Total Hip Arthroplasty

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Total hip replacement (THR) or total hip arthroplasty was first performed in 1960 and remains today as one of the most successful surgical endeavors at restoring function and quality of life. Hip replacement involves removing diseased or damaged bone where the femur articulates with the pelvis and replacing with an artificial prosthesis.

Currently there exist several options regarding prosthesis type, bearing surfaces, full replacement versus resurfacing, and approaches to putting the hip in place. I will briefly explain how I perform hip replacement and the rationale I use to decide what techniques and components I feel are the very best for my patient population.

Hip Resurfacing versus Total Hip Arthroplasty:

Hip resurfacing is not a new concept. First attempted in the 1970's it was abandoned due to unacceptably high failure rates. Advances in metallurgy have caused a resurgence in resurfacing through metal-on-metal designs. The potential advantage over standard hip replacement (the gold standard) is preservation of some of the bone of the femur, larger femoral head sizes more closely resemble the native hip, lower dislocation rates, and potentially easier revision when components wear out. Disadvantages unique to resurfacing are; inability to modify leg length, fracture of the femoral neck, and osteonecrosis (the bone under the resurfaced cap can die). Another problem, which is receiving a lot of attention, are concerns about metal-on-metal articulation which I will discuss below. Contraindications to receiving resurfacing are; osteoporosis, advanced age (typically used in patients under 60), femoral head size less than 50mm, patients with metal hypersensitivity, and patients with renal problems. Higher failure rates have also been seen in patients with body mass index over 35, tall patients, female patients, and patients with bone cysts greater than 1 cm. Evidence suggests that there exist no significant differences in activities allowable between resurfacing and total hip replacement.

Press-fit Versus Cemented Implants in Hip Replacement:

Advances in our understanding of how bone attaches or adheres to the implant have led us to conclude that press-fit designs may outperform cemented stems. There can at times be some thigh pain associated with press-fit stems while the bone is growing into the stem. Cemented stems do have a good track record but I now reserve them for instances where the bone quality is suspect (ex. osteoporosis) or where fracture of the bone has occurred.

Bearing Surfaces:

There exists no perfect bearing surface and none perform as well as the normal lubricated articular surface cartilage. However, advances in bearing surfaces is one of the most important advances that have increased the longevity of hip replacement implants. The most common bearing surfaces are: ceramic-on-ceramic, ceramic-on-highly cross-linked polyethylene, cobalt chromium (metal)-on-highly cross-linked polyethylene, metal-on-metal.

Ceramic-on-ceramic: linear wear per year is 0-3 micrometers, runaway wear has not been reported, no metal ions released, no cellular toxicity, no hypersensitivity, no chromosomal changes, squeaking and clicking have been reported, no seizing has been reported, fracture of components has occurred.

Metal-on-metal: linear wear per year is 5 micrometers, runaway wear has been reported, metal ions are released and are detectable in the blood and urine, cellular toxicity and chromosomal changes have been reported (no direct evidence of carcinogenicity), squeaking and seizing have occurred, no fracture of components.

Metal-on-highly cross-linked polyethylene: linear wear per year 10-20 micrometers, no runaway wear, no ion release, no cellular toxicity, no hypersensitivity, no chromosomal changes, no squeaking, no seizing, no fracture.

Ceramic-on-highly cross-linked polyethylene: Same findings as metal-on-polyethylene however the linear wear appears to be lower (estimated 30-40% over metal on poly). Recent evidence has concluded that wear of ceramic on highly crossed linked polyethylene is very similar to ceramic on ceramic

I typically prefer ceramic coupled with highly cross-linked polyethylene. The wear difference between the surfaces is negligible and the overall performance and safety appear maximized. Recently there have been grave concerns regarding metal-on-metal articulations and a few have been recalled. ALVAL (atypical lymphocytic vasculitis-associated lesion) is a delayed type hypersensitivity that can occur and cause pain and failure of a metal-on-metal implant. Further, patients with metal hypersensitivity or advanced renal disease should not receive metal-on-metal.

Approaches:

There are several approaches to placing a hip replacement and ultimately the approach used is not as important in the longevity of the implant as is the appropriate placement of the components. The most common approaches are posterior, anterolateral and the direct anterior approach. I am well trained and proficient at the posterior and anterior approaches. I have performed the anterolateral approach in a few instances when specific patient factors made that approach more appropriate. Currently I favor the direct anterior approach. The direct anterior

approach is a muscle sparing approach and I believe the most minimally invasive of the approaches. I find the advantages of the anterior approach to be; more accurate placement of components and therefore less risk of leg length disparity, less risk of sciatic nerve injury, lower dislocation risk, limited or no need for post-operative motion restrictions, better range of motion, less muscle damage and faster recovery. Disadvantages reported include; greater risk of fracture of the femur, more blood loss during surgery, and injury to a sensory nerve to the lateral (outside) of the thigh. I personally feel the benefits outweigh the risks and feel fracture risk is similar to other approaches (has more to do with bone quality and type of stem used) and my blood transfusion rate with the anterior approach is below national average for all hip replacements.

Therapy:

Therapy goals after total hip replacement are very similar with a few key exceptions for the direct anterior approach. All hip replacements should engage in physical therapy to decrease pain, improve gait and balance, restore range of motion and strength, and work on swelling issues. The first day is focused on getting out of bed/transferring and ambulation. Sets of moderate intensity isometric exercises for the gluteal and quadriceps muscles as well as ankle pumps are begun. Cryotherapy (cold therapy) is very useful in decreasing pain and is best used before and after therapy. I allow weight bearing as tolerated for almost all hip replacements (there are a few exceptions). For the posterior approach; an abduction pillow is occasionally used, the patient is not to flex the hip past 90 degrees, no internal rotation past neutral, no resisted hip abduction and no adduction past midline for 6 weeks. For the anterior approach the only exercise cautioned against is aggressive straight leg sets as this can cause iliopsoas tendonitis (I allow the patient to restore straight leg raise at their own pace, if it doesn't hurt, they can do it). Use of a stationary bike has been found to be strongly beneficial to total hip patients so I encourage its use as soon as the patient feels up to it.

For additional information:

www.arthritis.org
www.aaos.org
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