

# Avulsion fracture of the anterior inferior iliac spine

## Spinal iliyak anterior inferior avulsiyon kırığı

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A 14-year-old was admitted with right groin pain which has started after kicking ball in a football game one week before. He had limited active and passive hip extension. A plain AP radiograph of the pelvis revealed a bone fragment displaced inferiorly about 1 cm from the right anterior inferior iliac spine. The patient was treated conservatively with analgesics and limited weight bearing. Four weeks later, range of motion was normal without pain and at eighth week the hip flexors regained full strength.

**Key Words:** Adolescent; bone fractures; diagnostic X-Ray; ilium; soccer.

On dört yaşında erkek hasta sağ kasığında ağrı yakınması ile hastanemize başvurdu. Ağrısının, bir hafta önce futbol oynarken, şut attıktan sonra aniden başladığını belirtti. Aktif ve pasif kalça hareketlerinde kısıtlılık vardı. Ön arka pelvis grafisinde, sağ spinal iliyak anterior inferiordan 1 cm distale doğru deplasman kemik fragmanı görüldü. Hasta analjezik ilaçlar ve alt ekstremitesine yük vermesi önerilen taburcu edildi. Dört hafta sonra eklem hareket açıklığı normal sınırlarda ve ağrısız iken, 8 hafta sonra kalça fleksiyonu tam olarak elde edildi.

**Anahtar Sözcükler:** Ergen; futbol; iliyak kemik; kemik kırıkları; tanışsal radyografi.

Acute apophyseal pelvic avulsion fractures are usually considered to be uncommon injuries. However, they are not rare in adolescents who engage in athletic activities such as kicking a ball, running or jumping. During these activities sudden, forceful or unbalanced contraction of the musculotendinous unit attached to the spines of the pelvis can result in avulsion fractures. These fractures are seen at the developmental stage between the first appearance of ossification of the apophyses and their subsequent fusion to the corresponding pelvic tuberosities.<sup>[1-4]</sup>

In the literature several cases of anterior inferior iliac spine (AIIS) and anterior superior iliac spine (ASIS) avulsion fractures have been reported.<sup>[1,5-13]</sup> Nearly all of these patients were young and their fractures were related to sports activities.

## CASE REPORT

A 14-year-old boy presented to the hospital in August 2004 with moderate pain localized in the right inguinal area. The patient said that the pain had begun suddenly 1 week earlier while he was attempting to kick ball during a football game. At that time he was unable to continue his activity. Initially he thought he merely had a “pulled muscle” but he had persistent pain in his groin, which was aggravated by flexion of the hip.

His height was 175 cm and his weight was 68 kg. Inspection revealed no pathological findings in the inguinal region. There was tenderness on palpation in right inguinal area. Active range of motion of the right hip was limited to 10° of extension from neutral

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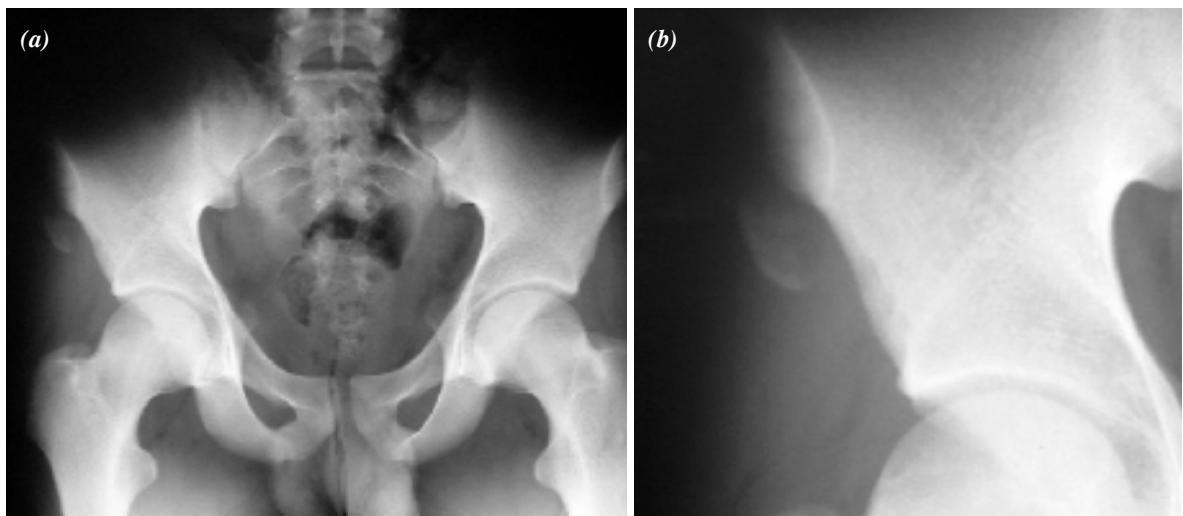
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**Fig. 1.** (a, b) Plain AP radiographs of the pelvis revealed a bone fragment displaced inferiorly about 1 cm from the right anterior inferior iliac spine.

and 70° of flexion. Passive range of motion was 20° of extension and full flexion. A plain AP radiograph (see Fig. 1) and CT (see Fig. 2) of the pelvis revealed a bone fragment displaced inferiorly about 1 cm from the right anterior inferior iliac spine.

Initial management consisted of a nonsteroidal antiinflammatory drug (ibuprofen) and limited weight bearing with crutches. Passive-assisted range-of-motion exercises were started as soon as pain allowed. Because the patient did not have any insurance coverage, physical therapy was limited and we could not obtain radiographs during follow-up visits. Two weeks after the patient's initial exam, he was able to walk without crutches with minimal pain. At fourth week he had normal range of motion with no pain. At his 8-week follow-up visit he had regained full strength in his hip flexors.



**Fig. 2.** CT scan showing avulsion fracture of the right anterior inferior iliac spine.

## DISCUSSION

Secondary ossification centers are located on the ends of long bones, where they are termed epiphyses, or at the insertion site of a muscle, where they are termed apophyses.<sup>[14]</sup> Ossification of pelvic apophyses occurs during adolescence, a time when many young people engage in strenuous athletic activity.<sup>[15,16]</sup> Avulsion fractures are more common during early adolescence because in this period the ratio of muscular strength to physeal strength is greatest and chondrocalcinosis is not yet finished. Our patient was a 14-year-old skeletally immature boy who was injured in a football game.

Avulsion fractures of the anterior inferior iliac spine are caused by the pull of the straight head of the rectus femoris muscle. These must be differentiated from avulsions of the upper rim of the acetabulum in the secondary ossification center of the ilium, which are caused by the pull of the reflected head of the rectus femoris muscle.<sup>[17]</sup> The rectus femoris muscle arises from the ilium in two heads. These are the reflected head, originating in the region immediately above the upper acetabular rim, and the straight head, originating on the anterior inferior iliac spine. The rectus femoris functions as a diarthroldial muscle which extends the knee and flexes the hip joint.

Avulsion fractures are usually caused by hip hyperextension and knee flexion. This mechanism achieves a maximum effect in the rectus femoris tendon, for example when a person kicks a ball. This

sudden muscle contraction to initiate a kick causes the avulsion of the muscle origin due to an open apophysis in adolescents.<sup>[5,17]</sup> The most commonly reported etiologies of avulsion fractures are sprinting in track or other sports, jumping over hurdles and kicking a soccer ball. Less commonly seen mechanisms involving excessive passive lengthening of the musculotendinous unit have also been reported, and example activities include swinging a baseball bat or performing splits during gymnastics. Direct trauma or chronic traction may rarely cause a pelvic avulsion fracture.<sup>[5,15]</sup>

Fractures of the AIIS appear to be less common than fractures of the ASIS. ASIS fracture is more likely to occur in older adolescents and young adults because the ASIS fuses later than the AIIS.<sup>[5,8,9]</sup>

With an acute avulsion fracture of the pelvis, the patient typically reports having heard a “pop” or “snap” during physical activity and sudden, severe pain, resulting in an attempt to stop suddenly due to loss of muscular function. Swelling can be noted. Local tenderness can be found by palpation. Tenderness can be detected through passive movements of the limb. Physical findings, symptoms, the patient’s age and biomechanical analysis of the accident can collectively raise the suspicion of an avulsion fracture, and radiographs can confirm the diagnosis.<sup>[1,15]</sup> The patient in this report presented with pain due to a sports injury one week before, and as he was also a teenager we considered avulsion fracture. A radiograph of the pelvis confirmed this diagnosis.

On physical examination point tenderness and swelling are noted over the avulsion site. The patient cannot bear weight because of severe pain. A lump may be palpated which represents the avulsion fragment, and patient feels pain during the palpation.<sup>[15]</sup> Although the patient is able to walk, any active flexing of the hip, as in climbing stairs, and especially against resistance, causes severe pain. Localization of AIIS avulsion is more difficult than that of ASIS because AIIS is deep to the sartorius and iliopsoas muscles. In such a case the clinician may consider a musculotendinous injury, but in adolescents these injuries are less common than physeal injuries.<sup>[5]</sup> AIIS avulsion fractures may also mimic fractures of the secondary ossification center in the superior margin of the acetabulum. The differentiation between these two types of avulsion fracture can be made by direct radiography or CT.<sup>[14]</sup>

The radiological appearance of AIIS fracture is characteristic. The avulsed fragment is typically crescent-shaped but can also appear triangular. The fragment is usually minimally displaced inferiorly.<sup>[5,8]</sup> This was the case in our patient, with the fragment being located 1 cm below the AIIS.

Treatment for AIIS avulsion is usually conservative, with crutches and toe-touch weight bearing, progressing to full weight bearing as tolerated. There are reports of open reduction and internal fixation in the literature, but these are few and no improvement in outcome has been shown.<sup>[5]</sup>

The conventional treatment of this injury includes bed rest and analgesia in the acute stage followed by gradual mobilization as pain allows over a period of a few weeks. The time to full recovery has been reported to vary from 3 weeks to 4 months.<sup>[17]</sup> With a nonsteroidal antiinflammatory drug treatment (ibuprofen) and limited weight-bearing, our patient was able to walk with minimal pain and no crutches after two weeks. At the fourth week he had no pain at full range of motion.

Very few authors describe operative treatment for this specific injury. If there is less time for full recovery surgery can be an alternative for athletes requiring a short period of rehabilitation. Operative treatment may avoid longstanding pain and disability in these athletes. Indications for surgery are significant displacement of the avulsed fragment (more than 2 cm), nonunion of the fracture and exostosis formation.<sup>[5,17]</sup>

Return to full activity in this injury is complete, with no restrictions or long term sequelae with both conservative and open treatments. Exostosis formation has been reported after conservative treatment with rest and immobilization. If it causes pain and impaired hip function, it may require surgical excision. Nonunion has been seen in a patient who had persistent symptoms and this was eventually treated by open reduction and internal fixation.<sup>[17]</sup>

The majority of common avulsion fractures heal adequately with conservative treatment and without complications, as was the case in the patient reported here.

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