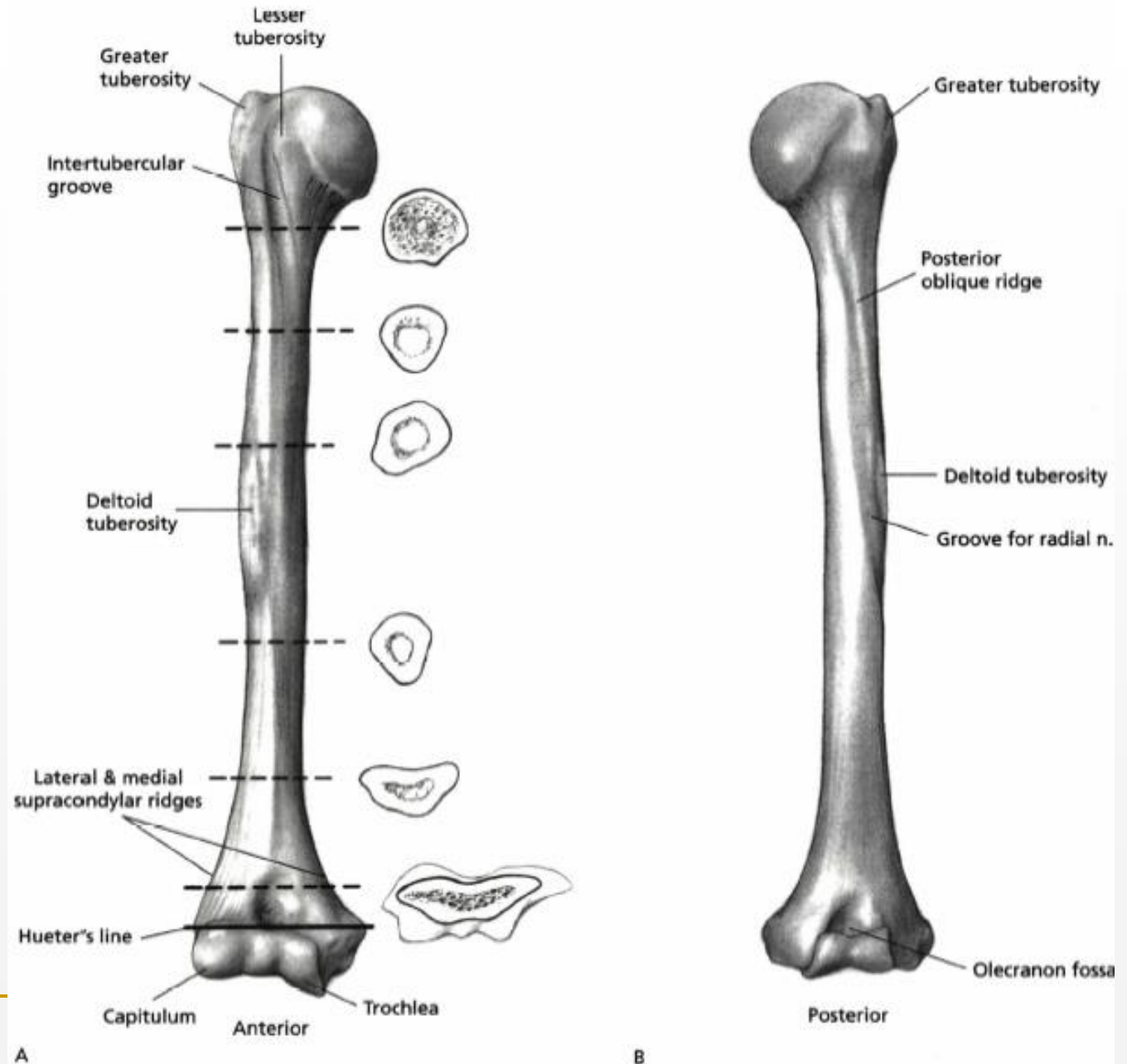
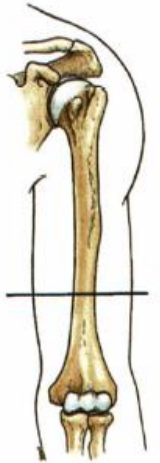
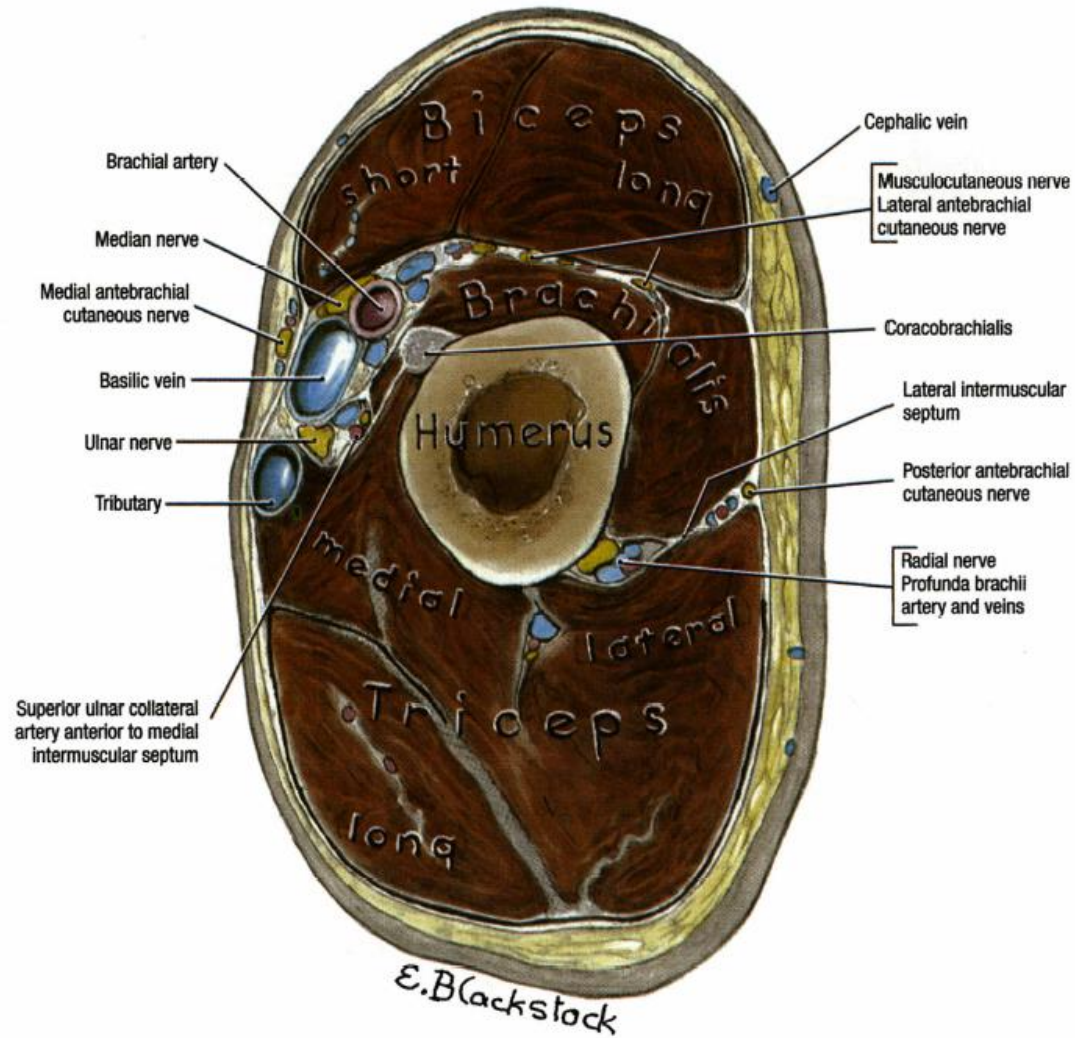

Treatment of Humeral Shaft Fracture

M. N. Naderi , MD

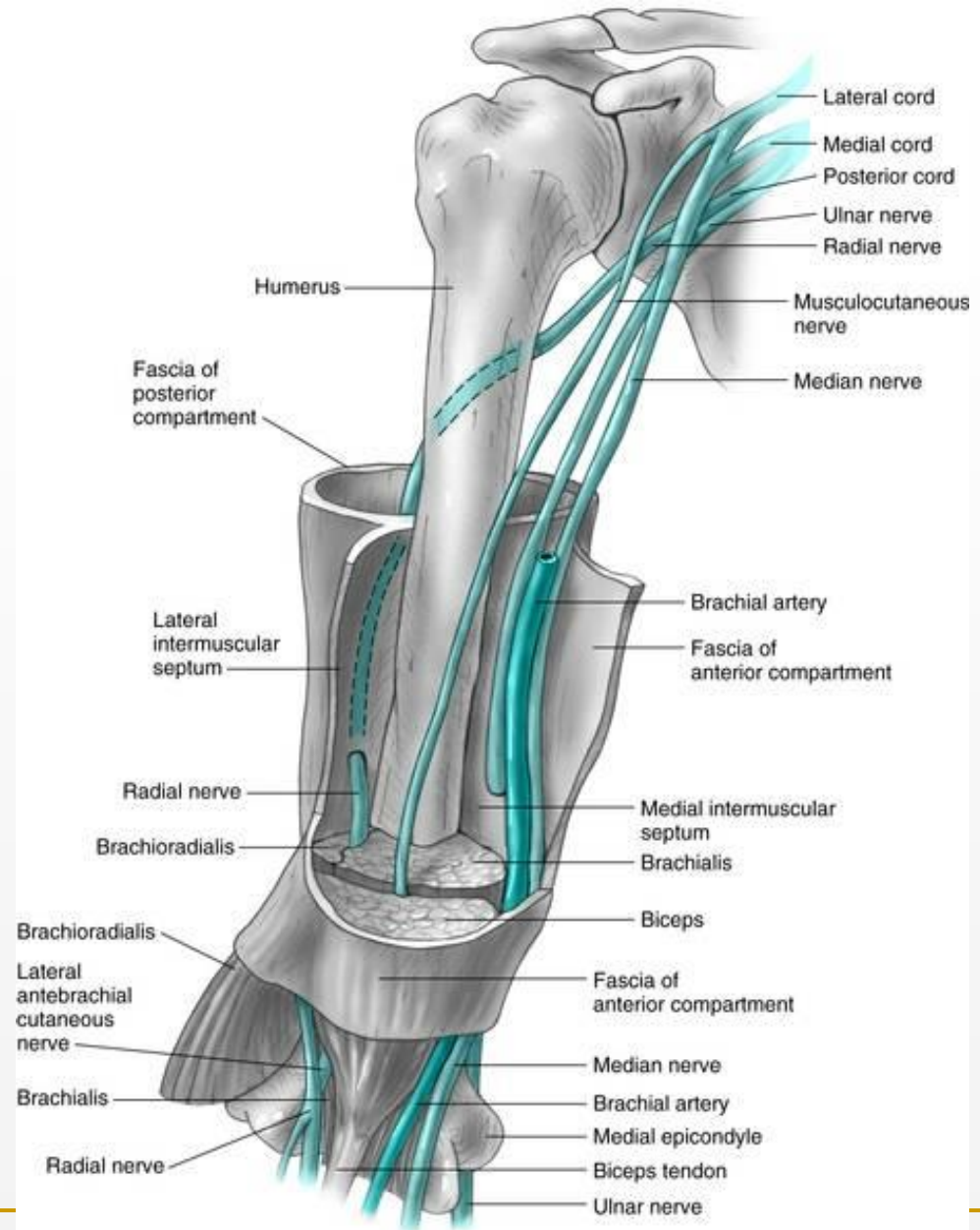
Anatomy



Anatomy

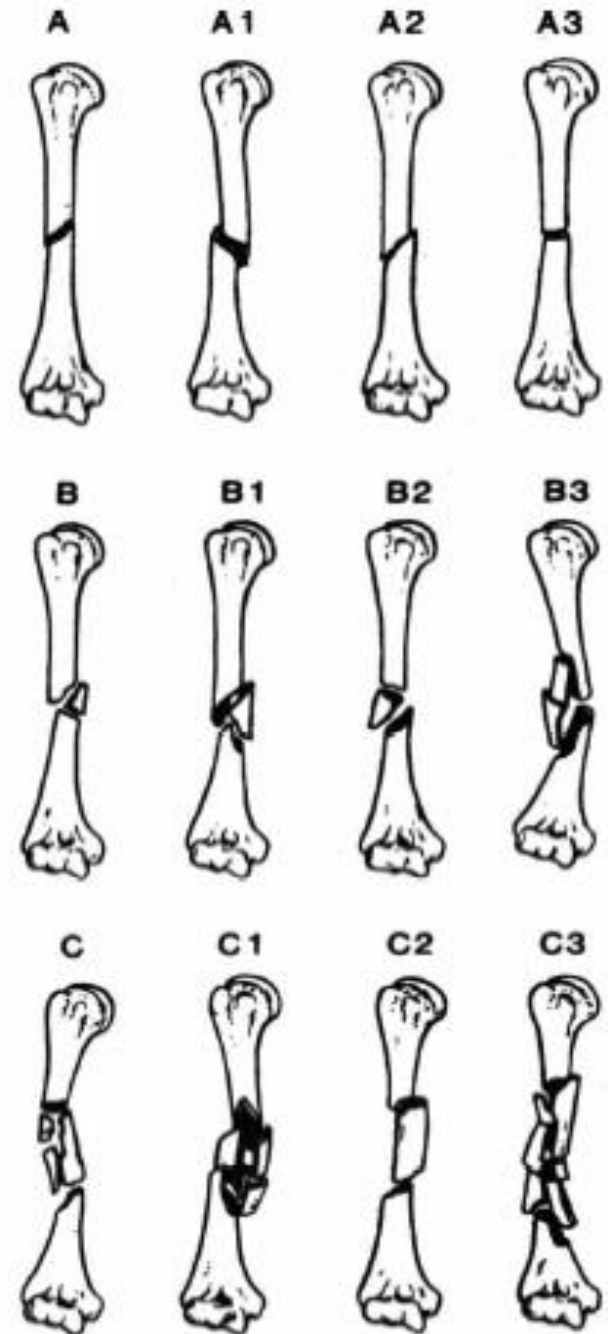


Anatomy



classification

- Low-energy Vs high energy
- Soft tissue injury
- Open fracture grading
- AO → A,B,C



Most humeral shaft fx can be managed nonoperatively

- **Angulation** 20 degrees
- **Rotation** 30 degrees
- **Shortening** 3 cm

Functional bracing

“gold standard” for nonoperative treatment



Indications for primary operation in humeral shaft fx

- **Fracture indications**
 - **Associated injuries**
 - **Patient indications**
-

Indications for Primary Operative Treatment of Humeral Shaft Fractures

Fracture Indications

Failure to obtain and maintain adequate closed reduction

Shortening >3 cm

Rotation >30 degrees

Angulation >20 degrees

Segmental fracture

Pathological fracture

Intraarticular extension

Shoulder joint

Elbow joint

Associated Injuries

Open wound

Vascular injury

Brachial plexus injury

Ipsilateral forearm fracture

Ipsilateral shoulder or elbow fracture

Bilateral humeral fractures

Lower extremity fracture requiring upper extremity weight bearing

Burns

High-velocity gunshot injury

Chronic associated joint stiffness of elbow or shoulder

Patient Indications

Multiple injuries, polytrauma

Head injury (Glasgow Coma Scale score = 8)

Chest trauma

Poor patient tolerance, compliance

Unfavorable body habitus

Morbid obesity

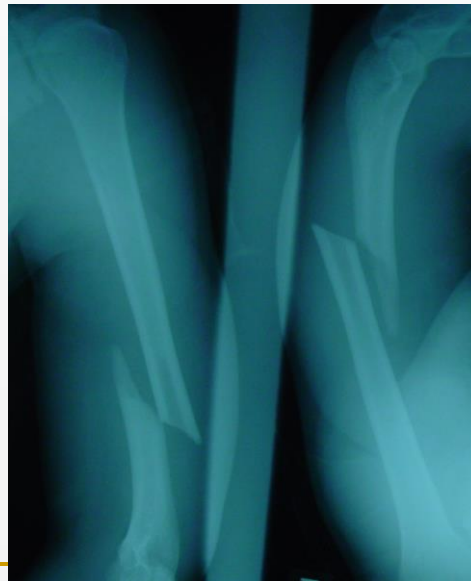
Large breasts

From McKee MD: Fractures of the shaft of the humerus. In Bucholz RW, Heckman JD, Court-Brown CM, eds: Rockwood and Green's fractures in adults, 6th ed, Philadelphia, 2006, Lippincott Williams & Wilkins.

plate osteosynthesis

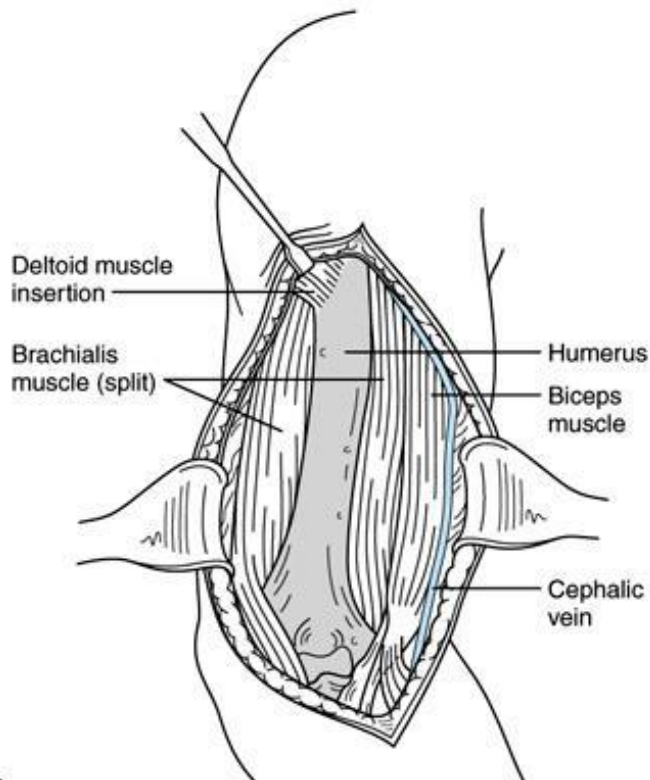
gold standard for fixation of humeral fractures

- high union rates (>95%)
- low complication rates (radial nerve palsy < 5%)
- rapid return to function

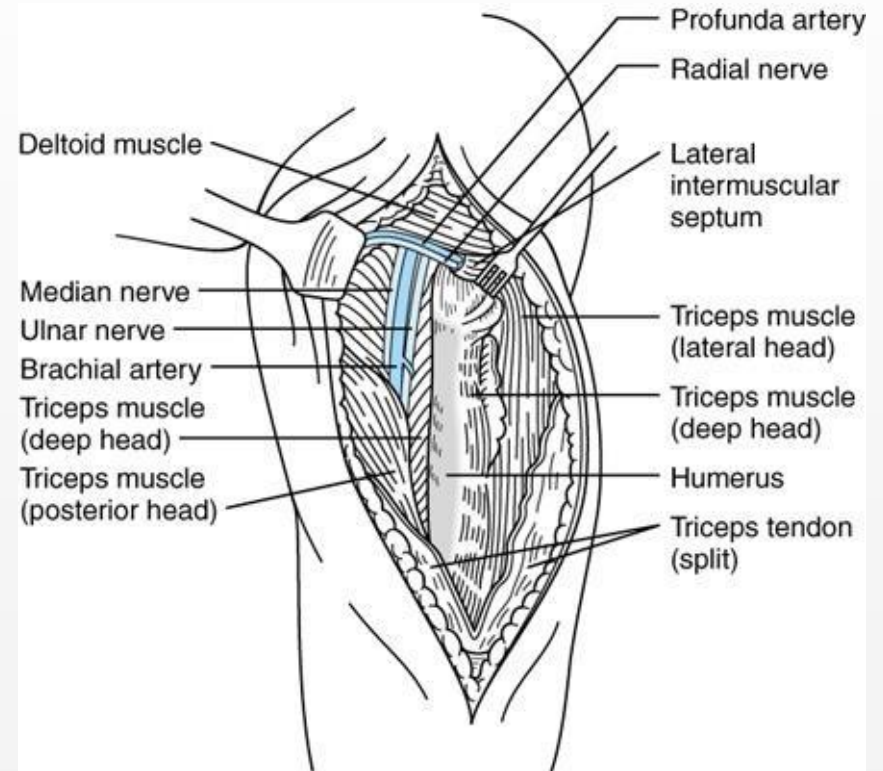


Surgical approaches

■ Anterolateral approach



■ posterior approach



Humeral nails were introduced with the hope that the results would parallel the clinical success seen with femoral and tibial nailing

Theoretical advantage of IMN :
less invasive surgery
undisturbed fracture hematoma
load sharing device

THE RUSSEL-TAYLOR HUMERAL INTERLOCKING NAIL

9 mm proximal end

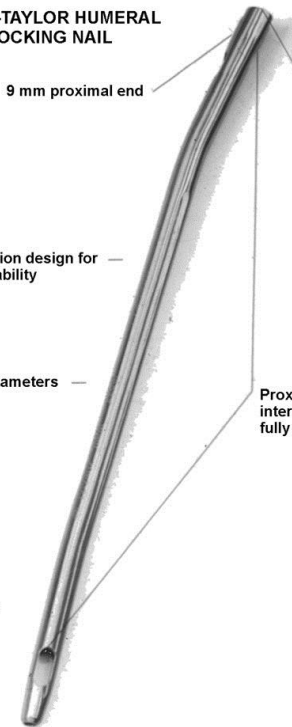
Positive lock keyway provides secure instrument fit for accurate proximal targeting. Unique proximal drill guide allows 20-degree variance for proximal screw placement.

Closed-section design for torsional stability

7, 8, and 9 mm diameters are available

Proximal and distal interlocking with 4.0 mm fully threaded screws

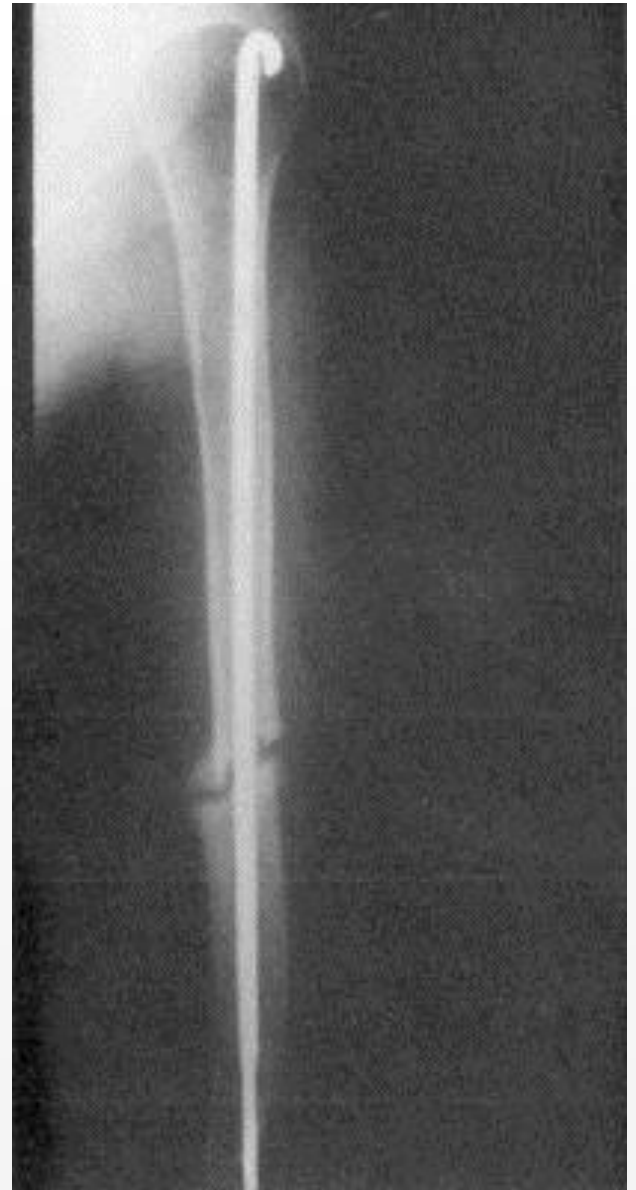
The 7 mm nail is solid, and the 8 and 9 mm nails are cannulated and can be inserted over a 2.4 mm guide rod.



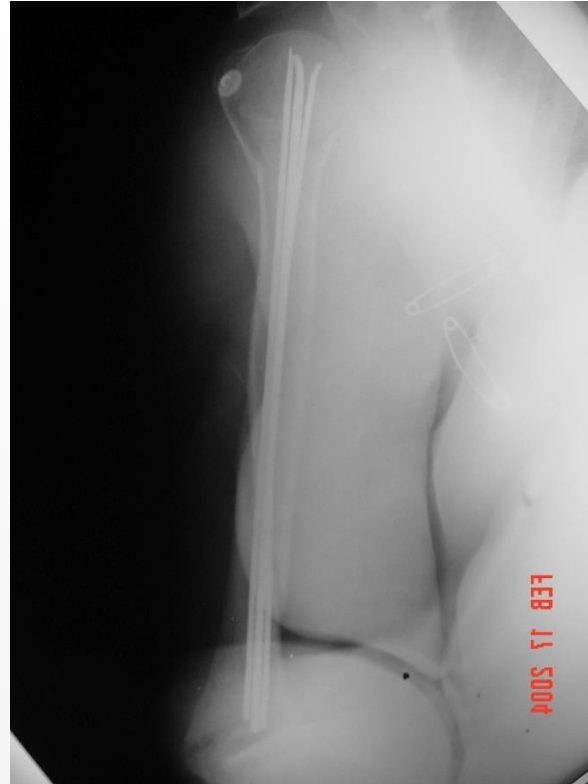
Flexible nail

Problems

- nail migration
- Insufficient rotatory stability

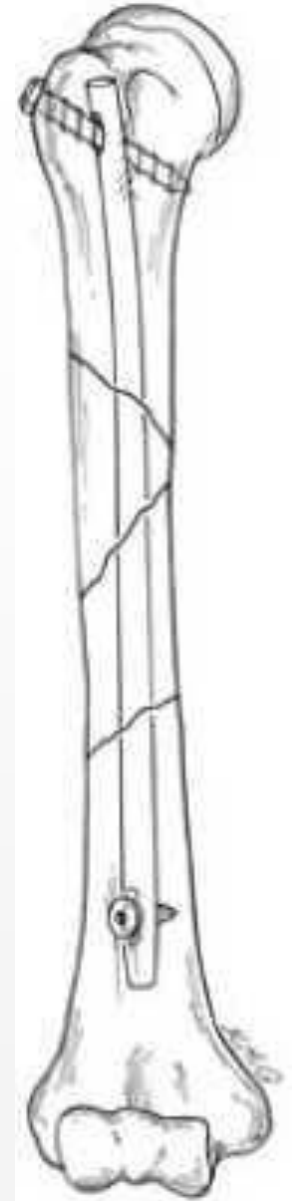


Titanium Elastic Nail



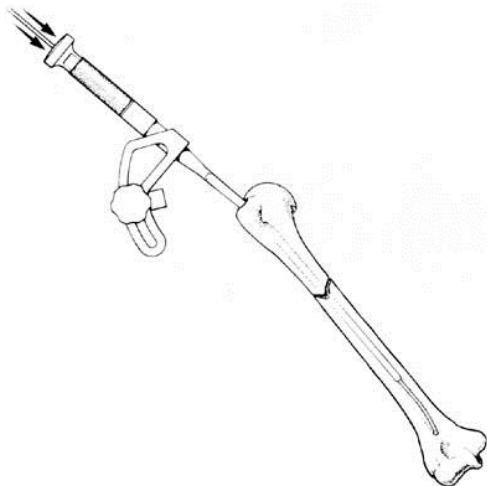
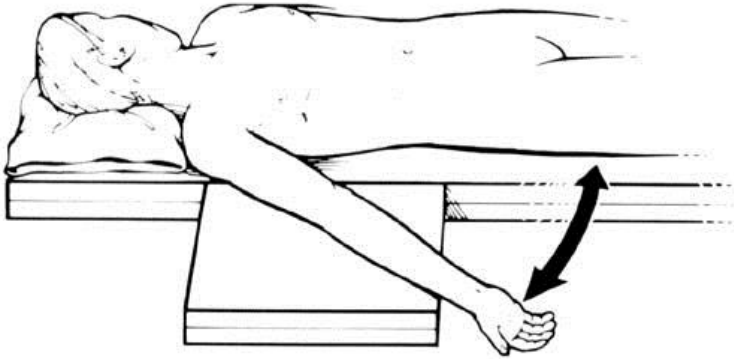
Interlocking nails

- **Biomechanical advantage (rotational stability)**
- **Risk of N/V injury during insertion of locking screws**

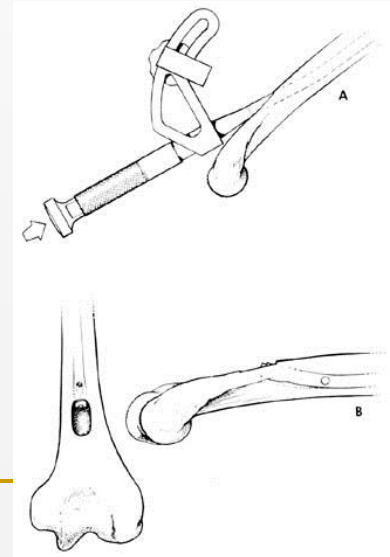
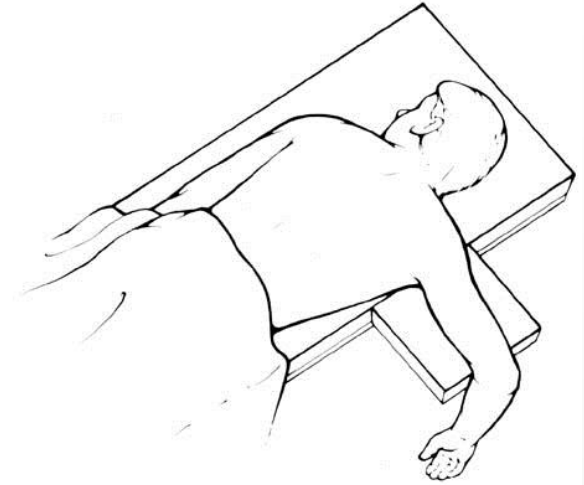


Approach

Antegrade

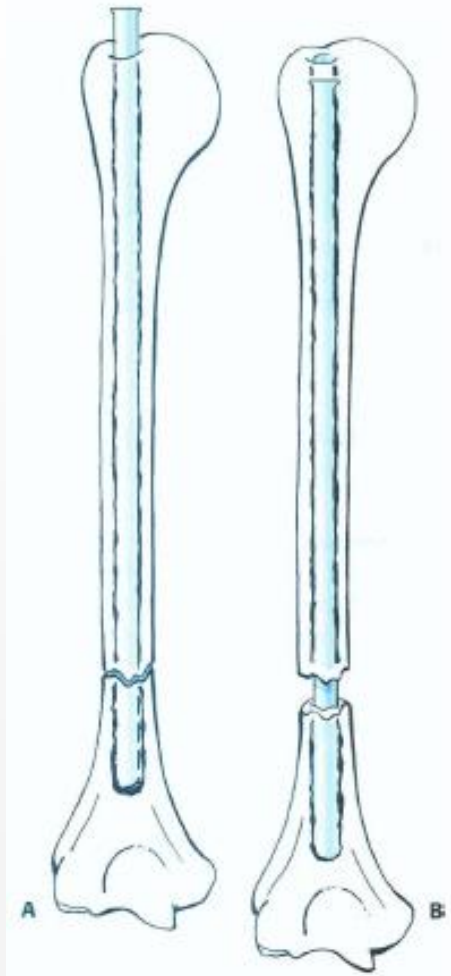


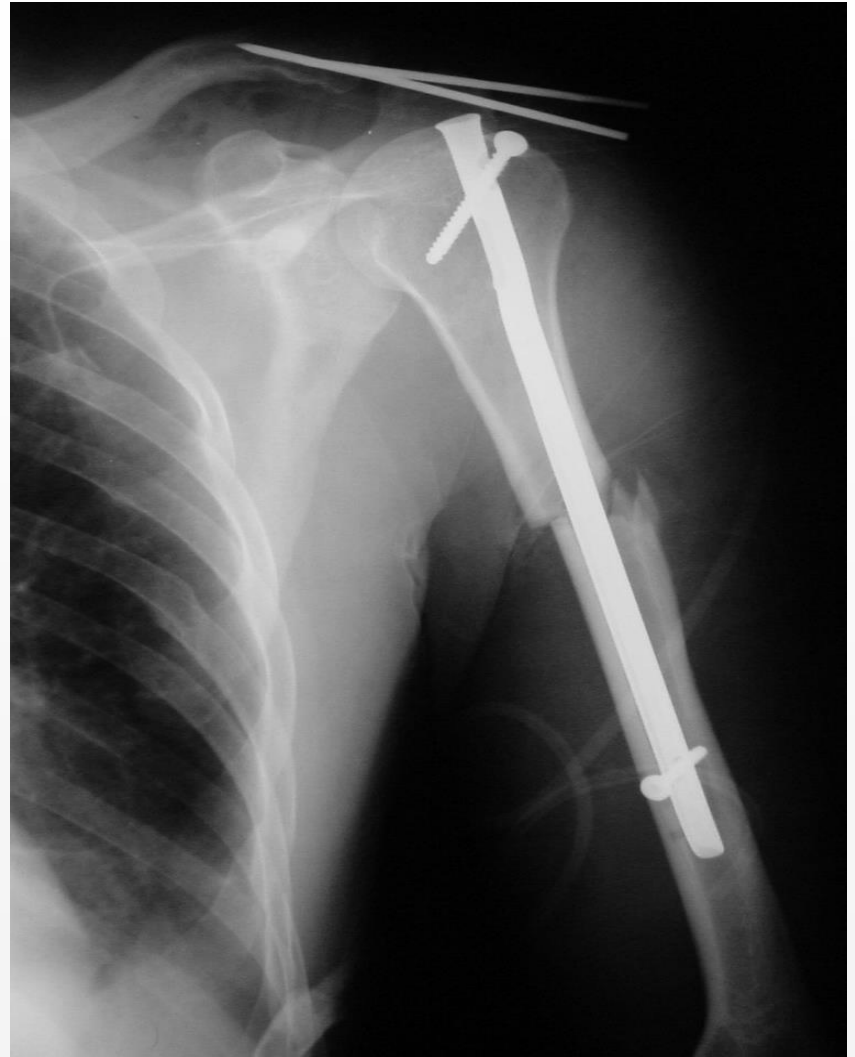
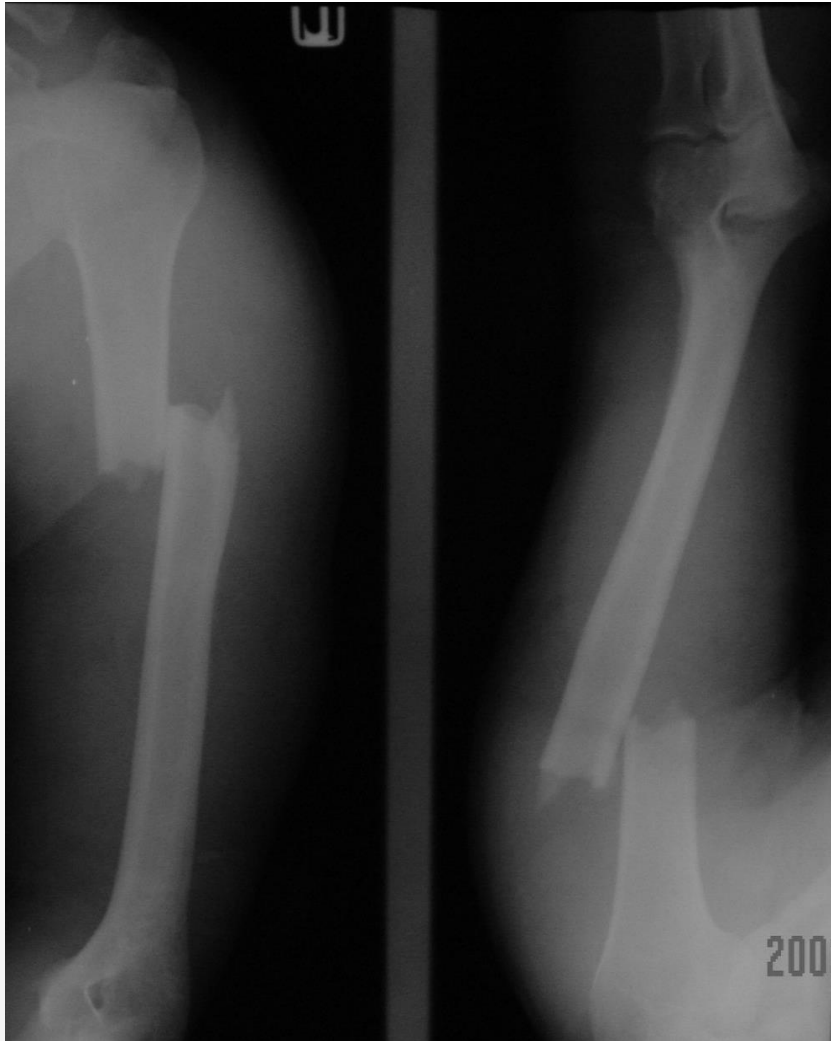
Retrograde



The entry point for a standard antegrade nail is in the greater tuberosity, just lateral to the articular margin

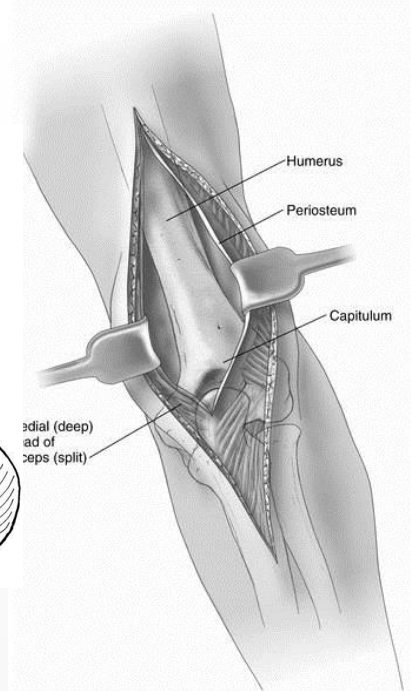
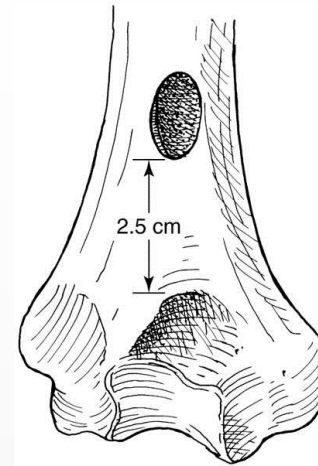
- **Injury of rotator cuff**
- **Proximal impingement**
- **Shoulder pain**





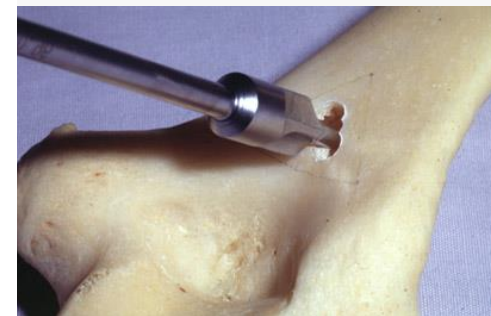
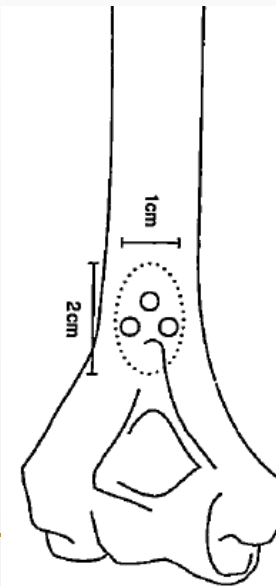
**In retrograde nailing start point is in the midline,
2 cm above the olecranon fossa**

- **Iatrogenic fx at entry site**
- **Poor elbow function**



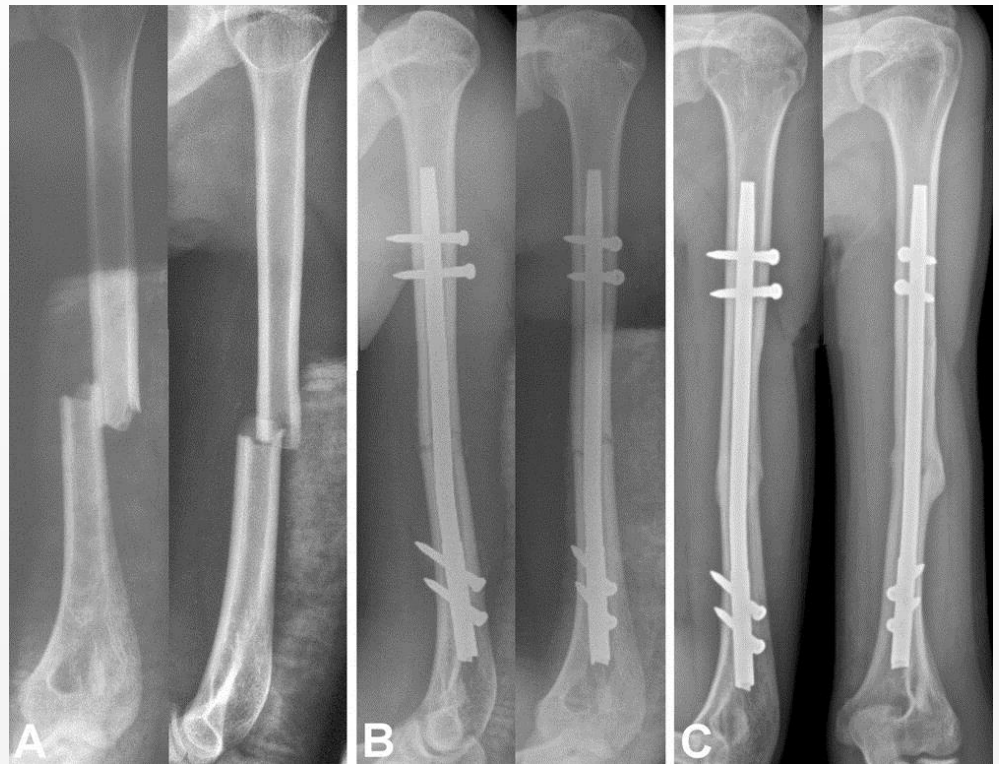
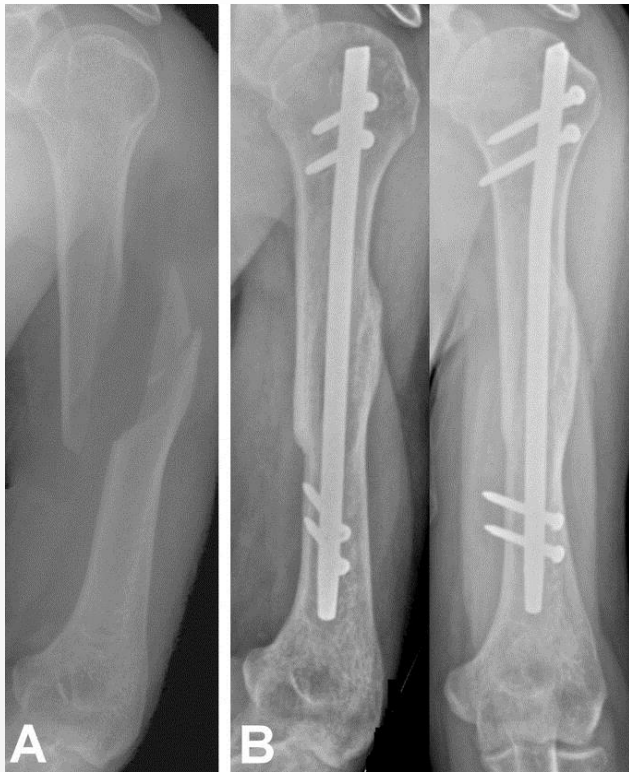
**Rommens created an entry site proximal
to the olecranon fossa in the metaphysis
of the distal humerus**

**Rommens PM, Blum J, Runkel M. Retrograde nailing of
humeral shaft fractures. Clin Orthop. 1998;350:26–39.**



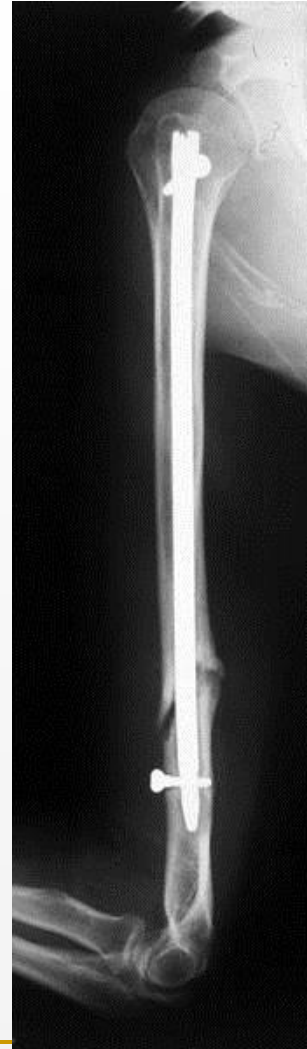
Cheng HR. Lin J. Prospective randomized comparative study of antegrade and retrograde locked nailing for middle humeral shaft fracture. J Trauma. 2008 Jul;65(1):94-102.

Antegrade and retrograde nailing have similar treatment results, including healing rate and eventual functional recovery for middle humeral fractures



**Humerus does not tolerate distraction
(risk factor for delayed and nonunion)**

**Nonunion after closed humeral
nailing is frequently associated with
distraction of the fracture**



Bhandari M, Devereaux PJ, McKee MD, et al: Compression plating versus intramedullary nailing of humeral shaft fractures—a meta-analysis. *Acta Orthop* 2006; 77:279.

higher reoperation rate and greater shoulder morbidity with the use of nails

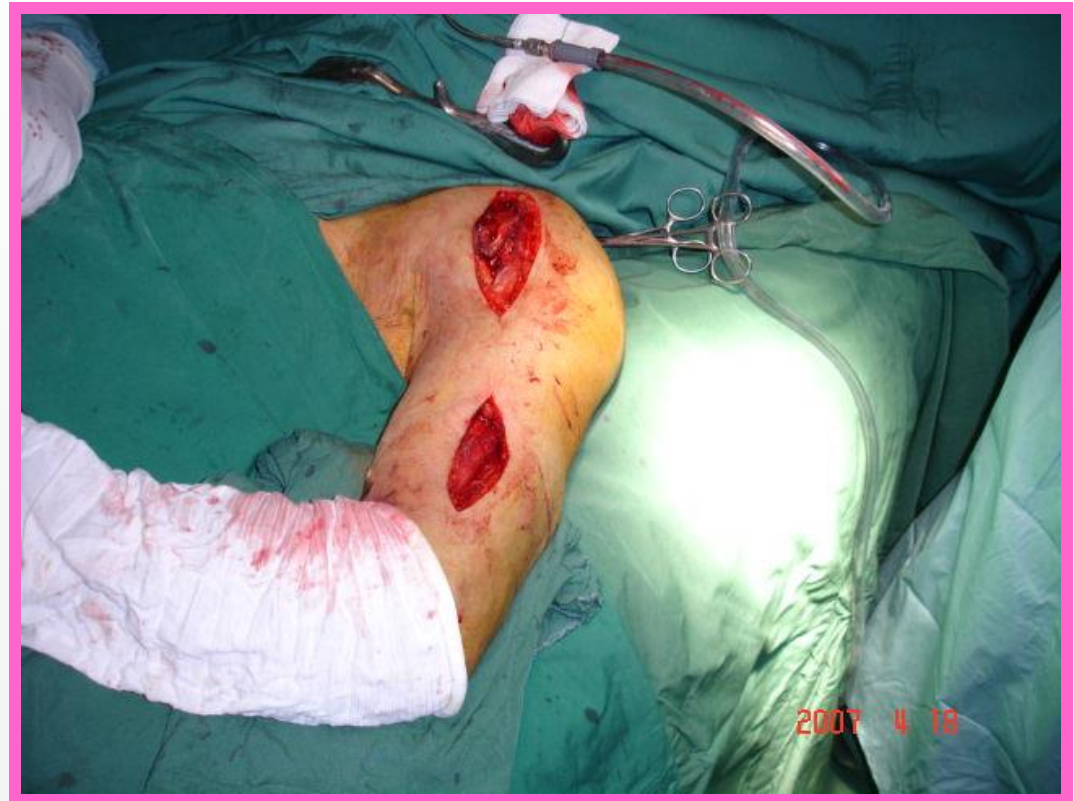
Humeral nails is preferred in:

1. widely separate segmental fractures
2. pathological fractures
3. fractures in patients with morbid obesity
4. fractures with poor soft tissue over the fracture site (such as burns)

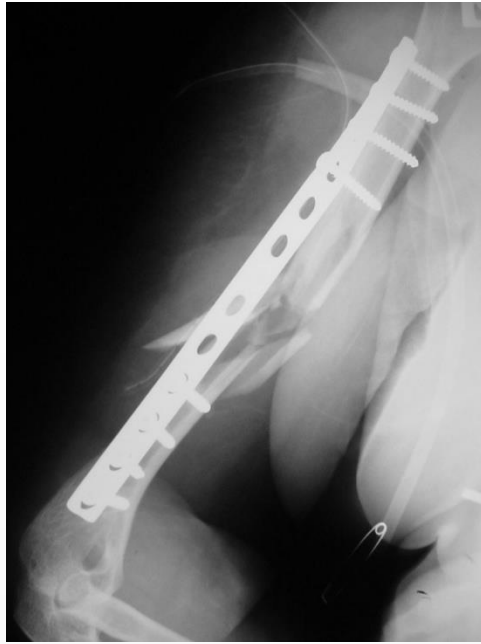


Minimally invasive plate osteosynthesis (biologic fixation)

- **risk of injury to the radial nerve**







Radial nerve palsy

- **In 12% of patients**
- **Usually neuropraxia**
- **Spontaneous recovery in > 90%**
- **EMG if no recovery after 4 month**
- **Indications for early exploration: open fx ,
Nerve palsy during closed treatment**

Shao YC, Harwood P, Grotz MR, et al: Radial nerve palsy associated with fractures of the shaft of the humerus: a systematic review. *J Bone Joint Surg* 2005; 87B:1647



Summary

- **Functional bracing → appropriate for ambulatory patients & isolated fractures**
 - **Operative treatment (plate or IMN) → appropriate for selected patients and multiple injured patients**
 - **Plating is the gold standard for fixation of humeral fx**
-

Thank you for attention

