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Irreducible Posterior Hip Dislocation with Associated Isolated Comminuted Greater Trochanter Avulsion Fracture Treated with Universal Locking Trochanteric Stabilization Plate: A Rare Combination of Hip Injury

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Abstract

Posterior hip dislocation with greater trochanter fracture is an uncommon injury pattern in the acute trauma patient. Frequently associated injury includes a combination of hip dislocation with posterior wall of acetabulum, head of femur fracture, intertrochanteric fracture and even the most severe type of combined acetabular fracture. We report a 42-year-old man post traumatic bilateral hip injuries with irreducible posterior hip dislocation and associated isolated greater trochanteric fracture successfully managed with open reduction and fixation of greater trochanter with universal locking trochanteric stabilization plate.

Keywords

Irreducible Posterior Hip Dislocation, Greater Trochanter Avulsion, Universal Locking Trochanteric Stabilization Plate

1. Introduction

Posterior hip dislocation is a common injury as a result of high velocity trauma most commonly from motor vehicle accidents [1] [2] [3]. There are several types of dislocation including posterior, anterior (pubic and obturator) dislocation while posterior dislocation remains predominant. These directions of dislocation results in associated fractures of either acetabulum, head of femur and even intertrochanteric fractures [4] [5]. The accompanying injuries of posterior hip

dislocation and acetabular fractures are well documented in the literature. Meanwhile, the incidence of posterior hip dislocation with ipsilateral intertrochanteric, subtrochanteric, and neck of femur are of rare occurrence but the numbers are on the rise owing to high impact injuries [2] [6]. To the best of our knowledge, only one case of posterior hip dislocation with associated greater trochanteric avulsion treated conservatively was reported [7]. Thus, we highlight a case of irreducible posterior hip dislocation associated with comminuted greater trochanteric avulsion treated operatively with open reduction and internal fixation using modified Universal Locking Trochanteric Stabilization Plate (ULTSP). There was also a contralateral comminuted left intertrochanteric fracture treated with cephalomedullary nailing.

2. Case Report

A 42-year old gentleman was referred to our center following a motor vehicle accident. He was a front seat driver of a car head on collision with a stationary lorry seated with both hip and knee flexed plunging onto the dashboard. Clinically, the attitude of right hip is in internal rotation with flexed hip and flexed knee. There were bruises present at the posterolateral aspect of right hip with notable shortening of right lower limb. The left hip appears normal in comparison to the contralateral hip but exhibits tenderness over the tip of greater trochanter with limited motion due to pain. Both lower limb pulses were present and no demonstrable foot drop was elicited during examination.

Plain radiograph of pelvic shows posterior dislocation of right hip with avulsion of greater trochanter with comminuted left intertrochanteric fracture (**Figure 1** & **Figure 2**).

Urgent closed manual reduction under sedation was undertaken in casualty twice but the dislocation was not reduced. Computed Tomography (CT scan) was done to evaluate fracture configuration and possible occult intraarticular

Figure 1. Plain pelvis radiograph showing right posterior hip dislocation with left intertrochanteric fracture.

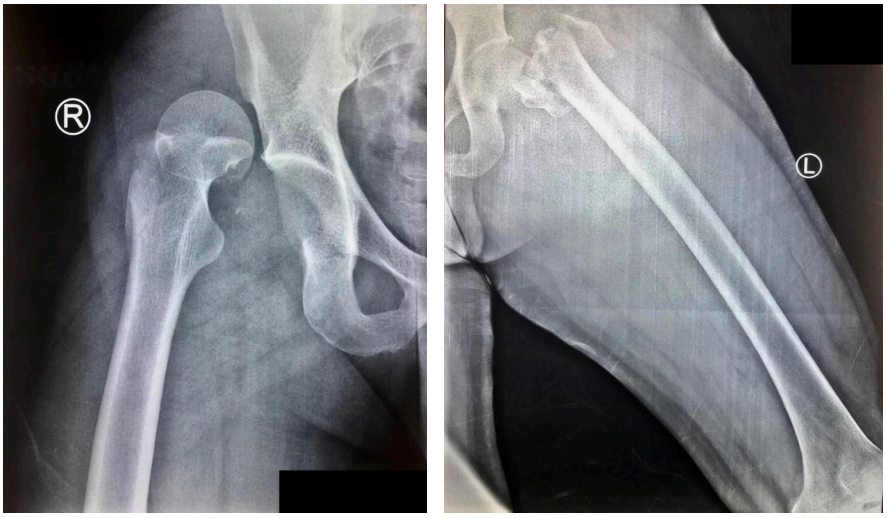

Figure 2. Plain AP radiograph of right hip showing posterior hip dilocation with greater trochanter avulsion (left) and comminuted left intertrochanteric fracture (right).

fragment that might hinder reduction (**Figure 3**). Detail of images revealed a comminuted fracture of greater trochanter with 2 large fragments. There were no intraarticular loose bodies noted.

He underwent open reduction of right hip and fixation of greater trochanteric avulsion simultaneously with cephalomedullary nailing of left femur. Under general anesthesia, patient was positioned on traction table for initial left femur fixation with long proximal femoral nail. Then, he was repositioned to left lateral decubitus position for open reduction and fixation of the right hip. Modified lateral Gibson approach was utilised to gain access to right hip. Intraoperatively, the head of femur was found to be buttonholed through the gluteus medius muscle which was attached to floating piece of greater trochanter, thus render the head out of acetabulum. The head of femur is then carefully brought out of gluteus medius and gently reduced into right acetabulum. Once reduced, the large posterior piece of greater trochanter is opposed back to its footprint and fixed with temporary k-wires. Subsequently, another large anterior piece of greater trochanter was searched and reattached to anterior fracture puzzle. Both avulsion pieces were then fixed to proximal femur with multiple 4.0 mm screws. Due to comminution and strong pull of short rotators, we supplement the fixation with trochanteric stabilization plate (**Figure 4**) to prevent early implant failure and to enable early rehabilitation.

Postoperatively, no foot drop on both lower limbs, however, he was put on skin traction of right hip for 5 days in ward and subsequently was allowed to mobilize with wheelchair. He was discharged home on day 7 post surgery (**Figure 5**).

3. Discussion

Posterior hip dislocation is the commonest dislocation encountered in most orthopaedic practices [7]. The associated complication of femoral head osteonecrosis is significant as the high risk of 2% - 10% is well documented with increasing

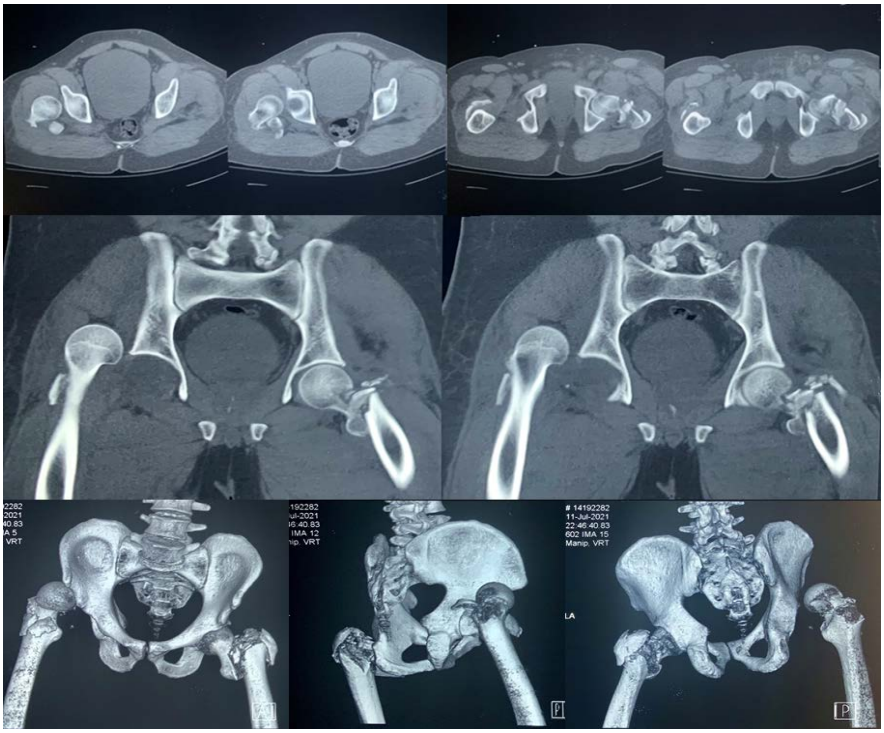

Figure 3. CT images of right posterior hip dislocation with 2 large and 1 small fragment with left comminuted intertrochanteric fracture.

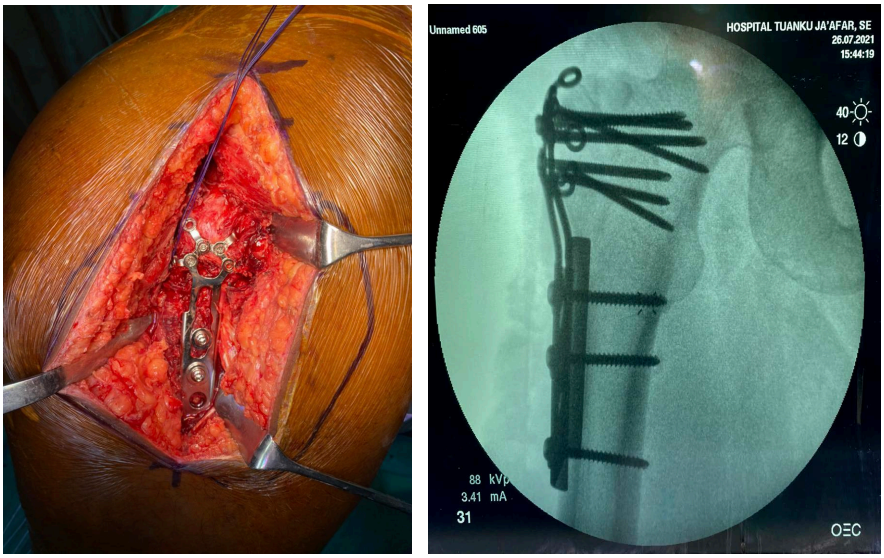

Figure 4. Intraoperative fixation of greater trochanter avulsion with Universal Locking Trochanteric Stabilization Plate (ULTSP) after multiple lag screw fixation (left), C-arm image after relocation of femoral head and greater trochanter fixation (right).

rate past 6 hours [2]. The rate is furthermore increased with the repeated number of reduction attempts to reduce the dislocation [8]. Repeated reduction attempt leads to rupture of the superior retinacular vessels arising from the deep branch of the medial circumflex artery which provides the blood supply to the femoral head [9] [10]. Therefore, immediate attempt for closed manipulation

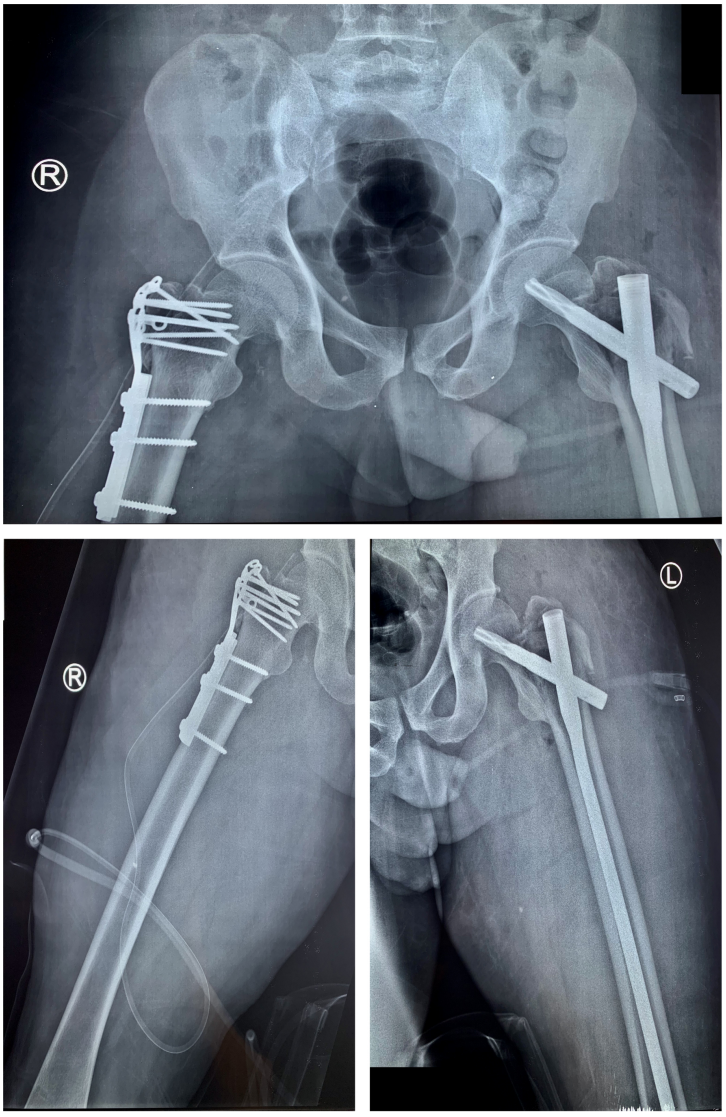

Figure 5. Postoperative pelvis radiograpgh (top), right femur with Universal Locking Trochanteric Stabilization Plate (bottom left), and left femur long proximal femoral nail (bottom right).

with successful reduction is of upmost importance to reduce the rate of femoral head osteonecrosis.

However, successful reduction is always hindered by various factors. These include associated fractures of femoral head, neck of femur, incarceration of soft tissue, osteocartilaginous loose bodies, associated fractures of acetabulum and associated fractures of proximal femur [11] [12]. In our case, posterior hip dislocation associated with greater trochanteric avulsion was subjected to close manipulation and reduction twice in emergency department under adequate sedation but was failed. There was no successful attempt ruling out possibility of instability post reduction due to non-concentric reduction nor incarcerated soft tissue inside the acetabulum. Previous authors have been documenting unsuccessful attempt due to incarceration of the soft tissue of various origin; button-

holed through the capsule, 2 cases for Canale and Manugian, 1 case for El-Andaloussi *et al*.; piriformis wrapped around the femoral neck, 1 case for Proctor, Slatis and Latvala and Canale and Manugian respectively; obstruction of the acetabulum by obturator internus, gamellus superior and inferior muscles, 1 case for Slatis and Latvala. Bucholz and Wheeles found an anatomical variant of the typical acetabular rim fracture represented by a posterosuperior and superior fragment which may occur when the capsule, iliofemoral ligament and rectus femoris muscle attachments are wrenched [13]. We noted the similarities with regards to both Canale and Manugian as well as El-Andaloussi report where intraoperatively the intact femoral neck was wrapped around the piriformis and remaining short rotator muscles prevent the head to be reduced into the acetabulum during reduction. This is a combined mechanism which involved initial buttonholed effect of femoral head but in our case through gluteus medius instead of piriformis and due to the high impact of trauma resulting in greater trochanteric avulsion fracture which serves as common attachment of piriformis and the short rotator muscle causing it to intertwined each other without any anchorage to the proximal femur. Thus, we proposed the possible mechanism of injury to be initial high impact force with hip flexed causing it to posteriorly dislocated with buttonholed effect and further excessive forceful adduction results in avulsion fracture of greater trochanter. There was no associated labrum tear to be considered as part of the factor for the irreducibility of the hip as described by Slatis and Latvala [14].

With regards to this injury, we suggest anatomical and rigid fixation of greater trochanter to prevent further dislocation as well as to restore abductor muscle function. Barasa and Mwenda however reported a similar case of posterior hip dislocation associated with greater trochanter avulsion fracture treated nonoperatively. They successfully reduce the dislocation using Allis manoeuvre under general anaesthesia and non-operative management following acceptable reduction of the avulsed greater trochanter. The patient was prescribed with 2 weeks of non-weight bearing, then partial weight bearing for one week and full weight bearing thereafter [7]. However, Yunus *et al*. suggested trochanter fixation in elderly as it proves to allow for rapid mobilization, rapid weight bearing with no risk of further displacement of greater trochanter due to the strong muscle pull of the short rotator [15]. Preoperatively, we anticipated difficulty locating exact anatomical plane during dissection in view of distorted anatomy after the injury. For our patient, we utilised a modified lateral Gibson approach to gain access to femoral head and greater trochanter. On initial superficial dissection, normal anatomy was observed with intact tensor fascia lata and uninjured gluteus maximus. However, on further deep dissection, the plane of piriformis, gluteus medius and minimus was lost, therefore, we start our deep dissection from distal taking the vastus lateralis and femur shaft as our reference and work towards proximally until we reach the piriformis insertion and the other short rotators where the femoral head was found within the substance of gluteus medius.

There are several methods for greater trochanter fixation namely screw fixation, tension band wiring and plating with various implant choices, *i.e.*, reconstruction plate, dynamic condylar screw, proximal femoral locking plate and dynamic hip screw with trochanteric stabilization plate fixation. We decided to fix this patient with multiple lag screws supplemented with trochanteric stabilization plate due to comminuted fracture morphology with 2 large and 1 small fragments. We modified the use of the extension plate alone without its combination with locking dynamic hip screw due to the absence of peritertrochanteric fractures. This modification shortens the operating time, reduce the loss of bone stock during reaming of hip screw and reduce the overall financial cost while still providing rigid fixation. The universal locking trochanteric stabilization plate provides angular stability through its locking holes over the implant's proximal arm. Furthermore, the arm can be easily contoured following the anatomy of greater trochanter as well as to accommodate the fracture pattern. The head extension served as lateral buttress to the greater trochanter piece to prevent slippage and lateral migration of the fracture site. The lateral plate allows distal fixation to the proximal femoral shaft providing further stability of the construct. In other series, Selvanayagam and Vivek fixed greater trochanteric fracture with 6.5 mm screw fixation in his case report and produce full range of hip motion without any evidence of osteonecrosis or osteoarthritis at one year follow up [16] [17]. Concha et al reported a case of obturator type hip dislocation with greater trochanteric avulsion fracture treated successfully with tension band wiring and produce Harris Hip Score of 89 at 1-year postoperative period [18]. Akash and Subawa in their series of anterior hip dislocation with greater trochanteric avulsion utilised proximal femoral plate for fixation and achieved satisfactory outcome at 4 months' postoperative period using Modified Merle d'Aubigne Score and Oxford Hip Score. On further spectrum of injury, posterior hip dislocation with intertrochanteric fracture is managed operatively with dynamic hip screw fixation reported by Rehan and Jaswant with good outcome after one year follow up [3]. With stable fixation, early physiotherapy can be commenced to prevent other complications related to prolonged bed rest. Dawson *et al*. reported presence of heterotrophic ossification ranging 2.8% - 9% in posterior hip dislocation thus with stable fixation, skateboard exercise and early rehabilitation can be prescribed to bring the risk further down [19]. For our patient, the Harris Hip Score for postoperative function assessed at current 6 months postoperatively scores at 80 which interpreted good results with no early radiological sign indicative of femoral head osteonecrosis. However, this is an early outcome as the femoral osteonecrosis might develop with time and affect the functional outcome thus requiring further follow up.

4. Conclusion

The immediate and successful reduction is paramount in treating posterior hip dislocation to prevent complications. However, irreducible hip dislocation asso-

ciated with acetabular, proximal femur, femoral head and large labral avulsion mandates open reduction and bony stabilization to provide concentric reduction, stable hip, and restoration of abductor function for early rehabilitation. Thus, the modified use of Universal Locking Trochanteric Stabilization Plate alone is a viable option for the management of isolated trochanteric avulsion fracture as it provides rigid fixation to prevent complications such as recurrent dislocation and accelerates restoration of abductor function.

Disclosures

Consent was obtained or waived by all participants in this study. The authors declare no conflicts of interest regarding the publication of this paper.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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