

Distal humerus— intraarticular fractures and complications

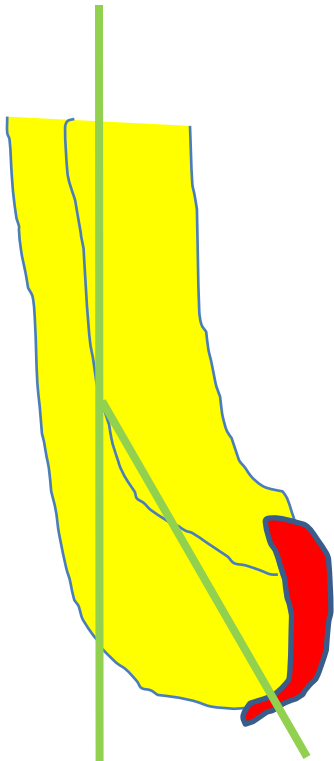
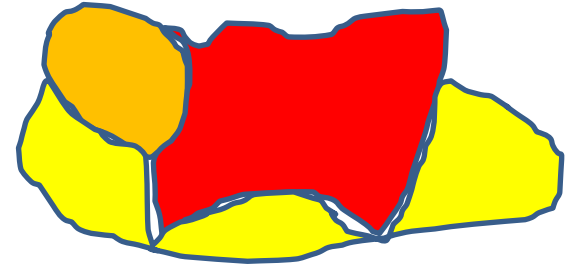
Vikas M. Agashe

P.D. Hinduja Hospital
Dr Agashe's Maternity
& Surgical Nursing home

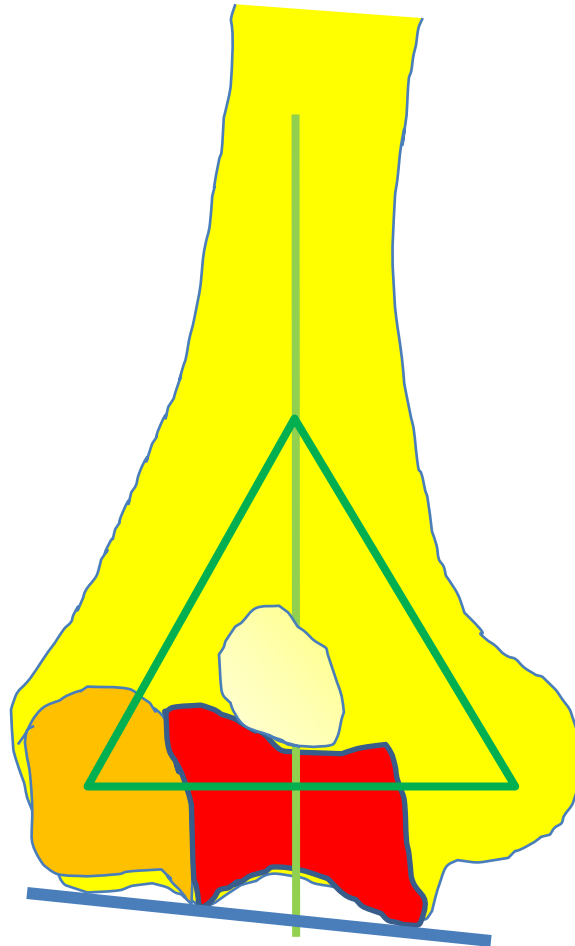
Dr Vivek Shetty
P.D. Hinduja Hospital



Lower end Humerus



30 degrees

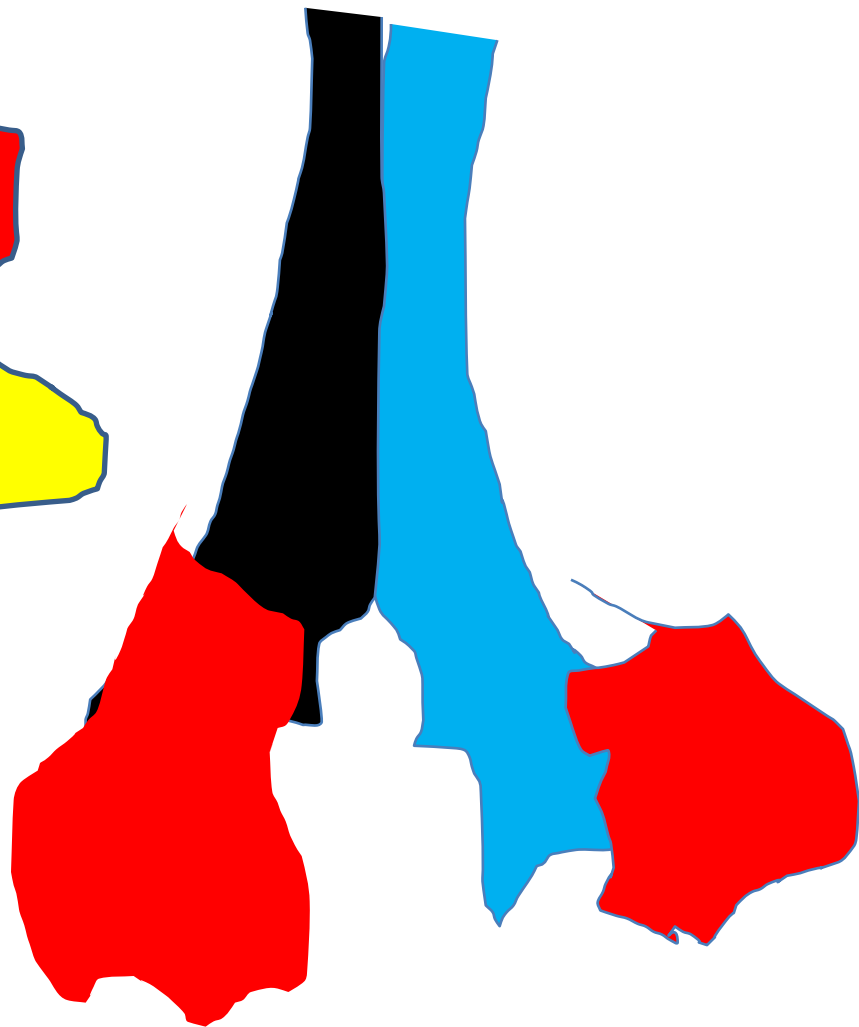
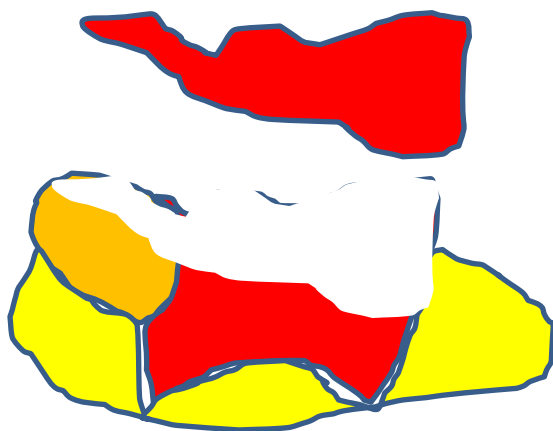
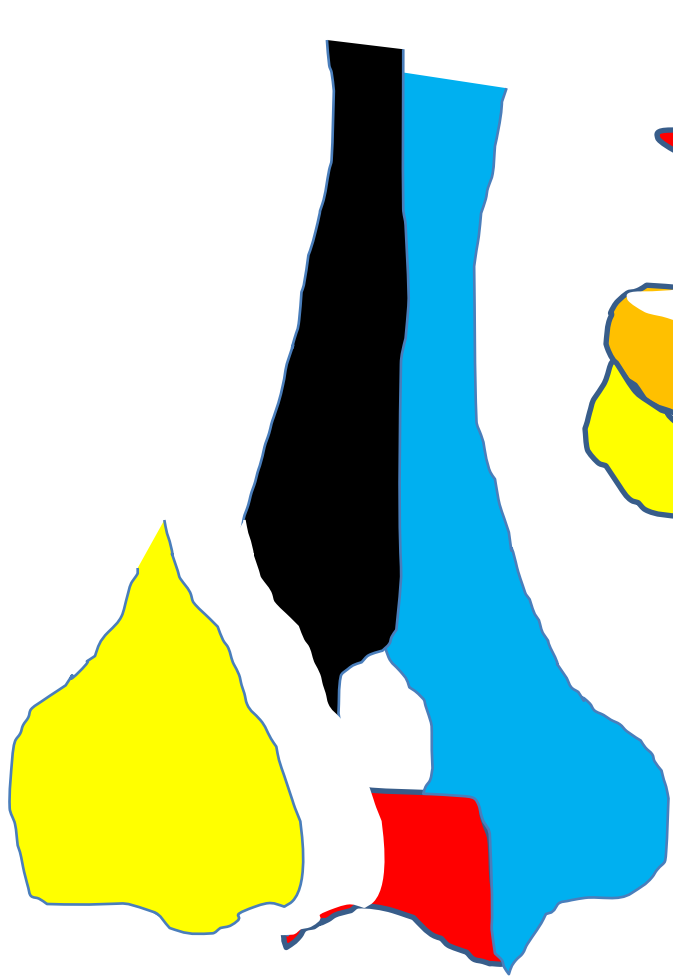


Medial and lateral columns diverge
from humeral shaft
at **45 degree** angle
& support

Tie arch or Articular
block

Partial Articular 13B

Complete Articular
13C

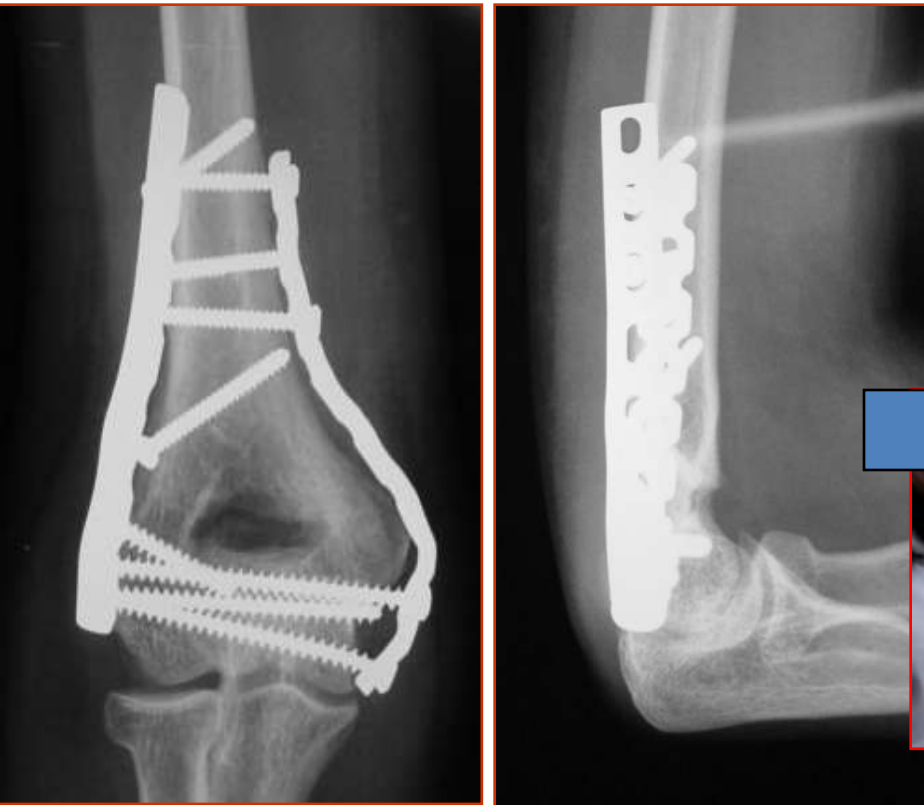


Aims & Expectations after intra articular Fracture

Surgeon – Good Xray

Patients ?

- Stable
- Good movements
- Pain free
- No neurological deficit



Problems

- Inherently unstable fractures
- Poor distal bone stock
- Expensive implants



Test the competence of surgeon

- Knowledge
- Skill
- Attitude

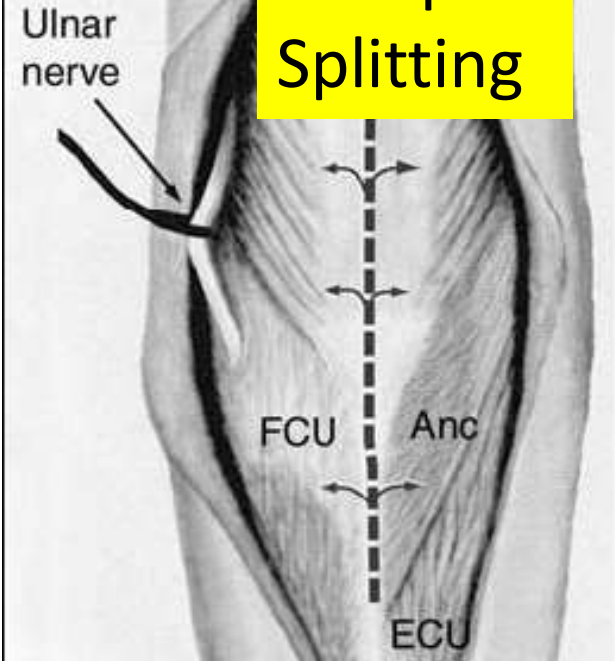
Distal humerus – intra-articular fractures --

- Analyse the fracture – Clinical., X rays & CT scan
- Plan the fixation –Like any intra articular fracture
- Plan the approach
- Reduction strategies
- Sequence of fixation
- Post op

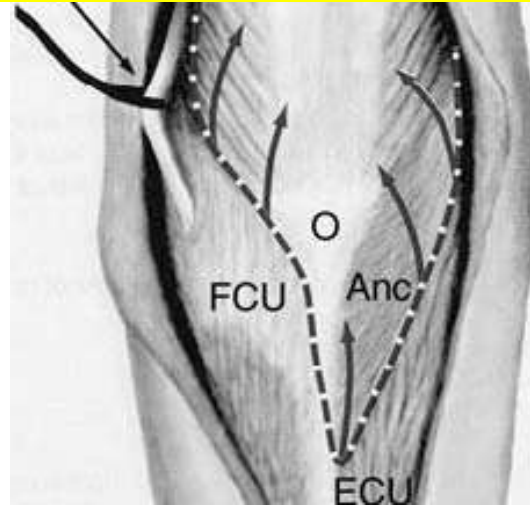
Controversies

- Cast/Bag of Bones/Internal fixation/
TWB/Total Elbow
- Olecranon osteotomy or Other approaches
- Fixation of olecranon osteotomy TBW or plate or
Screw
- Ulnar Transposition or Only dissection
- Addressing metaphyseal comminution –
shortening or bone grafting
- ***Orthogonal -90 90 plating or Parallel plating***

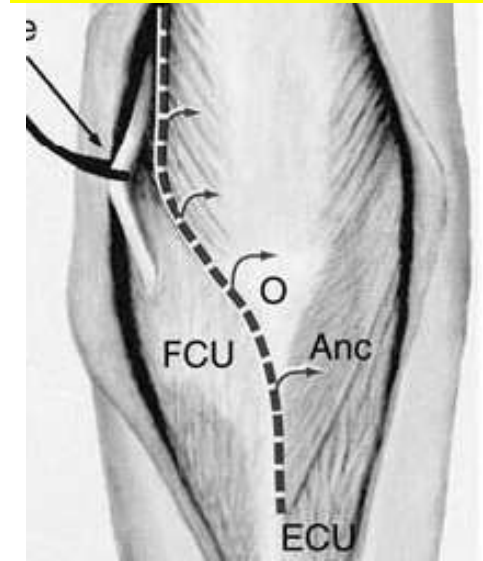
Triceps Splitting



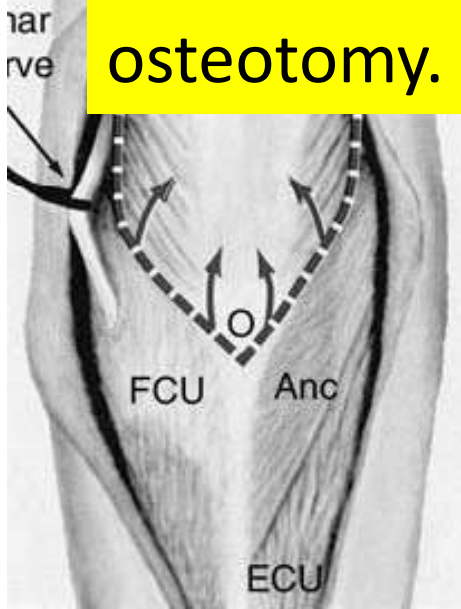
Triceps-reflecting anconeus pedicle



Bryan-Morrey.



Olecranon osteotomy.

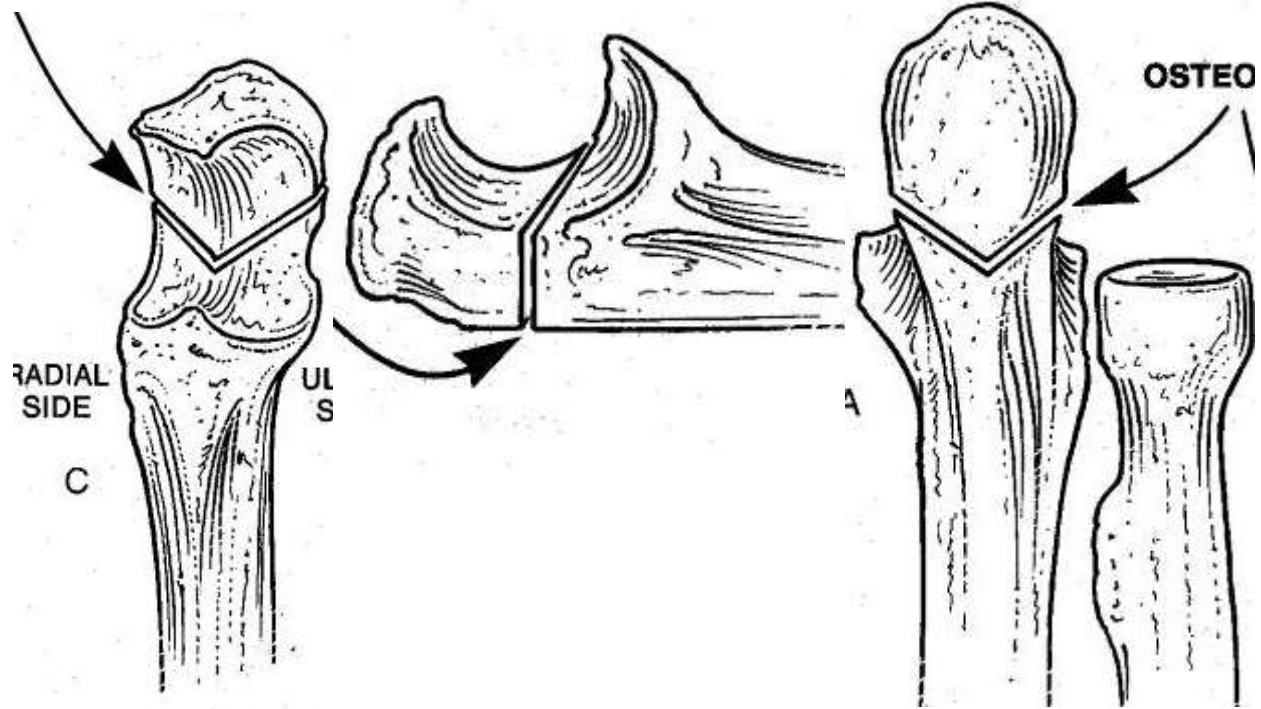
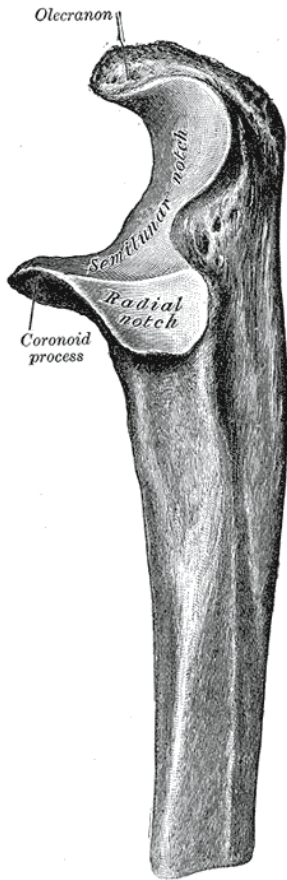


Paratricipital



Chevron osteotomy

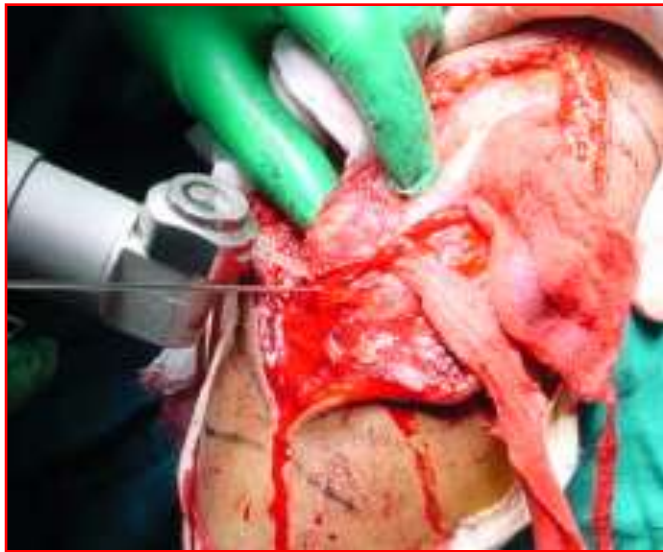
V shaped osteotomy with distal apex



Osteotomy preferably through Bare area

Osteotomy

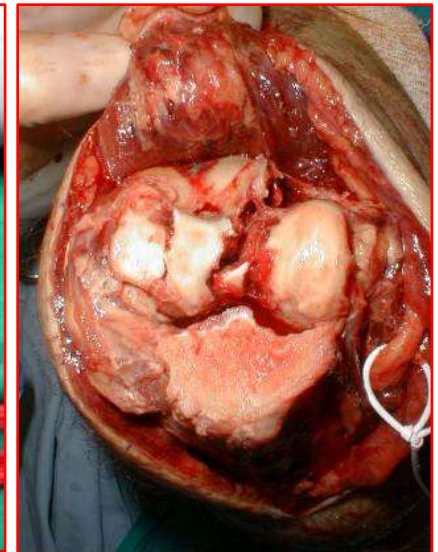
Initiation with
Oscillating saw
with a thin
blade



Completed
with straight
osteotome



Good
exposure



Attitude ----Relax during fixation of olecranon osteotomy resulted in



Stress fracture at the tip of the screw Removal of screw and wire and plating



F/60 presented with deformity & *pain*
in pronosupination –improved after
removal

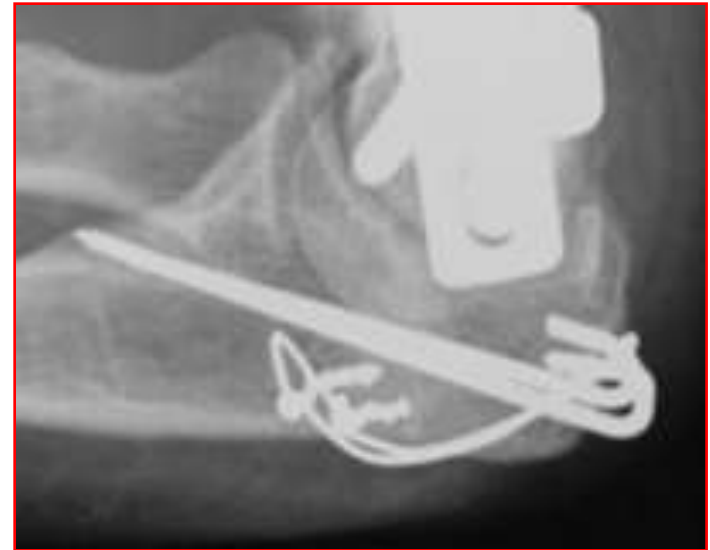


X rays and CT scan—
K wire in Radius

Osteolytic area in neck

Wire related problems can be avoided by

- Drilling wire oblique in anterior ulna cortex
- Impacting proximal ends in olecranon



Ulnar Nerve dysfunction

- More common than believed – Upto 25%
- **More** chances of **dysfunction** (**33% Vs 9%**) if **Anterior transposition done** in **asymptomatic** patient
- If **preoperatively** nerve dysfunction is present **Best to transpose the nerve**

Oscar Vazquez, MD,* Marijn Rutgers, MD,† David C. Ring, MD,† Michael Walsh, PhD,* and Kenneth A. Egol, MD* J Orthop Trauma Volume 24, Number 7, July 2010

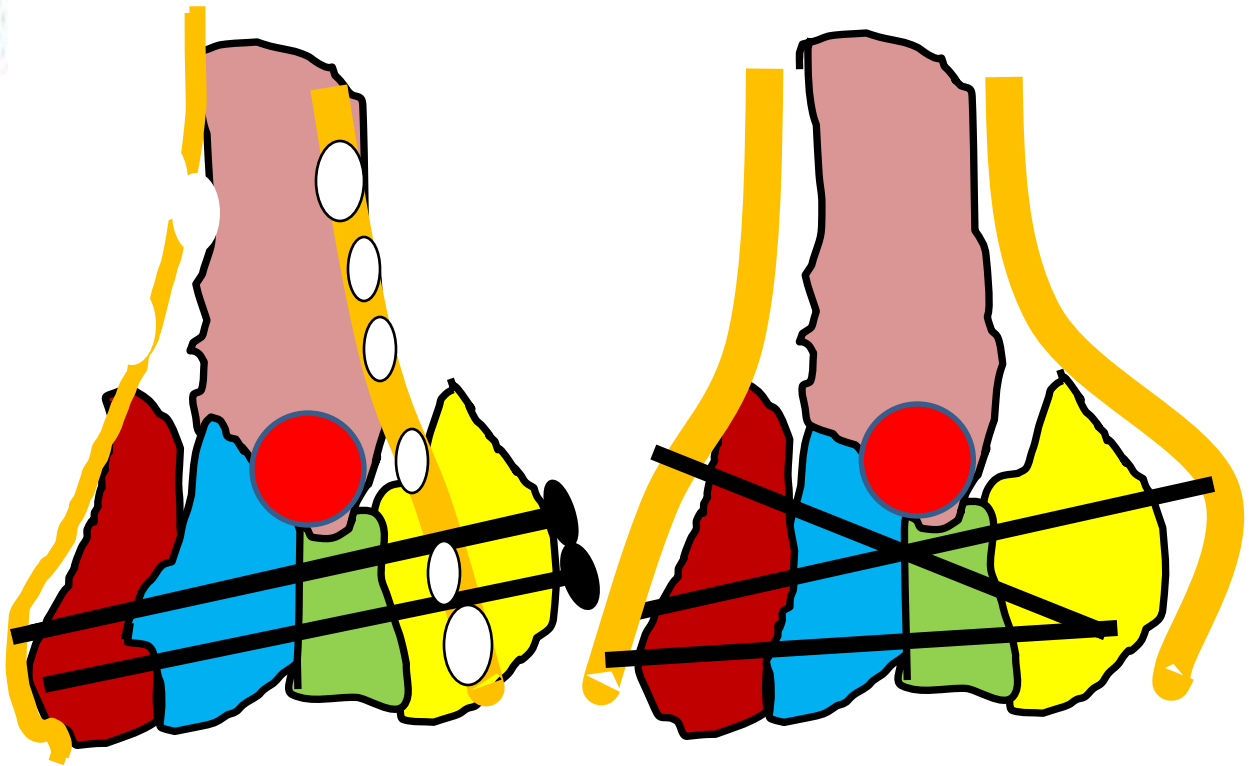
Incidence, management, and prognosis of early ulnar nerve dysfunction in type C fractures of distal humerus. [J Trauma](#). 2009 Dec;67(6):1397-401. doi: 10.1097/TA.0b013e3181968176.

Debate

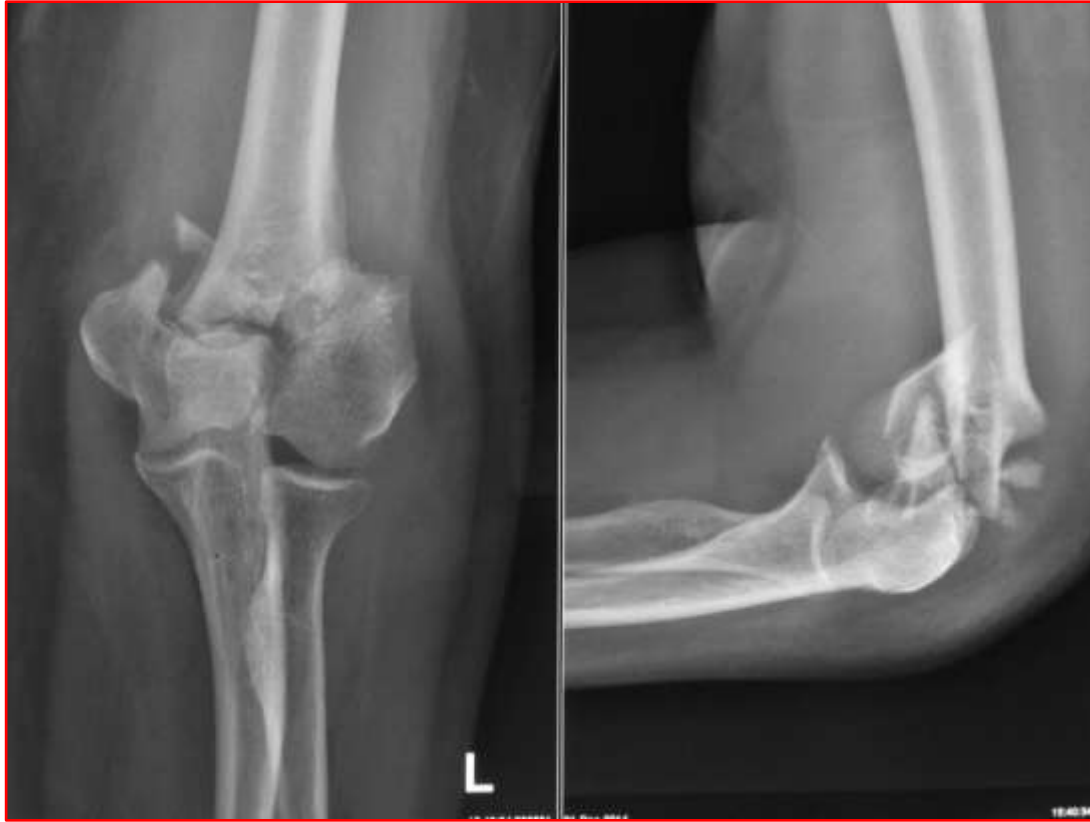


Plates parallel to each other

Orthogonal /
90 90 plating



Traditional fixation -- 90 -90 plating



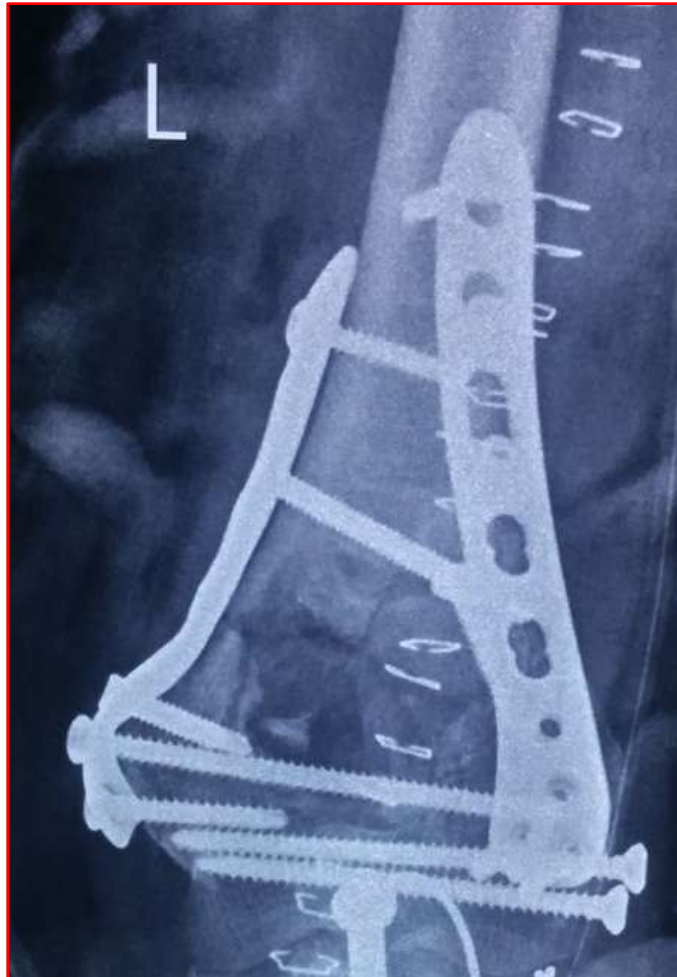
- M/55 Comminuted Fracture lower end Humerus
- 13 C2

The precontoured plates help greatly

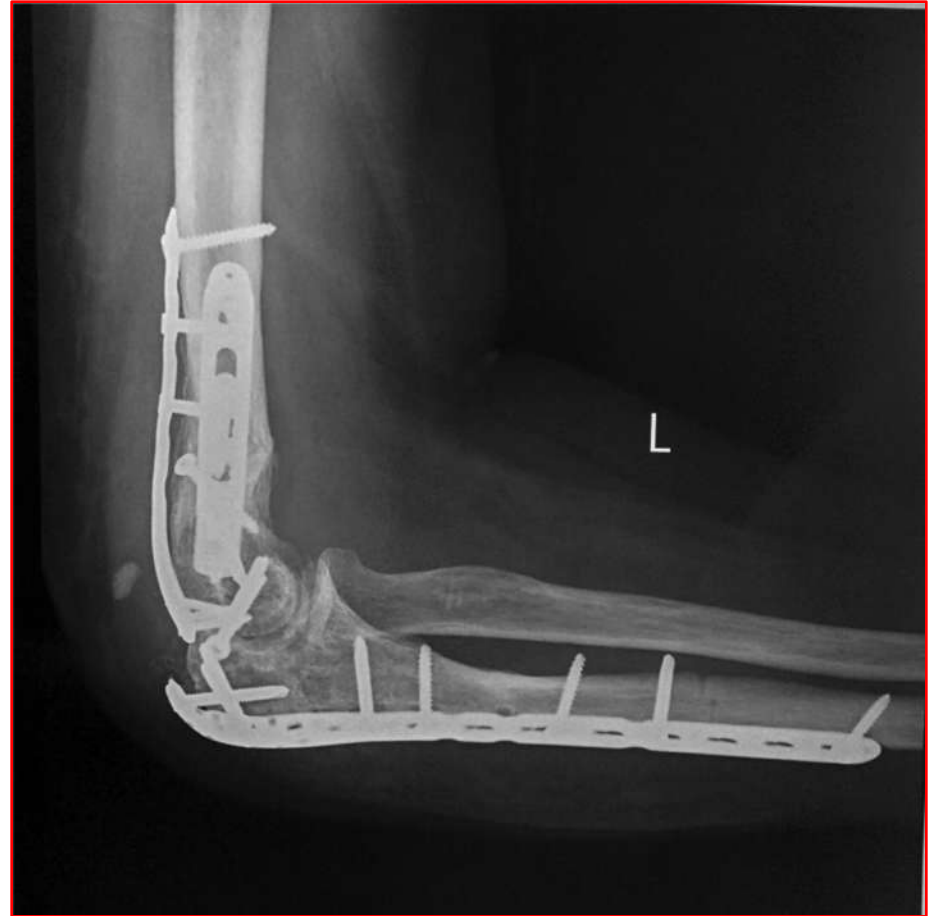


- The medial plate is along the pillar
- Lateral plate is placed posteriorly
& has an extension on the lateral pillar

Positional screws for Articular Block , Precontoured 90 90 plates



Well healed fractures -



Parallel plate technique

Is it only placing plates
parallel to each other ?

***No – It is Much
more***

M/ 50, operated three times earlier
presented 12 months after injury in 2003



Three attempts at osteosynthesis had failed



Opinions taken elsewhere

Leave him alone

to

Total elbow arthroplasty

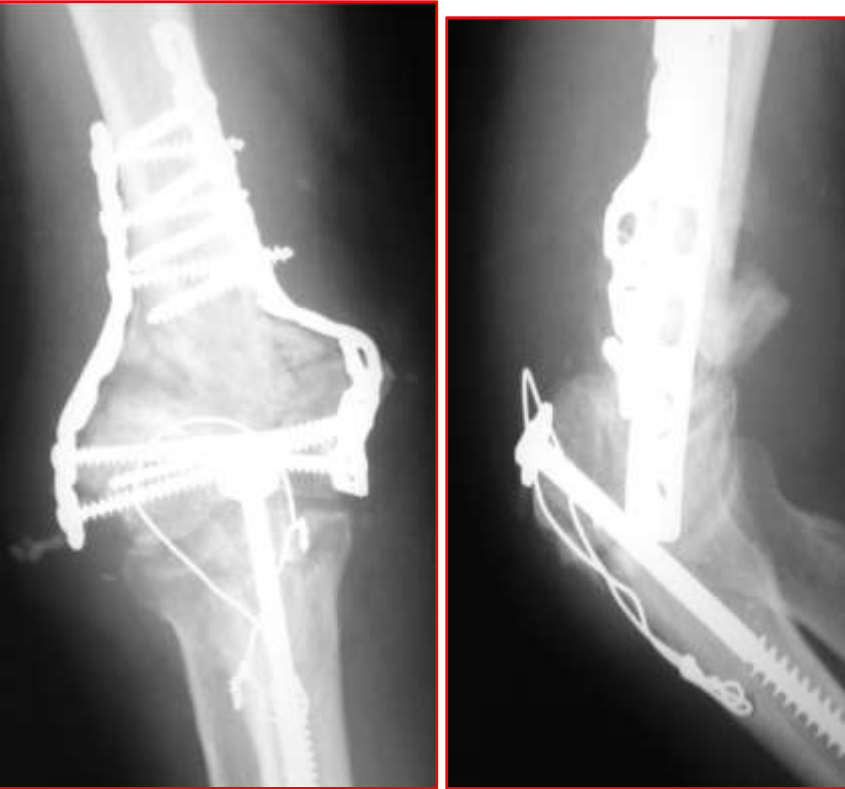


Knowledge – We had just read about parallel plate technique –OCNA 2002



So we ventured to operate on him

After parallel plating



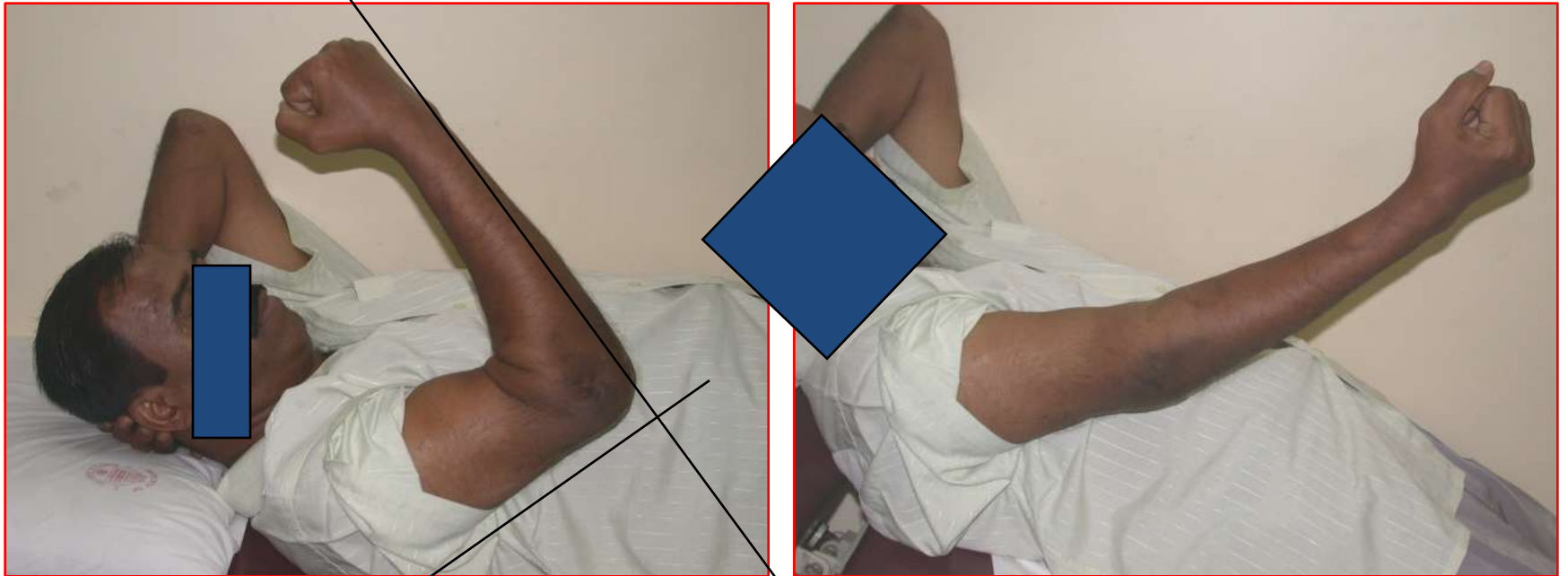
Concerns

- Union
- Range of movements
- Avascularity of fragments
- Arthritis

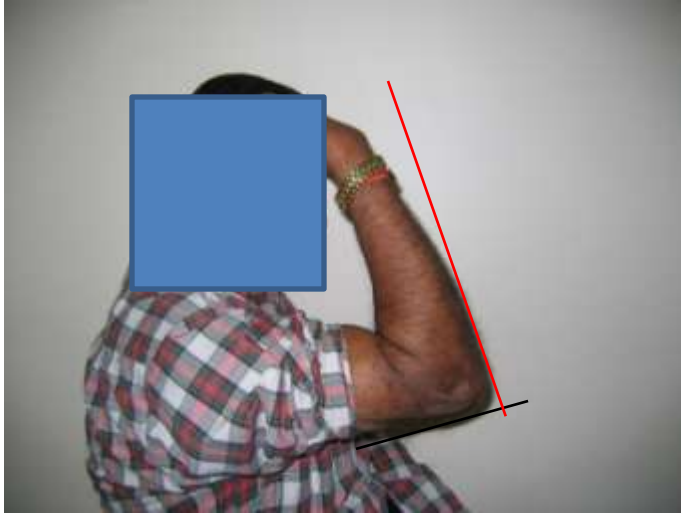
Three months post op



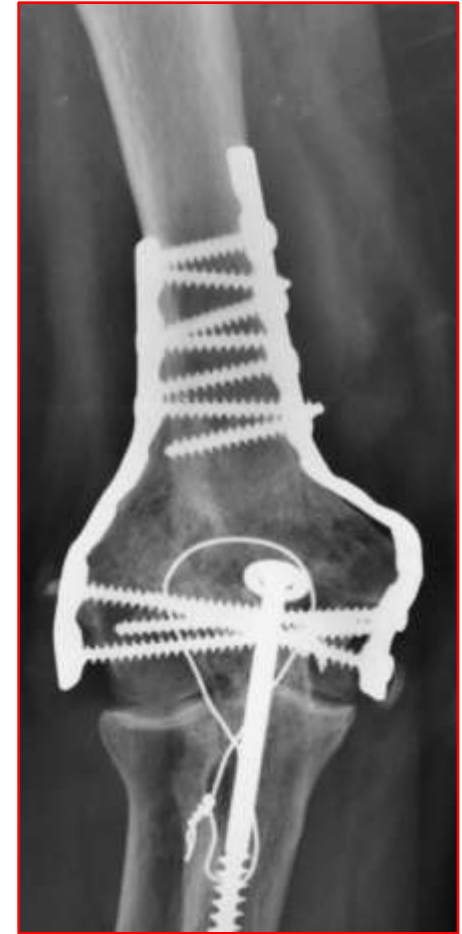
ROM At three months



At Fifteen months



At 12 years



Parallel plating concept developed by *Shawn W. O'Driscoll*

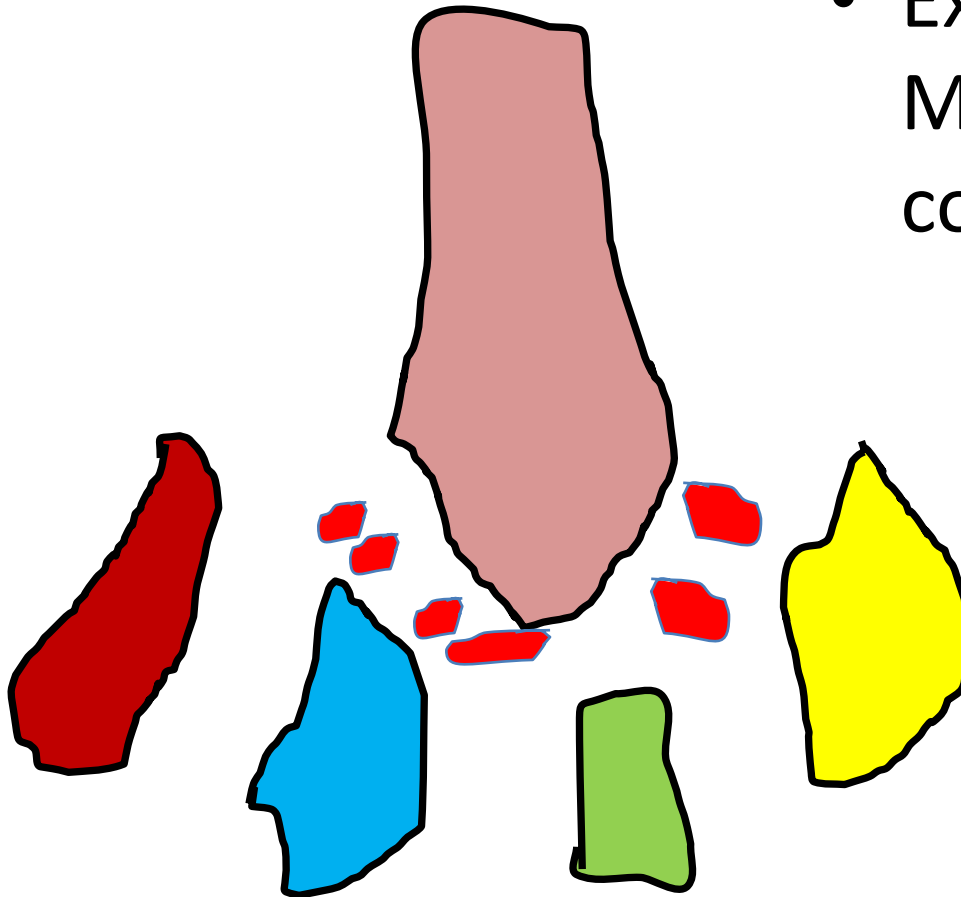
- Complex Distal Humeral Fractures:
Internal Fixation with a Principle-Based
Parallel-Plate Technique
- *Joaquin Sanchez-Sotelo, MD, PhD¹, Michael E. Torchia, MD¹
and Shawn W. O'Driscoll,*
- **OCNA 2002 , Shoulder & elbow surgery
2005 , JBJS 2007**

Parallel plating **A principle based technique and NOT just putting parallel plates**

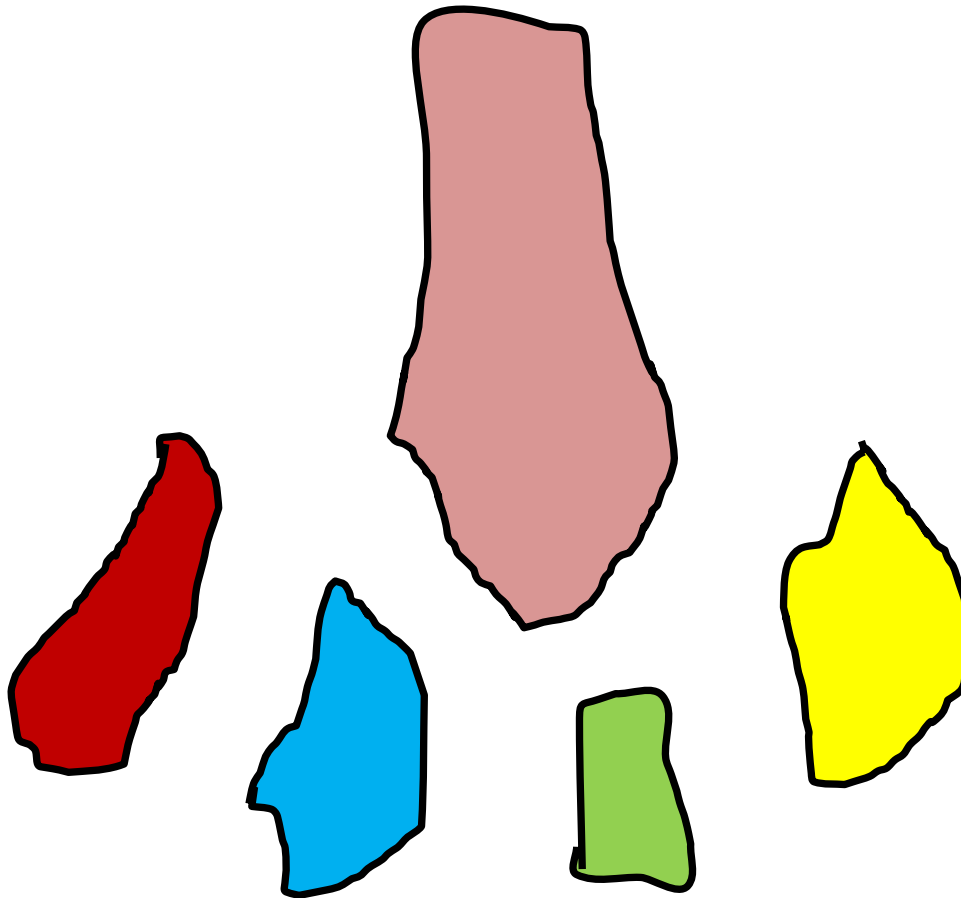
- **Enhancing fixation** in the **distal** fragments and
- Achieving **stability** at the **supracondylar** level **using this enhanced fixation**

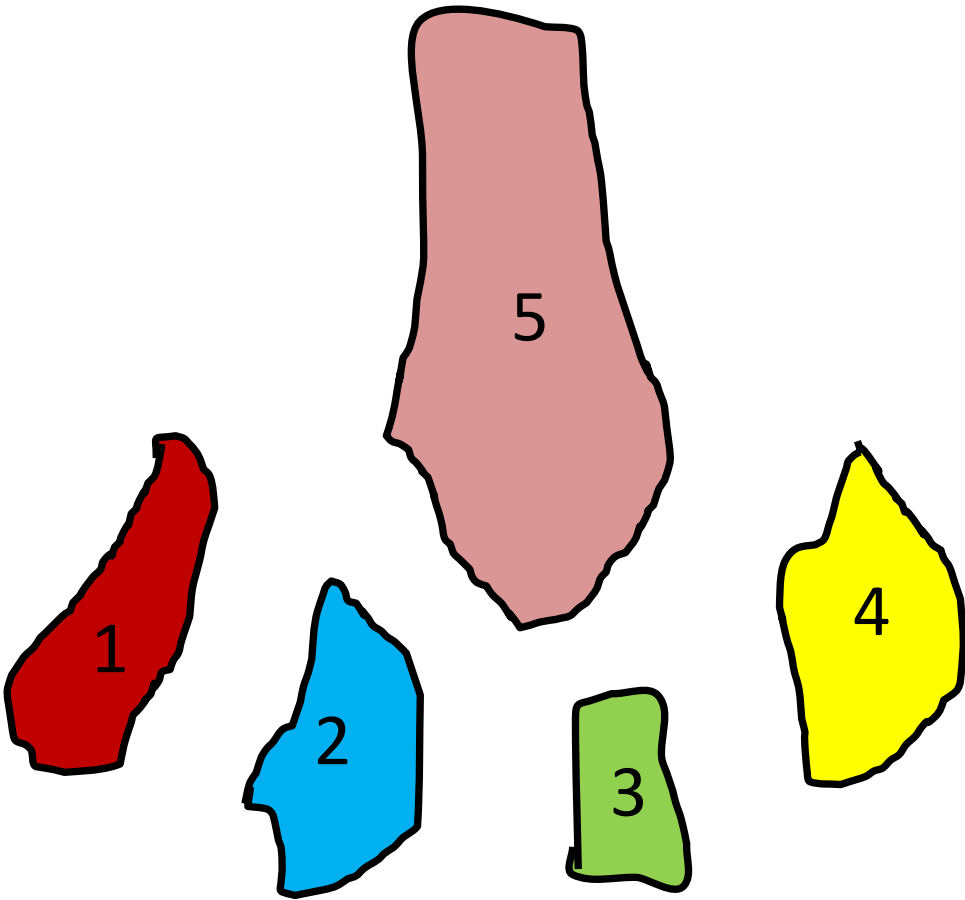
The procedure

- Excision of Metaphyseal comminution

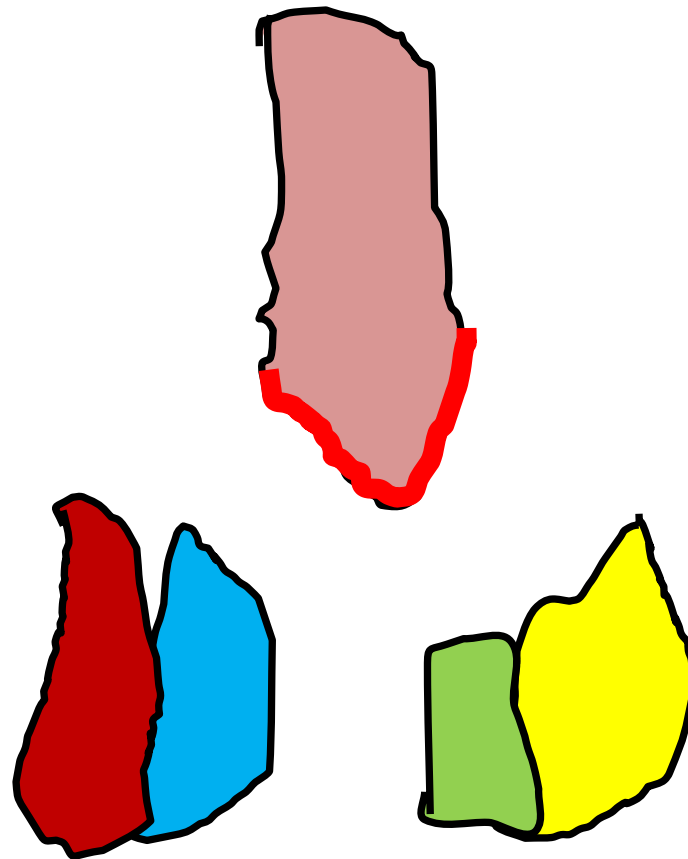


Parallel plating

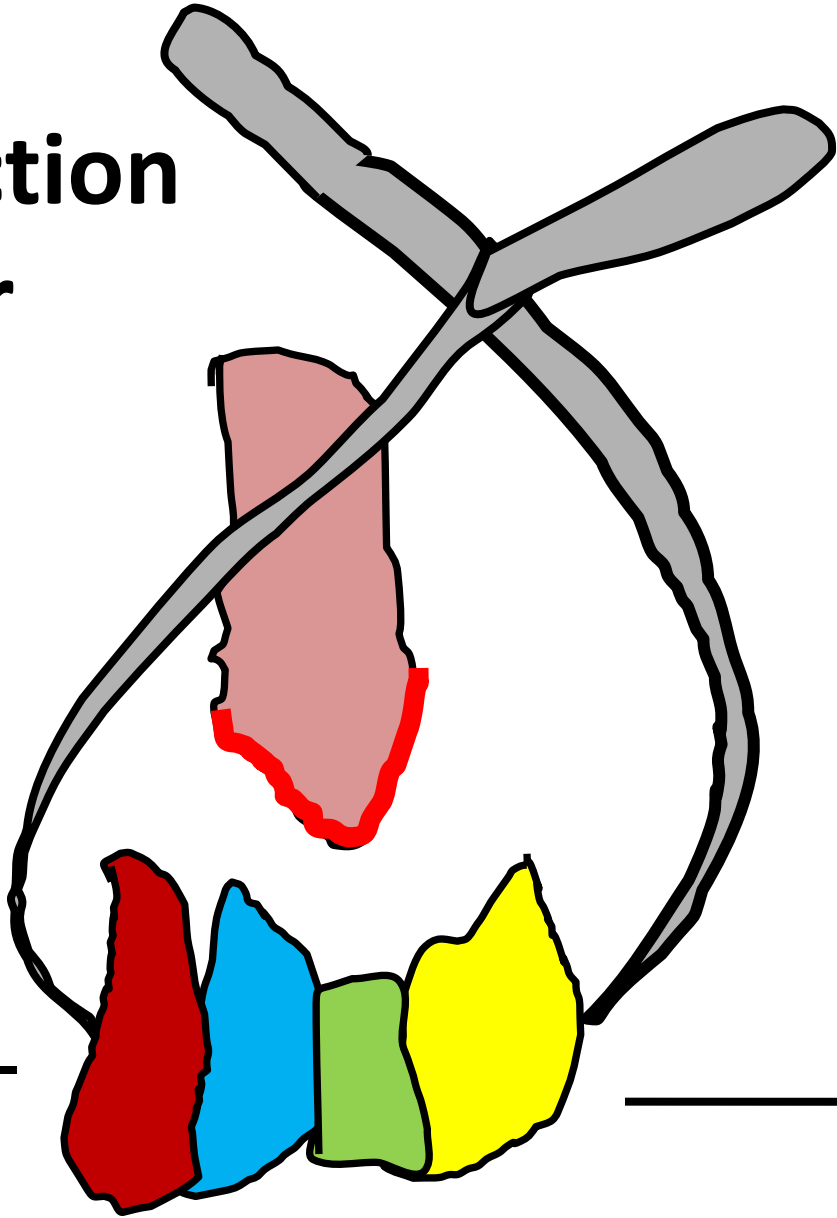




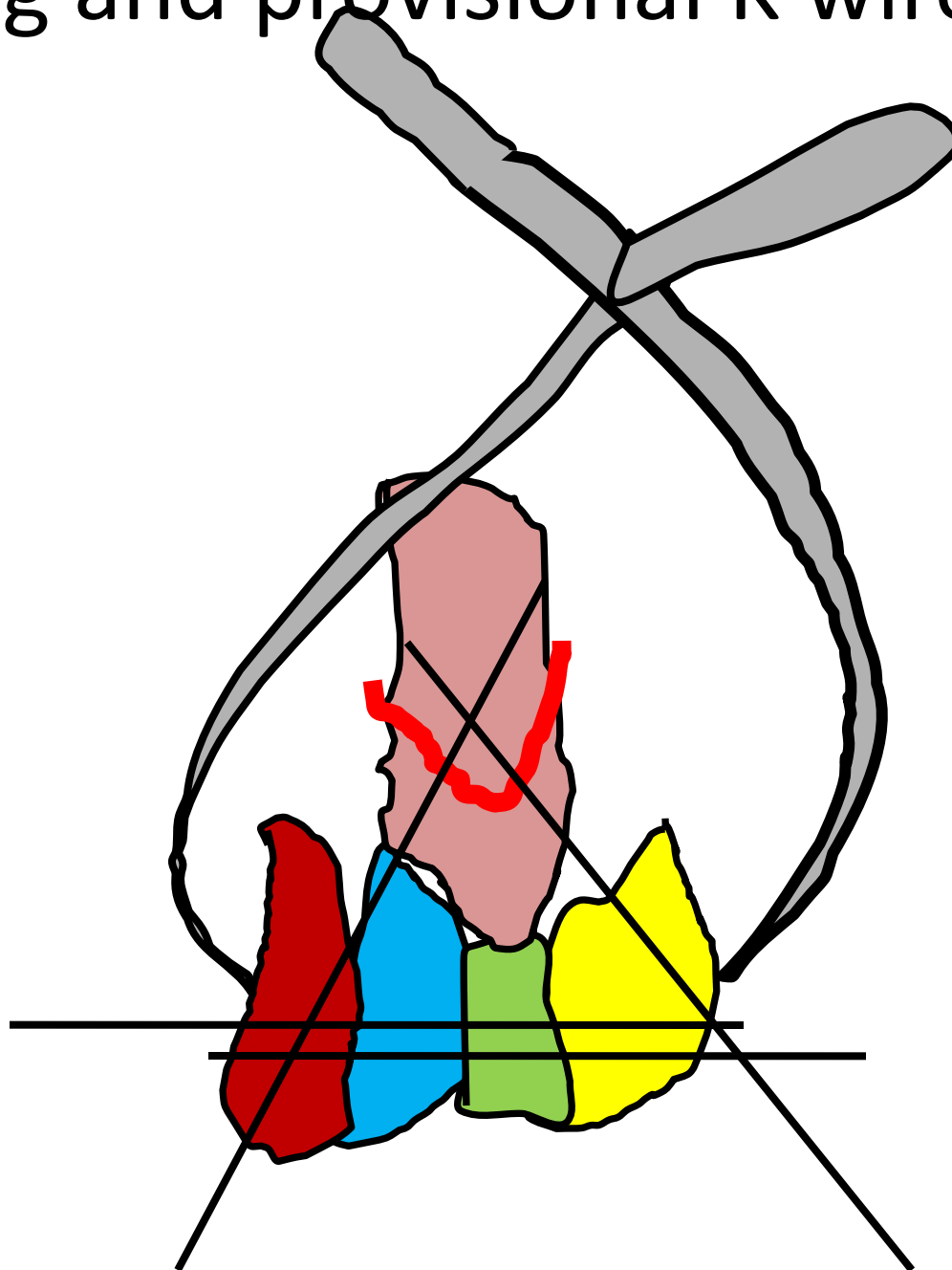
Reduction of distal Articular block



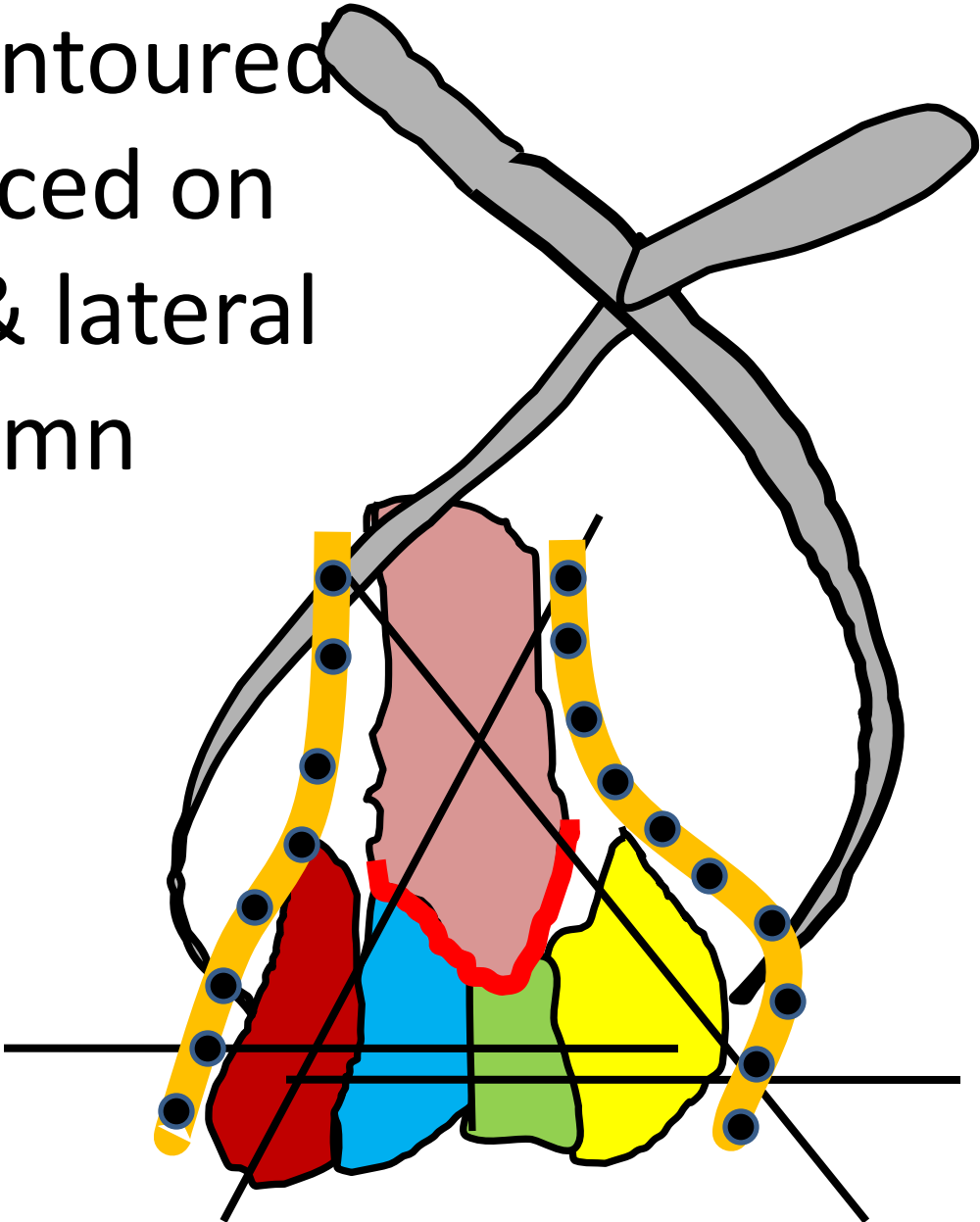
- **Reconstruction of Articular block**



Docking and provisional K wire fixation

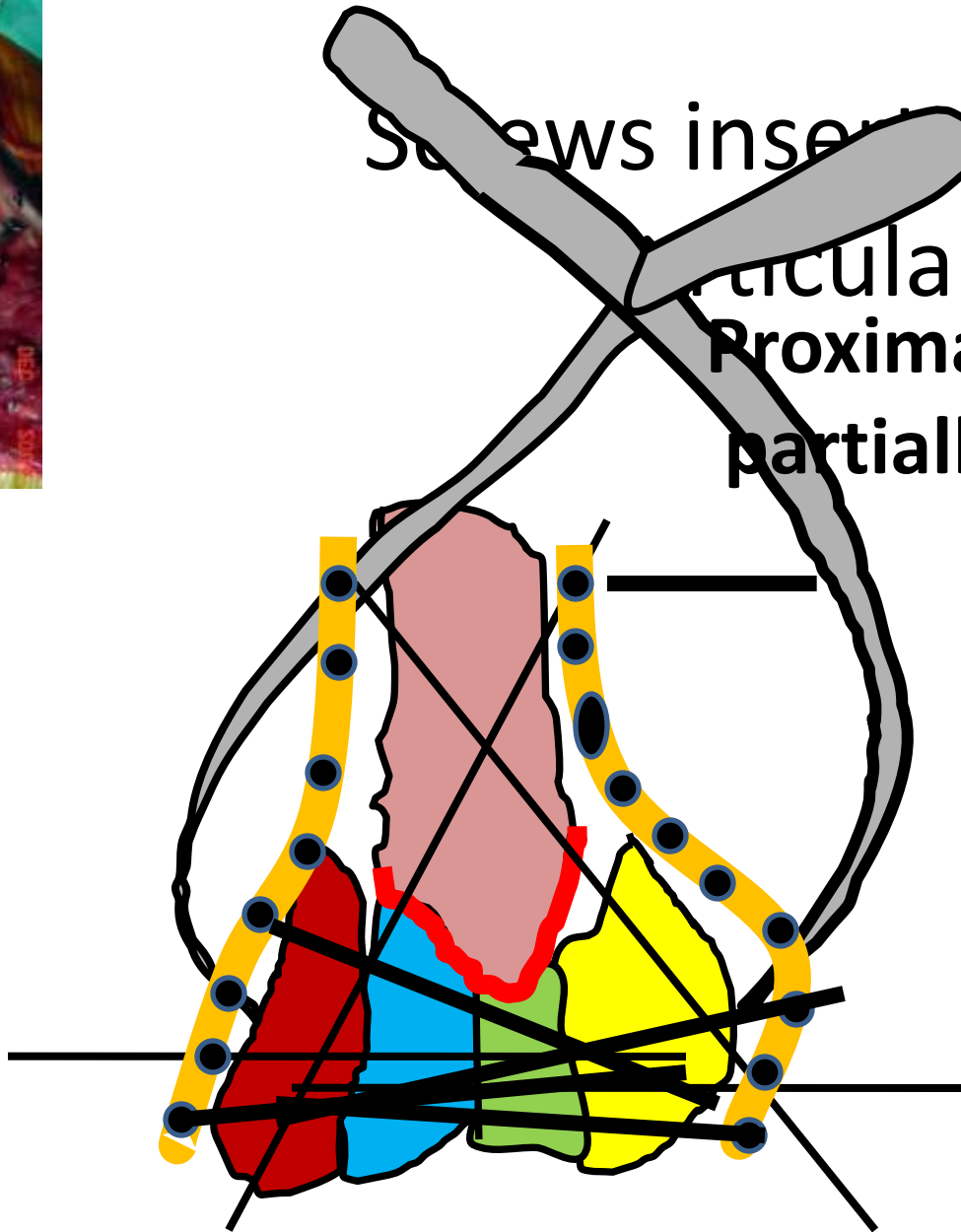


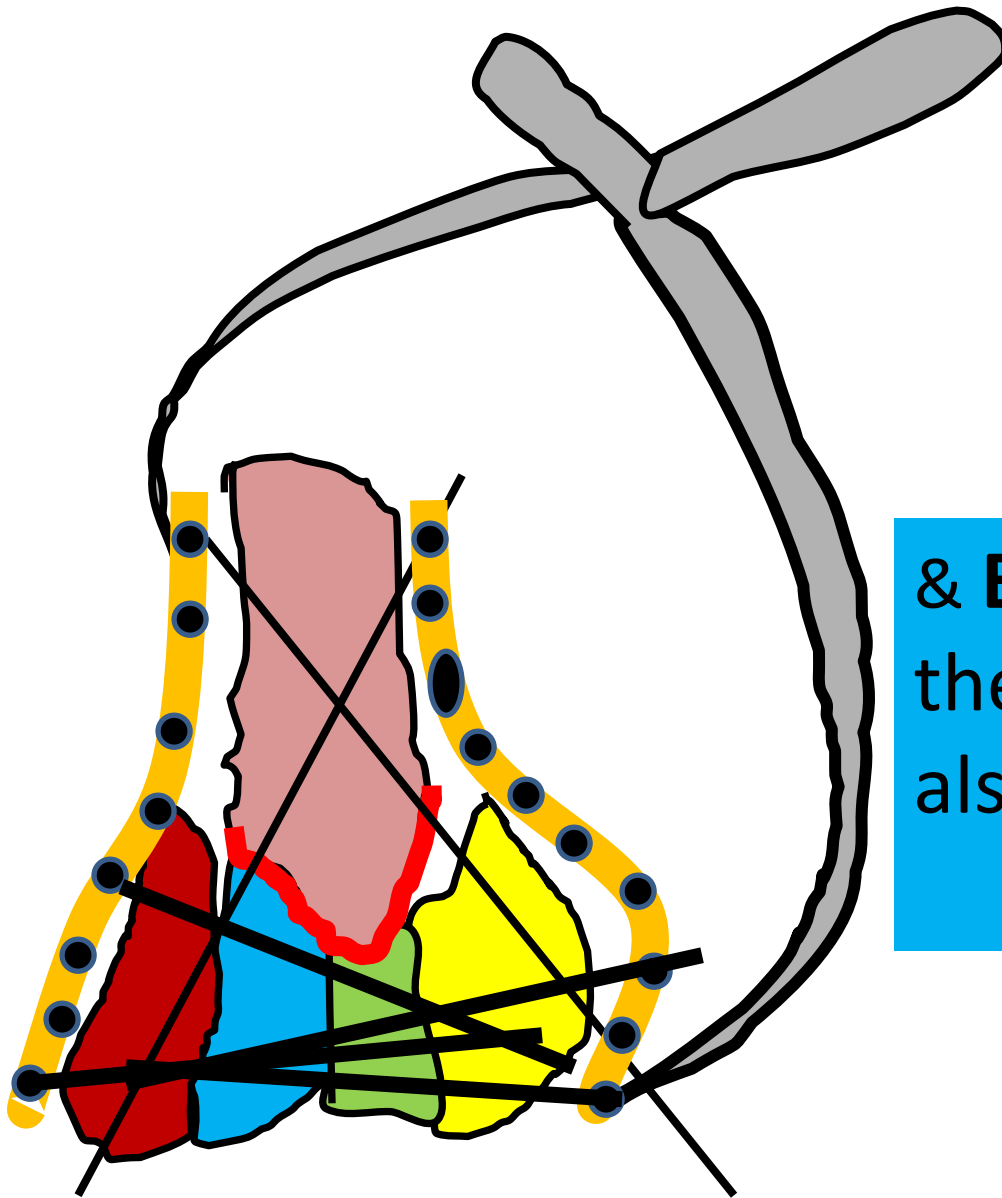
Plates contoured
and placed on
Medial & lateral
column





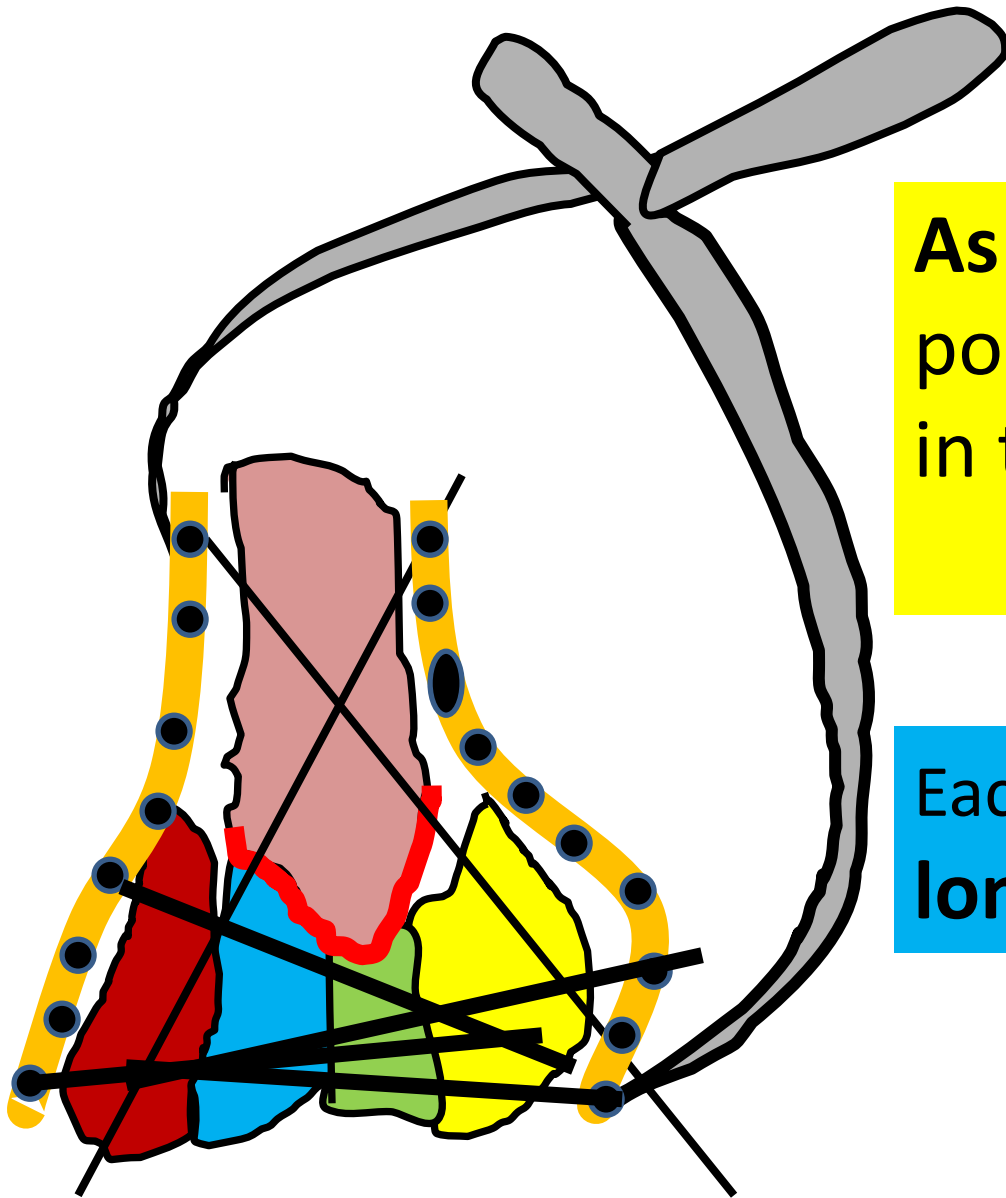
Screws inserted in
articular block
Proximal screw
partially inserted





Every screw in the distal fragments should pass through a plate

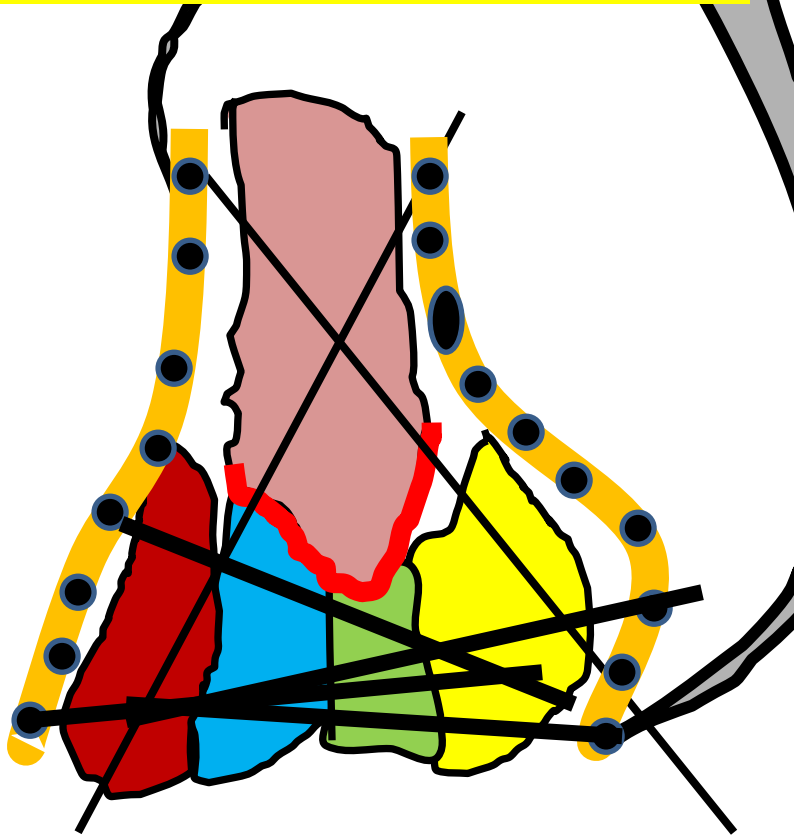
& Engage a fragment on the opposite side that is also fixed to a plate

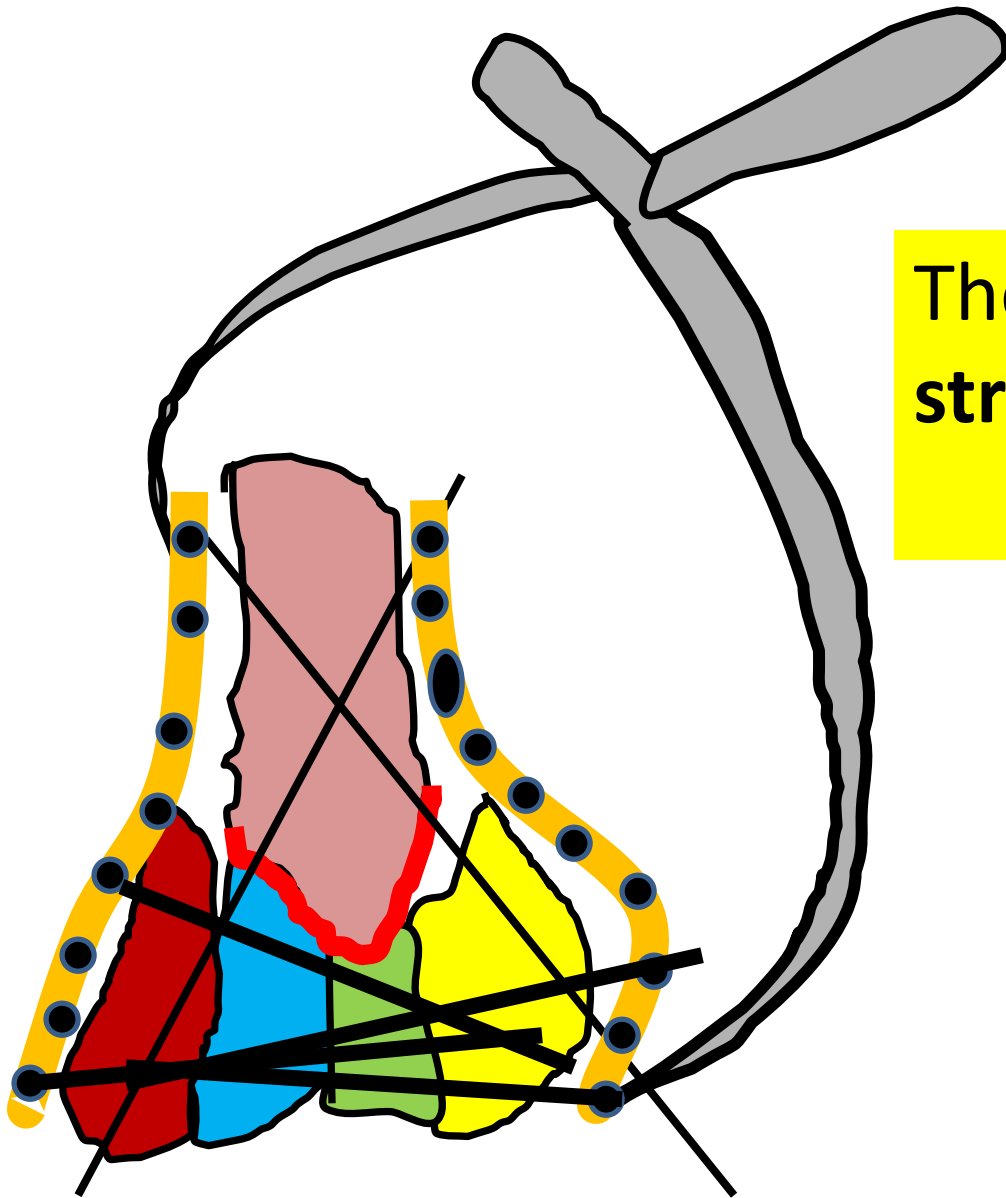


As many screws as possible should be placed in the distal fragments

Each **screw** should be as **long** as possible

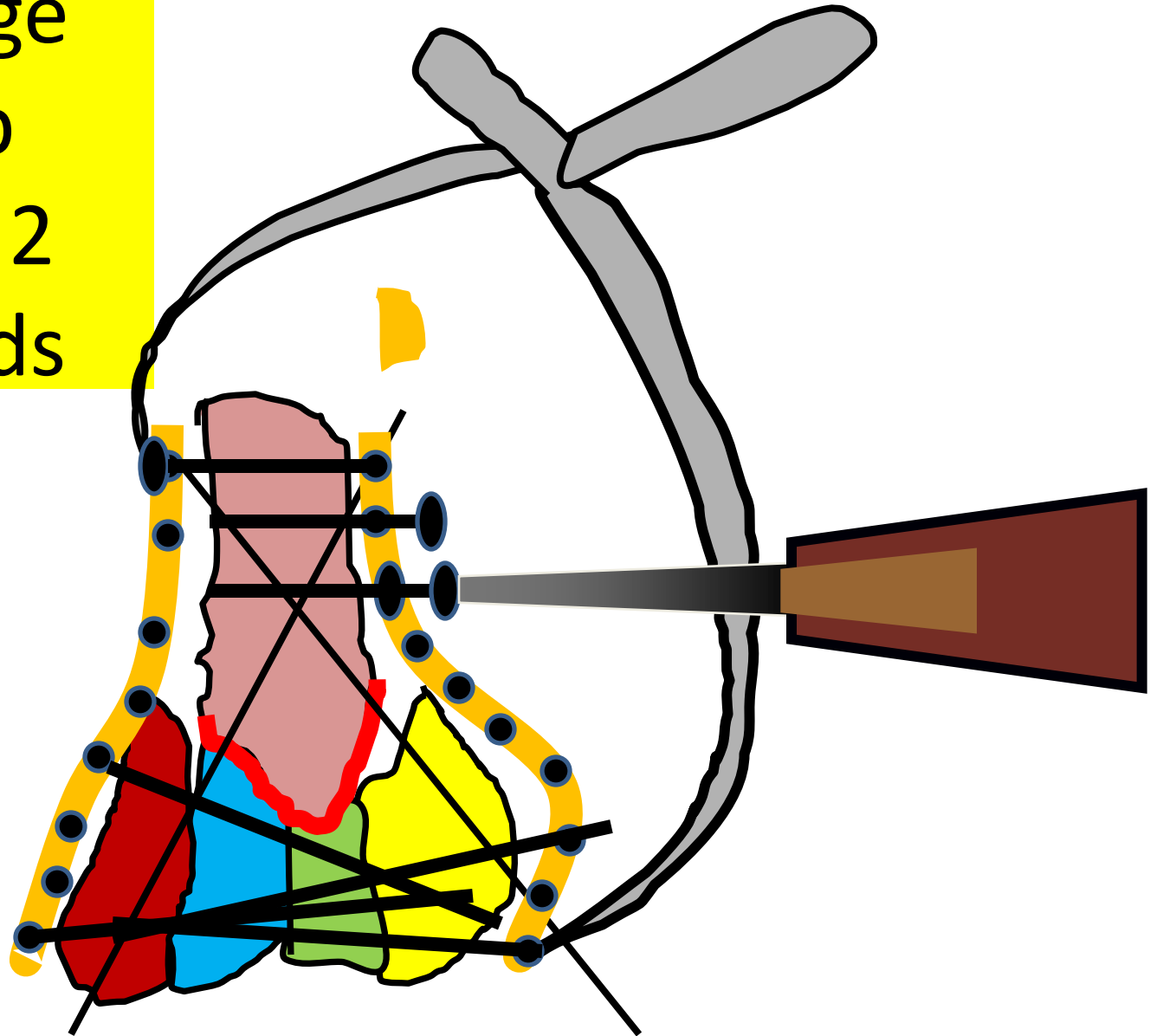
The screws should lock together by interdigitation, creating a fixed-angle structure



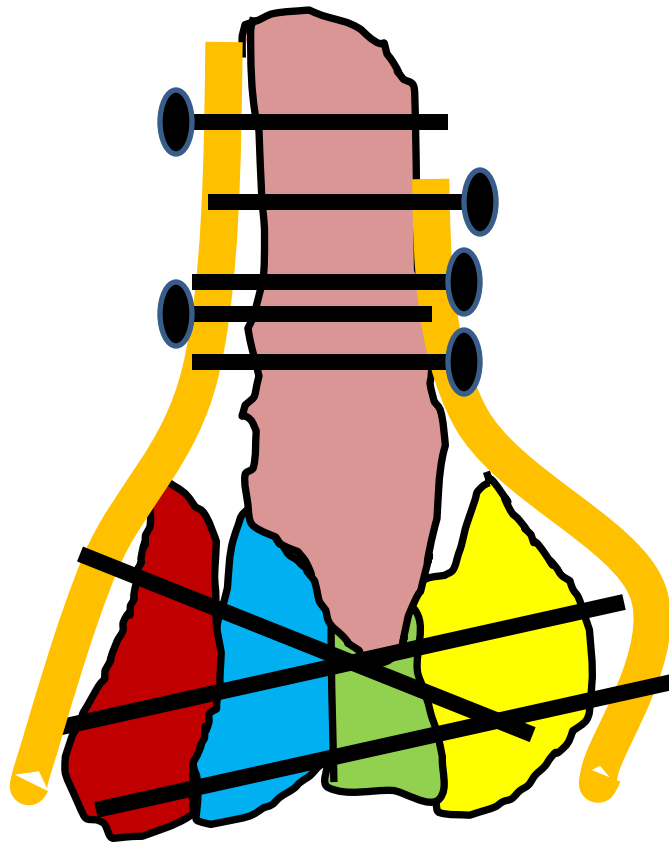


The plates should be
strong and stiff enough

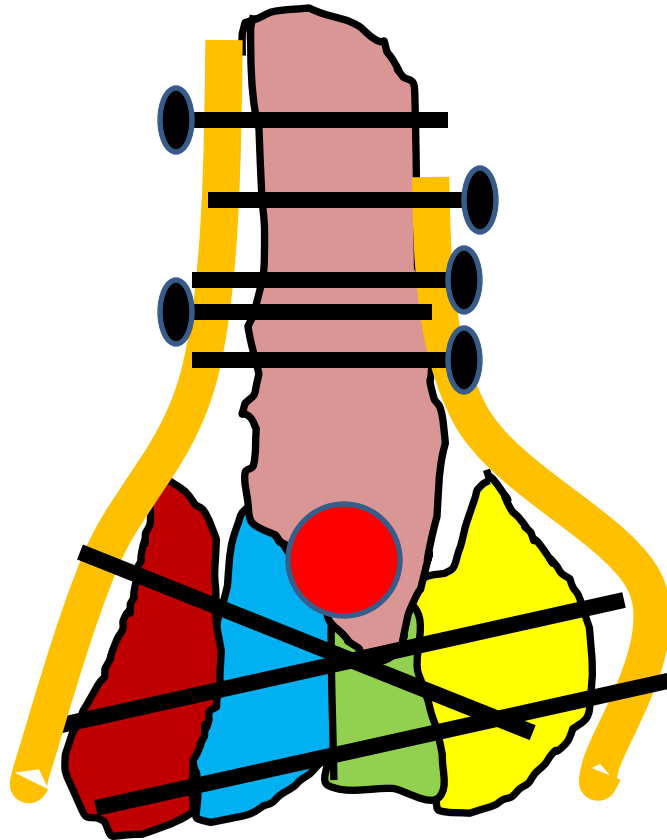
Compression
using a large
towel clip
clamp bet 2
screw heads



Fixation is completed



Creation of Olecranon Fossa by burr with olecranon as template



- **Very sturdy** fixation
- **Less chances of Non union,**

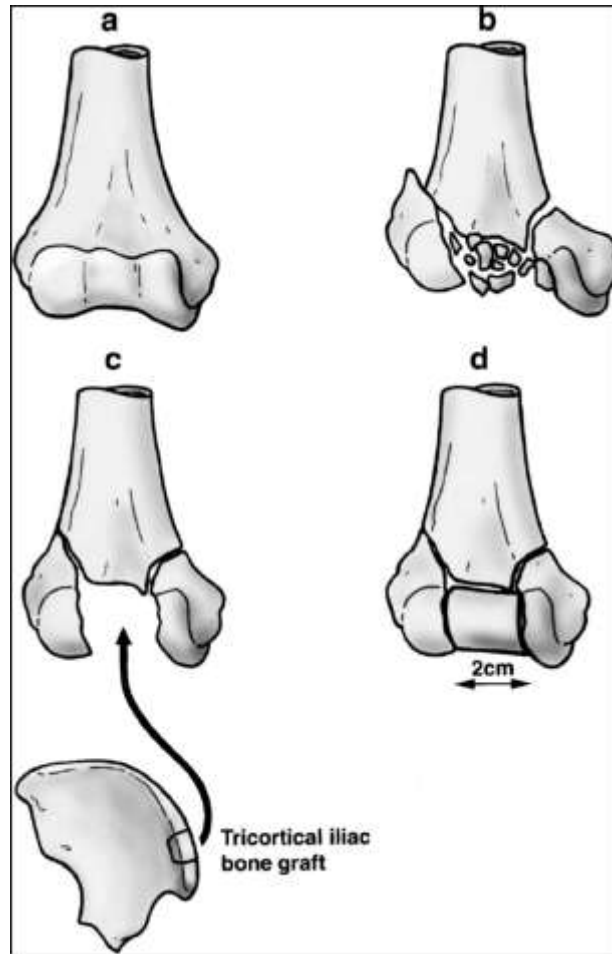
Useful for

- **low** fractures
- **Non union**
- **Markedly comminuted**
- **Severely Osteoporotic**

Drawbacks

- Dissection
- Hardware prominence
- Technically challenging
- Excellent molding of plates needed

Special situations Bone loss at articular surface



Tricortical Bone Graft for Primary Reconstruction of Comminuted Distal Humerus Fractures
P. V. Giannoudis, J Orthop Trauma 2005;19:741–743) (

Complications of 13C fractures

- **Nonunion**
- Elbow joint stiffness
- Heterotopic ossification,
- Ulnar neuritis,

– Nonunions are Challenging

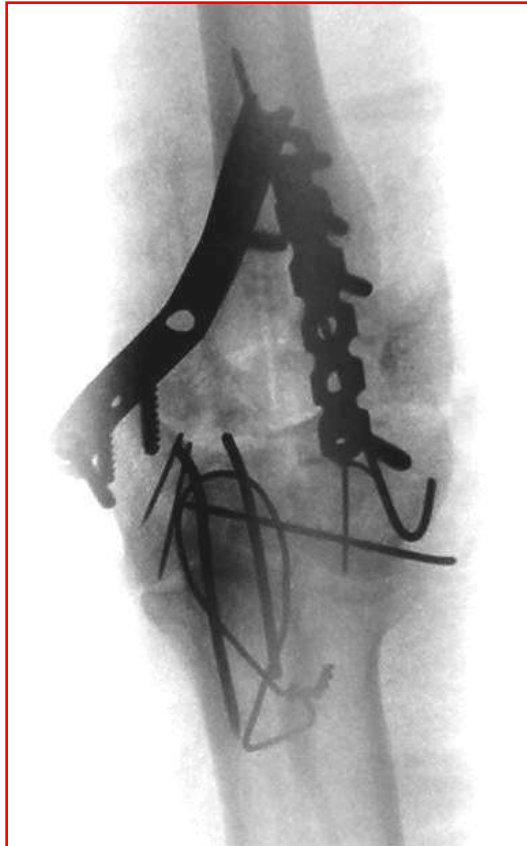
A Must read

Open Reduction and Internal Fixation of Delayed Unions and Nonunions of Fractures of the Distal Part of the Humerus

- Scars
- Implants
- Intra articular
 comminution,
- Bone loss
- Adhesions ,
- contractures
- Infection

- *David L. Helfet, MD, Peter Kloen, MD, PhD, Neel Anand, MD and Howard S. Rosen, MD*
- [J Bone Joint Surg Am.](#) 2003 Jan;85-A(1):33-40

M/45 Presented 4 months after internal fixation for Fracture distal end Humerus



Re exploration of Posterior incision

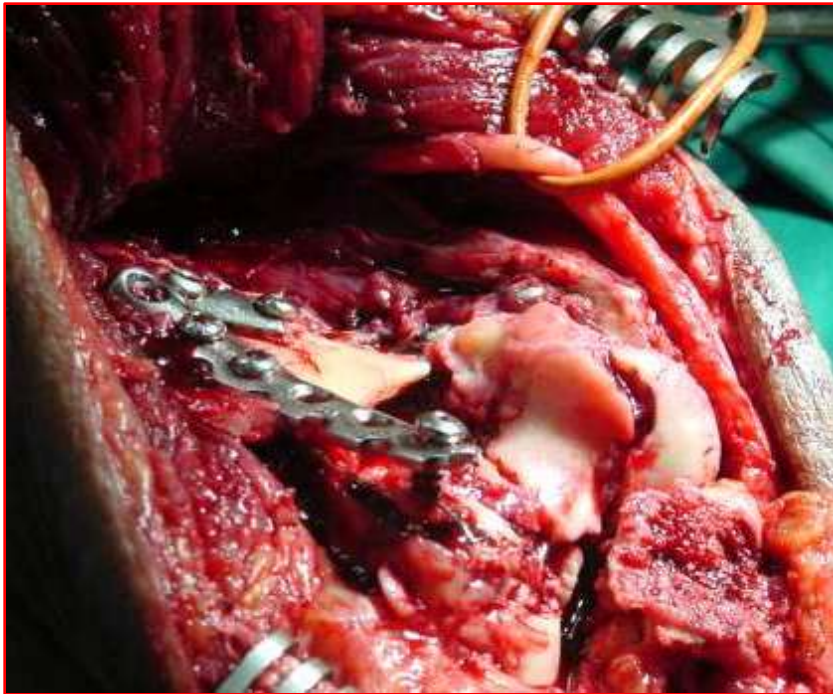
Re creation of
Olecranon Osteotomy



Adherent Triceps to be
freed from posterior
aspect for about 10cm

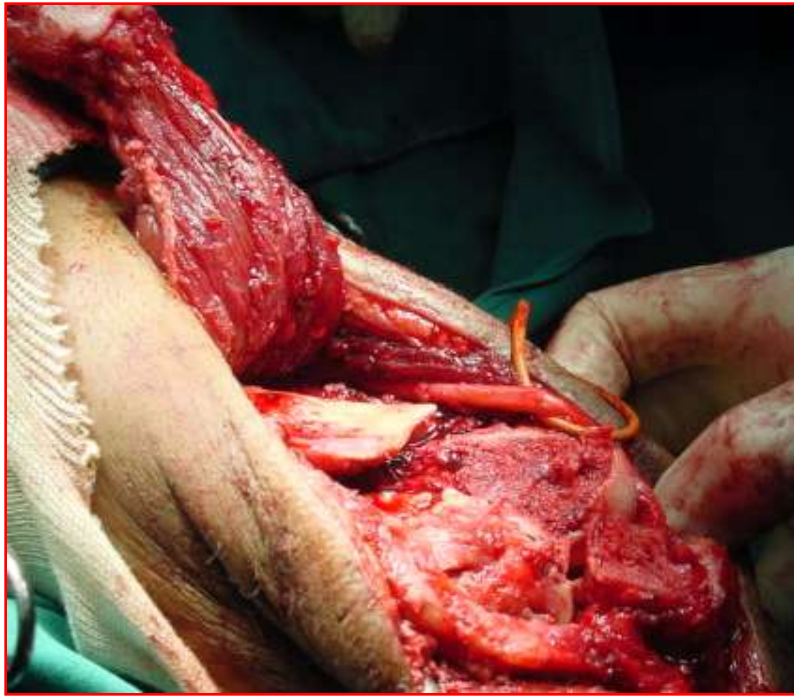


The nonunion is exposed well



- Identify & isolation of Ulnar Nerve
- Proximally – Beware of radial Nerve
- Exposure and removal of the hardware

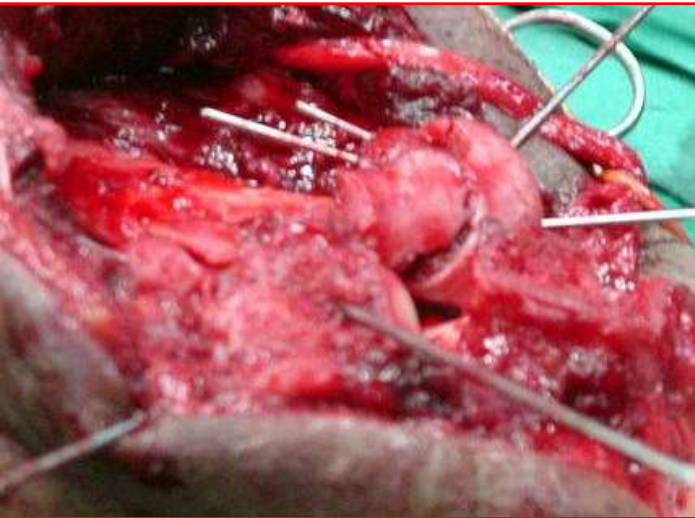
Thorough excision of fibrous tissue and sclerotic bone



Medullary cavity
of proximal fragment
opened

Elbow mobilized freeing the distal fragment anteriorly and posteriorly and releasing joint adhesions.

Docking , provisional fixation with K wires followed by parallel plating & bone grafting



At one year



Coronal Shear Fractures Lower end Humerus -Rare



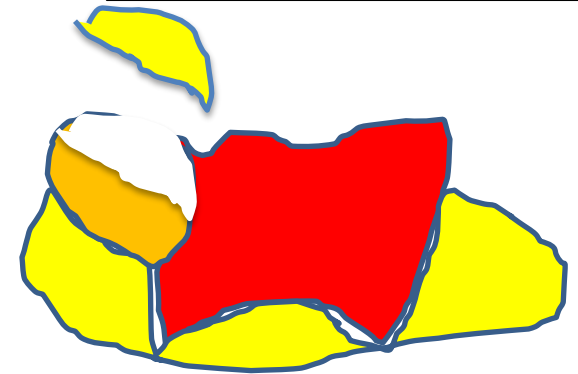
- Commonly missed
- Commonly associated with other injuries .
- Issues about approaches & hardware
- Complication rate is high

Classification ---Dubberley et ----Helpful in understanding and planning treatment

Coronal plane fracture
–Capitulum

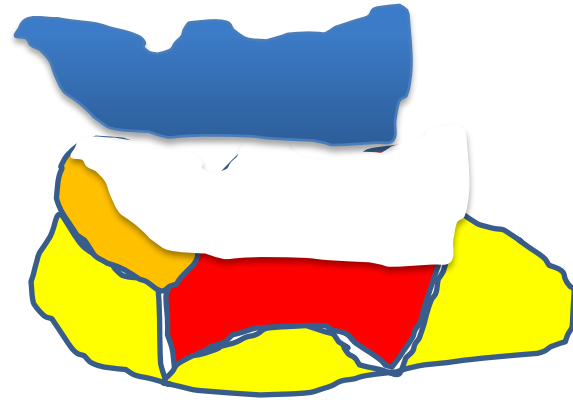


Type I



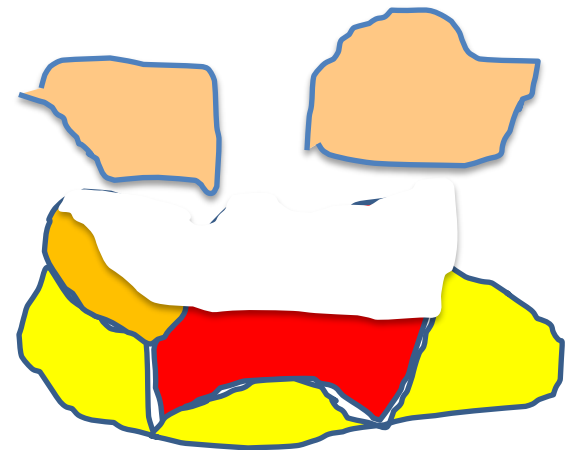
. Dubberley JH, Faber KJ, Macdermid JC, Patterson SD, King GJ:
Outcome after open reduction and internal fixation of capitellar and trochlear fractures.
J Bone Joint Surg Am 2006;88: 46-54.

II --Capitellum and trochlea as a single piece -- double arch sign



- . **Dubberley JH, Faber KJ, Macdermid JC, Patterson SD, King GJ:**
Outcome after open reduction and internal fixation of capitellar and trochlear fractures.
J Bone Joint Surg Am 2006;88: 46-54.

III capitellum and the trochlea as separate fragments



All these are classified as B if posterior part is involved

. Dubberley JH, Faber KJ,
Macdermid JC, Patterson SD, King
GJ:
Outcome after open reduction and

F/55 Fall on outstretched hand



-- M/28 Type I A--- Small fragment



**Anterior to
posterior
headless
screw**



It can get more complex



Dubberley
Type IIIB



double arch
but crossing one another

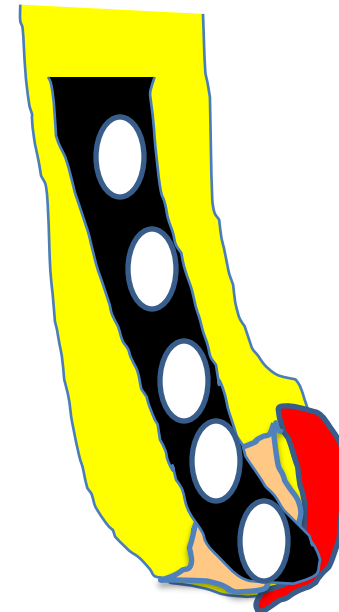
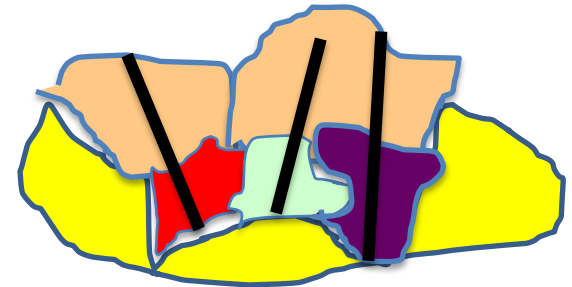
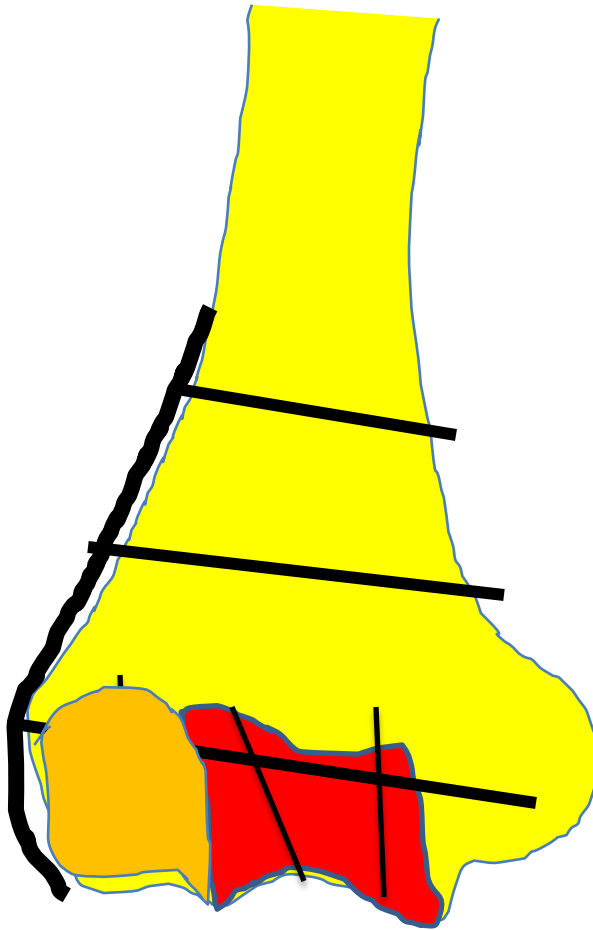
See the posterior extent

Tests competence of surgeon

- Knowledge
- Skill
- Attitude
- **Didn't know about Dubberley 3B**

Didn't realize that this articular block
Needs to be connected
properly to proximal fragment &
needs a plate

Olecranon Osteotomy gave good exposure ,Fractures Stabilized with Headless screws



Destruction of Capitulum ,unstable elbow but reasonable ROM



I had no knowledge that a plate can be used
NOR
Showed proper attitude

Take home message

- Good analysis – Clinical, X rays, CT
- Plan well
- Parallel & 90 90 both useful .
- Olecranon Osteotomy when significant comminution at articular surface
- Ulnar transposition not as a routine in asymptomatic patients
- Ulnar Transposition in symptomatic patients
- **Parallel plates ,Pre contoured plates, VA plates**

We have come a long way as far as implants are concerned



Unfortunately the incidence of Mishaps hasn't decreased -- but in fact increased !

