# Ischiofemoral impingement
# An unusual cause of hip pain in women - a case series

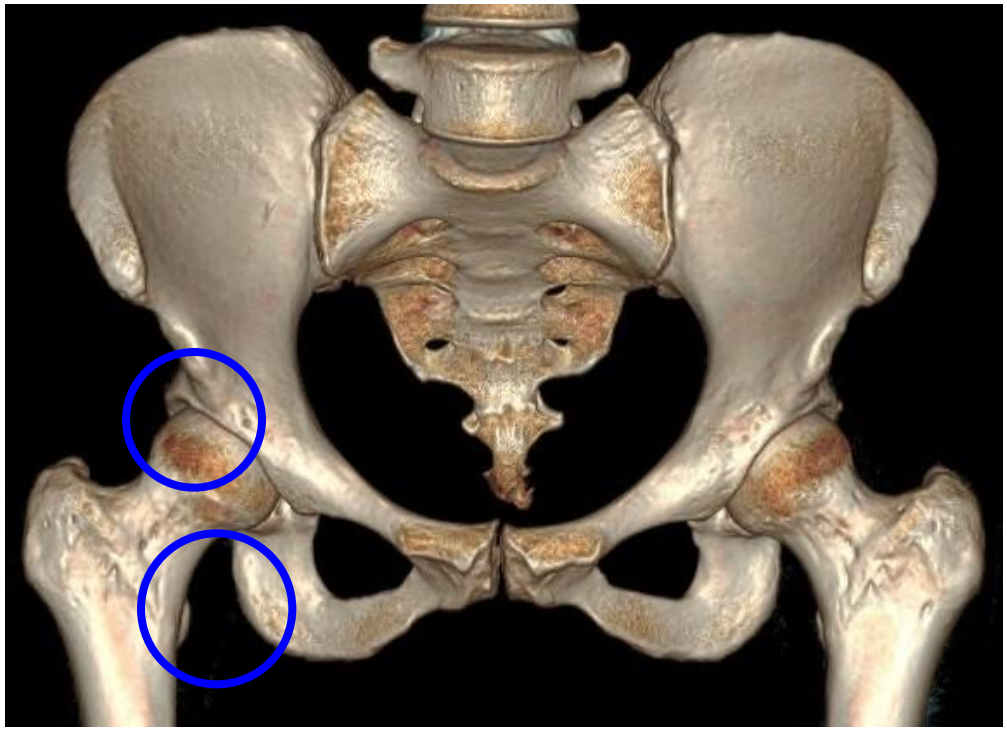
Moshirian Ghodduci K, Kichouh M, Antic M, Boulet C, Monabang Zoe C, De Maeseneer M, De Mey J

Universitair Ziekenhuis Brussel

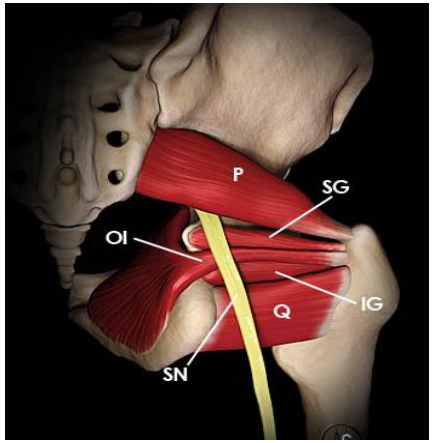
Vrije Universiteit Brussel

# Ischiofemoral Impingement

- The hip has 3 main bony sources for impingement
- Abnormal contact sites:
  - acetabulum vs femur(small ring)
  - ischium vs femur(big ring)

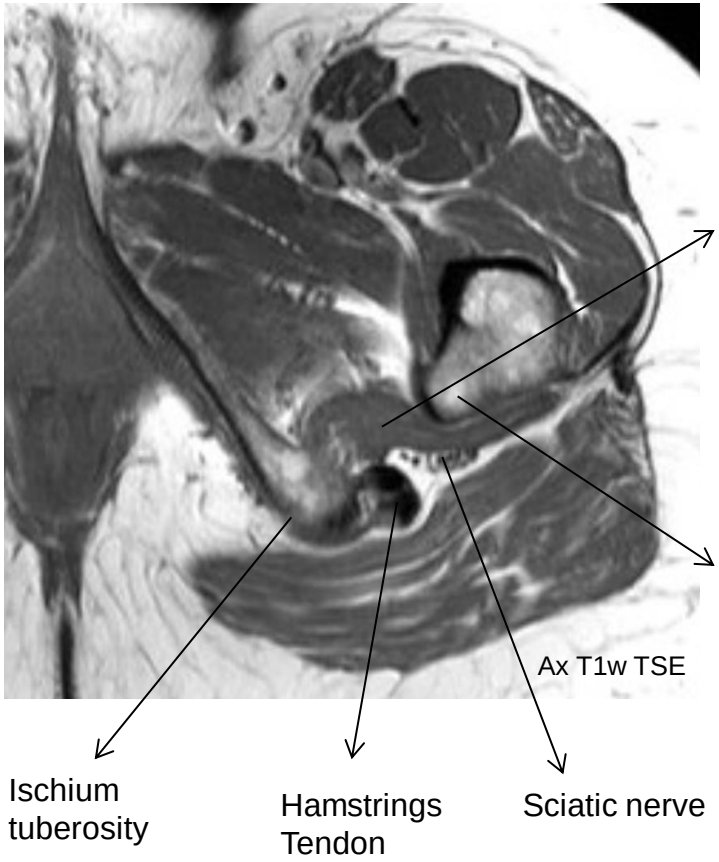


# Ischiofemoral impingement


Quadratus femoris muscle (QFM) is a flat muscle (Q) which has a orgin on the *Lateral margin of the obturator ring above ischial tuberosity and insertion on the Quadrate tubercle and adjacent bone of intertrochanteric crest of proximal posterior femur.*

IG: Inferior gemellus
OI: Obturator internius
SG: Superior gemellus
P: Piriformis
SN: Sciatic nerve.




http://www.radsource.us

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Ischiofemoral Impingement: Clinical presentation

- Non focal groin or buttock pain
- Ischialgia with radiation to the medial thigh
- Painful popping, difficult to localize
- Often diagnosed as “snapping iliopsoas”

*Stafford and Villar - J Bone Joint Surg Br 2011*

# Ischiofemoral impingement: study of literature

- **1977 Johnson** (J Bone Joint Surgery)
  - Intertrochanteric fracture
  - Surgery
  - Migration of the femoral head due to osteoarthritis

- **2008 Patti** (Skeletal Radiology)

- **2009 Torriani** (AJR)
  - 12 hips in 9 patients
  - 11 hips in 10 controls

- **2012 Tuson** (Skeletal Radiology)

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Literature: Torriani (AJR Am J Roentgenol.2009 Jul;193(1):186-90)

Torriani defined:

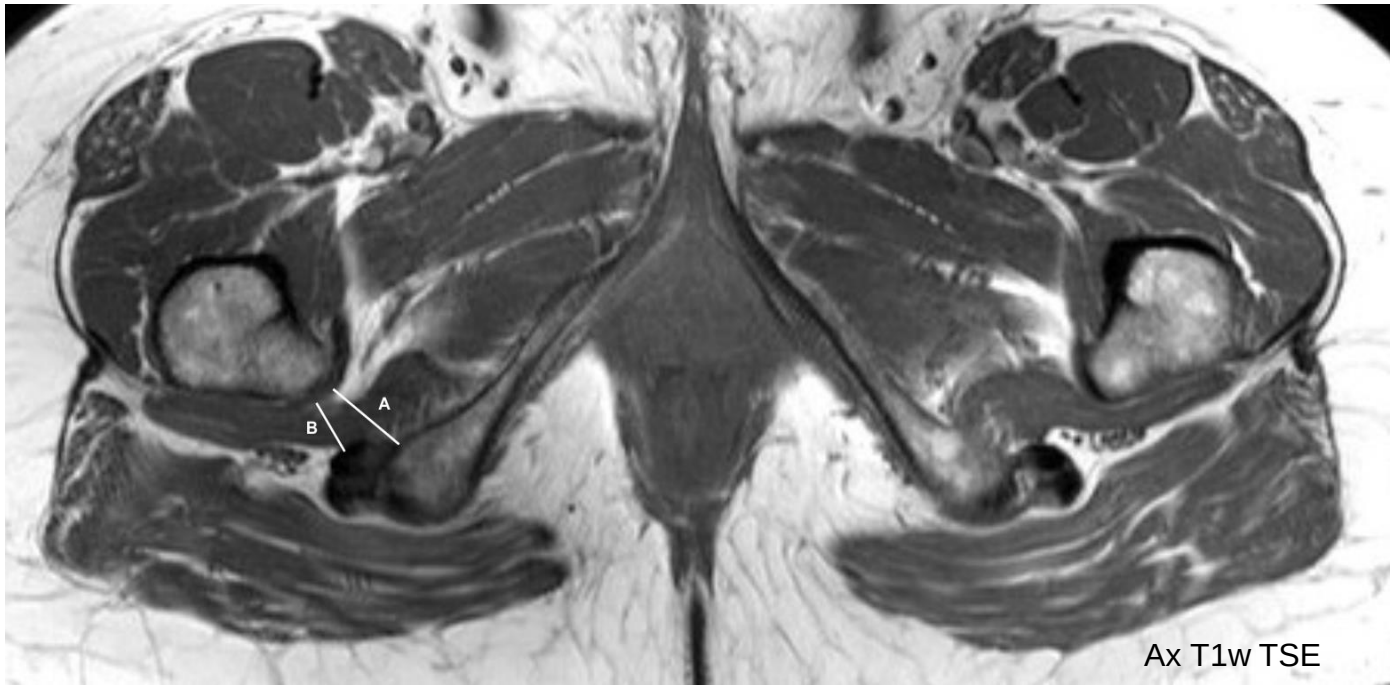
The ischiofemoral space (IFS) as a gap between the ischium tuberosity and the iliopsoas tendon or the lesser trochanter.

The quadratus femoris space (QFS) as the smallest gap between the superolateral surface of the hamstring tendons and the posteromedial surface of the iliopsoas tendon or the lesser trochanter.

He measured a cut off distance of 8 mm or more for the quadratus femoris space.

# Torriani (AJR 2009)

| Measurement | Affected Subjects (mm) | Control Subjects (mm) | P | Cutoff (mm)b | Sensitivity (%) | Specificity (%) |
|---|---|---|---|---|---|---|
| Ischiofemoral space | 13± 5 | 23 ± 8 | 0.002 | ≤ 17 | 83 | 82 |
| Quadratus femoris space | 7± 3 | 12 ± 4 | 0.002 | ≤ 8 | 83 | 82 |




A: Ischiofemoral space

B: quadratus femoris space

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Literature: Tosun (Skeletal Radiol. **2012** May;41(5):575-87 )

- Assessment of 1598 hips at 805 patients
- 50 patients with a total of 70 hips with **hip pain** and **QFM edema**
- Comparison with a control group of 30 normal volunteers (38 hips)
- QFM edema & fatty replacement were assessed visually by 2 independant musculoskeletal radiologist.
- IFS, QFS, Incl Angle*, HT Area** & TQFM Volume*** were measured

* Incl Angle: inclination angle is the angle between femoral neck and femoral shaft.

** HT Area: Hamstring tendon area.

*** TQFM Volume: Total Quadratus Femoris Muscle Volume.

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Average of mean measured values

| | Patients | controls |
|---|---|---|
| IFS | 12,9mm | 22,0mm |
| QFS | 6,7mm | 13,5mm |
| TQFMV | 18,64m³ | 24,80m³ |
| IA | 131,9° | 127,8° |
| HTA | 268,9m² | 240,0m² |

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Results

- Prevalence: 4,4%
- Bilateral involvement: 40%
- Female: 84%
- IFS, QFS and TQFMV significantly lower than controls
- HTA and IA significantly higher than controls

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

We present a cases series with different cause of Ishiofemoral impingement. The most frequent known causes are:

- History of surgery, fracture or arthrosis
- Gender: mostly female
- Congenital
- Hamstrings tendinopathy
- Positional
- Coxa valga

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

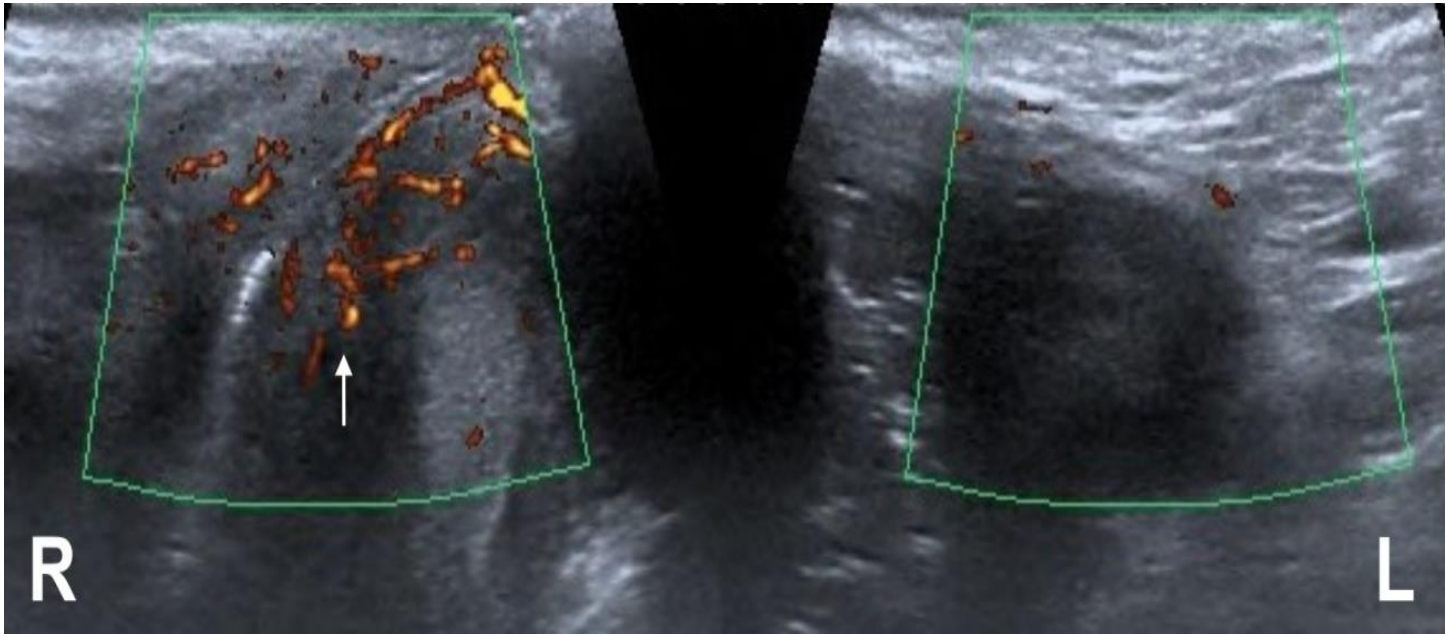
We present a cases series with different cause of Ishiofemoral impingement. The most frequent known causes are:

- History of surgery, fracture or arthrosis
- Gender: mostly female
- Congenital
- Hamstrings tendinopathy
- Positional
- Coxa valga

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Case 1:

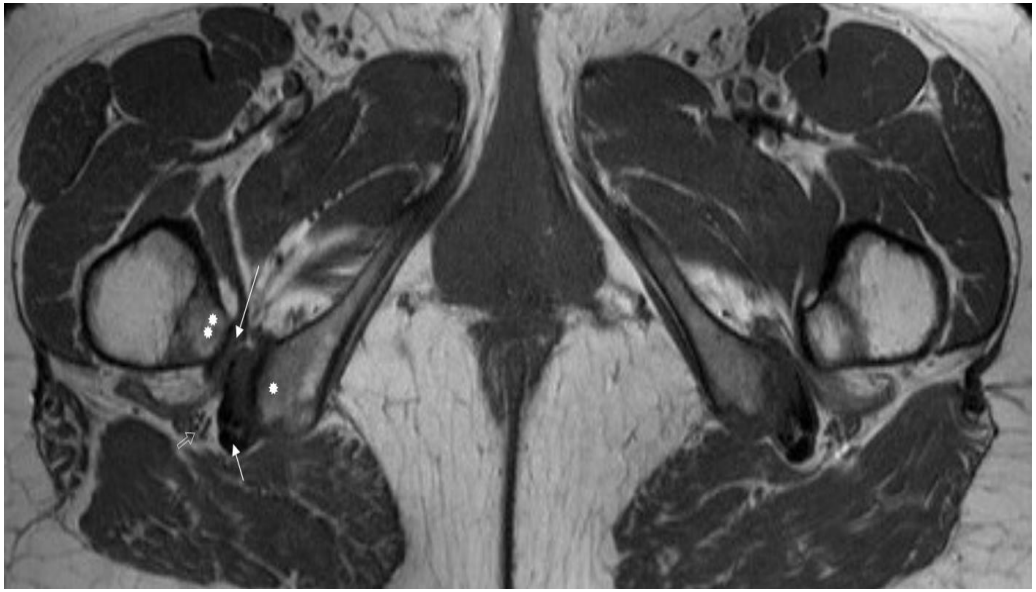
A 37-year-old woman prsented in our institution with chronic intermittent pain at the right medial thigh and the buttock associated with electric shocks radiating in the right knee

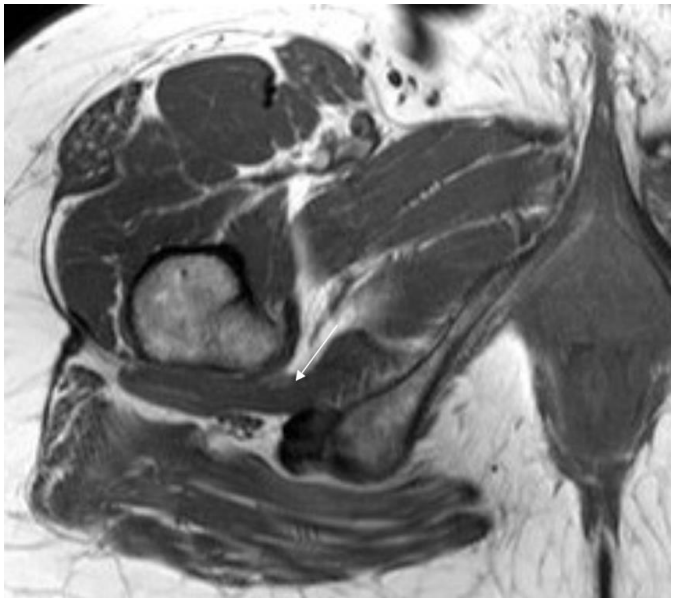



A performed ultrasound showed a signficant hyperhemia in the right ischiofemoral space

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Case 1: Correlated MRI





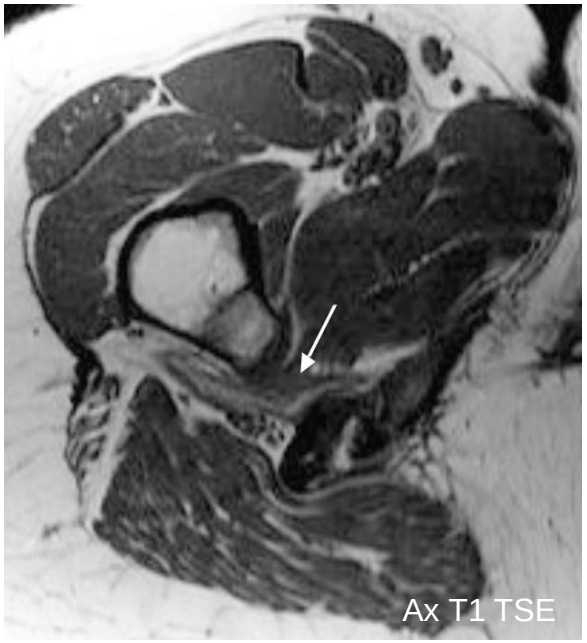
The correlated T1W TSE MRI showed a significant narrowing of the QFS (3mm) (white arrow).
Star: Ischium tuberosity , double stars: Lesser trochanter

Axial T1w TSE at a volunteer

# Case 1: Quadratus femoris space depending on the hip position


Neutral

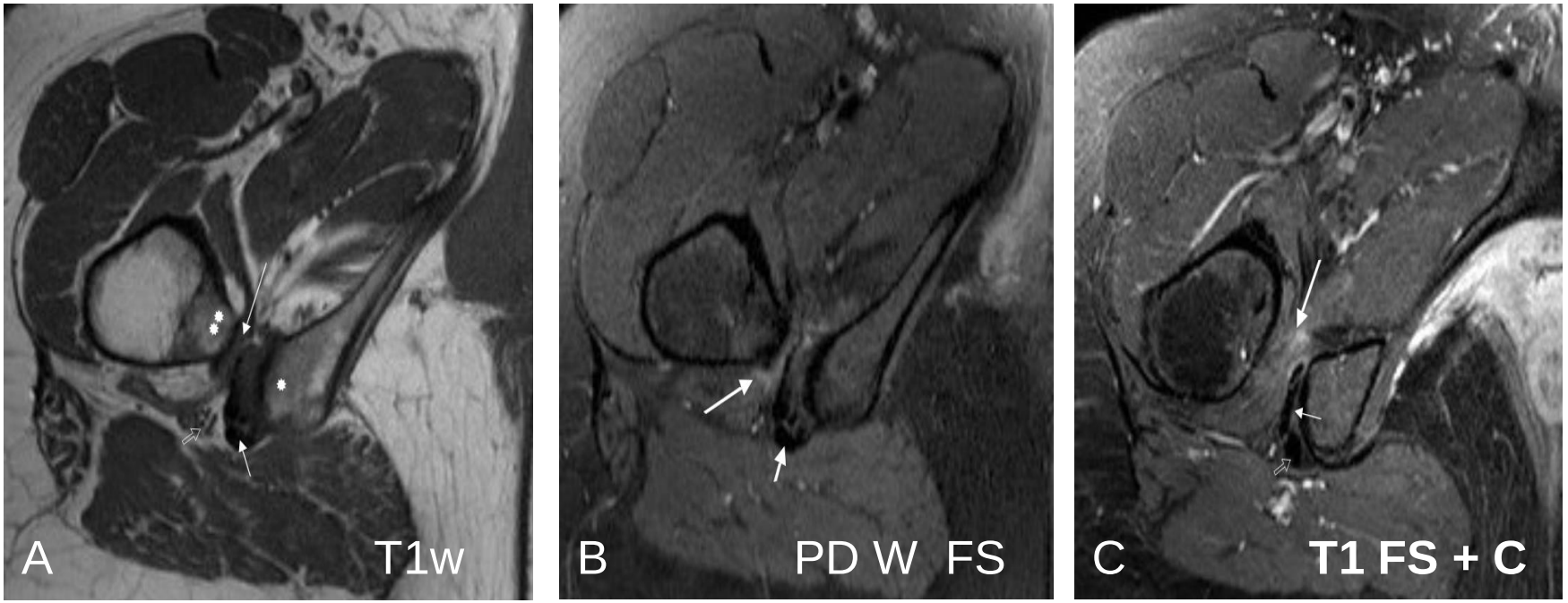

external rotation




internal rotation

Quadratus femoris space (long arrow)
Hamstring insertion (short arrow), sciatic nerve (open arrow),
ischial tuberosity ( star), lesser trochanter (double stars)

# Case 1: Correlated MRI

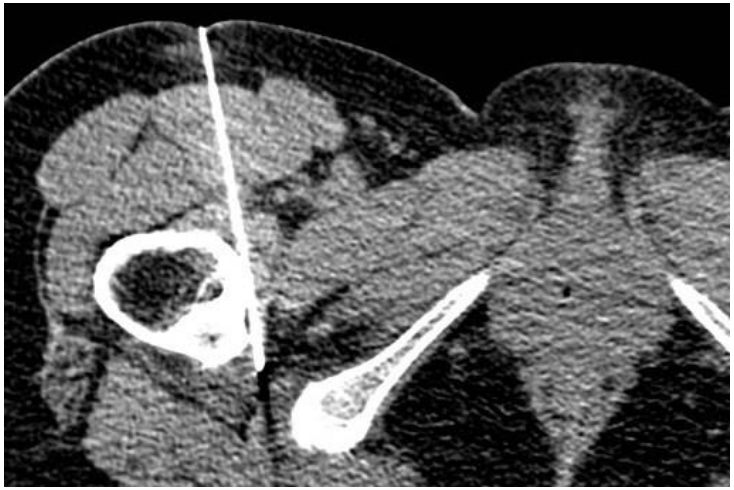



A: T1-w MRI shows narrowing of the QFS (long arrow).
Hamstring insertion (short arrow), sciatic nerve (open arrow), ischial tuberosity ( star), lesser trochanter (double stars).

B: PD-w FS MRI shows diffuse edema within the right QFMis (long arrow). Slight edema within the hamstring insertion (short arrow).

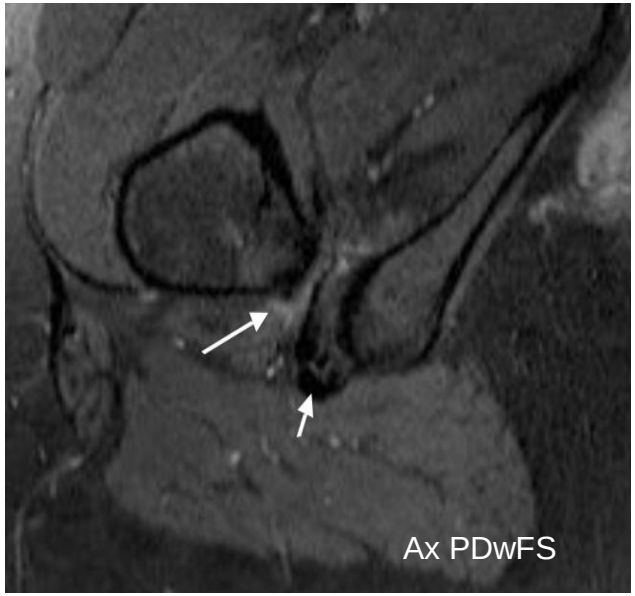
C: T1w FS MRI post gadolinium shows some diffuse enhancement within the right QFM (long arrow).
Short arrow : Semimembranosus insertion
Open arrow : Long head of the biceps femoris and semitendinosous tendon

# Case 1: diagnosis & treatment

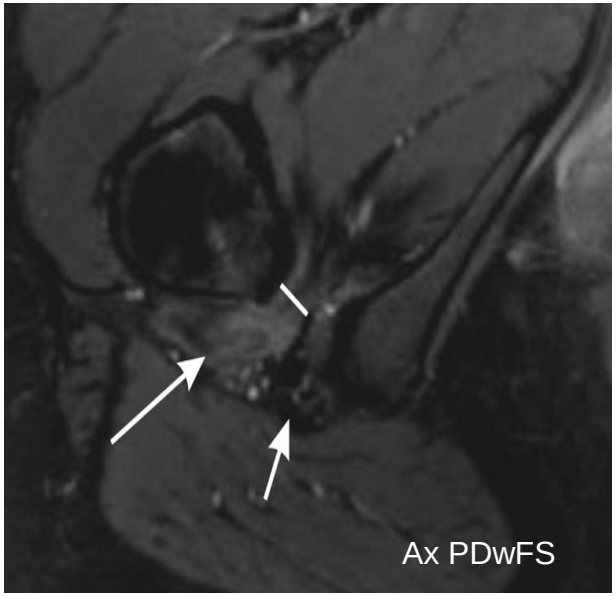


To confirm the diagnosis (and to treat) the ischiofemoral impingement, a mixture of 8 ml of lidocaïne (1%) and 40 mg of methylprednisolon were injected into the ischiofemoral space under CT scan control with a 18G spinal needle. With the hip in external rotation the needle was inserted anteriorly in the proximal thigh just below the inguinal ligament and laterally from the neurovascular femoral bundle. This anterior approach was preferred to a lateral or posterior approach that carries more risks of damaging the sciatic nerve. After the injection, the pain disappeared immediately even when the hip was moved into maximal external rotational and extension, confirming the diagnosis.

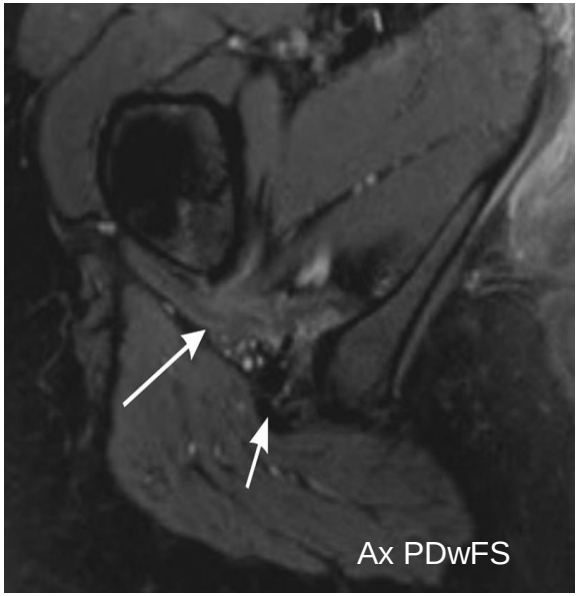
# Case 1: Follow up MRI after corticosteroid injection




Pre treatment




Post treatment




+ internal rotation

Follow up MRI performed after local injection of a mixture of lidocaïne and corticosteroïd showing a decrease of edema in the QFM and Hamstring insertion and increase of QFS.

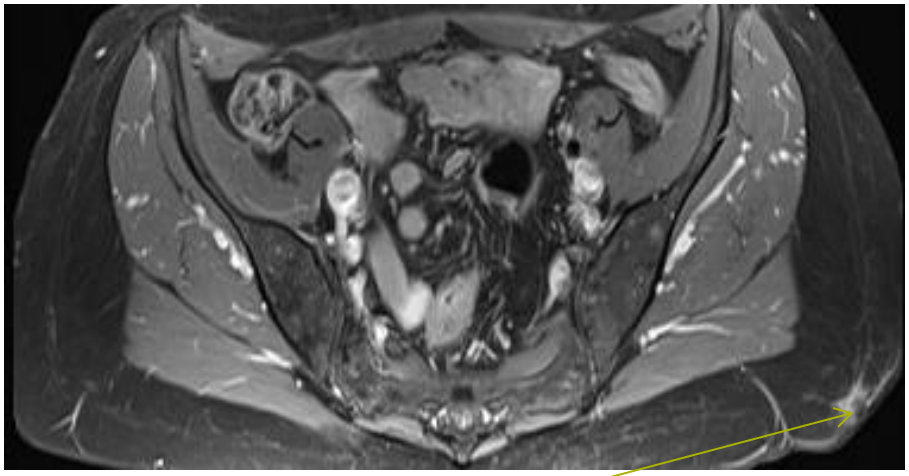
# Etiology

- History of surgery, fracture or arthrosis
- Gender
- Congenital
- Hamstrings tendinopathy ⟸
- Positional and overuse
- Coxa valga

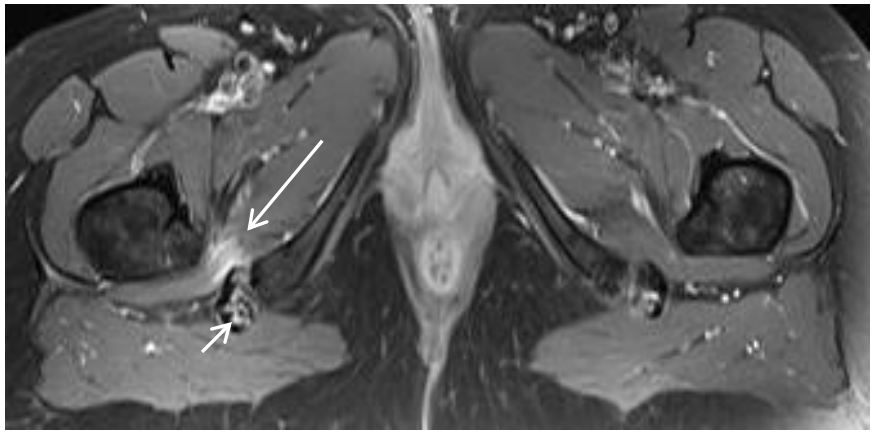
Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Case 2:

The hamstring tendons thickening in frame of teninopathy is a frequent cause of IFS narrowing.
A 24-year-old woman was bitten by a dog on her left tight 4 months earlier. She required surgery because of fat necrosis and infection. 4 months later she developed thigh pain especially on the right side. The performed MRI showed right hamstring tendinopathy with narrowing of QFS and edema within the quadratus femoris muscle. It could be caused by dynamic changes and overuse of the right hip. Note a slight tendinopathie of the left hamstring tendon without significant edema in the QFM.



Axial T1w FS showing a surgical scar after debridement of fat necrosis and infection on the left side



T1w FS post gadolinium showed hamstring tendinopathy on the right side with thickening of the tendon origin (short arrow) associated with contrast enhancement in the QFM and narrowing of the QFS (long arrow).

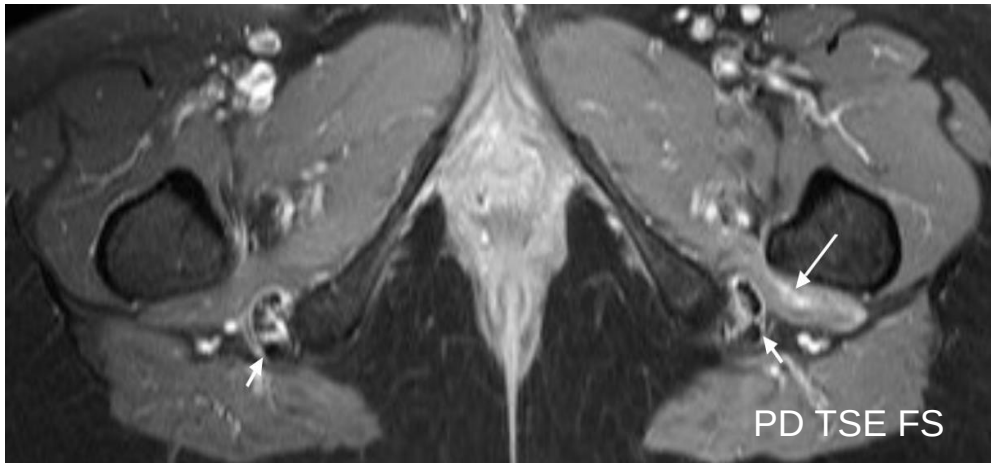
Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Case 3:

A 55-year- old woman with symmetric lower back pain and medial thigh pain. She had no previous significant medical history, but she was positive for Human Leukocyte Antigen (HLA) B27, suggesting Ankylosing Spondylitis. A performed MRI showed discrete bilateral sacroileitis, explaining the lower back pain. However, it also showed bilateral hamstring tendinopathy with thickening of the tendons and with narrowing of the QFS (6 mm).

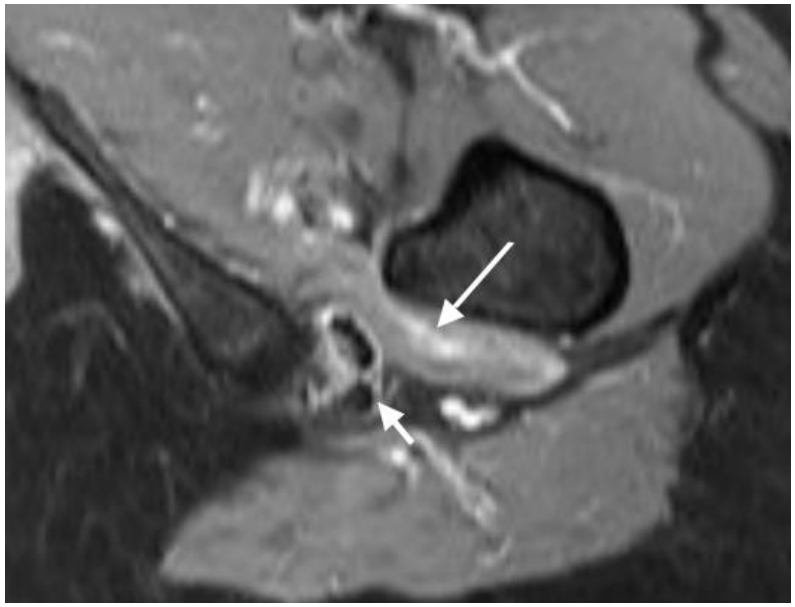
Note the edema within the quadratus femoris muscle on the PD-weighted fat suppression images.

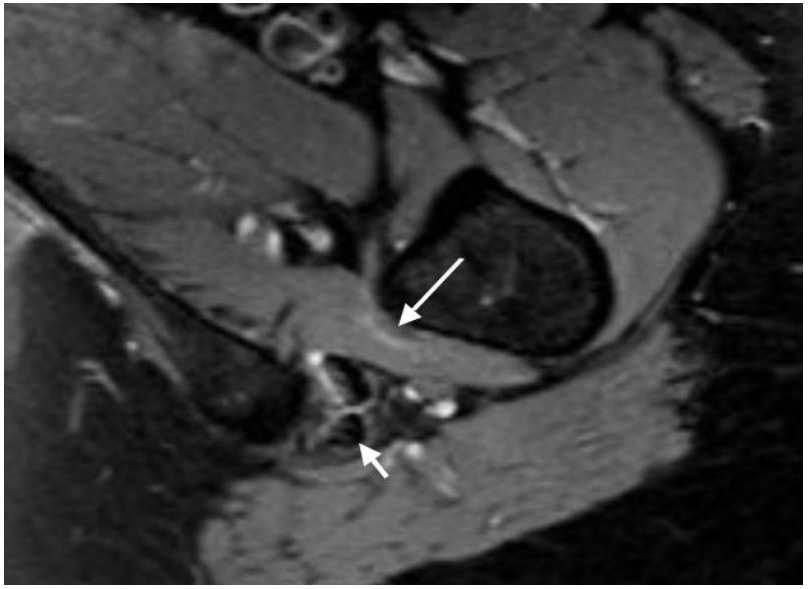



Short arrow: Bilateral Hamstring tendinopathy
Long arrow: Edema within Quadratus femoris muscle

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Case 3





The patient showed clinical improvement after three weeks treatment with oral NSAID's. Follow up MRI was performed demonstrating reduced Hamstring tendinopathy, an increase of the quadratus femoris space (13mm) and reduced edema in the quadratus femoris muscle.

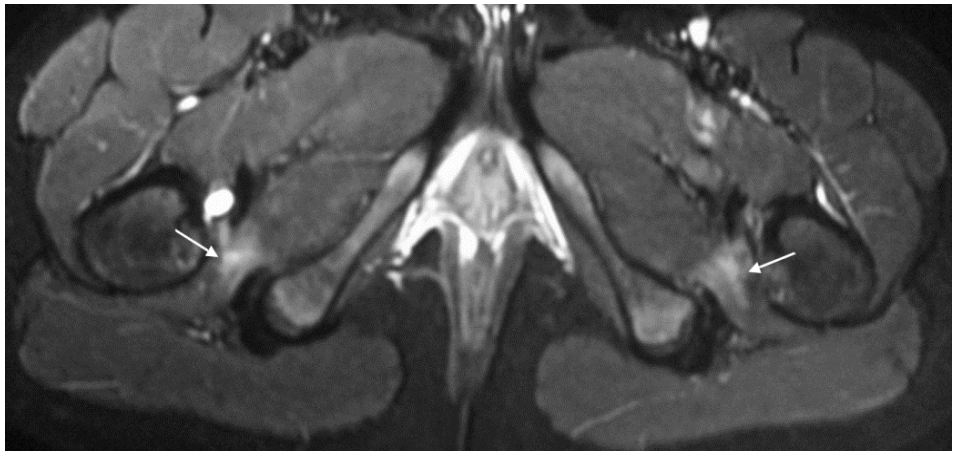
# Etiology

- History of surgery, fracture or arthrosis
- Gender
- Congenital
- Hamstrings tendinopathy
- Positional ⟸
- Coxa valga

Universitair Ziekenhuis Brussel
Vrije Universiteit Brussel

# Case 4:

A 17- year-old ballerina training intensively with her feet in extreme external rotation. No significant medical history. An MRI performed in neutral position showed bilateral diffuse edema within the quadratus femoris muscle. The quadratus femoris space was within normal limits in neutral position (14mm). The patient was not available for a follow up MRI with the legs in external rotation. However, as shown in the first two cases, the QFS is generally the narrowest in neutral and external rotation of the hip joint. In this patient, we suspect a positional QFS narrowing due to intensive training with the feet in extreme external rotation as the main cause of bilateral edema within the QFM.



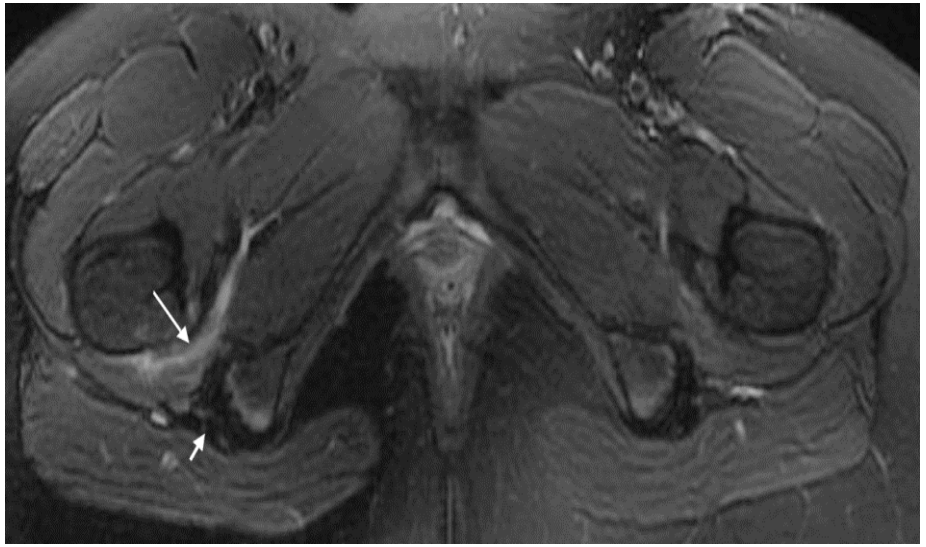
Axial PDW FS MRI performed in neutral position showed bilateral edema within the quadratus femoris (arrow) .

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Case 5:

A 14-year-old girl who had a bicycle accident with a wound on the left leg. Four months later she still complained of pain in her left leg during physical activities which included Zumba dancing. The right side was asymptomatic. Although she had meniscotomy of the right knee a few years earlier. A performed MRI of the pelvis showed a QFS of 6 mm on the right side and 8 mm on the left side. It also showed obvious edema in the right QFM and to lesser extend in the left QFM although the patient was completely asymptomatic on the right side. This case demonstrates that edema in the QFM is not always a cause of the pain.



PDW TSE FS MRI showed obvious edema in the QFM (long arrow) on the right side and a slight edema in QFM on the left side.

# Discussion

The quadratus femoris is a flat muscle arising from the lateral border of the ischial tuberosity and inserting into the quadrate tubercle and linea quadrata of the proximal femur: it is therefore at risk of impingement if the ischiofemoral space is narrowed.

Increased signal on MRI T2-weighted sequences within the quadratus femoris has been usually attributed to a muscular tear (4); the concept of ischiofemoral impingement was conceived as edema-like signal may occur without demonstrable fiber disruption (5).
Other tendons that could be involvement during ischiofemoral impingement include the iliopsoas insertion on the lesser tuberosity and the proximal hamstring tendons on the ischium. Alternative etiologies or interpretations of imaging findings include abnormalities of the ischium related to enthesopathy, overuse syndromes and abnormal MRI signal of quadratus femoris muscle from muscle strain and tear (3).

The cause of narrowing of the ischiofemoral space is often unclear. However, intertrochanteric fractures with involvement of the lesser trochanter, valgus osteotomies in the intertrochanteric region and osteoarthritis leading to superior and medial migration of the proximal femur have been described (2). On the other hand, entesopathy of the proximal hamstring insertion may be a potential mechanism for narrowing of the quadratus femoris space in the absence of any bony abnormality (1), as we showed in our second patient.

In the absence of any acquired bony abnormality, ischiofemoral narrowing may be congenital or positional. In our first patient, the abnormal relationship between the lesser trochanter and the ischium was likely congenital. In our ballet dancers, overuse of the quadratus femoris muscles in extreem external rotation of the hip could be the reason for the bilateral edema within the quadratus femoris muscle. This is a typical example of positional quadratus femoris space narrowing.

Irritation of the adjacent sciatic nerve may cause sciatica and can be confused with a low back problem.

All our cases occurred in women and this is in agreement with the literature (1) and could be explained by the morphology of the female pelvis which is wider and shallow with a more prominent lesser trochanter resulting in smaller ischiofemoral spaces, thereby giving less tolerance for further narrowing.

# Treatment of Ischiofemoral Impingement

- Optimum Strategy is unclear
- To modify activity + NSAID

  Active rest & to avoid provoking activities
- Injections: diagnostic & therapeutic (?)

  successful in 3 cases (Torriani 2009 and our series)
- To widen ischiofemoral space & resect lesser trochanter

  successful in 4 cases

  (Johnson 1977 & Ali 2011)

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

# Conclusion

- Ischiofemoral impingement could be the source of groin or posterior thigh pain/ ischialgia in women
- Congenital or acquired narrowing of the IFS could lead to Fatty atrophy of the QFM
- Not all patients with IF Impingement have narrowing of the IFS
- Not all IF space narrowing or QFM edema are symptomatic
- In doubt, the diagnosis could be confirmed by local infiltration

# MCQ 1

The quadratus femoris space is definitely narrowed if it mesures:

A. < 8mm

B. < 10mm

C. < 12mm

# MCQ 2

Which plane is the best to assess the ishiofemoral space on MRI

A. Coronal plane

B. Axial plane

C. Sagittal plane

# MCQ 3

The symptoms of ischiofemoral impingement can mimic ischialgia

A. True

B. False

# Correct answers to MCQ

1. A
2. B
3. A

# 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. Am J Roentgenol. 2009;193:186–90.
- 2. 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.
- 3. 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.
- 4. O'Brien SD, Bui-Mansfield LT. MRI of quadratus femoris muscle tear: another cause of hip pain. Am J Roentgenol. 2007;189:1185–9.
- 5. Kassarjian A. Signal abnormalities in the quadratus femoris muscle: tear or impingement? Am J Roentgenol. 2008;190:W379
- 6. Ali AM, Whitwell D, Ostlere SJ. Case report: imaging and surgical treatment of a snapping hip due to ischiofemoral impingement. Skeletal Radiol. 2011
- 7. Ozgur Tosun et al, Ischiofemoral impingement: evaluation with new MRI parameters and assessment of their reliability. Skeletal Radiol. 2012


Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel

Universitair Ziekenhuis Brussel

Vrije Universiteit Brussel