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Case Report

Pipkin IV fracture dislocation of the hip in a football athlete – A case report

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ABSTRACT

Pipkin type IV fracture dislocation of the hip is a rare, high-energy injury, that is associated with poor functional outcomes and complications. We report a case of a 20-year old male quarterback who sustained a Pipkin type IV fracture dislocation during a football game. He underwent immediate closed reduction, transfer to a Level I trauma centre, surgical management, and progressive rehabilitation. Clinical and radiographic assessments were carried out periodically for 1 year. At 10 months post-injury, the athlete returned to full-time play as the starting quarterback of his University football team. He completed a pain-free season at 1-year post-injury. Clinical and radiographic evaluations demonstrated appropriate healing with no complications. Despite the high-energy and often devastating nature of Pipkin Type IV injuries, this case report demonstrates that prompt, appropriate management and rehabilitation of this injury in a University quarterback led to positive functional outcomes. Further studies on the treatment and outcomes of this rare sport injury are needed to optimize management.

Introduction

Pipkin type IV fractures are uncommon injuries characterized by fractures of the femoral head and acetabulum in the setting of a hip dislocation [1,2]. The injury mechanism is often high-energy, with few documented cases from sports [1,3]. Notably, Pipkin IV fractures are associated with poor functional outcomes and complications [3–6]. While there have been reported cases of hip dislocations in football, none were associated with both femoral head and acetabular fractures [7,8]. Given the paucity of literature on Pipkin IV fractures, the treatment and rehabilitation protocol is heterogeneous, with limited data on optimal management. Therefore, the purpose of this case report is to describe the treatment and outcomes of a 20-year-old varsity football quarterback who sustained this rare injury. Ethical approval was waived in accordance with the institutional research ethics board. Informed consent for publication was obtained from the patient.

Case presentation

A 20-year-old male quarterback for a University varsity football team was tackled by another player in the first quarter, injuring his

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Fig. 1. AP and lateral X-rays demonstrating posterior fracture dislocation of the right hip.

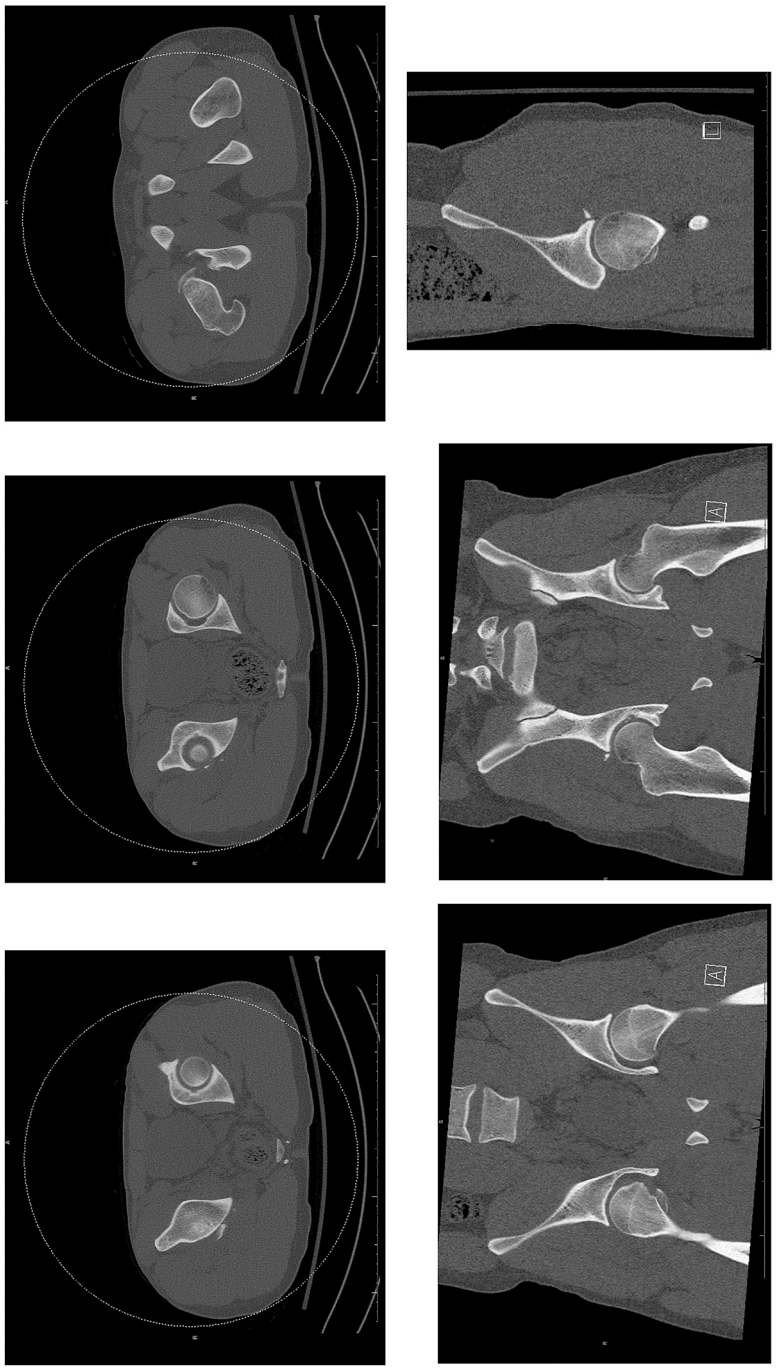

Fig. 2. Axial, coronal and lateral select CT cuts of the pelvis post right hip reduction.

Fig. 3. AP and Judet views of the pelvis at 2 weeks post-op demonstrating congruent right hip joint and hardware in place.

Fig. 4. AP and Judet views of the pelvis at 4 months post-op demonstrating well-reduced right hip joint, maintained hardware, mild heterotopic ossification, and no evidence of avascular necrosis of the femoral head.

right lower extremity. He was found to have a right posterior hip dislocation upon assessment by the team surgeon. A closed reduction was performed on the sideline. Neurovascular status was intact before and after reduction. However, the hip remained unstable and required two further reductions. He was subsequently transferred to a Level I trauma centre for further investigations and management.

X-rays of the pelvis demonstrated a posterior fracture dislocation of the right hip (Fig. 1). Under conscious sedation, he underwent closed reduction of the hip and was placed in a knee immobilization splint with the hip and knee in extension. CT of the pelvis post-reduction demonstrated comminuted fractures of the femoral head and a fracture of the posterior acetabular wall (Fig. 2), consistent with a Pipkin IV injury [1,2]. He was admitted to hospital and underwent surgical management one day post-injury.

Surgical management

The patient was positioned lateral decubitus. A Gibson approach to the right hip was utilized, along with a greater trochanter digastric osteotomy. The damaged portions of the gluteus minimus muscle were debrided. The posterior wall acetabular fracture was visualized, with detached labrum noted to be attached to the fracture. Anterior surgical dislocation of the hip was performed. Free comminuted chondral cancellous fragments were removed from the acetabulum. The femoral head fracture was fixed with two 3.0 mm partially-threaded headless compression screws. The infra-foveal femoral head was microfractured using multiple 2.5 mm drill holes in the region where there was unreconstructible chondral injury. The hip was reduced. Primary repair of the labrum was performed using two suture anchors.

A 3-hole 1/3 tubular plate was utilized as a spring plate over the small posterior wall fragment, secured with a 3.5 mm cortical screw. A 7-hole posterior wall reconstruction buttress plate was then contoured and applied across the spring plate. The greater trochanteric osteotomy was reduced and secured using 4.5 mm and 3.5 mm cortical screws. Fluoroscopy images demonstrated appropriate reduction and implant placement. Piriformis and external rotator tendons were repaired through bone tunnels. Soft tissues were repaired and closed accordingly.

Rehabilitation

Postoperatively, the patient was restricted to foot-flat weightbearing to the right lower extremity, no more than 70 degrees of hip flexion, and no hip adduction or internal rotation past neutral for 6 weeks. 6 weeks of DVT prophylaxis with enoxaparin in hospital and ASA 81 mg PO BID upon discharge was prescribed. The patient was discharged from hospital at 1-week post-surgery. X-rays at 2 weeks post-op demonstrated hardware in place with congruent hip joint (Fig. 3).

At 6 weeks post-op, X-rays of the right hip demonstrated healed greater trochanter osteotomy and some disuse osteopenia of the femoral head. He was cleared to start progressive weightbearing as tolerated with 25 % weight increase weekly until full weight-bearing in 1 month. Hip range of motion restrictions was removed and he was started on strengthening of the hip abductors, extensors, adductors, and flexors and his targeted return to sport program.

At 4 months post-surgery, x-rays continued to demonstrate a well-reduced hip with symmetrical congruent weightbearing surface, maintained hardware, without evidence of avascular necrosis. Mild heterotopic ossification in the supraacetabular region was noted (Fig. 4). He was cleared for impact exercise including jogging.

Return to sport

At 6 months post-surgery, the patient was performing pain-free jogging, swimming, and weight training. On physical examination, he had 120 degrees of hip flexion, 45 degrees of external rotation, and 20 degrees of internal rotation, comparable to the contralateral side. No popping or crepitus was noted with hip range of motion. He was cleared for return to sport specific training. At 10 months post-injury, the patient returned to full-time play as the starting quarterback of his University varsity football team. He remained pain-free and completed the entire season with no complications at 1-year post-injury.

Discussion

Pipkin type IV femoral head fractures are often a result of a high-energy mechanism and rarely seen in sports [1,3]. Poor functional outcomes and complications, such as post-traumatic osteoarthritis, avascular necrosis, heterotopic ossification, and sciatic nerve palsy are often associated with Pipkin type IV fractures [3–6].

From our literature review, we did not identify any Pipkin IV fractures that occurred in football. However, there were cases documenting hip dislocations, with one associated posterior wall acetabular fracture in this sport [7,8]. The athletes were able to return to pre-injury level of function but one case noted hip discomfort [7], and the other had a sciatic nerve injury that later recovered [8].

The surgical treatment of Pipkin IV fractures is heterogeneous. In the study by Shakya et al. [5], 79 % of the Pipkin IV fractures were treated with ORIF, 7 % had immediate total hip replacement, and 14 % were treated non-operatively. For ORIF, the most commonly used approach is the Kocher-Langenbeck for fracture fixation and fragment excision [3,4,9]. In addition, the Smith-Peterson and modified Stoppa approaches have been used for fixation of the femoral head or associated anterior column fractures [3]. More recently, the Gibson approach with surgical hip dislocation and trochanteric osteotomy has been described for managing Pipkin fractures, with a case series by De Mauro et al. [10] demonstrating positive outcomes for one case of Pipkin IV fracture. The post-operative protocol for

Pipkin IV fractures is also variable in degree of weightbearing and timing of removal of restrictions [2–4,6,9].

In our case, the management of this injury included timely recognition of dislocation and reduction at the sideline. The athlete was then transferred to a Level I trauma centre where surgery was performed within 24 h. A Gibson approach with trochanteric osteotomy for ORIF was used which spared the division of the gluteus maximus muscle, preserving its neurovascular supply. Given the significantly unstable reduction and near-circumferential labral tear, labral repair with suture anchors in addition to posterior wall fixation was performed. Postoperatively, an appropriate time frame of weightbearing and hip range of motion restrictions was set. A return to sport program where phases were advanced based on tolerance and performance rather than specific timelines was utilized. This allowed a safe, timely return to sport, without setbacks.

In conclusion, this case study describes an effective course of management of a University varsity football athlete's Pipkin IV injury. There is a need for more case reports and studies on the management and outcomes of this rare injury in order to optimize treatment.

Funding

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Ethics approval

Ethical approval was not required for this case report in accordance with the research ethics board of the University of British Columbia.

Informed consent

Informed consent for publication was obtained from the patient included in this case report.

CRediT authorship contribution statement

Alice (Wei Ting) Wang: Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing. **Amy Leith:** Data curation, Methodology, Writing – original draft, Writing – review & editing. **David J. Stockton:** Conceptualization, Methodology, Supervision, Writing – review & editing. **Jordan M. Leith:** Conceptualization, Methodology, Supervision, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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