

“Acute Primary Total Hip Arthroplasty for Combined Posterior Acetabulum Fracture with Ipsilateral Associated Posteriorly Dislocated Femoral Head with Femoral Neck Fracture. Using of Femoral Head as an Autograft Would be an Advantage”

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Learning Point of the Article:

Acetabular reconstruction using femoral head structural autograft and acute primary uncemented THA is a viable alternative to internal fixation in middle-aged patients with comminuted fracture of the acetabulum and femoral neck with hip dislocation.

Abstract

Introduction: Traumatic posterior hip dislocation with comminuted fracture of the ipsilateral acetabulum and femoral neck is a rare fracture pattern. These injuries are associated with high energy trauma and pose challenges during management. Controversy exists between hip preservation and replacement surgeries in middle-age patients. Open reduction and internal fixation (ORIF) have a high risk of non-union, avascular necrosis, and post-traumatic osteoarthritis of hip requiring total hip arthroplasty hip replacement (THA) as a secondary procedure later.

Case Report: A 56-year-old male presented with posterior hip dislocation and comminuted fracture of ipsilateral wall and column of the acetabulum, and femoral neck following a high energy trauma. He was managed by acetabular reconstruction using femoral head structural autograft combined with acute primary uncemented THA. At 2-year follow-up, the patient had good functional outcome with a satisfactory range of motion without any difficulty in weight-bearing and doing his daily activities.

Conclusion: Although uncommon, acetabular reconstruction using femoral head structural autograft and acute primary uncemented THA is a viable alternative treatment option compared to ORIF in middle-age patients with fracture of ipsilateral neck and acetabulum. This facilitates post-operative rehabilitation and avoids further operations for possible developing AVN or secondary arthritis.

Keywords: Hip dislocation, acetabulum fracture, femur neck fracture, acute total hip arthroplasty, acetabular reconstruction, femoral head structural autograft.

Introduction

Posterior hip dislocations account for 90% of all hip dislocations. Ipsilateral acetabular fractures are associated in up to 30% of posterior hip dislocations, typically caused by a high energy trauma and usually have concomitant injuries [1].

The Previous previous studies have reported significant morbidity and poor functional outcome with open reduction and internal fixation (ORIF) owing due to post-traumatic avascular necrosis (AVN) and secondary osteoarthritis of hip,

necessitating total hip arthroplasty (THA) as a secondary procedure in near future [2]. Primary THA is recommended by some authors for such injuries in elderly patients [3]. However, primary THA with acetabular reconstruction in acute setting is a complex and demanding procedure with unpredictable outcomes due to distorted anatomy, fracture comminution posing problems during implantation [3, 4]. Therefore, a dilemma still exists whether to preserve or sacrifice the femoral head as decision making becomes more difficult in patients in their 4th or 5th decades of life with limited literature available to

Access this article online

Website:
www.jocr.co.in

DOI:
10.13107/jocr.2021.v11.i04.2164

Author's Photo Gallery



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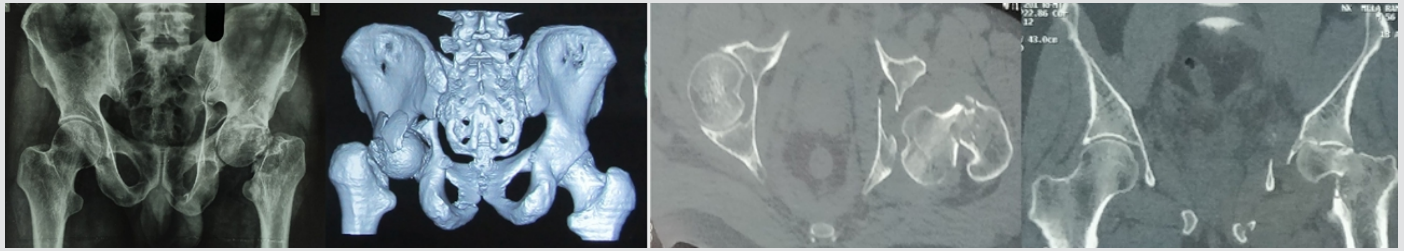


Figure 1: Pre-operative radiograph and computed tomography scan of a 56-year-old male showing fracture of the left acetabulum dome, wall, and column with associated fracture of ipsilateral femoral neck and impaction injury of the femoral head.

support the definitive treatment option [1].

Moreover, the combination of ipsilateral comminuted fracture of wall and column of acetabulum and femoral neck with posterior hip dislocation is an infrequently reported injury as the mechanism of both these injuries is not similar. To the best of our knowledge, early management of such injury combination by acetabular reconstruction using femoral head structural autograft and acute uncemented primary THA is rarely reported in literature till date. We, hereby, present a case with above combination and detailed discussion on surgical challenges.

Case Report

A 56-year-old male was brought to the emergency department complaining of severe pain and swelling in the left hip region with a history of a car accident with the patient sitting in the passenger seat, with his hip and knee flexed such as in a dashboard injury. On physical examination, he was conscious and oriented, but, unable to straight leg raise of the left lower limb which was slightly internally rotated, flexed, and shortened as compared to the opposite uninjured limb. Palpation revealed tenderness in pubic and left hip region. Radiographs and computerized tomography (Fig. 1) scan showed posterior dislocation of the left hip with comminuted fracture of ipsilateral acetabular dome, wall and column, and femoral neck. The patient was neurovascularly intact without any additional injuries. Pre-operative workup, counselling and written informed consent were done regarding the nature of the injury, treatment options, and complications.

He underwent surgery in lateral decubitus position using posterior approach. Intraoperatively, short external rotators of hip found are torn with ragged margins and an intact sciatic nerve. Fracture neck femur (Pauwel type 2) was having posterosuperior comminution and the fracture line was found to be extending basicervical neck to the base of the head of the femur with impaction articular cartilage injury of the femoral head. Acetabular posterior wall and column fracture were comminuted with loose wall fragments. The posterior column was found displaced posteromedially and reduced with the help of pointed reduction pelvic clamps. Stable definitive fixation of posterior column of the acetabulum was performed using 8-hole 3.5 mm titanium reconstruction plate and interfragmentary screws. Then, the fracture geometry of acetabulum was redefined. The femoral head was used to reconstruct the deficient posterior wall and dome of the acetabulum, which was provisionally fixed with k-wire and then secured by two 6.5 mm partial thread cancellous screw and one 3.5 mm cortical screw (Fig. 2). Using the standard technique, an acute primary uncemented THA was performed using 60 mm porous acetabular metal shell, liner (60 mm O.D), 36 mm femoral head, 60 mm (O.D), and size 7 femoral short stem. The acetabular component was fixed with screws for additional support. The hip was stable in all direction after reduction. The operating time was 80 min and the intraoperative blood loss was 550 mL.

Post-operative period was uneventful with satisfactory component alignment on radiographs (Fig. 3). He was kept non-weight bearing for 1 month followed by gradually increase in weight-bearing with support. The patient was able to bear full weight without support and radiographs showed a healed

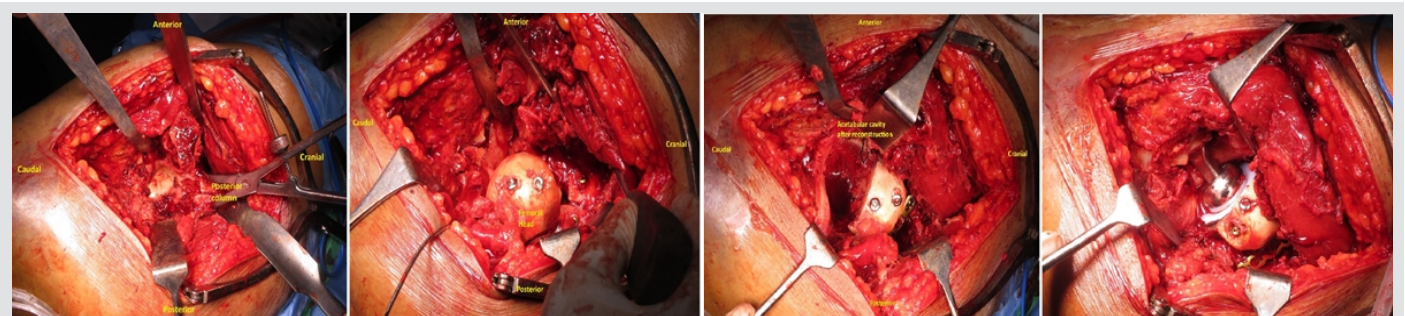


Figure 2: (Clockwise) Intraoperative photograph showing anatomically reduced posterior column of the left acetabulum using reduction clamp with the presence of a defect in the posterior wall and dome of the left acetabulum. Fixation of the posterior column using 3.5 mm reconstruction plate and screws, and reconstruction of acetabular dome and wall using femoral head structural autograft which is secured with 6.5 mm screws. Recreation of the spherical acetabular cavity after sequential reaming. Final photograph after reduction of the hip showing component positioning and stable hip.

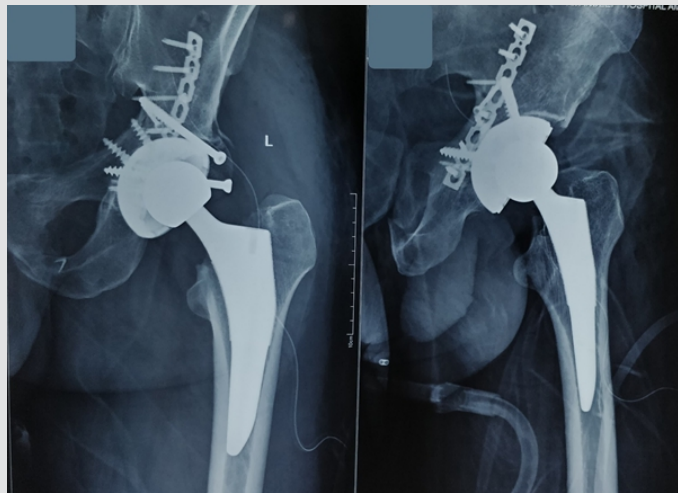


Figure 3: Immediate post-operative radiograph after acute primary uncemented total hip arthroplasty of the left hip with acetabular reconstruction using femoral head structural autograft showing anatomical reduction of the acetabular fracture along with satisfactory alignment and positioning of the femoral and acetabular components.

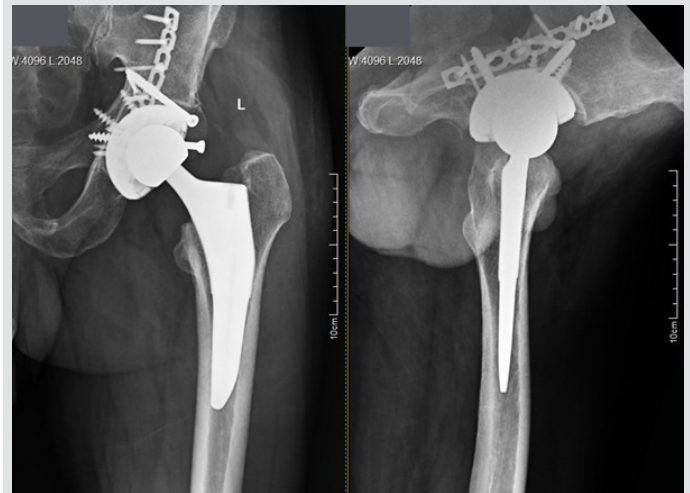


Figure 4: Anteroposterior and lateral radiograph of left hip showing healed fracture with stable total hip arthroplasty in situ.

fracture with stable implant at 6-month follow-up (Fig. 4). At 2-year follow-up, he had a good hip function (Fig. 5) a Harris Hip Score of 90.8 with a stable well-fixed implant [2] (Fig. 6).

Discussion

An ipsilateral comminuted fracture of the femoral neck, acetabular posterior wall and column with hip dislocation is essentially a rare injury, seen usually in young patients with 75% of them aged <50 years [1]. Deciding between femoral head preservation and replacement surgery remains controversial due to rarity of injury pattern, the paucity of a definite classification system and lack of consensus regarding management [1]. The final clinical outcome depends on the interval between the time of injury and treatment, type of surgical intervention, and implant selection.

Some studies recommend preservation of femoral head, especially in young patients, as it restores the natural bone stock of the patient and avoids complication related to acute arthroplasty such as dislocation, prosthesis loosening [1, 5]. However, in certain patients with complex fracture pattern, survival of the femoral head is doubtful and the fracture is not amenable for fixation, and an unfavourable outcome such as AVN, avascular necrosis, post-traumatic osteoarthritis, or non-union is anticipated in up- to 13--67% patients requiring conversion into an arthroplasty in near future regardless of treatment [3, 5, 6, 7, 8].

Therefore, it is worthwhile to perform acute THA as a definitive treatment in these cases as it leads to early restoration of function, improved survival with a reduced period of immobilization and prevents secondary complications [7, 8]. The Pprevious discouraging results after acute primary



Figure 5: Clinical photographs of the left hip showing good hip function and joint mobility at final follow-up.

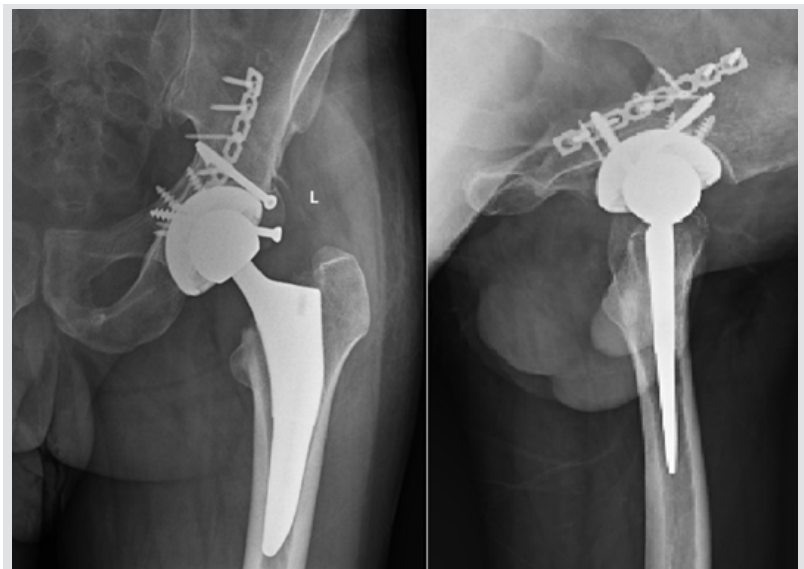


Figure 6: Final radiographs at 2-year follow-up showing stable well-fixed implant without any signs of loosening or osteolysis.

Table 1: Overview of the literature of similar case reports of combined fracture of the acetabulum and ipsilateral neck of the femur with dislocation.

Author	Patient demographics and mode of injury	Injury	Associated injuries	Interval between injury and surgery	Primary surgery	Secondary surgery	Complication	Final follow-up and outcome
Rajasekaran <i>et al.</i> 2018	52 years, male, history of segmental myoclonus; RTA.	Fracture of the posterior acetabular wall, femoral neck and shaft of the left side with anterior hip dislocation	Right Distal femur fracture (ORIF)	16 h	ORIF posterior wall acetabulum. ORIF using Intramedullary nail for shaft femur and two screws for femoral neck. ORIF distal femur right side after 3 days.	Anterior hip dislocation due to rhythmic contractions after 3 weeks managed by open reduction. AVN developed after 4 weeks of relocation surgery. Managed by nail removal and uncemented THA with acetabular reconstruction using cage after 8 months of initial surgery	AVN; secondary surgeries.	Lower Extremity Function score of 72 at 1 year (after THA).
Avtar <i>et al.</i> 2018	42 years male; RTA	Neglected left-sided acetabular posterior wall fracture with femoral head impaction injury with posterior hip dislocation	Foot drop	5 months	Uncemented primary THA with acetabular reconstruction using femoral head autograft.	None	None	Harris Hip Score of 76 at 3 months.
Zhao <i>et al.</i> 2017	34 years, male; RTA	Ipsilateral Left-Sided Transverse-posterior wall acetabular fracture with an associated the femoral head and femoral neck fracture with posterior hip dislocation	None.	1 day	Two surgeries; First, ORIF femoral head, neck and posterior wall using Kocher-Langenbeck approach. Second, ORIF of the transverse fracture using the ilioinginal approach.	None.	None till 12 months.	Satisfactory outcome at 12 months.
Irfine <i>et al.</i> 2015	38 years, female, schizophrenic; Fall from height	Ipsilateral Right-sided acetabulum, femoral neck and shaft fracture	Right humerus shaft fracture (ORIF), Pulmonary and liver contusion	5 h	Two surgeries; First, retrograde intramedullary nailing of femur shaft fracture and ORIF with cannulated screws for fracture neck femur. Second, after 7 days, ORIF acetabulum fracture using modified Stoppa approach then posterior wall fixation using a Kocher-Langenbeck approach.	Bipolar head prosthesis after 15 weeks due to non-union of neck and shaft femur	Non-union neck and shaft femur fracture.	Satisfactory outcome at 12 months.
Duygulu <i>et al.</i> 2006	52 years, male; RTA	Ipsilateral right-sided transverse and posterior wall acetabular fracture with femoral neck and shaft fracture with posterior hip dislocation	Right distal end radius fracture (Axial type external fixator)	8 h	ORIF acetabulum using a posterolateral approach. Intramedullary nail and cannulated screw fixation for a neck-shaft femur fracture. Pelvic fixator for pubic diastasis.	None	None	Good clinical outcome according to Friedman and Wyman system at 25 months.
Mestdagh <i>et al.</i> 1991	52 years, female; RTA	Ipsilateral left-sided transverse acetabular fracture with femoral neck and sacrum fracture with central hip dislocation.	Skull fracture, spleen rupture, ribs fracture	3 months	Cemented THA with acetabular reconstruction with metal reinforcement ring using Posterolateral approach	None	Limp and chronic pain due to posttraumatic arthritis of iliosacral and lumbar spine with weak abductors.	Merle d'Aubigne hip score of 14 at 4 years.
Present study	56 years, male; RTA	Ipsilateral left-sided fracture of posterior wall and column of acetabulum with femoral neck fracture with posterior hip dislocation	None	12 h	Uncemented acute primary THA with acetabular reconstruction using femoral head autograft and short stem femoral component.	None	None	Harris Hip Score of 90.8 at 2 years.

ORIF: Open reduction internal fixation, RTA: Road traffic accident, THA: Total hip arthroplasty

arthroplasty in acetabular fractures can be ascribed to technical difficulties, poor implant selection such as use of morselized allograft, bipolar prosthesis, cemented components with poor cementation techniques, or cup-cage construct to provide initial stability [2, 3, 4, 7, 9].

Femoral head as structural auto or allograft has been widely used in case with deficient acetabulum due to dysplastic hip or previous acetabular fracture with non-union/mal-union, revision arthroplasty [3, 10]. However, surprisingly little literature is available about acetabular reconstruction using femoral head structural autograft in acute primary THA for acetabular fractures in younger patients even though the conversion into arthroplasty after osteosynthesis remains high in such injuries [4]. Acetabular reconstruction using femoral head structural autograft and acute primary uncemented THA is a surgically demanding procedure in these cases and has been rarely reported in literature. It is an ideal definitive treatment option which facilitates post-operative recovery and early rehabilitation, thereby improving the patients' long-term functional outcome [4, 6, 7].

Our case was unique and different owing due to complex and rare fracture pattern, use of porous short stem femoral component and definitive management by acute primary uncemented THA using femoral head as structural autograft for acetabular reconstruction, whereas, most of the previous studies report use of morselized/reamed femoral head graft or cages to fill the defect/cavity medial to the acetabular component [3, 4, 6, 7, 9, 10]. The posterior approach was used in our case as this was the direction of dislocation and it gave easy access for sciatic nerve exploration and acetabular reconstruction, thereby, preserving the anterior structures from further iatrogenic injury to soft tissues. We encountered difficulty in reducing the medially displaced distal segment of

hemipelvis, as the reducing force is to be applied against gravity. Hence, Steinman pin may be used to joystick the proximal fragment of the acetabulum while K wires for temporary stabilization before fixation [3, 6]. Our case report, thus, emphasizes the importance of the development of standard classification system and management guidelines for such complex injury patterns.

Outcomes of late THA after failed primary fixation is less favourable with increased complication rates in comparison to primary THA due to the extensive scarring and need for extensive soft-tissue dissection, the presence of occult infection in the bone and/or retained hardware and anatomic or structural abnormalities from bone defects or residual deformities [6, 7, 8]. Nowadays, use of highly porous metal components allows rapid biological ingrowth improving stability, and have has reported excellent clinical and functional outcomes in acute primary THA after acetabular fractures [3, 4, 6].

A total of 6 six articles reporting on 4 four male and 2 two female patients aged between 34 and 52 years having posterior hip dislocation with ipsilateral fracture of femoral neck and acetabulum were reviewed (Table 1). The mechanism of injury included road traffic accidents (n=5) and falling from a height (n=1). The complex nature of injury in our case is shown to be associated with a high chance of femoral head AVN. Two patients treated with primary THA had a satisfactory outcome without the need for revision surgeries. Out of four patients that underwent hip preservation surgeries, one patient developed anterior hip dislocation with AVN while another patient had femoral neck non-union, necessitating conversion into hip arthroplasty later on. Two patients needed metal reinforcement ring and acetabular cage for acetabular reconstruction during THA, while, acetabular reconstruction using the femoral head



as autograft obviated the need for such implants in our case. We recommend the choice of an implant to be decided from a case-to-case basis.

Although satisfactory results could be expected after ORIF for patients with ipsilateral acetabular and femoral neck fractures without hip dislocation, we believe that uncemented primary THA with acetabulum reconstruction using femoral head autograft can be a good alternative for middle-aged to elderly patients having posterior hip dislocation with ipsilateral acetabulum and femoral neck fracture when there is a concern about non-union and AVN and avoids repeated surgeries [6, 7, 8].

Conclusion

Combination of posterior dislocation of the hip with comminuted fracture of ipsilateral acetabulum and femoral

Clinical Message

Although surgically challenging, an acute primary total hip arthroplasty with acetabular reconstruction using femoral head structural autograft can be a good alternative to ORIF in patients with complex acetabular fracture with ipsilateral neck femur fracture to avoid secondary procedures in near future.

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Conflict of Interest: Nil

Source of Support: Nil

Consent: The authors confirm that informed consent was obtained from the patient for publication of this case report

How to Cite this Article

Thorat B, Singh A, Arshad M, Salokhe S, Mavani R. "Acute Primary Total Hip Arthroplasty for Combined Posterior Acetabulum Fracture with Ipsilateral Associated Posteriorly Dislocated Femoral Head with Femoral Neck Fracture. Using of Femoral Head as an Autograft Would be an Advantage". Journal of Orthopaedic Case Reports 2021 April;11(4): 85-90.