

MANAGEMENT OF ACETABULAR DEFICIENCY IN COMPLEX PRIMARY AND REVISION TOTAL HIP ARTHROPLASTY

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Abstract

Background: Loss of acetabular bone stock either primarily or secondary to an already existing hip prosthesis pose a major challenge in total hip arthroplasty procedures. The defects can range from simple segmental defects to pelvic discontinuity for which an armamentarium ranging from simple autografts to customised triflange cages are at our disposal. The amount and site of acetabular bone loss usually drives the type of reconstruction. **Materials and Methods:** We present a series of 5 cases of total hip arthroplasty (2 primary and 3 revision) with various types of acetabular bone defects managed at Institute of Orthopaedics and Traumatology, Madras Medical College. **Result:** Mean followup was 2years(6 months to 3 years)and the patients have had good functional outcomes in terms of improvement in Harris hip score and were able to resume their daily activities. **Conclusion:** Acetabular deficiencies should be managed at the earliest to preserve the remaining acetabular bone stock and restore the hip biomechanics and provide a long term stable fixation and avoid resurgeries that is morbid for the patient.

INTRODUCTION

Total hip arthroplasty has become the mainstay of treatment that has helped the orthopaedic surgeons to tackle an array of complex hip pathologies. But it has brought about its own set of challenges that has pushed us to keep getting better at our techniques and improve our armamentarium of implants and instruments as well as our knowledge.^[1,2] Loss of acetabular bone stock either primarily or secondary to an already existing hip prosthesis poses a major challenge in total hip arthroplasty procedures.^[3] The major goals in the management of acetabular deficiencies are restoring hip centre and joint biomechanics, providing a rigid fixation of the prosthesis by a creating a solid bone stock.^[4] The various modalities of addressing the defect include biological options like auto and allografts, porous metal cups and augments that allow bone ingrowth. Non biological options include acetabular cages, roof rings, Jumbo cups, triflange cups, saddle prosthesis.^[5] Bone allografts can be used either as bulk allografts or morselized allografts. These allografts are incorporated into the defect by impaction bone grafting.^[6] Here we share our experience of managing five such cases at our institute.^[7]

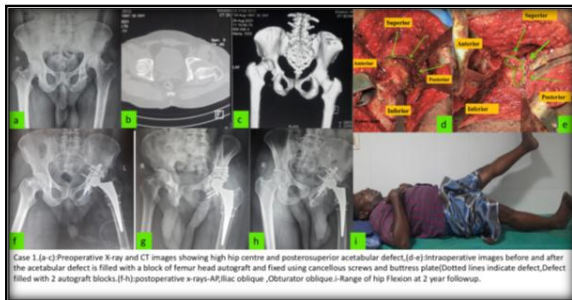
MATERIALS AND METHODS

All cases were performed by a single surgeon at the Institute of Orthopaedics and Traumatology, Madras medical college between 2020 and 2023. We performed 5 cases (2 primary and 3 revision). All patients were screened preoperatively for infection using Complete blood count, ESR, CRP. Preoperative radiological evaluation included standard X-ray views of the pelvis(Anteroposterior and Judet views)and computed tomography imaging with 3D reconstruction to assess the site and size of the defect. Femoral head allografts were used in secondary cases and femoral head autograft used in the 2 primary cases. Femur head allografts were acquired from the bone bank that is present at our institute. Post operatively patients were advised non weight bearing for 6 weeks. Hip abduction and quadriceps strengthening exercises were initiated along with knee and ankle mobilisation on POD-2. Toe touch weight bearing was initiated at 6 weeks and progressively increased. [Table 1]

Case Illustrations

Case 1: A 50 year old male who faced a road traffic accident and sustained a posterior wall acetabulum fracture, underwent acetabular plating on left side in 2019. Implant exit done after 18 months due to progressively increasing pain. Patient presented to us

with a Pre operative Harris hip score of 32.9. On evaluation patient had an arthritic left hip with superior migration of hip centre with a combined segmental and cavitary deficiency in the posterosuperior acetabulum. The defect size was measured to be 5.37 cm x 2.53 cm on computed tomography imaging. We performed a cemented total hip arthroplasty acetabular reconstruction using 2 blocks of femoral head autograft fixed using buttress plate and cancellous screws. There were no complications. Patient resumed daily activities and Harris hip score at 3 year followup was 79.7. Patient did not have any limb length discrepancy.



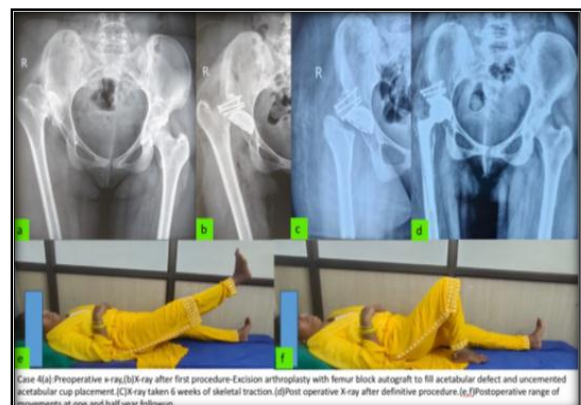
Case 2: A 62 year female who underwent bilateral total hip arthroplasty (right-Cemented, Left Uncemented) for avascular necrosis of bilateral femur head 12 years back presented to us with inability to bear weight on right side. CT evaluation was done and patient was diagnosed to have a secondary protrusio acetabuli with Paprosky's type IIIB acetabular defect with aseptic loosening of acetabular component with superior femur component migration. We went ahead with impaction bone grafting with frozen femoral head allograft which was morselized. Since the graft covered more than 50 % of the cup area, we augmented the graft with cage fixation and cemented acetabular cup. Femur component was not revised as it was robust.

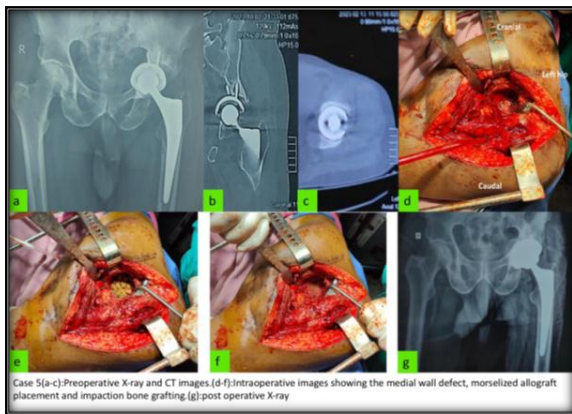


Case 3: A 39 year female underwent a uncemented total hip arthroplasty for avascular necrosis of left hip 13 years back. Before 5 years there was a periprosthetic fracture for which revision long stem total hip arthroplasty was performed. But there was non union of the periprosthetic fracture. That was the time patient presented to us. We performed implant exit as a first stage procedure with deep cultures taken to rule out infection. Patient was put on skeletal traction. CT scans showed a medial wall breach and superior acetabular defect and more than 2 cm superior migration of the hip centre which fell under paprosky type IIIA. Infection was ruled out by negative culture. Acetabular reconstruction was done medially using morselized allograft and block allograft with screws for the superior defect. A cemented long stem femoral prosthesis was used with a cemented stem. Narrow dynamic compression plating was used to augment the periprosthetic fracture.



Case 4: A 18 year female presented with Crowe type IV dysplastic hip with an underdeveloped acetabulum in her right hip with 6 cm shortening and a defect in superior dome of acetabulum. The patient was walking with a limp for more than 10 years. We planned a 2 stage procedure for the patient. First step we did an excision arthroplasty and used the femoral head autograft block with screws for acetabular reconstruction and uncemented cup was placed. We applied skeletal traction for the patient for 6 weeks during which patient developed foot drop which was managed conservatively using splints and physiotherapy. Secondly, we completed the arthroplasty procedure by implanting femoral stem and head. Patient has 1.5 cm shortening and able to walk unaided. Her Harris hip score at final followup was 90.6 (excellent).





CASE 5: A 57 year male who underwent uncemented total hip arthroplasty left side presented with pain and difficulty in weight bearing left hip. It was found to be a Paprosky type IIC defect in radiology. Intraoperatively, we found the defect size to be approximately 2.5cm x 2.5 cm on the medial wall. Since the cup had more than 50% native bone contact, we performed impaction bone grafting with

femur head allograft and upsized the uncemented acetabular cup by 4mm. We did not require a cemented cup or any other kind of augment. We did not revise the femur stem as we found to be stable.

RESULTS

Post operative assessment was done functionally using a Harris hip score and radiologically using X-rays. The mean Harris hip score preoperatively was excellent in one, good in 3 and fair in 1. We had good consolidation of the allografts placed and there was no case of deep infection. Complications that we encountered was foot drop in Case 4 that developed after the first procedure when the skeletal traction was applied. We had treated it conservatively with foot drop splint and physiotherapy. Patient showed signs of recovery and at the last followup, she had near normal ankle and toe movements. In case 3 ,we had superficial infection for which re suturing was done. Infection settled and patient was discharged uneventfully.

Table 1

Case	Type of acetabular deficiency	management	Follow up	Harris hip score at final follow up
1(primary)	Posterosuperior Combined deficiency (segmental + cavitatory)	Femur head autograft with cemented cup	3 years	82.6(Good)
2(Secondary)	Paprosky type IIIB	Allograft with cup-cage application	2.5 years	86.7(Good)
3(Secondary)	Paprosky type IIIA	Allograft with cemented cup	2 years	84.6(Good)
4(Primary)	Superior acetabular defect (Crowe type IV hip dysplasia)	Femur head autograft with uncemented cup	1 year 8 months	90.6(Excellent)
5(Secondary)	Paprosky type IIC	Allograft with uncemented cup revision	6 months	74.1(Fair)

DISCUSSION

Management of acetabular deficiencies must be tailor made and customised to each patient's pathology. The amount and size of acetabular defect dictates the type of augmentation that needs to be done.^[8] Isolated cavitatory defects can be managed with impaction bone grafting alone while combined segmental with cavitatory defects require further rim augmentation using either bone blocks or augments.^[9] In our case series, Case 5 had only a cavitatory defect with medial wall breach. So we opted for only impaction bone grafting with upsizing of the uncemented acetabular cup. Whereas Case 2 had a more larger defect coming under paprosky type IIIB which needed a cage to stabilise the graft followed by a cemented acetabular cup. Uncemented have an upper hand over cemented cups in those cases requiring revisions. In primary cases, patient's native femoral head autograft serves as a better option than allografts or augments. Autografts have a faster incorporation rate and are free of complications.^[10] So whenever adequate autograft is available, we should opt for it. This was done in the two primary cases (Case1 and 4) in our series where we used to reconstruct the acetabular dome defect using autograft blocks fixed

with buttress plates and screws. The aim should be to achieve a stable hip centre as close as possible to the native hip centre.^[11,12] This also ensures that patients do not suffer gross limb length discrepancy. In our series, all the patients had a manageable limb length discrepancy that was tolerated by the patients in activities of daily living.^[13,14]

CONCLUSION

Acetabular defects managed with allografts either in the form of morselized graft or as bone blocks is a very good treatment option showing good graft incorporation. Careful Preoperative planning followed by meticulous surgery and post operative rehabilitation provides the patients with excellent results and help us conquer these acetabular deficiencies.

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