

As the year 2007 concludes the Arthritis Institute gives blessings for the following advances in total hip and total knee replacement surgery, some of which it's research contributed to:

- I. The posterior minimally invasive surgery technique (developed in part by Dr. Dorr) had the best evidence-based medicine results of all published results of small incision surgery.
 1. Pagnano and colleagues from the Mayo Clinic in Rochester, Minnesota compared, in randomized prospective studies, Dorr's posterior operation to an anterior "no muscle cut" approach (two incisions) and found better recovery times and better patient satisfaction with the posterior small incision operation.

Pagnano MW, Trousdale RT, Meneghini RM, Hanssen AD. Patients preferred a mini posterior THA to a contralateral two-incision THA. Clin Orthop Relat Res. Dec 2006;453:156-159.

Pagnano MW, Trousdale RT, Meneghini RM, Hanssen AD: A randomized clinical trial shows that 2-incision total hips do not recover faster than mini-posterior total hips. J Bone Joint Surg Am 2008: accepted/in-press.

2. The anterior "no muscle cut" operation had no better muscle function at six weeks and three months postoperative compared to the posterior incision, as measured by gait analysis (walking studies).

Malik A, Dorr LD. The science of minimally invasive total hip arthroplasty. Clin Orthop Relat Res. Oct 2007;463:74-84.

Comparison of Gait Analysis Results Preoperatively at 6 Weeks and 3 Months in Relation to Different Surgical Approaches*

Gait Velocity	Anterolateral MIS	Anterior MIS	Posterior Standard	Posterior MIS
(m/min)	(N = 11)	(N = 10)	(N = 18)	(N = 30)
Preoperative SS velocity	60.6 ± 2.4	62.8 ± 3.4	56.9 ± 2.1	62.8 ± 1.3
6-week SS velocity	62.3 ± 6.6	54.4 ± 9.8	61.4 ± 13.0	66.5 ± 13.5
3-month SS velocity	71.5 ± 7.9	63.8 ± 10.8	69.1 ± 11.9	69.2 ± 11.1
Preoperative FST velocity	81.7 ± 5.3	70.6 ± 2.6†	69.9 ± 4.2†	80.4 ± 3.9
6-week FST velocity	80.0 ± 8.6	72.6 ± 7.1	71.8 ± 18.4	77.1 ± 14.5
3-month FST velocity	91.8 ± 14.8	82.7 ± 19.6	81.8 ± 19.8	82.7 ± 13.8

*Mean ± standard deviation; †significantly different from anterolateral MIS; MIS = minimally invasive surgery; SS = self-selected velocity; FST = fast velocity

At 6 weeks and 3 months postoperatively, there were no differences between groups in terms of velocity, cadence, stride length, single-limb support time, or double-limb support time. The amount of surgical soft tissue trauma appeared not to change the recovery of postoperative gait function.

3. Our research with a randomized blinded prospective study, in which our patients participated, proved posterior minimally invasive surgery had less pain and faster recovery than a posterior long incision.

Dorr LD, Maheshwari AV, Long WT, Wan Z, Sirianni LE. Early pain relief and function after posterior minimally invasive and conventional total hip arthroplasty. A prospective, randomized, blinded study. *J Bone Joint Surg Am.* Jun 2007;89(6):1153-1160.

4. There were no evidence-based scientific comparative studies showing benefits of any anterior (“no muscle cut”) operation.

Our conclusion is that surgeons who operate anterior, and do so well, should use that operation. However, any claim that the anterior “no muscle cut” operation is less invasive, or provides better recovery, have no scientific basis and should be considered only marketing statements.

II. The patient care model of the Arthritis Institute has been studied by several visiting orthopedic surgeon groups. This model is unsurpassed in its patient results which have been published.

1. First, the pain management is the best program yet developed for total hip and total knee recovery according to published results. The average pain score of total hip patients on discharge is between 1 and 2 on a scale of 10. For knees, it is between 2 and 2.5. Vomiting occurs in only 1-3% of patients. For results see:

Dorr LD, Long WT. Multimodal analgesia without parenteral narcotics for total knee arthroplasty. *J Arthroplasty.* In press.

Maheshwari AV, Boutary M, Yun AG, Sirianni LE, Dorr LD. Multimodal analgesia without routine parenteral narcotics for total hip arthroplasty. *Clin Orthop Relat Res.* Dec 2006;453:231-238.

2. There have been no deaths from pulmonary embolism in this decade among patients from the Arthritis Institute. The occurrence of a symptomatic blood clot is 0.4%, and most occur in patients with a history of previous blood clots. This data is published in:

Dorr LD, Gendelman V, Maheshwari AV, Boutary M, Wan Z, Long WT. Multimodal thromboprophylaxis for total hip and knee arthroplasty based on risk assessment. *J Bone Joint Surg Am.* Dec 2007;89(12):2648-2657.

3. With hip replacement we have six infections in 2053 primary total hip replacements (0.3%) since 2001. With knees we have 9 infections in 2199 primary total knee replacements (0.4%) in the same time period.
 4. Our nurses had no documented medical errors in caring for our postoperative patients in 2007. Home physical therapy visits by our therapists, (who have also cared for the patients in the hospital) improved recovery. These nursing care and physical therapy recovery programs for our patients are not exceeded by published data from any joint replacement center.
- III. The Durom (Zimmer) large head metal-on-metal articulation surfaces have had worse results than metal or ceramic heads articulating with highly cross-linked polyethylene. There has been more pain and more revision of cups, both in our experience and internationally. The best results have been with the Birmingham metal-on-metal articulations. We have also had good results with the Biomet metal-on-metal articulation surfaces.

Our experience with the Durom large head metal-on-metal articulation shows 5% revision within one year of operation. This may be caused by hypersensitivity to metal-on-metal or poor fixation of the cup design. The Australian Registry shows failure of Durom (Zimmer) at 4-5% and the ASR cup (Depuy) at 4-5%. The Birmingham cup has failure less than 1%.

Dr. Long continues to use metal-on-metal articulations of Biomet and has advised Zimmer to redesign the Durom metal-on-metal cup with a hemisphere shape and add hydroxyapatite to its surface to improve fixation.

A predictable articulation that seems to be the most comfortable at this time is ceramic or metal against highly cross-linked polyethylene. The wear is so low with this articulation that a total hip replacement can be expected to last 25-30 years when performed correctly with these materials. Highly cross linked polyethylene is also used by the Arthritis Institute for total knee replacement.

Dorr LD, Wan Z, Shahrदार C, Sirianni L, Boutary M, Yun A. Clinical performance of a Durasul highly cross-linked polyethylene acetabular liner for total hip arthroplasty at five years. *J Bone Joint Surg Am.* Aug 2005;87(8):1816-1821.

Wan Z, Boutary M, Dorr LD. The influence of acetabular component position on wear in total hip arthroplasty. *J Arthroplasty.* In Press.

IV. The use of computer navigation has provided consistently predictable and reproducible results for the surgeons at the Arthritis Institute. Dr. Dorr has developed the computer software program for total hip replacement with Orthosoft which was recently purchased by Zimmer. This computer program allows accurate placement of

the femoral and acetabular components to mate the two in the correct position to minimize wear and maximize stability. The leg length of the hips can be most accurately measured with the computer. The offset of the hip, which is the relationship of the femur to the pelvis, can also be most accurately measured with the computer. Therefore, computer navigation for the hip has been shown by studies published by the Arthritis Institute to be better than what even an experienced surgeon can produce using his experience and judgment, or intraoperative x-rays.

Dorr LD, Malik A, Wan Z, Long WT, Harris M. MD Precision and Bias of Imageless Computer Navigation and Surgeon Estimates for Acetabular Component Position. *Clin Orthop*. 465:92-99, December 2007.

Dorr LD, Malik A, Wan Z. Combined Anteversion Technique for Total Hip Arthroplasty. *J Bone Joint Surg*. In Press

Zhu J, Wan Z, Dorr LD. Effect of pelvic tilt on acetabular component placement in total hip arthroplasty. *J Bone Joint Surg*. In Press.

Dr. Long and Dr. Harris also use the computer navigation for total knee replacement. Dr. Long has refined this technique so it is a very simple and not a time consuming technique which verifies the position of the implants to allow predictable mating of the implants in the knee, just as the navigation allows predictable mating of the implants in the hip. This will improve tracking of the implants which improves range of motion, comfort, and longevity.

- V. Total knee replacement continues to be a durable operation with results expected to last, like hips, 25-30 years. The comfort of total knee replacement, in our patients, has improved with the use of the new gender based designs which have been modified to fit the bone better, improve patella tracking, and improve range of motion. Our prospective study is in the final six months of patient followup (some of the patients at the Arthritis Institute are included in this study). The design we use most often is the Natural Knee and sometimes the NexGen knee, both manufactured by Zimmer. Dr. Dorr has participated in the design teams for both the Natural knee and NexGen gender knee designs. We do not use mobile bearing knees, as marketed by Johnson and Johnson DePuy, because there is no evidence-based improvement in results, performance, or durability for at least as long as 10 years postoperative. They cost \$2,000 to \$3,000 more and therefore inflate healthcare costs without any known benefit.