

Pyrocarbon Hemiarthroplasty (Partial Shoulder Replacement)

WHY MIGHT I NEED A HEMIARTHROPLASTY?

A hemiarthroplasty is a partial shoulder replacement that is used to treat degenerative and arthritic conditions of the glenohumeral (shoulder) joint in younger and higher-demand patients.

WHAT IS A HEMIARTHROPLASTY?

A hemiarthroplasty is a partial shoulder replacement where just the “ball” (humeral head) is replaced with a prosthesis. Traditionally, this has been done with a metallic (cobalt chrome) ball. With a hemiarthroplasty, there is no plastic “socket” piece like there is with an anatomic total shoulder arthroplasty (TSA). Patients who have a hemiarthroplasty have very few long-term restrictions and may lift weights and participate in high demand activities without the concern of wearing out a plastic socket.

WHAT IS A PYROCARBON HEMIARTHROPLASTY AND WHAT DOES IT LOOK LIKE?

A pyrocarbon hemiarthroplasty (PYC-HA) is a special type of hemiarthroplasty. Pyrocarbon is a hard ceramic-like carbon material that is placed on a graphite core. This material is much softer than cobalt chrome and more similar in “stiffness” to human bone. A PYC-HA has a metal stem that goes in the canal of the humerus and a pyrocarbon head that attaches to the stem (Figure 1 and 2).



Figure 1: X-ray of a pyrocarbon hemiarthroplasty



Figure 2: Pyrocarbon hemiarthroplasty implant

WHAT ARE THE BENEFITS OF PYC-HA COMPARED TO METAL HEMIARTHROPLASTY?

Historically, traditional metallic hemiarthroplasty provided unpredictable long-term pain relief and, due to the hardness of cobalt chrome, may erode the socket bone (glenoid).¹ This may lead to the need for revision (redo) surgery. In contrast, PYC-HA is much softer and leads to very minimal erosion of the socket and subsequently less pain and a lower risk of revision surgery.^{2,3,4} PYC-HA has been recently approved for use in the United States and the midterm results have been extremely encouraging both in the United States and overseas.^{2,3}

WHY MAY A PYC-HA BE A BETTER OPTION THAN AN ANATOMIC TSA?

While an anatomic TSA is a very successful surgery with good long-term outcomes, the outcomes are much less predictable in younger, high-demand patients, and the risk of needing revision surgery in these patients is much higher compared to older and lower demand patients. In young patients, the cause of failure of an anatomic TSA is most often related to the plastic socket wearing out with heavy use.

In patients under the age of 60 who have an anatomic TSA, the 10-year survivorship (or chance you will still have your original implant at 10 years) has been reported to range between 62-85%.⁵⁻⁷ This rate continues to decrease at longer follow-up. Because of this, it is Dr. Schuette's preference to treat younger and high-demand patients with a PYC-HA rather than an anatomic TSA. Additionally, after a patient has fully recovered from a PYC-HA, there are no lifting or activity restrictions.

HOW LONG WILL MY PYC-HA LAST?

While we are still gathering long-term data for PYC-HA, mid-term survivorship has been very encouraging. Two separate studies have shown 7-year survivorship to be 97% in younger, active patients.^{2,3}

WHAT PERCENTAGE OF PATIENTS ARE SATISFIED AFTER A PYC-HA?

At mid-term follow up, patient satisfaction after PyC-HA has been reported to be 90-98%.^{2,3,8} Additionally, high rates of return to sport and work are also experienced.⁹

HOW WILL MY GLENOID (SOCKET) BE MANAGED DURING SURGERY?

With osteoarthritis, there can often be wear on the socket which makes the socket uneven with irregularities and ridges. If this is the case, Dr. Schuette will perform a "glenoidplasty" where he uses a burr to remove any irregularities and ridges. This creates a smooth, and concave surface for the PYC-HA to move on. Additionally, he may drill small holes in the glenoid bone. This releases the venous pressure in the bone which may improve pain. Drilling the bone may also promote new cartilage growth.

DO I NEED ANY SPECIAL TESTS BEFORE MY PYC-HA?

In addition to normal preoperative labs, Dr. Schuette will obtain a CT scan of your shoulder. This allows him to virtually plan and perform your surgery ahead of time. This is done by using a special computer program (Figure 3). By doing this, Dr. Schuette is able to better understand each patient's individual anatomy and plan for the appropriate implant sizes. This has been a great tool in Dr. Schuette's practice and allows him to personalize each patient's shoulder replacement.



Figure 3: A virtual plan for a pyrocarbon hemiarthroplasty

WHAT ARE THE MOST COMMON COMPLICATIONS AFTER A PYC-HA?

The most common complications following PYC-HA include glenoid bone erosion, persistent pain, rotator cuff dysfunction, and a deep shoulder infection known as a periprosthetic joint infection (PJI); however, these all occur at very low rates.

While glenoid bone erosion and incomplete pain relief are concerns with traditional metal HA, this has not been a significant issue following PYC-HA. In one of the longest follow-up studies, the average patient pain score was noted to be a 1 on a scale of 0-10.³ Additionally, the rate of glenoid erosion after PYC-HA has been noted to be much less than what is reported following metallic HA.^{2,3,8}

Like a normal shoulder, rotator cuff tears can negatively affect the function and outcomes of patients with a PYC-HA. Many patients with rotator cuff dysfunction may function without significant issues; however, revision surgery may be needed if pain or dysfunction becomes an issue.

PJI, or deep shoulder infection, occurs in about 1% of patients following shoulder arthroplasty.¹⁰ While rare, if a PJI does occur following PYC-HA, revision surgery may be needed to remove and then reimplant a new shoulder replacement. Because of this, we take several preoperative, intraoperative, and postoperative measures to minimize our patients risk of PJI.

FREQUENTLY ASKED POSTOPERATIVE QUESTIONS

How long will I stay in the hospital or surgery center after a PYC-HA?

Most patients will stay in the hospital or care suite for 1 night. If needed, a hospital stay more than 1 night may be appropriate. Occasionally, patients may go home the same day of surgery.

What type of anesthesia is used for a PYC-HA?

An interscalene brachial plexus nerve block along with general anesthesia is typically used for shoulder replacement surgery. You can discuss options for anesthesia with your anesthesiologist prior to surgery. A nerve block numbs the shoulder and arm during and after surgery. Depending on the type of block, this may last between 12 hours and 3 days.

How is surgical pain managed?

Pain after a surgical procedure is unavoidable but appropriate pain medication and ice therapy is implemented to manage pain. Additionally, your interscalene brachial plexus nerve block will help with immediate post operative pain. Most patients successfully manage pain with narcotics, Tylenol, anti-inflammatory medication, and ice. It is our goal to wean patients off narcotic medication within 1-2 weeks.

How long do I need to wear a sling?

The sling is meant to protect, not strictly “immobilize” the arm. The sling should be used intermittently for approximately 6 weeks after surgery; it is especially important to sleep in the sling and use it when out in a public place the first 6 weeks after surgery. Unless instructed otherwise, the sling should be removed at least 3 times a day to bend and straighten the elbow as well as perform passive shoulders motion exercises. Performing gentle hand exercises such as lightly squeezing a ball helps minimize swelling that can occur in the hand and fingers.

What are common problems experienced immediately after surgery?

Most people have some difficulty sleeping after shoulder surgery. In most cases, though, patients have also experienced sleep disturbances from their shoulder prior to surgery. Sleeping in a recliner or propped up on pillows can help. Over time, most people are able to sleep on the side that was operated on and will find that their overall sleep is significantly improved compared to prior to surgery.

Is physical therapy necessary after my shoulder replacement?

During the first week following surgery, physical therapy (PT) will not be needed. However, you will be instructed on gentle passive shoulder range of motion exercises that may be performed during the first few weeks. At your first postoperative visit you will be provided with a PT order. We believe seeing a physical therapist is important, so the progression of activity is done in a safe manner, leading to the best possible result.

When can I start strengthening after my shoulder replacement?

While you will be able to progress your active motion and progressively return to light daily activities at 6 weeks, we refrain from any strengthening until 3 months. At 3 months, light strengthening will be allowed with progressive strengthening at 4.5 months.

With a PyC-HA, the subscapularis tendon (rotator cuff tendon in the front of the shoulder) is repaired at the end of the procedure. Healing of the subscapularis is paramount to having a successful outcome following a PyC-HA. As a guideline, one can assume that the strength of the repair is only 30% of normal at 6 weeks postop, 50% of normal at 3 months postop, and improves to 80% of normal at 6 months postop.¹¹ Because of this, we take a slow and gradual approach to strengthening in order to maximize our patient outcomes.

When can I go back to my regular daily and physical activity?

The answer to this question varies for every individual depending on the activity. Cardiovascular exercise is important and encouraged after surgery; walking or riding a stationary bike without putting pressure on the operated arm are good activities to begin within the days or weeks after surgery. Most patients are able to independently perform all activities of daily living at 2-3 months following surgery.

When can I go back to work?

If work is more sedentary, such as computer-based work, returning a few days or weeks after surgery may be reasonable. For more physically demanding jobs it is important to discuss job requirements with Dr. Schuette to fully understand how the surgery may impact returning to work. Returning to a physically demanding job may take 4-6 months.

When can I return to activities such as golf, racket sports, jogging, and swimming?

In general, you will be allowed to chip and putt 3 months after surgery and return to full golf activities at 6 months. A similar progressive return to racket sports is recommended. Light jogging is allowed around 2-3 months after surgery. Swimming is allowed once full active shoulder range of motion has been achieved and light strengthening has begun; this is typically 3 months after surgery.

What is the typical rehab protocol following PYC-HA?

Please see Dr. Schuette's "Universal Shoulder Protocol" on his website: TCOmn.com/Hayden-Schuette

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