Distal Humeral Fracture-Principles and Techniques

> Regional Training 22 March 2010

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Impending doom !









Questions

- Are there other more urgent injuries(ATLS)?
- □ Is it open ?
- Is there a neurovascular problem ?
- Is there compartment syndrome ?
- Are there other injuries in the same limb?
- What are the patient's needs and expectations ?
- Do I need to fix it ?
- Have I got the skills to fix it ?
- Have I got the kit to fix it ?

EXTERNAL FIXATOR-TEMPORISING

Open and...
 Skills or kit not available
 Other more urgent injuries/multiple injuries
 Need to transfer
 While revascularisation is performed, if cannot wait for ORIF.

Otherwise, a Plaster backslab will do, initially.

EXTERNAL FIXATOR

Know your kit

- **Open** technique for pins
- Humerus proximally, ulna distally. Well away from zone of injury.

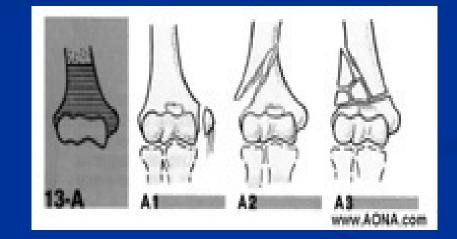


CLASSIFICATION

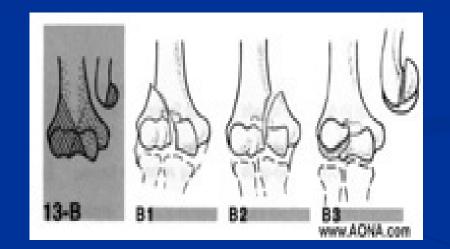
Horne (J Trauma 1980;20:71-4)
Riseborough & Radin (JBJS 1969;51A;130-41)
Orthopaedic Trauma Association 1987
All do not completely describe the #, prognosis or guide management.

AO classification is better, as at least divides into artic/extraartic and partial artic. Complicated !

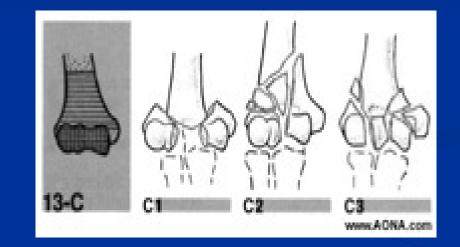
Extraarticular



Partial Articular



Completely Intraarticular



Past Problems

- Conservative treatment (plaster) led to stiffness, even if # reduced.
- Inadequate operative treatment led to failure, infection and stiffness.
- Inadequate operative treatment and plaster led to worst of both worlds
- AO led on adequate implants, accurate reduction and stable fixation with early movement.

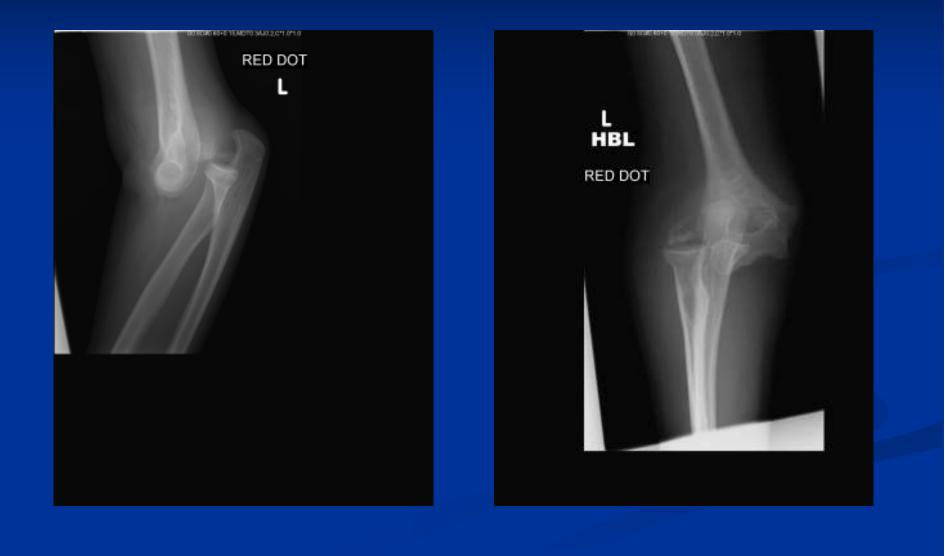
Epicondyle Fracture

Lateral rare

Medial with elbow dislocation (high level of suspicion)
 Undisplaced, conservative treatment in brace.

Displaced, ORIF cannulated screw(s)

Biepicondylar



Biepicondylar



Supracondylar Fracture

Extraarticular

- Unstable/difficult to control (shorten/rotate)
- Dual plate ORIF
- Either split or work either side of triceps. Use olecranon osteotomy if low fracture.

Supracondylar





Supracondylar





Supracondylar

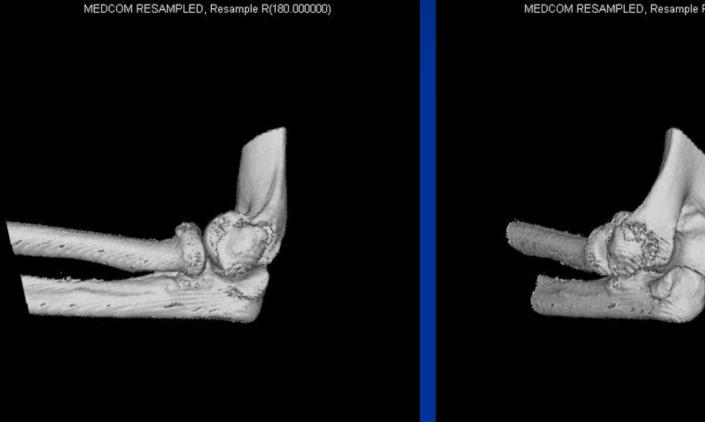


Unicondylar Fracture

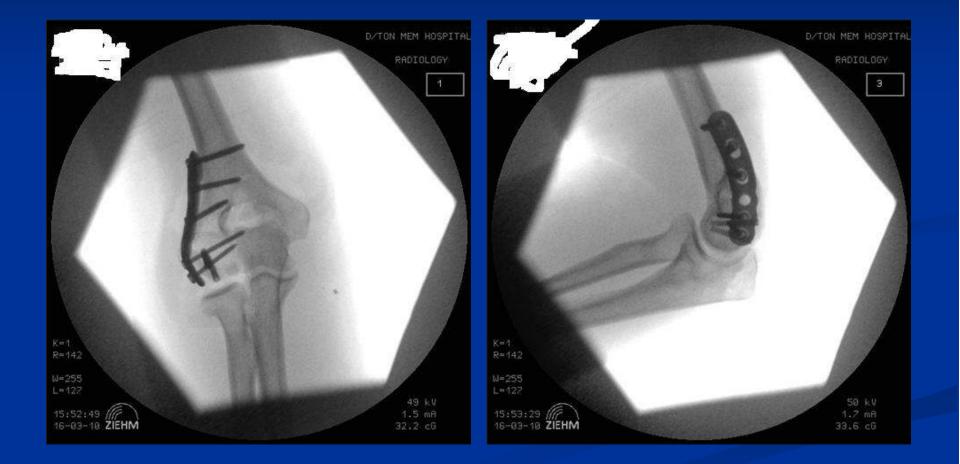
- Intraarticular, lateral more common.
- Consider CT scan
- Look for collateral ligament injury on opposite side of elbow.
- Usually unstable-rotated/displaced
- Olecranon osteotomy for access/vision
- Single buttress plate ORIF







MEDCOM RESAMPLED, Resample R(180.000000)



Capitellar/Trochlear

X Rays may be misleading-always consider CT
 Consider ligament injury on opposite side of elbow

- Usually displaced
- ORIF-Lateral approach avoiding LCL or

olecranon osteotomy

- Headless screw A-P or P-A
- Discard thin cartilage flakes

Capitellum





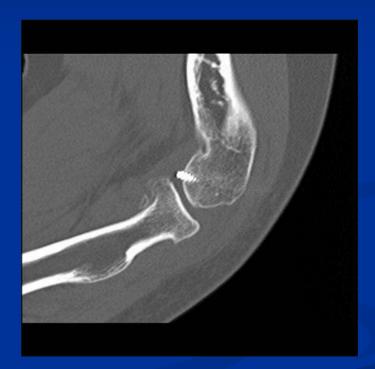
Capitellum





Capitellum

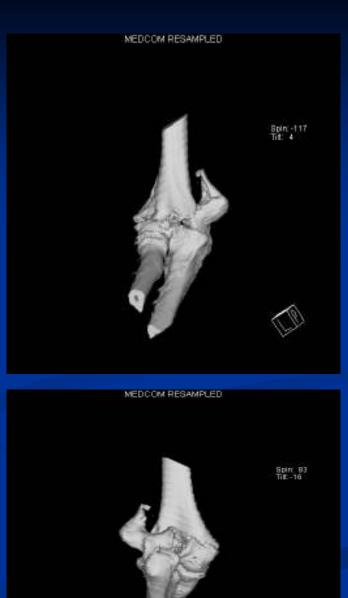




Complete Intraarticular #

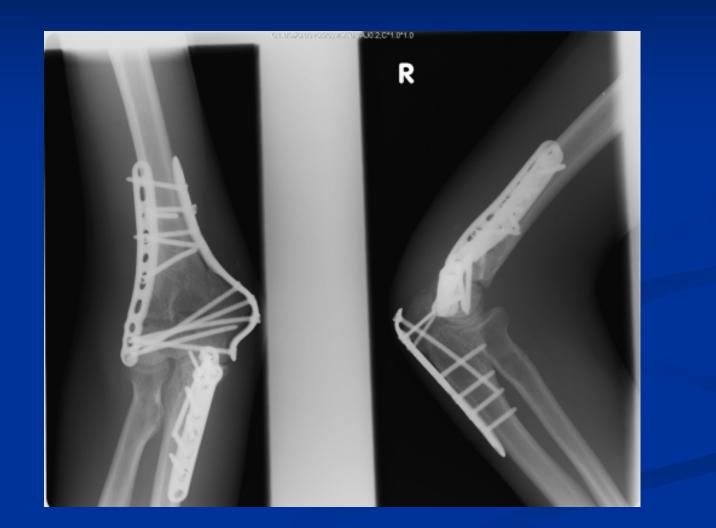
- Consider CT or traction views under II
- Ideally plan surgery with x ray of opposite side/templates
- ORIF for best functional results (Holdsworth, B. JBJS 1990;72B:362-65. Jupiter, J. JBJS 1985;67A:226-39.)
- Olecranon osteotomy/(triceps sparing approach)





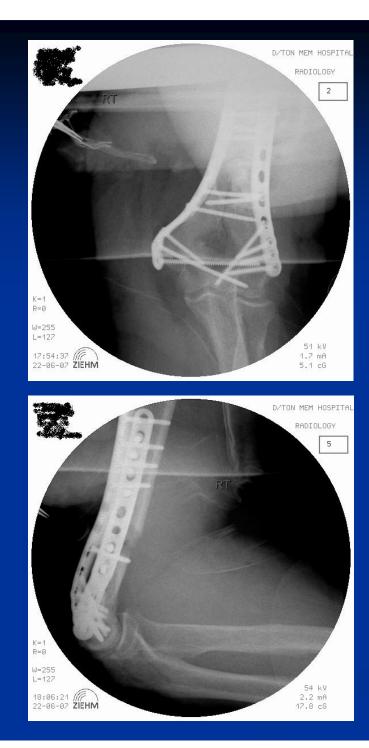
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Complete Intraarticular #



Complete Intraarticular # 2







Complete Intaarticular #2



Positioning



Approach

- Olecranon osteotomy for all intraarticular fractures – ?the only way to see the articular surface
- Posterior incision avoiding the olecranon bursa
- Mobilise the ulnar nerve and sloop-DO NOT CLIP TO DRAPES !
- Osteotomy and continue medial and lateral triceps mobilising incisions
- Bryan and Morrey/triceps tongue also possible)

Chevron Olecranon Osteotomy



- Point to wrist !
 Complete with osteotome
 Repair with Tension
 - Band or plate



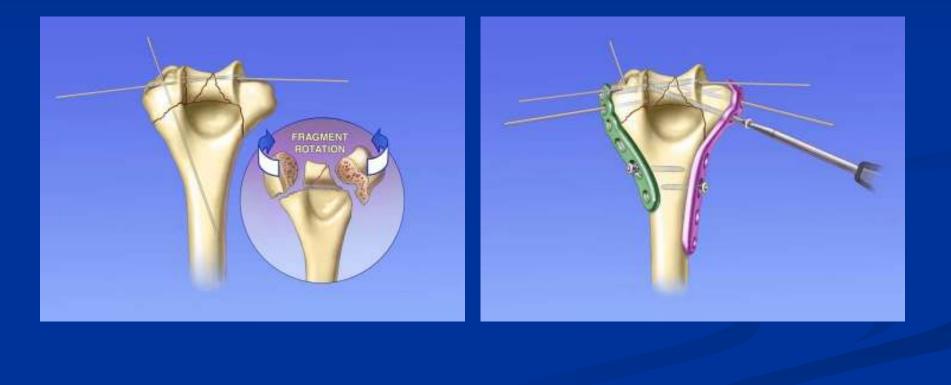


Provisional Fixation

- K wires for preliminary reconstruction of the articular block
- THERE IS NO PLACE FOR K WIRES AS DEFINITIVE FIXATION IN THESE FRACTURES !

Though may be used to hold tiny articular fragments, headless screws are better or 'lock in' with larger fragments.

K wire set-up



FIXATION

- THERE IS NO PLACE FOR 1/3 TUBULAR PLATES IN DISTAL HUMERAL # RECONSTRUCTION
- Either use small fragment set DCP/Recon plate or precontoured periarticular plates
- New locking technology *may* have advantages in soft bone

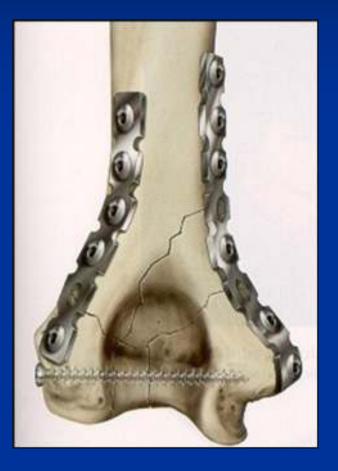
- Original AO technique
- Well proven technique
- Reconstruct the articular block first
- Then attach to humerus with compression
- As low as possible with plates but care not to detach ligaments
- Planning required to prevent screw clashes
- Schatzker & Tile 'The Rationale of Operative Fracture Care.' Springer Verlag Pub.









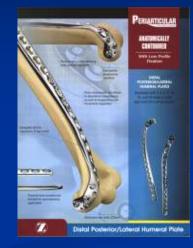


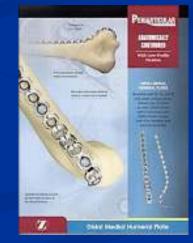




90/90 Precontoured Locking Implants







Parallel Plating

- Mayo Clinic USA. Shawn O'Driscoll. Aims-
- Early movement (@ 3 days)
- Union, especially supracondylar
- Now precontoured plates-save time, improve accuracy, prevent metal fatigue
- Stable fixation distally, extra plate holes distally
- Low profile plates with functional variation in thickness for less irritation and greater strength where needed

Technique and references

 Sanchez-Sotelo J, Torcia M, O'Driscoll S.
 Complex distal humeral fractures:internal fixation with a principle based parallel plate technique. JBJS 2008; 90A Supplement 2, part 1: 31-46.

Biomechanically superior in resistance to all stress planes, particularly torsion.
Few good clinical comparitive trials with 90/90 technique.

90/90 vs parallel plating

JSES JAN 2010 ■ 17 PERPENDICULAR ■ 18 PARALLEL NO DIFFERENCE **CLINICALLY** ■ SLIGHTLY **INCREASED NON** UNION RATE (2 in 90/90, 0 in parallel)

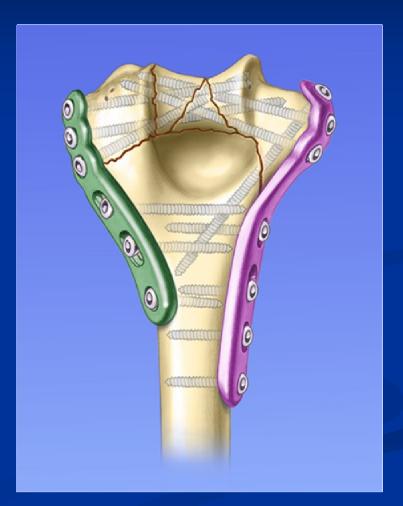


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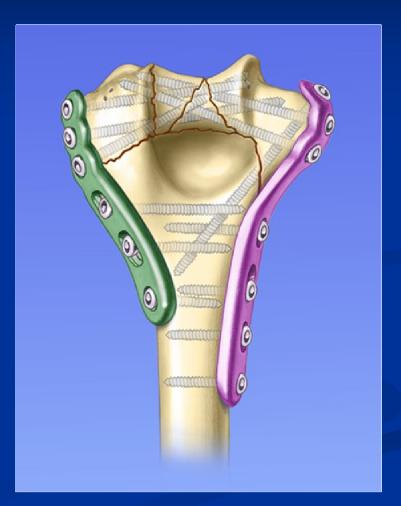
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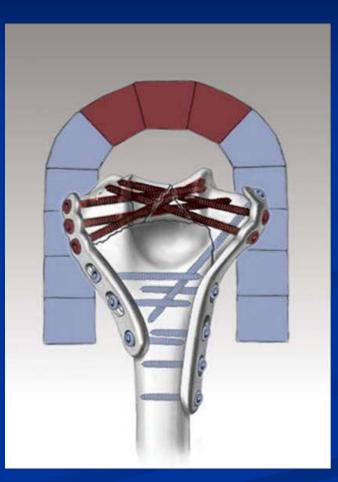
- Every screw passes through a plate
- Every screw engages a fragment on opposite side that is held by a plate
- As many distal screws as possible



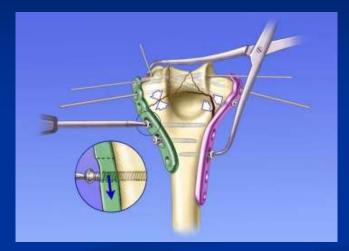
- Screws should be as long as possible
- Screws should engage as many articular fragments as possible

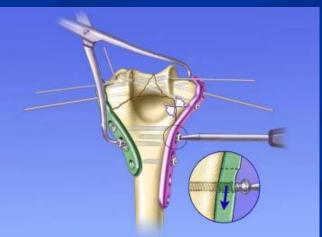


Distally screws should form an interdigitating arch (should not need locking, though available)



Supracondylar compression must be applied



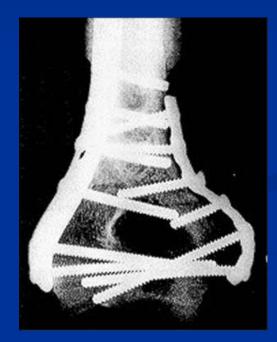


The end result





Not necessarily Acumed plates !



Heterotopic ossification

INDOMETHACIN 25 mg BD if no contraindications

Radiotherapy only if history of HO

REHABILITATION

 CAST only for 2-3 days for immediate comfort, I prefer in extension.

Fixation should allow early movement

- ELEVATE on pillows,+/- hand pump
- ACTIVE/ASSISTED moving to ACTIVE

NO RESISTANCE UNTIL HEALING ON XRAY

ORIF NOT SAFE

- Bag of Bones' approach
- Very frail elderly
- Medically unfit for GA/prolonged lateral decubitus
- Osteopenia

Remember TER for trauma -don't burn bridges with an olecranon osteotomy or infected/loose metalware in poor bone stock.

Bag of Bones





Bag of Bones



BAG OF BONES

Eastwood. JBJS 1937;19:364-9, coined the term. Gradual extension from 120 deg flexion after initial 2 weeks in C&C sling.

Evans. JBJS 1953;35:371-5. Unpredictable results, weakness and deformity.

TER for Complete Intraarticular #





TER for Complete Intraarticular #







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A multicenter, prospective, randomized, controlled trial of open reduction—internal fixation versus total elbow arthroplasty for displaced intra-articular distal humeral fractures in elderly patients

Michael D. HcKee, HD. FRCS(C) ..., Christian J.H. Veillette, HD, FRCS(C), HSc, BSc(Hen) , Jeremy A. Hall, NO, FRCS(C) , Emil H. Schamitsch, MD, FRCS(C) , Liss H. Wild, MScH-MP, Robert HcCormack, MD, FECS(C) , Bertrand Perey, HD, FRCS(C) , Thomas Gostz, MD, FRCS(C) , Mauri Zemar, RH, Karyn Nuon, RH, Scott Mandel, HD, FRCS(C) ; Shirlet Petit, RH, Pierre Gay, MD, FRCS(C) , Imme Leung, BScPT

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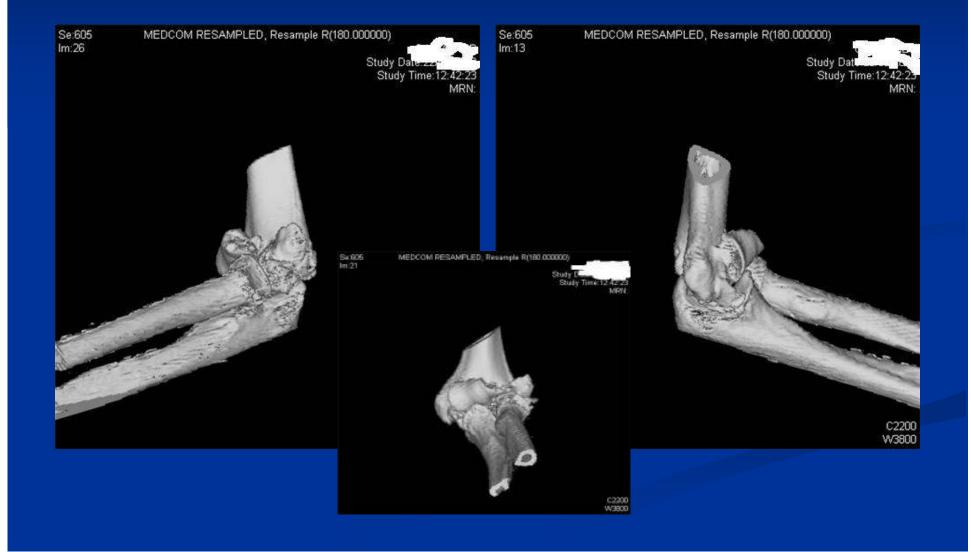
Kamineni S, Morrey
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 JBJS(A)2004;86:940 7.

INDICATIONS FOR TER

AGE >65
COMMINUTED
DISTAL FRACTURE
POOR QUALITY BONE
CONCERNS OVER ORIF QUALITY AND EARLY MOVEMENT



























Thankyou

