Posterior Wall Acetabular Fractures

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What is a Posterior Wall Fracture?

Review of anatomy and radiographic lines.

AP Pelvis – know outline of anterior and posterior walls
"Obturator Oblique" xrays= anterior column, posterior wall

Know definition of marginal impaction

How to determine how much PW is involved. Predictive of stability?

Biomechanical Consequences of Posterior Wall Fracture

Olson 1995: "Creation of a fracture of the posterior wall was followed by an increase in contact area, maximum pressure, and contact force in the superior aspect of the acetabulum. A concomitant decrease in these parameters was observed in the anterior and posterior walls. Anatomical reduction and fixation of the fracture with a plate and screws did not restore the pattern of loading to pre-injury levels."

Determines Outcome After Posterior Wall Fractures?

Associated injuries -Moed 2003
Superomedial dome impaction "Gull Sign" – Anglen 2003
Comminution (≥ 3 fragments) or fracture into the subchondral arc – Saterbak 2000
Morbid obesity – Karunakar 2005, Porter 2008
Age – Mears 2003 (also associated with other issues (ability to protect repair – all or none weight – bearing), osteoporosis, etc.
Quality of reduction – Matta 1996, Bhandari 2006

Other (related) factors:

osteoporosis
low-energy mechanism (fall from a standing height)
associated injury to the femoral head

Technical ability to fix fracture / availability of referral center

Technical Aspects of Posterior Wall Fracture Evaluation and Fixation: Methods for Maximizing Results

1. Understanding the Fracture
    a. Mechanism of injury important
    b. Identification of an associated dislocation
    c. Evaluation for associated femoral head fracture
    d. Imaging evaluation (AP, Judets, CT scans)
        i. Superior dome impaction
        ii. Superior dome extension
        iii. Marginal impaction
        iv. Free osteochondral fragments
        v. Retroacetabular surface involvement
        vi. Femoral head impaction

2. Patient Positioning (choice of position)
    a. Prone (familiar to acetabular fracture surgeons from other patterns)
        i. Flat top table with the leg drapped free
            1. Allows intraoperative manipulation of the leg
            2. Allows accurate imaging
            3. Allows knee flexion
        ii. Fracture table
            1. Allows intropeative distraction of the joint
            2. Hip flexion allows viewing of the joint
            3. Imaging somewhat compromised
    b. Lateral (familiar from hip replacement approaches)
        i. Allows flexibility with trochateric osteotomies
        ii. Allows intraoperative dislocation

3. Surgical Approach:
    a. Kocher-Langenbeck: for almost all posterior wall fractures
    b. Augmentative osteotomies: Trochanteric vs Digastric
        i. Usually not required
        ii. Allows enhanced exposure of cranial extentions
        iii. Relaxes the gluteus medius
        iv. Potentially minimized stretching and damage to the medius

4. Protection of the Sciatic Nerve

a. Identification of anamolous relationships between the nerve and the piriformis muscle
b. Retraction into the lesser sciatic notch
c. Knee flexion (and hip extension) to relax the nerve throughout

5. Identification of Intra-articular debris
    a. Facilitated with hip joint distraction
        i. Bone hook at the greater trochanter
        ii. Femoral distractor (flat top table; prone or lateral; supraacetabular to lateral femoral shaft
        iii. Use of the fracture table: allows hip flexion if prone
    b. Replacement of large osteochondral fragments and fixation

6. Identification and Reduction of Marginal Impaction
    a. Commonly observed in posterior wall fractures
    b. Must be accurately reduced
    c. The femoral head can be used as a template
    d. Stabilization of marginal impaction (and osteochondral fragments):
        i. Intraosseus osteochondral screws (1.5mm, 2.0mm, 2.4mm cruciate head screws)
            1. Allow compression of free osteochondral fragments
            2. Allow stabilization of marginal impaction
        ii. Bone grafting of defects
            1. Allograft chips
            2. Greater trochanteric cancellous bone graft
            3. Bone graft substitutes

7. Attention to Cranial Extension if Present
    a. May impact the surgical approach (may require trochanteric osteotomy)
    b. May impact patient positioning
    c. May impact hardware placement

8. Multifragmentary Posterior Wall Fractures
    a. Requires meticulous and systematic reconstruction
    b. May require multiple plates, independent lag screws, etc.

9. Fracture Extensions Involving the Retroacetabular Surface
    a. Requires meticulous and systematic reconstruction
    b. May require multiple plates, independent lag screws, etc.

10. Plating Techniques
    a. Undercontouring of the plate to compress the posterior wall
    b. Plate placement
        i. Balanced with respect to the wall
        ii. Peripheral enough to ensure capture of the wall fragment(s)

c. Spring plates
    i. 1/3 tubular: cut and over-countered
    ii. May be useful for small or comminuted peripheral fragments
d. Independent lag screws
e. Lag screws through the plate
f. Screw trajectories

11. Prophylaxis for Heterotopic Ossification
    a. Debridement of the Gluteus Minimus
    b. Indomethacin
    c. Radiation

12. Intraoperative Evaluation
    a. Concentric reduction of the hip joint
    b. Hip joint stability
    c. Safe placement of all hardware

Alternatives to Internal Fixation

Appropriate to consider when internal fixation not feasible:
Patient's condition precludes surgery
Presence of factors indicating poor prognosis (see section 1 above)

Nonoperative Treatment – generally associated with poor outcomes
Consider prolonged skeletal traction to keep femoral head reduced beneath acetabular dome.
Prolonged DVT prophylaxis

Resection Arthroplasty - may have limited role in patients with very unstable hip in ICU environment to facilitate mobilization, pain management

Total hip replacement
Delayed – traditional recommendation for "nonoperable" cases. Perform THA after bone consolidates. May be difficult reconstruction due to abnormal bony anatomy, persistent subluxation / dislocation, etc.
After ORIF – associated with increased complications. More difficult than primary THA due to scarring, HO, shortening, bone defects. Associated with increased OR time, blood loss, loosening, decreased survivorship.
Acute – requires concomitant repair of pelvis. Very little literature, all case series.

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