Skeletal Radiol (2004) 33:728–731
DOI 10.1007/s00256-004-0800-z

CASE REPORT

K. A. Chun
J. Morcuende
G. Y. El-Khoury

Entrapment of the acetabular labrum following reduction of traumatic hip dislocation in a child

Received: 19 February 2004
Revised: 8 April 2004
Accepted: 9 April 2004
Published online: 28 July 2004

K. A. Chun
Department of Radiology,
The Catholic University of Korea Uijongbu St. Mary's Hospital,
65–1 Kumoh-Dong, Uijongbu,
Kyunggi-Do 480–130, Korea

J. Morcuende
Department of Orthopaedic Surgery,
University of Iowa Hospitals and Clinics,
200 Hawkins Drive, Iowa City,
IA 52242, USA

K. A. Chun · G. Y. El-Khoury (✉)
Department of Radiology,
University of Iowa Hospitals and Clinics,
200 Hawkins Drive, Iowa City,
IA 52242, USA
e-mail: george-el-khoury@uiowa.edu
Tel.: +1-319-3563654
Fax: +1-319-3562220

Abstract In traumatic hip dislocation, concentric reduction can be prevented by various causes. Soft-tissue interposition, such as entrapment of the acetabular labrum, is a rare but important cause of failed reduction of a hip. Early diagnosis of incomplete reduction due to interposition of soft tissue is important, because delayed treatment is associated with a greater incidence of avascular necrosis of the femoral head and early onset of osteoarthritis. This report describes a case of acetabular labral entrapment following reduction of traumatic hip dislocation in a child. The importance of CT and MRI in arriving at an early diagnosis is emphasized.

Keywords Traumatic hip dislocation · Acetabular labrum · Entrapment · CT · MRI

Introduction

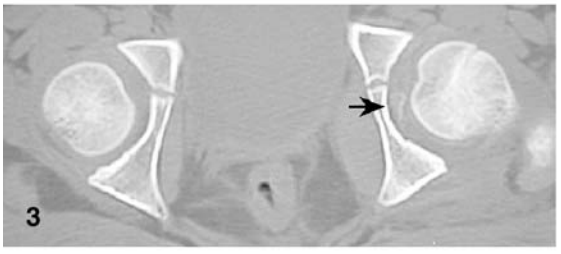
Traumatic hip dislocation in young children is an uncommon event, and only 5% of traumatic hip dislocations have been reported in patients below the age of 14 years [1]. In traumatic hip dislocation, complete reduction can be prevented by a bone fragment or rarely by soft-tissue interposition, such as acetabular labrum, joint capsule, or a ligament [2]. Review of the world literature revealed only 21 cases of acetabular labral entrapment preventing reduction of hip dislocation [2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14]. Among these, nine patients were children younger than 14 years of age [2, 6, 7, 8, 10, 11, 13]. Early diagnosis of incomplete reduction of hip dislocation due to soft-tissue interposition is important, because therapeutic delay is associated with poor results, including greater incidence of avascular necrosis of the femoral head and early onset of osteoarthritis [15].

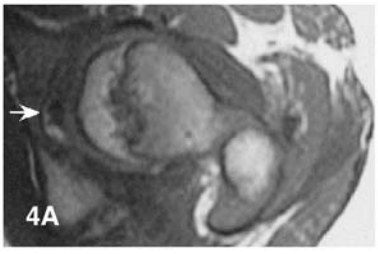
CT and MRI have been widely used in the evaluation of musculoskeletal trauma. Both modalities are useful in delineating intraarticular pathology [16, 17]. MRI has been used to demonstrate soft-tissue interposition following traumatic hip dislocation [13, 17], but either interposed soft tissue was not suspected on preoperative MRI or the interposition could not be surgically confirmed. This report describes a case of acetabular labral entrapment following reduction of traumatic hip dislocation in a child, emphasizing the CT and MR findings to arrive at an early diagnosis. To our knowledge, this report is the only surgically-confirmed case of acetabular labral entrapment diagnosed preoperatively by MRI.

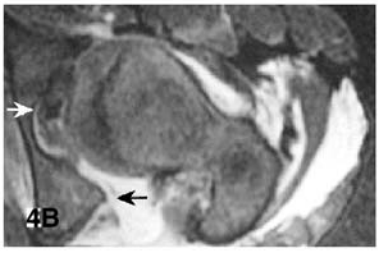
Case report

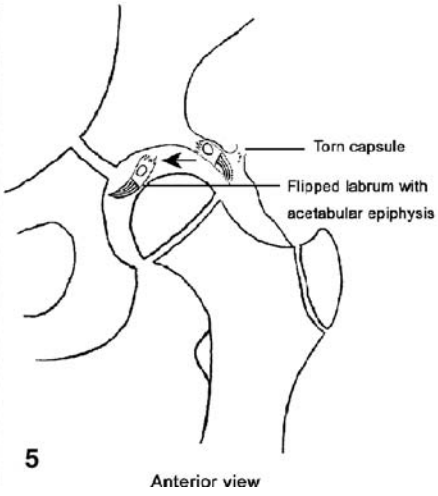
A 7-year-old girl who was riding in the front of an all-terrain vehicle was thrown off and then run over by the vehicle. The patient was taken to the local emergency room, where she was found to have posterior dislocation of the left hip. Reduction was attempted, and the patient was sent home. The patient continued to have pain, so she was referred to our hospital, where she was found to still have posterior dislocation of the left hip (Fig. 1). A closed reduction was attempted with the patient under conscious sedation.

A radiograph after reduction showed some joint-space widening (Fig. 2). A CT scan was ordered, and it revealed a thin bony fragment interposed between the femoral head and acetabulum (Fig. 3). MRI 1 day later revealed a posterior labral tear which had flipped anteriorly into the joint along with a small avulsed bony fragment from the posterior left acetabulum, which also appeared









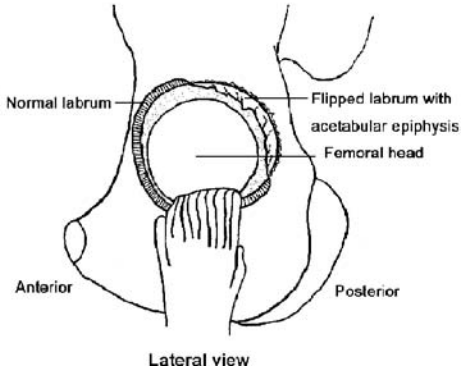


Fig. 1 Anteroposterior radiograph of the left hip shows posterior dislocation

Fig. 2 Post-reduction radiograph shows nonconcentric reduction with widening of joint space on the left

Fig. 3 CT shows a small intraarticular fragment (*arrow*) between the femoral head and acetabulum with asymmetric widening of the left joint space

Fig. 4 **A** Axial T1-weighted image shows an irregular low signal lesion (*arrow*) representing an interposed labrum with its contiguous acetabular epiphysis in the joint space. **B** Axial T2-weighted fat-saturated image shows an intraarticular interposed labrum (*white arrow*) and its contiguous acetabular epiphysis with absence of posterior acetabular labrum (*black arrow*). Note gluteus muscle injury and joint effusion. **C** Sagittal T2-weighted fat-saturated image shows disruption of posterior capsule (*black arrow*) with an intraarticular interposed labrum (*white arrow*) with an acetabular epiphysis

Fig. 5 Diagram of surgical finding shows flipped labrum and its contiguous acetabular epiphysis inside the joint from the ilium (*arrow*) with disruption of posterior capsule

connected to the torn labral fragment (Fig. 4A,B,C). In addition, there was disruption of the posterior joint capsule with formation of a hemarthrosis. Fluid also dissected between the gluteus muscles.

Three days after admission, the patient underwent an open surgical exploration of the left hip joint for removal of intraarticular fragments through a posterolateral approach. At surgery, there was soft-tissue interposition as well as interposed cartilaginous and bony fragments within the capsule, resulting from a labral tear with an acetabular epiphyseal fragment detached from the ilium which flipped into the joint (Fig. 5). The acetabular epiphyseal fragment was partially ossified. The labrum was detached between 11 o'clock and 5 o'clock, posteriorly. The posterior capsule was also torn, but the femoral head was intact. The labrum and acetabular epiphyseal fragments were reattached to the acetabular rim, and the capsular tear repaired. A post-operative radiograph revealed concentric reduction of the hip. Four months after the open reduction, the patient had no pain, and she was able to participate in physical activities without restriction.

Discussion

Traumatic dislocation of the hip in children is a rare lesion which differs in certain important respects from the same injury in adults [18]. Compared to adults, traumatic dislocations of the hip in children can arise from modest trauma due to ligamentous laxity. Associated fractures of the hip are also uncommon in children with hip dislocation. Joint laxity decreases with age, and the cartilage to bone ratio also diminishes. Hip dislocation in the older child is often associated with greater force and a greater chance of concomitant fractures. As with adults, posterior hip dislocations in children are far more common than anterior dislocations [1].

Traumatic hip dislocations are treated with immediate closed reduction, preferably within 6 hours of injury. This reduces the risk of osteonecrosis and posttraumatic osteoarthritis [19, 20]. Nonsurgical treatment is desirable, since open surgical reduction may result in vascular injury to the femoral head or late development of osteoarthritis. A review of the literature revealed that approximately 7% of traumatic hip dislocations in children require open reduction [18, 20].

Various causes have been implicated in blocking concentric reduction following traumatic hip dislocation without apparent fracture. Soft-tissue interpositions such as muscle, tendon, labrum, a portion of the capsule, ligamentum teres, and intraarticular hematoma have all been implicated in the failure of closed reduction [17, 21]. The entrapped tissues may be difficult to detect in children due to incomplete ossification of the hip [7]. An entrapped labrum is a rare cause for failure of reduction. When the acetabular labrum is caught between the femoral head and acetabulum, successful closed reduction is impossible. The labrum and hip capsule attach directly to the acetabular epiphysis, which is a large secondary ossification center of the ilium that forms a major portion of the acetabular rim [22]. Entrapment of the acetabular epiphysis and its adjacent labrum have also been recognized as causes of nonconcentric reduction following hip dislocation [6, 7]. Similar entrapment rarely occurs with anterior dislocation [7, 9].

In the radiologic evaluation of hip dislocation, it is essential that high-quality anteroposterior and lateral radiographs of both hips be examined for joint incongruity. This should be suspected if a break in Shenton's line is observed, or if the femoral head does not locate concentrically within the acetabulum [2]. Asymmetric widening of the joint space could be the only indication of soft-tissue interposition on radiography after attempted reduction of the hip dislocation. Such joint asymmetry should be evaluated by further imaging studies [15, 20].

CT has proved to be the best modality for detecting cortical disruptions, and it is very helpful for visualizing a small bony fragment which radiography fails to detect. CT is sometimes helpful in the detection of noncalcified intraarticular fragments after reduction and in demonstrating incongruity [16, 23]. MRI is superior to CT in demonstrating entrapped cartilage, acetabular labrum, muscle, and ligaments. In addition, MRI can discriminate between an intraarticular acetabular epiphysis and its attached labrum, versus only bony fragments by CT. MRI can also effectively demonstrate muscle injuries and capsular tears which invariably accompany traumatic dislocation of the hip. In the follow-up of patients with previous hip dislocation, MRI also is helpful in detecting osteonecrosis of the femoral head [17]. Visualization of a lesion of low signal intensity in the joint space between the femoral head and acetabulum, with irregularity or absence of the labrum from its normal position, on MRI is diagnostic of acetabular entrapment. In the past, arthrography and CT arthrography were useful in identifying traumatic capsular defects or detachment of acetabular labrum [23]. Currently, MRI is the technique of choice when entrapped soft tissues are suspected of obstructing concentric reduction of a dislocated hip in a child.

References

1. Salisbury RD, Eastwood DM. Traumatic dislocation of the hip in children. Clin Orthop 2000; 377:106–111.
2. Canale ST, Manugian AH. Irreducible traumatic dislocations of the hip. J Bone Joint Surg Am 1979; 61:7–14.
3. Paterson I. The torn acetabular labrum: a block to reduction of a dislocated hip. J Bone Joint Surg Br 1957; 39:306–309.
4. Dameron TB. Bucket-handle tear of acetabular labrum accompanying posterior dislocation of the hip. J Bone Joint Surg Am 1959; 41:131–134.

5. Matsubara T. A study of traumatic dislocation of the hip joint: analysis of the managements from the clinical features. J Jpn Orthop Assoc 1970; 44:995–1013.
6. Sandor L, Nyirady L, Jokai I. Traumatic hip luxation in children—curling of the acetabular edge as impediment to reduction. Beitr Orthop Traumatol 1979; 26:32–37.
7. Shea KP, Kalamchi A, Thompson GH. Acetabular epiphysis–labrum entrapment following traumatic anterior dislocation of the hip in children. J Pediatr Orthop 1986; 6:215–219.
8. Glynn TP, Kreipke KL, DeRosa GP. Computed tomography arthrography in traumatic hip dislocation. Skeletal Radiol 1989; 18:29–31.
9. Hall RL, Scott A, Oakes JE, Urbaniak JR, Callaghan JJ. Posterior labral tear as block to reduction in an anterior hip dislocation. J Orthop Trauma 1990; 4:204-208.
10. Olsson O, Landin LA, Johansson A. Traumatic hip dislocation with spontaneous reduction and capsular interposition. Acta Orthop Scand 1994; 65:476–479.
11. Hamilton PR, Broughton NS. Traumatic hip dislocation in childhood. J Pediatr Orthop 1998; 18:691–694.
12. Takahashi E, Imaizumi H, Matubara Y, Koike Y. The traumatic dislocation of the hip which was irreducible by ruptured limbus; 2 case reports. J Orthop Surg East-North Regional Jpn 1999; 43:78–80.
13. Price CT, Pyevich MR, Knapp DR, Phillips JH, Hawker JJ. Traumatic hip dislocation with spontaneous incomplete reduction: a diagnostic trap. J Orthop Trauma 2002; 16:730–735.
14. Kim YT, Ninomiay S, Tachibana Y, Tanabe T, Yano Y. Acetabular labrum entrapment following traumatic posterior dislocation of the hip. J Orthop Sci 2003; 8:232–235.
15. Burgos J, Gonzalez-Herranz P, Ocete G. Traumatic hip dislocation with incomplete reduction due to soft tissue interposition in a 4-year-old boy. J Pediatr Orthop 1995; 4:216–218.
16. Sauser DD, Billimoria PE, Rouse GA, Mudge K. CT evaluation of hip trauma. AJR Am J Roentgenol 1980; 135:269–274.
17. Laorr A, Greenspan A, Anderson MW, Moehring HD, Mckinley T. Traumatic hip dislocation: early MRI findings. Skeletal Radiol 1995; 24:239–245.
18. Funk FJ. Traumatic dislocation of hip in children. J Bone Joint Surg Am 1962; 44:1135.
19. Yang RS, Tsuang YH, Hang YS, Liu TK. Traumatic dislocation of the hip. Clin Orthop 1991; 265:218–227.
20. Mehlman CT, Hubbard GW, Crawford AH, Roy DR, Wall EJ. Traumatic hip dislocation in children: long-term follow-up of 42 patients. Clin Orthop 2000; 376:68–79.
21. Slatis P, Latvala A. Irreducible traumatic posterior dislocation of the hip. Injury 1974; 5:188–193.
22. Ponseti IV. Growth and development of the acetabulum in the normal child. J Bone Joint Surg Am 1978; 60:575–585.
23. Klein A, Sumner TE, Volberg FM, Orbon RJ. Combined CT-arthgrography in recurrent traumatic hip dislocation. AJR Am J Roentgenol 1982; 138:963–964.