

Total Shoulder Arthroplasty : Results, Outcomes and Expectations

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Disclosure

- Consultant for Tornier/Wright, DJO, and Conventus

General

- The literature is replete with data demonstrating the superiority of TSA vs hemiarthroplasty
 - A study by Edwards et al compared 601 TSA's with 89 hemi's and found that the TSA's had better outcomes scores, ROM, and satisfaction but also found that 56% of the glenoids had radiolucent lines (Edwards JSES 2003)
 - Pfahler et al compared 705 TSA's and 469 hemi's and found better subjective outcomes and Constant scores with the TSA's. However 68% of the glenoid components had radiolucent lines and the outcomes decreased with the severity and grade of these lines (Pfahler JSES 2004)

TSA Results

- The results for TSA are good with most studies reporting 90%-95% good to excellent results with about a 15% complication rate (Norris JSES 2002)
- The areas upon which we need to focus are
 - Disparity between expected outcomes and functional results
 - Factors that affect the outcomes
 - Patient
 - Pathology
 - Implants
 - Surgical technique

Patient related factors

- What the patient brings to the table matters
- Matsen evaluated 134 consecutive TSA's and found that postoperative function most significantly correlated with higher preoperative physical function, social function and mental health (JSES 2000)
- We know a good result preoperatively



Patient related factors

- Patients on chronic narcotics preoperatively had reduced outcome measures and satisfaction (Morris JSES 2015)
- Patients receiving workman's compensation had lower ASES scores (Jawa JSES 2015)
 - Compared 13 WC pt's (average age 56) with 63 non-WC (average age 63)

Pathologic factors that negatively affect outcomes

- Capsulorrhaphy arthropathy (Green JSES 2001)
- Post-traumatic osteonecrosis
 - Although TSA performed better than hemi's, TSA's only had a 57% satisfaction rating (Schoch JSES 2015)
- Proximal humeral malunions (Jacobsen JSES 2014)

Implant related factors-the glenoid



The glenoid is the weak link in TSA as the most common complication is glenoid loosening and wear

There has been an evolution of the glenoid from keeled to pegged to some form of bone ingrowth poly.

Glenoid Evolution

- Gartsman et al (JSES 2005) prospectively randomized 43 TSA's to either a pegged or keeled glenoid component and found on immediate postop radiographs that radiolucent lines were present in 39% of keeled and only 5% of pegged
- Edwards et al (JSES 2010) prospectively randomized 53 TSA's in the same fashion with radiographs obtained at 2 years
 - Radiolucent lines found in 15% of keeled and 0% of pegged immediately
 - At 2 years follow up lucent line found in 46% keeled and 15% pegged

Glenoid Evolution

- Churchill et al (JSES 2010) Evaluated 20 TSA's with minimum 5 year follow up with plain films
 - 10% had lucent lines immediately and progressed to 25% at 5 years
 - 85% of central pegs had bone incorporation
- Arnold et al (JSES 2011) Evaluated 35 TSA's with fine cut CT scans at 2 year follow up
 - Bone circumferentially present in 6/6 compartments in 23/35 and 4.5 in all 35
 - Overall Lazarus score 0.45 and Yian score 3.29
- Noyes et al (JSES 2015) evaluated 42 TSA's with average 7 year F/U with 81% bone incorporation of the anchor peg and 19% demonstrating some lucencies with 97% survivorship

Glenoid Evolution

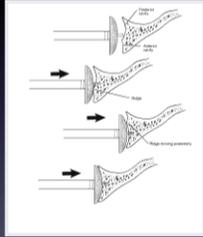
- Although glenoid lucencies have decreased with the evolution of the glenoid designs, we still have to have longer term data to assess the glenoid component survivorship
- Clearly there are other factors that affect the glenoid
 - Materials properties
 - Support of host bone
 - Quality of host bone
 - Orientation
- This is especially true in the B type glenoids where our results are significantly diminished compared to A type glenoids

Glenoid Evolution

- Materials properties
 - Noyes et demonstrated a significant reduction in lucent lines with highly cross-linked poly
 - Would other materials like pyrocarbon or ceramic improve wear rates?

Bone Support

- Walch et al reviewed 538 TSA's performed with a all poly keeled glenoid and found that 32% of glenoids were loose (>2mm complete lucent line) at 5 years
- Also found that subsidence (medial migration) was associated with corrective reaming and loss of the subchondral plate
- This emphasizes the importance of preserving the subchondral bone



Bone Support

- A recent study of 104 TSA's found that B glenoids were common (50%) and that despite all measures of obtaining full support by the host bone (eccentric reaming, leaving the component a little retroverted, down sizing the component), almost 50% were not completely supported by host bone

Balancing Act

- Therefore we must balance the art of:
 - Neutralizing the glenoid surface
 - Maintaining the hard subchondral bone
 - Completely supporting the component with bone
 - Maintaining neutral inclination
- This is where patient specific instrumentation and planning and augmented components may change our future



Satisfaction vs Outcomes

- The patient population where we have the greatest chasm between satisfaction and outcomes, is the arthritic patient under 55yo
- This is clearly multifactorial
 - Patient expectation not aligned with surgeon expectation
 - Increased physical demand of the working population
 - Difficult pathology

Can't get no satisfaction

- Golant et al polled the ASES regarding return to sport and found that 60% of respondents would allow TSA pt's to return to low impact sports while 80% would allow hemi's to do the same
- However a poll of young arthritic patients by Henn et al found that participation in sport and exercise was "very important"

Can't get no satisfaction

- I tell my patients that surgery is half art, half science, half blood sweat and tears (math courtesy Yogi Berra)
- The real art is aligning the expectations of the patient with realistic outcomes based on the pathology, demands, and the current limitations of the products used



Can't get no satisfaction

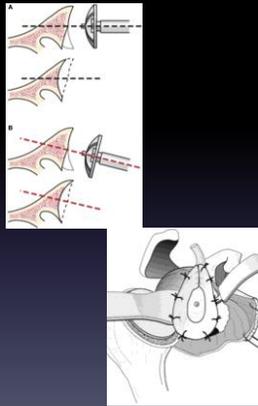
- Sperling et al reported unsatisfactory outcomes in 48% of 25 TSA's performed in patients under 55yo at a minimum 10 year F/U with 76% demonstrating evidence of radiographic loosening (Sperling JSES 2004)

Can't get no satisfaction

- A more recent study compared 46 TSA's and 20 hemi's in patients under 55yo at an average 7 year F/U and found that TSA's had less pain, greater ROM and better satisfaction with 92% survivorship while the hemi's had a 72% survivorship (Bartelt JSES 2011)

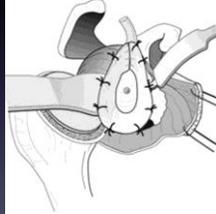
Other options?

- So if TSA is still better than a hemi in younger patients yet we have concerns about glenoid failure, is there something else that we can do?
 - Soft tissue interposition
 - Concentrically reaming the glenoid



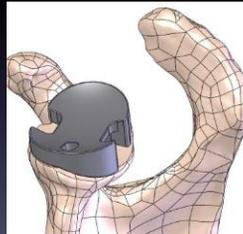
Soft Tissue Interposition

- Puskas evaluated 17 patients with 3 different types of interpositions (6 Garft jacets, 5 meniscal grafts, and 6 capsular interpositions)
 - Found that the revision rate was very high
 - Graftjacket- 5/6 revised by 26 months
 - Meniscal- 3/5 revised by 22 months
 - Capsule- 4/6 revised by 34 months



Options for the future

- Since TSA performs better than hemiarthroplasty in younger patients and those with a B type glenoid, maybe we should design a better glenoid that adheres to the 4 tenets of glenoid management
- There are several posteriorly augmented glenoids on the market, yet there is no long term data on their results



55yo with OA





Conclusions

- TSA is clearly better than hemiarthroplasty in almost every situation
- Our problem with TSA resides with the glenoid and is magnified in situations like the B type glenoids and in younger patients
- It is therefore incumbent that we identify the pathology that requires special attention and utilize all our resources to address it
- We also need to make sure that our expectations are aligned with those of our patients
