

# Problems Unique To the Reverse Total Shoulder Replacement

Shoulder joint replacement surgery (also called shoulder arthroplasty) is a great treatment for many people with shoulder pain from arthritis. But patients who don't have enough muscle function to stabilize the joint may not be able to benefit from the traditional implant design -- one that mimics the normal anatomic shoulder.

Instead, a different type of shoulder replacement, called reverse shoulder replacement has been developed. And it has worked so well, surgeons have expanded the number and types of patients who can qualify for this type. The reverse shoulder replacement does exactly as the name suggests: reverses the socket and the ball, placing the ball portion of the shoulder where the socket used to be and putting the socket where the ball or humeral head would normally be.

This new design gives a much more stable shoulder joint that can function without an intact rotator cuff. The artificial joint itself provides more stability by creating a deeper socket that prevents the ball from sliding up and down as the shoulder is raised. Shear forces are transformed into compressive forces. This simple change allows the large deltoid muscle that covers the shoulder to lift the arm. The result is a shoulder that functions better, is less painful, and can last for years without loosening.

That's the positive side of things. There are some problems that are unique to the reverse total shoulder replacement. The three most common problems with reverse shoulder replacements are neurologic injury, bone fracture around the implant, and hematoma (pocket of blood or other fluid trapped inside the joint). Other reported problems include infection, dislocation, baseplate failure, and fracture of the acromion (piece of bone from the shoulder blade that curves over the top of the shoulder).

The best way to handle these problems (referred to by surgeons as best practice) has not yet been determined. Likewise, the long-term results in patients who have a reverse shoulder arthroplasty are not available yet. For now, it seems an understanding of implant design, shoulder anatomy, and common complications will help the surgeon avoid problems and avoid failed surgeries.

Let's take a closer look at some of the more common problems. The first and potentially most damaging is neurologic injury. Cutting or pulling (traction) on the nerves to the arm can cause loss of sensation of the arm, hand, and/or fingers. Sometimes the reverse shoulder implant puts strain on the group of nerves to the arm called the brachial plexus. In other cases, the implant can displace (push aside) the nerve plexus creating loss of sensory and/or motor function of the arm. One other cause of nerve damage is scar tissue that can press (compress or impinge) nerves of the brachial plexus causing similar problems with sensation and movement.

Periprosthetic fracture is a break in the bone around the implant. Most of these fractures occur during the surgical procedure as the surgeon prepares the bone to receive the implant. The surgeon must be very familiar with the implant itself, its design and how it's supposed to work, as well as the best way to hold the implant in place. The surgeon must be careful when handling the patient's arm during the procedure. Extreme shoulder positions in a patient with weak or brittle bones can contribute to bone fractures.

Hematoma (blood trapped in the joint) is another common complication that doesn't have a single cause but many possible causes. Proper placement of the implant is necessary to avoid fluid collection in empty areas or what are called dead spaces. Sometimes patients develop pathways of drainage called sinus tracts at the incision site where blood and fluid can pool causing a hematoma. Studies have also shown that infection and hematoma are linked.

Up to 10 per cent of all patients receiving a reverse shoulder arthroplasty develop a serious infection. Risk factors include multiple previous surgeries, a large-sized dead space, poor sterile technique, and revision (second)

surgeries on the reverse implant. Surgeons use two methods of prevention for infections. One is to give the patient antibiotics just before the procedure. The other is to use cement that has antibiotic in it.

When these efforts fail and the patient develops an infection, then antibiotics specifically for the bacteria present are the treatment of choice. Infections that do not clear up with antibiotics may have to be treated surgically. The surgeon rinses the joint thoroughly with a saline (salt-based) solution and scrapes away any visible infection. This procedure is called irrigation and debridement. Sometimes it is necessary to remove part of the implant called the liner and replace it with a new one.

The simple act of reaching behind to scratch the middle of your back or (for women) undoing a bra-strap can dislocate a reverse shoulder implant. This action places the arm in a position of extension, adduction (arm close to the body), and internal rotation.

Any imbalance in the muscle tension around the shoulder or unusual shape of the shoulder socket can contribute to a dislocation with this motion. Placing the wrong sized socket or wrong sized round head that fits in the socket (or a mismatch of the two components) are additional reasons why dislocation can occur. Revision surgery may be the only way to treat this problem. But first, the surgeon will try putting the shoulder back in the socket and then placing the patient in a sling for three to six weeks. Patients are cautioned to avoid shoulder extension, adduction, and internal rotation (those motions that can flip the shoulder out of joint) until fully healed.

Finally, baseplate failure is a design problem that surgeons and manufacturers of reverse shoulder implants are working on. The baseplate is part of the round component that attaches to the shoulder where the socket used to be. If the patient's bone doesn't grow in and around the baseplate, the shoulder joint may not be secure or stable.

Makers of the implants have provided locking screws that can be angled into the denser bone to help prevent the problem of baseplate failure. A central screw (right through the middle of the bone) also helps anchor the humeral prosthesis in place. Other design features under investigation include using thicker screws, a tilted baseplate, and offsetting the center of rotation.

In summary, reverse shoulder arthroplasty has been around now for the last 10 - 12 years. They have worked well enough that surgeons now use them more routinely with a wider range of patients. The main use of reverse shoulder arthroplasty is for older adults with large rotator cuff tears. Fractures and failed traditional shoulder replacements are two other reasons why reverse shoulder arthroplasty might be used.

As with any surgery (and especially joint replacement procedures), there are potential problems and complications that can develop. Surgeons who know the possible pitfalls can take measures to prevent them whenever possible. Changes in implant design will continue to improve outcomes. We are all waiting for long-term results to be reported. Studies following patients over 10, 15, and 20 years will give us the kind of feedback needed to improve survival rates and prevent problems associated with this procedure.

Reference: Emilie Cheung, MD, et al. Complications in Reverse Total Shoulder Arthroplasty. In Journal of the American Academy of Orthopaedic Surgeons. July 2011. Vol. 19. No. 7. Pp. 439-449.