

Complex fractures of the humeral shaft



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Complex fracture

R.I.P



Changes in the AO/OTA classification system

~~Complex~~

Multifragmentary

revision January 2018

12C1



12C: Complex

12C2



12C3



12C1: Spiral

12C2: Segmental

12C3: Irregular

12C2 Multifragmentary, intact segmental fracture

12C2* Multifragmentary, intact segmental fracture

*Qualifications:

- i - Proximal diaphyseal-metaphyseal
- j - Pure diaphyseal
- k - Distal diaphyseal-metaphyseal



12C3 Multifragmentary, fragmentary segmental fracture

12C3* Multifragmentary, fragmentary segmental fracture

*Qualifications:

- i - Proximal diaphyseal-metaphyseal
- j - Pure diaphyseal
- k - Distal diaphyseal-metaphyseal



Complex fracture?



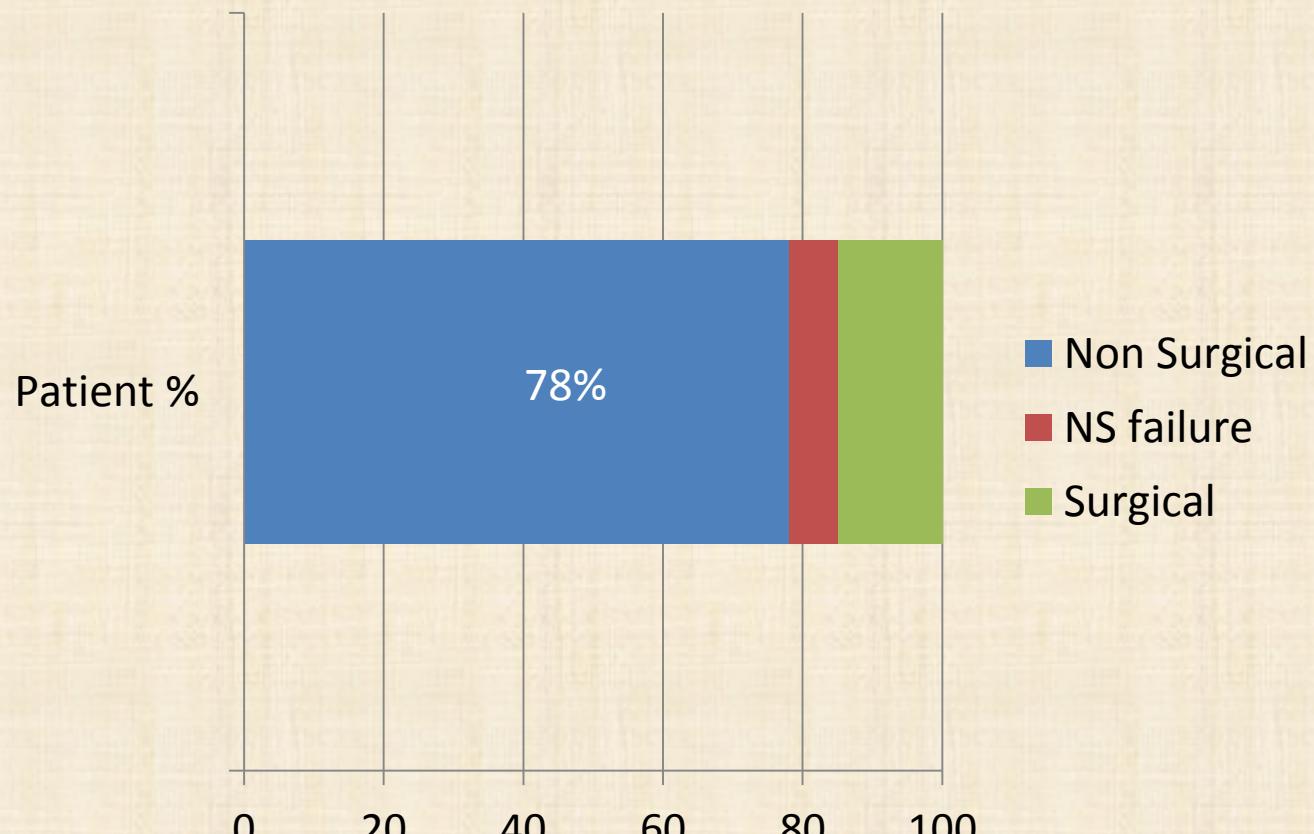
- 38 yo male
- Bicycle accident
- Closed injury
- NV OK



F/U 2 months

- No pain
- Back to work





Swedish Fracture Registry, 2017



Surgical indications

ABSOLUTE

- Open fractures (G-A 2/3)
- Vascular injury
- Bilateral fracture
- Floating shoulder or elbow
- Secondary radial nerve palsy

RELATIVE

- Segmental, Transverse, Pathological fractures
- Plexus/nerve injuries
- Polytrauma
- Paraparesis, Parkinsons disease
- Obesity, Age
- Non surgical treatment failure
 - reduction, soft tissues
- Nonunion



Complex humeral fracture?

Fracture type

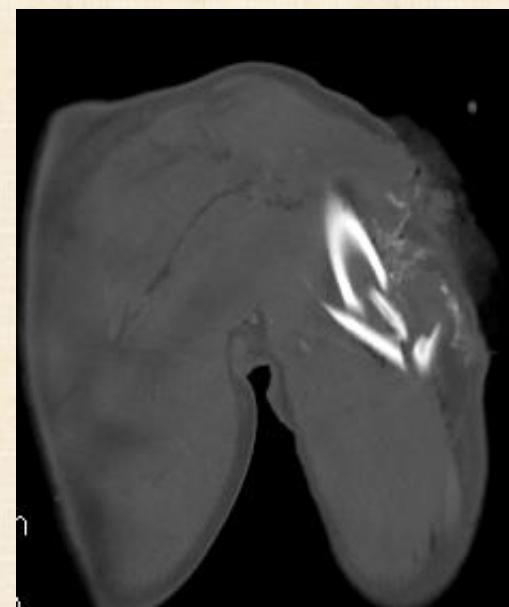
- 64 yo female
- Low energy trauma
- NV OK
- Multifragmentary fx
(C3)



Complex humeral fracture?

Soft tissue problems

- 48 yo female
- High energy trauma (MC)
- Open G-A type 3, deglaving, contaminated
- NV OK
- Deep infection day 4



Complex humeral fracture?

Obesity
and/or
other patient factors

- 26 yo woman
 - Previous amfetamin addiction
 - EP
 - BMI 53
-
- Seizure
 - Can extend in wrist but not in MCP:s



Complex humeral fracture?

Joint engagement

- 58 yo healthy female
- bicycle accident
- right hand dominance



Complex humeral fracture?

Implant related fracture

- 70 yo female
- Advanced osteoporosis
- Intramedullary
nailing of a proximal
humeral fracture 2 mths before
- New low energy trauma



Complex humeral fracture?

Pathological fracture

- 58 yo female
- Breast cc met



Nonunion: proximal third (29%)

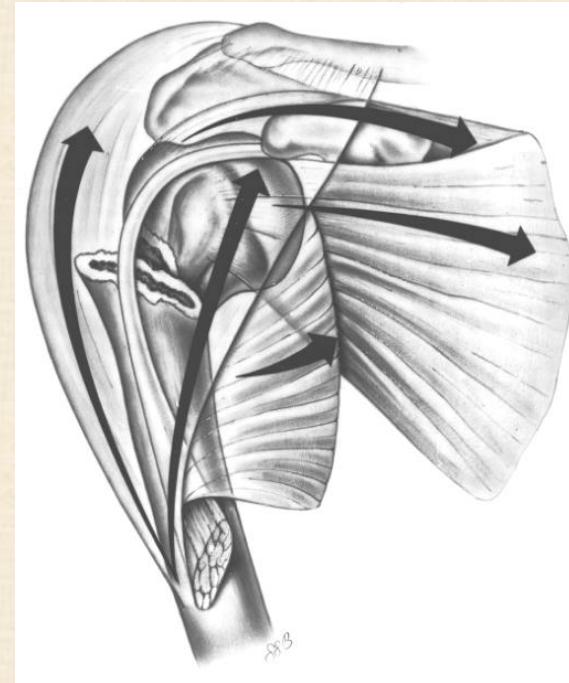


Plate or intramedullary nail Open or minimally invasive technique



Intramedullary Nail Versus Plate Fixation for Humeral Shaft Fractures: A Systematic Review of Overlapping Meta-analyses

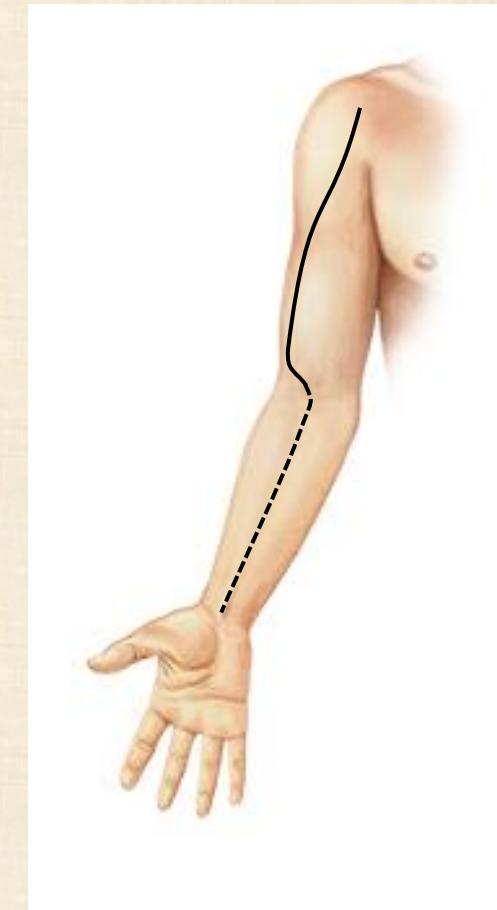
Jia-Guo Zhao, MD, Jia Wang, MD, Chen Wang, MD, and Shi-Lian Kan, MD



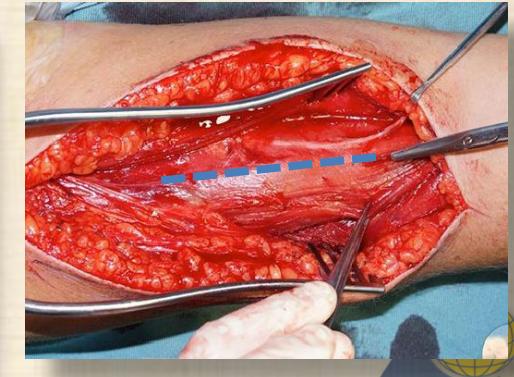
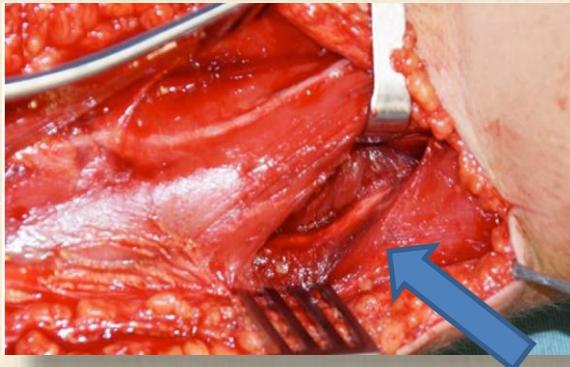
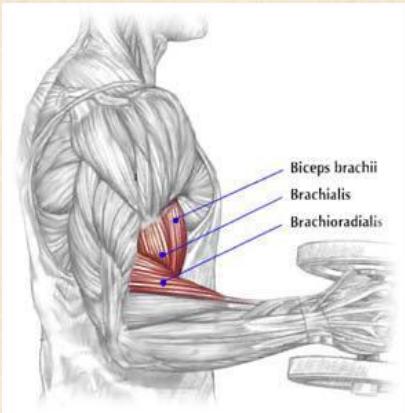
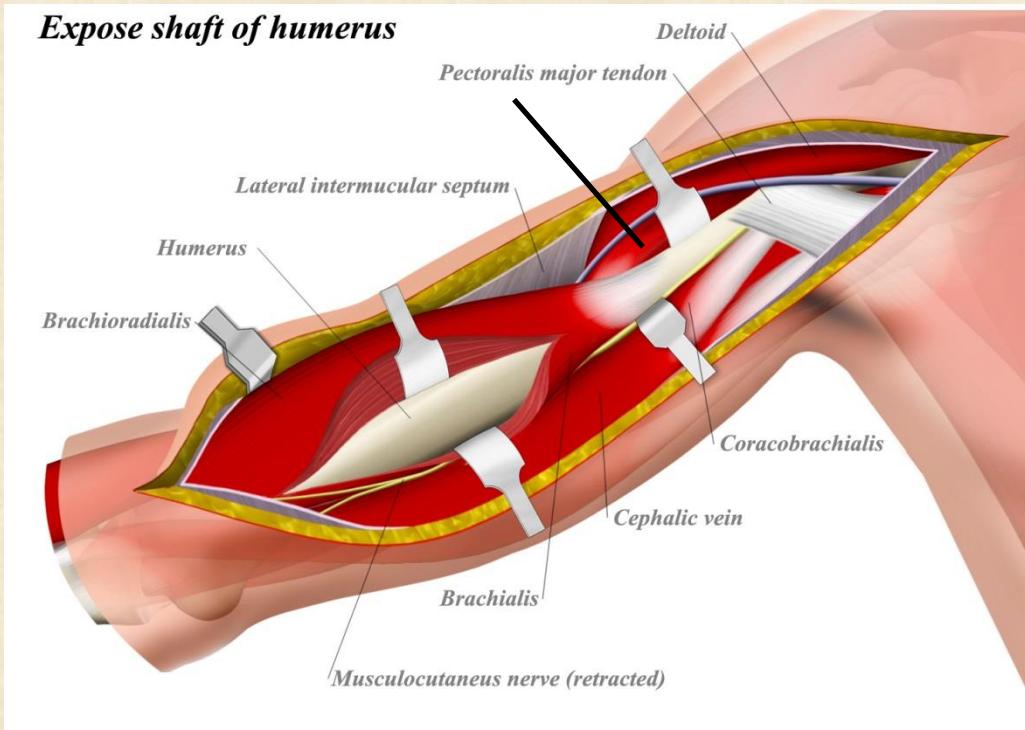


Proximal 2/3 fractures

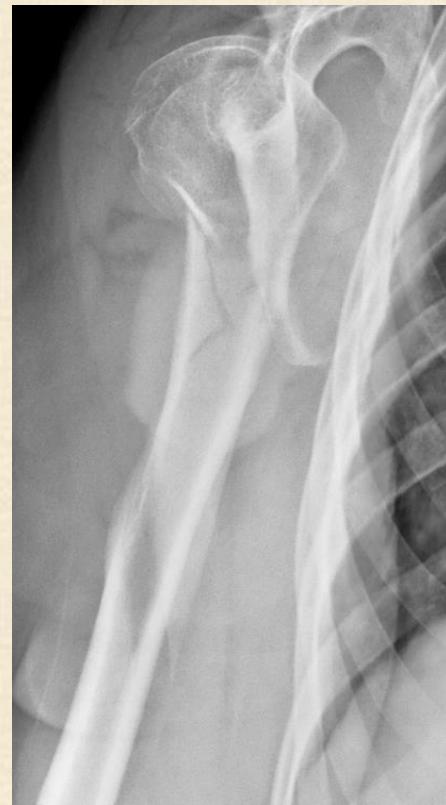
- Beach chair position
- Anterior approach
 - Deltpectoral – Henry



- Approach through the brachial muscle (brachial split)
- Full control of the radial and musculocutaneous nerve!



- 58 yo healthy female
- bicycle accident
- right hand dominance



Deltpectoral approach with distal extension

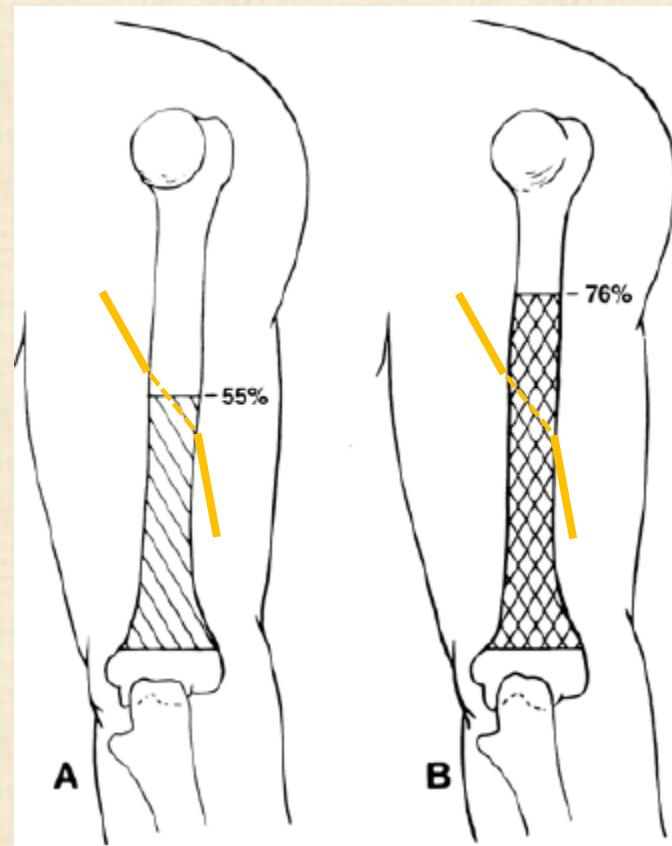
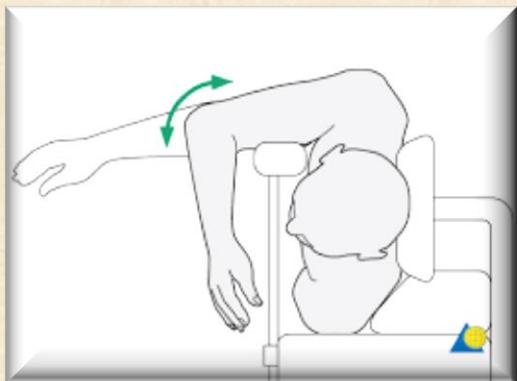




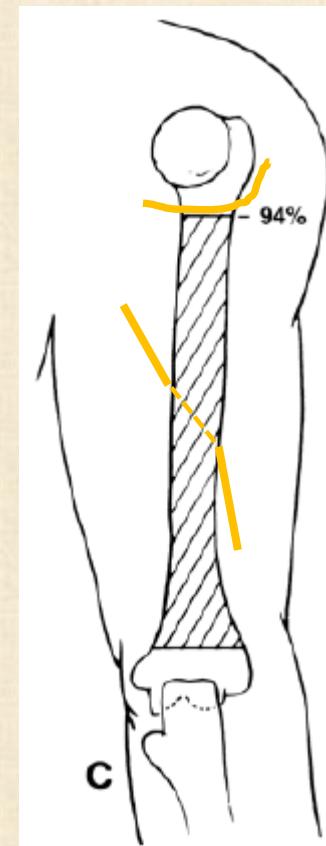
- Posterior approach

Distal 2/3

Triceps split



Triceps reflecting

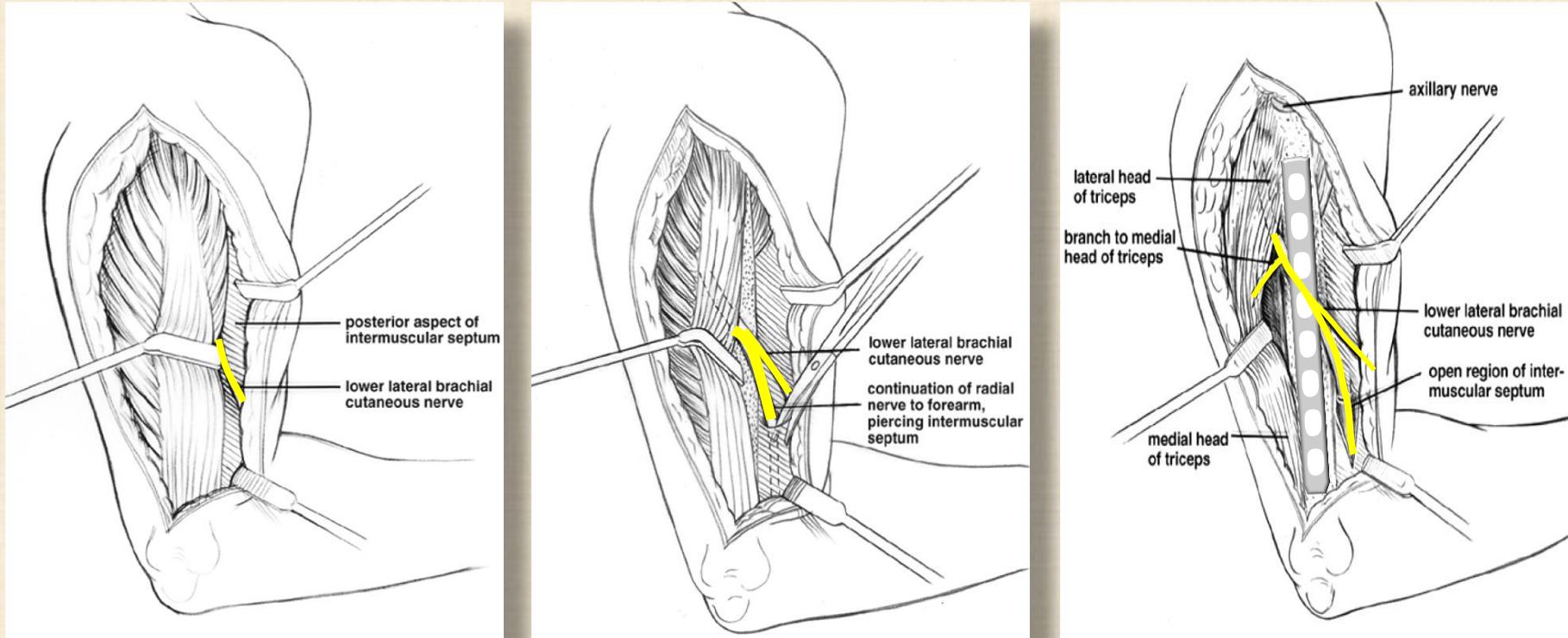


Alternative Operative Exposures of the Posterior Aspect of the Humeral Diaphysis

JBJS A 1996

WITH REFERENCE TO THE RADIAL NERVE*

BY MICHELLE GERWIN, M.D.†, ROBERT N. HOTCHKISS, M.D.†, AND ANDREW J. WEILAND, M.D.†, NEW YORK, N.Y.



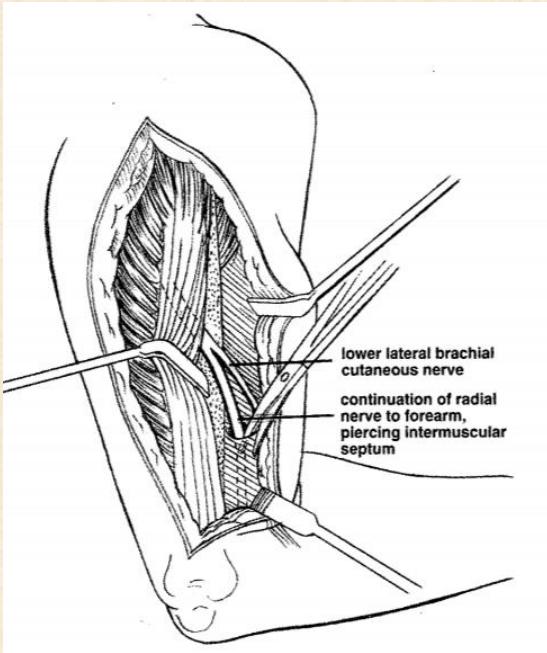
- 14.2 ± 0.6 centimeters proximal to the lateral epicondyle
- 20.7 ± 1.2 centimeters proximal to the medial epicondyle to



- 27 yo healthy female
- handball injury
- **primairly NV OK**
- **planned for non surgical tr.**
- **progressive radial nerve palsy
on F/U w change to brace**



Alternative posterior approach to the humerus



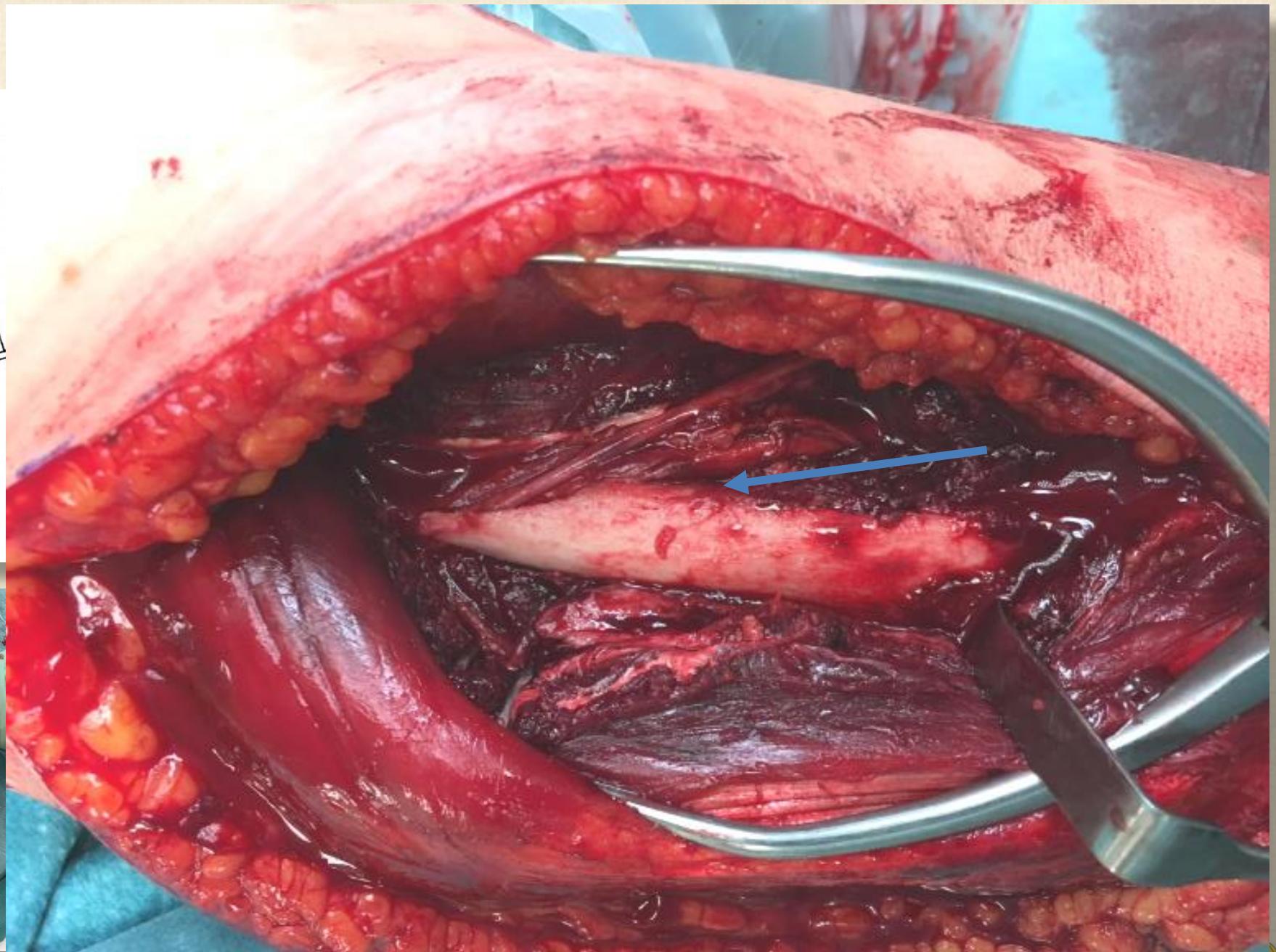
Radial nerve entrapment



Id of the lower lateral brachial cutaneous nerve

Gerwne et al.: Alternative Operative Exposures of the Posterior Aspect of the Humeral Diaphysis JBJS, 1996



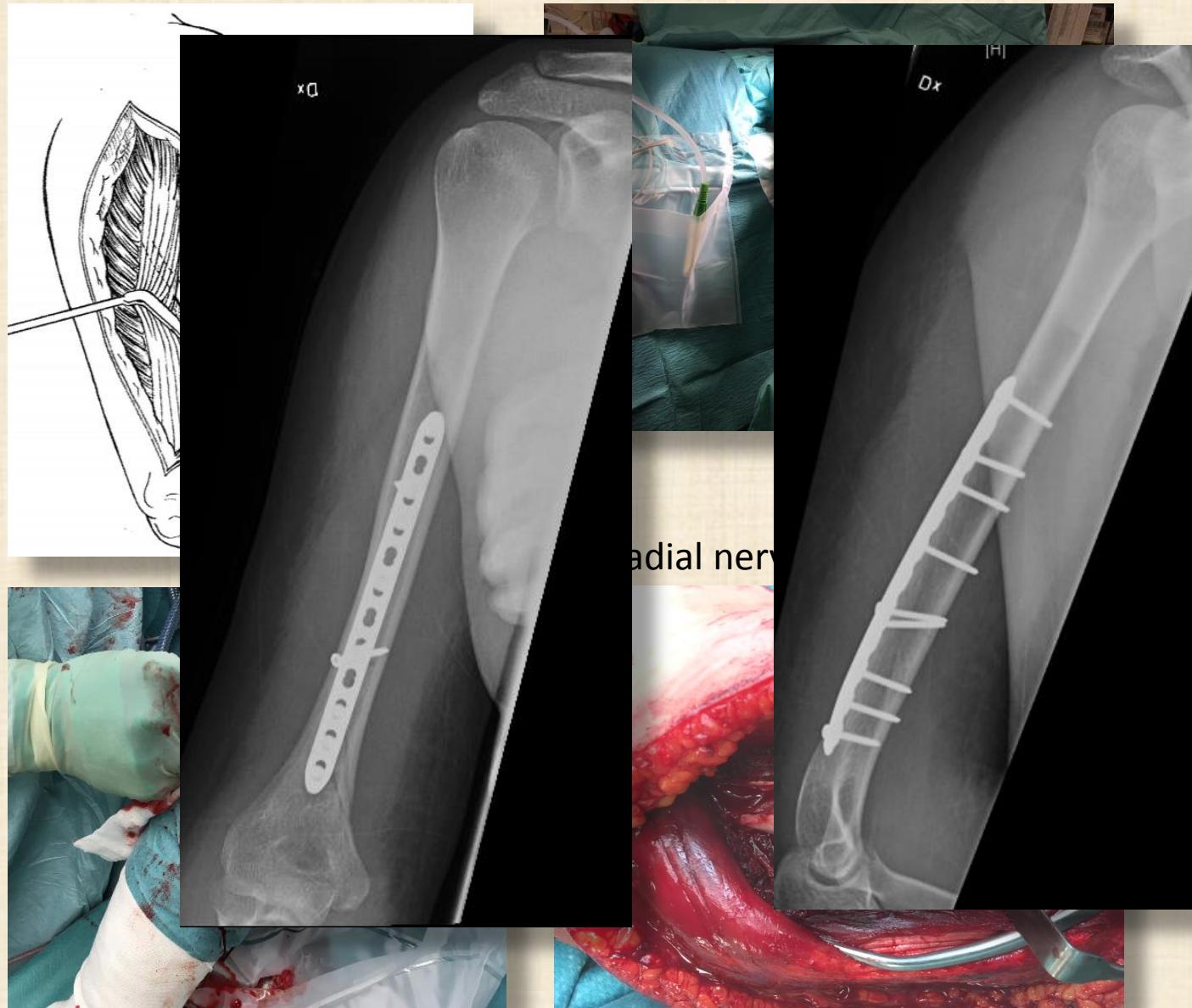


Id of the lower lateral brachial cutaneous nerve

Gerwine et al.: Alternative Operative Exposures of the Posterior Aspect of the Humeral Diaphysis JBJS, 1996



Alternative posterior approach to the humerus



Id of the lower lateral brachial cutaneous nerve

Gerwine et al.: Alternative Operative Exposures of the Posterior Aspect of the Humeral Diaphysis JBJS, 1996



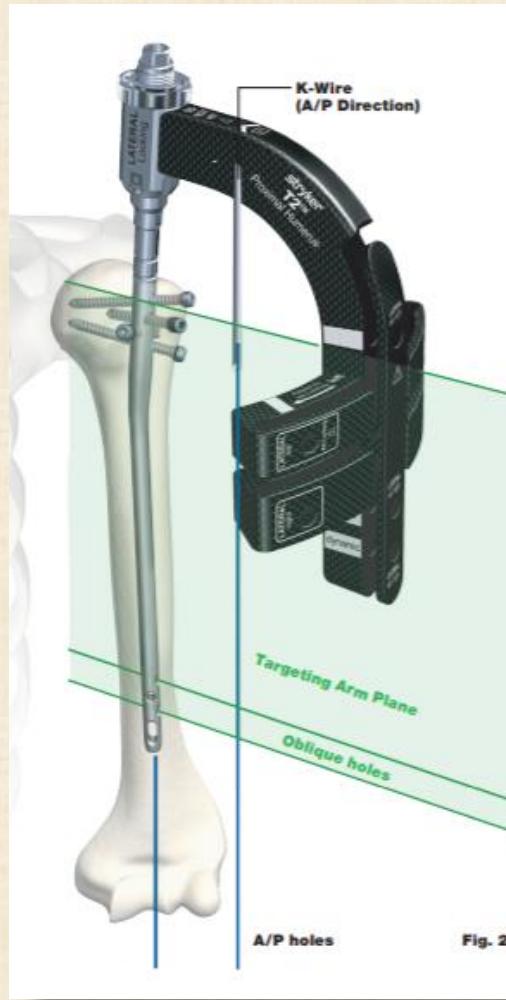
Nails

Mid-shaft solutions

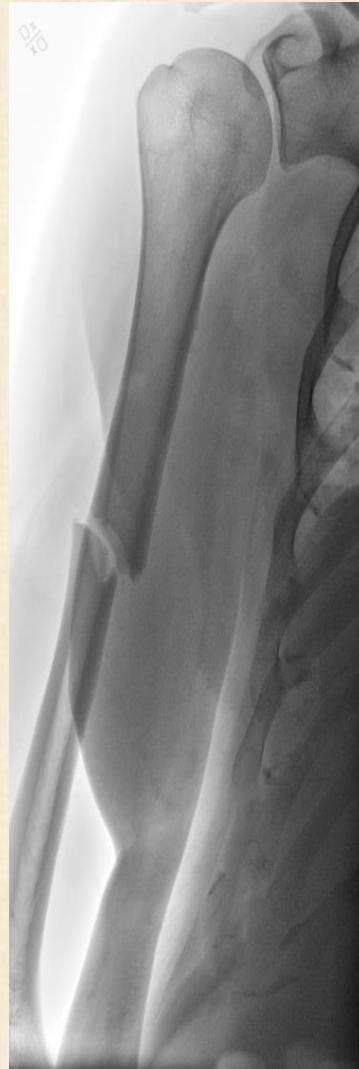
- anterograd
- retrograd



Proximal 2/3



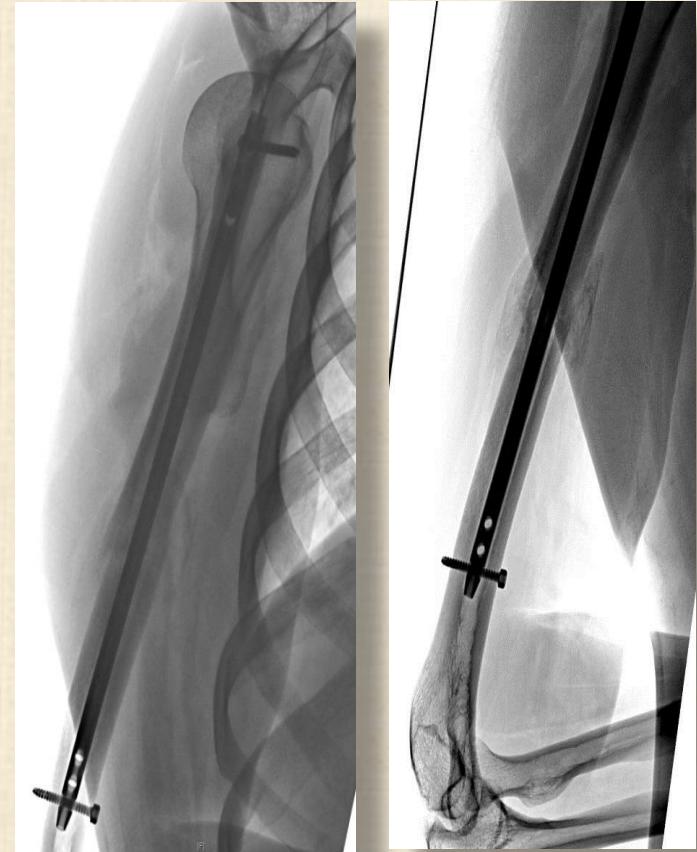
- 50 yo male
- Overweight, diabetes
- Heavy manual labour (repairing excavators)
- Fell at work
- Soft tissues fine
- Neurovascular OK



- 3 w
- Still pain
- Difficulties with the brace
(overweight!)
- NV OK



- Compression nailing at 7 weeks
- At 6 weeks p.o. still some shoulder pain
- Elbow OK
- Back to work



- 85 yo lady
- Independent
- Fell at home



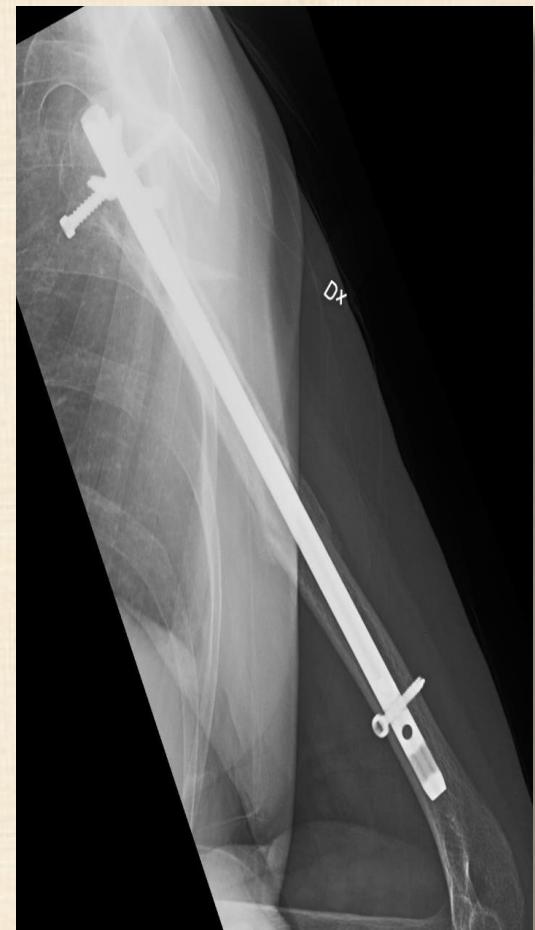
Your preferred treatment?

1. Non-op
2. Percutaneous plating
3. Open plating
4. Nailing
5. Arthroplasty



Follow up at 6 weeks:

- Pain free
- ROM: 90, 90, 20, glut
- Full use of her arm



Complications

- Loss of fixation
- Implant failure
- NV injury
- non union/ malunion
- Infection



6 weeks, loosening of the plate



Take home

- Gold standard is still non surgical management
- Absolut and relative indications
- Plates and nails
- Open or MIO
- Anterior and posterior approach
- Few complications



14 days F/U
- radial nerve palsy





M. Bilici et al.: Twisted long PHILOS plate fixation in a series of humeral fractures



