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## Case report

## Malunited anterior inferior iliac spine fracture as a cause of hip impingement: A case report and review of literature

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## ABSTRACT

Apophyseal injuries of the pelvis have increased recently with increased participation of teenagers in contact sports. Apophyseal fractures of the pelvis should be ruled out from apophysitis, os acetabuli and bony tumors. We report a case of fracture of anterior-inferior iliac spine following indirect injury to the hip in a young football player. The patient failed to get better with nonoperative management and continued to have pain in the left hip and signs and symptoms of impingement. He improved following surgical excision of the heterotopic bone and did not have any evidence of recurrence at 2 years follow-up.

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## Introduction

The incidence of apophyseal fractures of the hip and pelvis is most common in the adolescent population involved in sporting activities.<sup>1</sup> The same study has shown that about 75% of the patients were male with an average age of 14.5 years. Anterior-inferior iliac spine (AIIS) (29%) was the most common site of fracture with anterior superior iliac spine, ischial tuberosity, lesser trochanter and iliac crest being other sites of apophyseal injury. Another study has shown ischial tuberosity (54%) being the most common site of apophyseal injury of the pelvis followed by AIIS (22%).<sup>2</sup> The incidence of apophyseal injuries has increased due to increased participation of youth in sports as well as an increased incidence of apophysitis which is considered a precursor to avulsion fractures.<sup>1,3</sup> We report a case of 14 year old boy with a fracture of AIIS who presented with signs and symptoms of hip impingement.

## Case report

A 14 year old boy presented to our clinic with pain in the left hip for 3 months. He was injured over the left hip during a

football match. He was hit by a helmet of another player. He had continued his regular activity after the injury including training for football. He had pain over the left hip during walking, running and prolonged standing. In addition, he had difficulty in putting his sock and shoe on the left foot. Clinical examination revealed reduced flexion and internal rotation of the left hip. X-rays of the pelvis revealed a malunited fracture of anterior inferior iliac spine with excessive callus formation (Fig. 1). CT scan of the pelvis revealed a healed fracture of left anterior inferior iliac spine with heterotopic bone formation (Fig. 2A, B) and MRI helped to rule out any soft tissue pathology as well as neoplasm (Fig. 3A, B). Patient was treated with Indomethacin. There was no relief from pain at 3 months follow-up and so operative intervention was planned for hip impingement. Heterotopic ossification was excised through anterior approach. The movements of the hip after excision of heterotopic bone were checked during surgery. Flexion of the hip was confirmed to 120° and internal rotation to 40°. X-rays were taken postoperatively to confirm proper excision (Fig. 4). Patient was kept on crutches for 6 weeks and then weight bearing was started. Patient had full relief of symptoms and returned to full activity 3 months after surgery. He was asymptomatic at 2 years follow-up. He continued playing football and was asymptomatic. There was no pain. Physical examination has shown no evidence of weakness in his hip and follow-up X-rays did not show any recurrence of Heterotopic bone formation (Fig. 5).

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Fig. 1. Nonunion fracture of AIIS with inferolateral displacement.

## Discussion

An apophysis is a regular outgrowth around a bone and it originates from a separate center of ossification. It fuses with the parent bone later during growth and it usually does not articulate with another bone directly. It forms an important site for insertion of a ligament or a tendon.<sup>4,5</sup> The iliac apophysis appears as a secondary ossification on pelvic X-ray on the anterior and lateral aspects of the iliac bone.<sup>6</sup> The average age of fusion of iliac apophysis is 14 years in girls

and 16 years in boys with a range of 10–18 years in girls and 13–20 years in boys. The fusion of the apophysis occurs early in warm climates due to increased metabolism and it happens later in cold climates.<sup>5,6</sup>

The apophysis provides attachment to the tendons and is an area of weakness prior to its fusion with parent bone. The straight head of rectus femoris arises from the AIIS and attaches to the patella through a common quadriceps tendon. This muscle is an important flexor of the hip and extensor of the knee joint.<sup>1</sup> Violent force with hip in extension and knee in flexion produces excessive strain on this muscle. This results in apophyseal injury in adolescents as it is a weak area while it causes muscle sprain after the fusion of apophysis to the main bone.<sup>7</sup> Initially, we considered direct injury over AIIS to be the cause of avulsion fracture. However, careful history revealed that our patient was hit by a helmet of another player from the outer back side which resulted in forceful contraction of the rectus femoris with the hip in extension and knee in flexion. There was no direct assault over his AIIS.

Pelvic fractures in children have been classified by Torode et al into four categories for the purpose of management.<sup>8</sup> They include: Type I, nondisplaced fractures; Type II, displaced to 2 cm; Type III, displaced more than 2 cm; Type IV, symptomatic nonunion or painful exostosis. Nonunion and loss of muscle strength are main concerns for Type III and poor muscle strength and loss of motion and impingement are main concerns for Type IV avulsion fractures of the pelvis.

The diagnosis of an avulsion fracture of AIIS is made by careful history and physical examination.<sup>9</sup> Age of the patient is one of the most important diagnostic criteria for this type of fracture. The patient usually complains of persistent pain radiating to the thigh

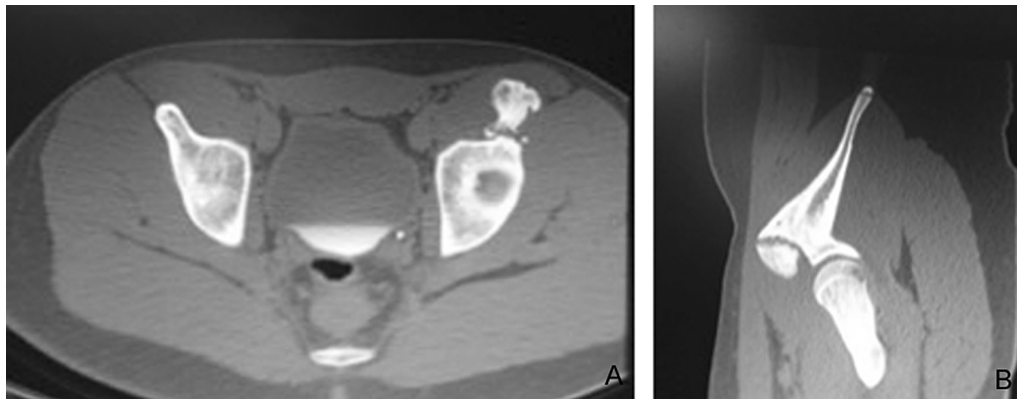


Fig. 2. Axial CT scan showing anterolateral heterotopic bone formation over AIIS (A); Sagittal CT scan showing anteroinferior heterotopic bone over AIIS (B).

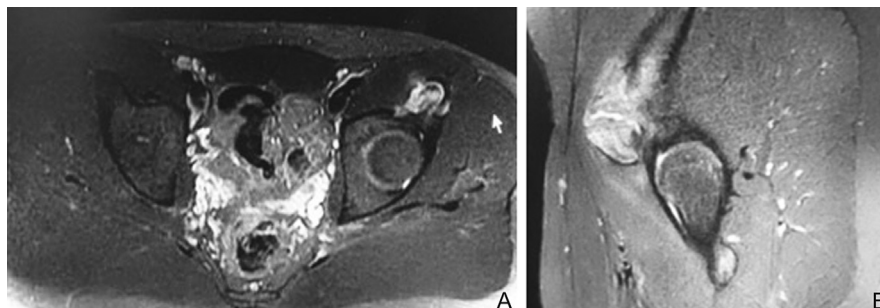
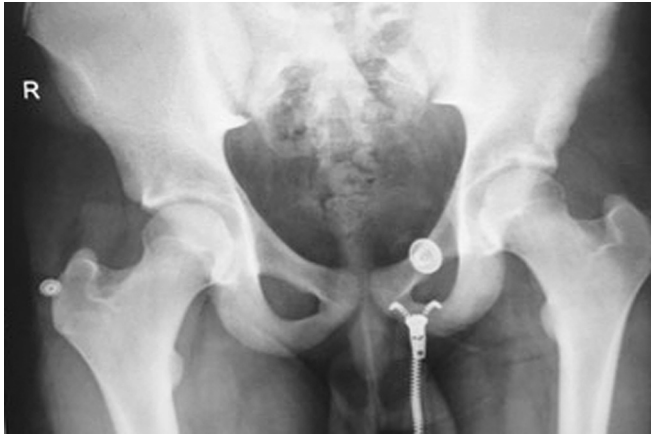


Fig. 3. MRI-axial T1 showing hyperintense signal without any evidence of heterogeneity (A); MRI-sagittal STIR showing hyperintense signal on T2 without any evidence of heterogeneity (B).



**Fig. 4.** Postoperative X-ray of the pelvis showing sclerosis over the margins of excised bone.

and it is difficult to localize the site of pain. The avulsed fragment is underneath the iliopsoas and Sartorius and so it is difficult to palpate particularly in a young athletic male. Anteroposterior radiograph of the pelvis plays an important role and careful assessment of radiograph is important. It may be difficult to detect a fracture on anteroposterior radiograph if the fragment diameter is less than 2 cm with minimal displacement.<sup>10</sup> The differential diagnosis of this condition includes os acetabuli and bony tumors. CT scan can help detect displacement of bony fragment, rule out os acetabuli as well as any heterotopic bone formation while MRI can help rule out other soft tissue pathology in absence of visible bony changes on the X-ray. Sometimes CT scan and MRI may fail to rule out neoplasm and in such cases biopsy may be needed.<sup>11</sup>

More than 95% of apophyseal injuries of the hip and pelvis in adolescents improve with nonoperative management which includes ice, restriction of activity which includes nonweight bearing and analgesics.<sup>1</sup> Metzmaker et al have developed rehabilitation protocol for patients with apophyseal iliac injuries. They have suggested an initial period of nonweight bearing followed by resistive exercise until full muscle strength is achieved. They have advocated a return to full sporting activity after relief of pain which can take about 12 weeks.<sup>12</sup>

Heyworth et al reported that 3% (4/120) of patients in his operative series with fracture of AIIS failed with conservative management and required surgical intervention.<sup>1</sup> Surgical intervention could be in the form of anatomic reduction and fixation with screws to excision of malunited fragment or heterotopic bone. Excision of the avulsed fragment is a preferred method over internal fixation.<sup>13</sup> Open and arthroscopic methods of excision of heterotopic bone have been described.<sup>14</sup> We preferred open method of excision of heterotopic bone to avoid violation of hip capsule. A case of heterotopic bone formation after excision of avulsed fragment has been reported in the literature as late as two years after initial surgery requiring repeat surgical excision.<sup>15</sup> The last follow-up in our patient was at 2 years after surgery without any evidence of pain or restriction of hip movement.

We conclude the following: (1) There is an increased incidence of apophyseal injuries of the hip and pelvis due to



**Fig. 5.** X-ray of the pelvis at 2-year follow-up showing no evidence of recurrence.

involvement of adolescents in contact sports. (2) Apophyseal injury of the pelvis and hip should be considered as differential diagnosis while evaluating pelvic pain in adolescents involved in sports. (3) There are increased chances of malunion and heterotopic bone formation in patients with missed diagnosis and failure to start early treatment. (4) CT scan and MRI may be needed in late diagnosed cases of malunion or heterotopic bone formation to rule out other possibilities. (5) We would suggest follow-up for at least 2 years postoperatively to check for any heterotopic bone formation.

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