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# Fatigue Fracture of the Femur Neck: A Case Report and Literature Review

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**Abstract** **Case Report**

Fatigue fractures are fractures that occur on a healthy bone following a rather intense and unusual activity. The diagnosis is based on anamnestic data (no notion of trauma), clinical data (especially pain, with poor clinical examination in general), and radiological data (the standard radiography allows in general to make the diagnosis, however, the use of other additional examinations such as ultrasound, MRI or scintigraphy may be necessary. The treatment of fatigue fractures is mainly functional and medical, but some cases require surgical treatment. The evolution of these fractures is generally satisfactory; however, complications are not uncommon, which can compromise the functional prognosis.

**Keywords:** Fatigue fractures, stress fractures, fractures of the neck of the femur, sportsmen fractures.



## INTRODUCTION

Fatigue fractures (also known as stress fractures) are due to a failure to adapt the bone to a functional overload. They are the result of a localized change in the bone structure, caused by repeated sub-maximal mechanical stresses (intensity below conventional fracture threshold) on a bone with normal elastic resistance (without obvious trauma) [1-4] . They differ from bone insufficiency fractures, which are linked to normal stresses on a bone with altered mechanical properties [1]. They are more frequent in the lower limbs, but they can affect all bones (Figure 1). Pain occurs exclusively during sports and disappear at rest. However, they progressively become permanent and can cause real fractures.

| Localisation | | Total pourcentage |
|---|---|---|
| Pelvis | | 1,6 |
| Femur : | Proximal | 29,8 |
| | Medium | |
| | Distal | |
| | Medial condyle | |
| Tibia : | plateau proximal | 56 |
| | Medium | |
| | Distal | |
| Tarsus - Metatarsus | | 8,7 |

**Fig-1: Distribution of stress fractures**

## OBSERVATION

A 58 year old housewife, followed in cardiology for valvular heart disease and hypertension under treatment, relating the concept of lifting heavy objects and looking after her paraplegic husband; she would lift him and move him several times a day. The patient reported muscle contracture type pain, on the inner side of the root of the right thigh that started 40 days prior to her admission, without notion of trauma. This pain forced her to use a small cane to help her move. The day before her admission, she stumbled

without falling, which caused her total functional impairment of the right lower limb, with exacerbation of pain.

The clinical examination revealed that the patient was stable on both hemodynamic and respiratory levels, moderately obese (body mass index BMI = 31.25kg/m-2), with no deformation of the right lower limb, no bruising or cutaneous opening, but with excruciating pain on palpation of the root of the right thigh and any attempt to mobilize the lower right limb. The patient had an X-ray of the right hip which denoted a unicortical, transcervical fracture of the right femoral neck (Figure 2).

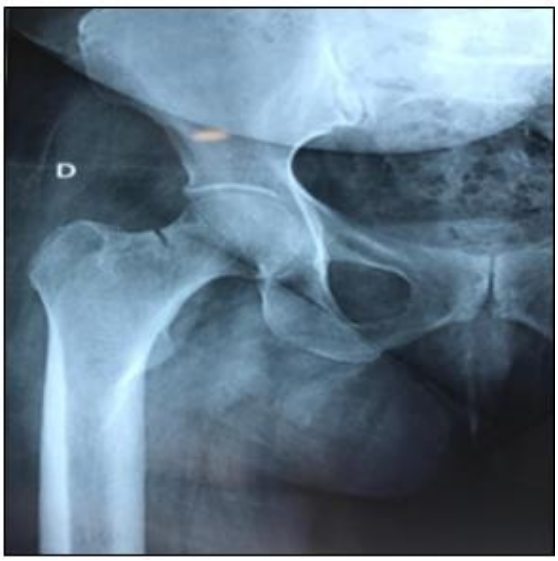


**Fig-2: X-ray of right hip: right femoral neck fracture**

After a preoperative check-up and therapeutic adjustment of the patient's defects, she was admitted to the operating room for fixation of the femoral neck with screws, wich was realized according to the following operative times:

- Spinal anesthesia, then orthopedic table installation, without traction.
- Swabbing and putting a sterile field in place.
- Small incision (3cm) in front of the right greater trochanter.
- Scopic guidance then introduction of two guiding and stabilizing pins.
- Wicking and setting up two screws (5.5mm/90mm+85mm) with washers.
- Closure and sterile dressing.

The postoperative course was uneventful. A post-operative x-ray was performed in order to check the proper positioning of the osteosynthesis material (figure 3).

**Fig-3: Radiography of the pelvis: osteosynthesis of the femur neck using 2 cervical screws**

Bandages were changed every second day. The stitches were removed the second week after the operation. The patient immediately resumed her previous treatment, as well as oral analgesics. Anticoagulants were prescribed for a period of 01 month. Post-operative rehabilitation began the day after the intervention in the form of passive and then active knee and ankle mobilization. The partial support period was 45 days.

The evolution was good and without complications, with consolidation and resumption of normal walking after 3 months.

## DISCUSSION

Fatigue fractures are injuries that occur as a result of repetitive and cyclical micro traumas on a healthy bone without major trauma, not to be confused with fractures that occur on a damaged bone (tumor, infection). These micro traumas cause bone changes and remodeling.

Fatigue fractures are significantly more common in the lower limbs. They are on the rise because of the increase in sports, which make them common among athletes, military recruits and young people who are starting to have an intense and regular physical activity (whereas this was not the case previously).

They may be favored by certain anatomical factors like an unequal length of the lower limbs [2, 3, 12, 13] or static foot disorders [2, 12].

Fatigue fractures occur when stresses continue; resulting in bone changes with bone remodeling which is therefore surpassed [5, 6, 7]. This explains the existence of a delay between the onset of unusual mechanical stresses and the occurrence of evocative clinical symptomatology (five weeks on average in the study of Comas et al.) [8]. This period must be taken into account in the diagnostic guidance, since pain is the master symptom regardless of the location. It is a progressive onset pain most of the time, purely

mechanical, which comes at effort, and disappears at rest, little intense at first, then gradually increases, causing the intensity of the activity to decrease until shutdown. Very often, the patient has pain-related lameness. The interrogation confirms the absence of a macro-traumatic cause and must seek out the existence of contributing factors such as the modification of training, of the running surface, of the type of shoe, or the intensification of training for a few weeks in a more or less athletic person [1, 3, 6, 8, 9, 10].

At palpation, pain can be discernable in some locations. In the palpable areas, we can denote exquisite pain, sometimes a slight swelling, even a small hematoma, or pain when contracting the muscles around the fracture site.
Some clinical testings were described:

- Fulcrum test for femur (figure 4 on the left) [2, 8, 10, 11]
- The Faber test for the hip (figure 4 on the right) [2]
- The hop test : exquisite pain caused by jumping on the suspected leg (Figure5)
- The tuning fork test : localized pain induced by the application of a tuning fork on the suspect area (Figure 6)

X-rays are performed with at least two perpendicular incidences, even oblique or comparative images to better visualize the first signs. The radiographic aspects will depend on the delay, the topography, the type of bone (cortical or cancellous), and on how early the resting is. Radiography may be normal, as it may show a crack, or the appearance of periosteal apposition on either side of the fracture site, or sclerotic lesion of the bone.

Ultrasound seems to be interesting for superficial bones (metatarsals), especially in the early phase when X-rays are still normal. Signs may be direct or indirect [1, 6]:

- Solution of continuity or irregularity of the cortical bone with hyperechoic thickening.
- Anechoic range indicating the presence of a subperiosteal collection.
- Thickening of the soft parts in contact with the cortical bone with a doppler signal reflecting a hypervascularization.

Bone scintigraphy reveals clinically silent lesions in their pre-fracture stage [1, 6]. However, it lacks specificity (33%) [2]. Magnetic resonance imaging can also detect subclinical lesions which correspond to hyperstressed areas, possibly in the pre-fracture stage [Figure 7-8].

**Fig-4: Fulcrum and Faber tests**

**Fig-5: Hop test**

**Fig-6: Tuning fork test**

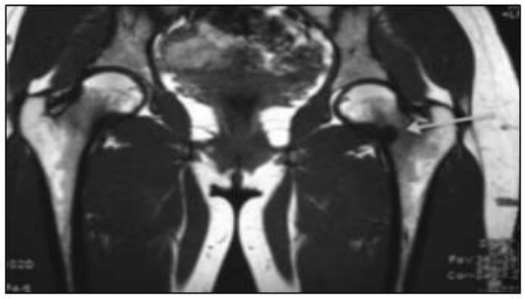

**Fig-7: MRI T1 coronal slices showing a hyposignal area at the level of the left femur neck, corresponding to the fatigue fracture**

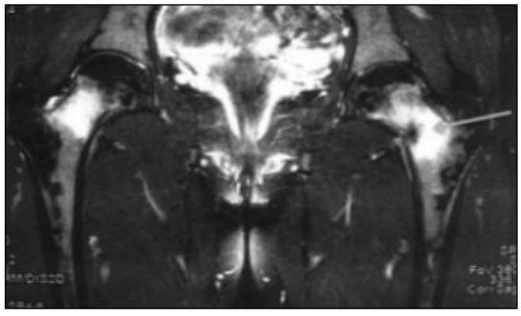

**Fig-8: MRI T2 coronal slice with fat signal saturation showing a hyposignal corresponding to the left femoral neck fracture line in the middle of a hypersignal area related to a bone marrow edema. Please note the presence of contralateral edema due to a lesser gravity fracture.**

Differential diagnosis include: tibial periostalgia, also referred to as medial tibial stress syndrome; tendinopathies and enthesopathies, particularly at the inguinal region; Compartment syndrome; vessel or nerve entrapment syndrome; and more rarely, osteoid osteoma and bone tumors (Ewing's sarcoma type).

Complications of fatigue fractures occur during the continuation of physical activity despite the pain [1], in the form of a complete fracture with secondary displacement, a delay in consolidation, pseudarthrosis for long bones, osteonecrosis complicating a subchondral stress fracture, or a recurrence that is linked to a too rapid resumption of activities [1], possibly related to uncorrected contributing factors.

The treatment is most often functional, and based mainly on analgesics and relative rest with cessation of the physical activity involved and removal of mechanical stresses. A surgical opinion is required for high risk fractures, especially when a secondary displacement or pseudarthrosis are feared. Indeed, a surgical treatment can be proposed from the outset in the event of a displaced fracture, or sometimes in a second step in case of a consolidation delay, or a secondary displacement, or after failure of a well-conducted functional treatment [2, 7, 13]. The period of time needed to resume activities depends on the type and location of the fracture, the degree of severity, the type of activity to be resumed (normal or sporting), and finally, depending on the disappearance of pain [7, 10, 12, 14, 15].

## CONCLUSION

In terms of fatigue fracture, prevention remains a strong point, via avoiding unusual intense activities, and as for athletes it is necessary to gradually and slowly increase the practice of physical exercise, without neglecting warm-up before playing sports, stretching properly after the training session, and using equipment which is adapted to the expected effort.

## REFERENCE


1. Bousson, V., Wybier, M., Petrover, D., Parlier, C., Chicheportiche, V., Hamzé, B., ... & Laredo, J. D. (2011). Les fractures de contrainte. *Journal de radiologie*, *92*(3), 188-207.
2. Behrens, S. B., Deren, M. E., Matson, A., Fadale, P. D., & Monchik, K. O. (2013). Stress fractures of the pelvis and legs in athletes: a review. *Sports health*, *5*(2), 165-174.
3. Prouteau, S., Benhamou, C. L., & Courteix, D. (2005). La fracture de fatigue: facteurs de risque et perspectives d'identification. *Science & sports*, *20*(2), 59-64.
4. Brukner, P., Bradshaw, C., Khan, K. M., White, S., & Crossley, K. (1996). Stress fractures: a review of 180 cases. *Clinical Journal of Sport Medicine*, *6*, 85-89.
5. Gervaise, A., Naulet, P., Pernin, M., Darbois, H., & Girodeau, A. (2008). Intérêt de l'imagerie dans le diagnostic des fractures de fatigue du militaire. *Médecine et armées*, *36*(4), 353-358.
6. Boyer, B., Bellaiche, R., Geffroy, Y., Potet, J., & Lechevalier, D. (2005). Fractures de contraintes Fractures de fatigue Fractures par insuffisance osseuse. *EMC-Radiologie*, *2*(5), 527-544.
7. Dauty, M., & Dubois, C. (2004, August). Fracture de fatigue chez le sportif et prise en charge intensive de rééducation. In *Annales de réadaptation et de médecine physique* (Vol. 47, No. 6, pp. 365-373). Elsevier Masson.
8. Comas, J. M., Anne, D., Charrot, F., Telmon, N., Benazet, J. F., Ribot, C., ... & Bernard, J. (1992). Ostéodensitométrie corps entier: étude de la composition corporelle de jeunes recrues souffrant de douleur osseuse et de fracture de fatigue. *Médecine et armées*, *20*(7), 603-607.
9. Patel, D. S., Roth, M., & Kapil, N. (2011). Stress fractures: diagnosis, treatment, and prevention. *American family physician*, *83*(1), 39-46.
10. Chen, Y. T., Tenforde, A. S., & Fredericson, M. (2013). Update on stress fractures in female athletes: epidemiology, treatment, and prevention. *Current reviews in musculoskeletal medicine*, *6*(2), 173-181.
11. Ivkovic, A., Bojanic, I., & Pecina, M. (2006). Stress fractures of the femoral shaft in athletes: a new treatment algorithm. *British journal of sports medicine*, *40*(6), 518-520.
12. Kahanov, L., Eberman, L. E., Games, K. E., & Wasik, M. (2015). Diagnosis, treatment, and rehabilitation of stress fractures in the lower extremity in runners. *Open access journal of sports medicine*, *6*, 87.
13. Murray, S. R., Reeder, M. T., Udermann, B. E., & Pettitt, R. W. (2006). High-risk stress fractures. *Comprehensive therapy*, *32*(1), 20-25.
14. Dobrindt, O., Hoffmeyer, B., Ruf, J., Seidensticker, M., Steffen, I. G., Fischbach, F., ... & Amthauer, H. (2012). Estimation of return-to-sports-time for athletes with stress fracture–an approach combining risk level of fracture site with severity based on imaging. *BMC musculoskeletal disorders*, *13*(1), 1-7.
15. Arendt, E., Agel, J., Heikes, C., & Griffiths, H. (2003). Stress injuries to bone in college athletes: a retrospective review of experience at a single institution. *The American journal of sports medicine*, *31*(6), 959-968.