18th ANNUAL INTERNATIONAL SAN FRANCISCO
Orthopaedic Trauma Course

Posterior Wall Acetabular Fractures: Determinants of Outcome

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Disclosure Information

Andrew H. Schmidt, M.D.

Disclosure of Financial Relationships

Royalties: Thieme, Inc (textbook)

Consultant: Abbott Labs (spouse)

Stock: Conventus Orthopaedics; Epien; PreferUS Healthcare, Epix Orthopaedics, ActivOrtho, Enova Illumination

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Conflicts of Commitment/ Effort

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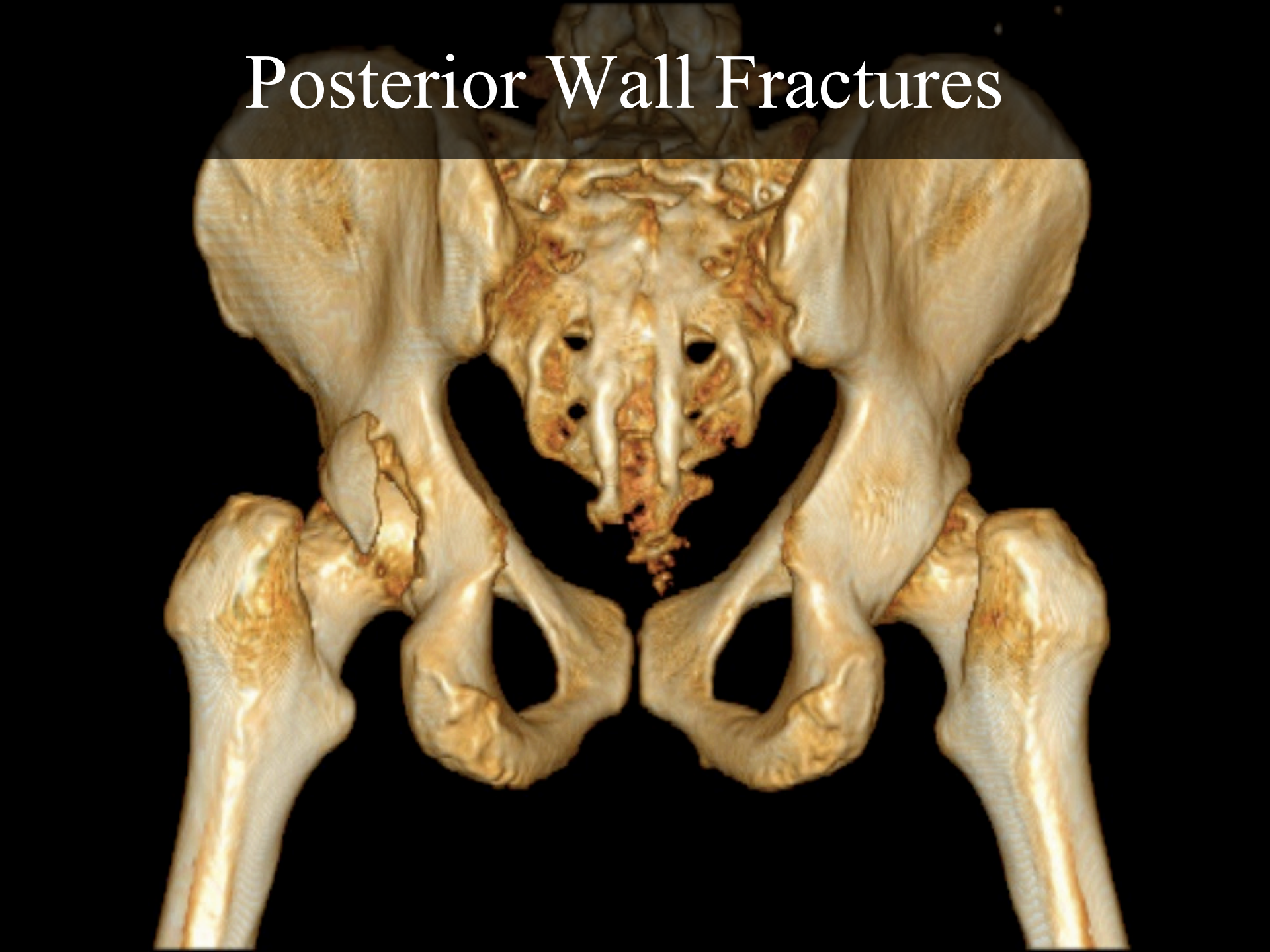
Disclosure of Off-Label and/or investigative Uses

I will not discuss off label use and/or investigational use in my presentation.

Objectives

- Review Anatomy, Classification, Mechanism of Injury
  - Understand Imaging
- Understand factors that determine outcome, and how those factors affect decisions for both operative and nonoperative treatment.

Posterior Wall Fractures



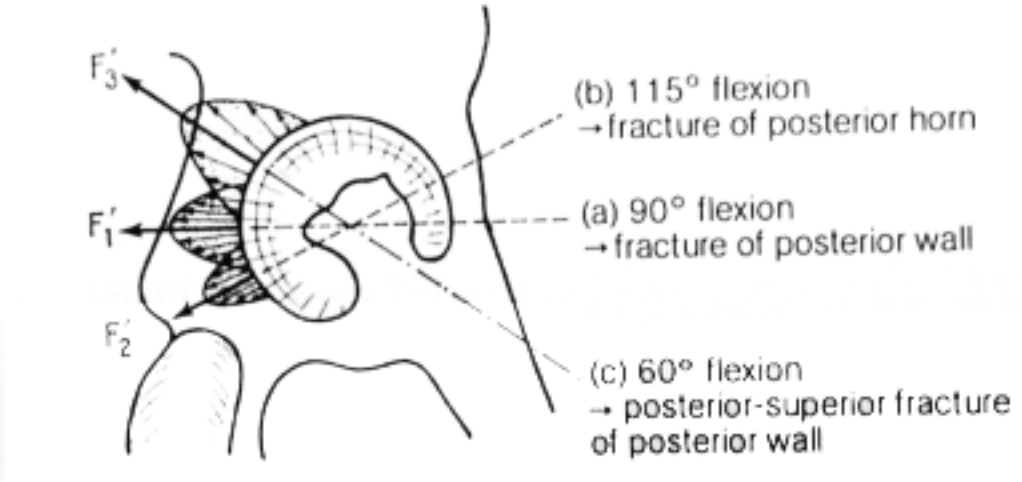
Letournel Classification

• Posterior Wall	223 (24%)
• Posterior Column	30
• Anterior Wall	18
• Anterior Column	39
• Transverse	70
• Trans + Post Wall	183 (19.5%)
• Post Col + Post Wall	32 (3%)
• T shaped	66
• Ant col + post ht	65
• Both Column	213
Total	939

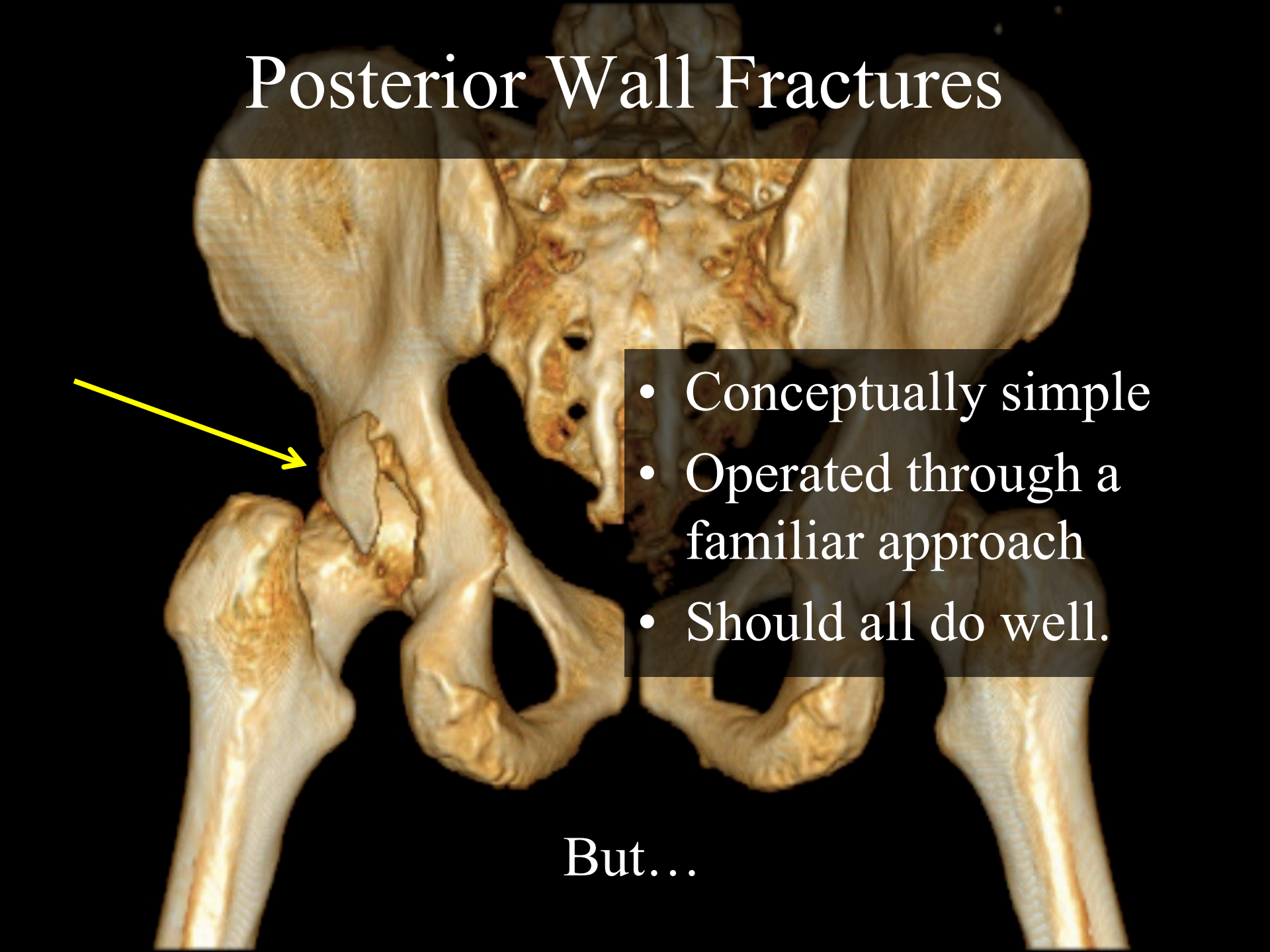
PW involvement in 46.5 %

Mechanism of Injury

- Usually an axial force directed through the flexed knee and flexed hip
  - Knee – dashboard in MVA
- Degree of femoral rotation and flexion as well as bone density determine the specific fracture pattern



Posterior Wall Fractures



- Conceptually simple
- Operated through a familiar approach
- Should all do well.

But…

TABLE III

DISTRIBUTION OF THE QUALITY OF THE REDUCTION ACCORDING TO FRACTURE TYPE, AGE OF THE PATIENT, AND INITIAL DISPLACEMENT OF THE FRACTURE*

	Quality of Reduction			
	Anatomical	Imperfect	Poor	Surgical Secondary Congruence
Fracture type				
Simple (n = 54)				
Anterior wall (n = 3)	3			
Anterior column (n = 12)	12			
Posterior wall (n = 22)	22 (100%)			
Posterior column (n = 8)	7	1		
Transverse (n = 9)	8	1		
Associated (n = 208)				
Posterior column-posterior wall (n = 10)	10			
Transverse-posterior wall (n = 60)	48 (80%)	10 (17%)	2 (3%)	
T-shaped (n = 31)	16 (52%)	10 (32%)	5 (16%)	
Anterior column-posterior hemitransverse (n = 15)	7	6	2	
Both-column (n = 92)	52 (57%)	24 (26%)	9 (10%)	7 (8%)

All had anatomic reduction !

Matta, JBJS, 1996:78-1: 1632-1645

TABLE IV

DISTRIBUTION OF THE CLINICAL RESULTS ACCORDING TO FRACTURE TYPE, QUALITY OF THE REDUCTION, AND RADIOGRAPHIC GRADE*

	Clinical Result			
	Excellent	Good	Fair	Poor
Fracture type				
Simple (n = 54)				
Anterior wall (n = 3)	1	1	1	
Anterior column (n = 12)	9	1	1	1
Posterior wall (n = 22)	9 (41%)	6 (27%)		7 (32%)
Posterior column (n = 8)	2	3	2	1
Transverse (n = 9)	5	3	1	
Associated (n = 208)				
Posterior column-posterior wall (n = 10)	7	2		1
Transverse-posterior wall (n = 60)	21 (35%)	21 (35%)	5 (8%)	13 (22%)
T-shaped (n = 31)	6 (19%)	18 (58%)	2 (6%)	5 (16%)
Anterior column-posterior hemitransverse (n = 15)	8	5	1	1
Both-column (n = 92)	36 (39%)	35 (38%)	9 (10%)	12 (13%)
Entire series (n = 262)	104 (40%)	95 (36%)	21 (8%)	42 (16%)

Highest proportion of poor outcomes

Matta, JBJS, 1996:78-1: 1632-1645

Imaging

- AP
- Judet (45° Oblique views)

- CT
  - Axial
  - 2D
  - 3D

AP X-ray

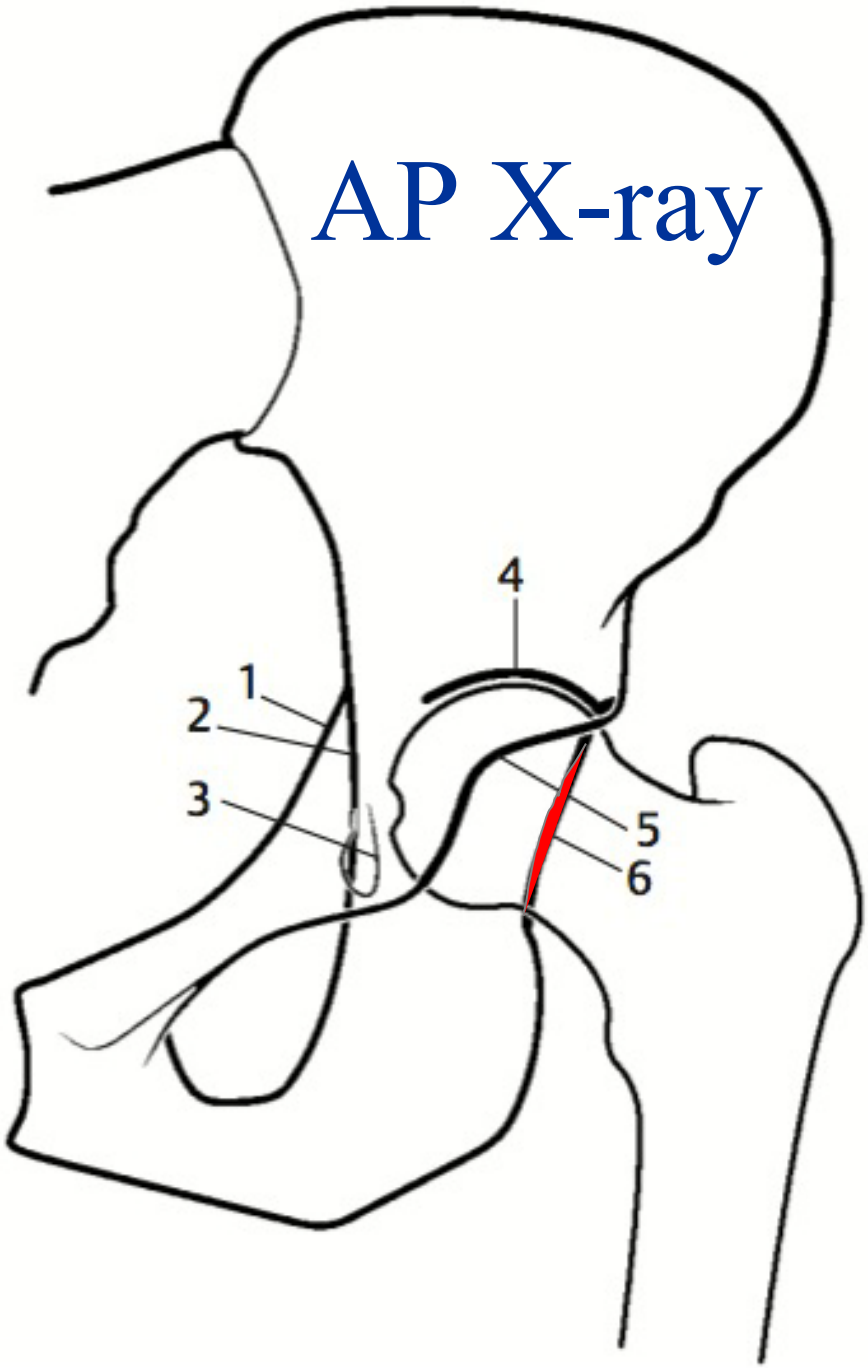
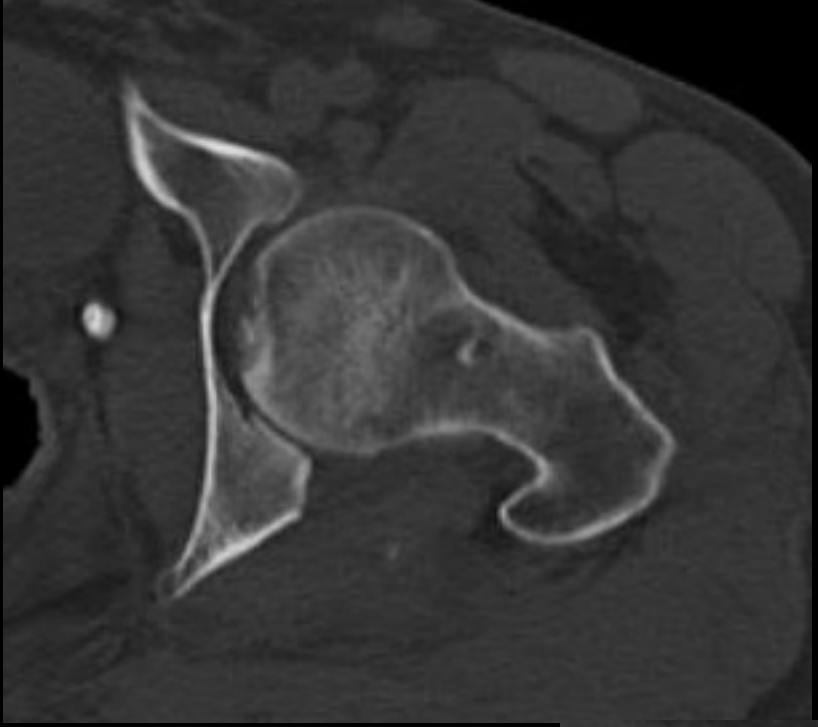
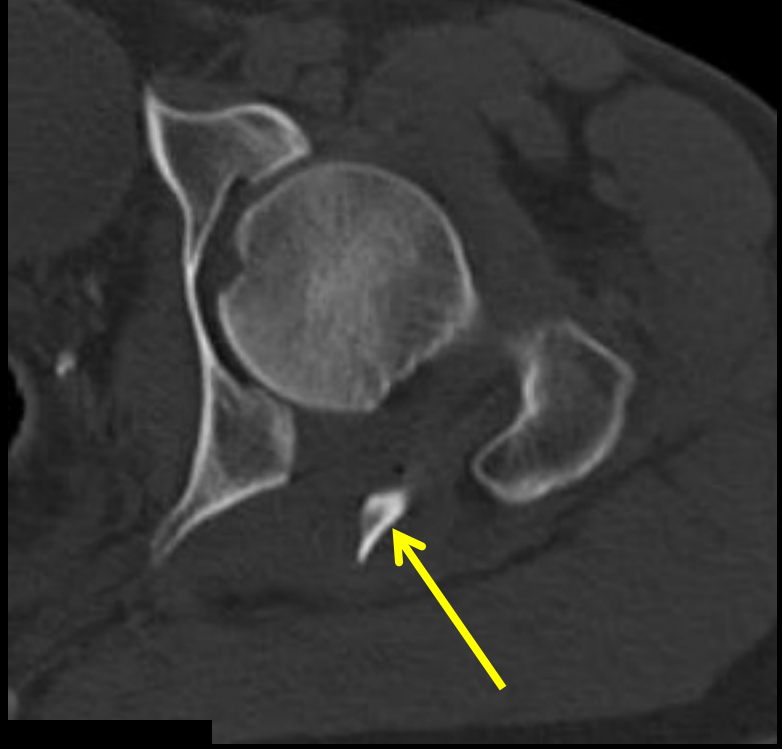


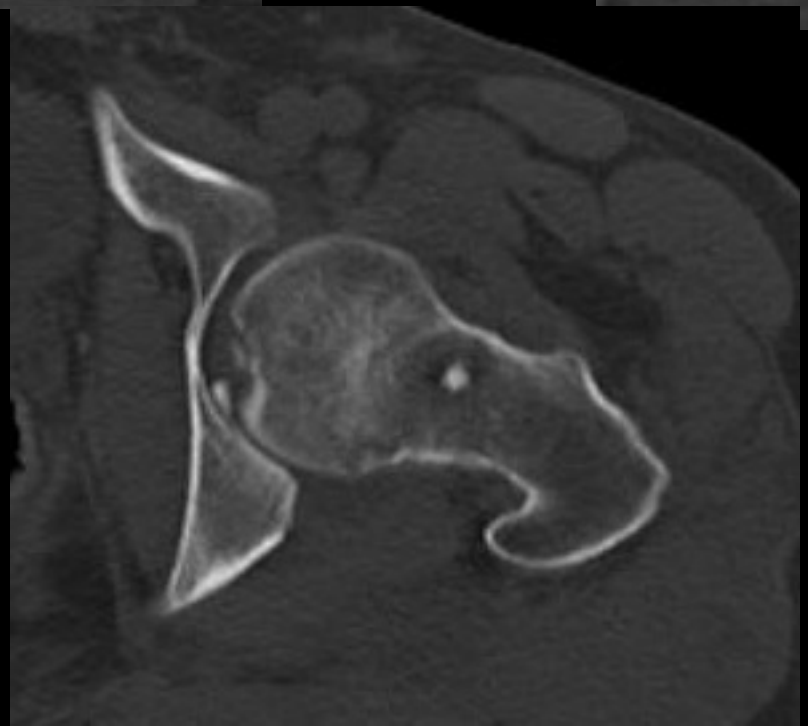
Table 20—1 The Six Acetabular Lines Visible on an Anteroposterior Hip Radiograph

1. Iliopectineal line
2. Ilioischial line
3. Radiographic teardrop
4. Radiographic roof
5. Anterior wall
6. Posterior wall

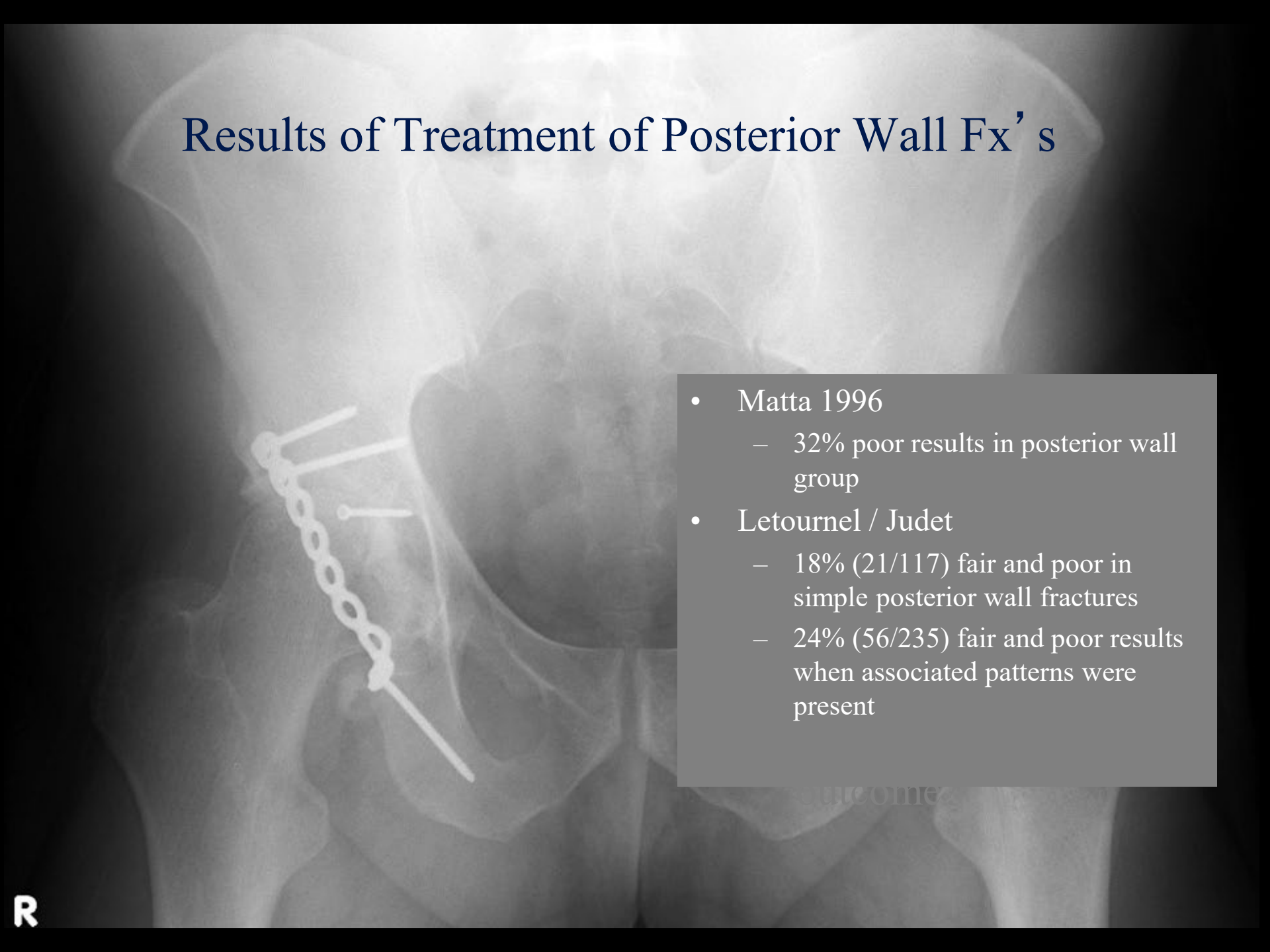
From Kregor and Stover, Surgical Treatment of Orthopaedic Trauma, 2007, Chapt 20







Results of Treatment of Posterior Wall Fx's



- Matta 1996
  - 32% poor results in posterior wall group
- Letournel / Judet
  - 18% (21/117) fair and poor in simple posterior wall fractures
  - 24% (56/235) fair and poor results when associated patterns were present

Posterior Wall Fractures

- Highly variable in presentation
  - Patient age, gender
  - Mechanism of injury
  - Size and # of fragments
  - Articular impaction
  - Bone quality
  - Associated roof impaction (extended patterns)
  - Associated column fractures

Letournel's Experience - 1980

- THA more likely to be required in posterior-wall fractures associated with marginal impaction ($p = 0.01$), wall comminution ($p = 0.005$) and in patients older than 50 years ($p = 0.01$).

- In patients >50 with marginal impaction and comminution of the posterior wall, the likelihood of THA was 46%, compared with 9% for younger patients without these fracture characteristics ($p = 0.002$).

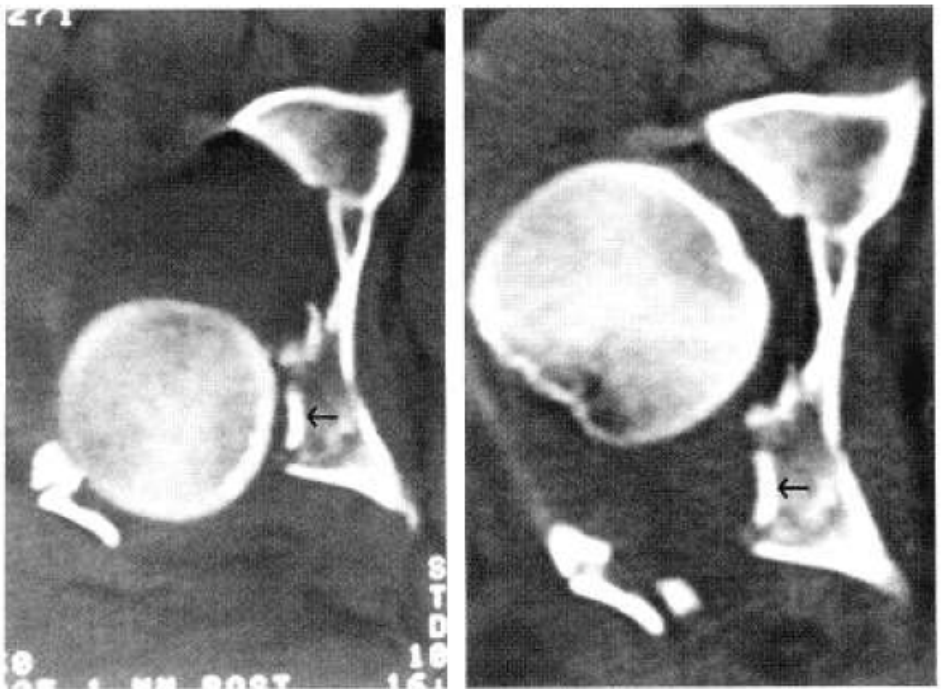
Clin Orthop Rel Research, vol 151, Sept 1980,

Journal of Orthopaedic Trauma
Vol. 4, No. 1, pp. 42–48

Acetabular Depression Fracture Accompanying Posterior Fracture Dislocation of the Hip

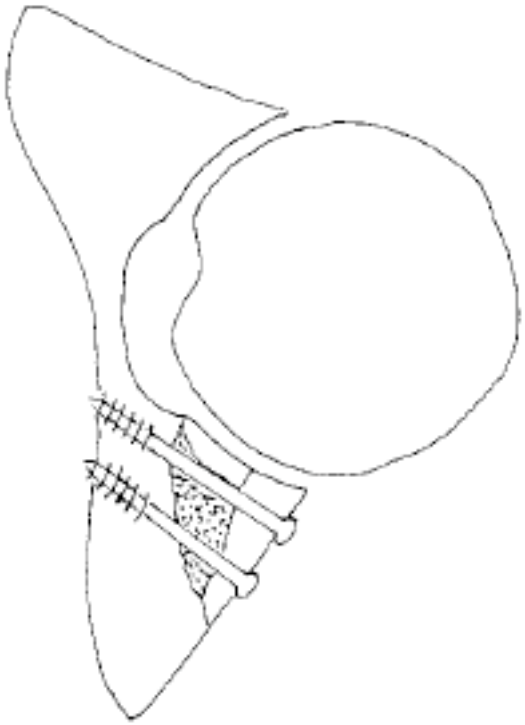
Robert J. Brumback, Edward S. Holt, Mark S. McBride, Attila Poka, G. Howard Bathon, and Andrew R. Burgess

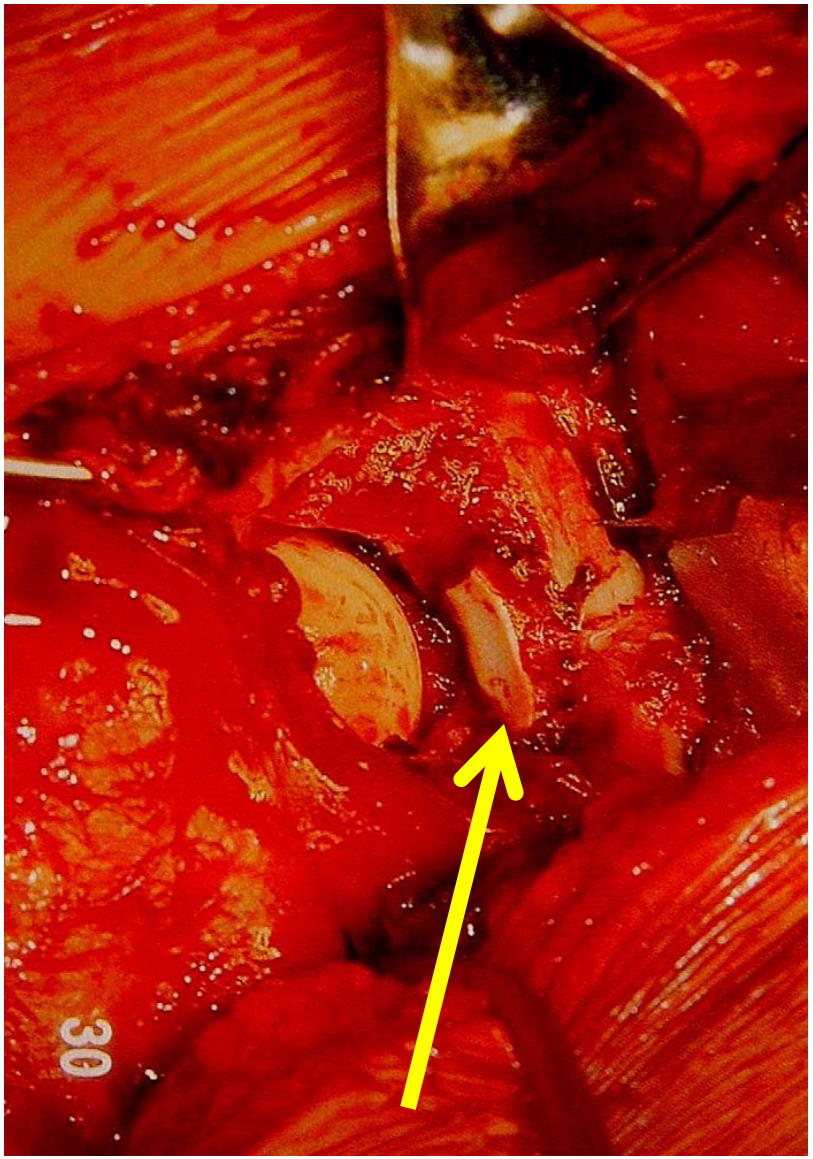
The Shock Trauma Center of the Maryland Institute for Emergency Medical Services Systems, and the Division of Orthopaedics, University of Maryland Medical System, Baltimore, Maryland, U.S.A.



Marginal Impaction

- Brumback - 23% of cases, recognized on CT
  - All unstable pre-op at 90° flexion
  - Indication for ORIF





Case courtesy of Bob Ostrum

Clinical Failure After Posterior Wall Acetabular Fractures: The Influence of Initial Fracture Patterns

Saterbak Andrea M.; Marsh, J. Lawrence; Nepola, James V.; Brandser, Eric A.; Turbett, Timothy

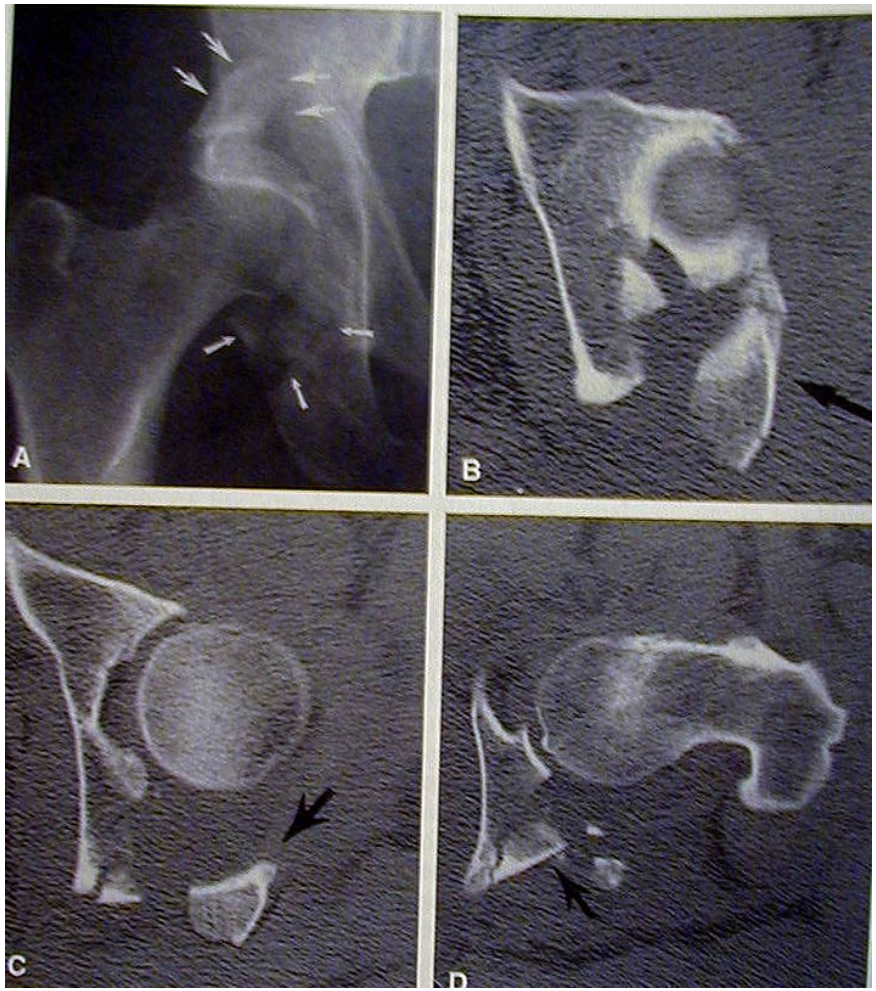
Journal of Orthopaedic TraumaJournal of Orthopaedic Trauma. 14:p 230-237, May 2000.

42 patients > 2 yr FU

11 (26%) failed within 1 year

Clinical Failure After Posterior Wall ORIF

- Poor results
  - Posterior wall comminution
  - Dome involvement
  - Depressed fragment
  - Extended posterior wall



J Bone Joint Surg Am. 2007;89:1170-76 • doi:10.2106/JBJS.F.00473

Outcomes of Posterior Wall Fractures of the Acetabulum

By Berton R. Moed, MD, and Jessica C. McMichael, MD

Investigation performed at the Department of Orthopaedic Surgery, Saint Louis University School of Medicine, St. Louis, Missouri

"MFA scores for patients with a posterior wall fracture of the acetabulum were significantly worse than normative reference values"

J Bone Joint Surg Am. 2012;94:1559-67

Two to Twenty-Year Survivorship of the Hip in 810 Patients with Operatively Treated Acetabular Fractures

Moritz Tannast, MD, Soheil Najibi, MD, PhD, and Joel M. Matta, MD

Investigation performed at the Hip and Pelvis Institute, Santa Monica, California

70 yr old w/ PW Fx, femoral head lesion, marg impaction

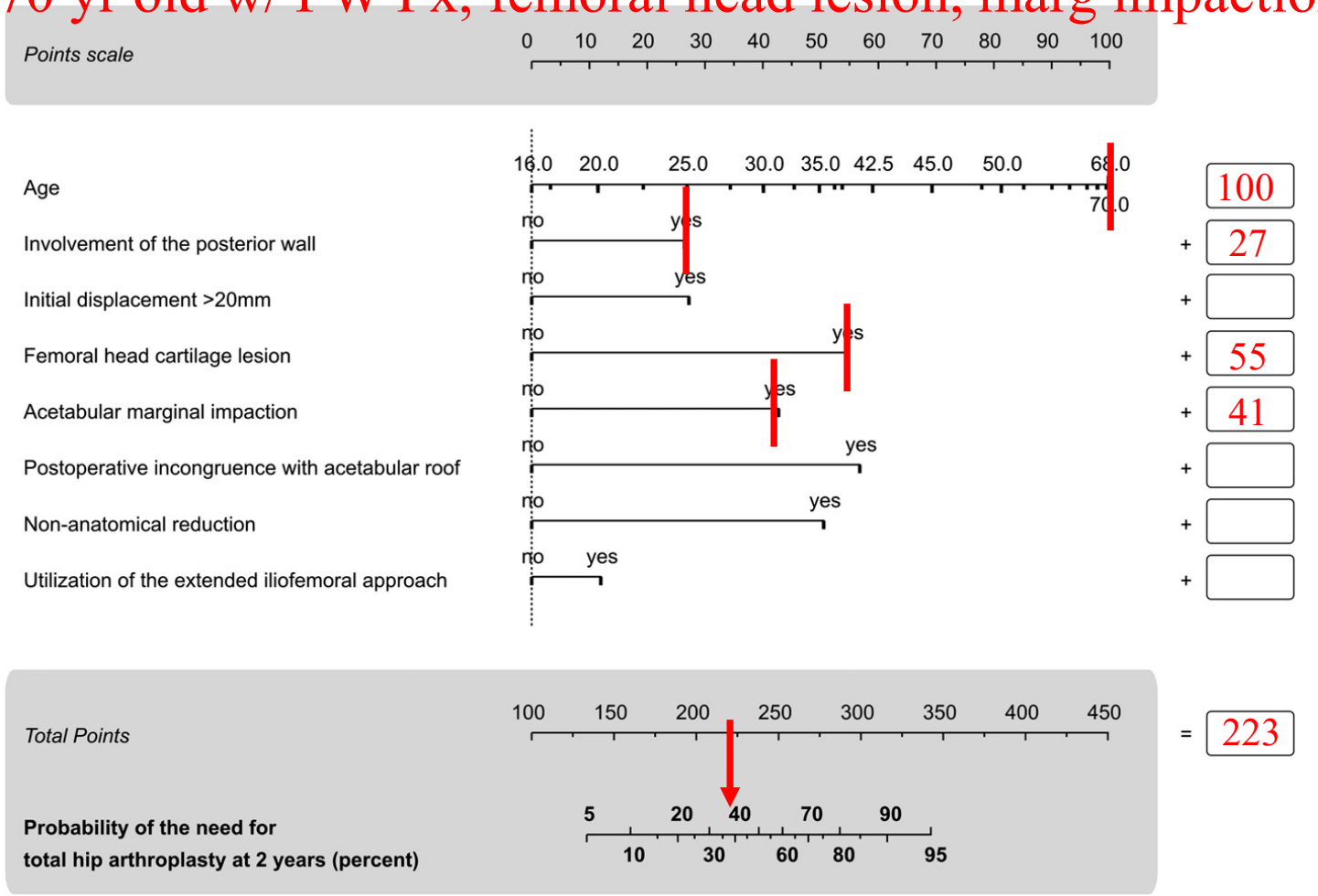
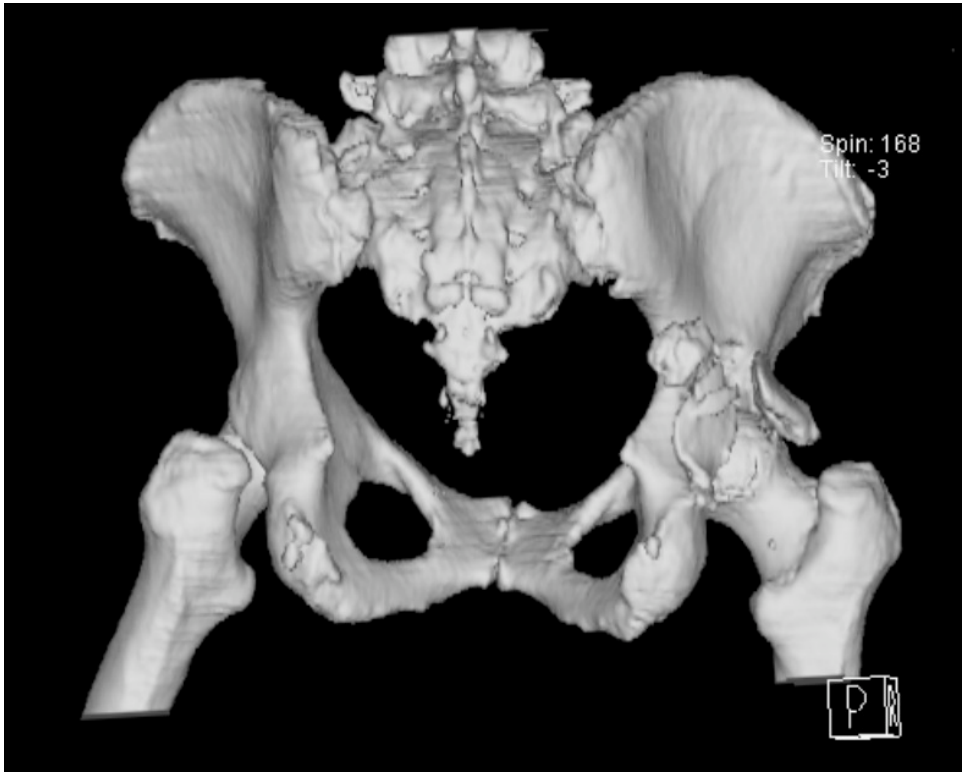


Fig. 3

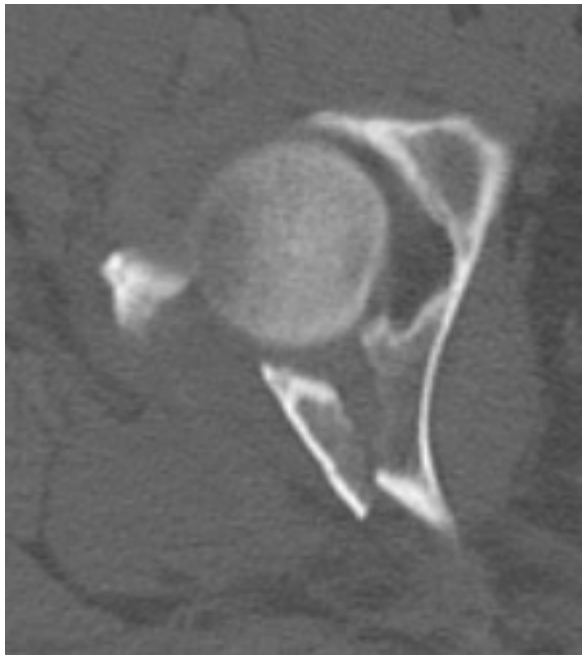
Nomogram predicting the early need for total hip arthroplasty (or hip arthrodesis) within two years postoperatively. To use the nomogram, locate the age axis and draw a line straight upward to the ''Points scale'' at the top to determine how many points the patient receives on the basis of his or her age. Repeat this process for each of the other predictor variables, then sum the points for the individual predictors. Locate this sum on the ''Total Points'' axis and draw a line straight downward to identify the predicted probability of the need for total hip arthroplasty within two years postoperatively.

Factors That Affect Outcome

- Fracture characteristics:
  - Marginal Impaction
  - Comminution
  - Femoral head damage
- Patient Characteristics
  - Obesity
  - Osteopenia



- Only 30% consist of one large fragment.
- Most are comminuted
- 25% have marginal impaction



What does this mean?

- When repairing PW fractures, surgical techniques must address these injury characteristics

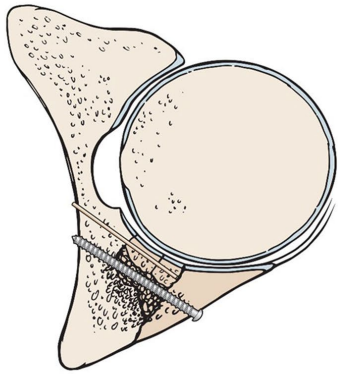
- When prognosis is obviously poor, THA is a reasonable alternative.

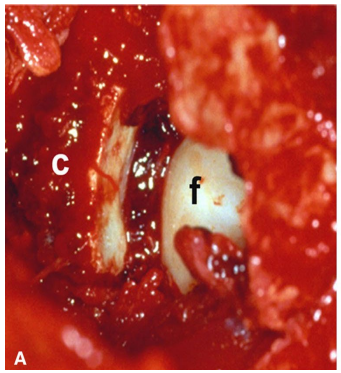
Technique

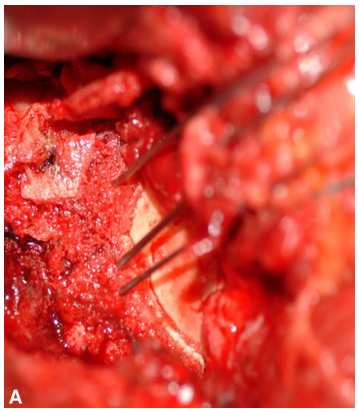
Pearls: How to Reduce and Fix Comminuted Posterior Acetabular Wall Fractures

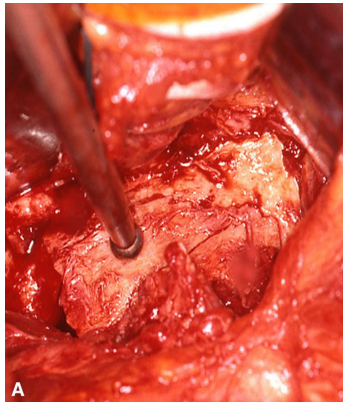
Berton R. Moed MD

iation of Bone and Joint Surgeons®









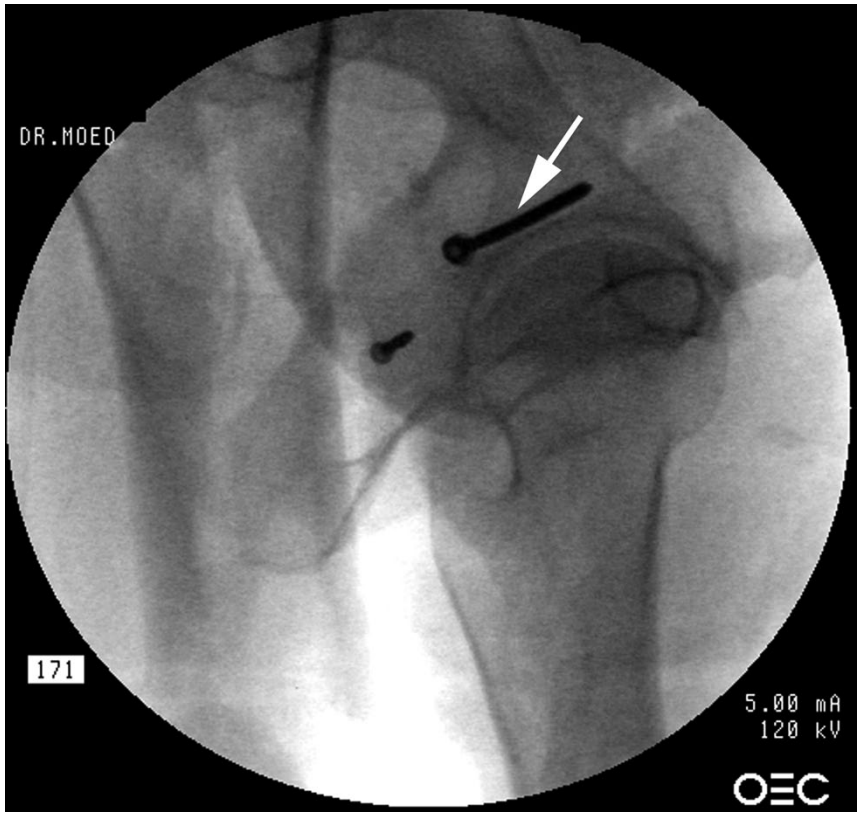
Outcomes of Posterior Wall Fractures of the Acetabulum

Surgical Technique

By Berton R. Moed, MD, and Jessica C. McMichael, MD

Investigation performed at the Department of Orthopaedic Surgery, Saint Louis University School of Medicine, St. Louis, Missouri

The original scientific article in which the surgical technique was presented was published in JBJS Vol. 89-A, pp. 1170-6, June 2007



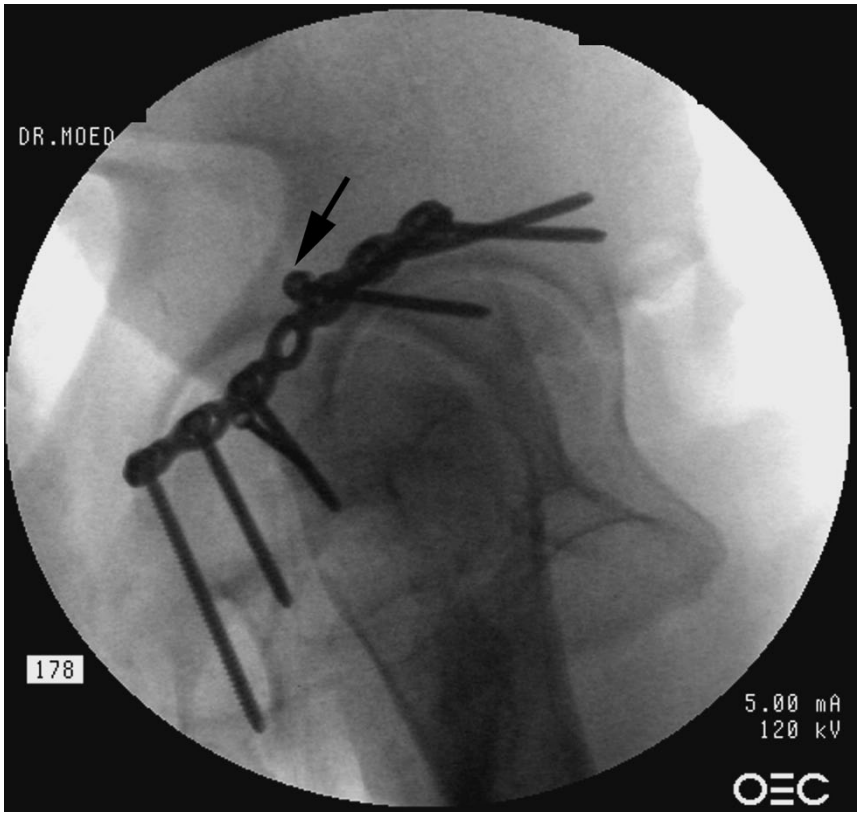


FIG. 11-C **FIG. 11-D**

Fig. 11-C The small posterior wall fragment has been fixed with two screws, one (arrow) in close proximity to the joint surface. This tangential view of the screw[10] shows it to be extra-articular. **Fig. 11-D** The plate has been placed right along the acetabular rim to buttress this small fragment. Tangential views show good positioning of the plate with all screws being extra-articular. The screw appearing to cross the joint (arrow) is the lag screw seen in Fig. 11-C.

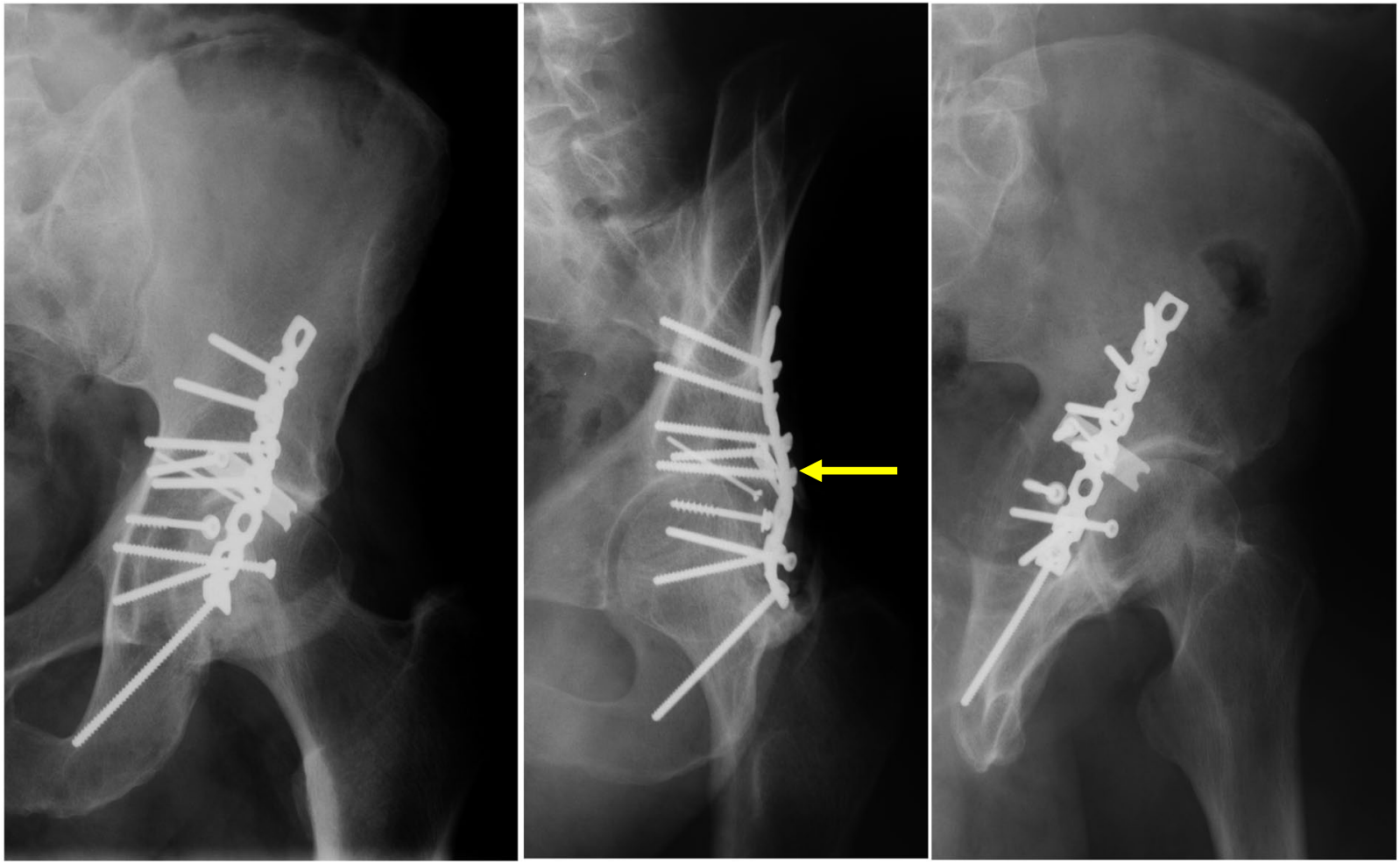


FIG. 8-F

Anteroposterior and oblique radiographs made at the four-year follow-up evaluation. The patient was asymptomatic with a clinical modifie Merle d'Aubigné score of 18.

Our Experience…

- Since 1993, 56 patients who had ORIF of their acetabular fracture at our center went on to THA

• PW	16	←
• Transverse + PW	13	← =33
• BC	11	
• T-type	4	
• PC +PW	4	←
• AC PHT	4	
• AW	3	
• Transverse	1	
Total	56	

Fx's with a posterior wall component account for majority (59%) of THA's

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Acute total hip arthroplasty versus open reduction internal fixation for posterior wall acetabular fractures in middle-aged patients

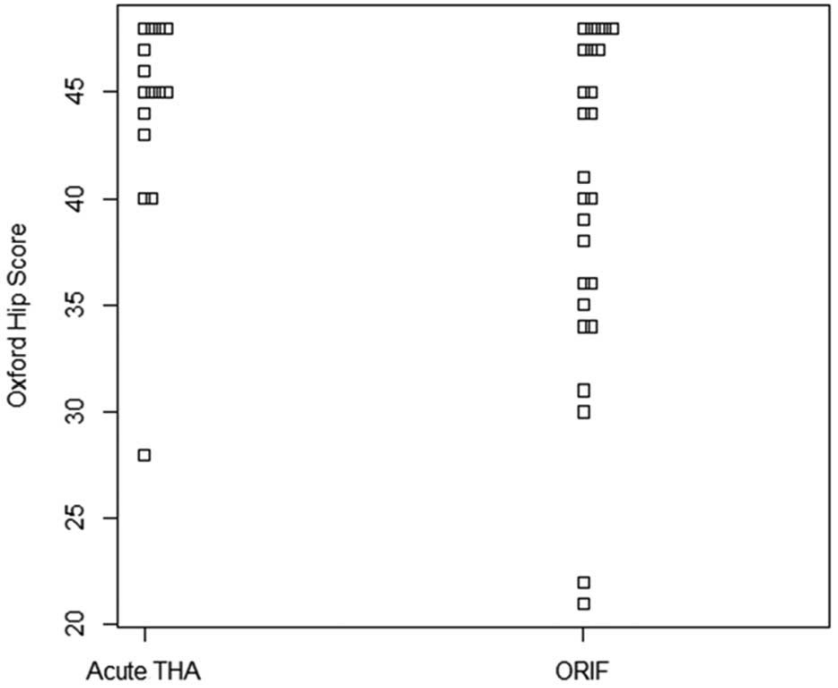
Lauren M. MacCormick, MD[a,*], Carol A. Lin, MD, MA[b], Jerald R. Westberg, BA[c], Andrew H. Schmidt, MD[c], David C. Templeman, MD[c]

- Retrospective study of patients aged 45 to 65 years old with posterior wallfxs treated with acute THA or ORIF between 1996 and 2011.
- Patients were matched by fracture pattern and age at a 2 (ORIF):1 (acute THA) ratio, with 32 ORIF patients matched to 16 acute THA patients.
- Oxford Hip scores and complications similar between groups
- 12 (37%) in the ORIF group had undergone THA or been referred for THA, and 2 revisions (13%) had occurred in the acute THA group.

Table 3

ORIF group outcomes based on accuracy of reduction

Accuracy of reduction[3]	Number of patients	Conversion to THA	Average time to THA
Anatomic	25	9	29 months
Imperfect	2	0	—
Poor	4	3	7 months
Surgical secondary congruence	0	—	—



Summary

- Posterior wall fractures do not all do well.
- The vast majority are appropriately treated with ORIF
  - In these, particular attention to surgical technique is needed to maximize outcomes.
- In elderly patients, these may be best treated with early ORIF.

Thank You