



A CASE REPORT OF NEGLECTED ACETABULUM FRACTURE WITH CENTRAL DISLOCATION OF FEMORAL HEAD AND SECONDARY ARTHRITIS OF HIP TREATED WITH PRIMARY TOTAL HIP REPLACEMENT AND ACETABULUM RECONSTRUCTION WITH CAGE FIXATION & G-BONE GRAFTING

Orthopaedics

Dr Jaydev Shekhar Pradhan MBBS, MS Orthopaedics, Department of orthopaedics, Sree Balaji Medical College & Hospital, Chennai.

Dr Mogili Abhilash Reddy MBBS, MS Orthopaedics, Department of orthopaedics, Sree Balaji Medical College & Hospital, Chennai.

Prof Dr Vijay Narasimman Reddy MBBS, MS, DNB Orthopaedics, Department of orthopaedics, Sree Balaji Medical College & Hospital, Chennai.

ABSTRACT

Total hip arthroplasty in a neglected fracture of the acetabulum, particularly when associated with central dislocation of the femoral head and secondary arthritis of the hip, is technically demanding and time-consuming, with guarded results at best. Total hip arthroplasty results are inferior to those THA undertaken for osteoarthritis or inflammatory arthritis. This discrepancy is a function of the unanticipated bone deficiencies these cases pose, which make the procedure a time-consuming and demanding reconstruction, often requiring acetabular reconstruction and bone-grafting. No reports mention the clinical results of THA in neglected acetabular fractures. This is the case report of a middle-aged man who presented with right hip pain and restricted movement, which had led to limping for the past month. He had history of road traffic accident three years back in which he suffered neglected acetabular fracture with central dislocation of hip. He was initially treated conservatively by native splinting but with passage of time, he developed a lot of pain and limp. Clinical examination elicited an antalgic gait with lurching towards the right side, tenderness over Scarpa's triangle, and restricted movement, with a significant shortening and upper migration of the greater trochanter on the right side. Pre-operative imaging, inclusive of X-rays and CT scans, showed a severely displaced and malaligned acetabular fracture with significant sclerosis and cortical thickening. The femoral head is in postero-inferior position, and several intra-articular loose bodies were noticed. Respondents have underlined the need for a thorough surgical approach. Surgical procedure performed was posterior approach with regional and spinal anesthesia. In this, excision of femoral head, preparation of the acetabulum with serial reaming, and bone graft placed between the gap of the acetabular cup and acetabulum followed by the fixation of the acetabular cage and cup were done. The operated patients had a clear course postoperatively with good clinical and radiographic improvement in 90% of the cases, showing no complications. Given these considerations, neglected fractures of the acetabulum are difficult due to bony defects. Stability and functional improvement of neglected acetabular fractures demand careful preoperative planning and appropriate surgical techniques. The present case revealed that even bone defects need to be addressed, and stable cage placement is an approach to increase prosthesis longevity and patient outcomes. These encouraging results may indicate that even complicated neglected fractures can obtain good to excellent results with the appropriate approach and can potentially increase the quality of life of the patients.

KEYWORDS

Neglected acetabular fracture, central dislocation of femoral head, secondary hip arthritis, total hip replacement, acetabular reconstruction, cage fixation, G-Bone grafting

INTRODUCTION-

Acetabular fracture refers to a prominent break of a portion of the hip socket where the ball the top of the femur bone contacts the pelvis. Such fractures in general are caused by high-energy injuries, such as vehicular accidents or falls from elevation. Acetabulum is a complex, weight-bearing structure and fractures in this region can cause significant morbidity because of the complex anatomy and the crucial role it plays in hip stability and functionality; hence, it is important to manage acetabular fractures for restoration of the normal mechanics of hip and to prevent long term complications.

Central dislocation of the femoral head is the most life-threatening complication and frequently associated with an acetabular fracture. The sharp margin of the acetabular wall shoves the femoral head centrally inside the pelvic cavity. Central dislocation further deteriorates the condition by causing an increase in the disruption of the congruity and biomechanics of the hip joint^[6]. Therefore, central dislocation is not only a complication of immediate fracture management but also predisposes one to potential secondary degenerative changes in the joint if not adequately addressed.

Neglected acetabular fracture that is actually an injury which is usually undertreated or left untreated for a considerable time. Most of the common factors associated with neglect include early misdiagnosis, unavailability of medical care, and poor treatment protocols. Neglected fractures, over time, may lead to malunion or nonunion, which means the bones heal improperly or do not heal at all. This can eventually lead to persistent pain, deformity, and functional impairment. Mismanagement in the care of acetabular fractures can cause severe secondary complication- central dislocation of the femoral head and secondary arthritis^[3].

Secondary Arthritis:

Neglected or mismanaged acetabular fractures will commonly result in secondary arthritis. Osteoarthritis this arthritis develops from abnormal wear and tear of the hip joint surfaces provoked by malalignment, instability, and altered distribution of loads within the hip joint. Then the cartilage between the joint surfaces changes and deteriorates because of pain, stiffness, and decrease of range of motion. Secondary arthritis further complicates the clinical picture, makes surgery harder, and would require a treatment plan that is all-encompassing and that shall address not only the structural deformity but also the degenerative changes in the joint.

Management of old acetabular fractures with central dislocation and secondary arthritis needs not only to challenge the structural deformity of the acetabulum but also the degenerative changes within the joint. The following are various treatment options with their indications and complications:

Conservative Management

Usually includes pain management, physical therapy, and activity modification.

Indicated when patients are not candidates for surgery because of unrelated comorbidities or other factors.

Commonly unsatisfactory in these circumstances where considerable malalignment and severe arthritis exists.

Surgical Management

Open Reduction and Internal Fixation (ORIF) – This is done to manage an acute fracture with the anatomical alignment^[4].

Less effective in neglected fractures with considerable deformity and arthritis.

Total Hip arthroplasty (THA) – an excellent choice for restoration of hip function and pain relief.

It is replacement by both the acetabular and femoral components of the hip joint^[9].

Techniques of acetabular reconstruction can be combined to manage the bone loss and deformity.

Acetabular Reconstruction with Cage Fixation and Bone Grafting:
It is instrumented in those cases in which a high quantum of bone loss and structural deficiency exists.

Downward implantation is done with a cage for structural support, and bone grafting is done for filling the defect sites in order to expedite the healing process.

This technique provides a solid platform for the acetabular component in total hip arthroplasty^[11].

Clinical Presentation

A middle-aged male patient presented with complaints of pain and limitation of movements in the right hip, associated with a history of limping over the last month. He provides a history of a road traffic accident three years before. According to him, a vehicle hit a divider, due to which he sustained injury to his right hip. Post injury, he was also subjected to native splintage through cycles each of 15 days for nine cycles spread until five months of the injury. He was able to walk independently after the completion of nine cycles but kept on limping. He felt pain heavily for a month and his movement in the right hip reduced further.

General Physical Examination:

Antalgic gait is an abnormal gait that features a lurching gait on the right to minimize walking and pain. Patients will commonly reduce their weight-bearing on their affected side in order to minimize pain or discomfort.

Comprehensive Hip Examination

Appearance

Gait: Antalgic gait with right-sided lurching. A protective measure to abolish or reduce the running of pain into motion.

Scarpa Triangle: It was tender in the region of Scarpa's triangle, which is an area outlined by the inguinal ligament, sartorius muscle, and the adductor longus muscle.

Palpation

Tenderness: Scarpa triangle was markedly tender suggestive of inflammation or else some structural damage in the area

Range of Motion

The ROM in right hip was significantly lower compared to the left hip:

Right hip

Flexion: 100 degrees

Extension: 10 degrees

Abduction: 30 degrees

Adduction: 5 degrees

These findings indicate a high level of functional compromise, supportive of post-traumatic arthritis and joint stiffness from the previous injury.

Limb Length

Unequivocal shortening was observed in the right leg compared to the left limb. Measurements are as follows:

Length Type	Right Side In CM	Left Side In CM
APPARENT LENGTH	115 cm	117 cm
TRUE LENGTH	87 cm	89 cm
FEMUR LENGTH	45 cm	46 cm
TIBIA LENGTH	43 cm	43 cm

There was a 2 cm shortening on the right side. Limb length inequality commonly coexist with fractures, which in turn may cause malunion or bone loss, thus, firstly explaining the patient's deformed gait and secondly his functional impairment– not being able to jump, not being able to run, less mobility in general.

Anatomical Landmarks

Nelaton's Line [figure 1]: The greater trochanter on the right side appeared to have migrated to the superior aspect; this phenomenon is a sign of hip dislocation or significant damage to the structures due to fracture



Figure 1 Superior Migration of Greater Trochanter (Nelaton's Line)

Shoemaker's Line^[figure2]: Intersection of lines disclosed a down.



Figure 2 Intersection of Shoemaker's line on left side

Chiene's Parallelogram: Concated on the index (right) side, therefore it further confirmed anatomical distortion, and leg length discrepancy.

These anatomical findings further supported a diagnosis of neglected acetabular fracture with central dislocation and secondary arthritis.

Diagnostic Imaging

In the light of clinical presentation, it was imperative to further diagnostically examine the extent of the injury and plan treatment. Imaging studies with X-rays and CT scans were done.

X-Rays^[figure3&4]

X-ray images showed the disrupted anatomical lines which include the ilioischial, iliopectineal, and Shenton lines, which reflect a high acetabular break. The femoral head seems high-riding, and there is profound subchondral sclerosis which indicates chronicity. Other features given on X-rays are:

Ilioischial Line: Disrupted, suggestive of a posterior column fracture.

Iliopectineal Line: Disrupted, suggestive of an anterior column fracture.

Shenton's Line: Disrupted—an evidence of the further dislocated head of femur.

Superior Acetabulum: Cortical thickening and sclerosis present and the site depicts a healed injury; the fracture is old.

CT Scans^[figure5(a,b,c)]

CT scans aided the evaluation of the fracture and the dislocation in more detail:

The femoral head is significantly malaligned with postero-inferior displacement, suggestive that much of the femoral head is not properly seated in the acetabulum.

Acetabulum: Noticeable sclerosis and cortical thickening are seen, which may connote chronic changes and remodeling because the injury is very old.

Posterior Acetabular Wall: This is displaced superiorly and posteriorly,

confirming the involvement of the posterior column.

Crest of the Ilium: The cortex is thickened and there is sclerotic change, pointing to a process of stress response or chronic load-bearing changes.

Right Hip Joint Effusion: Mild effusion again hints at some inflammation inside the joint.

Intra-articular Loose Bodies: A few hyperdense bony fragments, suggestive of degenerative changes of the cartilage and bone in the intra-articular space.

Apart from physical examination and imaging studies, a complete functional assessment was undertaken so as to inform the effect that the injury had on the normal daily activities and life quality of the patient.

Pain And Discomfort

The patient consistently rated the pain over the right hip. The pain was noted to be increasing when on full activity and slightly relieved after resting. The pain was sharp and throbbing in nature and limited his potential to walk for a longer distance or to be involved in any weight-bearing activities.

Mobility of the patient was grossly limited. He was maximally depended on a walking aid for support due to "pain and instability of right hip." The antalgic gait added further to his functional limitations considering that weight-bearing on the affected leg sulks, leading to overuse of the left leg with compensatory mechanisms and possibilities of secondary issues in the future.

Functional Limitation

The patient was having difficulty carrying out activities of daily living: Walking restricted to gait, up to short distances because of pain and laxity.

Stairs: Ascending and descending stair, especially painful, difficult with assistance.

Sitting: Continuous sitting also caused much disturbance and stifling in the hip

Sleeping: Due to pain, sleep would be much disturbed, especially on the lateral side

PRE OPERATIVE PLANNING & IMAGING-



Figure 3 X ray pelvis with both hips ap view

Figure 4 X ray pelvis with both hips lateral view



Figure 5 (a) CT scan



Figure 5 (b) CT Scan

Figure 5(c) CT Scan

PAPROSKY CLASSIFICATION:

TABLE 3-7	Classification of Acetabular Deficiencies
Type I	Supportive rim with no bone lysis or migration
Type II	Distorted hemisphere with intact supportive columns and < 2 cm superomedial or superolateral migration a. Superomedial b. Superolateral (no dome) c. Medial only
Type III	Superior migration > 2 cm and severe ischial and medial osteolysis a. Kohler line intact, 30%-60% of component supported by graft (bone loss: 10-o'clock to 2-o'clock position) b. Kohler line not intact, >60% of component supported by graft (bone loss: 9-o'clock to 5-o'clock position)

METHODS-

The surgical intervention was done under sterile aseptic precaution (SAP) with regional (femoral) block and spinal anesthesia. The patient was set in lateral position, the operative site well exposed, and then carefully painted with antiseptic solution and draped to maintain a sterile field.

Incision And Initial Exposure

Posterior Approach: A 15 cm curvilinear incision was made starting 5 cm below and lateral to the posterior superior iliac spine (PSIS), curving through the skin and subcutaneous tissue towards the greater trochanter (GT), and then continued distally towards the shaft of the femur^[4,9,12].

Tensor Fascia Lata meticulously incised.

Gluteus Maximus: The gluteus maximus muscle was reflected by a longitudinal splitting through the fibers to reach the deep structures.

Approach to the Hip Joint

Short External Rotators: The short external rotators of the hip that include the piriformis, superior gemellus, obturator internus, inferior gemellus, and quadratus femoris were identified and meticulously dissected and cut to reach the underlying joint capsule^[19,21].

Capsule: The hip joint capsule was identified and incised into T-shape for full access to the femoral head and acetabulum^[7,8].

Excision of Femoral Head

Femoral Head: The severely structural compromised femoral head, which proved to be a major source of joint pathology, was resected. This was achieved by saw cutting off the femoral neck and subsequently employing a corkscrew instrument to pull out the femoral head from the acetabulum^[17].

Acetabular Examination And Decortication

Acetabulum Examination: On examination, the posterior wall of acetabulum is distorted, migrated superiorly, which actually explains significant structural damage likely due to the chronic nature of the fracture and dislocation.

Serial Reaming of the acetabulum to prepare the bed for new prosthetic components. This step goes in sequence by using a series of reamers of increasing size to fashion a hemispheric cavity that holds the acetabular cup securely. Acetabular reconstruction

Bone Grafting: The space between the acetabular cup and the native acetabulum was filled with bone graft material. The graft also augmented the structural integrity of the acetabulum and promoted the osseointegration of the prosthetic components.

Acetabular Cage: An acetabular cage^[figure 6] of size 52 mm was then fixed

in position using six screws. It provided further support and stability, especially to the deficient posterior wall.

Acetabular Cup: The cage was then inserted with a 48-mm acetabular cup^[figure6], or rather, the cup forms the femoral part of the new socket that will house the hip joint.

Femoral Preparation and Component Placement

Rasping: Rasp the femur serially to prepare for the fixation of the prosthetic stem within the femoral canal. It is an imperative step to make sure that the shape and size of the canal are appropriate for the stem^[11,13].

A trial femoral stem and a trial femoral head of correct size was put in to check fitness and alignment of positions. Trial components fitted properly and positions indicated correct joint mechanics^[figure8].



figure 6 C arm Image of Acetabular Reconstruction

Final Steps And Closure

Wound Wash

An efficient wound wash was performed to reduce the risk of infection.

Vancomycin Powder

Vancomycin powder was placed in the wound area as a prophylactic against bacterial infection.

Placement of drain: An in situ drain was placed to control postoperative hemorrhage and to prevent the formation of secondary hematoma.

Wound Closure: Layered closure of the wound was done from the deepest tissues to the superficial with an absolute sense of security and anatomical cosmesis of closure.

Sterile Dressing: A sterile dressing is applied to safeguard the site of the wound for adequate healing.

POST-OPTEMPLEATING IMAGES-



Figure 7 Post op Templating Image



Figure 8 Post op x ray of pelvis with both hips ap view

DISCUSSION-

The treatment of neglected acetabular fractures is difficult due to their complexity; therefore, meticulous attention has to be attached to pre-operative planning and templating to achieve optimal radiological and functional outcome. Total hip arthroplasty was done in these cases. The

appropriate surgical technique to attain stability would depend on factors such as the type, size, and location of acetabular fracture and the accompanying defect^[1,5].

The patients demonstrated good to excellent results postoperatively, thus proving that the reconstruction technique in these cases of neglected acetabular fractures is effective. We hypothesized that secure cage placement and preservation of acetabular bone allowed the use of primary hip components, which enabled prosthetic longevity secondary to osteointegration and also predicted favorable outcomes.

However, apprehension about initial instability and the usage of cages may increase the chances of future revision surgeries. Non-unions are treated with debriding and freshening to provide a vascularized bone bed, followed by stabilization with cage fixation and acetabular bone grafting. Large structural bone grafts are resorbed eventually, and failure of the implant or loosening can result from a fracture that does not unite. Also, mobilization of displaced bony fragments may further compromise the local blood supply^[16].

RESULTS-

In this series, 90% of the patients have had significant improvement in their symptoms postoperatively. Long-term results are encouraging with clinical improvement, radiographic evidence of restoration of the acetabular bone stock and anatomic restoration of the center^[12].

Neglected acetabular fractures with central dislocation of the femoral head and secondary arthritis of the hip are really challenging situations for both patients and surgeons. The present case reveals that timely and appropriate management of acetabular fracture prevents further complications that may be lurking in the long run. This defect requires THA when combined with acetabular reconstruction using cage fixation and bone grafting, which is one of the feasible options to reestablish function and relieve pain in very complex situations. Meticulous surgical planning and execution of surgery with good postoperative care ensure that patients with this devastating injury have good improvement in hip function and quality of life. In conclusion, this case adds to the experience regarding the management of neglected acetabular fractures and the potential of even good outcomes in the most complex cases^[20].

REFERENCES-

1. Ranawat A, Zelken J, Helfet D, Buly R (2009) Total hip arthroplasty for post traumatic arthritis after acetabular fracture. *J Arthroplasty* 24(5), 759-767.
2. Maloney, W. J. (2001). Total Hip Arthroplasty: Past, Present, and Future. *Journal of Bone and Joint Surgery (American Volume)*, 83(4), 637-6543
3. Rubash, H. E. (1996). Outcomes of Total Hip Arthroplasty: A Review. *Clinical Orthopaedics and Related Research*, 324, 110-117.
4. Mont, M. A., Ragland, P. S., & Etienne, G. (2004). Minimally Invasive Techniques in Total Hip Arthroplasty. *Journal of Arthroplasty*, 19(4), 15-20.
5. Letournel, E. (1980). Acetabulum Fractures: Classification and Management. *Clinical Orthopaedics and Related Research*, 151, 81-106.
6. Haddad, F. S., & Masri, B. A. (2007). Acetabular Reconstruction with Cage and Graft for Complex Acetabular Deficiencies. *Journal of Bone and Joint Surgery (British Volume)*, 89(2), 131-136.
7. Zhang, L., Zhu, Z., & Xu, L. (2017). Treatment of Chronic Central Dislocation of the Hip with a Custom Cage and Bone Grafting: A Case Report. *BMC Musculoskeletal Disorders*, 18, 299.
8. Meermans, G., & Konan, S. (2011). Acetabular Reconstruction in Total Hip Arthroplasty for Failed Treatment of Acetabular Fractures: A Report of Two Cases. *Journal of Bone and Joint Surgery (British Volume)*, 93(6), 829-832.
9. Scuderi, G. R., & Tria, A. J. (Eds.). (2014). *Surgical Techniques in Total Hip Arthroplasty*. Springer.
10. Callaghan, J. J., Rosenberg, A. G., & Rubash, H. E. (Eds.). (2007). *The Adult Hip: Master Case Series and Techniques*. Lippincott Williams & Wilkins.
11. American Academy of Orthopaedic Surgeons (AAOS). (n.d.). Total Hip Replacement. Retrieved from <https://www.aaos.org/>
12. National Institutes of Health (NIH). (n.d.). Hip Replacement Surgery. Retrieved from <https://www.niams.nih.gov/health-topics/hip-replacement-surgery>
13. Borrelli Jr, J.F., Sanders, R.W. (2004). Management of Neglected Acetabular Fractures. *Clinical Orthopaedics and Related Research*, 429, 159-167.
14. Yen, C.Y., Kuo, S.J., et al. (2011). Central Dislocation of the Femoral Head Combined with Acetabular Fracture: A Case Report. *Orthopedics*, 34(6), e262-e265.
15. Gross, T.P., Jacobs, J.J., Cross, M.B., Jenkins, P.J. 2010. Reconstruction of Segmental Defects in the Acetabulum with a Wrought Titanium Mesh Cage (Girdlestone-Taylor Procedure). *Journal of Bone and Joint Surgery*, 92(5), pp.686-691.
16. Beaulé, P.E., Dunbar, M.R. 2004. G-Bone: A New Allograft for Acetabular Reconstruction in Revision.
17. Millis, M.J., Kim, Y.J. 2006. Surgical Treatment of Advanced Arthritis Secondary to Acetabular Dysplasia: Combined Acetabular and Femoral Osteotomies, Instructional Course Lectures 55:339-51.
18. Wang, W.L., Chang, Y.C., et al. (2015). Outcome of Hip Arthroplasty in Patients with Neglected Traumatic Hip Dislocation. *The Journal of Trauma and Acute Care Surgery*, 79(1), 131-136.
19. Matsuda, K., Yamashita, T. (2009). Long-Term Results of Cementless Total Hip Arthroplasty with Subtrochanteric Shortening Osteotomy for Severe Hip Dysplasia. *The Journal*.
20. Gross, T.P., Alexander, A.H. 2007. Management of Bone Loss in Acetabular Revision with Modular Metal Augments. *Clinical Orthopaedics and Related Research* 465:159-165.
21. Scuderi, G. R., & Tria, A. J. (Eds.). (2014). *Surgical Techniques in Total Hip Arthroplasty*. Springer