM inserts onto the posteromedial femur, where the muscle fibers converge to form a narrower attachment point than its broader origin[5].

In its anatomical relations, it is limited anteriorly by the obturator externus muscle, posteriorly by fat and the sciatic nerve, inferiorly by the adductor magnus muscle, and superiorly by fat and the inferior gemellus muscle[6].

Innervation and Function

The QFM is innervated by a small branch of the sacral plexus, formed by the roots of L4, L5, and S1. The path of the nerve to the quadratus femoris exits the pelvis through the greater sciatic notch, passing inferiorly along the anterior edge of the gemelli and obturator internus muscles, and inserting into the quadratus femoris anteriorly[6]. Its functions include external rotation and assisting in hip adduction[2].

Main Injuries of the Quadratus Femoris Muscle

Among the most common injuries of the quadratus femoris are myotendinous strains, partial tears, as well as impingement of the QFM belly, which is more common in middle-aged women[7]. These conditions, as presented in our clinical case, lead to posterior gluteal pain in the hip or groin, with no apparent cause, radiating down the thigh due to sciatic nerve inflammation[8,9].

MRI is highly effective in describing both the normal anatomy and pathological changes of the QFM. This examination is essential for a detailed analysis of typical injuries affecting this muscle4. Due to its excellent resolution for soft tissues and multiplanar capability, MRI allows for precise characterization of various abnormalities[2].

The presence of edema in impingement syndromes affecting the QFM can be accurately localized in axial images, in addition to facilitating the evaluation of the relationship between the muscle belly and surrounding structures[6].

Ischiofemoral Impingement

The hip, in its skeletal anatomy, can present two predominant conditions of impingement: when there is abnormal contact between the acetabulum and the femoral head, or between the ischium and the lesser trochanter of the femur[2]. In these cases, ischiofemoral impingement may be associated with three characteristic circumstances: hip pain, abnormality of the QFM, and a narrowing of the space between the ischium and the femur[3]. It is worth noting that the latter condition is not always present[4].

Ischiofemoral impingement is considered relatively rare, due to the approximate 2.0 cm distance between the lesser trochanter and the ischium[10]. This proximity makes contact between these structures a rare condition. The incidence of the phenomenon is not well known, as there are few reports in the medical literature and a challenge in making a precise clinical diagnosis[6].

The possible etiologies of this impingement, as indicated in the literature, include: an increase in the cross-sectional area of the femur in the region of the lesser trochanter, a congenital posteromedial position of the femur, and an angle approaching the coronal plane of the inferior ischiopubic ramus[2]. Additionally, there may be a reduced distance between these two structures as a result of acquired conditions, such as intertrochanteric fractures affecting the lesser trochanter, degenerative arthritis, or intertrochanteric valgus osteotomy[3].

It is important to highlight that all documented cases in the literature were observed in women, which may be correlated with the morphology of the female pelvis, which is wider and shallower compared to the male pelvis, predisposing it to ischiofemoral impingement[7].

Kassarjian *et al.*[6] associate the condition of impingement between the ischium and the posteromedial portion of the femur with compression of the QFM. In turn, Torriani *et al.*[2] conclude that ischiofemoral impingement can be a cause of hip pain and is correlated with abnormalities of the QFM observed in magnetic resonance imaging. Additionally, there is a relationship between the narrowing of the space between the ischial tuberosity and the lesser trochanter and the impingement on the QFM[2], a condition similar to the case presented in this article.

The altered QFM due to ischiofemoral impingement on MRI, as previously mentioned, is evidenced in the muscle belly due to maximum compression6. The MRI of our patient demonstrates edema, an inflammatory process, and fatty infiltration in the QFM belly. Torriani *et al.*[2], analyzing 12 hips, identified among the abnormalities in the QFM the presence of edema in all cases, partial rupture in 33%, and fatty infiltration in 8%.

Among the possible conservative treatments described and known, we can consider: stretching exercises[8], corticosteroid injections11, neurostimulation, and percutaneous ultrasound-guided physiotherapy[9].

Furthermore, according to the study by O'Brien and Bui-Mansfield[4], surgical interventions were not effective in providing resolution for cases of hip pain resulting from inflammatory processes in the QFM.

Correlation and Clinical Evaluation

The diagnosis of patients with ischiofemoral impingement is sometimes imprecise and requires a careful evaluation through MRI scans[6]. In the present case, the MRI presented two possible diagnoses: trochanteric bursitis and ischiofemoral impingement.

Considering that injection therapy is highly effective in treating trochanteric bursitis, if its use

had relieved all reported pain at a certain point, the diagnosis could still have been imprecise. However, the absence of pain in the trochanteric region during the physical exam conducted after the injection, along with the persistence of deep pain in the gluteal region, were decisive factors for the diagnosis of ischiofemoral impingement.

Conclusion

Although rarely described in the medical literature, ischiofemoral impingement is a significant cause of hip pain. Its identification and treatment remain a challenge for orthopedic specialists. A thorough understanding of the region's anatomy, along with clinical correlation and imaging studies that reveal a potentially reduced distance between the ischium and femur, as well as abnormalities in the appearance of the QFM, are essential for an accurate diagnosis.

Ischiofemoral impingement is often mistaken for other hip pathologies, and the differential diagnosis of trochanteric bursitis can be confirmed through injection therapy. In cases of deep gluteal pain, the orthopedic specialist should consider the possibility of ischiofemoral impingement syndrome. Therefore, a thorough evaluation of MRI findings is essential for early diagnosis and appropriate treatment, as well as a clinical approach that enables the differentiation of possible hip pathologies.

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