Shoulder Arthritis: An Owner's Manual

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Figure: The normal shoulder joint is a round ball on a concave socket (image on left) and the normal cartilage joint space is 3mm or greater. In arthritis the joint space is narrowed and the humeral head (ball) becomes irregular and flattened (image on right).

Shoulder Anatomy

The shoulder complex is made up of three bones: *Scapula* (shoulder blade), *humerus* (upper arm bone), and the *clavicle* (collarbone). The shoulder joint (glenohumeral joint) is composed of the humeral head of the upper arm bone (ball) and the glenoid socket, which is the outer part of the shoulder blade. Unlike the other large ball-in-socket joint in the body, the hip, the shoulder joint is a ball-on-socket. And the humeral head (ball) is larger than the socket (glenoid). This allows for the wide range of motion required for overhead sports and work.



As with all joints, movement is permitted by smooth, slippery cartilage surfaces which allow for minimum friction when the joint moves. This joint surface appears as white and shiny. An xray of a normal shoulder appears as a dark joint space of 3 mm or greater and this is the normal cartilage thickness of the shoulder joint (see above). The shoulder joint is stabilized by ligaments and muscles. The muscles of the rotator cuff also help move the ball on the socket

The normal joint cartilage is a thin shiny surface of about 2mm in thickness (see diagram below)



A normal shoulder joint allows you to throw, swim, work overhead, weightlift and perform other similar activities. Unfortunately, as a result of trauma, wear and tear, and other processes, arthritis can develop.

What is Arthritis?

According to the Center for Disease Control and Prevention (CDC), an estimated 50 million adults in the United States reported being told by their physicians that they have some form of arthritis (osteoarthritis, rheumatoid arthritis, post-traumatic arthritis, etc). This number means ~ 1 in 5 adults (22%) in the U.S.A. have the diagnosis of arthritis, and in 2007-2009, 50% of adults over the age of 65 years have been diagnosed with arthritis. Nearly

1 in 2 people may develop symptomatic knee arthritis by the age of 85 and 1 in 4 people may develop painful hip arthritis in their lifetime. In 2004, there were 454,652 total knee replacements, 232,857 total hip replacements, and 41,934 total shoulder replacements done in the U.S. The number of total shoulder replacements is projected to increase from its current rate up to 322% by the year 2015. The relatively lower number of total shoulders performed when compared to the total knee and hip procedures maybe due to the ability of patients to tolerate shoulder arthritis much longer than hip or knee arthritis as the shoulder is not a weight-bearing joint. Usually, patients come see the orthopaedic surgeon when pain limits sleep and function affects their quality of life.

There are *three major types of arthritis* including osteoarthritis, rheumatoid arthritis, and post-traumatic arthritis of the shoulder.

1) Osteoarthritis of the shoulder is a disease that involves breakdown of the articular cartilage that normally allows the joint to glide smoothly with each other. Loss of cartilage is seen on xray as loss of the joint space. Cartilage breakdown may be caused by wear and tear over time, but the key point is that cartilage does not heal when damaged. Instead, the body tries to heal by making more bone and this results in an irregular joint with extra bone spurs called osteophytes. The result is loss of motion due to irregular joint surfaces. In addition, the inflammation caused by the arthritis results in thickening and scarring of the joint capsule which also contributes to loss of motion.



2) <u>Post-traumatic arthritis</u> of the shoulder results when the shoulder joint is injured. This can be a result of bone fracture, dislocation, or damage to the surrounding ligaments/soft tissue around the shoulder joint.

This is a 22-year-old woman with arthritis after a fracture skiing and a surgical repair (screws and plate have been removed). Note that the humeral head (ball) is irregular and flattened.



3) Rheumatoid Arthritis and other inflammatory conditions of the shoulder is a systemic disease that can affect any joint in the body. This is a condition in which the lining of the joint (synovial cells) develops inflammation which damages the cartilage and bone of the shoulder. In some cases it is inherited and a family history of rheumatoid arthritis may be a cause. Women are affected more frequently than men and sometimes young adults can develop a form of this called juvenile rheumatoid arthritis. Typically, other joints are also affected such as the hands, knees, and even the spine.

Your physician may order blood tests which show markers for this inflammatory condition.

This condition is different than typical osteoarthritis as the process often results in erosions of the bone around the joint and the rotator cuff tendons may also be damaged. In some cases bony erosions and tendon damage may be severe (Image to right shows severe loss of tendons and erosion of bone so the humeral head moves upward out of the socket). Decreased joint spaces and marked wearing down of bone makes rheumatoid arthritis a consideration



Other Causes: Arthritis can occur after surgery as when anchors for an instability repair are placed in a location to damage the joint cartilage.





The above patient with anchors placed in a location that damaged the joint cartilage and developed arthritis. This patient developed arthritis as the result of metal anchors placed into the joint surface during a surgery to treat recurrent shoulder instability. The joint is irregular and there are erosions of the glenoid (socket). See CT image below.



Sometimes arthritis can occur after over tightening of the joint with instability surgery. This may result in loss of motion and damage to the joint surfaces over many years.



Figures above: Sometimes shoulder instability surgery may result in over-tightening of the joint and loss of external rotation (movement of the arm out to the side). (Top figure). The result of this over-tightening can be the development of arthritis, as the humeral head (ball) is pushed out the back of the joint and overloads the cartilage which then degenerates (lower two images).

<u>Other causes of shoulder arthritis</u> that may affect younger patients include: Humeral head avascular necrosis, iatrogenic causes, chondrolysis (may be result of pain pumps, infection, application of heat during surgery), post surgery arthritis, etc.

<u>Avascular necrosis</u> is a condition where the humeral head blood supply (which is critical in healthy bone maintenance) is disrupted and causes bone death. The bone collapses over time and will result in arthritis.



(Above left: AVN with collapse of superior-upper humeral head after loss of blood supply to bone-arrows; Above right: Severe AVN with flattening of humeral head after a fracture)

- <u>Arthritis after surgery</u> may be due to overtightening of a joint with instability surgery (see above), damage from implants and anchors for repair of tendons and ligaments (see above), infection, or simply unexplained.

- Chondrolysis is a condition characterized by rapid loss of cartilage in the shoulder joint. It has been associated with the use of intraarticular pain pumps, infection, application of heat with devices which are used to shrink tissue in shoulder stabilization operations, insertion of absorbable anchors, or simply with no known cause. It typically affects young and active adults and can be devastating in terms of it's affect on quality of life.

- Rarely, congenital (from birth) deformities of the joint can lead to earlier arthritis than is typically seen in the osteoarthritis form from wear and tear. See Figure below.



Figure: 40 year old woman with severe joint deformity and underdeveloped, small glenoid socket as the result of dwarfism.

What are the Common Symptoms of Shoulder Arthritis?

The natural history of shoulder arthritis is not known. It seems that many patients tolerate this condition or are unaware of it for a long time. They may note mild discomfort and progressive loss of motion. It may be that because the shoulder joint is not a weight-bearing joint like the hip or knee, it is tolerated much longer than arthritis of the lower extremity joints. This is also the reason why the total number of shoulder replacement surgeries in the United States is about 10% of those performed on the hip and knee (In 2004, there were 454,652 total knee replacements, 232,857 total hip replacements, and 41,934 total shoulder replacements done in the U.S.) That said, the growth of shoulder replacement is much greater than hip replacement surgery. Between 1993 and 2007, the number of total shoulder replacement surgery increased by 319%.

Shoulder arthritis often begins with dull pain in association with motion or activity. Usually it is a gradual onset and progresses slowly over time. Most patients then notice limited shoulder range of motion or stiffness with daily

activities. Loss of motion may also be accompanied by a feeling of grinding, catching, clicking or snapping within the shoulder joint. Weakness is usually due to pain inhibiting shoulder power. As shoulder arthritis progresses to an advanced stage, many patients will also experience pain that wakes them up at night.



How is Shoulder Arthritis Diagnosed?

A history of progressive loss of motion and pain interfering with sports, work, and eventually daily activities is a typical complaint of patients. Loss of sleep due to pain is also and important complaint we typically hear from patients. Crunching (crepitation), grinding sensations, and catching may also be symptoms the patient notices. You may also notice noise or crunching (crepitation) in your shoulder. Weakness maybe present simply due to pain interfering with your ability to move your arm.

The examination by a shoulder specialist will demonstrate loss of active motion but also passive motion. This is true stiffness as a result of the arthritic process and joint deformity which develops. Strength may be affected due to pain but is usually not true weakness.

Radiographs or X-Rays

Routine X-Rays will be ordered in the anteroposterior (AP) and axillary views.



Normal Axillary View	Arthritis Axillary View



MRI or CT Scan

Additional imaging may include a CAT Scan and sometimes an MRI. Many surgeons use a CAT scan to see the extent of joint deformity and help them plan for the shoulder reconstruction once surgery is elected by the patient. An MRI does not provide much useful information about the joint but can be helpful if there is a question about the rotator cuff in a patient who might also have weakness.



This CT shows severe arthritis with erosion of the back of the glenoid socket. The version of the glenoid can also be measured on the CT scan, which will help the surgeon plan your operation.

MRI:



Fig.: MRI is usually only useful in patients who may have an associated rotator cuff tendon tear as it is not particularly accurate for cartilage loss and bony deficiencies.

http://www.bosshin.com/rotator_cuff_pathologies/

What are the Treatment Options?

<u>Non-operative</u>, conservative treatment may be effective in some patients, or at least, may temporize and forestall the need for a shoulder replacement. These are listed below:

<u>Activity Modification</u>: This should be one of the first steps a patient takes, and sometimes simply eliminating some activities (like weight-lifting) markedly reduces pain.

<u>Physical Therapy:</u> This may be effective if flexibility can be restored to the shoulder; however, if there is severe joint irregularity and marked stiffness it may actually aggravate shoulder pain.

Pharmacologic treatment of shoulder arthritis include the following:

<u>Anti-inflammatory medications</u>: These are called NSAIDS (Non-steroidal anti-inflammatory agents) can be affective in some patients and there are many types of medications. Which is more effective is largely an individual patient issue as there is no real compelling evidence for one being better than the other. Some physicians may have a preference for their patients based on their perception of one being more effective than another and some medications require less doses each day. All of these may have side-effects including stomach upset, internal bleeding and other problems. So it is important to consult your physician if you take these medications for an extended period of time.



<u>Joint supplementation with *glucosamine/chondroitin*</u> can also be use to treat arthritis. Glucosamine and chondroitin (G/C) are two molecules that make up the cartilage found in your shoulder joint. They are the building blocks for cartilage formation. The theory of using glucosamine and chondroitin is that by congestion of more building blocks then there is more available for cartilage regeneration. However, there is currently no scientific evidence proving that the consumption of glucosamine and chondroitin will increase the quantity and also quality of the articular cartilage in an arthritis shoulder joint. There are many studies done in the literature on the use of G/C in arthritis. Most of these studies are done in patients with knee or hip arthritis. There is evidence that using G/C supplementation will have more pain relief

than placebo, however, no studies in the literature have shown that using G/C will alter the natural history of arthritis



<u>Cortisone injection</u> is another alternative method of treatment in patients with arthritis. Typically the cortisone is injected in combination with another pain reducing medication into your shoulder joint under imaging guidance. Cortisone is a type of anti-inflammatory medication and it helps to reduce the inflammation as it is directly injected into your shoulder joint. <u>Injections</u> of into the joint of corticosteroids may give marked pain relief; however, this affect is usually limited and may last anywhere from a few hours to a few months. Repeated such injections raises the risk for infection or damaging effects of steroid to the rotator cuff tendons.



Other alternatives include injection of joint lubrications fluid (Synvisc-TM, Orthovisc-TM, Hyalgan-TM, etc) into the shoulder. This is basically

artificial joint fluid with the proposed mechanism being protective by reducing joint compression and friction. There may also be an antiinflammatory effect. The majority of the studies done with these injection are in the knee and hip joint, and some have shown at least a temporary relief of pain similar to corticosteroid injections. The use of such injections for the shoulder has been limited (literature?) with no evidence of a reproducible effect or benefit above corticosteroid injection. In addition, insurance companies will generally not cover the expense of such an injection.



Surgical Treatment of Shoulder Arthritis

Surgical treatment of shoulder arthritis is indicated only when all of the conservative management options are exhausted. In our experience, patients will decide on shoulder surgery when they cannot sleep due to pain and their function has deteriorated so much that they cannot enjoy work activities and even daily living activities. A question we ask our patients is "what do you think the value of your shoulder is if 100% would be normal for you?" The average which patients report is 25%; however, there is a wide range as individuals may have varying perceptions of pain.

There are several methods of surgical management available and the factors that may help determine which management is right for you depends on your age, the location of arthritis (humeral head or glenoid or both), and the status of your rotator cuff muscles. The risk of surgery includes infection, bleeding, damage to nerve/artery/vein, blood vessel clots, chronic or postoperative pain, hardware failure, and need for second surgery.

In general, patients that are younger will likely be management with a joint preservation surgery (arthroscopy, debridement, etc). Arthroscopic debridement will help remove some of the mechanical and chemical irritants in the shoulder in addition to the loose cartilage flaps or loose bodies. This will help reduce the pain in your shoulder. However, the success of the arthroscopic debridement for shoulder arthritis is patient dependent and not very predictable.

Shoulder Joint Replacement

In patients with shoulder pain and arthritis, shoulder replacement maybe an option for treatment. It is recommended for patients with severe arthritis that have failed all conservative treatment modalities. There are three different kinds of shoulder replacements available on the market. These include hemiarthroplasty or humeral head resurfacing which is replacing only the humeral head, total shoulder replacement which is replacing both the humeral head and also the glenoid, and the reverse or inverse shoulder replacement which is used in patients with rotator cuff tears and arthritis of the shoulder. Please see the following page on further information regarding each type of replacement.

Article/abstract on patient expectations after TSA:

<u>Henn RF 3rd</u>, <u>Ghomrawi H</u>, <u>Rutledge JR</u>, <u>Mazumdar M</u>, <u>Mancuso CA</u>, <u>Marx RG</u>. J <u>Bone Joint Surg Am</u>. Preoperative patient expectations of total shoulder arthroplasty. 2011 Nov 16;93(22):2110-5.

98 patients underwent TSA at HSS were evaluated with preoperative evaluation included the American Shoulder and Elbow Surgeons (ASES) score, Shoulder Activity Scale, Short Form-36 (SF-36), and visual analog scale scores for shoulder pain, fatigue, and general health. Expectations were evaluated with use of the Hospital for Special Surgery's Shoulder Surgery Expectations Survey. <u>Expectations were not associated</u> with education, history of previous joint replacement, or comorbidities. However, younger patients had greater expectations of TSA which resulted in worse general

health on the visual analog scale and worse ASES scores.



There are many different brands of shoulder replacement implants. While all may differ in some design features they all attempt to help the surgeon achieve the same goal: Pain relief and improved function from patient. This is accomplished by allowing modularity of the components to fit different sizes patients with different joint deformities and to attempt to restore normal anatomy. There is no evidence that one design is better than another while changes in design features and even bearing surfaces are ongoing.

Hemiarthroplasty or Resurfacing

Humeral head replacements may be used in younger patients (<50 years) that have arthritis on the humeral head and not the glenoid. Sometimes these are patients with post-traumatic arthritis and deformities (prior fracture) which prevents use of a conventional implant with a stem. Thus two different kinds of resurfacing of the humerus are available. One is without a stem and covers the bone of the humeral head and the other replaces the humeral head with a stem down the hollow humeral shaft. The results after each type can be excellent; however, a complete shoulder replacement (Total Shoulder Arthroplasty is more durable and more predictable in relieving pain and restoring function.) The reason for this is pain from wearing down of the socket over time.

Please see the relevant articles on the outcome of hemiarthroplasty vs. total shoulder arthroplasty in the literature below.

1) J Bone Joint Surg Am. 2005 Oct;87(10):2178-85.

Quality-of-life outcome following hemiarthroplasty or total shoulder arthroplasty in patients with osteoarthritis. A prospective, randomized trial. Lo IK, Litchfield RB, Griffin S, Faber K, Patterson SD, Kirkley A. http://www.ncbi.nlm.nih.gov/pubmed/16203880

2) J Bone Joint Surg Am. 2000 Jan;82(1):26-34.

Shoulder arthroplasty with or without resurfacing of the glenoid in patients who have osteoarthritis.

Gartsman GM, Roddey TS, Hammerman SM. http://www.ncbi.nlm.nih.gov/pubmed/10653081

3) J Bone Joint Surg Am. 2005 Sep;87(9):1947-56.

A comparison of pain, strength, range of motion, and functional outcomes after hemiarthroplasty and total shoulder arthroplasty in patients with osteoarthritis of the shoulder. A systematic review and meta-analysis.

Bryant D, Litchfield R, Sandow M, Gartsman GM, Guyatt G, Kirkley A. http://www.ncbi.nlm.nih.gov/pubmed/16140808

4) J Shoulder Elbow Surg. 2004 Nov-Dec;13(6):604-13.

Minimum fifteen-year follow-up of Neer hemiarthroplasty and total shoulder arthroplasty in patients aged fifty years or younger.

Sperling JW, Cofield RH, Rowland CM. http://www.ncbi.nlm.nih.gov/pubmed/15570228

5) J Shoulder Elbow Surg. 2007 Nov-Dec;16(6):683-90. Epub 2007 Oct 29.

Total shoulder arthroplasty versus hemiarthroplasty for rheumatoid arthritis of the shoulder: results of 303 consecutive cases.

Sperling JW, Cofield RH, Schleck CD, Harmsen WS. http://www.ncbi.nlm.nih.gov/pubmed/18029202

- Paul please link to former fireman testimonial after Hemiarthroplasty



Case Example 1: 22 Year old skier with posttraumatic arthritis after a fracture skiing. This was treated with a hemiarthroplasty. 4 years later she has no pain and is very active in sports:



Case 2: 19 year old mechanic with limited motion and pain due to a severe joint deformity from birth and after a failed surgery. He had a resurfacing and four years later is working as a mechanic with no pain.





Total Shoulder Replacement

Total shoulder replacement is an excellent operation to improve pain and function in patients with shoulder arthritis. Studies have shown excellent clinical results and long-term durability in patients with TSA. The overall durability of the total shoulder replacement is >85% at 20 years free from revision surgery (Torchia et al). While hemiarthroplasty and humeral resurfacing can be very effective treatment, total shoulder replacement gives a more predictable and durable outcome (see references above). This procedure is indicated in patients with severe arthritis of the shoulder joint who have a normal rotator cuff and a deformity which permits placement of the glenoid socket.

<u>J Shoulder Elbow Surg.</u> 1997 Nov-Dec;6(6):495-505. **Total shoulder arthroplasty with the Neer prosthesis: long-term results.** <u>Torchia ME, Cofield RH, Settergren CR.</u> <u>http://www.ncbi.nlm.nih.gov/pubmed/9437598</u> There is some controversy regarding what the age cut-off should be in terms of younger patients, as durability is a concern with younger individuals and in individuals who will be very active in sports or work activities where loads on the joint are anticipated to be high. In general, total shoulder replacement is preferred in patients over 60 years of age. That said, a discussion between the younger patient and the physician is important in order to decide the best treatment, hemiarthroplasty, resurfacing, total shoulder replacement. Please see the study below on the outcome of TSA in patients less than 55 years of age.

<u>Bartelt R</u>, <u>Sperling JW</u>, <u>Schleck CD</u>, <u>Cofield RH</u>. Shoulder arthroplasty in patients aged fifty-five years or younger with osteoarthritis. J Shoulder <u>Elbow Surg.</u> 2011 Jan;20(1):123-30.

The younger patient with glenohumeral arthritis presents a challenge because of concerns about activity and frequency of failure. The purpose of this study was to define the results, complications, and frequency of revision surgery in this group. Between 1986 and 2005, 46 total shoulder arthroplasties and 20 hemiarthroplasties were performed in 63 patients who were aged 55 years or younger and had chronic shoulder pain due to glenohumeral osteoarthritis. All 63 patients had complete preoperative evaluation, operative records, and minimum 2-year follow-up (mean, 7.0 years) or follow-up until revision. Nine shoulders underwent a revision operation. The implant survival rate was 92% (95% confidence interval, 77%-100%) at 10 years for total shoulder arthroplasty and 72% (95% confidence interval, 54%-97%) for hemiarthroplasty (Kaplan-Meier result). Patients who underwent total shoulder arthroplasty had less pain (P = .01), greater active elevation (P = .05), and higher satisfaction (P = .05) at final follow-up compared with those who underwent hemiarthroplasty. Complete radiographs were available for 47 arthroplasties with a minimum 2-year follow-up or follow-up until revision (mean, 6.6 years). More than minor glenoid periprosthetic lucency or a shift in component position was present in 10 of 34 total shoulder arthroplasties. Moderate to severe glenoid erosion was present in 6 of 13 hemiarthroplasties. This study indicates that there is intermediate- to long-term pain relief and improvement in motion with shoulder arthroplasty in young patients with osteoarthritis. These results favor total shoulder arthroplasty in terms of pain relief. motion, and implant survival.

Case Study: 48 year old flight attendant with severe shoulder pain due to arthritis. After surgery he returned to work with excellent function and no pain.



(Paul please insert video of patient showing before and after....I have included it in attachments)

What is a realistic expectation for sports participation after shoulder replacement:

Patients generally can do most things they want to with the exception of collision and contact activities. Skiing is fine but falling risk fracture of the shoulder and loosening of the prosthesis. Similarly, heavy impact loading as with construction work puts the joint at risk. That said, patients generally define their health and their value in life by what they chose to do (link to patient testimonials)

Useful articles on patient activities and restrictions after TSA:

1) <u>Vogel LA</u>, <u>Carotenuto G</u>, <u>Basti JJ</u>, <u>Levine WN</u>. Physical activity after total joint arthroplasty. <u>Sports Health.</u> 2011 Sep;3(5):441-50.

A systematic review of the literature regarding physical or athletic activity after TJA was performed to determine current clinical opinion and recommendations regarding appropriate activity levels after TJA, as well as variables affecting successful surgery and improved outcomes. The literature reports contradictory results regarding rates of physical activity after TJA as well as the relationship between physical activity and rates of revision surgery. The current trend in expert opinion shows more liberal recommendations for patients to engage in athletic activity after TJA. Individual characteristics, lifestyle, and patient preferences must be taken into account when one considers appropriate recommendations for athletic activity after TJA. *Current trends in clinical opinion favor a higher level of athletic activity after TJA, but clinicians should caution patients not to participate in contact sports or sports that create high joint loads in the replaced joint.*

2) <u>Golant A, Christoforou D, Zuckerman JD, Kwon YW</u>. Return to sports after shoulder arthroplasty: a survey of surgeons' preferences. <u>J</u> Shoulder <u>Elbow Surg.</u> 2012 Apr;21(4):554-60. Epub 2011 Mar 9.

A survey was distributed to 310 members of the American Shoulder and Elbow Surgeons, inquiring about allowed participation in 28 different athletic activities after 5 types of shoulder arthroplasty options (total shoulder arthroplasty, hemiarthroplasty, humeral resurfacing, total shoulder resurfacing, and reverse shoulder arthroplasty). The response rate to the survey was 30.3%, with <u>74.1% of respondents allowing some return to</u> <u>athletic activity after shoulder arthroplasty</u>. The 28 athletic activities were grouped into 4 categories based on the load and possible impact to the shoulder. <u>Only 51% of respondents allowed any participation in contact</u> <u>sports, whereas 90% allowed some participation in noncontact low-load</u> <u>sports.</u> Return to sports after humeral resurfacing was highest, at 92.0% of the respondents, whereas the least percentage of surgeons allowed sports after reverse total shoulder arthroplasty, at 45.2%. <u>Surgeons were more likely to recommend return to sports if the activities did not involve significant contact, risk of fall or collision, or application of high loads to the shoulder joint. Surgeons were also more likely to recommend return to sports if the arthroplasty did not involve the glenoid.</u>

3) <u>Magnussen RA</u>, <u>Mallon WJ</u>, <u>Willems WJ</u>, <u>Moorman CT 3rd</u>. Long-term activity restrictions after shoulder arthroplasty: an international survey of experienced shoulder surgeons.J Shoulder Elbow Surg.</u> 2011 Mar;20(2):281-9.

An online survey was sent to members of the American Shoulder and Elbow Surgeons (ASES) and the European Society for Surgery of the Shoulder and Elbow (SECEC). Participants received a list of 37 activities and classified their postoperative recommendations for each activity as allowed, allowed with experience, not allowed, or undecided. The participation rate was 18%, including 47 North American surgeons and 52 European surgeons. All patients were allowed to participate in nonimpact activities, including jogging/running, walking, stationary bicycling, and ballroom dancing. Sports requiring light upper extremity involvement, including low-impact aerobics, golf, swimming, and table tennis, were allowed after hemiarthroplasty and TSA, and were allowed with experience after RTSA. Sports with fall potential, including downhill skiing, tennis, basketball, and soccer, were allowed with experience after hemiarthroplasty and TSA, and undecided or not allowed after RTSA. Higher-impact sports, such as weightlifting, waterskiing, and volleyball, were undecided after hemiarthroplasty and TSA and were not allowed after RTSA. European surgeons were more conservative than American surgeons in their recommendations after hemiarthroplasty and TSA, but good agreement between the 2 groups was noted regarding restrictions after RTSA.

4) <u>Zarkadas PC</u>, <u>Throckmorton TQ</u>, <u>Dahm DL</u>, <u>Sperling J</u>, <u>Schleck CD</u>, <u>Cofield R</u>. Patient reported activities after shoulder replacement: total and

hemiarthroplasty. J Shoulder Elbow Surg. 2011 Mar;20(2):273-80.

The purpose of this study was to define and compare the self-reported activities of patients following shoulder arthroplasty either total (TSA) or hemiarthroplasty (HA). Two groups of 75 patients each following TSA or HA were matched by age, sex, operative side, timing from surgery, and state of residence. A mailed questionnaire asked patients to report on their level of pain, motion, strength, and choice of 72 different activities. Reported activities were classified as low demand, intermediate demand, or high demand. Ninety-nine patients completed the survey, 52 in the TSA group (average age 62 years; 30F:22M), and 47 in the HA group (average age 62 years; 27F:20M). *No difference on a pain scale was reported between groups. Better results were reported in the TSA group in forward flexion (P = .006), internal rotation (P = .04), and strength (P = .04).* The most commonly reported activities in each category were: low demand (eg, cooking), medium demand (eg, gardening), and high demand (eg, snow shoveling). For each activity there was no significant difference between groups.

DISCUSSION/CONCLUSION:

Conventional thinking that HA provides for more activity is not supported by patient-reported activities when compared with TSA. Patients following TSA reported better motion and strength and were equally as active as the HA group.

COMPLICATIONS OF SHOULDER REPLACEMENT:

Possible complications after Hemiarthroplasty or TSA include the following:

Nerves or blood vessels in the vicinity of the joint replacement may be damaged during surgery, although this type of injury is infrequent but it can be a complication of TSA. Over time, nerve injuries will often improve and may completely recover.

Infection is a complication of any type of surgery. In shoulder joint replacement, infection may occur in the wound or deep around the

prosthesis. It may happen while in the hospital or after you go home. Minor infections in the wound area are generally treated with antibiotics. Major or deep infections may require more surgery and removal of the prosthesis with placement of an antibiotic spacer and long term antibiotics. Infections, skin cuts, or dental procedures can spread bacteria to your joint replacement. Therefore it is important to notify your surgeon if you have any concerns about a possible infection to your shoulder replacement.

Another complication seen after TSA is related to the prosthesis. Although prosthesis designs and materials, as well as surgical techniques, continue to advance, the prosthesis may wear down and the components may loosen. The components of a shoulder replacement may also dislocate or fracture secondary to a traumatic event. Excessive wear, loosening, or dislocation may require additional surgery or revision procedure.

Stiffness is another complication of TSA. Some patients may develop a progressive loss in range of motion despite physical therapy.

Rotator cuff tears is another possible complication after TSA. The patient may develop pain or loss of range of motion especially active ROM. This may require a revision surgery either with repair of the Rotator cuff tear or revision of the arthroplasty components.

Please see the articles/abstracts below on complications after shoulder arthroplasty.

1) <u>Farng E, Zingmond D, Krenek L, Soohoo NF</u>. Factors predicting complication rates after primary shoulder arthroplasty. <u>J</u> Shoulder <u>Elbow</u> <u>Surg.</u> 2011 Jun;20(4):557-63.

They hypothesis of this study was that a mandatory statewide discharge database could identify the epidemiology of primary shoulder arthroplasty, 90 day complication rates, implant survival rates, and patient and hospital characteristics associated with complications. We identified patients undergoing primary total shoulder replacement and hemiarthroplasty between 1995 and 2005. We report rates of complications within 90 days of surgery and performed survival analysis using revision surgery as the

endpoint. Logistic and proportional hazard regression models were used to estimate the effect of patient and provider factors in predicting the rates of adverse outcomes. During the study period, 15,288 patients underwent shoulder arthroplasty. Patients undergoing total shoulder arthroplasty and hemiarthroplasty had no statistically significant difference in the aggregate risk of 90-day complications or the risk of implant failure within the study period. Fracture patients were shown to have a higher risk of short-term complications (odds ratio, 3.2; P < .001). Implant failure rates were lower in patients with fracture, rheumatoid arthritis, increased comorbidity, and advanced age. This study reports similar rates of short-term complications and implant failure in patients undergoing total or hemiarthroplasty, an overall mortality rate of 1.3%, and a pulmonary embolism rate of 0.6%. The findings of our study indicate that the risk of short-term complications is highest in patients undergoing total or hemiarthroplasty for a fracture compared with nonfracture indications. Our results also indicate that longerterm, implant survival is largely driven by factors associated with increased activity, such as age. In patients undergoing surgery for arthritis of the shoulder, we found no difference in implant survival rates between total and hemiarthroplasty of the shoulder.

2) <u>J Bone Joint Surg Am.</u> 1996 Apr;78(4):603-16.
Complications of total shoulder-replacement arthroplasty.
<u>Wirth MA, Rockwood CA Jr</u>.