



REVIEW ARTICLE

# Femoral Head Insufficiency Fracture after Overuse Injury; Case Report of a Rare Entity and Literature Review

Mazin Usama MD<sup>1</sup>, Ahmed Al Ghaithi MD<sup>1</sup>, Humaid Al Farii MD FRCSC<sup>1</sup>, Wafa Al Baluki MD FRCSC<sup>1</sup>

Department of Surgery,  
Orthopaedic division. Sultan  
Qaboos University Hospital.  
Muscat. Oman



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## ABSTRACT

**Background:** Overuse injuries develop gradually over time without a specific traumatic event. They are more commonly reported as the cause of lower limb injuries compared to acute incidents. The incidence of overuse injuries varies among different sport types but comparing them across sports or establishing specific links is challenging due to methodological heterogeneity. Youth sports' growing popularity in the region has led to a rise in sports-related overuse injuries. Raising awareness is crucial for proper management and prevention of overuse injuries in this age groups.

**Case Summary:** Hence, we present a case report concerning a 10-year-old boy who experienced an overuse injury in a relatively uncommon area, specifically the femoral head.

**Conclusion:** Our intention is to contribute to the existing knowledge and comprehension of such injuries.

## Introduction

Overuse injuries are a growing concern in youth sports, developing gradually over time without a specific traumatic event. The skeletal maturity of young athletes plays a crucial role in their susceptibility to overuse injuries<sup>(1,2)</sup>. The growth plate, a region of developing cartilage near the ends of long bones, is particularly vulnerable to stress during periods of rapid growth<sup>(3-5)</sup>. Arnold et al. highlighted that the growth plate undergoes structural changes during maturation, which may weaken its anchoring points and make it more susceptible to injury<sup>(2,4,6)</sup>. Additionally, the rate of bone mineralization may lag behind bone linear growth during pubescent growth spurts, further compromising the integrity of the growth plate<sup>(4)</sup>.

The location of overuse injuries can vary depending on the sport and repetitive movement patterns involved. Gymnasts commonly experience overuse injuries around the wrist<sup>(1,2)</sup>, while long-distance runners often sustain injuries in the distal femur<sup>(7)</sup>. Baseball pitchers frequently develop shoulder overuse injuries<sup>(1,2,4,8)</sup>, emphasizing the importance of sport-specific training programs and conditioning to address the unique demands placed on different body regions<sup>(9)</sup>.

Among the various sites affected, the femoral head is a relatively rare location for overuse injuries. Understanding and managing overuse injuries in the femoral head is crucial for proper treatment and prevention of long-term complications. This case report presents a rare case of a 10-year-old boy with a femoral head overuse injury, aiming to enhance understanding and awareness of this condition. The report discusses the clinical presentation, diagnostic evaluation, treatment approach, and patient outcome, emphasizing the importance of early recognition and appropriate management of overuse injuries in the femoral head.

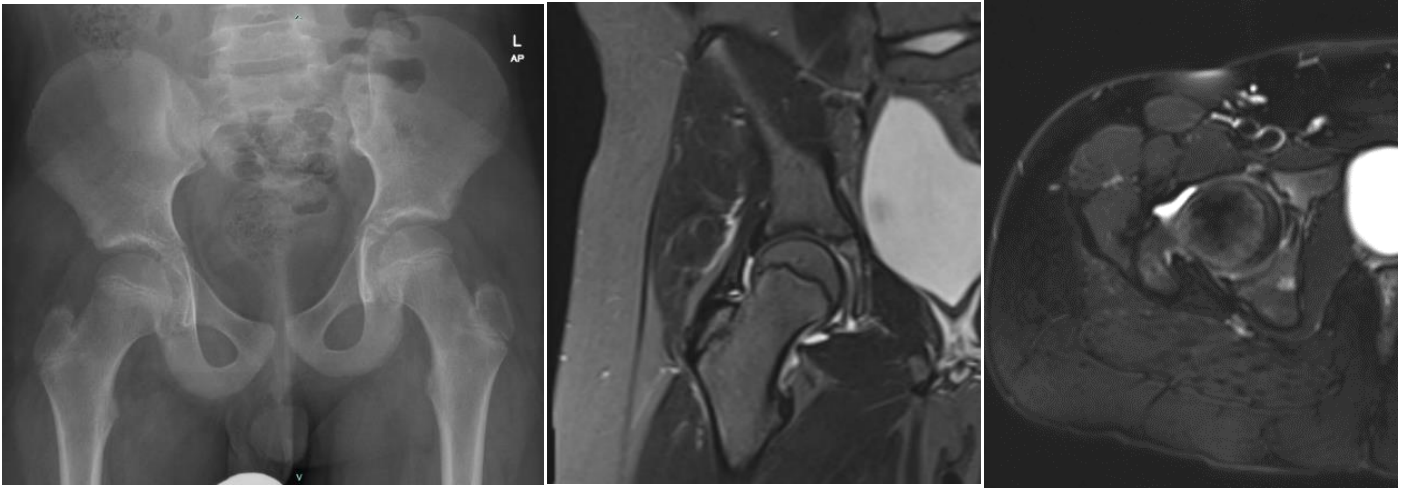
## Case Presentation

A 10-year-old boy presented with right hip pain that had been present for approximately two weeks.

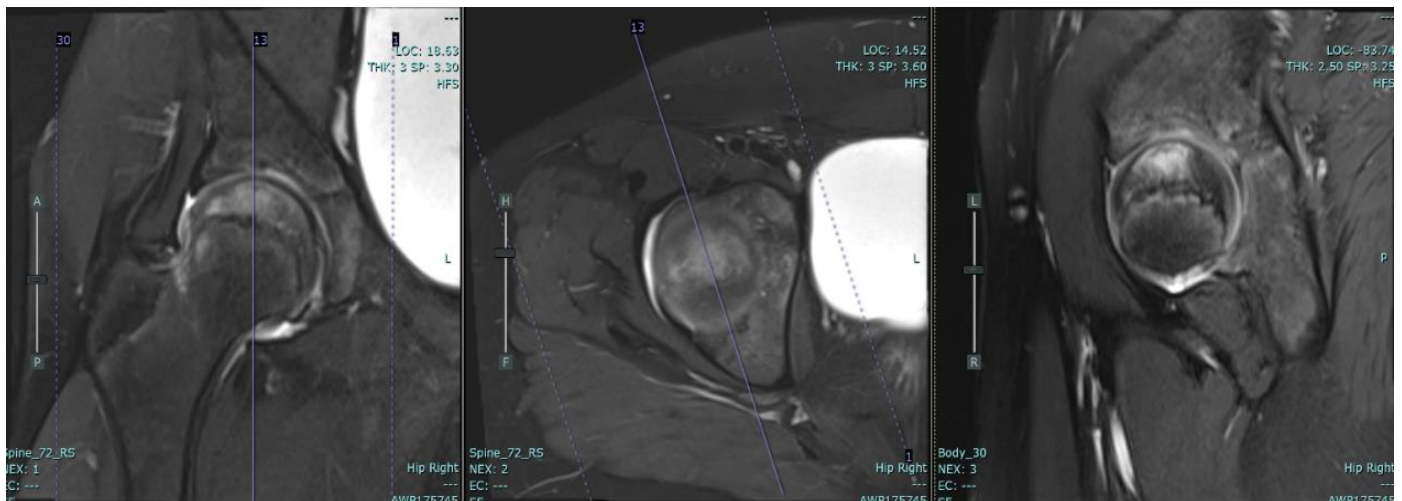
The pain started immediately after his karate training sessions. The child reported difficulty sitting with crossed legs and a subtle limp while walking. Initial clinical evaluation showed normal range of motion in both hips, with slight pain during rotational movements. Laboratory tests, including white blood cell count and C-reactive protein level, were within normal limits. Radiographs showed no fractures, and an ultrasound examination revealed no abnormalities. The case was initially categorized as an unspecified musculoskeletal injury, and observation was planned. However, due to persistent pain and limping, further investigations were conducted including MRI that was unremarkable (Fig. 1).

A follow-up visit, a few weeks later showed no improvement in pain and limping. Repeat MRI revealed bone marrow oedema and a subchondral hypointense linear signal abnormality along the weight-bearing surface of the femoral head, consistent with a subchondral insufficiency fracture. Necrotic areas suggestive of conditions like Perthes disease were not observed. (Fig. 2) Therefore, final diagnosis was an overuse injury of the right femoral head.

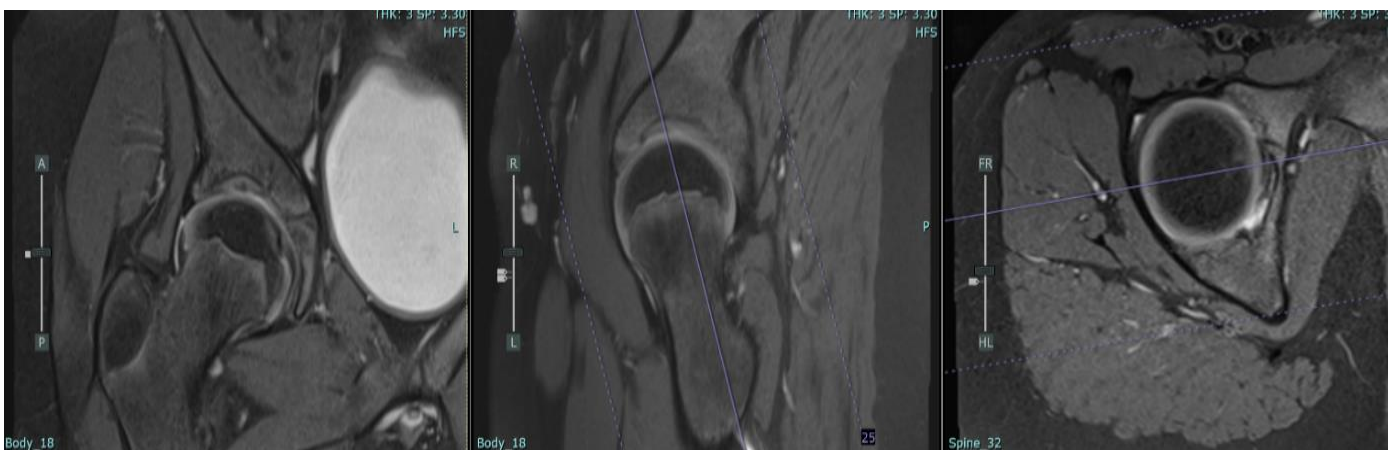
Conservative treatment was initiated, including toe-touch weight bearing with crutches and maintaining range of motion in the hip. Follow-up evaluations showed gradual resolution of symptoms, complete resolution of pain at the three-month mark, and radiographic improvement with no signs of avascular necrosis (Fig. 3) The patient was allowed to gradually resume weight-bearing and progressively return to normal activities.



**Figure 1:** The image displays pelvis radiographs of both hips, revealing no abnormalities. Additionally, an MRI of the pelvis showed a normal appearance of the femoral heads.



**Figure 2:** displays an MRI scan of the right hip, indicating the presence of edema in the femoral head while maintaining the normal height of the femoral head.



**Figure 3:** exhibits an MRI scan of the right hip, indicating the resolution of oedema and the normal appearance of the femoral head.

## Discussion

In recent years, there has been a noticeable increase in youth participation in competitive sports, leading to physical load exerted on the growth plate and subsequent mechanical stress<sup>(4)</sup>. The repetitive load can exceed the growth plate's tolerance limit, resulting in changes in the immature skeleton<sup>(4)</sup>. Post et. al. showed increased overused injuries among high school athletes in US. The rate of overuse injuries reported in 2012-2013 was 1.64/10,000 athletic exposure that increased to 6.6/ 10,000 athletic exposure based on the date collected from 2014-2015 through 2018-2019<sup>(10)</sup>. Furthermore, Bell and colleagues reported the risk factor related to overuse injuries and highlighted that specialized young athletes are at 4 times higher risk to sustain an overuse injury compared to low specialization athletes<sup>(11)</sup>. Moreover, increasing hours of training place young athletes at higher risk of sustaining overuse injuries.

In one report, the athletes sustained serious overuse injuries had twice the odd of engaging in higher number of organized weekly sport hours compared to athletes without serious injuries<sup>(9)</sup>. Field et al. in their report on the incident of sport-related stress fracture among adolescent, showed that higher hours of practice of high impact sports like basketball, running, soccer, tennis, cheerleading, and volleyball was significantly predictive of developing stress fracture<sup>(12)</sup>. On the other hand, reports had shown that karate carries a lower risk for injuries as non-contact sport<sup>(13-17)</sup>. Zetaruk et. al surveyed 68 children aged 6-16 years who participated in the karate season at private school. Majority of injuries were minor, mainly bruises or minor sprain where no time off the sport was required. The Risk of injury increases with experience or ranking, hours spent on training<sup>(18)</sup>.

Gender disparities have also been noted in the occurrence of overuse injuries, with a higher incidence among girls compared to boys regardless of the specific sport activity<sup>(5,10,19,20)</sup>. Straccioli et al. reported that 90.9% of injuries around the pelvis in their retrospective review were overuse injuries and were more prevalent among female athletes<sup>(20)</sup>. The

underlying factors contributing to these gender disparities require further investigation, as they may involve physiological, biomechanical, or psychosocial differences.

Diagnosing overuse injuries can be challenging, as they often present with nonspecific symptoms and may not be evident in initial imaging studies. In the case of the femoral head overuse injury presented, initial radiographs and ultrasound did not reveal any abnormalities. However, MRI emerged as the gold standard for diagnosing stress injuries, providing detailed information on the location, extent, and nature of the injury<sup>(21-24)</sup>. The repeat MRI in the case report demonstrated bone marrow edema and a subchondral hypointense linear signal abnormality, confirming the diagnosis of a subchondral insufficiency fracture. Conservative management is the mainstay of treatment for overuse injuries in young athletes. It typically involves a period of protected weight-bearing with the use of crutches or immobilization devices<sup>(21,24)</sup>. Gradual progression of weight-bearing and a structured rehabilitation program allow for tissue healing and restoration of function. In severe cases, complete cessation of the sport may be necessary, followed by a gradual return to activity<sup>(3)</sup>. Preventive strategies, such as limiting training hours, adjusting training intensity, and implementing stretching and conditioning programs, are essential to minimize the risk of overuse injuries in young athletes<sup>(3,4)</sup>.

## Conclusion

Overuse injuries in youth athletes, including the rare entity of femoral head overuse injury, pose a significant challenge for healthcare providers, coaches, and parents. Early recognition, accurate diagnosis, and appropriate management are crucial to prevent long-term complications and allow for a safe return to sports activities.

### **Conflict of Interest:**

All authors declare that they have no conflicts of interest.

### **Funding/sponsorship:**

No funding has been received to produce this work.

### **Patient/ Guardian Consent:**

A written consent obtained from the father to publish the case. No Clinical picture of the child is published.



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