Should I Do a Reverse Total Shoulder Arthroplasty?

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Goals of Lecture

• Be able to discuss the utility of reverse total shoulder arthroplasty (rTSA) in your practice.
• Understand the design differences between reverse total shoulder arthroplasty
• Be aware of the general procedure and identify technical tips to allow for ease of implantation.

Poll of Hands

• In your practice, do you do the following surgeries?
  • Rotator cuff surgery?
  • Proximal humerus fracture ORIF?
  • Shoulder hemiarthroplasty?
  • Total shoulder arthroplasty?
  • Reverse total shoulder arthroplasty?
Arthritis

- Arthritis and joint pain affect 1 in 3 adults
  - Caucasian
  - Men over 45
  - Women over 55
  - Overweight and inactive individuals
- Shoulder Arthritis
  - Less common, just as debilitating
  - Causes depression, activity limitation, decreased job performance

Causes of Shoulder Arthritis

- Primary
  - Osteoarthritis- Unknown etiology
- Secondary
  - Atraumatic (Alcohol, corticosteroid, cytotoxic drugs)
  - Post-inflammatory (crystals, rheumatoid, rotator cuff)
  - Post-surgical (Capsulorraphy, intraarticular hardware)
  - Post-traumatic (dislocation, fracture, AVN)

Increasing Usage of Shoulder Arthroplasty

- 2002
  - 25K primary arthroplasty
  - 41:59 TSA vs HA
- 2011
  - 67K primary arthroplasty
  - 30K (44%) were reverse TSA

**Reverse TSA cleared by FDA in 2004**
Indications for Reverse TSA
- Irreparable rotator cuff tear with poor motion
- Cuff tear arthropathy
- Fracture sequelae
- Instability
- Revision arthroplasty
- Tumor

Contraindications for Reverse TSA
- Poorly or nonfunctioning deltoid
  - Trauma
  - Stroke
  - Birth palsy
- Painful, irreparable cuff tear with good active motion

Technically Complex Variations
- Referral to tertiary center
- Revision surgery
- Significant glenoid bone loss
- Need for muscle transfers
- Previous fixation in the glenoid
  - Labral anchors
  - Laterjet
Which Total Arthroplasty System to Use?

Biomechanics and Implant Styles

- **Historical**
  - **Neer Prosthesis (1970)**
    - High failure rate at glenoid
    - Loss of motion
  - **Current**
    - **Grammont (1985)**
      - **4 features**
        - Inherently stable
        - Weightbearing surface must be convex
        - Center of sphere within scapula neck
        - Center of rotation medialized and distalized
      - Basis for most designs today

Controversy in Implant Designs

- **Current Designs**
  - Medialized vs. Lateralized
    - Scapular notching and decreased ROM, less stability
    - Less notching, increased motion and stability
    - Glenoid failure in older designs
  - **130 degree versus 150 degree**
    - Lateral displacement-less notching
    - Inferior displacement—tensions deltoïd
    - More stable at internally rotated position

Oh et al. JSES 2014
Virani et al. JSES 2013
Biomechanics and Implant Styles

- Best Implant?
  - Stable joint
  - Provides greatest range of motion
  - No impingement or notching
  - Low failure rate

- Best Implant for you…
  - What you feel most comfortable using
  - Depends on your experience and outcomes

Surgical Approach

- Deltipectoral
  - Advantages
    - Extensile, Intermuscular and internervous
    - Inferomedial osteophytes, inferior capsule, and humerus access
  - Disadvantages
    - Instability (5.1% vs 0.8%)
    - Subscapularis damage
    - Glenoid exposure

Gilliespie et. al. 2015 Orthop clin N Am.

Surgical Approach

- Anterosuperior
  - Advantages
    - En face view of glenoid
    - Preserve subscapulants
  - Disadvantages
    - Difficult to place glenoid with inferior tilt - increased notching (86% vs 56%)
    - Medial calcar osteophytes
    - Theoretical deltoid injury and dehiscence
    - Non-extensile

Gilliespie et. al. 2015 Orthop clin N Am.
General Procedure (Deltoplectoral)
- Incision, dissection through interval
- Biceps tenodesis vs tenotomy
- Subscapularis peel vs osteotomy vs tenotomy
- Humeral head resection
- Glenoid preparation
- Metaglene and glensphere placement
- Humeral broaching
- Trialing and implantation

Technical Pearls
- Glenoid Exposure
  - Patient positioning
  - Incision placement
  - Development of subdeltoid and subacromial space
  - Humeral head resection
  - Removal of osteophytes (posterior osteophytes)
  - Medial calcar release, osteophyte removal
  - Capsule release
    - From subscapularis
    - Inferior capsule off glenoid
    - Removal of labrum

Prosthesis Positioning
- Humeral component
  - 0 degrees to 30 degrees retroverted
    - Range of motion unchanged
    - Slightly better IR with 0 degrees
- Glenoid component
  - 0 degrees retroverted
  - Inferiorly placed on glenoid
  - 0 to 10 degree inferior tilt
Implant tensioning

- Subjective testing
- Trial and retial
- Beware of overstuffing - neuropraxia
- No significant gapping of glenosphere-poly
  - 0-90 degrees flexion
  - Approximately 50 internal/external rotation
- Reducing components should be snug, but not difficult
- Dislocating component should be somewhat difficult, but not impossible
- “Finger testing”

Repairing Tissue

- Subscapularis controversy
  - Repair - provides anterior support
    - data tends to favor, but not consensus
    - May cause “Hornblower”
    - May be implant dependent
  - Not repair
    - limits external rotation
    - creates contracture
    - increases work from deltoid
- Tuberosities in fracture
  - Consensus now is to attempt fixation of all tuberosities (suture repair)
  - Questionable union rates of tuberosities

Boileau P et. al. JSES 2002
Onstot B et al. ORS Meeting 2012
Ackland et. al. 2010 JBJS

Post-operative protocol

- Many available
  - Early vs. late ROM, PT vs. home therapy

Author’s Protocol

- Post-operatively
  - Sling
  - hand/wrist/thumb ROM
  - 2 week follow-up
    - Begin passive ROM
    - continue sling
    - PT if concern of compliance
  - 6 week follow-up
    - Out of sling
    - If achieved full PROM, begin AROM
  - 12 week follow-up
    - If full AROM, begin strengthening
Outcomes

- rTSA versus ORIF for proximal humerus fracture
  - (Chalmers JSES 2014) rTSA > ORIF for ROM and cost

- rTSA vs Hemiarthroplasty for fracture
  - Against (Ferrel JOT 2015)
    - Better flexion, less ER, similar shoulder scores. Higher complication rate with rTSA but lower revision rate
  - For
    - (Gallinet Ort trauma Surg Res 2009) Better flexion, abduction and constant scores
    - (Garrigues Orthopaedics 2012) Better motion, better shoulder scores
  - Conclusion
    - Elderly with 3-4 part fracture should get rTSA > HA
    - Young with 3-4 part fracture should probably have attempted fixation

- rTSA versus hemi for cuff tear arthropathy
  - (Lueng JSES 2012) rTSA superior in pain relief, function, and elevation at 2 years
  - (Young JBJS 2013) rTSA has better functional outcome

- Return to Activity after rTSA (HSS 2015)
  - 85% returned to 1 sport
  - 5.3 month average time to return
  - 93% good to excellent outcome

- Long term data- rTSA for CTA
  - (Guery JBJS 2006) 8 patients at 10 years. Survivorship at 10 years was 91%, revision rate 84% for CTA
  - (Favard Clin Ort Sur Res 2011) 527 shoulders. Survivorship to 89% at ten years.

Complications

- Meta Analysis 2 year follow-up (Zumstein JSES 2011)
  - Overall complication rates 20.7%
  - Re-operation rate 3.3%
  - Revision rate 10.1%
Why Do Reverse Total Shoulder Arthroplasty?

- Patient factors
  - Patient population aging
  - Increasing incidence of arthritis
  - Number of rotator cuff repairs aging

- Widening Indications
  - Arthritis
  - Cuff tears
  - Fractures

- Surgical factors
  - Similar operative time as other total joints
  - Common approach for shoulder surgeries
  - Reproducible surgery

- Outcomes
  - High patient satisfaction rate
  - Preserve motion
  - Excellent pain relief

THANK YOU!