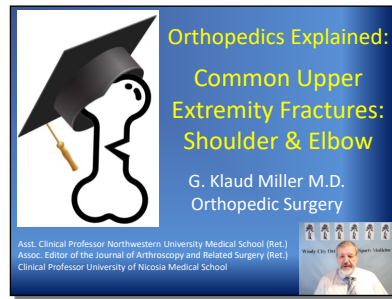


Slide 1

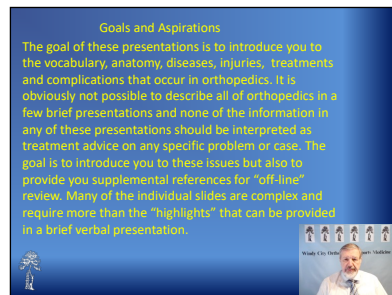


Orthopedics Explained:
Common Upper Extremity Fractures: Shoulder & Elbow
G. Klaud Miller M.D.
Orthopedic Surgery

Asst. Clinical Professor Northwestern University Medical School (Ret.)
Assoc. Editor of the Journal of Arthroscopy and Related Surgery (Ret.)
Clinical Professor University of Nicosia Medical School

Wahdy, G. M. D. Miller, M. D.

Slide 2

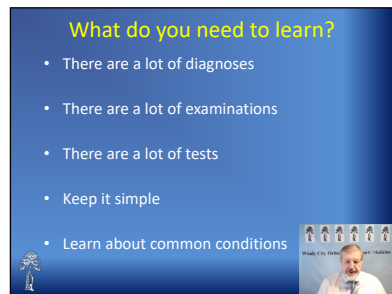


Goals and Aspirations

The goal of these presentations is to introduce you to the vocabulary, anatomy, diseases, injuries, treatments and complications that occur in orthopedics. It is obviously not possible to describe all of orthopedics in a few brief presentations and none of the information in any of these presentations should be interpreted as treatment advice on any specific problem or case. The goal is to introduce you to these issues but also to provide you supplemental references for "off-line" review. Many of the individual slides are complex and require more than the "highlights" that can be provided in a brief verbal presentation.

Wahdy, G. M. D. Miller, M. D.

Slide 3



What do you need to learn?


- There are a lot of diagnoses
- There are a lot of examinations
- There are a lot of tests
- Keep it simple
- Learn about common conditions

Wahdy, G. M. D. Miller, M. D.

Slide 4

CLAVICULAR FRACTURE


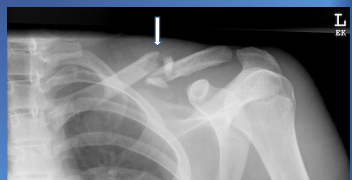
- Extremely common
- Fall on outstretched hand, fall onto outside of shoulder, direct hit to clavicle
- 2.8% of all fractures and 44% of shoulder fractures
- 24.4 fractures per 100,000 person years (Owens), bike, football, soccer
- **Historical treatment: sling; No activities that exacerbate pain; full recovery in 12 weeks**
- Open reduction & internal fixation: becoming more common



The clavicle is your collarbone. Fractures are very common in sports and bicycling. Historically, surgery was almost never done. More recently, open reduction and internal fixation is becoming more common.

Slide 5

Midshaft Clavicle Fracture



A typical midshaft clavicle fracture with displacement and comminution.

Slide 6



Plate fixation of a midshaft clavicle fracture

Slide 7

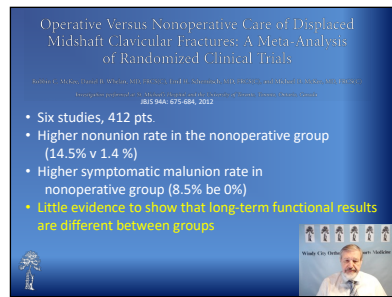


Plate fixation gives better x-rays and a higher healing rate, but does NOT necessarily improve function

Slide 8



Another series that shows a higher risk of nonunion without surgery but costs were higher with surgery and equivocal better function

Slide 9

Neither operative nor nonoperative approaches superior for treating displaced midshaft clavicle fractures: a partially blinded randomized controlled clinical trial
Bone & Joint Journal 103B: 762-768; 2021

- 120 pts. : 60 Op v 60 Nonop
- **ORIF better at 6 weeks, No differences @ 1 year**
- Nonunion 9.5X higher with nonop, 10/55 (18%); 1/51 ORIF (2%)
- **12/54 (23%) ORIF need plate removal**
- **No definite recommendation for either op or nonop!!!!**

Wesley Eric Dillingham, MD, FRCPC

Again, a recent study showed a higher risk of nonunion without surgery but plates not uncommonly require removal. Overall, no definite difference with either treatment.

Slide 10

Operative Management **Complications**

Better understanding of anatomy, numerous techniques available, better plates, arthroscopic approaches

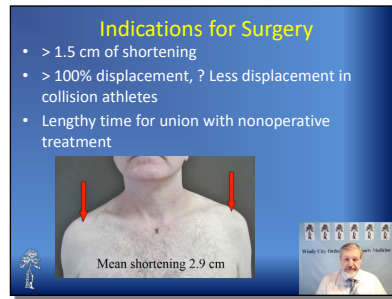
Why not fix all of them?

- Loss of Reduction
- Implant Migration
- Clavicle & Coracoid Fracture
- Articular Injury
- Nonunion, Malunion
- Infection
- Neurovascular Injury
- Stiffness
- Hardware Prominence?
- Need for Removal?

Wesley Eric Dillingham, MD, FRCPC

Again, surgery is not a free lunch, it has complications. Screws can pull out and plates can displace.

Slide 11



Current recommendations for surgery. Significant shortening and significant displacement.

Slide 12



A bad malunion with deformity, shortening, and residual displacement

Slide 13




A bad nonunion with severe displacement, and a bad cosmetic deformity but without severe shortening

Slide 14

HUMERUS FRACTURE

- *Proximal* occur near the shoulder joint; treatment depends on displacement, comminution, patient expectations/level of activity.
- *Mid-shaft* – Injury to radial nerve causes wrist drop and numbness of the hand dorsum
- *Distal* are uncommon in adults; but often require surgery
- Most heal without surgery
- Over 90% with nerve injury have complete recovery of nerve in 3-4 months




Humerus fracture characteristics are largely dependent on where the fracture is in the humerus. The midshaft humerus fractures tend to be the biggest risk of problems because of potential injury to the radial nerve and a wrist drop. However, most of these nerve injuries will recover spontaneously. The Neer classification for proximal humerus fractures is still probably the most commonly used. It classifies by the number of fracture fragments (i.e. 2, 3 or 4 part fractures).

Slide 15

Neer Classification of Proximal Humerus Frs.

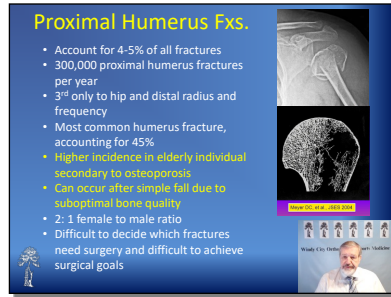
2 Part	3 Part	4 Part
Anatomical neck		
Surgical neck		
Greater tuberosity	Greater tuberosity	Greater and lesser tuberosity
Lesser tuberosity	Lesser tuberosity	



Slide 16

Proximal Humerus Fxs.

- Account for 4-5% of all fractures
- 300,000 proximal humerus fractures per year
- 3rd only to hip and distal radius and frequency
- Most common humerus fracture, accounting for 45%
- Higher incidence in elderly individual secondary to osteoporosis
- Can occur after simple fall due to suboptimal bone quality
- 2: 1 female to male ratio
- Difficult to decide which fractures need surgery and difficult to achieve surgical goals

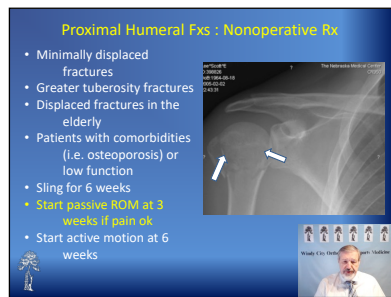


Proximal humerus fractures are the 3rd most common injury seen in the general population in the ER. They are very common in elderly women because of osteoporosis.

Slide 17

Proximal Humeral Fxs : Nonoperative Rx

- Minimally displaced fractures
- Greater tuberosity fractures
- Displaced fractures in the elderly
- Patients with comorbidities (i.e. osteoporosis) or low function
- Sling for 6 weeks
- Start passive ROM at 3 weeks if pain ok
- Start active motion at 6 weeks

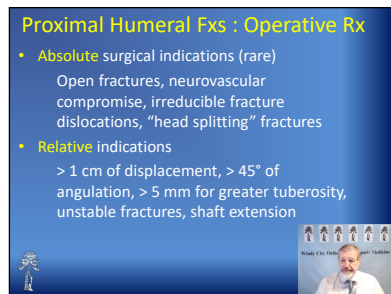


Most proximal humerus fractures can be successfully treated with nonoperative care

Slide 18

Proximal Humeral Fxs : Operative Rx

- **Absolute** surgical indications (rare)
Open fractures, neurovascular compromise, irreducible fracture dislocations, "head splitting" fractures
- **Relative** indications
> 1 cm of displacement, > 45° of angulation, > 5 mm for greater tuberosity, unstable fractures, shaft extension



Surgery can be appropriate for the more severe types of proximal humerus fractures.

Slide 19

Locking Proximal Humerus Plates

- Fixed Angle Device
- Versatile
- Better fixation than traditional devices
- **NOT a panacea !!**
- Technical factors
 - are critical !!!

Open reduction and internal fixation with plates has been advocated but can be technically difficult and has a high complication rate.

Slide 20

Hemiarthroplasty or Reverse TSA?

- Good pain relief
- **Function unpredictable**
- Best indication is for unreparable injuries in osteopenic patients
- ✓ Head splitting fractures
- ✓ Nonviable head

Hemiarthroplasty has been the “go to” treatment historically for the unreparable fractures but function is frequently unpredictable.

Slide 21

Reverse Total Shoulder Arthroplasty


- RTSA has become a popular treatment for displaced 3 and 4 part proximal humerus fractures in elderly patients
- Often poor bone quality
- **Rotator cuff quality is unknown and often poor**

More recently, reverse total shoulder arthroplasty has been used more frequently. It provides much better function even in the face of a bad rotator cuff tear.

Slide 22

Treatment: ? Consensus

- **Lack** of agreement and classification systems
- **Lack** of evidence to guide treatment
 - Few studies comparing different treatment options
 - Less than 15% of studies with appropriate study design
- Why is this important?
 - Potential harm
 - **High complication rate in operative treatment**
 - Up to 40% complication rate reported
 - Up to 15% reoperation rate




The literature is NOT clear on surgery versus nonsurgical treatment or what type of surgical procedure is appropriate for the individual patient. Surgery has a significant complication rate.

Slide 23

Management of Proximal Humeral Fractures: Surgeons Don't Agree

- 8 fellowship trained surgeons
 - 3 shoulder trauma
 - Avg 12.6 years into practice
- 38 x-rays of proximal humerus fractures
 - 0 management options




Eight “authorities” could not agree on the treatment of specific individual fractures

Slide 24

Management of Proximal Humeral Fractures: Surgeons Don't Agree

Results:

- interobserver agreement between surgeons 41%
 - Improved when # of choices decreases
- intraobserver agreement also poor
 - When shown their own "real life" cases surgeons made the same clinical treatment decisions on only 36.5% of the time!




Only 50% of the surgeons even agreed with their OWN previous treatment recommendations when they were shown the same cases later on

Slide 25

Hemiarthroplasty for Humeral Four-Part Fractures for Patients 65 Years and Older: A Randomized Controlled Trial


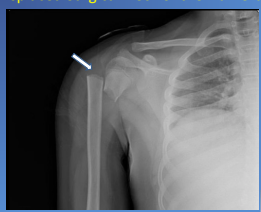
- 50 patients over 65 with 4-part fractures
 - Hemiarthroplasty vs Nonoperative Rx
- Outcomes at 1 year no difference:
 - Constant and SST
 - VAS pain/disability
 - ROM (FE 98° vs 94°)
- 1 early revision (head-stem separation) in op group
- 1 conversion to hemi in nonop group at 13 months



In this series there was no difference when people were randomized to nonsurgical versus prosthetic replacement

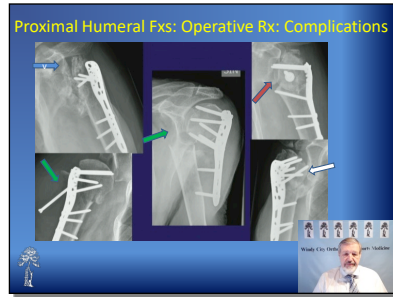
Slide 26

Displaced Surgical Neck of the Humerus Fracture



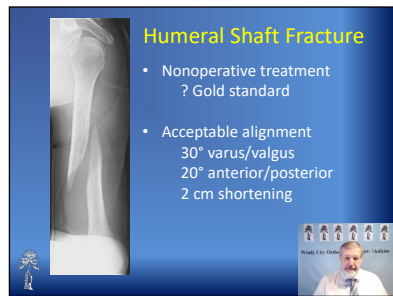
A completely displaced proximal humerus fracture

Slide 27



Complications of internal fixation of proximal humerus fractures include avascular necrosis (blue arrow), nonunion (red arrow), plate breakage, hardware pullout (green arrows)

Slide 28



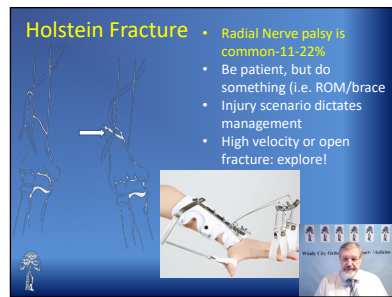
However, most patients with humeral shaft fractures can be successfully treated nonoperatively even with significant angulation

Slide 29



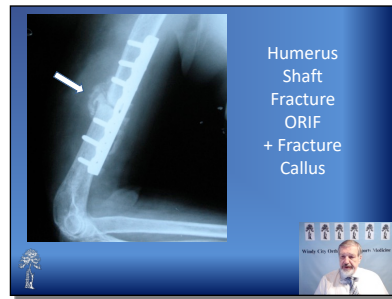
Dr. Augusto Sarmiento proved that most shaft fractures can be treated with a simple brace with low morbidity and good success

Slide 30



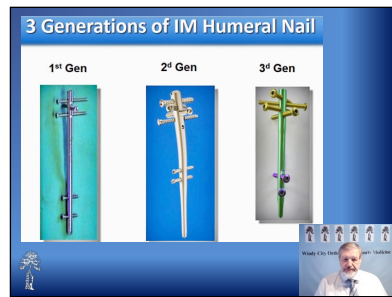
The Holstein fracture is a fracture close to the elbow that injures the radial nerve and results in a wrist drop. It usually can be managed nonoperatively with successful nerve recovery without surgery. A Wrist drop splint is shown in the lower right.

Slide 31



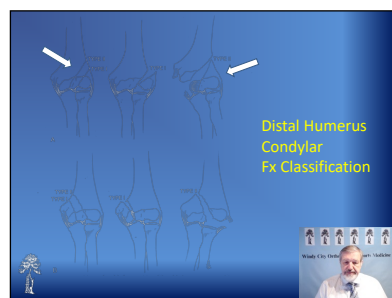
A humerus shaft fracture fixed with a plate and good callus

Slide 32



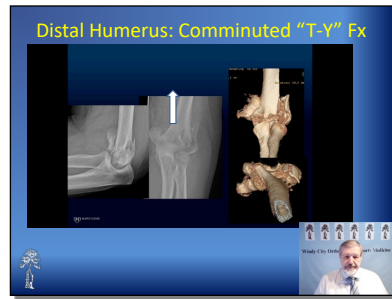
More recently, intramedullary rods are being used more frequently for humeral shaft fractures. Locked rods prevent shortening.

Slide 33



The classification of intraarticular distal condylar humerus fractures

Slide 34



Distal humerus fractures are commonly very comminuted and displaced and frequently require surgery. The pictures on the right are 3D CT reconstruction of the x-rays on the left. These are commonly from a fall on the elbow that forces the forearm bones up into the humerus.

Slide 35



Open reduction and internal fixation of a distal "T-Y" fracture

Slide 36



A “T-Y” fracture with hardware failure and a varus malunion

Slide 37

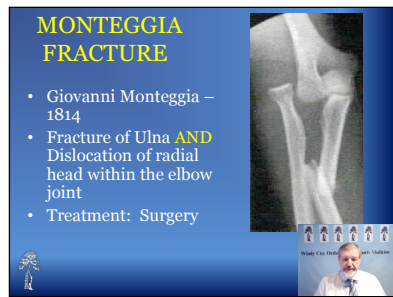
Ulnar shaft fractures are commonly defensive in nature defending against a blow, hence the name “nightstick fracture”

Slide 38



Typical examples of nightstick fractures

Slide 39



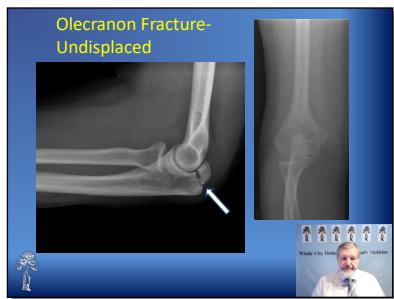
The Monteggia fracture is a proximal ulna shaft fracture with a dislocation of the radial head. It was described in 1814 before x-rays were invented! It typically requires surgery

Slide 40



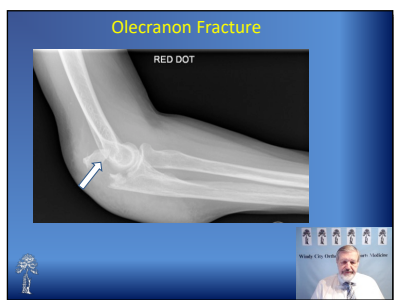
The Galeazzi fracture is a fracture of the radius with a dislocation of the ulna at the wrist. It also most commonly requires surgery.

Slide 41



The olecranon is the “tip” of the elbow and is the attachment of the triceps muscle that straightens out the elbow.

Slide 42



A displaced olecranon fracture usually requires surgery.

Slide 43



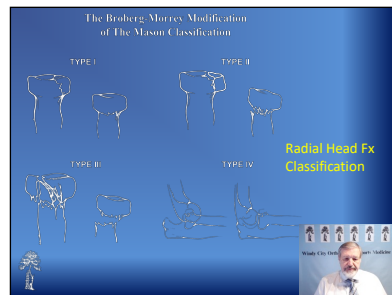
A tension band technique is the historical standard for ORIF.

Slide 44



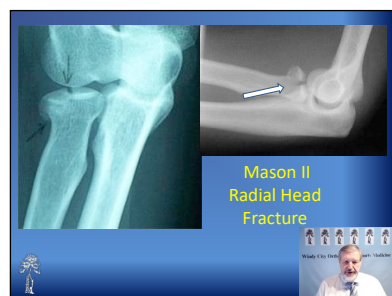
A plate is more commonly used recently

Slide 45



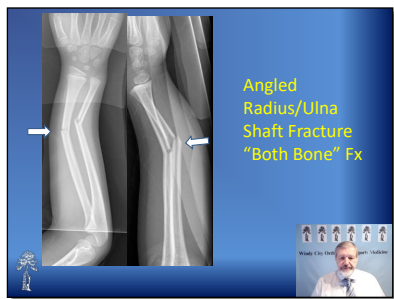
The radial head looks like the end of a baseball bat. It is an intra-articular fracture by definition. Treatment is typically nonoperative unless very severe or a loose piece.

Slide 46



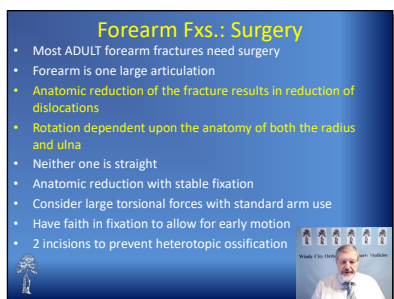
A typical Mason II displaced radial head fracture. This can be very successfully treated without surgery.

Slide 47



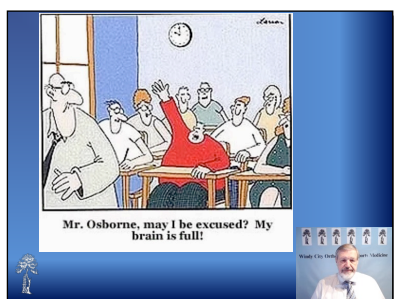
Both bone fractures involve fractures of the radius and ulna. In children, they can be treated nonoperatively. In adults they usually require surgery.

Slide 48



Principals of surgical treatment of both bone fractures. The reductions need to be anatomic in order to avoid limitations of rotational motion.

Slide 49



Thank you for listening.

