Chapter 51 – Wrist and Forearm

Episode Overview

1. List 3 views of shoulder
2. Describe the sensory and motor components of the brachial plexus
3. List 6 indications for orthopedic consultation for clavicle fractures
4. Describe the AARD syndrome with clavicle fracture
5. List 6 associated injuries with scapula fractures
6. Describe the Neer’s classification of Proximal Humerus fractures
7. Describe AC joint injury classification and subsequent management
8. List 6 techniques for reduction of anterior shoulder dislocation
9. What is Luxatio-Erecta? What are Hill-Sach’s and Bankart lesions
10. Describe 4 X-ray findings in posterior shoulder dislocation
11. Describe 4 tests for Impingement syndrome
12. Describe the NEER classification for rotator cuff injury
13. Describe the management of impingement syndrome and rotator cuff tears

WiseCracks:

1. What is the ‘whistler technique’ for shoulder reduction in the field?
2. Landmark for shoulder injection?
3. Best splint for posterior dislocation

Rosen’s in Perspective:

- The shoulders inherent instability is what allows such great ROM, but also means that it accounts for more than 50% of ED dislocations
- The first method of reduction described was the hippocratic (leg in axilla) technique, but even the Egyptians had accurate drawings of shoulder reductions
- The type of injury is dependent on the strength of bones v. ligaments; children tend to fracture whereas adults tend to sprain or dislocate

Anatomy:

- 3 bones: humerus, scapula
  - Clavicle
    - S shaped strut that pushes arm away from axial skeleton
    - Rosens notes: ‘provides the neck with acceptable cosmetic appearance’
      - Just imagine what people would look like without! The horror!
  - Humerus
    - Proximal articulated with glenoid fossa and provides attachments for many muscles (supraspinatus, infraspinatus, teres minor - greater tuberosity, subscapularis - lesser) which form rotator cuff
- 3 joints: glenohumeral,
  - Sternoclavicular
SCJ is the only articulation between axial skeleton and thus has significant movement
- Directly anterior to mediastinum badness
  - Acromioclavicular
    - Connects lateral clavicle to acromion process
    - Stabilized by weak AC ligaments and stronger coracoclavicular ligaments
  - Glenohumeral
    - Ball and socket joint with minimal bony stability.
- 1 pseudoarticulation
  - Scapulothoracic joint joined to thorax with 18 different muscle insertions and origins
- 1 synovial membrane
- 1 neurovascular bundle
  - Brachial plexus
  - Subclavian vessels
  - Enter superiorly between the clavicle and first rib, traverse under coracoid and on to inferior aspect of glenohumeral joint as median, ulnar, radial nerves and axillary vessels.
  - Nerve roots c5-c8

1) List 3 views of shoulder
a. True anteroposterior or '45-degree lateral'
   - Preferred over AP as it shows glenohumeral joint without bony overlap
   - Case courtesy of Dr Ian Bickle, Radiopaedia.org, rID: 46994
b. Trans-scapular lateral or ‘Y-view’

- Case courtesy of Dr Craig Hacking, Radiopaedia.org, rID: 37498

c. Axillary lateral views
- Arm must be abducted, which can be a challenge

- Particular advantages include relationship in glenoid fossa and lesions of coracoid, humeral head and glenoid rim

2) Describe the sensory and motor components of the brachial plexus

<table>
<thead>
<tr>
<th>SPINAL LEVEL</th>
<th>SENSORY AREA</th>
<th>MUSCLE</th>
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<tbody>
<tr>
<td>C2-4</td>
<td>—</td>
<td>Trapezius</td>
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<tr>
<td>C5</td>
<td>Lateral arm</td>
<td>Deltoid</td>
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<tr>
<td>C6</td>
<td>Lateral forearm and thumb</td>
<td>Biceps</td>
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<tr>
<td>C7</td>
<td>Tip of long finger</td>
<td>Thumb extensors</td>
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<tr>
<td>C8</td>
<td>Tip of little finger and medial</td>
<td>Finger flexors</td>
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<td>forearm</td>
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<td>T1</td>
<td>Medial arm</td>
<td>Hand interossei</td>
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</table>
3) List 6 indications for orthopedic consultation for clavicle fractures

a. First, some definitions - Rosens uses Allman Classification
   - Type I - stable with coracoclavicular ligament in tact
   - Type II - torn coracoclavicular ligament - often displaced
   - Type III - involve articular surface

   1. Open fractures
   2. Associated neurovascular injuries
   3. Type II lateral fracture - 30% non union
   4. Severely comminuted
   5. Displaced fractures of the middle third
   6. Type III

4) Describe the AARD syndrome with clavicle fracture

a. AARD - atlantoaxial rotary displacements. The pathophysiology of AARD is not well understood but it is suspected that the clavicle fracture and AARD occur sequentially and may be associated with a lax or disrupted alar ligament. Sternocleidomastoid muscle spasm may also be a contributing factor. Give-away is the ‘cocked-robin’ position with patient, often pediatric female, head bent towards fracture side but rotated away. You see an injured robin in your ED, CT it!

5) List 6 associated injuries with scapula fractures

a. Delayed
   - Pneumothorax
   - Hemothorax
   - Pulmonary contusion

b. Acute
   - Rib fracture
   - Humerus fracture
   - Clavicle fracture

6) Describe the Neer’s classification of Proximal Humerus fractures

a. 2 components: number of fractured parts and displacement
   - Parts: Humoral head, greater tuberosity, lesser tuberosity, humeral shaft
   - Displacements = angulation > 45 degrees or displace > 1cm

b. One part fracture: lines involve 1-4 parts but non are displaced
   - Conservative treatment

c. Two part fracture
   - Line involves 2-4 parts and one part is displaced
   - Ie. surgical neck, greater tuberosity, anatomical neck
   - Call ortho

d. Three part fracture:
Fracture line involves 3-4 parts and two are displaced
- Ie. greater tuberosity and shaft displaced, lesser tuberosity and articular surface in place
- Call ortho

e. Four part and BEYOND
  - HULK SMASH - fracture in all 4 parts with 3 displaced

7) Describe AC joint injury classification and subsequent management
a. Modified Rockwood system
  - Type I sprains of AC with no separation of acromion and clavicle. Mild swelling and tenderness. Full ROM
    - Sling immobilization, follow up PCP, ROM and strength exercises when pain subsides (1-3w)
  - Type II - joint space widened and clavicle displaced upwards. Mild swelling and tenderness. Full ROM
    - Sling immobilization, follow up PCP, ROM and strength exercises when pain subsides (1-3w)
  - Type III - completed disruption of AC ligaments, CC ligament and muscle attachment. Coracoclavicular distance increased by 25-100%. Arm abducted ++ pain
    - Sling immobilize and early ortho follow-up
  - Type IV - type III + clavicle displaced into trapezius. Arm abducted ++ pain
    - Call ortho - early surgical treatment
  - Type V type III + clavicle displaced superiorly > 100% (often by 3x)
    - Call ortho - early surgical treatment
  - Type VI - rare inferior displacement
    - Call ortho - early surgical treatment

8) List 6 techniques for reduction of anterior shoulder dislocation
a. Stimson / hanging weight
  - Prone with 10-15lbs on forearm
b. Traction-counter traction
  - Folded shit in axilla providing counter traction
c. Snowbird - first described in Skiers in Utah
  - Seated patient with elbow at 90. Physician places foot in stockinette tied around elbow for traction
d. External rotation method of leidelmeyer
  - Supine, elbow at 90, slow gentle external rotation
e. Milch
  - Supine, HOB 20-30, slow abduction with ext. rotation. If 90 abduct and 90 ext. rotation, then gentle traction
f. Scapular manipulation
  - Repositioning of glenoid fossa. First obtain traction then rotate scapula clockwise from inferior tip, while stabilizing superior tip
g. Bonus: Hippocratic method
9) **What is Luxatio-Erecta? What are Hill-Sach’s and Bankart lesions**
   a. A harry potter spell?
   b. Translation: erect or raised dislocation. This is an inferior dislocation in which the superior aspect of the humeral head lies inferior to glenoid fossa. Clinically the patient has a flexed elbow with their hand on their forehead. This has a higher incidence of neurovascular injuries, so clinical suspicion should be high. Reduction is traction counter traction
   c. Hill-Sach - I like to think of the humeral head as a ‘hill’ and the deformity is a bone impaction from the glenoid rim. Significance is increased risk of future dislocation. Bankart lesion is the negative impression of the glenoid rim (injury of the anterior (inferior) glenoid labrum) and is associated with capsule-labral avulsions, and affected patients may benefit from arthroscopic repair. Call yo’ surgeons

10) **Describe 4 X-ray findings in posterior shoulder dislocation**
    1. AO - loss of half moon elliptic overlap of humeral head and glenoid fossa
    2. AP - rim sign - distance between glenoid rim and humeral head in increased
    3. Drumstick sign - internal rotation of humeral head appears like ‘drumstick’ or light bulb
    4. Reverse hill-sachs (impaction fracture of anteromedial humeral head)

11) **Describe 4 tests for Impingement syndrome**
    a. Note this is a pathological continuum of rotator cuff tendinitis and subacromial bursitis
    1. Painful arc - pain with active ROM 60-90 degrees (subacromial) or 120-180 degrees (acromioclavicular)
    2. Neer impingement sign - pain with forced forward elevation while examiner locks the scapula in place. This is resolved by injection of 10cc beneath ant. Acromion
    3. Hawkins-Kennedy - Arm placed into 90 degrees of flexion followed by internal rotation
    4. Infraspinatus muscle test - resistance to internal rotation with arm adducted and elbow flexed to 90

12) **Describe the NEER classification for rotator cuff injury**
    a. Type I - traumatic tear (5%)
    ■ Usually young patient with microtrauma in overhead sports
    b. Type II - Tears with dislocation
    ■ Typically anterior, associated with future instability
    c. Type II - impingement tears (90%)
50% have no history of injury, usually >40 year, and usually secondary to over used mixed with poor blood supply and age-related degenerative changes
  ○ All should have ortho follow up as may require surgical repair
  ○ Diagnosis is best with U/S

13) Describe the management of impingement syndrome and rotator cuff tears
  ● Impingement syndrome - Primary does not typically involve rotator cuff tears, but can sometimes be secondary to rotator cuff tears as rotator cuff holds humeral head inferior to acromion
  ■ Mild pain with no night symptoms
    ● NSAIDs, rest, duty modification
    ● Failure can benefit from corticosteroid injections
  ■ Persistent pain severe at night
    ● Often has formations of adhesions
    ● Above + physio
    ● Failure can benefit from corticosteroid injections
  ■ Above plus significant tendon degeneration with signs of complete tear of rotator cuff
    ● May require decompressive surgery

WiseCracks:
1. What is the ‘whistler technique’ for shoulder reduction in the field?
   a. Developed for on mountain self reduction in snowboarders who were a little overzealous in the park. Can be done with snowboard still on for additional traction. Patient grasps both hands together around knee with knees bent to 90 in a ‘sit up’ position, locks hands and leans back. Additional scapular manipulation by bystander may result in greater efficacy

2. Landmark for shoulder injection (if conscious sedation is contraindicated)?
   a. Two approaches
      i. Ant: Medial to the head of humerus, lateral to the coracoid process by 1cm and directed posteriorly at a slight superior and lateral angle
      ii. Post: the sulcus between the head of the humerus and acromion is identified. The needle is inserted 2-3cm inferior and medial to the posterolateral corner of the acromion and directed anteriorly towards the coracoid process.
   b. Video:
3. **Best splint for posterior dislocation**
   a. Unlike ant dislocation where we accept an internally rotated sling, ortho has often requested a sling with 90 degrees of ext. rotation for up to 4 weeks!