Management of Acetabular Fractures in the Elderly

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The aging epidemic is upon us. The “baby boomer” generation is entering the ranks of senior citizens and seniors are living longer thanks to medical advances. This change in population demographics has caused a new awareness among orthopaedic surgeons. The orthopaedic specialty is now treating more than 300,000 fracture hips, 16,000 pelvic fractures, and 3000 acetabular fractures annually. Fractures of the hip are usually managed by surgical intervention to decrease pain, decrease medical co-morbidities, and to retain or improve function.\textsuperscript{1-3}

Acetabular fractures are uncommon compared to other fractures; however, they are increasing as people function to a later age. Fractures in the elderly differ from those in the younger adult acetabular trauma patient. Younger patients usually suffer injury through high velocity trauma. However, in the elderly the usual mechanism of injury is a fall from a low height with minimal velocity\textsuperscript{4} and many of these fractures are called insufficiency fractures since they are associated with osteopenia and osteoporosis.

The treatment of these fractures continues to undergo change with a trend to surgical intervention. Surgery is chosen when possible to decrease pain and improve function.\textsuperscript{5} The goal is to offer the geriatric patient one procedure that has the highest expectation of success. The Orthopaedic Trauma Service at Mount Sinai has treated patients with simple and complex acetabular fractures where indicated. Our initial experience with complex fractures was unsatisfactory with open reduction and internal fixation. Patients required further interventions, with most needing total hip arthroplasty. This procedure proved to be complicated by previous procedures and our experience in other areas of the skeleton with primary arthroplasty led us to primary joint arthroplasty in certain acetabular fractures.

Patient Selection

Eleven patients were included in this series. The age of the patients ranged from 67 to 78 years. There were 3 males and 8 females. Fracture patterns were transverse in 5 (1 male and 4 females); posterior wall in 3 (1 male and 2 females); posterior column and wall in 1 (a female); one transverse and posterior wall (a female); and 1 with associated femoral neck fracture.

All patients were admitted to our hospital within 10 days of the injury. Six patients came through the Mount Sinai Emergency Department and the other five were transferred from other institutions for tertiary and definitive care. All patients had incongruity, instability, or both. No patient experienced dislocation. There were no nerve palsies detected.

Basic preoperative trauma protocols were used. Hydration, transfusion, and hematological review of platelet and cell morphology were instituted. Neurological examination was performed by the surgeon, orthopaedic house staff, as well as a board certified neurologist. Six of the 11 patients had Greenfield filters placed preoperatively. Indications for insertion of a filter included cardiac and pulmonary disease, obesity, and preoperative venous insufficiency.\textsuperscript{6}

Surgery was performed on 5 patients within 2 days of admission, 3 patients within 3 days, and 3 patients with 5 days. All patients were placed on low molecular weight heparin prior to surgery and continued postoperatively until discharged. One aspirin daily was prescribed after discharge for life.

Indications for surgery were determined after standard radiographic evaluation. These studies included, plain radiographs [anteroposterior pelvis; anteroposterior and lateral of involved hip; and Judet views – obturator in-
ternal) oblique and iliac (external) oblique]. All patients underwent computerized axial tomography with 3 mm cuts performed through the acetabulum. All radiographs yielded patterns of instability, incongruity, or both.

All of the patients were treated through a posterior-lateral Kocher-Langenbeck approach. Cell saver was utilized on all cases. Prophylactic antibiotics were used for 48 hours. The patients were positioned on an image table with a radiolucent pelvic holder. Base line images with the image intensifier were taken and saved. A trochanteric osteotomy was indicated in 5 patients. The osteotomy was useful for exposure of the fracture as well as identification of the sciatic nerve.

The preoperative goals were: a stable rather than an anatomical reduction, to support bone loss with autograft or allograft, and to stabilize the anterior and posterior columns with cannulated long and large (greater than 4.5 mm) screws.

Primary reduction was made after the femoral head was removed. The reduction was made and held with large pelvic and acetabular clamps. Cannulated wires were drilled either from the inside or outside of the acetabulum (Fig 1). This was made easier since the head was removed and the shaft mobilized out of the way.

Once the columns were restored the patient’s acetabulum was treated as a total joint arthroplasty. Revision principles were utilized. These included a stable rim construct that would support an acetabular cup (Fig. 2).

This exposure and construct made joint replacement easier. The ability to work inside and outside the acetabulum aided the decision-making process for uncemented or cemented support cages. Despite suggestions made by other investigators, there was no attempt to reconstruct the medial wall, once the socket was restored graft material and smaller guide wires were placed. In some cases the wires could be placed from within the fractured socket; pushed

Figure 1 A and B, Technique of acetabular reconstruction after head is removed. Large guide pins for cannulated screws are added. C, Acetabular cage is inserted after primary fixation with screws.

A

B

C
retrograde and then antegrade after placement of the shell or cage.

Once the acetabulum was stabilized, an uncemented cup or acetabular shell with a cemented cup was chosen. In 7 cases a multiple hole hydroxyapatite cup (Stryker, Allendale, N.J.) was used; a GAP shell with cemented polyethylene liner (Stryker, Allendale, N.J.) was used in 4 cases (Fig 3).

The femoral side was treated with an antibiotic impregnated cement and stem. Trochanter fixation was performed with Dall-Miles cables (Stryker, Allendale, N.J.).

Case Example
A 74-year-old female suffered a fall on a local sidewalk. She struck her left knee with a force that resulted in a transverse fracture of the left acetabulum. Her co-morbidities included hypertension, type 2 diabetes mellitus, and venous stasis. After initial stabilization including placement of a Greenfield filter, surgery was performed through a Kocher-Langenbeck approach. A trochanteric osteotomy was needed (Fig. 4).

Results
Average anesthesia time was 5 hours and the average blood loss was 3 units. No nerve palsies were observed. All trochanters united. Every patient was able to survive surgery and ambulate with external support. At 4 months postoperatively, eight patients used a walker, two patients used a cane, and one patient was walking without support. (Subsequently three patients died from causes unrelated to the operative intervention in the period ranging from 6 to 14 months post-injury).

The eight survivors are all ambulating independently. Six currently use walkers, three use a cane, and one ambulates without support.

The prosthesis bone interfaces have remained constant.
No revisions have been needed or suggested. The areas that were bone grafted have consolidated. The screw fixation has remained unchanged.

Complications have been few. One deep infection was observed at four weeks postoperatively. It was in a female patient with a transverse fracture pattern treated with an acetabular shell. Treatment was by radical debridement, dislocation of the joint, exchange of a poly to a constrained liner. Postoperative suppression antibiotics continue one-year postoperatively. She currently lives semi-independently in an adult community complex. She ambulates with a walker.

Surprisingly no cases of heterotopic ossification have been observed.\textsuperscript{14,15} Patients were not given radiation or non-steroidal anti-inflammatory drugs.

**Discussion**

Aging is all about function. Most of our seniors need to maintain their independence and lifestyle. Recent advances in prosthetic replacement of other joints have encouraged this treatment of the difficult acetabular fracture.

Revision total hips with acetabular deficiency can be problematic.\textsuperscript{16-18} Many arthroplasty surgeons use the AAOS classification system for acetabular deficiency.\textsuperscript{19} Our conclusion was that many of these fractures were similar to a type 4 pelvic discontinuity (Fig. 5).

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**Figure 4** A 74-year-old female that suffered a low velocity fall while walking on the street; A, Transverse fracture pattern; B, reconstruction with an acetabular cage, cemented liner, and cemented stem.

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Joly and Mears stated that “certain acetabular fractures possess an intrinsically abysmal prognosis irrespective of the initial method of treatment.”\textsuperscript{20} Open reduction internal fixation is preferred and thought to offer the highest chance...
of a favorable functional outcome after most displaced acetabular fractures. However, prognosis is poor for certain injury patterns and in the elderly. Letournel and Judet as well as Matta attributed unfavorable outcomes of anterior and posterior wall as well as posterior column fractures to elderly osteoporotic bone. They observed the best results in young healthy adults and the worst outcomes in patients over the age of 50 (particularly in females).

Acetabular fractures in the elderly have marked comminution, underlying arthritis, impaction of articular surfaces, and associated fractures of the pelvis and femoral neck. Impaction of the articular surface has been shown to significantly impact the prognosis.

More than 10 million Americans suffer from osteoporosis and osteopenia. Another 18 million are at risk. Tencer has shown that osteoporosis significantly affects fracture fixation. This is demonstrated by a decrease in the diameter of trabecular bone, loss of bone mass and shear strength, and loss of interconnecting struts as well as compressive strength. Screw pullout is affected by the above mechanisms.

As alluded to previously in this review, Mears, Velyvis, Chang, and others reviewed causes of success and failure in displaced acetabular fractures treated by open reduction and internal fixation. They concluded that age, bone quality, impaction, underlying arthritis, and comorbidity played a significant role. Even with improved fixation techniques such as cables, Mears and colleagues alluded to the fact the primary replacement may be better for the patient. His group reported on 63 cases with 27 patients having severe osteoporotic bone. Supplementation of the fixation was performed as well as the use of a multi-screwed cup acting as “hemispherical” plate. The group stressed medial wall reconstruction for primary socket stability. Our success with revision arthroplasty using rim support negated the above premise in our patient group.

Late total hip arthroplasty after open reduction and internal fixation can be complicated and unrewarding. Complications secondary to previous surgery include heterotopic bone, proliferative scar, obstructive hardware, occult infection, ischemic muscle and poor soft tissue, nerve and vessel entrapment, bone defects and nonunion (especially in non-operative treatment or delayed surgery). Poor outcome function (Harris Hip Score) has been associated with this group.

Conclusion

Surgery for acetabular fractures needs to be individualized. Thinking must include the premise that all osteopenic bone is pathological. Open reduction internal fixation must improve the prognosis and not cause complications. Thinking that primary open reduction is the first of a two stage procedure is compromising the geriatric patient. Primary total joint arthroplasty can be successful if the socket can be stabilized either with a rim-fit uncemented cup or with a cemented acetabular cage. Time of the procedure and comorbidities must be considered. Immediate mobilization of the patient must be the goal.

These fractures are difficult and challenging from all perspectives. Work in this field continues to evolve. Further outcome studies are needed, particularly from multicenter locations. However, the problem is upon us and must be confronted with a well planned and executed surgical intervention. The goal is a functioning patient who is able to maintain his or her independence.

References

16. Romness DW, Lewallen DG: Total hip arthroplasty after


