

Management of Protrusio Acetabuli Using Hybrid Total Hip Replacement and Bone Grafting: A Case Report

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ABSTRACT

Protrusio acetabuli is an uncommon condition in which the femoral head gradually migrates medially into the pelvis, resulting in pain, restriction of hip movements, and progressive arthritis. Surgical management in elderly patients is difficult because of poor bone quality, medial wall defects, and altered hip anatomy. Total hip arthroplasty with acetabular reconstruction is often required to restore hip function and relieve pain. A 73-year-old female presented with severe bilateral hip pain for five years, with marked worsening over the last year. She had difficulty walking and performing daily activities. Radiographs, CT scan, and MRI revealed bilateral protrusio acetabuli associated with advanced osteoarthritis and avascular necrosis of both femoral heads, more severe on the right side. The patient underwent right-sided hybrid total hip replacement using a posterolateral approach. During surgery, the medial acetabular wall was found to be thinned and deficient. The excised femoral head was morselised and used as an autograft to reconstruct the medial wall and support acetabular cup placement. Postoperatively, the patient showed good pain relief and gradual improvement in mobility with protected rehabilitation. This case highlights the importance of careful preoperative assessment and proper acetabular reconstruction in complex protrusio acetabuli. Use of femoral head autograft helped restore bone stock and achieve stable implant fixation. Reporting this case is important because successful hybrid total hip arthroplasty with bone grafting in elderly patients with protrusio acetabuli is technically demanding and infrequently reported.

Keywords: Bone transplantation, Hip, Hip joint/surgery, Orthopaedic procedures, Osteoarthritis, Postoperative rehabilitation

CASE REPORT

A 73-year-old female presented with complaints of gradually increasing pain in both hip joints for the past five years, which had become more severe during the last one year. The pain was mechanical in nature, increasing on walking and relieved with rest. She had difficulty in walking, climbing stairs, and carrying out routine household activities. There was no history of trauma or similar complaints in the past. She was a known hypertensive and was on regular medication with adequately controlled blood pressure.

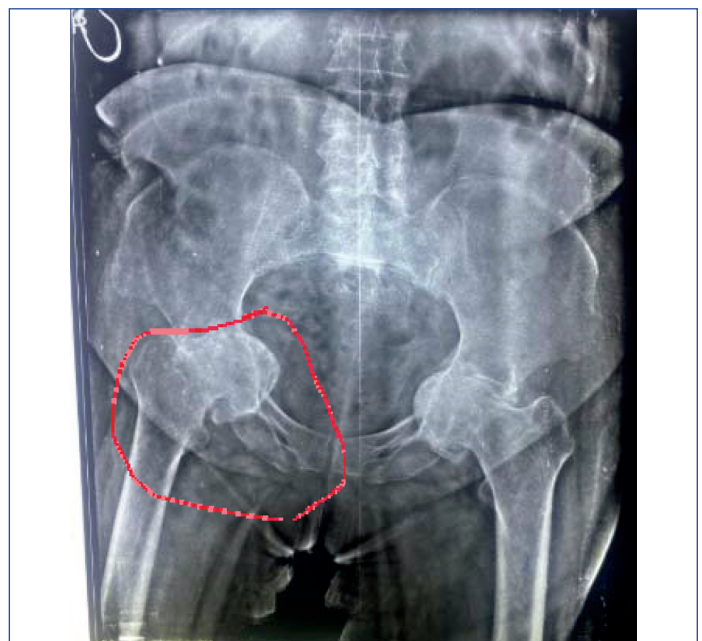
On examination, movements at both hip joints were painful and restricted especially flexion and internal rotation. Tenderness was present around both hips. There was no apparent limb length discrepancy, and distal neurovascular examination was normal.

Plain radiographs of the pelvis showed advanced degenerative changes in both hip joints with bilateral protrusio acetabuli, seen as medial displacement of both femoral heads beyond the ilioischial line [Table/Fig-1]. MRI of both hips revealed bilateral acetabular protrusion with marked narrowing of the joint spaces, subchondral cystic changes, cartilage thinning, and avascular necrosis of both femoral heads, more severe on the right side. Degenerative labral changes were also noted. These findings suggested advanced arthritic involvement and supported the decision for surgical management [Table/Fig-2a,b].

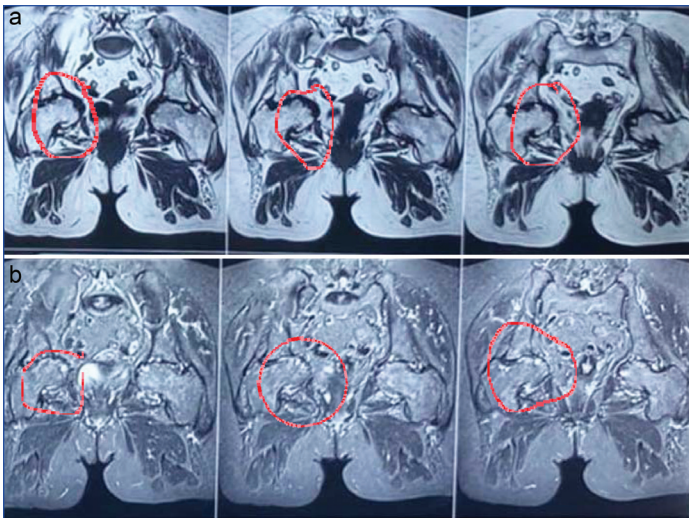
A preoperative three-dimensional CT scan was performed for detailed evaluation of the acetabulum and surrounding bony anatomy. The scan confirmed bilateral protrusio acetabuli with significant medial migration of both femoral heads. The medial wall of the acetabulum was thinned with reduced bone stock, predominantly on the right side. Sclerotic changes were noted along the acetabular floor. CT imaging also helped in assessing the severity of protrusion, planning acetabular reconstruction, and determining the possible requirement for bone grafting. Based on clinical and radiological findings, a diagnosis of bilateral protrusio acetabuli with secondary osteoarthritis and avascular necrosis

of both femoral heads was made, with the right side being more severely affected [Table/Fig-3a,b].

As the patient had more severe pain and functional limitation on the right-side, right hybrid total hip replacement was planned first. The left hip was managed conservatively with analgesics, physiotherapy, and activity modification, and the patient was advised regular follow-up for possible staged surgery in future if symptoms worsened. Written informed consent for surgery and publication of clinical photographs and radiographs was obtained from the patient and also from patient's relatives.



[Table/Fig-1]: Preoperative X-ray of bilateral protrusio acetabuli with avascular necrosis of bilateral femoral head (right >left) with reduction in joint spaces and osteophytes present marginally.



[Table/Fig-2a,b]: MRI cut-sections of bilateral protrusio acetabuli with marginal osteophytes and gross reduction of joint spaces.



Study Name: CT PELVIS

b **CT BILATERAL HIP JOINT**

- Erosion of articular surface of bilateral hip joint and acetabulum is noted.
- Severe reduction of bilateral hip space noted.
- Subchondral cysts(Goodes) with subchondral sclerosis noted at bilateral femoral head
- Marginal osteophytes noted at bilateral hip joint and visualised lower spine.
- Medial intrapelvic displacement of bilateral femoral head noted s/o protrusio acetabuli.
- No obvious fracture line seen
- No dislocation of joint.
- No hematoma seen in the soft tissue
- Surrounding muscle appears normal

IMPRESSION:

- FEATURES OF BILATERAL HIP OSTEOARTHRITIS WITH PROTRUSIO ACETABULI AS DESCRIBED.

[Table/Fig-3a,b]: CT scan 3D reconstruction images along with reports of same patient.

The procedure was carried out under combined spinal and epidural anaesthesia using a posterolateral approach. Intraoperatively, the femoral head was found to be collapsed and necrotic with a deep medially displaced acetabulum. The medial acetabular wall was thin and deficient, requiring reconstruction before cup placement. The excised femoral head was morselised and used as an autologous bone graft. The graft was impacted into the medial acetabular defect to restore bone stock and recreate the normal hip centre. The acetabular cup was then press-fitted securely, followed by implantation of a cemented femoral stem.

The use of femoral head autograft provided structural support to the deficient medial wall and helped achieve stable fixation

of the acetabular component. It also avoided the need for graft harvesting from another site and promoted biological incorporation [Table/Fig-4,5].

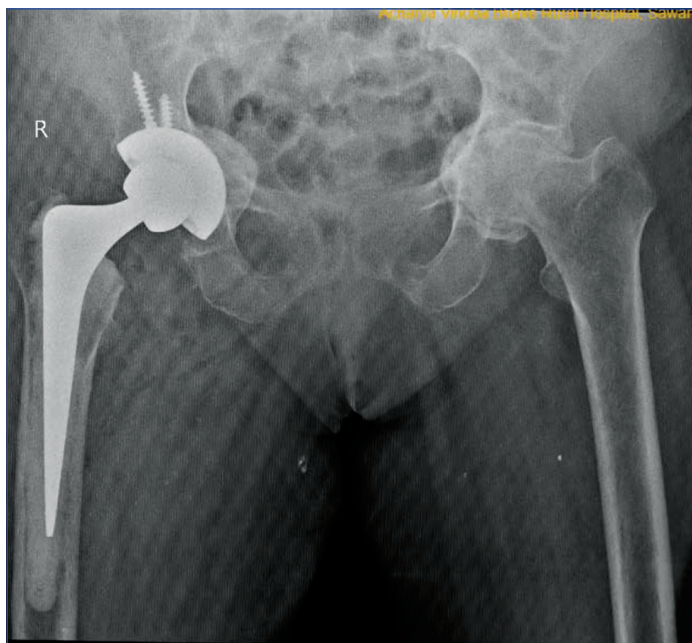


[Table/Fig-4]: Intraoperative procedure for total hip replacement procedure where femoral head has been removed and autologous graft has been placed followed by acetabular rimming.



[Table/Fig-5]: Intraoperative procedure for total hip replacement where cementing has been done for stem insertion followed by fixation of metallic head subsequently.

The postoperative period was uneventful. The suction drain was removed on the second postoperative day. Postoperative radiographs showed satisfactory implant position and restoration of the hip anatomy with implant in situ [Table/Fig-6]. Sutures were removed after 14 days. The patient was started on non-weight-bearing mobilisation with walker support for six weeks, followed by gradual progression to weight-bearing as tolerated [Table/Fig-7].



[Table/Fig-6]: Postoperative X-ray with total hip replacement right-side.



[Table/Fig-7]: Non-weight bearing mobilisation image postoperatively.

At six months follow-up, the patient had significant relief in pain on the operated side and was able to walk comfortably with improved daily activity. Radiographs at follow-up showed stable implant position without loosening or graft-related complications. The left hip continued to be managed conservatively and the patient remained under regular follow-up.

DISCUSSION

Protrusio acetabuli is an uncommon hip condition in which the femoral head gradually shifts medially into the pelvic cavity, causing pain, stiffness, restricted movements, and secondary osteoarthritic changes. Earlier studies by Sotelo-Garza A and Charnley J reported that progressive protrusion can disturb normal hip mechanics and lead to significant functional disability if not treated appropriately [1]. With advances in surgical techniques and implant design, the results of total hip arthroplasty in such complex cases have improved considerably over the years [2].

Imaging plays a major role in both diagnosis and surgical planning. Plain radiographs help in determining the severity of protrusion by assessing the relationship of the femoral head to the ilioischial line. Paprosky WG et al., highlighted the importance of assessing acetabular bone loss and defect pattern before reconstruction [3]. In addition, CT scan evaluation provides better understanding of medial wall deficiency, remaining bone stock, and the possible requirement for bone grafting during surgery.

Several reconstructive methods have been described for the management of protrusio acetabuli. Use of femoral head autograft is commonly preferred during acetabular reconstruction because it helps support the deficient medial wall, restores lost bone stock, and gradually incorporates with the host bone [2,4]. Another advantage is that the graft can be obtained from the excised femoral head itself, thereby avoiding the need for graft harvesting from a separate site. Previous studies have also shown that impacted autograft reconstruction helps restore the anatomical hip centre and contributes to stable long-term fixation of the acetabular component in patients with protrusio acetabuli [2,5,6].

Both cemented and uncemented implants have been used successfully in patients with protrusio acetabuli. Uncemented components are generally favoured in younger patients with adequate bone quality because they allow long-term biological fixation. However, in elderly patients with osteoporotic bone, cemented femoral stems provide immediate stability and dependable fixation. Previous systematic reviews have reported encouraging functional recovery and satisfactory implant survival in patients with protrusio acetabuli treated with total hip arthroplasty combined with acetabular bone grafting techniques [7].

Bone grafting is an important step during acetabular reconstruction as it helps restore the anatomical hip centre and reinforces the deficient medial wall. Dorr LD et al., demonstrated that impacted femoral head autograft with hemispherical cup placement can restore acetabular bone stock and provide durable fixation [2].

In the present case, hybrid total hip arthroplasty with impacted femoral head autograft provided stable acetabular reconstruction and satisfactory restoration of hip biomechanics. At six months follow-up, the patient had marked reduction in pain, improved walking ability, and better performance of routine daily activities. Follow-up radiographs showed stable implant position without loosening or graft-related complications. Several reports in the literature have addressed management strategies for protrusio acetabuli during total hip arthroplasty, emphasising bone grafting and hybrid fixation to restore the anatomic hip centre and ensure implant stability. In a landmark study, Sotelo-Garza A and Charnley J (1978) reported good long-term outcomes in patients treated with Charnley's low-friction arthroplasty using bone grafting techniques to reinforce the medial wall [1]. Dorr LD et al., (1999) introduced the medial protrusio technique, demonstrating that hemispherical uncemented cups with

autologous femoral head grafting effectively restored bone stock and achieved durable fixation over extended follow-up [2]. Paprosky WG et al., (1994) further validated acetabular reconstruction using impacted bone grafts and cemented cups in cases with extensive medial defects, achieving functional improvement and low rates of loosening [3]. A recent systematic review by Ansari S et al., also supported the role of bone grafting and hybrid fixation techniques in the management of protrusio acetabuli, especially in elderly patients with deficient medial acetabular bone stock [7].

These consistent results across decades of literature support the approach adopted in the present case- hybrid fixation with impacted femoral head autograft- as a reliable and reproducible strategy for complex acetabular reconstruction in elderly osteoporotic patients.

CONCLUSION(S)

Protrusio acetabuli is a difficult condition to manage in elderly patients because of poor bone stock, medial wall defects, and altered hip anatomy. Successful treatment depends on detailed preoperative evaluation and proper reconstruction of the acetabulum during surgery. In the present case, hybrid total hip arthroplasty with impacted femoral head autograft resulted in good pain relief, improved walking ability, and stable implant fixation at follow-up. This case suggests that the use of femoral head autograft along with hybrid fixation can provide satisfactory functional and radiological outcomes in complex cases of protrusio acetabuli.

Accurate preoperative imaging and meticulous surgical technique are crucial in managing protrusio acetabuli. Bone grafting during acetabular reconstruction helps restore hip anatomy and improves the long-term success of total hip arthroplasty.

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