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Cemented Total Hip Arthroplasty in Protrusio Acetabuli in Rheumatoid Arthritis Using Impacted Morselized Bone Grafting and Wire Mesh: A Novel Technique with Literature Review

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ABSTRACT

Protrusio acetabuli secondary to rheumatoid arthritis (RA) presents a complex reconstructive challenge during total hip arthroplasty (THA), particularly in the presence of medial wall deficiency and osteoporotic bone. Restoration of hip biomechanics and medial support is essential to prevent cup migration and recurrence of protrusion. A 75-year-old female with long-standing RA presented with bilateral end-stage hip arthritis and advanced protrusio acetabuli. Radiographs demonstrated Tönnis grade 3 osteoarthritis and Sotelo-Garza grade 3 (left) and grade 2 (right) protrusio. Intraoperatively, Paprosky Type 2C medial wall defects were identified. Staged bilateral cemented THA was performed using titanium mesh and impacted morselized autologous femoral head graft prior to cementation of the acetabular component. At Seven-year follow-up, radiographs demonstrated graft incorporation and restoration of the hip center without evidence of cup migration or loosening. Harris Hip Score improved from 36 preoperatively to 86 at final follow-up. Titanium mesh combined with impacted autologous cancellous graft provides a biologically favorable and cost-effective option for medial wall reconstruction in rheumatoid protrusio acetabuli undergoing cemented THA.

Keywords: Rheumatoid arthritis, protrusio acetabuli, total hip arthroplasty, Titanium mesh, cancellous bone graft.

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INTRODUCTION

Rheumatoid arthritis is a chronic inflammatory disease frequently involving the hip in advanced stages. Progressive synovitis leads to cartilage destruction, periarticular osteopenia, and medial migration of the femoral head, resulting in protrusio acetabuli. Ranawat et al. first highlighted the technical challenges of THA in rheumatoid protrusio and emphasized the importance of medial wall reconstruction to prevent progressive medialization and implant failure [1].

The reported incidence of protrusio in RA varies between 5–20%, depending on disease severity and duration [2]. Failure to restore the anatomical hip center increases joint reaction forces and predisposes to early loosening [3]. A recent systematic review by Ansari et al. confirmed that restoration of hip center and use of bone grafting significantly influence implant survival in protrusio acetabuli [4].

Several reconstructive strategies have been described, including cemented cups with impaction grafting, cementless hemispherical components, reinforcement cages, and porous metal augments [5]. Cemented reconstruction supported by autologous bone graft has shown satisfactory outcomes in rheumatoid patients [6]. Long-term studies have demonstrated improved stability and lower loosening rates when medial bone grafting is performed [7].

Impaction bone grafting allows biological restoration of bone stock while providing medial buttress support. Titanium mesh has been used to contain graft material and improve mechanical stability in acetabular defects[8]. Contemporary reports support the effectiveness of mesh-supported impaction grafting in acetabular reconstruction[9].

We describe a reproducible technique using titanium mesh and impacted autologous graft for Paprosky Type 2C defects in rheumatoid protrusio.

CASE REPORT

A 75-year-old female with a 15-year history of seropositive rheumatoid arthritis presented with progressive bilateral hip pain and inability to ambulate for four years. She had undergone bilateral total knee arthroplasty six years earlier. RA was medically controlled on disease-modifying therapy.

Radiographic evaluation demonstrated Tönnis grade 3 osteoarthritis with Sotelo-Garza grade 3 protrusio on the left and grade 2 on the right (Figure 1). Preoperative Harris Hip Score was 36.

Figure 1: Preoperative radiograph of bilateral hip arthritis with protrusio acetabuli

Surgical Technique

Staged bilateral cemented total hip arthroplasty was performed six weeks apart using a posterior approach. After femoral head excision, a Paprosky Type 2C medial wall defect was identified (Figure 2a). Fibrous tissue was curetted, and peripheral reaming was performed to expose bleeding cancellous bone while avoiding medial reaming.

Autologous cancellous graft was prepared from the excised femoral head and morselized into 8–10 mm fragments (Figure 2b). A titanium mesh was contoured to match the defect morphology and sized slightly larger than the defect to achieve stable peripheral support (Figure 2c). The mesh was positioned over the medial wall defect, and morselized graft was impacted over it to reconstruct the acetabular floor and restore the hip center (Figure 2d).

An all-polyethylene acetabular cup was cemented in 45° of abduction and 20° of anteversion. A cemented femoral stem was inserted in appropriate version. Postoperative radiograph at four weeks demonstrated satisfactory component positioning and restoration of hip biomechanics (Figure 3). Partial weight-bearing was allowed for six weeks to facilitate graft consolidation.

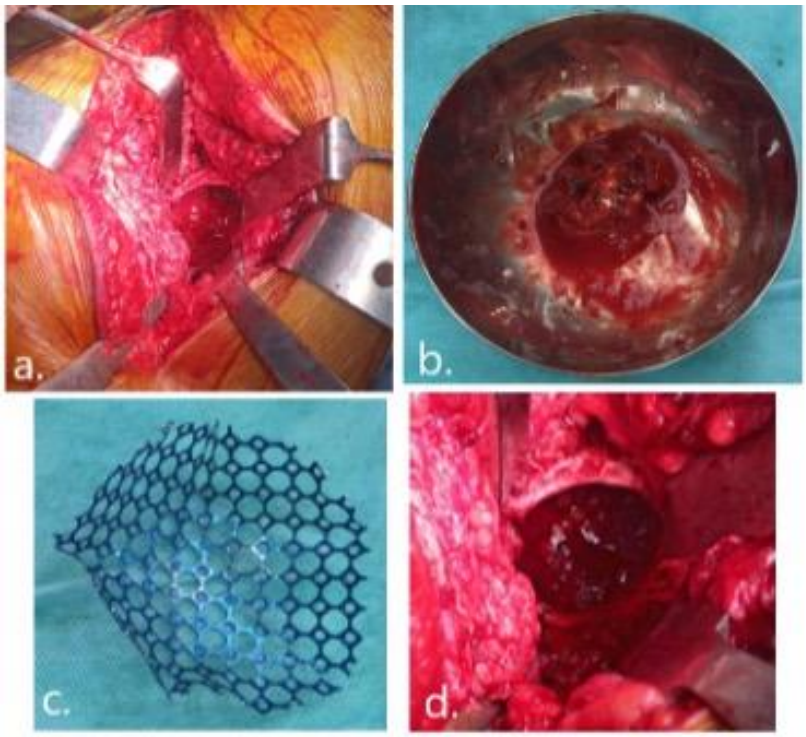

Figure 2: Acetabulum with a Paprosky Type 2C defect (a), Morselized bone graft obtained from femoral head (b),Contoured Titanium wire mesh (c), Wire mesh and bone graft construct covering the acetabular defect (d)

Figure 3: Post-operative radiograph after 4 weeks of THR of left hip.

RESULTS AND DISCUSSION

Radiographs at six months demonstrated trabecular continuity across the graft-host interface, consistent with graft incorporation. At seven-year follow-up, radiographs showed maintained cup position without evidence of loosening or migration in both hips (Figure 4).

Clinically, the patient demonstrated significant improvement in mobility and function. At seven years, she was ambulating independently without support or lurch (Figure 5). The Harris Hip Score improved to 86 at final follow-up.

There was no recurrence of protrusio acetabuli.

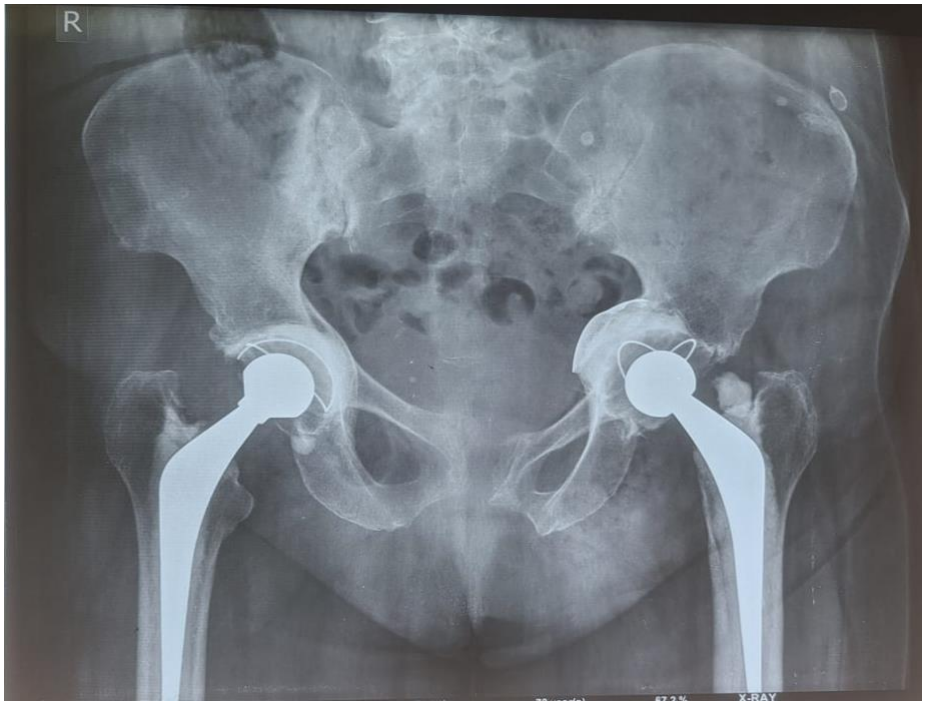

Figure 4: Post-operative radiograph at 7 year follow up of Bilateral THR.

Figure 5: Patient at 7 year follow up actively ambulating without lurch or any support

DISCUSSION

THA in rheumatoid protrusio presents significant biomechanical challenges. Ranawat et al. emphasized the importance of medial bone grafting in preventing progressive medialization [1].

Recent systematic analysis confirms that restoration of anatomical hip center is a major determinant of implant longevity [4]. Cemented acetabular reconstruction supported by autograft has shown satisfactory long-term survival in RA patients [6,7].

Clohisy and Harris demonstrated improved survivorship of cementless cups compared to cemented sockets in selected patients [3]; however, elderly osteoporotic patients may benefit from cemented fixation with biological graft restoration.

Titanium mesh provides containment and resistance against superomedial joint reaction forces. Contemporary studies report successful graft incorporation and defect reconstruction using mesh-supported impaction grafting techniques [8,9].

Compared to porous metal augments and reinforcement cages such as the Bürch-Schneider anti-protrusio cage, this technique offers reduced cost, preservation of bone stock, and simpler future revision. However, larger series with longer follow-up are required to validate durability.

CONCLUSION

Cemented THA with titanium mesh and impacted autologous cancellous graft is a reliable and cost-effective method for managing Paprosky Type 2C medial wall defects in rheumatoid protrusio acetabuli, demonstrating satisfactory mid-term outcomes.

CLINICAL MESSAGE

- Medial wall defects in rheumatoid protrusio acetabuli require restoration of the anatomical hip center to ensure long-term implant survival.
- Titanium mesh acts as a containment scaffold, preventing graft extrusion and providing immediate mechanical support.
- Impacted autologous femoral head graft restores bone stock and creates a biological medial buttress.
- Cemented acetabular fixation over a stable graft–mesh construct can provide durable results in elderly osteoporotic patients.
- This technique offers a cost-effective alternative to porous metal augments or reinforcement cages while preserving options for future revision.

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