Robotic Knee Surgery:

Advanced Relief for Those Aching Joints

By: Jon S. Dounchis, M.D.

Do your arthritic knees slow you down? Are you giving up some of your favorite activities because your arthritic joints won't keep up? Do you have difficulty with that exercise program that is so important for your global health?

Osteoarthritis, otherwise known as "wear and tear arthritis," affects 43 million Americans, and is the most common type of arthritis. Nearly one-half of individuals will suffer from knee arthritis during their lifetimes. Where bones meet to make joints, as in the knee, their surfaces are covered by cartilage. Cartilage is an extraordinarily smooth tissue that allows a normal joint to move with minimal friction. In fact, the coefficient of friction of cartilage rubbing against cartilage is less than 1/200 of an ice cube rubbing against another ice cube. Unfortunately, that cartilage covering can wear off the surface of the bone, just like the tread wears off a tire, leading to exposed bone rubbing on exposed bone; this is the nature of osteoarthritis. The signs and symptoms of arthritis include pain, swelling, stiffness, deformity, grinding, catching, giving-way and weakness. Because these symptoms are generally aggravated by activity, particularly higher-impact activity, individuals suffering from osteoarthritis tend to reduce their activity levels over time to the tolerance of their joints. This can be a slow progression that sneaks up on you insidiously, or an acute flare that brazenly grabs your attention. Either way, your aching knee just can't keep up.

What to do for that knee? Mild arthritis often responds to anti-inflammatory medication, Tylenol, physical therapy, a focus on non-impact exercises, cortisone injections, visco-supplementation injections, rest, icing and activity modification. When these remedies fail, the arthritis progresses, your function and activity declines, it is time to consider other alternatives.

For some individuals with mild knee arthritis and mechanical symptoms, knee arthroscopy can be a useful next step. However, many individuals' knee arthritis will not respond well to arthroscopy, but may not be severe enough for a complete (total) knee replacement. It is for those knees in the "middle range" that robot-assisted partial knee replacement (Makoplasty TM) can be most effective. When only one or two of the three knee compartments is affected by arthritis, it is possible to resurface just the arthritic part of the knee, leaving intact the valuable ligaments of the knee and the rest of the normal cartilage and bone. This is an inherently much more conservative solution to a traditional total (complete) knee replacement, and offers a more naturally feeling result as well. Partial knee replacements have performed well for decades but require precise

placement for optimal function and durability, a goal that is sometimes elusive with traditional surgical techniques or even computer navigation. Fortunately, new robotic technology has been applied to partial knee replacement to yield more consistent results: MakoplastyTM. Mako is the name of the company that designs and manufactures the RIO platform robot that assists the surgeon. Here's how it works.

Once the surgeon and patient determine that a Makoplasy may be the right option (based on clinical symptoms, exam findings, and radiographs taken in the office) a CT scan is performed. The CT data is put in to the computer to form a 3-D model of the patient's knee. Prior to the actual operation, the partial knee components are ideally positioned on the bone surface in this virtual computer world. Once in the operating theater, the patient's knee is registered and taken through a range of motion. This allows the surgeon and computer to assess how tight or loose the knee is in extension (straight) or flexion (bent) before any bone preparation. The partial knee components are adjusted again so that the knee is equally balanced through the range of movement. Once all the adjustments have been made in 3D virtual computer space, the robotic arm allows the surgeon to precisely prepare the bone to be resurfaced with the partial knee components, exactly as planned on the computer. Compared to traditional techniques, the Rio robotic system also facilitates the resurfacing of two compartments if necessary.

In summary, the advantages of the RIO robotic platform manufactured by Mako are: ligament and bone preservation of a partial knee replacement, component positioning and knee balancing in a virtual 3D computer realm prior to bone preparation, and precise execution of the plan with the robotic arm. This is done with a minimally invasive approach, cosmetic incision, minimal blood loss, less scaring, a short one night hospital stay, accelerated rehabilitation and return to activities with the benefit of a more naturally functioning knee.

Fortunately for Naples residents, and thanks to Joe Pinion, CEO at Physician's Regional Medical Center, the RIO is presently in use at the Pine Ridge facility.

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