Medical Management of Shoulder Arthroplasty

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Anatomy of the Shoulder

- Actually 4 joints
  - Glenohumeral
  - Acromioclavicular (AC)
  - Sternoclavicular (SC)
  - Scapulothoracic
    - Not truly a joint
Anatomy of the Shoulder

- Most motion occurs at GH joint
  - Ball-and-socket joint
    - Golf ball on golf tee
      - Allows for a great deal of motion
      - Requires soft tissue to provide stability
Anatomy of Shoulder

- **Rotator cuff**
  - 4 muscles and their tendons: SS, IS, Sub, TM
  - Tendons coalesce and form a cuff around humeral head
  - Helps with rotation
  - Provides a fulcrum for shoulder motion

- **Long head of biceps tendon**
  - One of two tendons of the biceps – not the main one
  - Enters GH joint in rotator interval (SS/Sub)
Shoulder Pain

- Many possible causes
  - More than one cause can exist at the same time
  - Can be difficult to distinguish
Evaluation of Shoulder Pain: History

- Where does it hurt?
- When does it hurt?
  - Time of day?
  - Activities?
- Other symptoms
  - Stiffness?
  - Weakness?
  - Grinding?
Evaluation of Shoulder Pain: History

- Function
- Prior treatment
Evaluation of Shoulder Pain: Physical Exam

- Tenderness
  - GT
  - Post GH joint
  - AC
  - Biceps groove
Evaluation of Shoulder Pain: Physical Exam

- **ROM**
  - Active & passive
    - Elevation
    - Rotation
  - Crepitus

- **Strength**
  - Deltoid
  - Rotator cuff
Evaluation of Shoulder Pain: Physical Exam

- Neurologic

- Neck
  - Can mimic shoulder pathology
Evaluation of Shoulder Pain – X-rays

- 4 views
Evaluation of Shoulder Pain – X-rays

- 4 views
  - AP
Evaluation of Shoulder Pain – X-rays

- 4 views
  - AP
  - True AP
Evaluation of Shoulder Pain – X-rays

- 4 views
  - AP
  - True AP
  - Axillary
Evaluation of Shoulder Pain – X-rays

- 4 views
  - AP
  - True AP
  - Axillary
  - Outlet
Evaluation of Shoulder Pain

- CT
  - Bony anatomy
    - Especially glenoid
  - Rotator cuff
    - Limited information
Evaluation of Shoulder Pain

- **MRI**
  - Bony anatomy
    - Not as detailed as CT, but usually enough

- **Rotator cuff**
  - Detailed information
    - Integrity
    - Quality
Evaluation of Shoulder Pain

- Ultrasound
  - Rotator cuff
    - Cheap, fast, convenient
    - Operator-dependent
    - Patients unable to have MRI
Rotator Cuff-Related Pain

- Rotator cuff syndrome
  - Tendinitis
  - Bursitis
  - Impingement

- Rotator cuff tears
  - Partial-thickness
  - Full-thickness
Rotator Cuff-Related Pain

- Tend to feel it on side of the shoulder and arm
- Worse with overhead and behind back
  - Putting on coat
- Worse when lifting objects with extended arm
  - Grocery bag off backseat
- Worse at night
Rotator Cuff-Related Pain

- Not necessarily a tear
  - Could be inflammation and impingement
  - Could be partial-thickness tearing, or small full-thickness tear
Rotator Cuff-Related Pain

- MRI
  - Will distinguish tears from tendinopathy
  - Will results change treatment?
    - Not necessarily an indication for surgery
      - PT, NSAIDs, +/- cortisone often effective
      - Reasonable to observe small full-thickness tears

- Correlate with physical exam
  - Is MRI indicated?
  - Are findings relevant?
Rotator Cuff Tears

- Surgical treatment is usually arthroscopic
  - Small incisions
  - Outpatient
Rotator Cuff

- Assessment of the cuff has major implications for the treatment of glenohumeral arthritis.
Glenohumeral Arthritis

- Symptoms
- Types
- Treatment/Prognosis
Symptoms of GH Arthritis

- Pain
  - Deep
  - Nighttime
- Stiffness
- Crepitus
- Decreased function
Types of GH Arthritis

- Arthritis with intact rotator cuff
  - OA
  - RA/inflammatory arthritis
  - Mixed patterns
  - AVN
  - Post-traumatic

- Cuff-deficient arthritis
Cuff-Intact Arthritis – Exam

- Cartilage wear
  - AROM/PROM usually decreased and painful
  - Crepitus

- Rotator cuff intact
  - Strength testing usually good

- “Good engine, bad tires”
Osteoarthritis – X-rays

- **AP**
  - Joint-space narrowing
  - Subchondral sclerosis
  - Osteophytes
    - “Goat-beard”
Osteoarthritis – X-rays

- Axillary
  - Posterior glenoid wear
Osteoarthritis – Humeral Head Position

Centered on AP

Posteriorly subluxed on axillary
Treatment of Cuff-Intact Arthritis

- **PT**
  - Usually not effective
  - Can exacerbate
  - Perhaps effective in early OA with concurrent cuff symptoms

- **NSAIDs**
Treatment of Cuff-Intact Arthritis

- Injections
  - Steroids
    - Short-term
    - Limited number of doses
      - Damage to other structures in the joint
      - Risk of infection
    - Contraindications
  - Viscosupplementation
    - No evidence of efficacy in shoulder
Surgery for Cuff-Intact Arthritis

- Arthroscopy
  - Debridement/Lavage
  - Microfracture
  - Interposition

- May be appropriate in rare cases only
  - Young patient (<40)
  - Early disease
Treatment of Cuff-Intact Arthritis

- Surgery
  - TSA
    - Standard of care for OA of GH joint
    - Excellent results
    - Long lifespan
    - Restoration of function/activity level
    - Low rate of complication
Principles of Shoulder Arthroplasty

Clinical Goals

- Relieve pain
- Improve function
- Avoid complications
  - Shoulder stiffness
  - Shoulder weakness
  - Persistence of pain
  - Component loosening
  - Rotator cuff tears
Principles of Shoulder Arthroplasty

Technical Goals

- Anatomic reconstruction of the articular surfaces
- Proper soft tissue balancing
- Restoration of normal glenohumeral kinematics
The Principles of Shoulder Arthroplasty Exposure

- **Controlled The Environment**
  - **Know** where the bleeders are located
    - Cephalic
    - “Three sisters”
  - **Know** where the nerves are located
    - Axillary
    - Musculocutaneous
    - Radial
  - **Know** your hang-ups
    - Capsuloligamentous releases
    - Osteophytes are located
  - **Correct retractors**
The Principles of Shoulder Arthroplasty Positioning

- Beach chair/semi elevated position
- Head secured, eyes protected
- Scapula exposed
  - Allows arm extension
- Adherent plastic drapes
  - Create a sterile barrier
Principles of Shoulder Arthroplasty
Reproducing Anatomy

- Must understand what is normal
  - Not a ball on a stick

- Resect only the anatomic portion of the humeral head

- Humeral head prosthesis
  - Covers osteotomy site
  - Restore native height, version, offset
What do we do?
- Incision in front of shoulder
- Detach one muscle: subscapularis
  - Repaired at the end
- Releases
  - Remove scar, adhesion, thick and stiff capsule, osteophytes
Total Shoulder Arthroplasty

- Replace humeral head
  - Humeral stem (usually titanium)
  - Cobalt-chrome head
- Reshape and resurface glenoid
  - All-polyethylene
  - Cement
Total Shoulder Arthroplasty

- **Recovery**
  - 1-2 days in the hospital
  - PT begins right away
    - Gentle at first
    - External rotation limited so subscap can heal
  - Sling
    - All the time for 2 weeks
    - Can remove when at home from 2-6 weeks
    - Discontinue at 6 weeks
Total Shoulder Arthroplasty

- Recovery
  - Can use right away for gentle activities
    - Eating
    - Holding a piece of paper
    - Anything you can do in a sling
  - No driving for 6 weeks
  - Golf
    - Chip/putt at 6 weeks
    - Long-game at 12 weeks
    - 18 holes at 6 months
Total Shoulder Arthroplasty

- **Functional expectation**
  - Full range of motion
  - Excellent pain relief
  - Daily activities
  - Golf, tennis, swimming

- **Permanent restriction**
  - Heavy lifting (>50 lbs)
  - Hard, sudden forces
    - Boxing, martial arts
    - Jackhammer
Total Shoulder Arthroplasty

- **Lifespan**
  - Loosening of the glenoid most common mode of failure
    - Rocking forces
    - Poly wear
  - Can see “lucent lines” around anchorage
Total Shoulder Arthroplasty

- **Lifespan**
  - Expect very little lucency for about 10 years
  - Can see more each year
    - Does not always correlate to comfort/function
  - Lucency does not equal failure

- **Management of symptomatic loosening**
  - Glenoid removal
  - Glenoid revision
Cuff-Intact Arthritis Take-Home Points

- NSAIDs, lifestyle modification
- TSA gold standard of surgical treatment
  - Predictably good results
  - Durable
Cuff-Deficient Arthritis

- Sometimes called “cuff arthropathy”

- Rotator cuff torn or incompetent
  - Competent cuff keeps humeral head centered, provides fulcrum for motion
  - Incompetent cuff allows “escape” of humeral head
Cuff-deficient Arthritis - Presentation

- **Pain**
  - Similar to OA

- **Pseudoparalysis**
  - Can’t lift arm
  - +/- ER lag
  - PROM often preserved (ie: not truly stiff like OA)
Cuff-deficient Arthritis - Presentation

- Cartilage wear
  - Motion usually decreased and painful

- Rotator cuff not intact
  - Strength testing shows weak elevation
    - May show weak ER “Hornblower sign”

- “Bad engine, bad tires”
Cuff-deficient Arthritis

- Joint-space narrowing
- Anterosuperior escape
  - High-riding humeral head
  - Decreased acromiohumeral distance
  - “Acetabularization” of acromion
- Humeral osteophytes less typical
Cuff-Deficient Arthritis

- TSA insufficient
  - Does not restore fulcrum
  - Does not improve motion/function
  - Rocking force on glenoid leads to early loosening and failure
Reverse Shoulder Arthroplasty (RSA)

- Orientation of glenohumeral joint is reversed
  - Glenosphere fixed to scapula with screws
  - Polyethylene socket fixed to humeral stem
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Reverse Shoulder Arthroplasty (RSA)

- Same surgical approach/exposure
  - Releases
  - Subscap detachment/repair
Reverse Shoulder Arthroplasty (RSA)

- Reversed articulation more constrained
  - Substitutes for dynamic stabilization of cuff
  - Restores fulcrum
- COR moved inferior and medial
  - Tensions deltoid
  - Lengthens lever arm
Reverse Shoulder Arthroplasty (RSA)

- Can restore physiologic forward elevation in cases of pseudoparalysis
- Does not restore external rotation
- Stability comes at a cost
  - Different functional expectations
The Principles of Shoulder Arthroplasty
Reverse Total Shoulder Arthroplasty

• Medialized center of rotation on the face of the glenoid
  - Minimize shear force at implant interface

• Diverging screws with central post
  - Metaglene baseplate fixation

• 155 degree humeral neck resection
  - Provides stability
Reverse Shoulder Arthroplasty (RSA)

- Relatively recent innovation
  - Therefore less information about lifespan
- Higher rate of complications
- Technically more challenging
  - Techniques improving rapidly
- Revision???
Reverse Shoulder Arthroplasty (RSA)

- Recovery similar to TSA
  - Short hospital stay
  - No PT in the beginning
- Goal is pain relief and functional ROM
There are many possible causes of shoulder pain

PT, NSAIDs, +/- cortisone may be appropriate

Some causes of pain can be treated with arthroscopic surgery

- Rotator cuff
- Biceps
- AC joint
Summary

- GH arthritis can inhibit function and interrupt daily life
- If conservative management fails, arthroplasty can have excellent results
- Status of the rotator cuff affects what kind of arthroplasty is appropriate
Thank you