

Case Report

Post-traumatic acetabular dysplasia following pelvic fracture malunion associated with an acetabular labral tear: A case report and literature review

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ABSTRACT

Residual acetabular dysplasia has been reported to be the pre-arthritis condition of the hip due to abnormal joint force during the normal physiological load that leads to an acetabular labral tear. This report shows the sequelae of a malunited acetabulo-pelvic fracture that resulted in hip dysplastic morphology and may be the cause of subsequent acetabular labral tears. The under-coverage or the dysplastic alignment of the pelvis after treatment of the fracture should be of concern for a secondary acetabular labral tear of the hip.

Introduction

Acetabular and pelvic fractures are life-threatening injuries that require immediate resuscitation and management. In hemodynamically stable patients with stable fracture configurations, conservative treatment is the most common treatment method that leads to good to excellent treatment outcomes. Intact posterior pelvic rings and congruent configurations of the acetabulum are generally accepted for non-operative management after acetabular and pelvic injuries. Conservative management consists of bed rest, skeletal traction, and the use of balance-traction suspension equipment.

Residual acetabular dysplasia has been reported to be the pre-arthritis condition of the hip due to abnormal joint force during normal physiological load. With the increase of the vertical slope of the acetabulum, this results in the hip joint force having a greater shearing vector to the acetabular labrum and leads to acetabular labral pathologies. The labrum supports about 1–2% of the total load applied across the hip joint under the simulation of normal walking with the center of the femoral head achieving equilibrium near the center of the acetabulum. In congenital dysplasia of the hip (CDH), it has been shown that the equilibrium achieved is at the lateral edge of the acetabulum and the labrum supports the load as much as 4–11% of the total load applied across the joint [1].

In the presence of dysplastic configurations of the acetabulum (a central-edge angle of Wiberg less than 25° or the Tönnis angle greater than 10°), the early detection and surgical correction of the malalignment with a procedure of periacetabular osteotomy or rotational acetabular osteotomy may prevent further tears of the labrum and prevent osteoarthritic changes in the affected hip [2,3].

The complications of pelvic fracture malunion have been reported and these include the persistence of pain, instability, impairment of gait, impotence, and incontinence [4]. From literature reviews, there were no reports of acetabular labral tears associated with the acetabulum or pelvic malunion. This report shows the sequelae of the malunited pelvic fracture that may lead to acetabular labral tears that can result from abnormal shearing forces to the hip joint.

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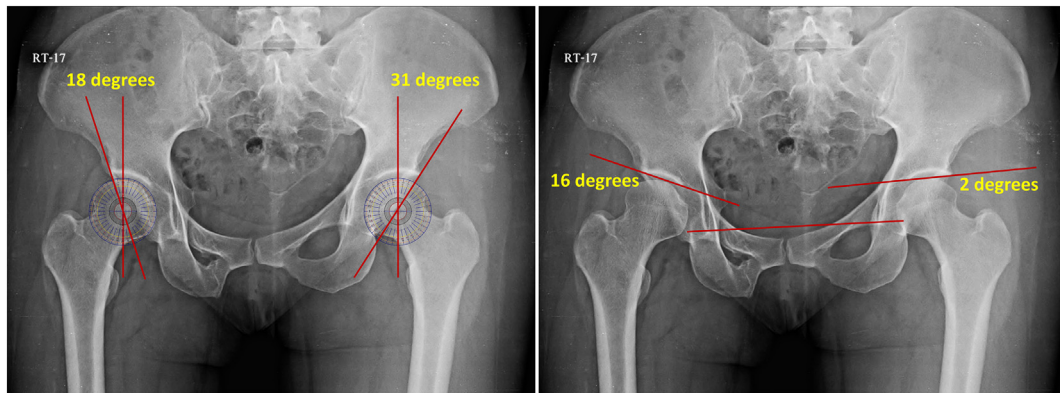


Fig. 1. Plain radiograph of both hips in the anterior-posterior (AP) view. The central-edge angle (CEA) of Wiberg is 18° of the right hip compared to 31° in the left hip. The Tönnis angle of the right hip is 16° compared to 2° in the left hip.

Case report

A 49-year-old right-handed female, a housewife, presented with right hip and groin pain for 4 months. She had no recent trauma prior to the pain. She had no underlying disease or risk of avascular necrosis of the hip. She had a history of a pelvic fracture resulting from a car accident when she was 20 years of age and was treated conservatively with bed rest and medications. Her hip and groin functioned well after union of the pelvis.

Physical examination revealed an antalgic gait without Trendelenburg sign. She had equal lengths of the lower limbs. The C-sign was presented with mild tenderness of the right anterior groin. Passive hip range of motion revealed flexion/extension at 150/0/20°, internal rotation/external rotation was 15/0/60° and abduction/adduction was at 60/0/20°. The FADDIR and FABER tests were positive. The resisted straight leg raise test was slightly positive. No labral click was detected. The hip abduction power was of grade V. She had a normal neurological examination of the lower limbs without any signs or symptoms of spinal problems.

Plain radiographs of the hip in an anterior-posterior (AP) view revealed dysplastic parameter of the right hip with evidence of a healing fracture of superior and inferior pubic rami at the right hip with no significant cam deformity of the femoral head (The ideal true AP pelvic radiograph as the coccyx and symphysis pubis are in a straight line could not be achieved due to malalignment and deformity of the pelvic ring) (Fig. 1). The magnetic resonance imaging (MRI) of the right hip showed an anterosuperior labral tear (Fig. 2).

The patient was treated conservative with activity modification and oral medications without improvement for 3 months. An intraarticular injection was performed using 40 mg (1 ml) of triamcinolone combined with 5 ml of 1% xylocaine without adrenaline, under fluoroscopic guidance. The visual analog scale (VAS) was improved from 8/10 to 2/10 at the first 3 months post diagnostic-therapeutic injection. The pain returned about fourth months post injection. The treatment options included; arthroscopic debridement, arthroscopic labral refixation, periacetabular osteotomy and total hip replacement were discussed. Following comprehensive discussion, the patient decided to do arthroscopic examination and labral refixation of the right hip.

The patient was positioned supine using a radiolucent, traction table. The arthroscopic examination of the peripheral compartment from the proximal anterolateral viewing portal revealed a small cam deformity of the femoral head-neck junction and loss of the labral seal at the anterolateral aspect the femoral head (Fig. 3). The compression and flip test was positive (Fig. 4) indicating an

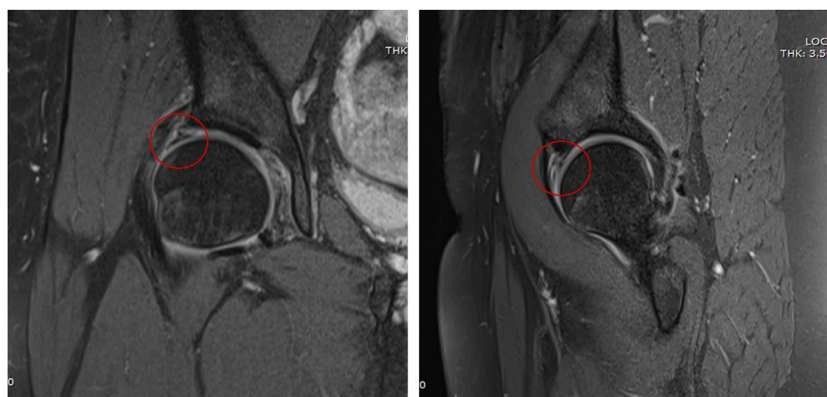


Fig. 2. The coronal and sagittal T2-weight MRI of the right hip reveals an anterosuperior labral tear without significant chondral damage (the red circle). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



Fig. 3. The arthroscopic view of the right hip from the proximal anterolateral viewing portal, the hip was flexed approximately 20° and revealed a small area of the cam deformity of the femoral head (A) and the loss of the labral seal effect around the anterolateral aspect of the femoral head (black arrow).

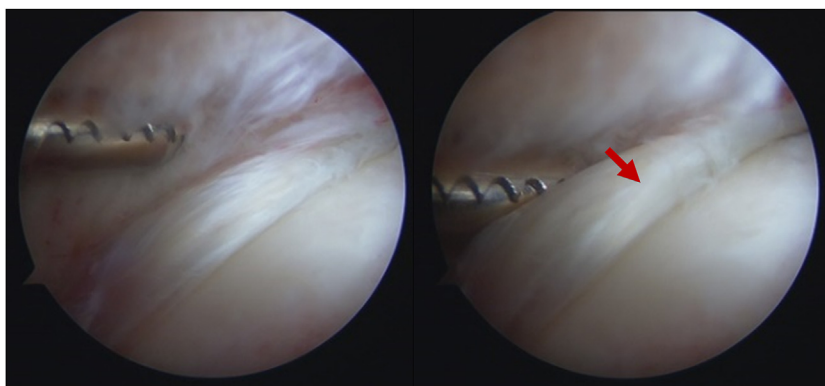


Fig. 4. The compression and flip test of the anterosuperior labrum showed a positive test that the labrum edge was eased to evert under compressive force (red arrow). (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)

indirect sign of a labral tear [5]. After limited rim trimming of anterosuperior aspect of the acetabulum, the 1–3 o'clock aspects of the labrum were re-fixed using three double-load suture anchors (SUTUREFIX, Smith&Nephew) in the 3, 2, and 1 o'clock positions with looping around the rest of the labrum (Fig. 5). The cartilage condition of the acetabulum and femoral head were normal. Without the inter-portal capsulotomy so that the capsular closure was not been performed.

Restricted weight bearing with a toe-touch gait was advocated for the first 6 weeks post-operative using axillary crutches. Early active and passive hip range of motion was encouraged immediately post-operative. Weight bearing was increased after 6 weeks post-operative until 8 weeks to full weight-bearing without a gait-aid. There was no heterotrophic ossification prophylaxis used after surgery.

Clinical symptoms were improved after 6 months post-operative. VAS was improved from 7/10 to 2/10 at 12- and 24-months following surgery. The modified Harris Hip Score was improved from 72.6 preoperative to 92.4 at 24 months post-operative. The post-operative range of motion of the right hip revealed flexion/extension at 150/0/20°, internal rotation/external rotation was 20/0/60°, and abduction/adduction was at 60/0/20°. The plain radiographs of AP and frog leg views of the hip approximately 2 years after the operation revealed no significant osteoarthritic changes from the pre-operative radiographs (Fig. 6).

Discussion

There are many complications or sequelae of acetabular and pelvic fracture malunions that include; the persistence of pain, instability, impairment of the gait, impotence, and incontinence. Congruity of the hip joint with stability of the fracture configuration is acceptable for non-operative management with good long-term outcomes [6].

Residual acetabular dysplasia has been reported to be the pre-arthritis condition of the hip due to abnormal joint forces during normal physiological loads that can lead to acetabular labral tears [1–3]. Dysplastic hips with labral tears have treatment options that include non-operative management (medication, activity modification, strengthening exercises for the hip abductor and core muscles) and surgical management. In the dysplastic hip (CEA less than 20° and Tönnis angle more than 15°) without osteoarthritic changes of the hip, treatment options are osteotomy of the acetabulum that include; periacetabular osteotomy (PAO) [2], rotational acetabular osteotomy [3], or shelf acetabuloplasty [7]. These have shown to have good post-operative results and good long-term outcomes, with or without concomitant acetabular labral repair. The arthroscopic labral repair alone has limited results due to the persistent, abnormal shearing forces of the hip after surgery and might lead to the re-tearing of the repaired-labrum. The predisposing

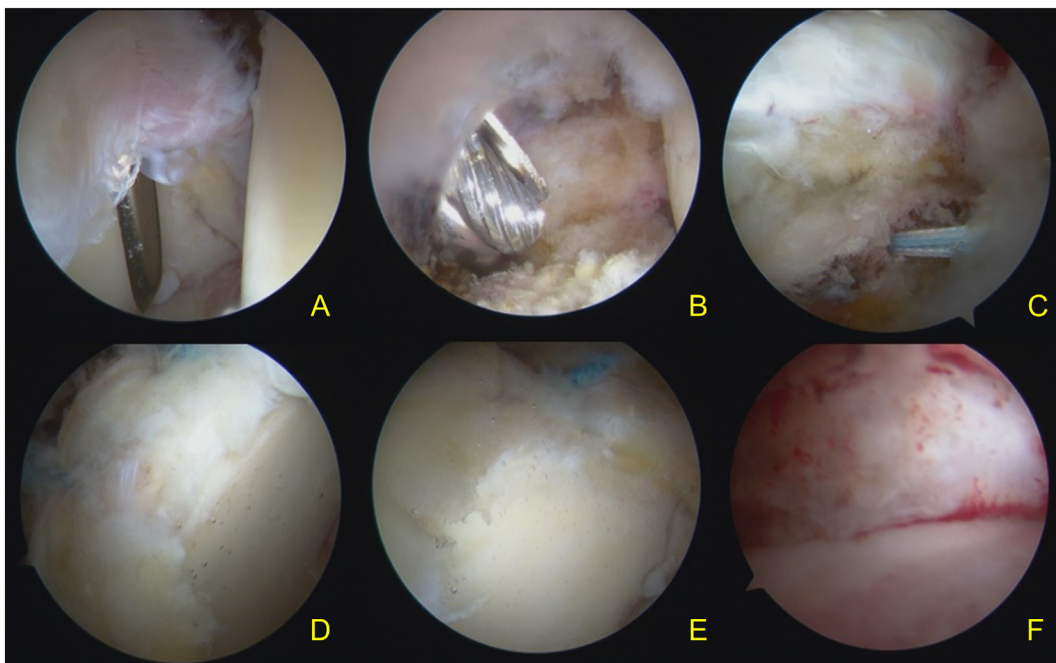


Fig. 5. The arthroscopic view of the right hip, central compartment under traction from the anterolateral viewing portal. The labral tear was identified and detached (A), limited acetabular rim trimming (B), anchor placement (C) and the labral re-fixation was performed (D, E). The sealing of the labrum was observed after labral repair (F).



Fig. 6. Plain radiographs of the AP and frog leg view of the both hips 2 years post-operative revealed no significant changes compared to the pre-operative radiographs of the right hip. This included the degree of osteoarthritis and overall alignment of the hip joint.

factor for poor results following acetabular osteotomy include; pre-operative joint space width less than 2 mm, incongruence of the hip joint space and an age of more than 25 years [8,9]. In advanced osteoarthritic changes of the hip, total hip replacement is the appropriated treatment option either in normal or dysplastic morphologies of the hip.

The patient in this report had history of a right acetabular or pelvic fracture and had been treated conservatively. Her right hip functioned well after the fracture united. The physical examination and the radiographic evaluation of the right hip revealed an acetabular labral tear with dysplastic morphology of the right acetabulum that may have resulted from an acetabular or pelvic fracture malunion. These malunited-fractures might be the cause of subsequent anterosuperior labral tears. The left hip revealed normal function and configuration without obvious dysplastic morphologies, cam morphology of the femoral head-neck or pincer type of the acetabulum. Her right hip had a temporary response with an intra-articular steroid injection lasting for several weeks. Steroid injections have shown no benefits for the patient with acetabular labral tears in long term treatments. Only 6% of the acetabular labral tear patients reported significant pain relief 6 weeks after the injection [10]. We had comprehensively discussed with the patient regarding the possible treatment options (including non-operative treatment, arthroscopic labral repair alone, arthroscopic labral repair with stage PAO, PAO alone, total hip replacement in the later stage of her hip condition). The patient decided on an arthroscopic labral repair with stage PAO and her clinical condition improved after the arthroscopic labral repair alone. As a result, she decided to do labral repair without subsequent PAO and preferred the total hip replacement if her hip had progressed to advanced osteoarthritis. This is the first report about the consequences of acetabular or pelvic malunion that may lead to symptomatic acetabular labral tears.

Conclusion

The malunion of acetabular or pelvic fractures that result in hip dysplastic morphology may be caused by abnormal load on the hip joint and leads to acetabular labral tears. The under-coverage or the dysplastic alignment of the pelvis after fracture treatments should be of concern for secondary acetabular labral tears of the hip.

Conflict of interest

The authors declare that there is no potential conflict of interest relevant to this article.

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