



Bilateral Femoral Neck Stress Fractures in a Female Athlete Triad: Treated by PCCP and Cannulated Screws

Mohamed Elamin^{1,2*}; Amgad Fadlseed¹; Lyndon Low²; Paul O'Grady¹; Osman Yagoub¹; Bridget Hughes¹

¹Orthopaedic department, Mayo University Hospital, Co. Mayo, Ireland.

²Orthopaedic department, Galway University Hospital, Co. Galway, Ireland.

***Corresponding Author(s): Mohamed Elamin**

Orthopaedics department, Galway University Hospitals,
Newcastle Rd. Co. Glaway, Ireland.

Tel: +353-894121257; Email: mhmdalialtb@gmail.com

Abstract

Introduction: Stress fractures are common in athletes, accounting for 1-20% of all sports injuries attending sport clinics. Literature has reported few cases of femoral neck stress fractures (FNSF) which represent only 10% of all stress fractures.

If mis-diagnosed, FNSF carries serious complications such as fracture displacement, femoral head necrosis, and chronic disabilities to the athlete, moreover, around half of all athletes with these very rare injuries fail to rejoin sport activities.

Case report: We present an 18-year female amateur cyclist who failed conservative management for bilateral femoral neck fracture and had fixation for both neck of femora. A diagnosis of female athletic triad was made on the basis of amenorrhea, inadequate dietary intake, and stress fractures of both femoral necks.

Six months following surgery the patient was mobilizing without pain, her menses normalised and she remained asymptomatic 2 years post hip surgery.

Conclusion: This case report highlights the importance of knowing the risk factors of stress fractures in young athletes, namely FNSF. While a high index of suspicion needs to be maintained especially in younger patients with chronic hip pain, female athletes present an additional challenge with the possibility of female athlete triad.

To prevent poor outcomes following FNSF, any young athlete with non-resolving groin pain should be referred for a hip X-Ray. If symptoms do not resolve with conservative management, a prompt MRI assessment is warranted. All Medical staff, family physicians and athlete coaches, should be made aware of this rare but serious condition.

Received: Jan 06, 2022

Accepted: Jul 06, 2022

Published Online: Jul 08, 2022

Journal: Journal of Case Reports and Medical Images

Publisher: MedDocs Publishers LLC

Online edition: <http://meddocsonline.org/>

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Introduction

Stress fractures are common in athletes, accounting for 1-20% of all sports injuries attending sport clinics [1]. Literature has reported few cases of femoral neck stress fracture (FNSF) which represent only 10% of all stress fractures [1,2].

Stress fractures have been attributed to many factors including: vit. D deficiency, metabolic disease, renal osteodystrophy and Female Athlete Triad (FAT) [2]. FNSF have been reported in athletes of the second to fifth decade of life with increased risk among female athletes. The abnormal physiological changes that occur in female athlete triad is the theory behind increased incidence in young female athletes [3]. Moreover, a sharp increase of exercise after period of rest is associated with a higher chance of developing FNSF [4].

Most of athletic FNSFs are considered fatigue fractures secondary to the repetitive loads on a normal bone. However, because of the abnormal bone density in female athlete triad, these stress fracture could be regarded as insufficiency stress fracture [5,6].

The most frequently used classification for FNSF is based on Xray and/or bone scans (Fullerton & Snowdy) in which FNSF has three types: Type I fracture at the tension side, type II fracture at the compression side and type III complete displaced fracture [7]. In addition, Arendt & Griffith developed a grading system based on different MRI-weighted images to predict the outcome [8].

If mis-diagnosed, FNSF carries serious complications such as fracture displacement, femoral head necrosis, and chronic disabilities to the athlete, moreover, around half of all athletes with these very rare injuries fail to rejoin sport activities [9].

Case report

An 18-year female amateur cyclist attended her family doctor for atraumatic left hip pain. Her pain has been present for a few months before seeking medical advice. Later on, her hip pain became progressively daily, at night time, not relieved by NSAIDs. She used to cycle (20-30 kilometers twice weekly) and she developed secondary amenorrhea for the last 2 years before presentation to emergency department.

The patient was advised to rest, take NSAIDs, and was referred to physiotherapy. Her pain failed to settle and she presented to the emergency department after 2 weeks with severe left hip pain and inability to weight bear.

On examination, BMI was 23.7 (Normal values 18.5-25), height 1.68 meters and weight 67 kg. walking with two crutches. She had limited painful left hip range of movement (mainly internal rotation). Right hip examination was unremarkable.

Investigations for menstrual dysfunction (FSH, LH and estrogen levels) were normal. Laboratory studies for low energy availability (FBC, RFTs, LFTs, Metabolic screening: TFT, PTH, Vit. D, Ca+2 and Phosphorus) as well as DXA scan were normal.

Plain x-rays showed left complete (type III) femoral neck fracture and right incomplete compression (type II) femoral neck fracture. MRI scans demonstrated bilateral neck of femur fractures (Figure 1).

The patient was assessed by a multidisciplinary team including orthopaedic surgery, rheumatology, gynaecology, nutrition and dietetics. A diagnosis of Female Athletic Triad was made on

the basis of amenorrhea, inadequate dietary intake, and stress fractures of both femoral necks.

After discussing the risks and benefits of conservative vs. surgical intervention, the patient was consented for internal fixation of both hips, with a 6 weeks interval between the two surgeries.

Her family and athlete coach were included in her post-operative recovery and implementation of an appropriate dietary and training plan.

Six months following surgery the patient was mobilizing without pain, her menses normalised and she returned to cycling. Pelvis x-rays done one year post surgery showed signs of fracture healing (Figure 2). She remained asymptomatic 2 years post hip surgery.

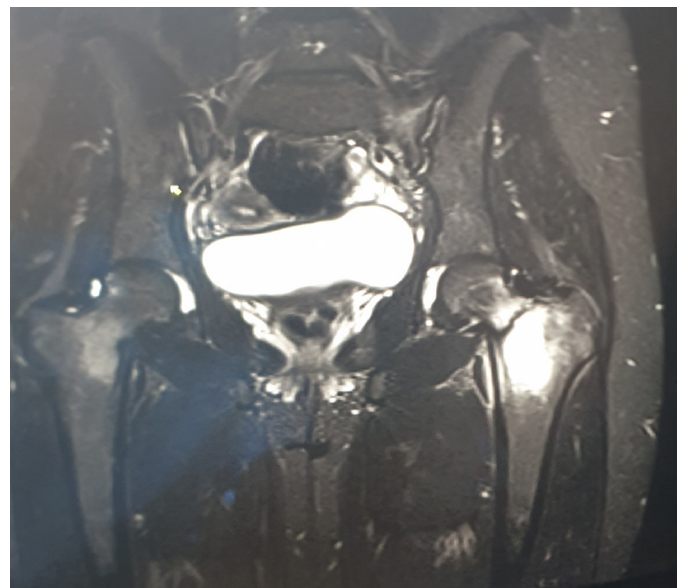


Figure 1: MRI of the pelvis: Bilateral Femoral neck stress fractures (Left complete. Right: Incomplete fracture).

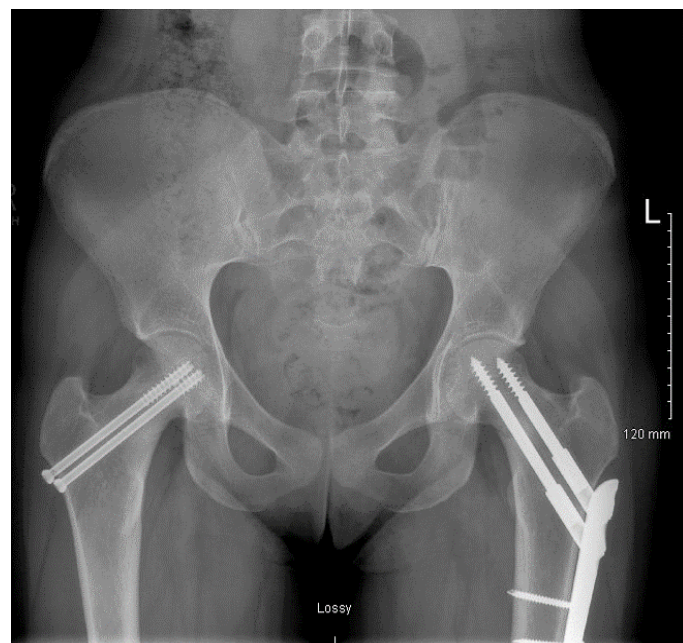


Figure 2: Plain X-ray of pelvis 12 months post-operative: Internal fixation of both hips, with signs of fracture healing on both sides.

Discussion

A stress fracture occurs due to the mechanical failure of bone under load. This failure may occur in normal bone subject to abnormal stress (fatigue fracture), or may occur in abnormal bone subject to normal stress (insufficiency fracture).

Female Athletic Triad (FAT) is characterized by menstrual disturbance, eating disorder and decreased bone mineral density. Nazem and Ackerman [10] questioned the necessity of having all the three components of FAT simultaneously to make the diagnosis, as each component can occur at different time sequence.

Our patient had amenorrhea, normal DXA scan and she denied eating disorder. A normal DXA scan, however, does not rule out decreased bone mineral density in this case report; because during adolescence period, females acquire peak skeletal mass. In addition, Bennell et al found that amenorrhoeic athletes have up to 20% less lumbar spine BMD than eumenorrhoeic athletes [11].

This has been further supported by the American College of Sports Medicine which consider a Z score of -1 to -2 as a low score in premenopausal athletes. [12]. Meczekalski et al noted that most patients with FAT have a state of oestrogen deficiency secondary to functional hypothalamic amenorrhoea. This may reduce the normal inhibitory effect on osteoclasts, hence compromising bone structure and mineral density [13].

The pattern of femoral neck stress fracture and fixation type carries additional impact on the outcome. Vertical fracture, for example, tend to displace due to shear forces acted upon, in addition, sliding hip screws (SHS) showed superior results over cannulated screws in treating vertical femoral neck fractures [14]. This is because SHS has greater load to failure and less shearing stress forces [15]. In this report, all authors preferred minimally invasive technique using the Percutaneous Compression Plate (PCCP) to fix left femoral neck of femur fracture. Despite the fact that our patients had asymptomatic right hip, and incomplete compression fracture pattern, the orthopaedic team decided to fix the femoral neck fracture to prevent its propagation.

Although our case was not referred immediately by her family doctor or athlete coach, she presented promptly to ED and had her hip surgery done urgently. Most studies showed that delayed presentation is associated with poor outcome such as non union, femoral head necrosis, chronic disabilities, early hip joint replacement and failure to return to sport activities [16,17]. Likewise, literature from the Finish military stressed on early presentation and immediate imaging of all symptomatic military personnel beside adopting educational sessions for healthcare workers. All the aforementioned measures have been proven to reduce rates of displaced FNSFs, hence complications [17].

Our patient returned to basic sport activities after 6 months from the second surgery, which is comparable time to most literature. Some studies [4,16,17] have shown time to return to sport in all cohorts and case reports of FNSF to be between 3 to 12 months.

Conclusion

This case report highlights the importance of knowing the risk factors of stress fractures in young athletes, namely FNSF. While a high index of suspicion needs to be maintained espe-

cially in younger patients with chronic hip pain, female athletes present an additional challenge with the possibility of female athlete triad.

To prevent poor outcomes following FNSF, any young athlete with non-resolving groin pain should be referred for a hip X-Ray. If symptoms do not resolve with conservative management, a prompt MRI assessment is warranted. All Medical staff, family physicians and athlete coaches, should be made aware of this rare but serious condition.

Conflict of interest

The authors declare that there was no conflict of interest in conducting this work.

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