Complications of internal fixation – what now!

Thomas Wright MD
University of Florida Department of Orthopaedics and Rehabilitation
Gainesville, Fl.

Disclosure

- I receive Royalties from Exactech
  - Design surgeon – TSA, Fx prosthesis, RTSA and proximal humerus plate
- Institutional research support - Exactech

Introduction

- Proximal humerus fx - fixation
- Percutaneous pinning
- IM rod
- Fixed angled Plating

Introduction

- Avoiding pitfalls of internal fixation of Proximal Humerus Fractures
- Bailout for failed fixation

Preop Decision Making

- Not all proximal humerus fractures require surgery – 80 + % treat nonop
- Choose best treatment method
  - Adequate imaging
  - Know host medical limitations
- Have a backup plan

Before Surgical Prep

- Adequate biplanar floro
  - Bring floro in from head
  - Make sure can get Grashey and axillary lateral before prep
- Arm holder

Obtain an Excellent Reduction

- Technique
  - –Deploy large sutures through subscap, supraspinatus and infraspinatus adjacent to corresponding tuberosity
    - Control tuberosities and head

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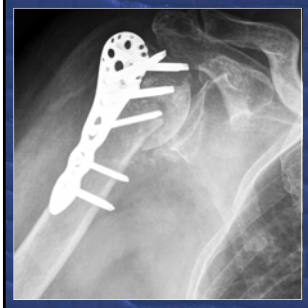
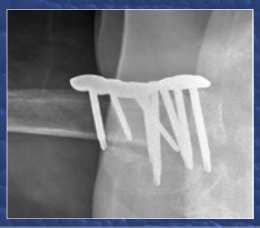
Any Problem with this Fixation!





-Bad reduction
-Bad reduction
-No medial calcar reconstruction
-No medial calcar support

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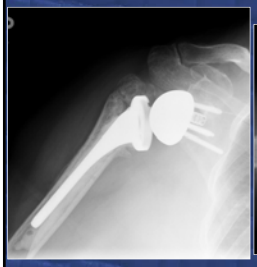
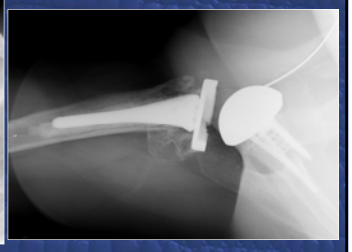
No second chances – the first shot is the best – Bailout RTSA





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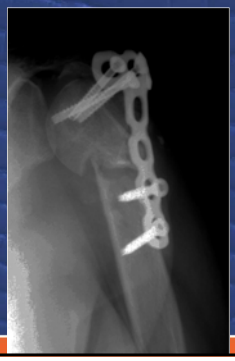
Reduction Varus/Extension Fxs

- –Push shaft under head
  - Large elevator – shoe horn
  - Traction (shaft is almost always anterior to head)
- –Pull on tuberosity sutures
  - Rotate head into valgus (restore neck shaft angle)
  - Locking shaft below head

How about this Fixation?

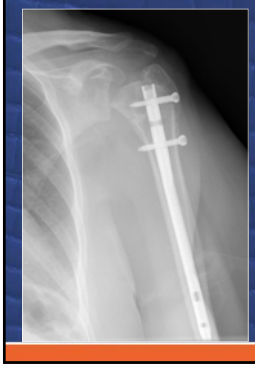


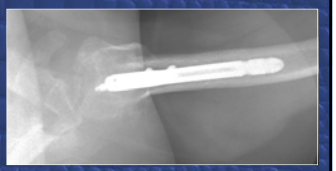
- -Bad reduction
- -Bad reduction
- -No medial calcar reconstruction
- -No medial calcar support

Valgus Impaction Fx

- –Push lateral head superior-reducing to glenoid - do not break medial hinge
- –Pull tuberosities around under head

IM Fixation is it a Panacea?





-Valgus impacted
-Bad reduction
-Bad reduction
-No superior reconstruction
-No superior support

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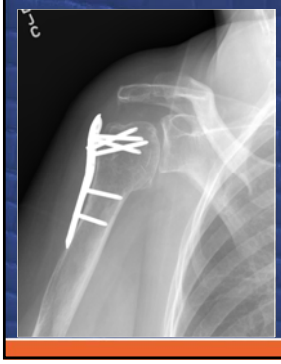
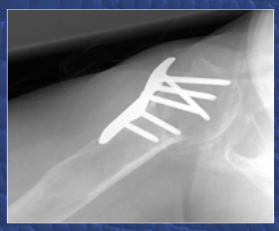
Are we doing better?





-Reduction fair
-No medial calcar support
-Fx united but AVN

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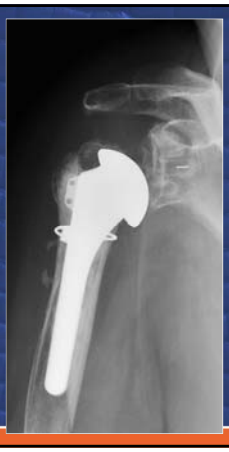
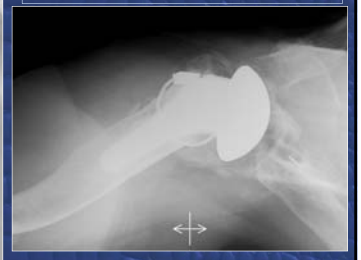


Bailout – tuberosities in good position and soft tissues in good shape can convert to TSA occurs mostly with AVN otherwise RTSA



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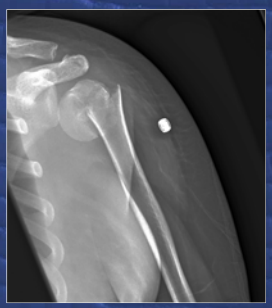
Greater Tuberosity FX

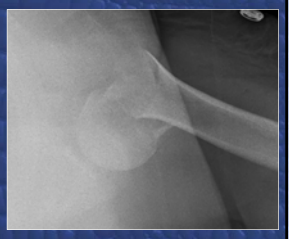
- Obtain a good reduction
- Always use suture to neutralize forces
- May use screw but not alone
- Always floro to avoid over reduction

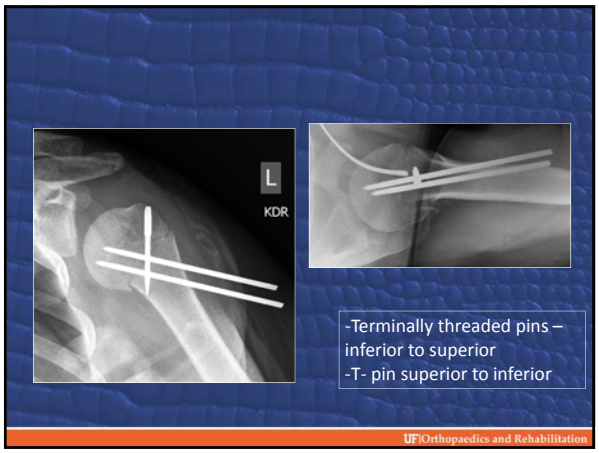
Percutaneous Pinning

- Pt selection – good bone, simple fx, no comminution
- Obtain a good reduction, good reduction, good reduction, good reduction
- Lateral to superior terminally threaded pins should be placed in lower ½ of head – center on lateral
- Small abduction pillow
- Cut pins below skin

Good candidate for percutaneous?







IM Rod

- Obtain good reduction
- If greater tuberosity is fx would consider another technique
- Consider incorporating sutures around lateral screw

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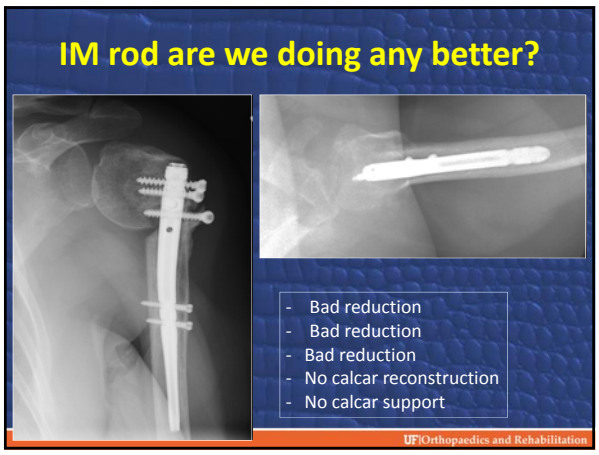
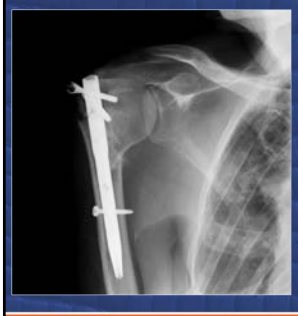


Air Ball



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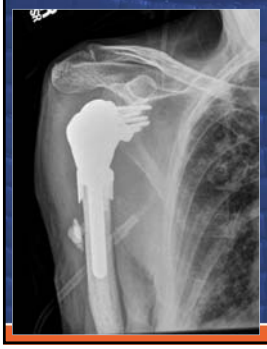
Bail Out – Humeral Reconstruction Prosthesis RTSA



- Pulmonary cripple
- Biologically unlikely to unite fracture
- One operation

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Fixed Angled Plating

- Obtain a good reduction
- Do not dissect in biceps groove or around medial metaphyseal spike
- Do not drill though head allows head to settle on screw – number one mode of failure
  - After perforating lateral cortex drill in reverse or tap drill in
- Do not place screw close subchondral bone
- Get screw fixation inferior for varus extension type and superior for valgus impaction type

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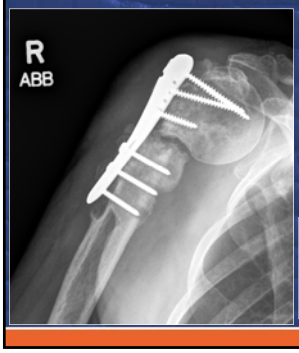
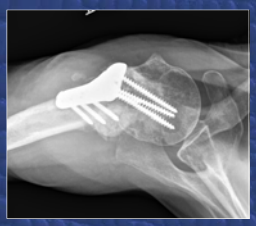
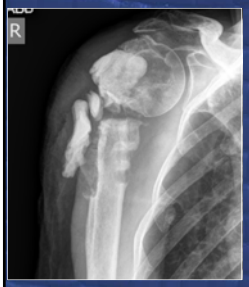
Another Winner!



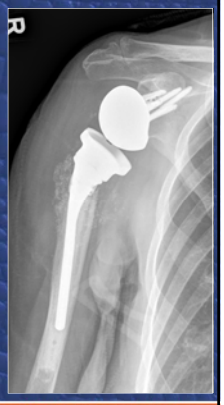


- Bad reduction
- Bad reduction
- No medial calcar reconstruction
- No medial calcar support

Toss in some pus



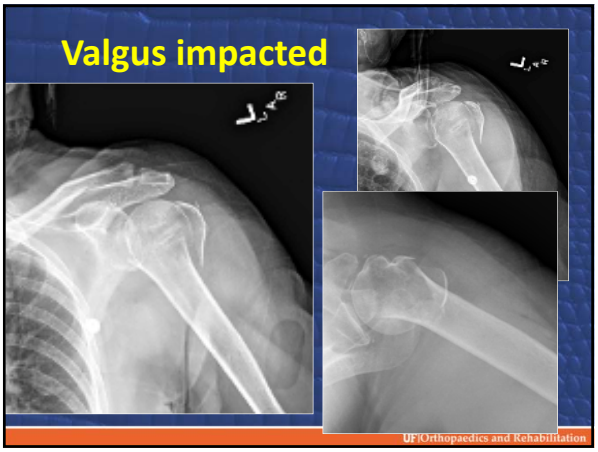
Bailout – 2 stage RTSA



Fixed Angled Plating

- Increase subchondral support by increasing surface area of support
  - –Large pegs or blade
  - –Multiple screws
- Analogous coffee table more support below top greater weight coffee table can bear without breaking

Valgus impacted



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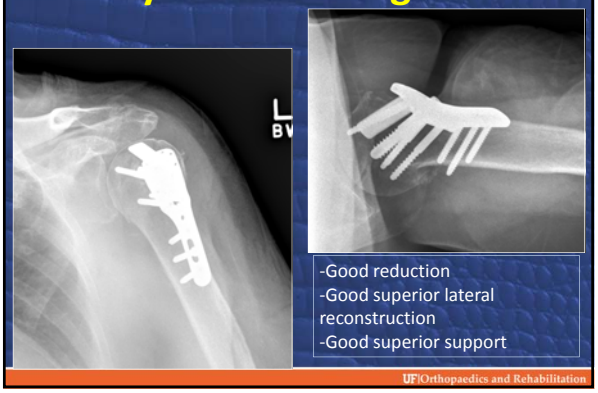
Now you are talking!



-Good reduction
-Good superior lateral reconstruction
-Good superior support

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Fixed Angled Plating

- Both Varus Extension and Valgus Impaction fractures - large bone void
- Both constructs load sharing characteristics markedly improved by filling defect with bone filler
- Always incorporate all three tuberosity sutures in final construct

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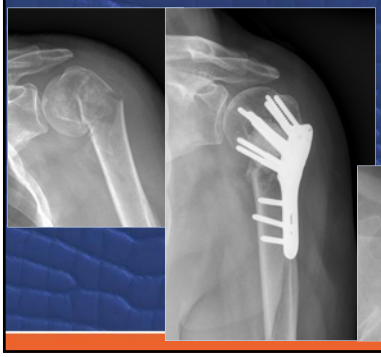
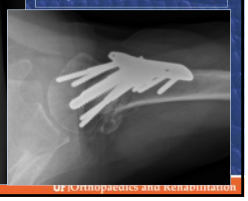
Varus Extension Type-We Got It!



-Good reduction
-Medial calcar reconstruction
-Medial calcar support
-Void filled
-Sutures attached to plate



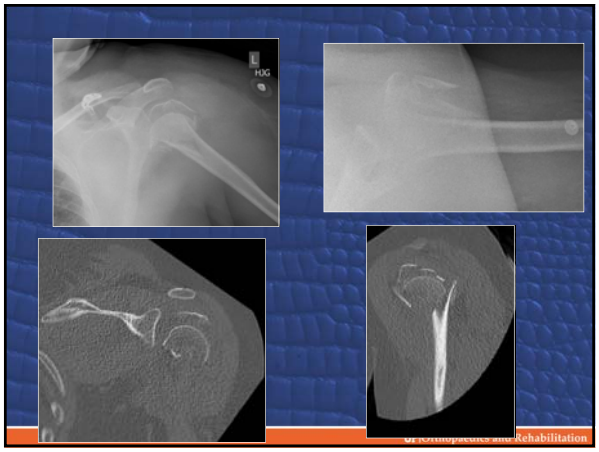
Conclusion

- Obtain a good reduction – life will be better

Conclusion

- When things go bad
  - –RTSA generally the answer
  - –However these pts do not do as well as primary RTSA for fx


UF College of Medicine
Department of Orthopaedics & Rehabilitation
UNIVERSITY of FLORIDA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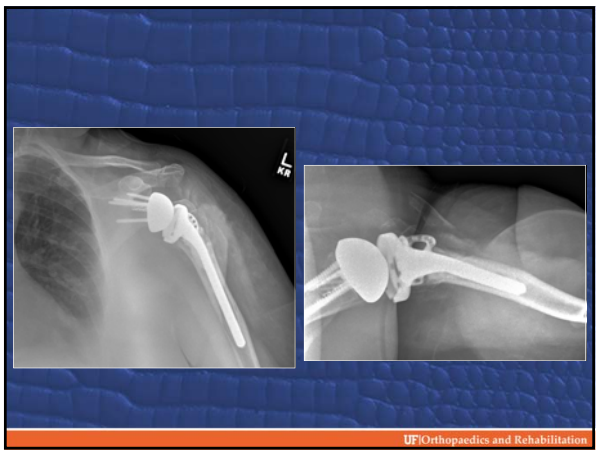
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