SHOULDER ARTHRITIS & OTHER DISORDERS:
SURGICAL TREATMENT OPTIONS FOR THE PAINFUL SHOULDER

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Please read this guide before your visit so we can better answer any questions during your consultation. Joint replacement is one of the most successful procedures in modern medicine. The surgical treatment of shoulder, more specifically glenohumeral, osteoarthritis and rotator cuff injury by shoulder replacement is typically very reliable in reduction of pain and improvement in function.

OVERVIEW

The shoulder joint, also known as the glenohumeral joint (GH), primarily consists of a ball and socket made up of the round ball of the humeral head and the concave socket of the glenoid. The movement of the shoulder is facilitated by the muscles of the rotator cuff along with the smooth cartilage surfaces between the glenoid and humerus, allowing for smooth, frictionless motion between the two. When that cartilage breaks down whether from wear or tear over time, trauma, or inflammatory conditions such as rheumatoid arthritis, patients develop an irregular joint surface which leads to a loss of motion, pain, and discomfort.

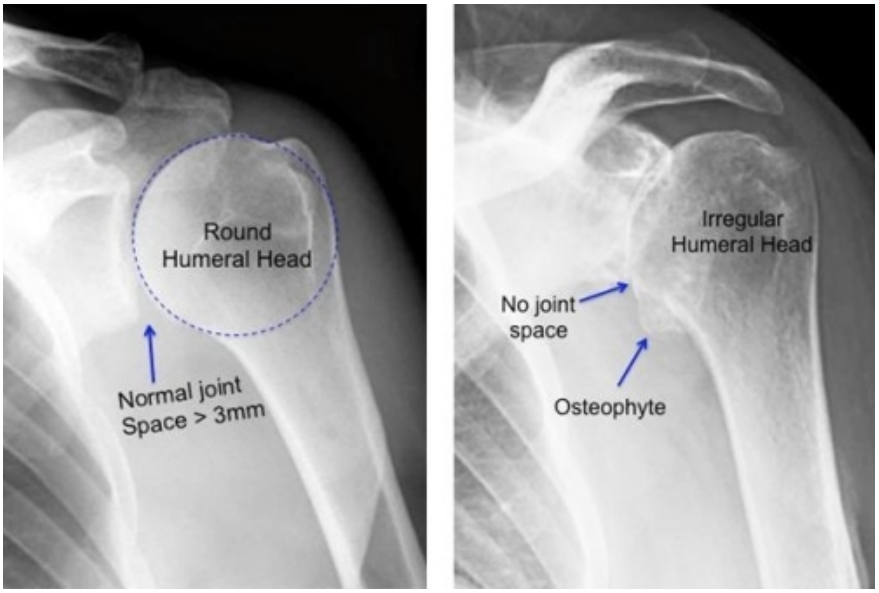


Figure 1: The normal shoulder joint is a round ball on a concave socket (image on left) and the normal cartilage joint space is 3mm or greater. In arthritis the joint space is narrowed, and the humeral head (ball) becomes irregular and flattened (image on right).

Image from "Shoulder Arthritis: An Owner's Manual". Xinning "Tiger" Li, M.D.; Paul Yannopoulos, B.A.; Jon JP Warner, M.D. Dec. 2012

Total (also known as full or complete) shoulder replacement (TSA) involves removal of the ball or humeral head of the shoulder joint and resurfacing of the socket, or glenoid, portion where the shoulder articulating surfaces are exposed, usually due to severe cartilage wear or joint damage.

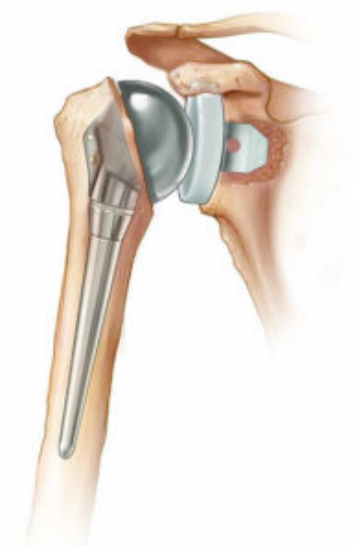
A reverse total shoulder replacement (rTSA) is designed specifically for the treatment of glenohumeral arthritis when it is associated with irreparable rotator cuff damage, complex fractures as well as for a revision of a previously failed conventional TSA in which the rotator cuff tendons are deficient.

In both replacement types, the ball and socket are replaced with metal and a durable plastic socket. As such, there is no more bone rubbing on bone, but rather metal articulating with a new plastic bearing, thereby re-establishing the joint mechanics and dimensions.

This guide is intended to provide information regarding total shoulder replacement, less invasive surgery, risks and benefits of the procedure, outpatient joint replacement, and state-of the-art surgical techniques.

THE EVOLUTION OF SHOULDER REPLACEMENT

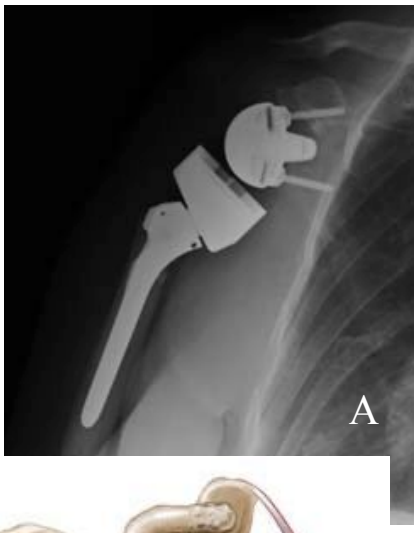
Prior to the availability of shoulder replacement surgery, shoulders with severe arthritis or other disorders were typically treated with medications and/or injections to manage symptoms, activity modification, and immobilization. While these treatment options could alleviate pain, each are associated with significant limitations and complications.



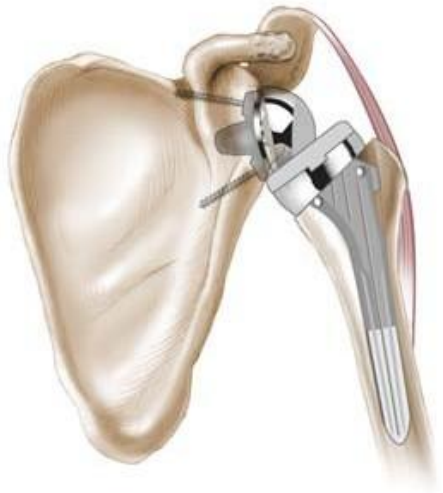
In a normal, or "anatomic" total shoulder arthroplasty, the ball and socket of the shoulder is replaced to mimic the shoulder's natural joint anatomy and mechanics. The humeral head or "ball" is replaced with a metal implant made of cobalt chrome and titanium which resembles the head's native size and anatomy. The glenoid, or "socket" is replaced with polyethylene (plastic) that is similar in size and shape to the natural glenoid anatomy. This procedure is typically indicated for patients with arthritis of the shoulder that have intact, or normal, rotator cuff tendons.

Image from "Shoulder Replacement Surgery." Mayo Clinic. Aug 18, 2021

The earlies recorded attempts at shoulder replacement occurred in 1893 when French surgeon Jules Emile Péan debrided a shoulder joint destroyed by tuberculosis arthritis and replacing the joint with a platinum and rubber replacement. In the 1930s and 40s, surgeons experimented with a variety of different materials to treat GH arthritis, but the modern age of total shoulder replacement began in the 1950s. In 1955, Charles Neer performed the first hemiarthroplasty, replacing a broken or fractured humeral head, and leaving the patient's own natural glenoid surface. This began to be used more generally in patients with GH arthritis as well. However, over time patients also began to develop arthritis on the glenoid surface as well, leading to the development of a polyethylene glenoid prosthesis in the 1970s.



However, while this helped to remedy the issue of GH arthritis, Neer noticed that patients with an insufficient rotator cuff had poorer outcomes. This led to the development of the reverse total shoulder replacement (rTSA) in which the components are reversed so that the "ball" is placed on the glenoid socket whereas the "socket" is placed on the humeral stem. The 1970s and 1980s saw a flurry of different designs based on this idea but in the end, it was the design of Paul Grammont that proved superior in 1985. His design is what most modern implant designs are based off today. The rTSA saw great success in Europe after its introduction, however, was not FDA approved in the USA until 2004.



The rTSA implant design acts as a fixed fulcrum which allows the deltoid to elevate the arm without a normal rotator cuff.

Image from "Shoulder Arthritis: An Owner's Manual". Xinning "Tiger" Li, M.D.; Paul Yannopoulos, B.A.; Jon JP Warner, M.D. Dec. 2012

Throughout the years, the materials used in shoulder replacement have continued to improve. The metal surfaces are often comprised of cobalt-chrome and titanium. The metals must be durable to last for years, if not decades, and must be well tolerated by the body. The humeral stem component (attaches to the inside of the upper arm bone) is made of titanium and the new "ball" or glenosphere head is made of cobalt-chrome (because it must be scratch-resistant), as it articulates with the plastic surface of the socket. The durable plastic is a highly crosslinked ultra-high molecular weight polyethylene that has properties to maximize strength while minimizing wear. It must be able to last the many years expected, and the many shoulder cycles expected throughout the patient's lifetime.

Historically, both the stem and socket components were cemented into place, similar to knee replacement prostheses. Over time, it was discovered that cementless, or "biologic", fixation allows bone ingrowth into the components. This biologic fixation can be rigid once ingrown and has the potential to be dynamic since bone can remodel unlike its cemented counterparts. However, cementless fixation requires initial rigid stability and time to allow the bone ingrowth process to mature and complete. In cases of severe osteoporosis or poor bone quality, the humeral stem can be fixed with cement, which eliminates fracture risk, and allows immediate stem fixation.

CONSIDERATIONS BEFORE SURGERY

While this operation is very successful, it is still a significant surgical procedure and a long recovery. While we encourage early passive range of motion, you are in a sling for approximately 4 weeks and while return to specific activities varies, generally return to full activities is not for around 4-6 months.

Whenever anesthesia is involved, there are potential risks. Preferred anesthesia for this procedure is general as well as a block to the arm known as an interscalene block. This involves numbing the arm from the shoulder down. Generally, all prospective patients would benefit from optimizing their health prior to any elective procedure.

LIMITATIONS, DISADVANTAGES, AND COMPLICATIONS

As impactful as a shoulder replacement is on improving quality of life, the components are limited because they are man-made. As such, while rare and unusual, there are limitations and risks to the procedure. First, while it may feel so, the shoulder replacement is not a "normal" shoulder. The implants are not made with the intention of withstanding significant shoulder forces from things like pushups, pullups, heavy weightlifting. So, it is important to limit strenuous, high impact activities of the shoulder to help preserve the life of the replacement. There are also lifetime lifting restrictions in which we advise no repetitive lifting of greater than 25lbs overhead and 50lbs from ground to waist in the affected arm. However, we encourage patients to remain active and participate in things such as swimming, golf, biking, walking, hiking, and more.

While our goal is to maximize your range of motion after this procedure, you may never gain a restored ROM of 180 degrees (full, normal ROM). Our goal is to achieve range of motion that would at least allow you to reach a low shelf or cabinet with ease. While patients typically can have a range of motion that allows them to reach more than a low shelf, this is not a guarantee.

Your internal rotation or range of motion up the back will also be restricted which may affect things such as hooking/unhooking a bra or passing a belt through posterior belt loops. This is to protect the shoulder, as excessive internal rotation puts the shoulder in a position of danger of dislocation.

Additionally, the artificial materials can be subject to loosening or wear. These failure mechanisms are infrequent, but possible. Bone ingrowth is reliable in over 98% of patients but loosening over time can occur. The plastic bearings can also potentially wear, though modern materials are so durable that this is rare. Polyethylene surfaces have been used for decades, with durability over 30 years in many cases. Most joint replacements will outlive the patient. Studies typically suggest that implant failure is less than 1% per year.

Specific risks to total shoulder replacement surgery include infection, bone fracture, joint stiffness, nerve or arterial injury, ligament or soft tissue injury, continued pain, fracture, heterotopic bone formation, shoulder instability, dislocation, or implant failure. These risks are rare, lower than 1% in most cases. Other surgical complications include heart attack, stroke, kidney failure, blood clot, pulmonary embolism, heart failure, bleeding, nerve palsy, and others. The most common complications are usually nausea or constipation from the pain medications. Some patients have pre-existing conditions that may increase their risk for a particular complication somewhat, and consultation is necessary to assess these risks.

THE FUTURE

Shoulder replacement is already a very successful procedure, but advances are continuing to be made on both the surgical as well as the recovery side. Newer implant designs are being developed that help to further improve the already great biomechanics of the implant to assist in increased strength and ROM. We also use a preoperative CT scan to create a patient specific 3D model which allows us to ensure optimal placement of the implant to ensure maximal stability and range of motion.

Improvements in pain management with a multimodal approach focuses on using many different medications at lower doses, to achieve an overall better analgesic effect. Advanced blood management strategies have essentially eliminated the need for blood transfusion, donation, or surgical drain use. Rapid recovery protocols have allowed 24-hour discharges, and in some cases same-day surgery.

REOPERATIONS

Revision shoulder surgery is infrequent but is required in some cases. If cement fails by loosening or fracture, or a cementless component loosens, a new component can replace the prior one. If the plastic wears, it can be changed in isolation, while leaving the surrounding metal components alone. Revision surgery is more complicated, takes longer to perform and recover, and is associated with an increase in complications and risks.

However, shoulder revisions can be performed safely. Everything is done to avoid the need for revision surgery in the future, but it can be performed safely when necessary.

CONCLUSION

Shoulder replacement surgery is one of the most successful procedures available in modern medicine. For patients with severe glenohumeral osteoarthritis with or without rotator cuff injury or other disorders, a shoulder replacement restores function and alleviates pain. Patients can return to most activities and regain their active lifestyle. Durability is expected to achieve excellent results for decades. Risks and complications are infrequent, and techniques and protocols are constantly modified to reduce risks even further.

Involvement with research and participation in meetings is essential to remaining current in these evolving techniques. Even with the success of current protocols, I continue to look for ways to improve patient outcomes and recovery. The purpose of this guide is to provide a general understanding of shoulder replacement surgery and the associated benefits and possible risks. Hopefully, the information presented has answered some questions, and possibly generated new ones. I recommend that you read this guide thoroughly, and at your leisure prior to your consultation. I recommend that you discuss it with your family or caretaker. Please feel free to contact us if you have any questions. You will be asked to sign and acknowledge that you have read and understood these materials prior to surgery. Please file a copy in your records and keep as a resource. Thank you for your interest and taking the time to read this guide. We look forward to meeting you soon.

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I have read this document entitled "Shoulder Arthritis & other Disorders: Surgical Treatment Options for the Painful Shoulder" under quiet conditions at my leisure away from Dr. Bonner's office. I have discussed the information with those family members I feel should be aware of it. I understand its contents and accept the inherent risks in the surgery described.

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Patient: Sign Your Name Here Print Your Name Here Date

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Witness: Sign Your Name Here Print Your Name Here Date