Chapter 8
Post-traumatic Arthritis of the Acetabulum

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Key Points

- Articular step-off greater than 2mm significantly increases the risk of post-traumatic arthritis.
- The high failure rate of cemented acetabular components has made uncemented implants the mainstay for reconstruction in cases of posttraumatic arthritis.
- The results of THA after acetabular fracture are humbling at 10 years when compared to THA for cases unrelated to posttraumatic arthritis.
- The overall revision rates after THA following acetabular fractures are substantially higher than those following a conventional primary THA and, hence, a multispecialty treatment approach of these challenging injuries is essential.

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Introduction

Acetabular fractures are challenging injuries that require careful planning and specific fixation for each fracture pattern. These injuries typically demonstrate a bimodal distribution – young patients with high-energy trauma and old patients with osteoporotic bone from low-energy falls [15]. Despite accurate open reduction and internal fixation of challenging acetabular fractures, there is an undeniable risk of developing posttraumatic arthritis that can compromise patient outcomes [19]. Certain select fracture types with significant comminution in poor bone quality require activity modification and weight-bearing restrictions as open reduction and anatomic fixation would not be successful. However, the majority of the fractures require anatomic restoration of the articular surface, especially in young patients. Elderly patients with poor bone quality may be treated conservatively allowing imperfect articular surface congruency, followed by total hip arthroplasty (THA) [20].

The incidence of posttraumatic arthritis is 13% in cases where the articular congruity has been adequately restored (less than 2 mm). There is a marked increase in posttraumatic arthritis to 44% when the step-off between acetabular articular fragments is greater than 2 mm [6]. However, the reported incidence of posttraumatic arthritis can be as high as 67% per some reports [17, 23]. Most cases of posttraumatic arthritis after acetabular fractures require THA as the mainstay of treatment. Usually, such patients can fall into one of the following three categories [12]:

- Category I – Patients with hip degeneration due to the initial injury or because of complications associated with prior treatments. Such patients may present with osteonecrosis of the femoral head, fracture mal-union, or nonunion and remnant fracture fragments.
- Category II – Comminuted fractures in elderly patients with osteoporosis that are not amenable to primary open reduction internal fixation and must rely on healing by secondary congruence. In these cases, patients can either receive a THA for an acute fracture or delayed arthroplasty for secondary congruence.
- Category III – The nature of the fracture precludes a good result with initial anatomic fixation. Impacted and multifragmentary fractures through the weight-bearing dome of the acetabulum are usually not amenable to good function even after excellent open reduction and internal fixation leading to posttraumatic arthritis.

THA remains the main treatment for posttraumatic arthritis after acetabular fractures. However, it remains inferior when compared to THA for nonfracture-related arthritis [7, 19, 21]. Increased failure in posttraumatic situations can be attributed to cemented acetabular components, initial method of fracture fixation, preexisting hardware, increased propensity for infection, younger age of the patient, abnormal anatomy, sclerotic bone bed, and decreased acetabular bone stock [15]. Conversely, cementless acetabular reconstruction has improved survivorship and has become the preferred implant choice for posttraumatic arthritis of the acetabulum [1].

In this chapter, we will outline our treatment algorithm for posttraumatic arthritis of the acetabulum including surgical planning, implant selection, and surgical technique, and we will also present some representative cases highlighting key principles. In addition, we will review current outcomes associated with THA for posttraumatic arthritis of the acetabulum.

Surgical Planning

Planning for surgery involves a thorough understanding of the patho-anatomy associated with the original fracture and possible fixation constructs used initially. A complete history and physical examination is imperative, and in acute cases, it is imperative to check the patient's soft tissue to exclude degloving injuries such as the Morel-Lavallée lesion [3]. Prior incisions must be examined to understand which approach to the hip has been previously used. Previous wounds must be examined for infections such as erythema, fluctuance, drainage, and sinus tracts. Chronic wounds with exposed bone or hardware will likely require muscle flap coverage and plastic surgeon consultation. Skin bridges between old and new incisions should be maximized in order to preserve skin blood supply.

A detailed neurovascular examination must be documented including the motor, sensory, and peripheral vascular status. Acetabular fractures may be associated with neurovascular compromise due to the mechanism of injury or subsequent surgical procedures. Nerve conduction studies, electromyography (EMG), and vascular studies may be considered preoperatively if the status is compromised. Our preference is to use the posterolateral approach to the hip which is extensile and allows adequate exposure to the acetabulum and the femur.

From the surgical perspective, we can classify the patients in to three types [20]:

- Type I – Patients requiring a conventional primary THA. In these cases, there is adequate bony support for the cup, and the hip center of rotation is preserved in its native anatomic location with no need for structural reconstruction. Such patients typically display posttraumatic arthritis in well-reduced fractures and osteonecrosis of the femoral head.
- Type II - Patients require fracture stabilization along with THA. In the majority of cases a primary THA implant would suffice, but, occasionally, there is inadequate bony support for an acetabular cup due to the unstable fracture pattern of present nonunion. Such patients will require cup support with additional internal fixation.
- Type III – Patients that require significant reconstruction; these are challenging situations due to significant alterations in the joint anatomy. With such cases, it is essential to restore the hip center of rotation with revision THA principles including bone graft or augments, cage or cup-cage constructs, and, possibly, even custom tri-flange components. Examples include cases with an absent wall, defective column, or cases with acetabular protrusio.

Radiographic evaluation begins with radiographs consisting of anteroposterior views of the pelvis and both hips along with Judet views, and inlet-outlet views of the pelvis [8]. In addition, we typically perform computed tomography (CT) scans with three-dimensional (3D) reconstruction [9, 14]. These images help with evaluating the adequacy of bony support for cup fixation at the appropriate location. We prefer classifying acetabular defects using the Paprosky classification system [16]. The images also help with evaluating the preexistent internal fixation that may or may not need to be removed to perform a THA. It is also essential to evaluate the need for supplementary fixation of walls and columns and the need for structural enhancement by bone grafts, prosthetic augments, cup-cage constructs, or custom tri-flange implants [2, 5]. This approach will help with the reconstruction of the hip center of rotation while determining adequate bony coverage of the uncemented cup over at least 80% of its outer diameter [12].

Implant Selection

The high failure rate of cemented acetabular components has made uncemented implants the mainstay for reconstruction in cases of posttraumatic arthritis [1, 5, 13]. Uncemented multihole porous metal cups allow the surgeon to plan screw trajectories in the available host bone, while the porous metal surface can achieve initial scratch fit for primary stability. Based on the type of bone defect created due to the initial injury and subsequent surgeries, it is also advisable, especially for complex reconstructions, to have various porous metal augments and cages available. Custom tri-flange components typically require 3D CT reconstructions and subsequent manufacturing from the implant company. In such cases implants should be ordered several weeks in advance.

Surgical Technique

Hypotensive anesthesia is essential to reduce blood loss in such challenging surgeries. We prefer the extensile posterolateral approach to the hip for these surgeries for excellent visualization of the acetabulum and the femur. It is important to securely fix the patient in the lateral decubitus position using either a peg board or a hip positioning device. This is because the surgeon must rely on external landmarks for appropriate cup placement, as internal structures such as the posterior wall, transverse acetabular ligament, and weight-bearing roof may not be in the native anatomic position. Intraoperative fluoroscopy must be available as well to confirm cup placement and restoration of hip center of rotation.

In cases with prior internal fixation hardware, the position of the implants may be used to locate the correct placement of the cup. We usually do not remove the previously placed implants unless they obstruct cup placement. Adequate, careful soft tissue dissection is required to visualize the acetabulum in its entirety. Release of the insertion of the gluteus maximus tendon from the linea aspera should be performed to allow the femur to be shifted anteriorly. Also, removal of the anterior capsule and scar tissue allows for a pocket to be created for the femur to be translated anteriorly. A supra-acetabular Steinmann pin or a 90-degree bent Gelpi retractor, a right angle Hohmann retractor on the posterior column, a ball-spike pusher to shift the femoral shaft anteriorly, and a blunt Hohmann retractor at the inferior border of acetabulum usually suffice for a clear 360-degree view of the socket.

Placing the cup in adequate anteversion and abduction is critical to the patient's function and implant longevity. With porous metal implants, it is essential to coat the exposed surface of the implant to avoid excessive fibrosis. While closing the incision, it is essential to not leave any dead space, and the use of drains with meticulous soft tissue closure must be ascertained. Postoperative care resembles the protocol for THA such as posterior-hip precautions and physical therapy. However, the weight-bearing status may vary depending on the stability of the reconstruction construct and it may have to be modified on an individual basis. In the next section, we will present several cases that reinforce the aforementioned principles.

Case Examples

We present case examples based on the three types of patients [20] described in the surgical planning section of the chapter:

- Type I – Patients requiring a conventional total hip arthroplasty. Figures 8.1, 8.2, and 8.3 are case examples of patients that had prior acetabular fractures which had united with sufficient bone stock for primary total hip arthroplasty without additional acetabular reconstruction.
- Type II – Patients requiring fracture stabilization along with THA. Figures 8.4, 8.5, and 8.6 are case examples of patients requiring acute fracture fixation and concurrent THA to ensure adequate support for the implants.
- Type III – Patients requiring significant acetabular reconstruction to restore the center of rotation. Figures 8.7, 8.8, and 8.9 are case examples of patients that rely upon revision hip replacement principles to ensure optimal outcome.

Outcomes

We review several studies that report on the mid-term and long-term outcomes for THA in cases of posttraumatic arthritis after acetabular fractures. A recent study from the Mayo Clinic reported their mid-term results on 30 primary THAs that were performed with a porous metal acetabular component after open reduction internal fixation (ORIF) of acetabular fractures from 1999 through 2010 [22]. From these

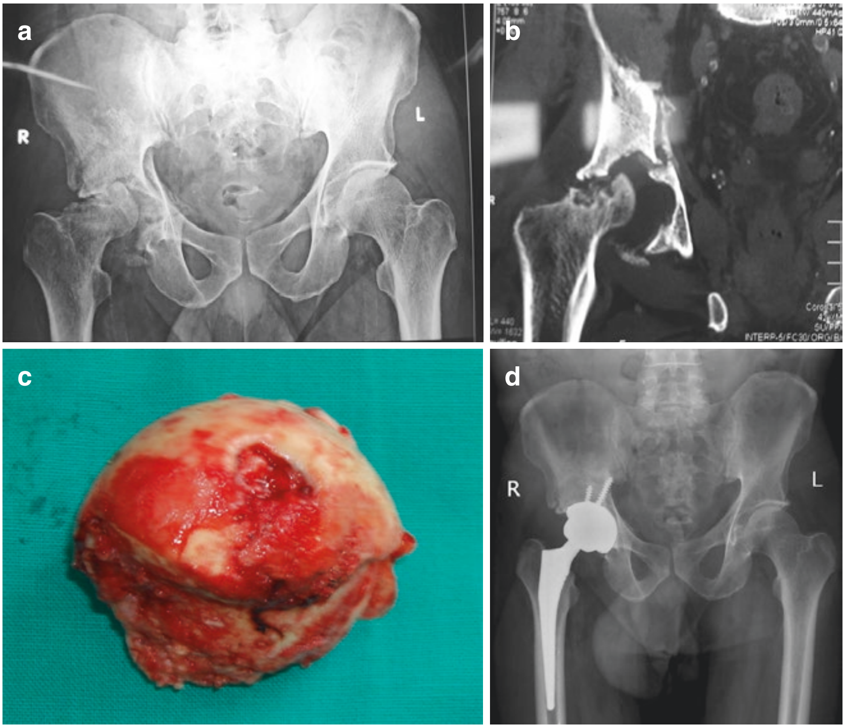
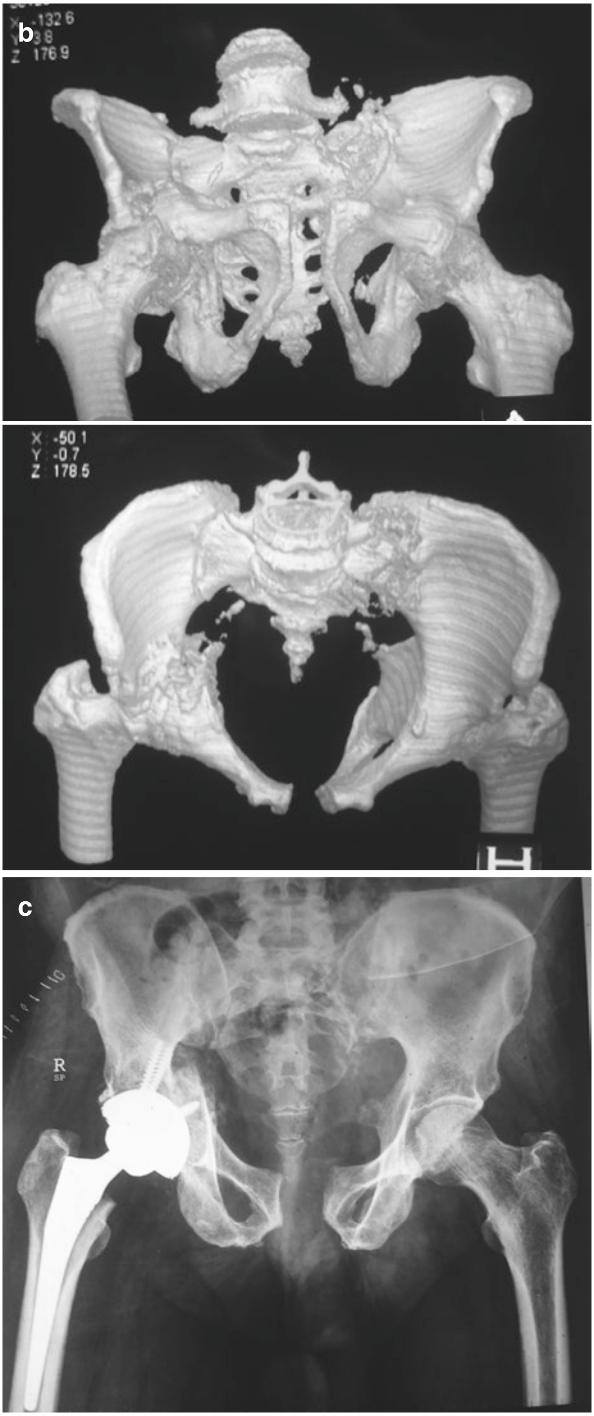


Fig. 8.1 (**a**) Pre-operative AP Pelvis radiograph of a 42 year-old male with an old acetabular fracture leading to post-traumatic arthritis secondary to femoral head osteonecrosis. (**b**) Pre-operative CT scan showing the incarcerated head fragment. (**c**) Intra-operative photograph of the incarcerated femoral head. (**d**) Post-operative AP pelvis radiograph displaying press-fit acetabular and femoral components

Fig. 8.2 (**a**) Pre-operative AP pelvis radiograph of a patient with a chronic mal-united acetabular fracture and pelvic ring injury. (**b**) 3D CT reconstructions of a patient with a chronic mal-united acetabular fracture and pelvic ring injury. (**c**) Post-operative AP pelvis radiograph displaying press-fit acetabular and femoral components

Fig. 8.2 (continued)



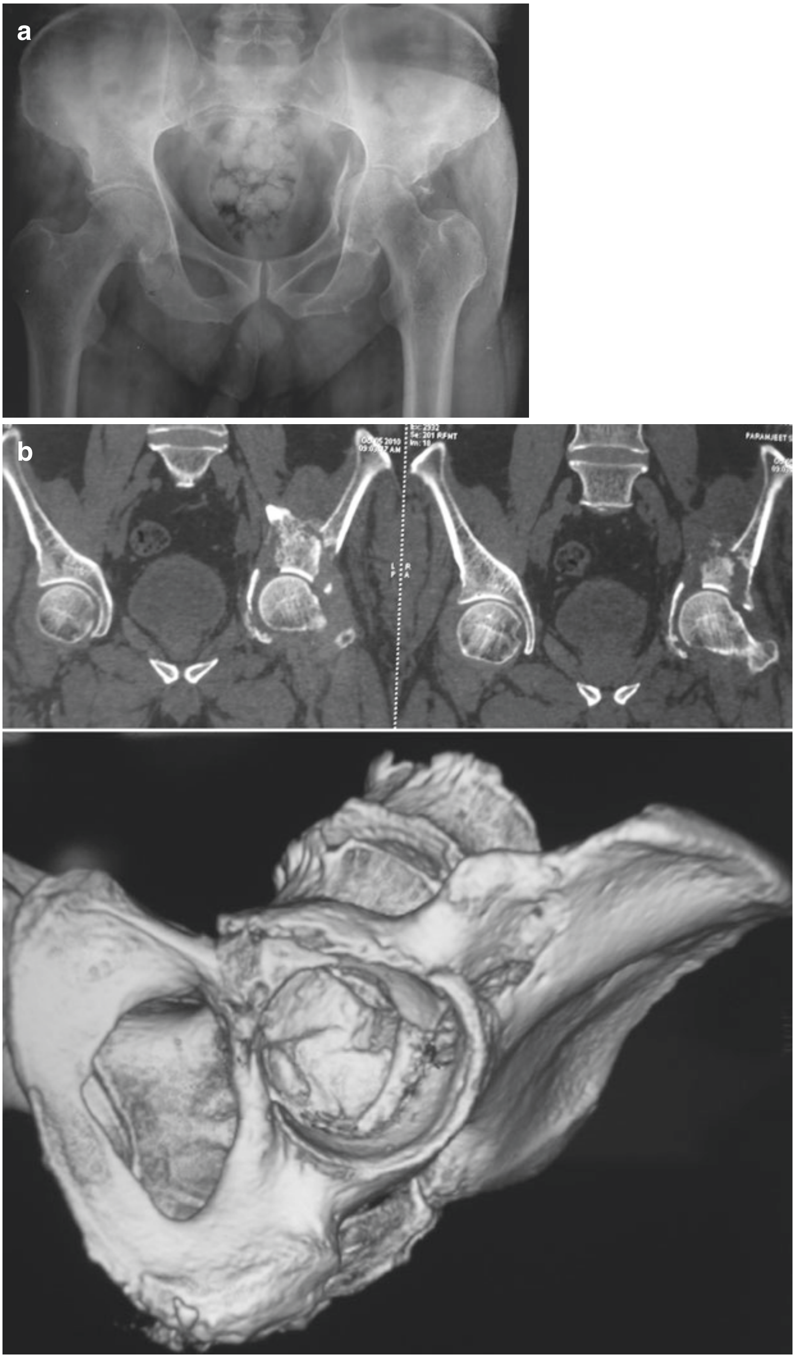


Fig. 8.3 (**a**) Pre-operative AP pelvis radiograph of a patient with a chronic acetabular fracture and medial protrusion of the femoral head. (**b**) 3D CT reconstructions of a patient with a chronic acetabular fracture and medial protrusion of the femoral head. (**c**) Post-operative AP pelvis radiograph displaying press-fit acetabular and femoral components with medial bone graft

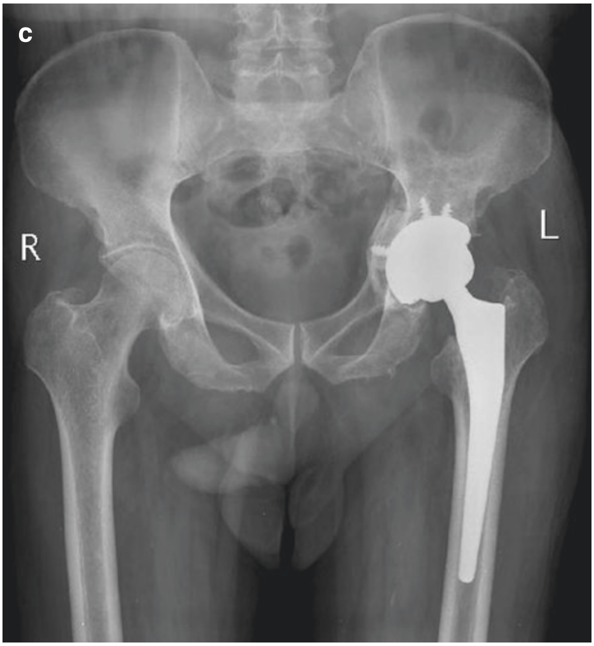


Fig. 8.3 (continued)

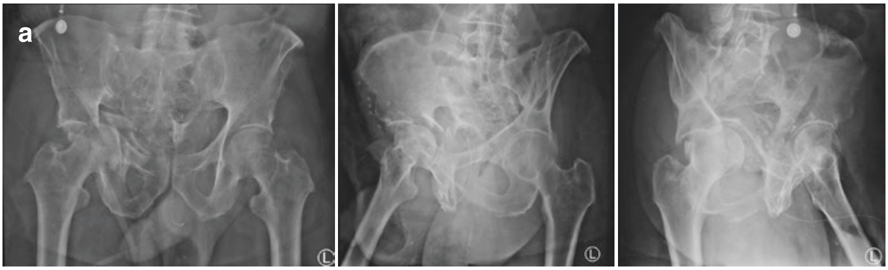


Fig. 8.4 (**a**) Pre-operative radiographs of a 67 year old patient with a both columns acetabular fracture and antecedent hip pain associated with osteoarthritis. (**b**) 3D CT reconstruction of a 67 year old patient with a both columns acetabular fracture and antecedent hip pain associated with osteoarthritis. (**c**) Post-operative AP pelvis radiograph displaying press-fit acetabular and femoral components with medial bone graft and posterior column and wall fixation

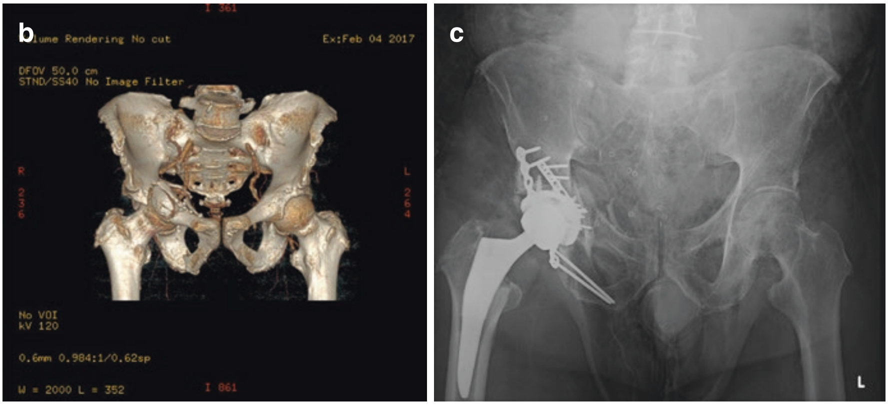


Fig. 8.4 (continued)

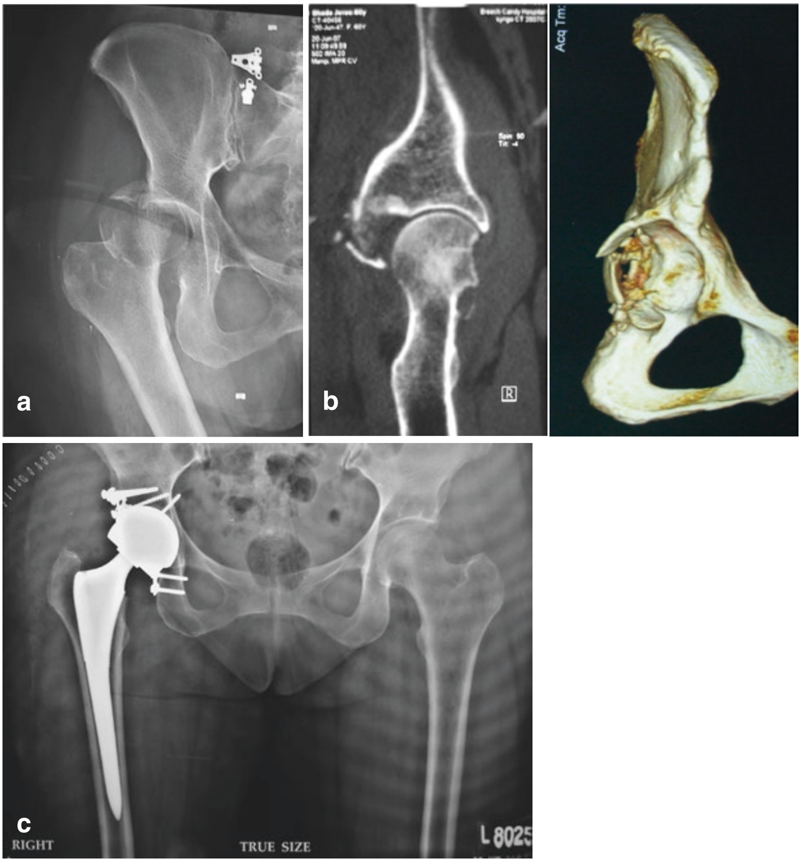


Fig. 8.5 (**a**) Pre-operative AP right hip radiograph of a 60 year-old gynecologist who sustained a fracture-dislocation of her left hip after a fall. (**b**) 3D CT reconstructions of a 60 year-old patient with the fracture dislocation. (**c**) Post-operative AP pelvis radiograph displaying press-fit acetabular and femoral components with posterior wall fixation

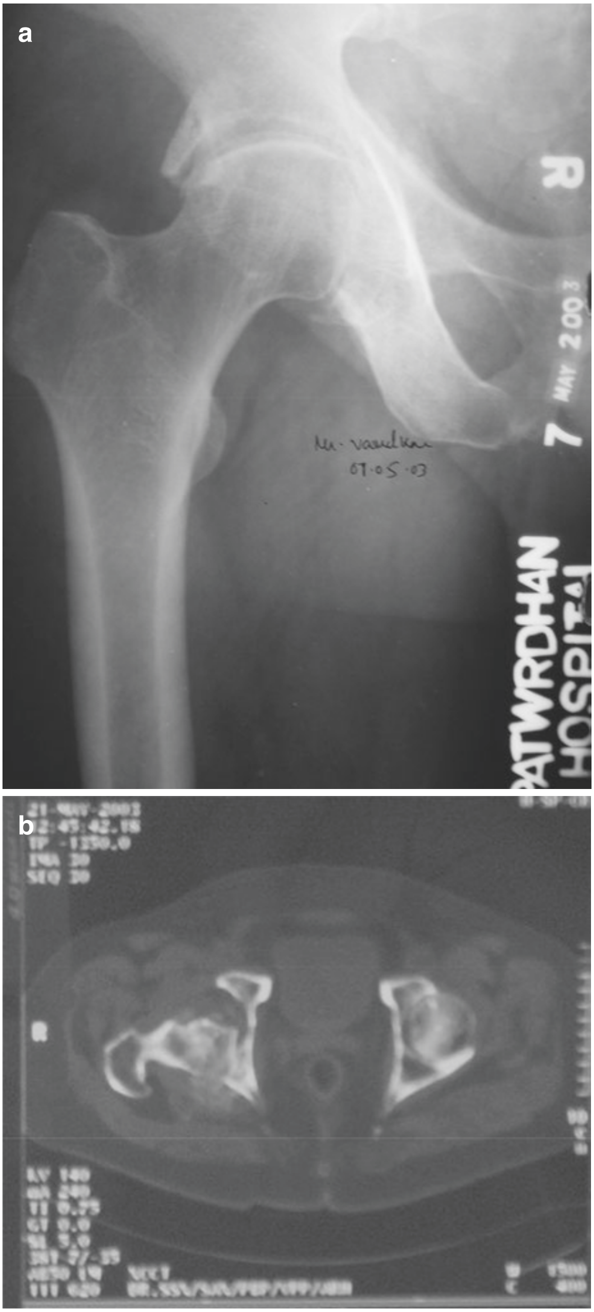
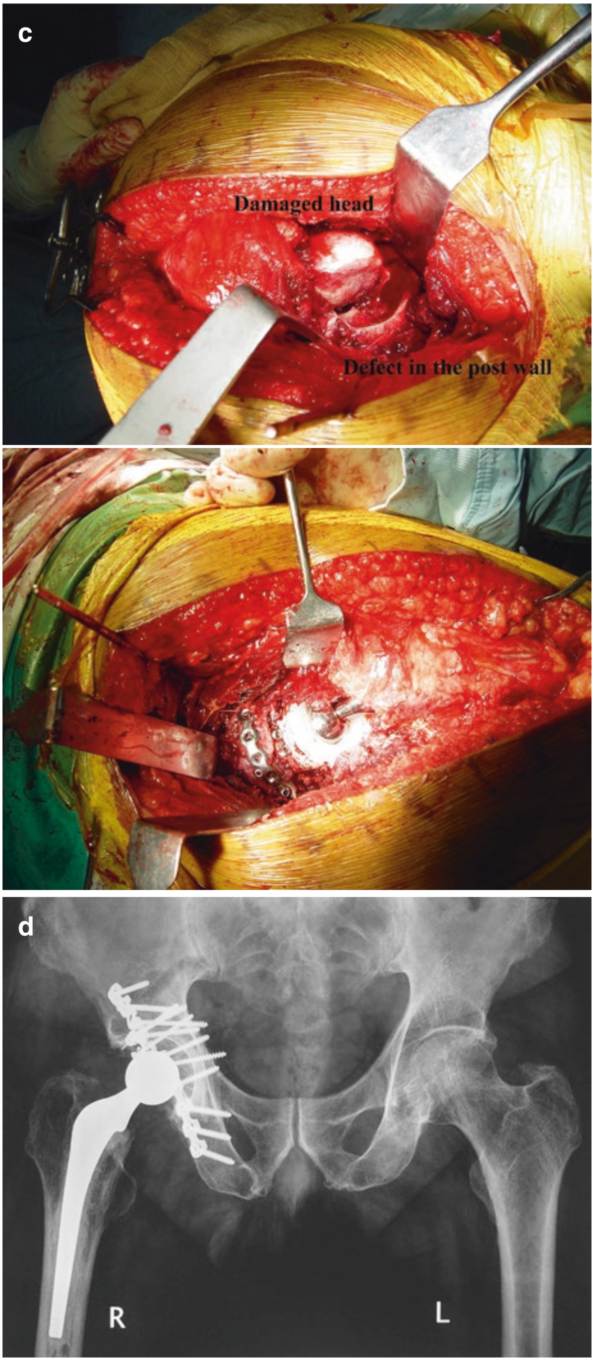


Fig. 8.6 (**a**) Pre-operative AP right hip radiograph of a 65 year-old male treated non-operatively for a right acetabular fracture. (**b**) CT reconstruction showing posterior wall erosion and femoral head subluxation. (**c**) Intra-operative pictures showing the acetabular defect and reconstruction with a segment of the femoral head fixed with inter-fragmentary screws and supported by a buttress plate, restoring the socket. A cemented hip replacement was performed. (**d**) Post-operative AP pelvis radiographs showing a cemented total hip replacement with posterior wall and column fixation

Fig. 8.6 (continued)



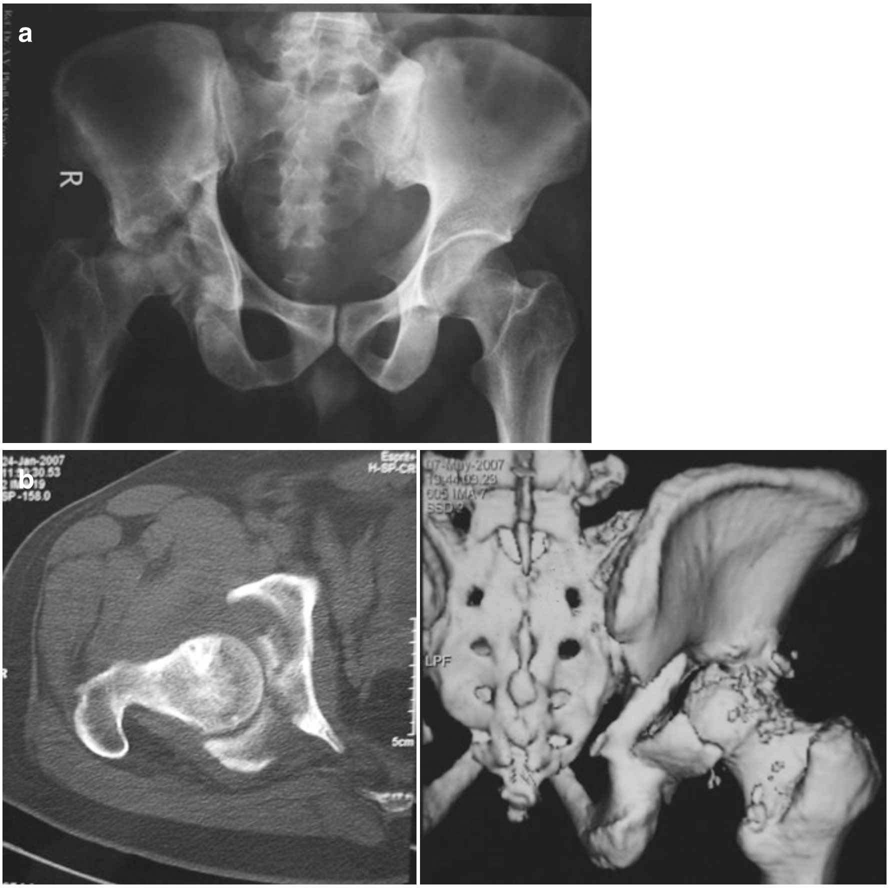


Fig. 8.7 (**a**) Pre-operative AP pelvis radiograph of a 32 year-old patient with a both-columns acetabular fracture. (**b**) 3D CT reconstructions of the fracture pattern. (**c**) Post-operative AP pelvis radiograph showing a cage-cup construct with fixation of the posterior column. A trochanteric osteotomy had to be performed to access the acetabulum during the procedure

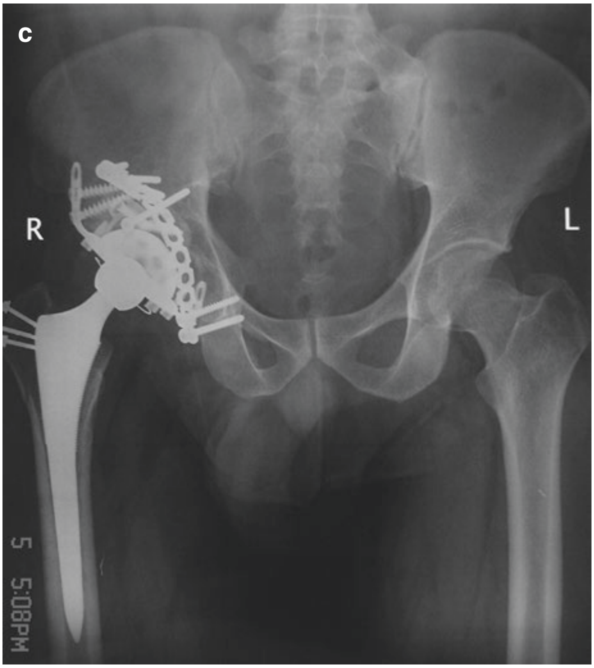


Fig. 8.7 (continued)

cases, 28 (93%) THAs had a minimum follow-up of 2 years. The authors reported that the fracture pattern was of the elementary type in 8 of 30 hips (27%, posterior wall fracture in 6 hips, transverse fracture in 2 hips) and associated type in 13 of 30 hips (43%, T-type fracture in 5 hips, transverse-posterior wall fracture in 4 hips, posterior column/posterior wall in 3 hips, and associated both column in 1 hip). The fracture pattern was unknown in 9 of 30 hips. Nine of 30 hips (30%) had radiographic evidence of osteonecrosis of the femoral head, and 6 of those had confirmed traumatic dislocations at the time of their initial injury. A majority of patients underwent the anterolateral approach, and only 9 of 30 hips were performed using the posterolateral approach. No acetabular components were revised for aseptic loosening. Five-year survival with revision for any reason as the endpoint was 88% (95% confidence interval, 0.70–0.96). Failures were related to infection. Three hips (11%) underwent resection for infection, with all being treated with two-stage arthroplasty. Harris hip scores improved from a median of 39 preoperatively (range, 3–87) to 82 at the most recent follow-up (range, 21–100; $p < 0.01$). Fifteen of 28 hips (54%) had a good or excellent result, 3 (11%) had a fair result, and 10 (35%) had a poor result. Two patients (7%) experienced at least one dislocation postoperatively. Both were treated with a closed reduction and hip abduction brace treatment.

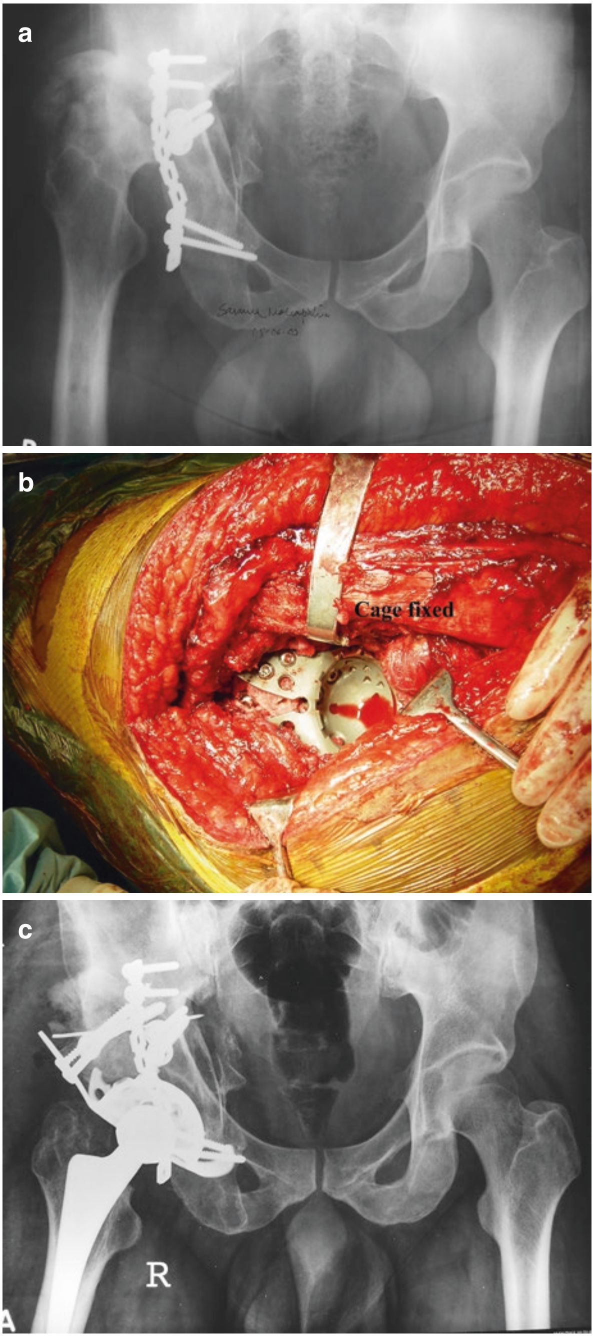


Fig. 8.8 (**a**) Pre-operative AP pelvis radiograph of a patient with failed acetabular fracture fixation. (**b**) Intra-operative images showing fixation of a cage and the femoral head autograft. (**c**) Post-operative images displaying the cage-cup construct and restoration of the hip center of rotation

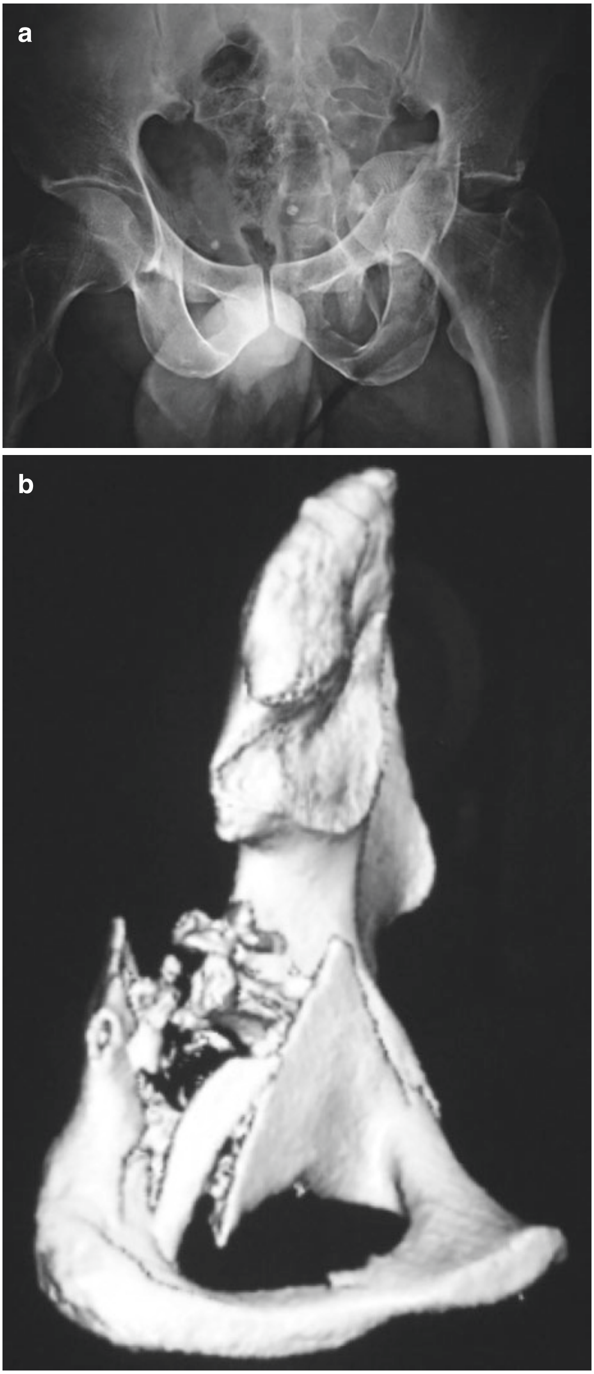


Fig. 8.9 (**a**) Pre-operative AP pelvis radiograph of a comminuted both columns fracture. (**b**) 3D CT reconstruction of the fracture pattern. (**c**) Post-operative radiographs showing posterior column fixation and cage cup construct

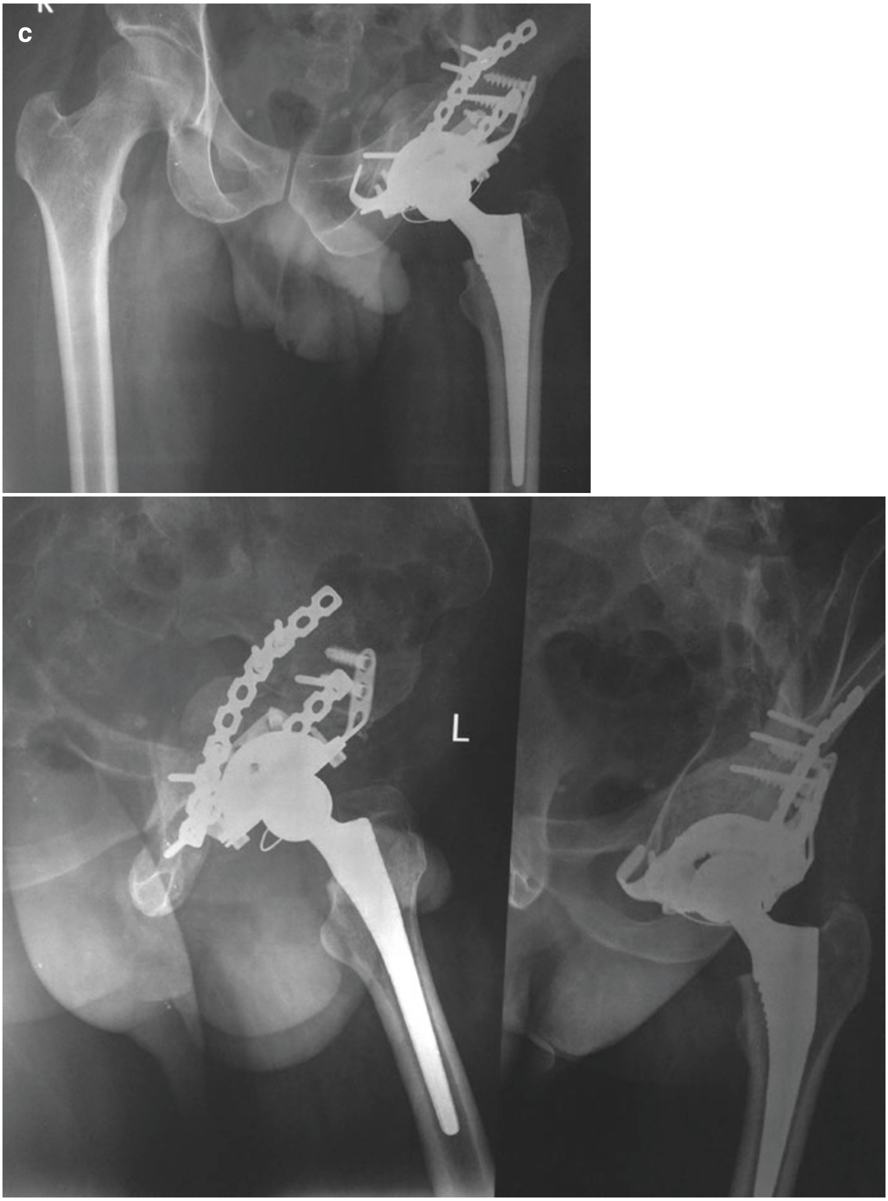


Fig. 8.9 (continued)

Another promising study from the Hospital for Special Surgery describes their results with 32 THAs performed for posttraumatic arthritis after acetabular fractures; 24 patients were treated with a prior ORIF, and 8 were managed conservatively [18]. Average time from fracture to THA was 36 months (range, 6–227 months). The average follow-up was 4.7 years (range, 2.0–9.7 years). With regard to fracture classification, 16 patients (50%) had simple fracture patterns, and 16 patients (50%) had associated patterns. One patient had a concomitant pelvic fracture. The most common fracture patterns were isolated posterior wall fractures in 13 (41%) cases, both-column fractures in 4 (13%) cases, and posterior column–posterior wall in 5 (16%) cases. Cementless acetabular components were used in all 32 cases. The authors reported 79% 5-year end point survival for revision, loosening, dislocation, or infection. Survival for aseptic acetabular loosening was 97%. Six (19%) revision surgeries were necessary due to infection (two cases), aseptic acetabular loosening (one case), aseptic femoral component loosening (two cases), and a liner exchange for dislocation (one case). Revision surgery correlated with nonanatomic restoration of the hip center and a history of infection ($P < 0.05$). Two other patients also had at least one dislocation, but they both responded to conservative treatment with closed reduction and bracing, which resulted in a dislocation rate of 9%. Harris hip scores increased from 28 (0–56) to 82 points (20–100).

Studies from China have reviewed outcomes at 5 years and 6.3 years after THA for acetabular fractures. Zhang et al. retrospectively analyzed 53 patients (55 hips) who underwent THA because of failed treatment for acetabular fractures. The mean duration of follow-up was 64 months (range, 32–123 months) in 49 patients [23]. Thirty-three hips (60%) had simple fracture patterns, and 22 (40%) had complex patterns. The most common patterns were posterior wall fractures in 28 (51%) hips, transverse-posterior wall fractures in 13 (23%) hips, and fractures of the posterior column and posterior wall in 6 (11%) hips. Patients treated without ORIF underwent a posterolateral approach to the hip. However, in patients with prior fixation, a posterolateral approach was used in 28 hips, while a direct lateral approach and a posterolateral plus anterolateral approach were used for removal of hardware in 2 hips, respectively. The authors used cement-less cups in 48 of 55 hips, and cemented cups in 7 hips with 5 of them in combination with acetabular reinforcement rings (ARRs). The authors report that with revision or definite radiographic loosening as the end-point, the 5-year survival in their study was 100%. Three cement-less acetabular components had a partial radiolucency (zones 2 and 3 [4]); in 2, the radiolucency was less than 1 mm wide, and in 1, it was more than 2 mm wide. All of them were associated with a good or excellent Harris hip score and were considered stable. A complete radiolucency, from zones 1 to 3, more than 2 mm wide, was seen in 1 cemented cup. None of the acetabular cups or ARRs showed any evidence of migration. All bone grafts completely incorporated without any complications. Complications included 1 dislocation and 3 sciatic nerve injuries. No instances of deep wound infection were present. The dislocation was successfully treated with closed reduction with no recurrence. The mean duration of follow-up was 64 months (range, 32–123 months) in 49 patients (51 hips); 4 patients were lost to follow up. The average Harris hip score increased from 49.5 (range, 22–78) before surgery to

90.1 (range, 56–100) at the latest follow-up examination ($P < 0.001$). Results were excellent for 36 hips, good for 11, fair for 2, and poor for another 2. In the ORIF group, the average Harris hip score increased from 9.5 (range, 30–78) to 90.1 (range, 56–100) ($P < 0.001$), and in the non-ORIF group, it increased from 54.3 (range, 22–76) to 92.4 (range, 56–100) ($P < 0.001$). Moreover, the average postoperative Harris score was significantly higher in the ORIF group than in the non-ORIF group ($P < 0.05$). Similar significant improvements in average Harris hip scores were also seen both in patients with cement-less acetabular reconstructions and in those with cemented cups ($P < 0.001$). Another study from China evaluated outcomes of cement-less acetabular components at 6.3 years (range, 3.1–8.4 years) after surgery in 31 hips with posttraumatic arthritis after acetabular fractures [10]. Of the 31patients, 19 (65%) had undergone ORIF (open-reduction group), and 12 (35%) had received conservative treatment for the acetabular fractures (conservative-treatment group). 14 patients (45%) had elementary fracture patterns while 17 patients (55%) had associated fracture types. The posterolateral approach to the hip was used in all patients. At the follow-up of 6.1 years, the authors reported no infection and no revision surgery. The rate of anatomical restoration of center of hip rotation was 100% (19/19) in the open-reduction group, and 67% (8/12) in the conservative-treatment group ($P = 0.02$), compared with 93% (13/14) in the simple group and 82% (14/17) in the complex group ($P = 0.61$). Anatomical restoration was positively related to fracture treatment ($r = 0.48$; $P = 0.006$), but it had no relation to fracture pattern ($r = 0.16$; $P = 0.40$). By the final follow-up evaluation, six acetabular components had partial radiolucent lines at the bone implant interface, all 1 mm or less; and they occurred in zone 1 in five hips and in zone 3 in one hip. Osteolysis was not observed in any patient. Of the patients with structural bone graft, only one had minor graft resorption. Four patients (13%) had complications after THA. One patient whose complex fracture was treated conservatively fell 4 years after surgery, causing posterior hip dislocation. Another patient whose complex fracture was treated with ORIF had posterior hip dislocation 14 days after surgery because of failure to adhere to posterior hip precautions. Both patients were successfully treated with closed reduction; neither patient had a recurrent dislocation until the latest follow-up evaluation. The sciatic nerve was injured during THA in one patient in the open-reduction group who had a complex fracture. The patient had dorsal pedal numbness and drop foot after surgery. The average Harris hip score increased from 49 ± 15 before surgery to 89 ± 5 after surgery, and 29 patients (94%) had either excellent or good results. The average Harris hip score for the open-reduction and conservative-treatment groups increased to 87 ± 6 and 91 ± 3 ($P = 0.07$), respectively, after surgery; for the complex and simple groups, it increased to 88 ± 6 and 90 ± 4 ($P = 0.25$), respectively. There was no significant difference between the open-reduction and conservative-treatment groups or between the complex and simple groups regarding the number of hips with excellent and good results.

The results of THA after acetabular fracture are humbling at 10 years when compared to THA for cases unrelated to posttraumatic arthritis. Morrison et al. performed a retrospective case-control study for patients at their institute between 1987 and 2011 [15]. During this period, the authors performed 95 THAs after acetabular fracture; of those, 74 (78%) met inclusion criteria and had documented follow-up beyond 2 years in their institutional registry. They also selected 74 matched patients based on an algorithm that matched patients based on preoperative diagnosis, date of operation, age, gender, and type of prosthesis. All surgeries were performed through the posterolateral approach. The primary outcomes were revision and incidence of complications. Secondary outcomes were radiographic signs of heterotopic ossification or implant loosening. The majority of acetabular fractures were treated by ORIF (58 of 74 [78%]), whereas 16 of 74 (22%) were treated nonoperatively. The most frequent type of fracture involved the posterior wall, accounting for 31% of all injuries. Fractures involving both columns were seen in 16%, whereas other fracture types were less common and were observed in less than 10% of patients. 49% of patients had elementary fracture types while 51% of patients had associated patterns. The 10-year survivorship after THA was lower in patients with a previous acetabular fracture than in the matched cohort (70%, 95% confidence interval [CI] 64–78% versus 90%, 95% CI 86–95%; $p < 0.001$). Younger patients (<60 years) had worse THA survivorship after acetabular fractures than did older patients (60%, 95% CI 51–69% versus 83%, 95% CI 72–94%; $p < 0.038$), and both had inferior survivorship to the matched cohort (92%, CI 87–97% and 96%CI 92–99%; $p < 0.001$). The 10-year survival for THA after a simple acetabular fracture was 83% (95% CI 77–89%) as compared with 60% (95% CI, 52–68%; $p = 0.032$) for associated fractures. Patients with previous acetabular fracture had a higher likelihood of developing infection (7% [five of 74] versus 0% [zero of 74]; odds ratio [OR], 11.79; $p = 0.028$), dislocation (11% [eight of 74] versus 3% [two of 74]; OR, 4.36; $p = 0.048$), or heterotopic ossification (43% [32 of 74] versus 16% [12 of 74]; OR, 3.93; $p < 0.001$). In patients with previous acetabular fracture, 13 patients (20%) were revised for loose acetabular component, 6 patients for wear and joint instability (8%), 2 for infection, and 1 each for femur fracture, loose femoral component, and recurrent dislocation. Revisions for the matched cohort included 11 patients for cup loosening and one patient for recurrent dislocations.

Of the 51 patients in the acetabular fracture group, who did not have a revision, 6 had no radiographs available, 46 had well-fixed components, and none had cup loosening. Of the 62 control patients without revision, 3 had no radiographs available, 59 had well-fixed components, and none had cup loosening.

To summarize the outcomes of THA in posttraumatic arthritis after acetabular fractures, Makridis et al. performed a systematic review in 2014 [11]. In total 654 patients were reviewed (659 hips) with a median follow-up of 5.4 years (range 12 months – 20 years). Median follow-up was 3.9 years (range 12 months–12 years) in the acute THA group and 6.3 years (range 12 months – 20 years) in the delayed THA group. A large majority of fractures were posterior wall fractures (140 patients; 21.4%) followed by transverse/posterior wall fractures (63 patients; 9.6%), posterior column-posterior wall fractures (51 patients; 7.8%), and both column fractures (49 patients; 7.5%). Treatment of acetabular fractures was only described in 625 fractures of which 473 fractures (75.7%) were treated with ORIF and 152 fractures (24.3%) nonoperatively. The majority of the studies reviewed by the authors reported no failure of initial treatment of acetabular fractures. 237 patients (36%)

were treated with acute total hip arthroplasty. Delayed total hip arthroplasty was performed in the remainder of the reviewed patients following either operative or nonoperative management of the initial acetabular fracture. In the early-THA cases, the median interval between time of injury and total hip arthroplasty was 10 days (1–29). In the delayed cases, the average time from injury to THA was 6.6 years (2 months–45 years).

With regard to acetabular components, an uncemented acetabular component was used in 484 patients (80.1%) and a cemented one in 120 patients (19.9%). For femoral components, the data was available in 569 hips with 340 patients (59.8%) receiving an uncemented and 229 patients (40.2%) a cemented femoral component. An antiprotrusion acetabular cage was rarely used, and acetabular bone graft was used in all cases. Anterolateral and posterolateral surgical approaches were used in a majority of the cases. In the early THA group, Kaplan–Meier survivorship analysis with any loosening, osteolysis, or revision as the end-point revealed that the 10-year cup survival was 81%. In the late THA group, this percentage was 76%. The log-rank test showed that this difference was not significant ($P = 0.287$). In the late THA group where the proportion of uncemented and cemented implants were available, Kaplan–Meier survivorship analysis with any loosening, osteolysis, or revision as the end-point revealed that the 10-year survival was 86.7% for the uncemented cups and 81% for the cemented. The log-rank test showed that this difference was not significant ($P = 0.163$). In the early THA group, 13 cups (7.5%) out of 173 implants were revised. Four cups were revised for aseptic loosening, one for traumatic loosening, six for dislocation, and two for infection. It was unclear how many of these cups were cemented and how many were uncemented. In the late THA group, 35 cups (9.6%) out of 365 implants were revised. Sixteen cups (45.7%) were uncemented (13 were revised for aseptic loosening, 1 for traumatic loosening, and 2 for infection). Nineteen cups (54.3%) were cemented (17 were revised for aseptic loosening, 1 for dislocation, and 1 for infection). The three most common complications were heterotopic ossification, infection, and dislocation which occurred in a total of 292 out of 654 patients (44.6%). The Harris hip score was used to describe the functional outcome with a median value of 88 points. Regardless of the type of treatment, and according to the Harris hip score, younger patients achieved better clinical outcomes than older patients (92.94 ± 4.48 versus 81.68 ± 4.58, respectively) ($P < 0.001$). Almost all of the studies did not compare Harris hip scores for acute versus delayed THA. Thirty-three patients died, and the overall mortality rate was 5%. No patient died in the acute perioperative phase. The minimum time of postoperative mortality was 4 months after surgery and maximum within 10 years after surgery.

In conclusion, THA for posttraumatic arthritis associated with acetabular fractures shows promising results and satisfactory functional and radiological outcomes. However, there are no prospective studies to compare directly the outcomes following acute or delayed total hip arthroplasty secondary to acetabular fractures. The largely retrospective data available in the literature indicate that the clinical outcomes, revision rates, and implant survivorship do not differ when either an early or a late THA is performed. The overall revision rates after THA following acetabular fractures are substantially higher than those following a conventional primary THA, and, hence, a multispecialty treatment approach of these challenging injuries is essential.

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