*Arşiv Kaynak Tarama Dergisi*
**Archives Medical Review Journal**

# Ischiofemoral Impingement Syndrome
## İskiofemoral Sıkışma Sendromu

Cüneyt Tamam

Tatvan Asker Hastanesi Ortopedi Kliniği Tatvan, Bitlis,Turkey

**ABSTRACT**

Ischiofemoral impingement is newly recognized extracapsular cause of atypical hip and groin pain. Ischiofemoral impingement was first defined by Johnson in 1977. It is characterized by a narrowed space between the ischial tuberosity and the lesser trochanter, associated with changes in ischiofemoral space . The diagnosis of the ischiofemoral impingement is complex. Normal radiological and ultrasound appearances may be seen in ischiofemoral impingement patients with atypical hip pain. It is important to have a focus on the symptoms , through the history taking, physical examination, and appropriate imaging studies of the hip.In this study, we aimed to review the etiology, clinical presentation, imaging modalities, differential diagnosis and treatment options of ischiofemoral impingement.

**Key words :** Ischiofemoral, Impingement, Lesser trochanter, Quadratus femoris , Hip arthroscopy

**ÖZET**

Iskiofemoral sıkışma sendromu; atipik kalça ve kasık ağrılarının yeni tanımlanmış ekstrakapsüler nedenli bir sendromdur. Iskiofemoral sıkışma ilk olarak 1977 yılında Johnson tarafından yapılmıştır. İskial çıkıntı ile trokanter minör arasındaki alanın daralması ve iskiofemoral alanda patolojik değişiklikler ile karakterizedir. Iskiofemoral sıkışma tanısın konulması zor ve karmaşıktır. Atipik kalça ağrısı olan iskiofemoral sıkışma hastalarında normal radyolojik ve ultrasonografik görüntüler gözlenebilir. Tanı koymak için semptomlar üzerine yoğunlaşarak hasta öyküsünü, fizik muayeneyi ve uygun görüntüleme yöntemlerinin kullanılması önemlidir. Bu çalışmada ischiofemoral sıkışma sendromunun etyolojisini, klinik görünümünü, görüntüleme yöntemlerini, ayırıcı tanı ve tedavi seçeneklerini gözden geçirmeyi amaçladık.

**Anahtar kelimeler:** Iskiofemoral, sıkışma, trokanter minor, Quadratus femoris , kalça artroskopisi

## Introduction

Ischiofemoral impingement (IFI) syndrome is a newly recognized pathologic condition. It is characterized by a narrowed space between the ischial tuberosity and the lesser trochanter, with intermittent compression of the quadratus femoris muscle between the ischium and the lesser trochanter, and associated edema or fatty replacement of the quadratus femoris muscle[1,2].

Ischiofemoral impingement was first defined by Johnson in 1977. He reported on 3 postoperative patients with persistent pain. The pain was located in the medial aspect of the thigh and groin and was exacerbated by a combination of extension, adduction and external rotation of the hip. The patients were treated with resection of the lesser trochanter[3].

In 2008 Patti et al. recognized that IFI may also develop in patients without previous surgery. They presented the case of a woman in whom pain developed due to soft-tissue entrapment in the ischiofemoral space, highlighting the the concept of ischiofemoral impingement , where the quadratus femoris is compressed directly between the lesser trochanter and the ischium[4].This entity is more frequently found in women. Bilateral involvement is reported in about one third of patients. The affected patients are usually older than patients with other types of impingement, with a mean age of 51–53 years (range, 14–77 years) [1,2].

In this study, we aimed to review the etiology, clinical presentation, imaging modalities, differential diagnosis and treatment options of ischiofemoral impingement.

## Etiology

The cause of ischiofemoral impingement may be positional, acquired, or congenital [5]. The acquired causes are proposed as; fractures of the proximal femur with involvement of the lesser trochanter, valgus-producing intertrochanteric osteotomy,osteoarthritis leading to superior and medial migration of the femur , and enthesopathy of the proximal hamstring insertion, reduction of the horizontal offset in hip arthroplasty , and hip o steochondromas[1,3]. Positional factors causing IFI symptoms include internal/external rotation, adduction/abduction, and flexion/extension. Therefore, IFI symptoms can be seen in the athlete who performs supraphysiologic range of motion activities of hip joint[1,2,6].

The congenital causes of ischiofemoral impingement are suggested to be pelvis morphology , proximal femoral valgus and antetorsion, dysplasia of acetabulum or proximal femur. The female predominance of ischiofemoral impingement thought to be due to the different osseous configuration of the female pelvis compared with the male anatomy [1,2,7]. An anatomical study in cadavers by Sussman et al. demonstrated a wider intertuberous diameter, defined as the distance between the inner aspects of the ischial tuberosities, in women compared with men and suggested that the larger intertuberous diameter and associated changes in angulation of the ischium may account for the greater incidence of IFI in women[8]. In a recent study, Bredella et al found that patients with IFI had an increased ischial angle, independent of age and gender,suggesting that the orientation of the ischium with a wider ischial angle can lead to narrowing of the IF space and predispose to IFI[9].

Tosun et al. found a higher inclination angle, the angle between the long axis of the femoral neck and the long axis of the femoral shaft, and a larger hamstring tendon cross-sectional area in patients with IFI compared with controls[2]. Bredella et al. revealed that an increased femoral neck angle in patients , compared with controls, contribute both to femoroacetabular impingement and to ischiofemoral impingement[9]. The volume of the quadratus femoris has been reported to be significantly smaller in patients with ischiofemoral impingement, and fatty replacement of quadratus femoris muscle was a frequent finding (94 %). As Tosun et al. noted, the exact cause of narrowing and fatty replacement of quadratus femoris muscle remains unclear [2]. It is possible that narrowing of the ischiofemoral space can compress the quadratus femoris muscle and cause edema, inflammation, and fatty replacement. On the other hand, it is possible that quadratus femoris muscle atrophy may cause the narrowing in ischiofemoral space [10].

## Anatomy

The quadratus femoris is a short, flat, and quadrilateral-shaped muscle, located on the posterior aspect of the hip joint. It arises from the the inferolateral margin of the ischium, above the ischial tuberosity, anterosuperior to the hamstring origins, and along the posteromedial portion of the proximal femur, in the quadrate tubercle on the posterior intertrochanteric line [figure 1].

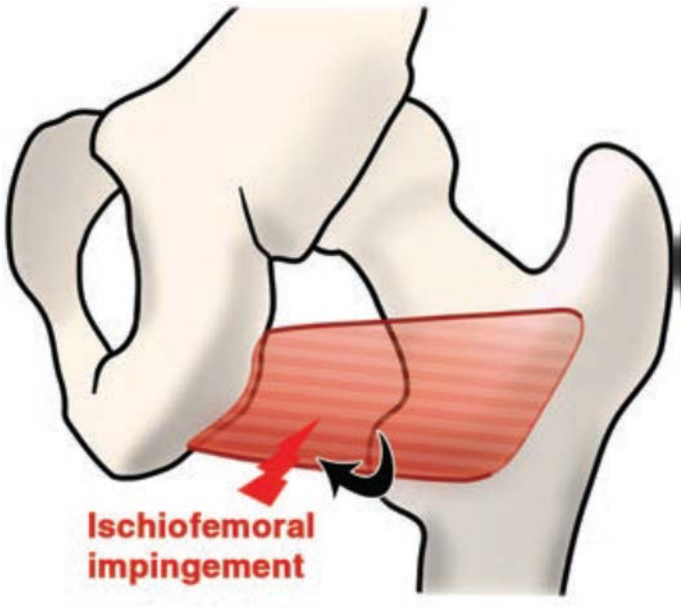



**Figure 1. Ischiofemoral impingement 7 (Drawing by Sutter R)**

The fibers of the quadratus femoris muscle (QFM) have a horizontal orientation and are interspersed with fat in its ischial portion.The anatomical relations are: anteriorly with the external obturator muscle and posteriorly with fat, the sciatic nerve, and the hamstring tendons [figure 2].

On its superior aspect is the inferior gemellus muscle and the adductor magnus is at its inferior margin. A synovial bursa is often found between the undersurface of the muscle and the lesser trochanter [2,12]. QFM is one of several external rotators of the hip and acts as adductor.It is innervated by a small branch of the sacral plexus, formed by the roots of L4, L5 and S1. The nerve to the QFM externalizes at the pelvis through the greater sciatic notch, along an anteroinferior path to the gemellus muscles and obturator internus, and penetrates the QFM on its anterior surface[13,14].

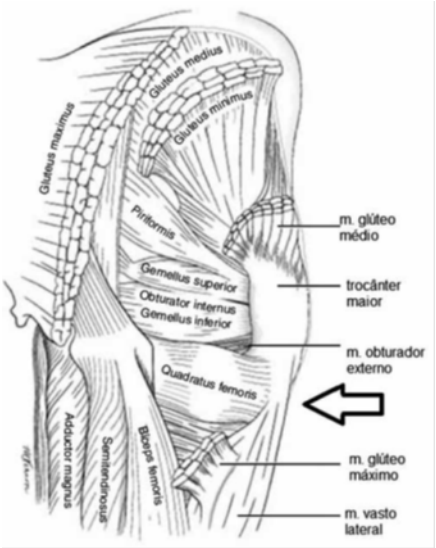



**Figure 2. IF space anatomy; Posterior view of the hip, intermuscular relationships. Quadratus femoris muscle (arrow)[11].**

## Clinical Presentation

Clinically main symptom in patients with ischiofemoral impingement is typical nonspecific chronic pain in the hip, groin and/or buttock. Pain may radiate distally into the lower extremity with thigh and/or knee pain, which is likely due to close proximity of QFM to the sciatic nerve and pressure effect may produce radiculopathy symptoms.

Patients may also experience mechanical symptoms, such as snapping sensation, crepitation,or locking in the joint and gait abnormality in hip extension phase[1,5].Patients may state history of post-partum, fitness, trauma of prior hip surgery with unsatisfactory results at 4 to 6 months[15].

Physical examination include inspection , evaluation of gait and symmetry, ligament and functional testing. To date, there is no validated physical examination test to confirm the diagnosis of IFI. However, physicians should have a high suspicion for IFI when symptoms are reproduced by actions that narrow the ischiofemoral space[16]. The symptoms may be

reproduced by a combination knee extension, hip extension, adduction and internal rotation maneuvers that impinge the muscle.

1. Johnson Test[15] (Extension, Adduction, External Rotation Impingement Test)

a) Patient is positioned lateral with extension, adduction, external rotation of hip and stabilization of lumbar lordosis. Contralateral hip in flexed position.

b) Positive test consistent with pain along groin area [Figure 3].

**Figure 3. Johnson Test[15] (Extension, Adduction, External Rotation Impingement Test)**

2. Modified Johnson Test[15] :Extension, Adduction, Internal Rotation Impingement Test

a) Patient is positioned prone with extension, adduction,internal rotation of hip and stabilization of lumbar lordosis. Contralateral hip in neutral position.

b) Positive test consistent with pain along groin area.

3. Ischiofemoral Dynamic Stress Test[15]

a) Patient is positioned prone with both hips in neutral position. Affected side is brought to 90 degrees of knee flexion with the examiner's thumb palpating the Ischiofemoral space just lateral to the ischial tuberosity. The hip is rotated internally and externally. This maneuver may be performed in neutral and fully abducted positions.

b) Positive test consistent with pain along palpation area.

4. Gait Stride Test[15]

a. Patient is asked to walk with short stride length followed by exaggerated stride length.

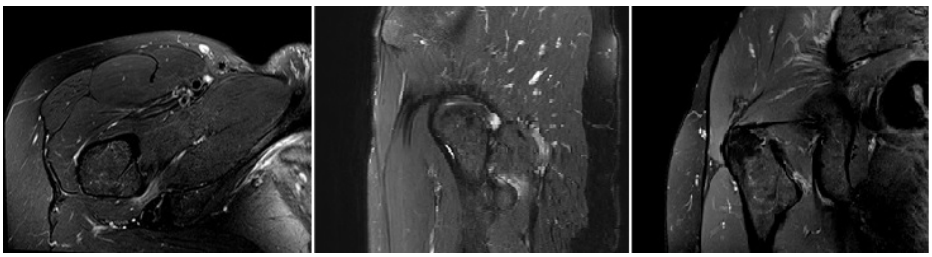
b. Positive test consistent with pain and/or mechanical symptoms along groin or posterior hip area of affected side.

## Imaging

Imaging is essential in the diagnosis of IFI. Plain radiographs are typically normal, they may demonstrate decreased distance between the osseous prominences of the lesser trochanter and ischium , as well as cystic changes and sclerosis within the lesser trochanter or ischial tuberosity [4,6,17]. Ultrasound studies of the hip and surrounding structures have not so far proved useful in the diagnosis of either ischiofemoral impingement or an acute tear in quadratus femoris, however can be used to rule out a snapping psoas tendon[18,19]. MR arthrograms can be used to differentiate an intra-articular pathology[19].

Magnetic resonance imaging (MRI) remains the best diagnostic modality for IFI [Figure 4]. MR imaging demonstrates a reduced ischiofemoral and quadratus femoris space with edema present within the quadratus femoris muscle at the site of maximal impingement, suggesting ischiofemoral impingement. The lesser trochanter and ischial tuberosity are normally approximately 2 cm apart from each other, allowing the femur to rotate without contacting the ischial tuberosity or the hamstring tendon. With the hip in internal rotation, the ischiofemoral space measures $23 \pm 8$ mm and the quadratus femoris space measures $12 \pm 4$ mm. In neutral position, the mean ischiofemoral space measures $29.3 \pm 5.9$ mm and the quadratus femoris space measures $13.5 \pm 4.5$ mm. In subjects with IFI, the ischiofemoral space measures $13 \pm 5$ mm and the quadratus femoris space measures $7 \pm 3$ mm with the hip in internal rotation and the mean ischiofemoral space measures $12.9 \pm 3.7$ mm and the quadratus femoris space measures $6.71 \pm 2.7$ mm in neutral position[1,2].

The IFI lesion is best visualized on axial T2-weighted images of MRI. The presence of edema in the muscle belly rather than the myotendinous junction, and absence of fiber disruption, help to differentiate ischiofemoral impingement from quadratus femoris muscle tear[12,20]. Quadratus femoris atrophy, which is associated with IFI, is best visualized on T1-weighted MRI images as hyperintense fatty replacement and volume loss of the muscle[2].



Axial T2 MRI Sagittal T2 MRI Coronal T2 MRI

**Figure 4.**

The inclination angle between the femoral neck and long axis of the femoral shaft, ischial angle, hamstring tendon area, and total quadratus muscle volume measurements may also be helpful in diagnosing ischiofemoral impingement. Additional imaging features that can propose impingement includes bursa formation, edema, and tears of the hamstring tendons, or edema surrounding the iliopsoas tendon insertion[1,2] .

## Differential Diagnosis

The differential diagnosis is made with those conditions leading to hip-groin pain reported in the literature. Some of these conditions are lumbar disc disease, spinal stenosis, tendinitis, bursitis, osteitis, osteoarthritis, rheumatoid arthritis, cancer, inguinal hernias, inguinal lymphadenopathy, menstrual conditions, urinary tract problems, pelvic inflammatory diseases, femoroacetabular impingement-pyriformis syndromes and muscle strains[21-24]. Differential diagnoses must be eradicated by performing clinical history, physical examination and imaging modalities.

## Treatment

Currently, there is no consensus on treatment of ischiofemoral impingement. Initial management may be conservative treatment that includes rest, activity restriction, anti-inflammatory nonsteroidal medications, percutaneous ultrasound therapy[18] and physical therapy to include stretching and strengthening of the quadratus femoris and core musculature[25]. CT-guided or ultrasound-guided injections with anesthetic and steroids can be used as a diagnostic test and for symptomatic relief [6,26] . Ultrasound-guided prolotherapy is another conservative treatment recently defined[27].

Surgical treatment options include decompression of the quadratus femoris with resection of the lesser trochanter[5,28]. Safran and Ryu described an anterior technique, which required detachment of the iliopsoas tendon from the lesser trochanter in a case report of a 19-year-old female patient with IFI who was treated arthroscopically. They stated that detachment of the iliopsoas tendon risked persistent hip flexion weakness, however it was a superior alternative to detachment of the quadratus femoris given the potential for vascular injury and subsequent development of avascular necrosis[28] . Howse et al. presented a case report in 2014 describing a posterior technique; Cutting Block Technique, preserving the attachment of the iliopsoas tendon in addition to preserving the quadratus femoris muscle. This technique eliminates the potential risks of persistent hip flexion weakness and the potential for vascular injury and subsequent development of avascular necrosis[29]. However this technique has its own potential risks of sciatic nerve damage, notching of the subtrochanteric space and damage to medial femoral circumflex artery in proximity to the quadratus femoris muscle.

## Conclusion

The diagnosis of the ischiofemoral impingement is complex. It should always be considered in the differential diagnosis for atypical pain in the groin or buttock. Appropriate history taking, physical examination, and imaging studies of the hip ensures the diagnosis. The symptoms may be reproduced by a combination of extension, adduction and external rotation of the hip. MRI is the imaging modality of choice, and special attention should be paid to the ischiofemoral space. the ischiofemoral impingement syndrome should be treated conservatively in the first line.

## References

1. Torriani M, Souto SC, Thomas BJ, Ouellette H, Bredella MA. Ischiofemoral impingement syndrome: an entity with hip pain and abnormalities of the quadratus femoris muscle. AJR Am J Roentgenol. 2009;193:186–90.
2. Tosun O, Algin O, Yalcin N, Cay N, Ocakoglu G, Karaoglanoglu M. Ischiofemoral impingement: evaluation with new MRI parameters and assessment of their reliability. Skeletal Radiol. 2012;41:575–87.
3. Johnson KA. Impingement of the lesser trochanter on the ischial ramus after total hip arthroplasty: report of three cases. J Bone Joint Surg Am. 1977;59:268–9.

4. Patti JW, Ouellette H, Bredella MA, Torriani M. Impingement of lesser trochanter on ischium as a potential cause for hip pain. Skeletal Radiol. 2008;37:939-41.
5. Ali AM, Whitwell D, Ostlere SJ. Case report: imaging and surgical treatment of a snapping hip due to ischiofemoral impingement. Skeletal Radiol. 2011;40:653-6.
6. Taneja AK, Bredella MA, Torriani M. Ischiofemoral impingement. Magn Reson Imaging Clin N Am. 2013;21:65-73.
7. Sutter R, Pfirrmann CW. Atypical hip impingement. AJR Am J Roentgenol. 2013;201:437-42.
8. Sussman WI, Han E, Schuenke MD. Quantitative assessment of the ischiofemoral space and evidence of degenerative changes in the quadratus femoris muscle. Surg Radiol Anat. 2013;35:273–81.
9. Bredella MA, Azevedo DC, Oliveira AL, Simeone FJ, Chang CY, Stubbs AJ et al. Pelvic morphology in ischiofemoral impingement. Skeletal Radiol. 2015;44:249-53.
10. Viala P1, Vanel D, Larbi A Cyteval C, LaredoJD . Bilateral ischiofemoral impingement in a patient with hereditary multiple exostoses. Skeletal Radiol. 2012;41:1637-40.
11. Yanagishita CMA, Falótico GG, Rosário DAV, Pugina GG, Wever AAN, Takata ET. Ischiofemoral impingement – an etiology of hip pain: case report. Rev Bras Ortop. 2012;47:780-3.
12. Kassarjian A, Tomas X, Cerezal L, Canga A, Llopis E. MRI of the quadratus femoris muscle: anatomic considerations and pathologic lesions. AJR. Am J Roentgenol. 2011;197:170-4.
13. Gray H. Muscles and fasciae. In Gray's Anatomy (Eds: T Pickering, R Howden):415-31. New York, NY, Crown, 1977.
14. Netter FH. Anatomy, Physiology and Metabolic Disorders. 2nd ed. West Caldwell, NJ, Ciba-Geigy, 1991.
15. Allston J. Stubbs hip arthroscopy: ischiofemoral impingement clinical evaluation. ISHA Annual Scientific Meeting October 2014 Rio de Janeiro, Brazil.
16. Tosun O, Cay N, Bozkurt M, Arslan H. Ischiofemoral impingement in an 11-year-old girl. Diagn. Interv Radiol. 2012;18:571-3.
17. Stafford GH, Villar RN. Ischiofemoral impingement. JBJS. Br. 2011;93:1300-2.
18. Peltola K, Heinonen OJ, Orava S, Mattila K. Quadratus femoris muscle tear: an uncommon cause for radiating gluteal pain. Clin J Sports Med. 1999;9:228–30.
19. Truong WH, Murnaghan, ML, Hopyan, S, Kelley SP. Ischioplasty for femoroischial impingement a case report. JBJS Case Connect. 2012;26:e51.
20. Kassarjian A. Signal abnormalities in the quadratus femoris muscle: tear or impingement? AJR Am J Roentgenol. 2008;190:W379.
21. Blankenbaker DG, Tuite MJ. The painful hip: new concepts. Skeletal Radiol. 2006;35:352–70.
22. Anderson SE, Siebenrock KA, Tannast M. Femoroacetabular impingement: evidence of an established hip abnormality. Radiology. 2010;257:8–13.

23. Klinkert Jr P, Porte RJ, de Rooij TP, de Vries AC. Quadratus femoris tendinitis as a cause of groin pain. Br J Sports Med. 1997;31:348–9.
24. Bano A, Karantanas A, Pasku D, Datseris G, Tzanakakis G,Katonis P. Persistent sciatica induced by quadratus femoris muscle tear and treated by surgical decompression: a case report. J Med Case Rep. 2010;4:236.
25. Willick SE, Lazarus M, Press JM. Quadratus femoris strain. Clin J Sport Med. 2002;12:130-1.
26. Backer MW, Lee KS, Blankenbaker DG, Kijowski R, Keene JS. Correlation of ultrasound-guided corticosteroid injection of the quadratus femoris quadratus femoris with MRI findings of ischiofemoral impingement. AJR Am J Roentgenol. 2014;203:589-93.
27. Kim WJ, Shin HY, Koo GH, Park HG, Ha YC, Park YH. Ultrasound guided prolotherapy with polydeoxyribonucleotide sodium in ischiofemoral impingement syndrome. Pain Pract. 2014; doi: 10.1111/papr 12215.
28. Safran M, Ryu J. Ischiofemoral impingement of the hip: a novel approach to treatment. Knee Surg Sports Traumatol Arthrosc. 2014;22:781–5.
29. Howse EA, Mannava S, Tamam C, Martin HD, Bredella MA,Stubbs AJ. Ischiofemoral space decompression through posterolateral approach: cutting block technique. Arthrosc Tech. 2014, doi: 10.1016/j.eats. 2014.08. 003.

**Correspondence Address / Yazışma Adresi**
Cüneyt Tamam
Tatvan Asker Hastanesi
Ortopedi Kliniği
Tatvan, Bitlis, Turkey
e-mail: ctamam@yahoo.com