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## Traumatic lesser trochanteric avulsion fracture in a preadolescent: A case report

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### Abstract

Lesser trochanter avulsion fracture is a rare condition in the pediatric population and especially occur in preadolescent, due to their immature and building-up skeleton. We report a case of a 13-year-old boy, received at our service, who was diagnosed with this condition and underwent conservative management. Outcomes were excellent, with consolidation within seven weeks and return to sport at 12 weeks post-trauma.

**Keywords:** Lesser trochanteric, avulsion fracture, preadolescent, case report

### Introduction

Avulsion fractures are very rare in common orthopedic practice. In the pediatric population, avulsion fractures of the lesser trochanter represent less than two percent of avulsion fractures occurring in the pelvis and proximal femur [1-3]. Adolescents are more predisposed due to anatomical characteristics of their immature skeleton and the timing of lesser trochanter ossification [4]. Circumstances are typical and clinical examination is marked by a painful limp with tenderness on the medial side of the thigh. Radiographs give the diagnosis and management is conservative, with good outcomes [5].

We report a case of a 13-year-old preadolescent who has been referred to our service ten hours after hip trauma. We discuss frequency, anatomical predisposition, circumstances of occurrence, diagnosis, management, and outcomes of avulsion fracture of the lesser trochanter.

### Observation

A 13-year-old boy was referred to our hospital for the management of right hip trauma. Ten hours earlier, during his sportive education course, the patient has fallen from his height while running with a reception on his right inferior limb. This led to right hip pain. He was referred to our service for better management.

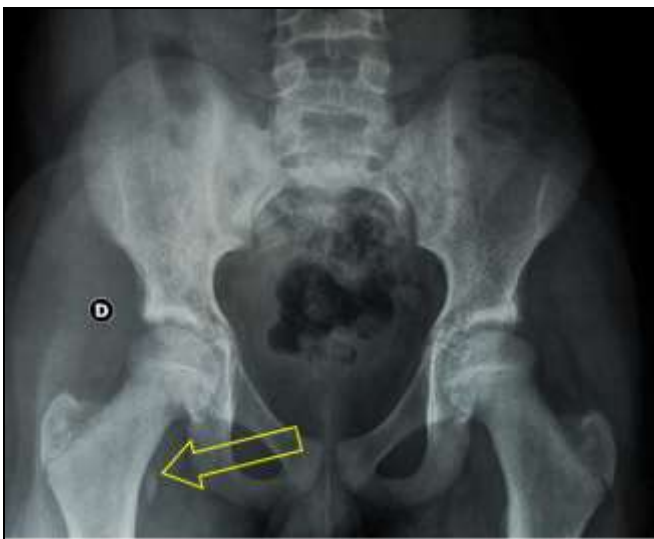
On physical examination, there was functional impairment of the right inferior limb, but no tumefaction, neither deformation of the limb nor cutaneous evidence of trauma. Palpation of the proximal right thigh, on its medial aspect, was painful. The hip could not be flexed more than 90 degrees without pain. The comparative hips radiography showed avulsion fracture of the lesser trochanter with a proximal 1 cm displacement and without any additional bony lesion of the homolateral proximal femur, nor the bony pelvis (Figure 1).

The patient received analgesics and crutches were prescribed to prevent weight bearing on the affected limb.

The patient has been reviewed on the first-week post-trauma, with control radiography which has shown no further displacement. Then, we reviewed him two weeks later and he did not have any complaints. We allowed partial weight-bearing, as well as home-kinesitherapy with passive soft mobilization of the right hip. On the seventh post-trauma week, we reviewed him with control radiography which was unremarkable, showing a consolidation of the fracture (Figure 2). We then allowed full weight-bearing, without practicing sport. On the 12<sup>th</sup> post-injury week, the patient was reviewed, he had no complaint and his right hip's range of motion was normal. We consequently allowed him to return to sport.



**Fig 1:** Pelvic radiography showing the avulsion fracture of the right lesser trochanter, with a proximal displacement (yellow arrow).



**Fig 2:** Pelvic radiography showing consolidation (yellow arrow) on post-trauma week 7.

## Discussion

Among pelvic and femoral avulsion fractures, the lesser trochanteric one is rarely encountered, representing from 1-2% [2, 3]. They generally occur in adolescents, around 14 years, with ranges varying from 7 to 16 years. Some cases in less than two years old children have been reported [6]. Male is largely more affected than female, representing 75% of patients [3].

Adolescents have a high predisposition to this kind of fracture since they have an immature, building-up skeleton. In long bones, the traction epiphysis or apophysis is an outgrowth that receives muscle or ligament insertion and contributes to peripheral growth of the bone [4, 7]. The apophysis has a growth plate. For the lesser trochanter, a secondary ossification center appears at eight to twelve years old and closes around eighteen years old [8]. This justifies why many cases are seen at 14 years old, as the growth plate is still open. In adolescents, the apophysis growth plate is weaker than the tendon and muscle which are attached to it. Additionally, tendon insertion on the

cortical part of the apophysis, through Sharpey's fibers, is also resistant. Regarding this, an eccentric muscle contraction can result in avulsion fracture rather than a tendon or muscle section [4, 7]. The LT receives tendon from the iliopsoas muscle, which originates from transverse apophysis of the second to fifth lumbar vertebra and iliac fossa. This muscle acts as a hip flexor. Thus, forceful traction of the iliopsoas muscle while the thigh is extended and fixed can lead to an avulsion fracture of the LT, as well as hip hyperextension associated with abduction [9].

Most common circumstances include hurdling, running, sprinting, and jumping. This is mainly due to the increased participation of adolescents in sports activities. Some authors have reported atypical circumstances as seizures, freestyle soccer, classical ballet, falls, and gymnastics [8]. Some patients report a prodromal pain and cracking sensation just before the full clinical presentation, which includes a painful limp, associated with painful flexion of the hip or functional impairment of the hip, resulting in the inability to stand up on both inferior limbs [4,8]. Our patient had his trauma during a run and did not report any prodromal signs. However, he had a painful limp and functional impairment of his right hip. On clinical examination, external evidence of trauma is minor. The main findings are tenderness on the medial side of the hip, along with Ludloff sign, which is pain on flexion of the hip greater to 90 degrees or inability to raise the thigh while sitting [4, 8], both found in our patient. At this step, differential must include slipped capital femoral epiphysis, Legg-Calvé-Perthes disease, subacute infectious arthritis, and transient hip synovitis. While the latter has a good prognosis, the first three should mandatorily be diagnosed and treated on time [5]. Plain radiograph easily comforts the diagnosis by depicting a Salter-Harris type I fracture with avulsion of the LT, which is usually displaced proximally, under the action of the tendon of the iliopsoas muscle. According to McKinney *et al.* [5], avulsion fractures of the LT are classified into four types. The fracture in our patient was classified as type 2. Radiographs may look normal in non-ossified bone. In this case and presence of high clinical suspicion, ultrasound, computed tomography or magnetic resonance imaging can be of great help to provide diagnosis [5, 8]. We opted for conservative management as types 1 to 3 McKinney avulsion fractures of the LT should be conservatively treated. This generally includes analgesic, non-weight bearing for 2 to 3 weeks. During the first two weeks, a radiograph should be ordered to check for secondary displacement. From the third week, personalized kinesitherapy is started. As union occurs in 6 weeks, full weight-bearing is then allowed. Return to sport is indicated 12 weeks later, as complete bony healing has occurred. Given good results with this approach, cast immobilization is unnecessary [5, 8]. We allowed sport in our patients on week 12.

Outcomes of avulsion fractures are excellent, allowing the patient to get back to a normal level of activity and competition sport by four months after injury. In post-therapeutic asymptomatic patients, the persistence of anomalies on radiographs does not worsen the prognosis [2].

## Conclusion

Avulsion-fracture of the lesser trochanter is a rare entity in children. The clinical suspicion is guided by the patient's age, the mechanism of the accident, and clinical findings. Radiographs comfort the diagnosis and management is essentially conservative, with excellent outcomes and normal return to physical activities.

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