

Case Report

High-centre total hip arthroplasty with acetabular augment for massive acetabular bone loss following two-stage management of an infected, chondrolysed hip after fracture-dislocation of the acetabulum: a case report

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ABSTRACT

Post-traumatic septic arthritis of the hip following surgical fixation of an acetabular fracture is an uncommon but devastating complication that can progress to rapid chondrolysis of the femoral head and, if unchecked, massive acetabular bone loss. Management requires a staged strategy combining infection eradication with later reconstruction. We report a 55-year-old man who sustained a traumatic hip fracture-dislocation with an undisplaced acetabular fracture, initially treated elsewhere with closed reduction followed by open reduction and internal fixation (ORIF) with plating. Three months later he presented with a discharging sinus at the surgical site and radiographic evidence of near-total chondrolysis of the femoral head. He was managed with implant removal, thorough debridement and insertion of antibiotic-loaded cement beads (Girdlestone-type resection arthroplasty), followed by culture-directed systemic antibiotics. Although the infection resolved and the wound healed, the patient remained symptomatic with persistent hip pain. Repeat imaging showed complete loss of the femoral head, proximal femoral migration and near-total acetabular bone loss, confirmed on computed tomography. He subsequently underwent total hip arthroplasty (THA) with a high hip centre construct and an acetabular augment to compensate for the posterior and superior acetabular defect encountered intraoperatively. A staged protocol of aggressive debridement and antibiotic cement spacing, followed by high hip centre THA with augment support, is a viable salvage strategy for infected, chondrolysed hips with severe acetabular bone loss, and can restore a functional, pain-free joint when anatomic reconstruction is not feasible.

Keywords: Hip fracture-dislocation, Acetabular fracture, Post-surgical hip infection, Femoral head chondrolysis, Girdlestone resection arthroplasty, Antibiotic cement spacer, High hip centre, Acetabular augment, Total hip arthroplasty

INTRODUCTION

Fracture-dislocation of the hip with an associated acetabular fracture carries a recognised risk of avascular necrosis and post-traumatic arthritis, and, less commonly, deep surgical-site infection after open fixation, reported in roughly 4-8% of patients undergoing ORIF for acetabular fractures.¹⁻⁷ When infection involves the joint, it can

destroy articular cartilage and subchondral bone within weeks, producing rapid chondrolysis of the femoral head.⁸⁻¹⁰ Once deep infection is established around retained metalwork, eradication generally requires implant removal and debridement, commonly staged as a resection (Girdlestone-type) arthroplasty with an antibiotic-loaded cement spacer, followed by reconstruction once infection is quiescent.^{9,11-13} When the interval of instability and

infection is prolonged, progressive proximal migration of the femur and erosion of the acetabulum can leave severe, and sometimes unreconstructable by conventional means, bone loss.^{10,14,15} We present the staged management of one such case, culminating in a high hip centre THA with acetabular augment support.

CASE REPORT

Initial injury and fixation (outside hospital)

A 55-year-old man sustained a traumatic dislocation of the right hip with an undisplaced fracture of the acetabulum. He was initially treated at an outside facility with closed reduction, followed by ORIF with plate osteosynthesis of the acetabular fracture (Figures 1 A and B), an injury pattern with a well-recognised risk of avascular necrosis of the femoral head.^{1-3,14} He was followed up at another outside hospital roughly two and a half months later, at which point the fixation remained in situ and appeared satisfactory on plain radiographs (Figure 1 C).

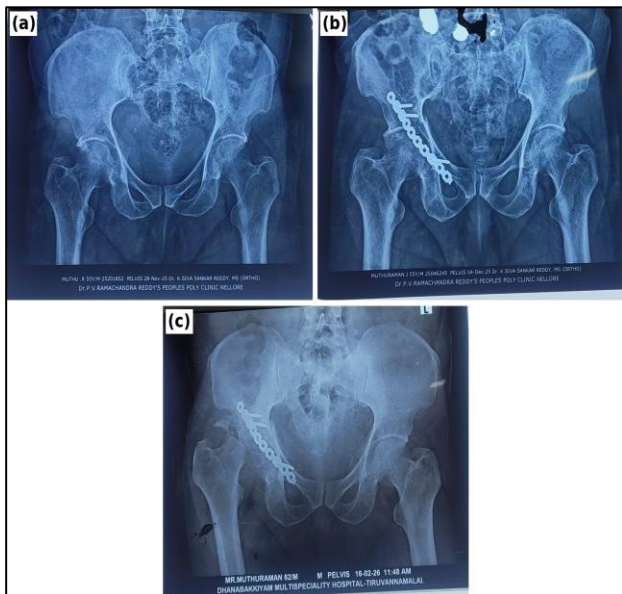


Figure 1 (A-C): (A) Initial pelvis radiograph following the index injury (fracture-dislocation of the right hip with undisplaced acetabular fracture), prior to definitive fixation, (B) Postoperative radiograph following ORIF of the acetabular fracture with plate osteosynthesis at the outside hospital (pre-op and post-op acetabular implant fixation), (C) Follow-up radiograph approximately 2.5 months after ORIF, with fixation *in situ*.

Presentation with infection

Approximately three months after the index surgery, the patient developed a discharging sinus with purulent drainage at the surgical site over the right hip, and presented with this complaint. Imaging at presentation (Figure 2 A) demonstrated retained hardware with

radiographic evidence of near-total chondrolysis of the femoral head, consistent with septic arthritis of the hip secondary to surgical-site infection.^{8,9,16}

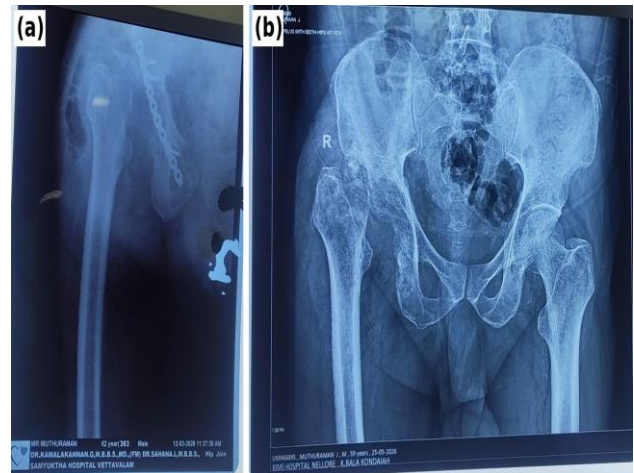


Figure 2 (A and B): (A) Radiograph at presentation with a discharging surgical-site sinus, showing retained hardware and near-total chondrolysis of the femoral head. (B) Radiograph after debridement and antibiotic cement spacer placement, showing proximal femoral migration and acetabular bone loss.

Stage 1: Debridement and antibiotic cement spacer

The patient underwent removal of the retained implant with thorough surgical debridement of the hip. An antibiotic-loaded cement bead spacer was fashioned and inserted in the resected joint space (a Girdlestone-type resection arthroplasty), aiming to eradicate infection while maintaining soft-tissue length and providing local antibiotic delivery.^{9,11-13,17} Intraoperative tissue and pus cultures were sent, and the patient was subsequently treated with systemic antibiotics tailored to culture and sensitivity results. Follow-up imaging after the spacer procedure (Figure 2 B) confirmed implant removal, an antibiotic spacer construct, and interval proximal migration of the femur with progressive acetabular bone loss.^{10,14} Clinically, the discharge settled and the wound healed well (Figure 4 A), and inflammatory markers normalised; however, the patient continued to report persistent hip pain and returned to the outpatient clinic for further management.

Reassessment and reconstructive planning

On this presentation, radiographs showed complete loss of the femoral head with proximal migration of the femur and near-complete loss of acetabular bone stock. Computed tomography (CT) of the pelvis was obtained to characterise the extent of the acetabular defect and to plan reconstruction. Preoperative C-reactive protein was 1.813 mg/L (normal range 0.1-5 mg/L), which is within normal limits and supports quiescent infection prior to definitive surgery.

Stage 2: High hip centre THA with acetabular augment

Definitive reconstruction with THA was planned once infection quiescence was confirmed clinically and biochemically.^{9,18} Intraoperatively, complete acetabular bone loss was confirmed, with a large posterior wall/column defect precluding placement of the acetabular component at the native hip centre. A high hip centre technique was therefore adopted: the acetabular cup was placed at a superior, more stable location on the remaining ilium, with a structural augment used to support the cup and compensate for the posterior column and wall deficiency.¹⁹⁻²³ A femoral stem was implanted in the proximal femur. Postoperative radiographs confirmed a well-seated high hip centre cup with augment and femoral stem in satisfactory position (Figures 3 A and B).

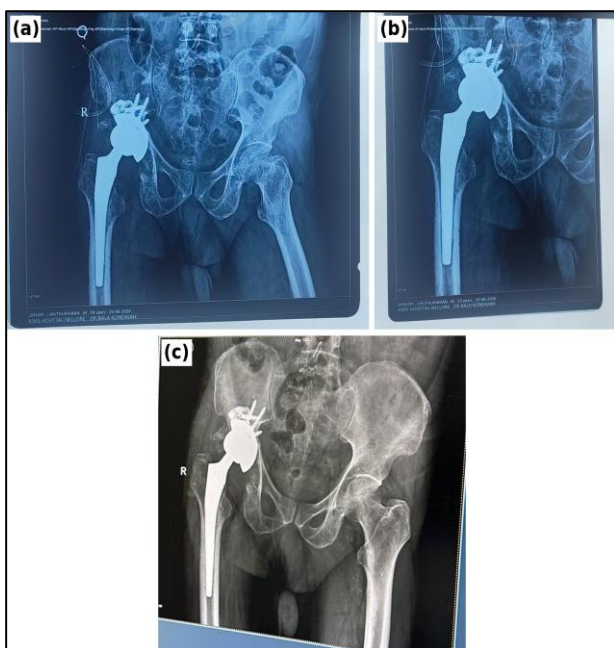


Figure 3: Postoperative radiographs after high hip centre THA with acetabular augment support; (A) Overall reconstruction, (B) Close-up view, (C) One-month follow-up radiograph, confirming a well-seated high hip centre cup with augment and femoral stem in satisfactory position.

Postoperative course and outcome

The postoperative course was uneventful, with a healed, stable surgical wound (Figure 4 A). The patient was progressively mobilised with walker-assisted weight-bearing under physiotherapy supervision (Figure 4 B) and reported significant improvement in pain compared with the pre-reconstruction state. At one-month follow-up, the patient was able to walk without walker support, had resumed daily activities independently, was able to climb stairs, and reported no pain at the surgical site. Radiographs at this visit confirmed a well-seated high hip centre cup with augment and femoral stem in satisfactory position (Figure 3 C).



Figure 4 (A and B): Clinical photographs. (A) Healed surgical scar. (B) Patient mobilising with a walking frame during postoperative rehabilitation.

One-month functional assessment

At the one-month postoperative visit, formal functional assessment was performed using the Harris hip score. The patient reported slight, occasional pain with no compromise of activity, and walked with a slight limp using a cane for long walks, managing approximately 30 minutes of walking without pain. He climbed stairs normally using the railing, sat comfortably on an ordinary chair, and was able to use public transportation, though he put on shoes and socks with some difficulty. No visible deformity was present, and limb-length discrepancy was less than 1 cm. Combined hip range of motion was 180-200°. These findings correspond to a Harris hip score of 81/100 (Pain 40/44, function 33/47, absence of deformity 4/4, range of motion 4/5), placing the hip in the “Good” category at this early stage (Figure 5).

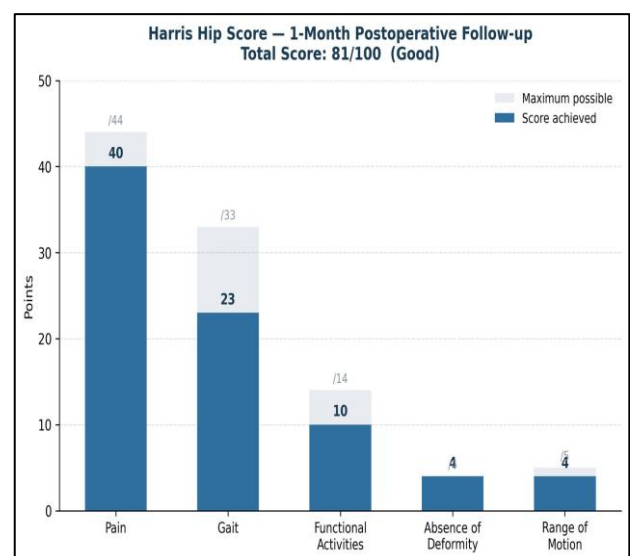


Figure 5: Harris hip score component breakdown at one-month postoperative follow-up (Total score 81/100, Good).

At this one-month stage, he will improve more in the coming months, as continued physiotherapy, strengthening and gait training are expected to further reduce residual limp, improve independence from the cane, and ease difficulty with activities such as putting on shoes and socks.

DISCUSSION

Deep infection after acetabular fracture fixation is uncommon, occurring in an estimated 4-8% of patients undergoing ORIF, with risk increased by factors such as obesity, associated abdominal trauma, prolonged ICU stay and Morel-Lavallée lesion, and carries high morbidity. Rapid chondrolysis of the femoral head-as seen in this patient within a few months of the index surgery-is a recognised, aggressive consequence of untreated or partially treated septic arthritis of the hip which itself compounds the pre-existing risk of avascular necrosis inherent to fracture-dislocation of the hip.^{1-9,16}

The mainstay of management for an infected joint with retained metalwork is implant removal with thorough debridement; when the femoral head and acetabular cartilage are already destroyed, resection (Girdlestone-type) arthroplasty with an antibiotic-loaded cement spacer allows local antibiotic delivery, preserves soft-tissue tension, and provides a bridge to later reconstruction once infection is eradicated, an approach with an established track record in septic arthritis of the hip.^{9-13,15,17,18} Girdlestone resection arthroplasty was first described in 1928 as a salvage procedure for septic and post-traumatic hip disease, and remains a reliable first stage before conversion to THA once infection is controlled.^{11,12} Two-stage protocols using a preformed antibiotic cement spacer followed by cementless THA have been shown to achieve durable infection control together with meaningful improvement in pain and hip function in prospective series of septic hip arthritis.^{13,18} A prolonged interval in resection arthroplasty, as occurred in this patient, predisposes to progressive proximal femoral migration and acetabular erosion, which can leave the acetabulum severely deficient at the time of planned reconstruction-precisely the scenario encountered intraoperatively in this case, with a large posterior column/wall defect.^{10,14}

The functional cost of a prolonged interval in resection arthroplasty is well documented. Girdlestone arthroplasty left unconverted typically yields a persistently painful, functionally limited hip, with dependence on walking aids and a marked leg-length discrepancy, and reported perioperative mortality for the resection procedure itself has ranged as high as 7-62% in older, infected-arthroplasty cohorts, reflecting the frailty of the population in whom it is most often required.²⁴ Conversion of a Girdlestone resection arthroplasty to THA has, however, been shown in matched case-control data to achieve a clinical outcome comparable to aseptic revision THA performed for similarly sized bone defects, despite worse preoperative function and greater leg-length discrepancy in the

resection-arthroplasty group.²⁵ This evidence supports the strategy adopted here: accepting the functional limitations of a temporary resection state in order to first secure infection eradication, before committing to definitive reconstruction.

Reconstruction of severely deficient acetabula in revision THA remains one of the more difficult problems in hip surgery.^{19,26} Placing the acetabular component at a high hip centre, rather than attempting to restore the anatomical centre of rotation over a deficient bony bed, is a long-described strategy that avoids the need for large structural grafts, at the cost of a theoretically increased risk of impingement, altered abductor biomechanics and dislocation if not combined with careful cup orientation and, where needed, augment or graft support.^{21-23,27,28} Modern porous metal augments used with the high hip centre technique or standard revision cups have reported favourable mid- to long-term survivorship in the setting of major acetabular bone loss, and cup-augment or cup-cage constructs are now well established alternatives to bulk allograft for Paprosky 3-type defects, with allograft-based reconstructions showing more variable, technique-dependent success in comparative series.^{20,26,29} In this patient, a high hip centre construct combined with a structural augment allowed a stable, well-supported cup to be achieved despite near-total loss of the native acetabulum, avoiding the added morbidity of bulk allografting in a previously infected field.

Comparative series of alternative bone-loss reconstruction strategies provide further context for the results that might be expected in this case. Systematic review data on jumbo cups in revision THA report re-revision-free survivorship of approximately 95% at a mean follow-up beyond nine years, with dislocation, aseptic loosening and periprosthetic joint infection as the leading complications.³⁰ Long-term follow-up of trabecular metal augments used for severe acetabular defects has similarly demonstrated durable osseointegration of both shell and augment beyond seven years, restoring the hip centre of rotation without significant medialisation, albeit with a recognised risk of late infection and recurrent instability.³¹ Flying-buttress porous tantalum augment constructs for superolateral defects have likewise shown acceptable mid- to long-term revision rates in the largest reported cohort to date.³² These figures underline that, even with modern augment technology, revision reconstruction for massive acetabular bone loss carries a meaningful risk of complication, and continued surveillance of this patient's construct is warranted.

Instability is among the most feared early complications of a high hip centre construct, given the altered abductor lever arm and soft-tissue tension that accompany superior cup placement.^{21,27} Dual-mobility bearings have been increasingly adopted in revision THA specifically to mitigate this risk; comparative series report dislocation rates as low as 3% when a dual-mobility cup is used in the revision setting, compared with substantially higher rates

seen historically with conventional bearings.³³ Although a standard bearing was used in this case, careful intraoperative attention to cup orientation, offset restoration and soft-tissue tensioning was necessary to minimise dislocation risk, and a dual-mobility or constrained liner may be a reasonable adjunct to consider in similarly high-risk reconstructions.

This case illustrates two teaching points relevant to practice. First, a discharging wound or unexplained pain after acetabular ORIF warrants prompt investigation for deep infection, since delay allows rapid, irreversible chondrolysis and progressive bone loss that substantially complicates eventual reconstruction.^{4,5,8,9} Second, when infection has been definitively eradicated but the acetabulum is left severely deficient, a high hip centre THA with augment support is a reasonable and reproducible salvage option, avoiding structural allografting in a field with a history of infection while still restoring a stable, functional hip.^{20,21,23,29}

This report has the inherent limitations of a single case: the outcome cannot be generalised, and longer-term follow-up with formal functional scoring (e.g., Harris hip score, Oxford hip score) was not yet available at the time of writing. Nonetheless, early one-month follow-up already demonstrates a stable, pain-free reconstruction with a return to independent ambulation and stair-climbing, and the case adds to a limited body of literature describing high hip centre THA with augment support specifically in the context of prior septic chondrolysis, as distinct from the more commonly reported indications of developmental dysplasia or aseptic revision.

CONCLUSION

Staged management-implant removal, debridement and antibiotic cement spacing followed, after confirmed infection eradication, by high hip centre THA with acetabular augment support-successfully salvaged a severely compromised hip in this patient with post-traumatic septic chondrolysis and massive acetabular bone loss. This approach mirrors the outcomes reported for comparable augment-and jumbo cup-based reconstructions in the revision arthroplasty literature, where durable survivorship and meaningful functional improvement are achievable despite major bone loss, provided infection is definitively controlled before reconstruction is undertaken. Early recognition of surgical-site infection after acetabular fixation is essential to limit the extent of joint destruction that ultimately dictates the complexity of reconstruction. Careful attention to cup positioning, soft-tissue balance and dislocation-prevention strategies, including consideration of dual-mobility bearings, is warranted whenever a high hip centre technique is used for major bone loss.

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