Proximal Humeral Fractures

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INTRODUCTION

- Peri-articular Fracture
- Alters Shoulder Kinematics
- Functional Impairment
- Variable Outcomes

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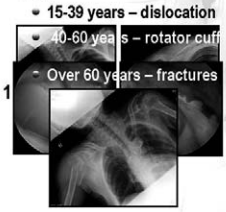
INCIDENCE

- 4 - 5% of all fracture
- Over 65 years
  - ➔ 75-80%
- Over 50 years
  - ➔ Females : Males =4 : 1
- Young age
  - ➔ High energy forces
- Elderly
  - ➔ Low energy falls

- Age
  - 15-39 years – dislocation
  - 40-60 years – rotator cuff
  - Over 60 years – fractures



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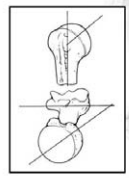
ANATOMY

- Head retroverted 30°
- Radius of curvature 22-25 mm
- Small flat glenoid
- 25-30% head contact
- Labrum depth of glenoid 50%
  - *- Saha AK 1961*



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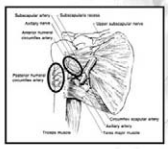
BLOOD SUPPLY

- Anterior humeral circumflex artery (Arcuate complex)
- Posterior humeral circumflex artery (posteromedial complex)



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BIOMECHANICS

- Greatest ROM of any joint
- Critical role of the soft tissues
- Ligaments provide passive restraint against instability
- Humeral head fulcrum
  - deltoid
  - rotator cuff
  - biceps

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PROBLEMS IN MANAGEMENT

- Comminuted fracture
- Osteopenia
- Loss of motion
- Limited place for internal fixation

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CONSEQUENCE OF INJURY

- Pain
- Weakness
- Stiffness
- Loss of function
- Traumatic arthritis

- Loss humeral height
- Deltoid weakness
- Instability
- Rotator cuff pathology
- Nerve injury

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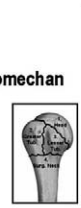
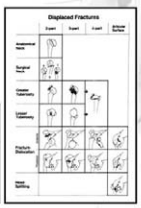
CLASSIFICATION

- Why ??
  - ➔ For proper management
  - ➔ Inter-obsever variability
- Neer(1970)-anatomy and biomechan
  - 4 segments
    - Articular or head
    - Both tuberosities
    - Shaft
  - Displacement >1 cm
  - Angulation > 45°





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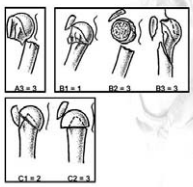
CLASSIFICATION

- AO-ASIF
  - Type A, B, C System
    - A – extra-articular
    - B – partial articular
    - C - articular
  - Numeric based on severity



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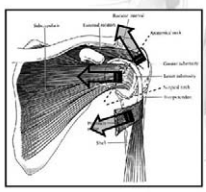
DEFORMITY

- Supra & Infra-spinatus
  - – Greater Tuberosity
    - Superior & Posterior displacement(ant D/L)
- Subscapularis
  - – Lesser Tuberosity
    - Medial Displacement(post D/L)
    - Immobilized in slight ER
- Pectoralis
  - – Shaft
    - Medial Displace



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MECHANISM OF INJURY

- The most common mechanism of injury
  - Fall onto the outstretched hand
  - Excessive rotation
  - Direct blow

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ASSOCIATED INJURIES

- Rotator cuff tears
- Ipsilateral upper extremity fractures
- Nerve injries
  : Axillary & brachial plexus
- Vascular injuries
  : Axillary artery
- Compartment syndromes
- Cervical spine injuries
- Chest injuries

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HISTORY

- Mechanism of injury
- Previous shoulder pathology
- Age – Sex – Handedness – Occupation
- Motivation & psychological well being

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PHYSICAL EXAM

- Motion secondary to pain
- Deltoid & soft tissues obscure details
- Ecchymosis 24-48 hours
- Elbow – forearm – wrist – hand exam
- Careful neurovascular exam(axillary N. m.c)
- Cervical spine & chest wall

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IMAGING

- Trauma series
  - Anteroposterior and lateral radiographs in the scapular plane
  - Axillary view

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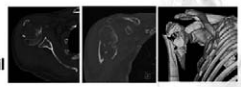
IMAGING

- CT scans
  - complex proximal fractures
  - pre-op planning
  - superior to MRI for bony detail
  - 3D reconstruction
- MRI scans
  - relationship of tuberosity fragment to the rotator cuff tendon
  - dislocation – fracture dislocation
- Others
  - arthrography
  - ultrasonography



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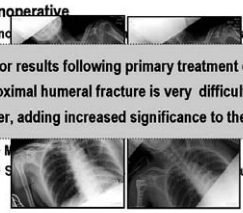
PRINCIPLE OF MANAGEMENT

- Nonoperative
  - → nc… able.(50-80%)
- Poor results following primary treatment of a comminuted proximal humeral fracture is very difficult to reconstruct later, adding increased significance to the initial treatment.
  - → M…
  - → S… ures in the elderly



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PRINCIPLE OF MANAGEMENT

- Early restoration of bony & soft tissue anatomy
  - → Allow early range of motion & rehabilitation.
- Nonoperative management of unstable fractures
  - → Increased incidence of malunion, weakness, pain, and LOM.
- Surgery!!
  - → The best chance for a successful outcome.
  - → The worst complications results from unsuccessful surgery.

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TREATMENT METHODS

- Non-operative treatment
  - 50-80% of patients
  - Balance between protection and mobilization
  - Traction
  - Hanging cast
  - Abduction cast
  - Sling (for support) & early motion
  - Pendulum exercises
  - Physical therapy

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TREATMENT METHODS

- Operative treatment
  - Closed Reduction
    - Sling
    - Percutaneous pinning

  - Open Reduction
    - Sutures, staples, wires
    - Cannulated screws
    - Plate fixation
    - Intramedullary nails
    - External Fixation
    - Prosthetic Arthropalsty

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TREATMENT METHODS

- Fracture type and bone quality dictate the type of treatment.
- Early surgery may be difficult !
- Late surgery is much more difficult !
  - Subacromial, capsular & muscula scarring
  - Fixed retraction of tuberosities & cuff
  - Malunion or Nonunion
  - Osteonecrosis

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DECISION MAKING

- Stabillity & displacement
- Health of the patient
- Quality of the bone
- Ability to hold fixation
- Cooperate with rehabilitation

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TIMING OF SURGERY

- Immediate
  - Open fractures
  - Compartment syndrome
  - N-V compromise
- 1-3 days
  - Simple closed fractures
- 3-7 days
  - Complex closed fractures

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PLANNING OF SURGERY

- Surgical tactic
- Preop drawing
- Type of implant
- Location of implant
- Bone graft

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PATIENT POSITIONING

- Semi-Fowlers
- Beach chair
- Lateral decubitus
  - C-arm image
  - Iliac crest

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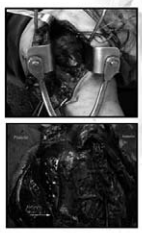
SURGICAL APPROACHES

- Delto-pectoral A.
  - Most fractures
- Anterolateral acromial A.
- Deltoid spilt A.
  - Isolated tuberosity Fx.
- Posterior A.
  - Glenoid Fx.



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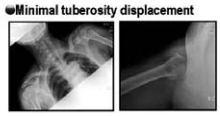
OPERATIVE MANAGMENT

- Closed Reduction
  - sling
    - Primarily for anterior dislocations with associated GT fractures
    - Following reduction of the dislocation
    - Minimal tuberosity displacement



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OPERATIVE MANAGMENT

- Percutaneous Pinning
  - primarily 2 part fractures, occasional 3 part fracture
  - reducible fracture
  - good bone quality
  - terminally threaded pins
  - avoid smooth pins
  - wide pin spread
- subchondral bone
- cut beneath skin
- early ROM exercises
- remove pins 4-8 weeks
- aggressive rehab

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OPERATIVE MANAGMENT

- Open Reduction
  - Sutures, staples, wires
    - Few controlled published studies
    - Limited indications
    - #5 nylon or Ethibond suture
    - Prefer tension band techniques
  - Cannulated screws
    - Percutaneous or open technique
    - 4.0 or 4.0 mm
    - At least 3 screws
    - Good bone quality
    - Subchondral bone

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OPERATIVE MANAGMENT

- Plate Fixation
  - historical perspective
    - loosening & loss of reduction
    - impingement of bulky hardware
    - extensive stripping & AVN
    - malunion & nonunion
    - shoulder stiffness

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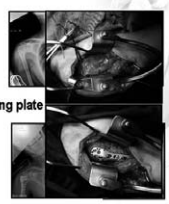
OPERATIVE MANAGMENT

- Plate Fixation
  - current perspective
    - younger patients – good bone
    - 2, 3 and some 4 part fractures
    - modern low profile implants-Locking plate
    - small angled blade plate
    - early ROM & rehabilitation



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OPERATIVE MANAGMENT

- Intramedullary Nails
  - good in theory, bad in practice
  - loked nail
  - limited indications
    - segmental fractures
    - pathologic fractures
    - diaphyseal extension
    - burn patients
    - complex ipsilateral injury

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OPERATIVE MANAGMENT

- External Fixation
  - open fractures
  - critically ill patients
  - associated vascular injuries
  - temporary frames
  - convert to Internal fixation

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OPERATIVE MANAGMENT

- Prosthetic Arthroplasty
  - Displaced 3 & 4 part fractures
  - Elderly
  - Osteopenia
  - Aggressive rehab
  - Good pain relief
  - Poor motion

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OPERATIVE MANAGMENT

- Impression fractures
  - ant. head<20% :closed reduction (Post D/L- ER immob.)
  - ant. Head 20-45%:Modification of McLaughlin procedure
  - head defect >45%, D/L >6 month: prosthesis
- Head-splitting fractures
  - prosthesis
  - OR/IF(young patients)

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COMPLICATIONS

- Nonunion
- Malunion
- Avascular Necrosis
- Nerve Injury
- Vascular Injury
- Joint Stiffness
- Rotator Cuff Pathology
- Deltoid Dehiscence
- Heterotopic Ossification
- Recurrent Dislocations

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SUMMARY

- Diffcult & Challenging Fracture
- Most Treated Nonoperative
- ORIF in Young Patients with Unstable Fractures
- Fixed Angle Device is Promising
- Prosthetic Arthroplasty in Elderly
- Loss of Motion Very Common

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