CASE REPORT – OPEN ACCESS

International Journal of Surgery Case Reports 11 (2015) 117–120

Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

# Avulsion fracture of anterior inferior iliac spine complicated by hypertrophic malunion causing femoroacetabular impingement: Case report

Ghalib Ahmed Alhaneedi[1], Abdullah Saad A. Abdullah*, Syed Imran Ghouri[2], Yousef Abuodeh[3], Mohammed M. Al Ateeq Al Dosari[4]

*Orthopedic Department, Hamad General Hospital, Hamad Medical Corporation, Doha, Qatar*

ARTICLE INFO

*Article history:*
Received 13 February 2015
Received in revised form 20 April 2015
Accepted 21 April 2015
Available online 5 May 2015

*Keywords:*
Avulsion fracture
Femoroacetabular impingement
Extra-articular hip impingement
Anterior inferior iliac spine

ABSTRACT

*INTRODUCTION:* Avulsion fractures of the anterior inferior iliac spine are uncommon and such injuries are caused by the sudden forceful contraction of the straight head of rectus femoris muscle while the hip is hyperextended and the knee is flexed.
*CASE PRESENTATION:* This case report describes the condition of 17 year old male footballer who complained of pain in the right groin for duration of 2 years after being involved in forceful sport activity. Detailed history, clinical examination, X-rays and CT scan revealed hypertrophic malunion of avulsion fracture of anterior inferior iliac spine causing an extra-articular type of femoroacetabular impingement. The patient was surgically treated when conservative management was unsuccessful.
*DISCUSSION:* This is the first case of hypertrophic malunion of avulsion fracture of anterior inferior iliac spine with femoroacetabular impingement that has been recognized in Qatar. The patient was surgically treated in order to relieve symptoms and avoid osteoarthritis.
*CONCLUSION:* Malunited avulsion fracture of anterior inferior iliac spine can cause extra-articular femoroacetabular impingement.


## 1. Introduction

Avulsion fractures of the anterior inferior iliac spine are rarely encountered and most commonly associated with trauma or overuse [1–4]. This injury occurs most frequently in sports that involve kicking like football, soccer and rugby [5,6].

Femoroacetabular impingement is caused by structural abnormalities on both acetabular and femoral sides that lead to chronic groin pain and progressive degenerative changes [7,8].

However, femoroacetabular impingement due to hypertrophic malunion of avulsed fracture of anterior, inferior iliac spine has rarely been reported [9–12].

## 2. Case report

A 17 year-old man was referred to our clinic with a 2 years history of persistent right groin pain and inability to return to his sport activity. The onset of pain was sudden after trying to kick the ball forcefully during a competitive game of football. In his medical history, he was treated as a case of adductor strain in a private clinic. Pelvic X-rays, CT scan and MRI were taken and the patient was treated with rest, analgesia, and physiotherapy. The patient continued to have right groin pain and inability to return to his sport activity. The patient was referred to Hamad General Hospital to do bone scan in order to rule out the possibility of avascular necrosis of femoral head and the bone scan result revealed to be negative. Examination of his lower extremities and pelvis showed tenderness at the anterior aspect of hip, painful limitation of flexion and internal rotation, positive impingement sign and positive cycling test. Considering the history, clinical examination and a review of his previous imaging studies, the diagnosis of avulsion fracture of the anterior inferior iliac spine was suspected. New pelvic X-rays were done which revealed an abnormal hypertrophic malunion of the anterior inferior iliac spine fracture causing an extra-articular femoroacetabular impingement (Fig. 1). The CT scan revealed an

* Corresponding author. Tel.: +974 70166789.
*E-mail addresses:* ghaliboudah@yahoo.com (G.A. Alhaneedi), abdullahsaad21@gmail.com (A.S.A. Abdullah), ims2311@rediffmail.com (S.I. Ghouri), yousefabuodeh@yahoo.com (Y. Abuodeh), maldosari1@hmc.org.qa (M.M.A.A. Al Dosari).
[1] Tel.: +974 55975125.
[2] Tel.: +974 55570447.
[3] Tel.: +974 66647274.
[4] Tel.: +974 55567278.

http://dx.doi.org/10.1016/j.ijscr.2015.04.025

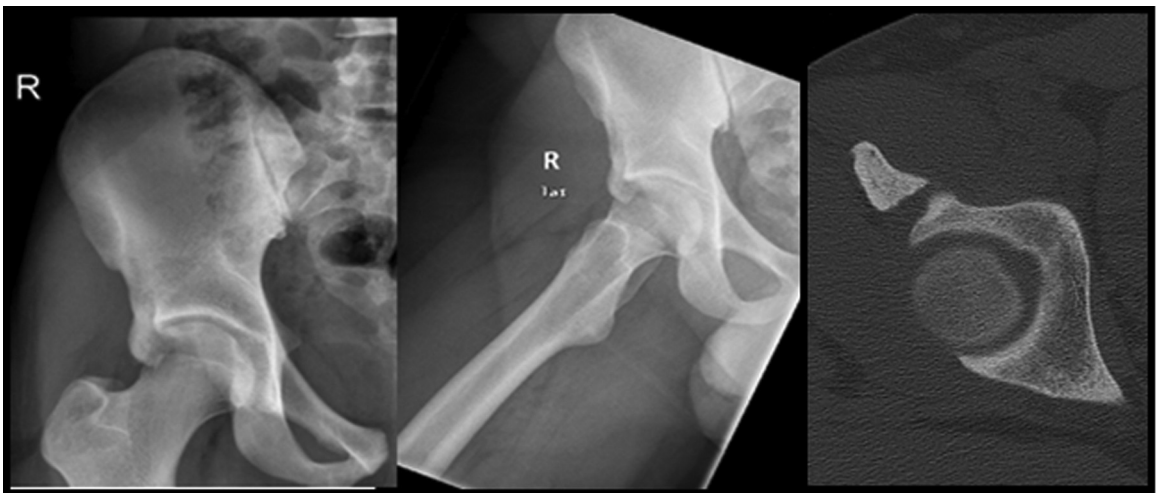


**Fig. 1.** X-rays and CT films of right hip at initial presentation.

inferiorly displaced bony fragment from the right anterior inferior iliac spine (Fig. 1). Conservative treatment in the form of nonsteroidal anti-inflammatory drugs and physiotherapy was started and continued for 12 weeks but without any response (Fig. 2), then surgical excision of the hypertrophic malunited fragment was done through the anterior hip approach. Postoperative course was uneventful and the patient was discharged from hospital after 3 days. Postoperative physiotherapy in the form of range of movement and strengthening exercises was started after 2 weeks. At 6 weeks follow up, examination of the right hip revealed full painless range of motion, negative impingement and cycling tests. The patient was followed up as an outpatient for two years postoperatively and the patient was asymptomatic with no sign of recurrence during the follow up period (Fig. 3).

## 3. Discussion

Avulsion fractures of the anterior inferior iliac spine are less frequent than other pelvic avulsions with an incidence of 14.8–22.1% among acute avulsion fractures of pelvis in young athletes. Pelvic

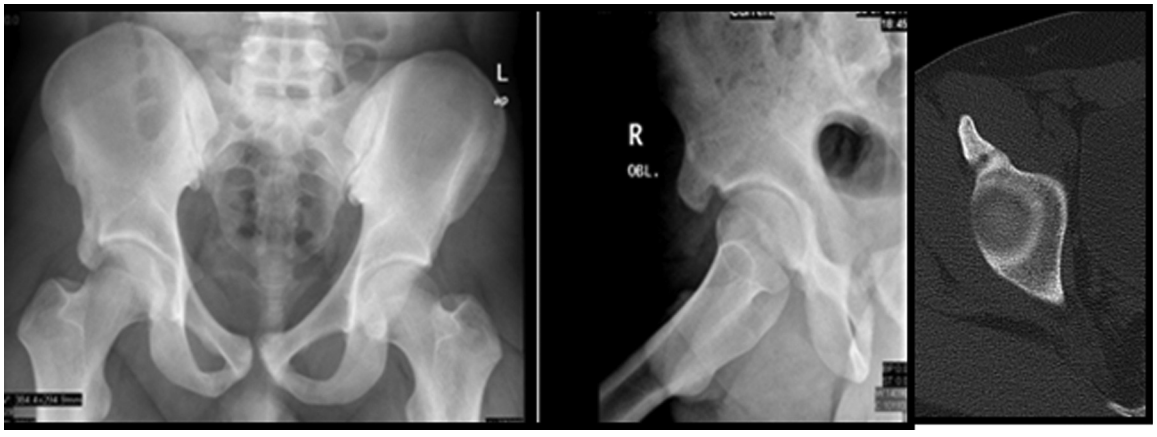


**Fig. 2.** X-rays and CT films of right hip at initial presentation.

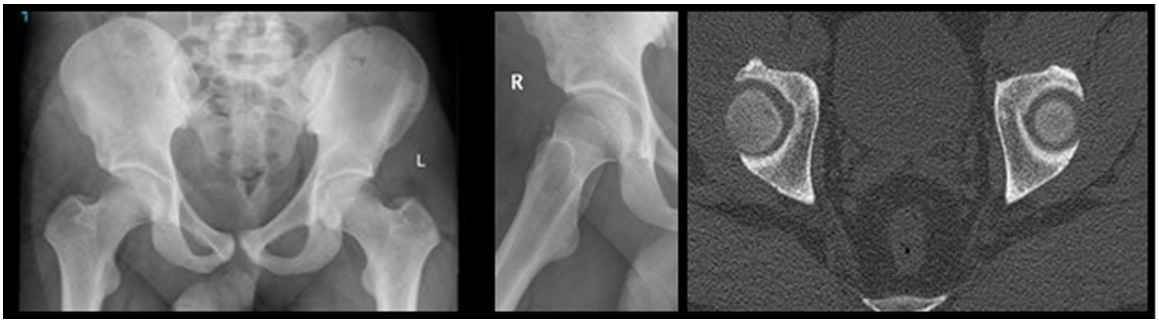


**Fig. 3.** X-rays and CT films of right hip after surgery.

avulsion fractures are more common in male [5,13], adolescents and young adults between 14 and 23 years of age, and when the ratio of muscular strength to the physical strength is considerably high. The mechanism of anterior inferior iliac spine avulsion fracture is due to the pull of the straight head of the rectus femoris muscle [1,3] which usually occurs with hip joint extended while the knee joint in a flexed position, and it is usually seen after sports that involve mostly forceful kicking or running like soccer, rugby and tennis players [5,6]. A high index of suspicion is needed for the diagnosis of anterior inferior iliac spine fractures and generally is established with proper clinical history, physical examination and radiographs of the pelvis [1,2,12].

The anteroposterior and oblique radiographs of the pelvis should be interpreted with caution and the affected side should always be compared with the other side since the avulsed fragment is generally minimally displaced [3,12]. To confirm the diagnosis, CT scan is indicated [14]. Thus, during the evaluation of the groin pain, a careful history, clinical signs and radiological findings should be assessed properly. Avulsion of anterior inferior iliac spine should be kept in mind even in skeletally mature patients [12].

Treatment of avulsion fracture of anterior inferior iliac spine is generally non-operative and consists of rest, ice and analgesia followed by course of physiotherapy in the form of protected weight bearing, range of movement exercises for hip and knee, and strengthening muscle exercises to restore the joint function. Athletic activity may be resumed when full strength and full range of movement have been restored in the affected joint [15]. Avulsion fracture of anterior inferior iliac spine treated conservatively usually requires 6–8 weeks to heal [15].

Femoroacetabular impingement can result in structural changes of the hip and induces early osteoarthritis of hip joint, especially in young and active persons [7,8].

The hip flexion and internal rotation will be significantly limited if the anterior inferior iliac spine is extending to the acetabular rim or more distally which may justify operative decompression [16]. More recently a case series study is demonstrating successful arthroscopic decompression of the anterior inferior iliac spine impingement as an extra-articular source for hip impingement [4], but there is no evidence that currently supports arthroscopic over open surgical excision [17,18].

In this case report, the lesion was extra-articular and the intraoperative examination revealed right hip impingement between the hypertrophic anterior inferior iliac spine and the anteromedial femoral head–neck junction.

In our case, the right anterior inferior iliac spine showed obvious hypertrophy with malunion. The muscle traction was causing fragment displacement and that combined with excessive callus formation resulted in hypertrophic malunion of the fractured anterior inferior iliac spine in this patient.

## 4. Conclusion

Malunited avulsion fracture of anterior inferior iliac spine can cause an extra-articular femoroacetabular impingement. Extra-articular femoroacetabular impingement should be kept in mind as a differential diagnosis in the assessment of hip pathology. Diagnosis of such cases needs proper clinical and radiological examinations. After unsuccessful conservative management, surgical excision of hypertrophic fragment has to be done to relieve the symptoms and to avoid degenerative changes of hip joint especially in athletics.

## Conflict of interest

No conflict of interest.

## Sources of funding

Not source of funding. No sponsors.

## Ethical approval

The patient provided his consent to the publication of this report.

## Consent

Informed consent was taken from the patient for publication of the case and related data.

## Authors contribution

Dr. Ghalib Alhaneedi – consultant orthopedic and the primary physician of the patient and data collection and first author.

Dr. Abdullah Abdullah – resident orthopedic involved in writing the discussion and first author.

Dr. Yousef – secondary contributer to data collection.

Dr. Sayed – secondary contributer to data collection.

Dr. Al Dosari – honorary author.

## References

[1] M. Naude, B.G.P. Lindeque, D.C.J. Ransburg, Avulsion fractures of the pelvis, Sports Med. 15 (June (2)) (2003) 18–24.
[2] Lu-Wen Chen, Szu-Erh Chan, Anterior inferior iliac spine avulsion fracture in an adolescent runner, J. Emerg. Crit. Care Med. 19 (1) (2008) 35–39.
[3] J.E. Gomez, Bilateral anterior inferior iliac spine avulsion fractures, Med. Sci. Sports Exercise 28 (2) (1996) 161–164.
[4] I. Hetsroni, C.M. Larson, K. Dela Torre, R.M. Zbeda, E. Magennis, B.T. Kelly, Anterior inferior iliac spine deformity as an extra-articular source for hip impingement: a series of 10 patients treated with arthroscopic decompression, Arthroscopy 28 (November (1)) (2012) 1644–1653.
[5] F. Rossi, S. Dragoni, Acute avulsion fracture of the pelvis in adolescent competitive athletes prevalence location and sports distribution of 203 cases collected, Skeletal Radiol. 30 (3) (2001) 127–131.
[6] J. Porr, C. Lucaciu, S. Birkett, Avulsion fractures of the pelvis – a qualitative systematic review of the literature, J. Can. Chiropr. Assoc. 55 (December (4)) (2011) 247–255.
[7] R. Ganz, J. Parvizi, M. Beck, M. Leunig, H. Nötzli, K.A. Siebenrock, Femoroacetabular impingement: a cause for osteoarthritis of the hip, Clin. Orthop. Relat. Res. 417 (December) (2003) 112–120.
[8] M. Beck, M. Kalhor, M. Leunig, R. Ganz, Hip morphology influences the pattern of damage to the acetabular cartilage: femoroacetabular impingement as a cause of early osteoarthritis of the hip, J. Bone Joint Surg. Br. 87 (7) (2005) 1012–1018.
[9] C.M. Larson, B.T. Kelly, R.M. Stone, Making a case for anterior inferior iliac spine/subspine hip impingement: three representative case reports and proposed concept, J. Athroscopy 27 (12) (2011) 1732–1737.
[10] D.K. Matsuda, C.P. Calipusan, Adolescent femoroacetabular impingement from malunion of the anteroinferior iliac spine apophysis treated with arthroscopic spinoplasty, Orthopedics 35 (March (3)) (2012) e460–e463.
[11] M. Hufeland, T. Hartwig, D. Krüger, C. Perka, N.P. Haas, J.H. Schröder, Arthroscopic correction of extra-articular subspinal impingement in the hip joint, Orthopade 42 (October (10)) (2013) 879–883, http://dx.doi.org/10.1007/s00132-013-2130-0.
[12] C. Tamam, D. Yildirim, Avulsion fracture of anterior inferior iliac spine in a skeletally mature man; mimicking pathologic bone lesion, Eur. J. Gen. Med. 8 (1) (2011) 82–84.
[13] J.N. Metzmaker, A.M. Pappas, Avulsion fractures of the pelvis, Am. J. Sports Med. 13 (September–October (5)) (1985) 349–358.
[14] P.E. Beaule, E. Zaragoza, K. Motamedi, N. Copelan, F.J. Dorey, Three-dimensional computed tomography of the hip in the assessment of femoroacetabular impingement, J. Orthop. Res. 23 (2005) 1286–1292.
[15] B. Reider, The School-Age Athlete – Sports Medicine, 2nd ed., Saunders, Philadelphia, 1996, pp. 720–721.

[16] I. Hetsroni, L. Poultsides, A. Bedi, C.M. Larson, B.T. Kelly, Anterior inferior iliac spine morphology correlates with hip range of motion: a classification system and dynamic model, Clin. Orthop. Relat. Res. 471 (8) (2013) 2497–2503, http://dx.doi.org/10.1007/s11999-013-2847-4.

[17] B.T. Kelly, J.C. Clohisy, Open vs. arthroscopic: which is better for treating extra-articular hip impingement, AAOS Now (2014) http://www.aaos.org/news/aaosnow/jul14/clinical6.asp

[18] H. Pan, K. Kawanabe, H. Akiyama, K. Goto, E. Onishi, T. Nakamura, Operative treatment of hip impingement caused by hypertrophy of the anterior inferior iliac spine, J. Bone Joint Surg. Br. 90 (5) (2008) 677–679, http://dx.doi.org/10.1302/0301-620X.90B5.20005.