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Case Report

Acetabular labral entrapment following spontaneous nonconcentric reduction of posterior hip dislocation in a child [☆]

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ABSTRACT

Traumatic pediatric hip dislocations are uncommon and can occur following minor trauma. This injury may be overlooked, as pediatric hip dislocations can reduce spontaneously prior to medical attention. In this scenario, the presenting hip radiographs may provide evidence of a prior transient hip dislocation episode by demonstrating signs of a nonconcentric hip reduction, and prompt further evaluation with advanced imaging. We present a rare case of a traumatic posterior hip dislocation with spontaneous nonconcentric reduction in a child. CT and MRI revealed a block in concentric reduction by the avulsed and entrapped posterior acetabular labrum and contiguous epiphyseal fragment. This case highlights the imaging characteristics of this rare injury, and the importance of early diagnosis to guide surgical management.

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Introduction

Traumatic hip dislocation is an uncommon injury in children, with only 5% of hip dislocations occurring in patients younger than 14 years old [1]. Hip dislocations in children can occur following low-impact injuries, including during childhood play, sports activities, and low-height falls [2–4]. In fact, studies by

Vialle et al. and Mehlman et al. found that the majority of pediatric hip dislocations occurred following low-impact trauma, at 52% and 64% of dislocation cases respectively [3,4]. The low force needed to produce a hip dislocation is especially true in the younger child (2 to 8 years of age) [5]. Additionally, concomitant acetabular fractures are seen in the minority of pediatric hip dislocations [4]. These characteristics are in contradistinction to adult hip dislocations, which typically

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require high-impact trauma and coexisting acetabular fractures are common. These differences are attributed to the laxity and unossified bones of the pediatric hip [2–4].

Traumatic pediatric hip dislocations with spontaneous reduction have rarely been described in the literature [6,7]. This injury can be overlooked clinically as the trauma history may be mild and the hip is grossly reduced at presentation. However, the presenting radiographs may demonstrate findings of a nonconcentric hip reduction including asymmetric joint space widening, and raise the possibility of a prior transient hip dislocation episode. Identifying this radiographic abnormality is important because a nonconcentric hip reduction requires further evaluation with advanced imaging to determine the cause, and surgical treatment is usually required. Timely recognition and treatment of a nonconcentric hip reduction is crucial in alleviating pain, restoring joint stability, and possibly reducing the risk of serious complications such as femoral head avascular necrosis (AVN) and early osteoarthritis [2,6,8].

We report a rare case of a transient posterior hip dislocation with spontaneous nonconcentric reduction in a 9-year-old child following low-impact trauma. Presenting radiographs demonstrated subtle but critical findings of nonconcentric reduction, with subsequent CT and MRI revealing an entrapped acetabular labrum and epiphyseal fragment. This case highlights the important role of multimodality imaging in the diagnosis of this serious, and potentially overlooked injury.

Case report

A 9-year-old boy, who was jumping to reach the top of a door frame, slipped upon landing and ended up in the splits position. He had immediate pain in his left hip and was evaluated soon after at a local facility. AP pelvic radiograph at presentation (Fig. 1) revealed asymmetric widening of the left hip joint space compared to the right hip, raising concern for intra-articular hip pathology. Left hip CT done the next day (Fig. 2) revealed a small linear intra-articular osseous fragment in the hip joint space medially with resultant joint space widening. Subsequent left hip MRI (Figs. 3 and 4) done 2 days postinjury demonstrated a torn posterior labrum that was avulsed from the posterior acetabular rim and flipped anteriorly, entrapped in the medial joint space. The avulsed labrum was associated with the small osseous fragment identified on the earlier CT, compatible with a fragment of acetabular epiphysis. There was also a tear of the posterior hip joint capsule and corresponding posterior soft tissue edema. Constellation of findings were consistent with a transient posterior hip dislocation with spontaneous nonconcentric reduction. The nonconcentric reduction was due to the avulsed and entrapped posterior acetabular labrum and contiguous epiphyseal fragment.

Seven days after the original injury, the patient was referred to our institution and continued to endorse pain with hip motion. The following day, he was taken for open reduc-



Fig. 1 – Presenting AP pelvic radiograph demonstrates subtle widening of the left hip joint space compared to the right hip.

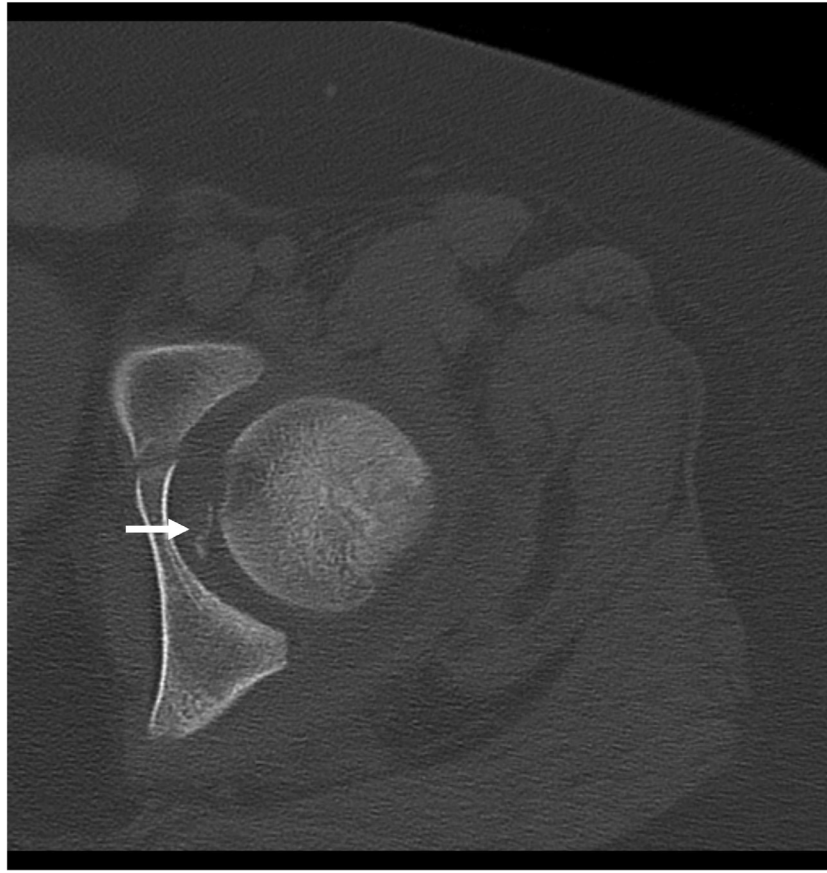


Fig. 2 – Axial CT scan of the left hip demonstrates a small intraarticular osseous fragment interposed between the femoral head and the acetabulum (white arrow). Also noted is abnormal joint space widening, as well as absence of the posterior rim of the left acetabulum, which represents the donor site of the interposed fragment.

tion of the left hip. Intraoperatively, the diagnosis of labral and osseous entrapment was confirmed. The posterior labrum was torn from the 2 o'clock to the 5 o'clock position and pulled into the joint space along with a fragment of the posterior acetabular epiphysis and articular cartilage. Findings were in keeping with a prior posterior hip dislocation, with the femoral head avulsing the posterior labrum and acetabular epiphyseal fragment into the joint space upon spontaneous femoral head reduction. These components were all removed from the joint space and the frayed, torn portions of the surrounding labrum were sharply excised. Anatomic concentric reduction was then achieved and confirmed on the postoperative radiograph (Fig. 5). The patient's pain was much improved postoperatively, and he was discharged on post-op day 1 with toe touch weight bearing restrictions and crutches. On 1 month follow-up, he reported no continued pain and was able to advance weight bearing as tolerated over the following weeks.

Discussion

Traumatic pediatric hip dislocations are uncommon and can occur following low-impact trauma [3–5]. The diagnosis is

straightforward when the child presents dislocated, however, the diagnosis can be difficult if the hip spontaneously reduces prior to medical attention. Price et al. [6] reported 3 cases of traumatic pediatric hip dislocations presenting with spontaneous nonconcentric reduction. The presenting radiographs of each case demonstrated abnormal asymmetric hip joint space widening, but the diagnosis was missed in all 3 cases and treatment was delayed. All cases eventually required surgical open reduction to remove interposed labrum and capsule in order to achieve concentric reduction and alleviate the patient's symptoms [6].

Pelvic and hip radiographs are the initial imaging study when evaluating a pediatric patient with traumatic hip pain. Every radiograph should be evaluated for hip joint congruency, regardless of any provided history of dislocation. Asymmetric joint space widening or disruption in Shenton's line may be the only clue for a nonconcentric hip joint reduction and should prompt advanced imaging to assess for possible interposed tissue [2,4].

Interposition of soft tissue or osseous components can block a concentric hip reduction, including interposed muscle, tendon, labrum, joint capsule, and osseous or chondral fragments [2,3,9,10]. In our case, nonconcentric hip reduction was due to an avulsed and entrapped posterior labrum with corresponding acetabular epiphyseal fragment, which has been

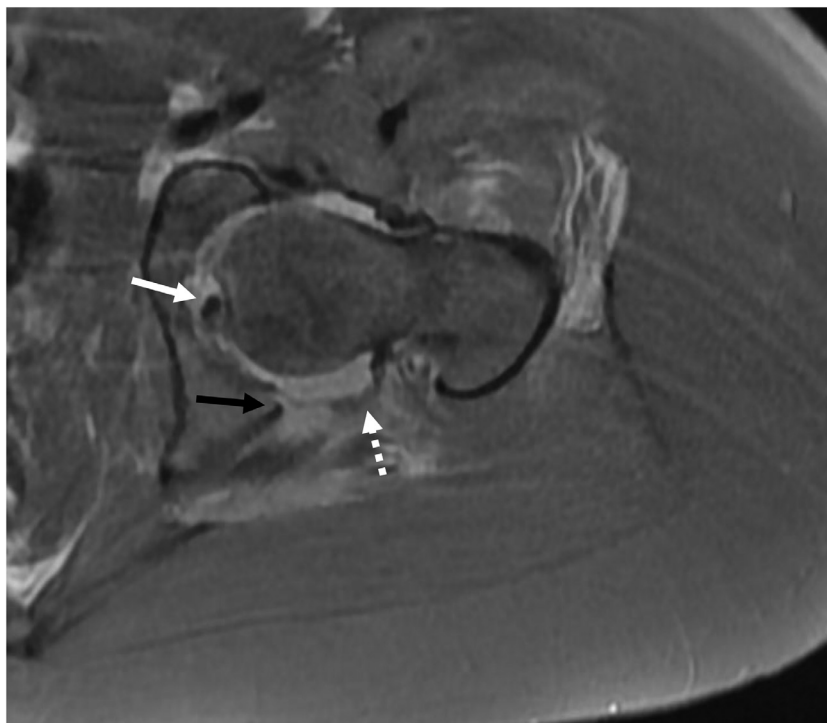


Fig. 3 – Axial proton-density fat saturated MRI of the left hip demonstrates low-signal intensity tissue consistent with the avulsed posterior labrum and contiguous acetabular epiphyseal fragment entrapped between the femoral head and acetabulum (white arrow). Note the absence of labral tissue at the posterior acetabular rim (black arrow) and the torn posterior capsule (dashed white arrow).

rarely described [2]. In children, the labrum attaches directly to the acetabular epiphysis, which does not fuse until the age of 13 [11,12]. This anatomy offers the potential for an acetabular epiphyseal fragment to be avulsed along with the posterior labrum.

Advanced imaging with CT or MRI can help identify potential interposed tissue in a nonconcentric hip reduction. CT is excellent for identifying intra-articular osseous fragments, can assess joint space symmetry, and is readily available in the emergency department [13]. However, CT is inferior to MRI in evaluating for soft tissue interposition, including entrapped labrum or intra-articular chondral fragments [12,14]. As in our case, an entrapped labrum on MRI will appear as low signal intensity tissue interposed in the joint space, with corresponding absence of labral tissue at its typical location. A recent retrospective review by Thanacharoenpanich et al. included a cohort of patients with prior hip dislocations who received both postreduction MRI and CT. Cases of entrapped labrum were all identified by MRI, but none could be seen by CT. Additionally, all patients with entrapped labrum in this study underwent surgery to achieve concentric reduction, with the authors stating MRI strongly impacted surgical decision making [12]. Thanacharoenpanich et al. and others recommend obtaining a postreduction MRI in all cases of pediatric hip dislocation [12,14].

In our case, the CT and MRI were complementary—the MRI revealed the soft tissue injury and the CT best depicted the osseous component. While there is not a clear indication for the

use of CT in these cases, CT may be ordered by clinical or surgical providers during the patient work-up and does provide excellent identification of any intra-articular osseous fragments. This case highlights that an intra-articular osseous fragment on a postreduction CT may be the “tip of the iceberg”, and can alert the Radiologist to a potential associated labral avulsion that would be better evaluated by MRI. Ultimately, we believe MRI is the best individual study in the evaluation of a nonconcentric hip reduction. However, Radiologists may encounter CT scans of this injury and should also be familiar with the potential CT findings.

Nonconcentric hip reductions with entrapped tissue typically requires surgical removal of the interposing tissue in order to restore joint congruency. An open hip arthrotomy is a familiar approach and exposure for orthopedic surgeons, and was the elected approach in this case and similar cases in the literature [2,6,7]. Hip arthroscopy is an option, but requires access to a hip arthroscopy-trained specialist. Surgical achievement of concentric reduction should be done in a timely manner to alleviate pain, restore joint stability, and possibly reduce the risk of serious complications, including femoral head AVN and early osteoarthritis [2,8]. Therefore, an early and accurate imaging diagnosis is vital.

AVN is a potential serious complication following a pediatric hip dislocation, and a delay in hip reduction is the only statistically proven risk factor for AVN [4,15,16]. Because the risk of AVN is time dependent, traumatic hip dislocations require urgent reduction. The risk of AVN following a

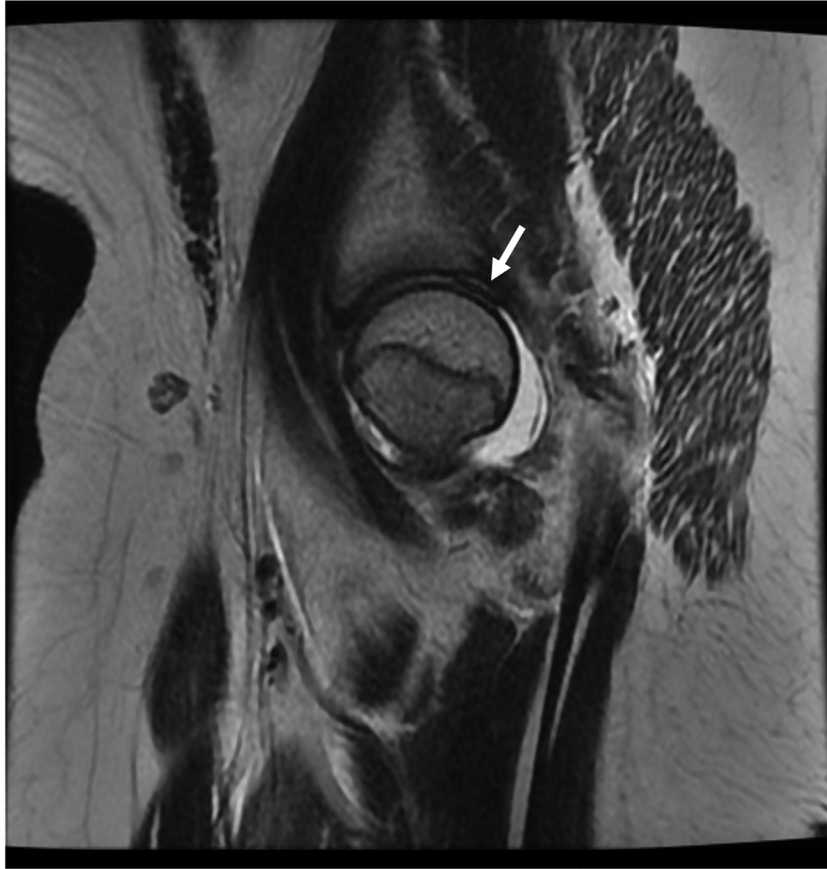


Fig. 4 – Sagittal T2-weighted MRI demonstrates the torn posterior labrum and contiguous acetabular epiphysis interposed between the femoral head and acetabulum (white arrow). A joint effusion is also present.



Fig. 5 – Postoperative radiograph demonstrates concentric reduction of the left hip.

nonconcentric hip reduction with interposed tissue is unclear, as this is a rare injury and there are no known studies specifically evaluating AVN in this setting. However, given what is known regarding hip dislocations and AVN, orthopedic surgeons generally consider a nonconcentric reduction to be an urgent surgical issue. MRI is highly sensitive and specific in diagnosing AVN, and some have advocated obtaining an MRI 2 to 3 months following a pediatric hip dislocation episode to screen for AVN [15]. However, there is no consensus on follow-up imaging, and obtaining a follow-up MRI based on the patient's clinical symptoms or radiographic findings is also reasonable.

In conclusion, this is a rare case of a traumatic pediatric hip dislocation with spontaneous nonconcentric reduction due to an entrapped labrum and acetabular epiphyseal fragment. This serious injury could be overlooked clinically and radiographically. Asymmetric joint space widening on the presenting hip radiographs may be the primary clue for a transient hip dislocation episode and should prompt advanced imaging if present. MRI is the preferred imaging modality to further evaluate a nonconcentric reduction, however CT can also provide valuable information. An early and accurate diagnosis is important to guide surgical management.

Patient consent

The complete written informed consent was obtained from this patient for the publication of this article and the accompanying images.

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