ANDERSON ORTHOPAEDIC RESEARCH INSTITUTE

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Awards go to Research About Life After Surgery

What can patients expect after a hip replacement?

Collaborating in a study with surgeons from four other joint replacement centers, Dr. Andy Engh investigated an issue that has been somewhat overlooked in orthopaedic research and one that many patients have wondered about — sexual function after hip surgery. Led by Dr. Ryan Nunley of the Washington University School of Medicine in Saint Louis, Missouri, the multi-center study also assessed another quality-of-life issue that is increasingly important to hip patients, the ability to return to work.

"We needed to re-examine both topics," says Dr. Andy. "The number of younger hip patients is growing, and they often have expectations for a higher level of activity after their hip arthroplasties."

Age aside, many patients hope to return to normal sexual function, and current post-surgery scoring systems just don't measure this factor.

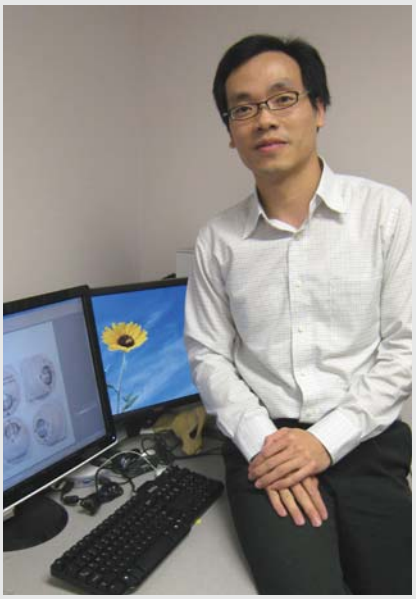
The researchers got their answers to both sets of questions through a survey of 943 hip arthroplasty patients from the different centers. With respect to sexual function, they investigated whether patient responses were related to different surgical procedures or components, for instance, whether a person had a total hip replacement or a hip resurfacing procedure.

In the final analysis, no difference was found between surgical factors and a patient's ability to return to sexual activity, the quality of sexual activity, or the feeling of hip instability during sex after surgery (see Table 1, page 9).

They found that after a hip replacement patients tend to return to more frequent sexual activity or to their previous level. Most patients also reported higher levels of satisfaction and very little hip instability. Females were more likely than men to report increases in frequency and quality of sex.

See Results page 9

Inside:



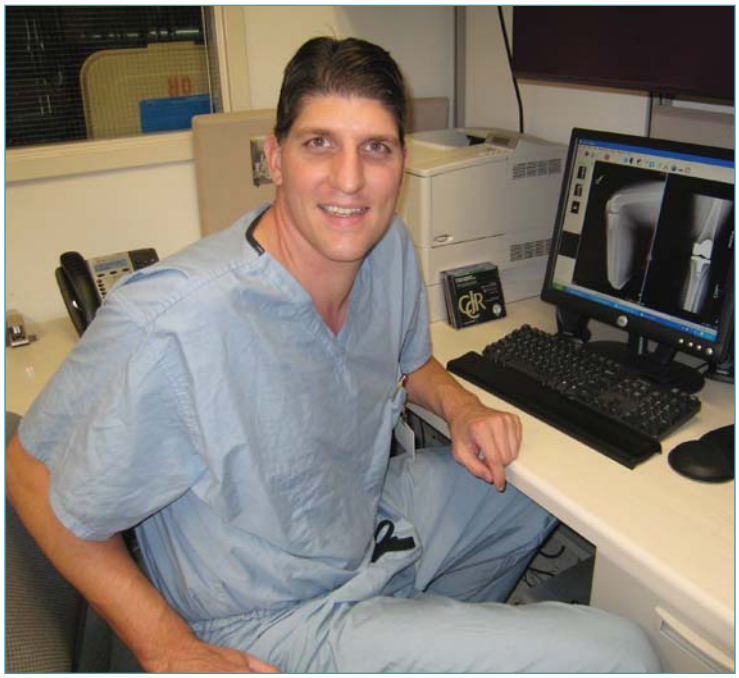
Time Flies

Henry Ho, one of AORI's research project managers, has provided expertise to a variety of research projects for the past five years. With a Masters in Biomedical Engineering, Henry is supporting Dr. Andy Engh's and Dr. Kevin Fricka's continuing investigations into metal-on-metal hip implants. Based on AORI's data, about 0.5% of patients with metal-on-metal components have developed local tissue reactions. Engh and Fricka are investigating retrieved components to discern possible causes. Henry has developed a method whereby they can analyze the components from images on their computers. Ready to take on any challenge, Henry is much appreciated by everyone at AORI.

Trying for a Life-long Knee Replacement

Could a new knee implant be more durable than today's gold standard? Could it last a patient's lifetime?

These are questions Dr. Kevin Fricka is setting out to answer in a new AORI study comparing the performance of cemented knee replacements — today's gold standard — with that of recent trabecular knee implants. The main difference between these components is how they adhere to a patient's bone. As the name implies, cemented components are cemented in place. The bond for trabecular tibial implants is achieved through bone ingrowth. Composed of metal that mimics the sponge-like, yet strong, structure of bone, trabecular implants contain pores and channels into which bone grows. According to Fricka, such ingrowth has the potential to create a life-long bond. Most cemented knee replacements last 15 to 20 years; learning whether trabecular knees can meet or surpass that benchmark means Fricka will be following the patients in this study for 5, 10 and 15 years after their surgeries.



Q. Dr. Fricka, why did you decide to undertake this long-term research?

FRICKA. Although cemented knee replacements are very durable, a leading cause for their failure is component loosening after years of use. Cementless knee components have the potential to minimize component loosening by forming a more durable bond through bone ingrowth. Two-year outcome studies have shown that trabecular tibial components have excellent fixation, so when they became available for clinical use, I wanted to learn how they would compare with cemented knees.

We fully expect that patients in our study will report no difference in how the prostheses feel. Still, we are evaluating short-term performance to make sure there is no increase in failures. Then we will assess the durability of both components for at least 15 years after surgery.

Q. Currently, cementless knee replacements are considered inferior to cemented knee replacements. Why is that?

FRICKA. Traditional cementless implants have a beaded coating over the surface. Bone grows into the crevices between the beads. In hip replacements enduring bonds are formed with beaded implants, but this isn't always the case with knee replacements. Bone does not fully grow into the tibial plate, and this can lead to implant loosening. Consequently, the revision rate for cementless knees has been higher than for cemented knee replacements.

Q. Why do you expect the trabecular tibial implants to outperform the beaded cementless implants?

FRICKA. Trabecular metal is bone friendly. Because it has a rough, high-friction surface, when we first put the implant in place, it sticks to the bone. This provides good initial stability and allows bone ingrowth to occur. Within the first 6 to 12 weeks after a knee replacement, we see bone growing into the pores and channels of the implant. Because the entire metal back and pegs of the tibial plate are made of the trabecular metal, bone can grow

into the prosthesis from every side, and, theoretically, all the way through the implant.

Q. What are the potential benefits of trabecular implants over cemented ones?

FRICKA. The biggest potential benefit is long term. At some point, as the patient puts million and millions of cycles on a cemented knee, the bond may fatigue or break. I equate it to having a cap cemented on a tooth. It will be fine for many years, but eventually it may fatigue and loosen. On the other hand, if bone grows into a prosthesis, it could form a life-long bond.

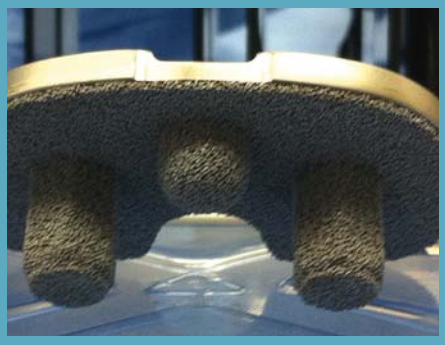
There's also an early potential benefit. That's shorter operation time. We're only talking 10 or 15 minutes, the time it takes for the cement to set, but less time under anesthesia is always a benefit to the patient.

Preservation of bone stock is another potential benefit. With cemented knee replacements, we drill a hole into the tibia (see adjacent box) and then use cement to bond the prosthesis to the bone. Bone preservation is somewhat limited with this method. With trabecular implants bone can grow into the voids.

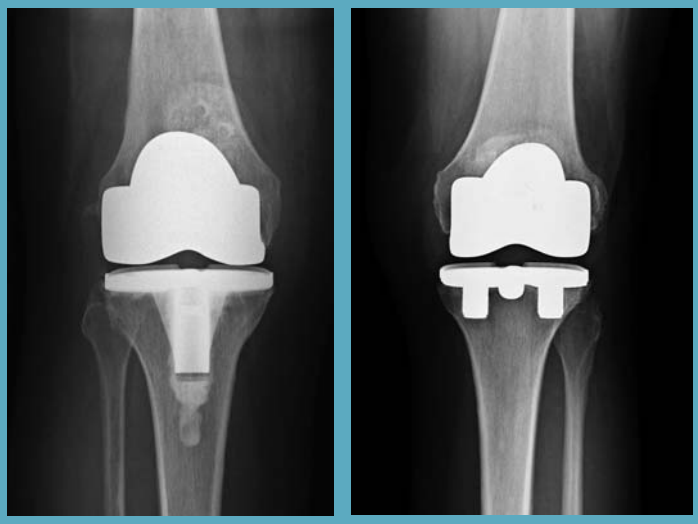
Q. Even with durable bonds, the polyethylene in knee replacements could need replacing at some point, correct?

FRICKA. That's right. Both cemented and cementless knees face the long-term prospect of a polyethylene insert wearing down. However, if a tibial implant is well-fixed, we can just switch the polyethylene. If its bond is loose, a more technically challenging procedure is required to also replace the implant.

Under the Surface



Left: This close-up of the back of a trabecular tibial plate shows the textured metal composing it. Pores throughout the plate allow bone tissue to grow into it.



X-rays of a cemented knee (left) and a cementless trabecular knee (right) show how each is implanted. For cemented knees a hole is drilled into the tibia, and bone cement (seen as the lighter white color) is inserted. In contrast, the trabecular implant is pressed into the bone, and bone tissue grows into it, creating a bond.

Q. Do you have any other thoughts to share with our readers?

FRICKA. Anytime we use cement, there's a 1 or 2 percent chance that a piece will not adhere as well as we want and that it will loosen within the first 5 years. That's a small chance, but I have no reservations about bone growing into the trabecular implant.

With that said, I don't think our study will show that 99% of the cementless knees and only 80% of the cemented knees will be doing well after 20 years. We have very good results with cement. We're just always looking for something better.

Continuing our Tribute

The response from patients and colleagues to Dr. Charles Engh's retirement has been wonderful. Dr. Charles sends his thanks for the good wishes and memories. For those who measure life's accomplishments by those we have touched, such letters mean more than a wall of awards.

Articles from the 1980s about Dr. Charles's cementless hip replacement.

And Dr. Charles has touched the lives of many. Directly, he has helped more than 6500 patients with his renowned surgical skills. Indirectly, he has reached countless more through his dogged determination to improve hip replacements. Consider this, over the past 40 years, Dr. Charles —

- Published over 200 research manuscripts in peer-reviewed orthopaedic journals, 18 book chapters, and 1 book,
- Demonstrated surgical techniques at more than 100 seminars hosted by AORI,
- Mentored 88 Anderson Fellows from 1983-2010,
- Presented more than 665 lectures at American hospitals, universities, and conferences,
- Gave 126 presentations to total joint specialists in Argentina, Australia, Belgium, Bermuda, Brazil, Canada, China, Columbia, England, France, Germany, Greece, Holland, India, Italy, Japan, Korea, Mexico, Nepal, Norway, South Africa, Spain, Switzerland, Taiwan and Thailand, and
- Supported the development of an internationally recognized orthopaedic research institute

Still, these numbers pale in comparison to the words of patients, co-workers, and surgeons. We continue our tribute with their stories.

In the early days: Dr. Charles and Dr. Jerry vacationing with their sister, Sally, and their parents, Sara and Otto Engh, the founders of the Anderson Clinic.

Patient's Favorite Recollection

Phil Fleming had a right hip replacement in 1999 and a left one in 2009.

My favorite recollection happened just before the second operation. Dr. Charles was in his scrubs, and I was lying on the gurney. He asked what I hoped to get out of the operation. I replied that I hoped for two things.

What's the first thing? he asked. I said to have a pain-free left hip. Dr. Charles said he would do that.

What's the second thing?

I said I hoped to be able to continue my pleasurable but inelegant game of doubles tennis, and that it would be handy to have both legs the same length.

Without so much as cracking a smile, Dr. Charles replied, "We always get them within five or six inches."

He really knew how to pull my chain. Of course both legs are spot on, and I'm grateful for that.

I have had several hospital experiences in my 81 years, but none that compare to the quality and caring assistance I received at the Anderson Clinic. I am forever grateful.

Patient Letter:
Beyond a Sedentary Life

Linda Frey says she "got a lot younger" after having total hip surgery at the age of 47. A physician herself, Frey appreciated the expertise of Dr. Charles so much that she has recommended several patients to him.

I was sad to learn that Dr. Charles Engh was retiring from clinical practice (though, of course, happy for him). He has made such a profound difference in my life.

Shortly before my first appointment with Dr. Charles, I spoke with one of his patients, a woman from California who answered the phone with the words, "Rebuilt Sally." She was thrilled with the results of her surgery and referred to Dr. Charles as "a dream." She also told me about his pioneering work in bringing porous-coated implants to the United States. I was very interested in the porous metal approach since at age 39, I was still young. My hip, however, was very old. As a child I had three hip surgeries, and increasingly severe osteoarthritis had developed subsequently.

I liked Dr. Charles right away. When I first saw him, he was kneeling on the floor to converse with a seated elderly gentleman. With me, he was warm, kind, unassuming, and not at all pushy, while also being obviously knowledgeable. At the time, I was limping, but not in severe pain. He said, "Come back and see me when you're ready."

That moment occurred seven years later during a long-desired trip to Santa Fe. After a day of walking with a cane, my husband and I went out to eat. When it came time to leave the restaurant, I couldn't even walk the block to the car. Upset, I went back to see Dr. Charles. He simply said, "Have the operation."

It took him little more than an hour to replace my hip and to change my life.

I liked Dr. Charles right away. When I first saw him, he was kneeling on the floor to converse with a seated elderly gentleman.

Within a few months, I was walking without a cane for the first time in years. Every time I did something new, went for a walk, or climbed a hill or stairs when traveling to beautiful places, I would say to myself, "Thank you, Dr. Charles."

I've had no problems with my hip, even 16 years after the surgery. Now, I go for long hikes and work out regularly. I've lost weight, and my overall health is much better than it would have been had I continued my rather sedentary life. I know my husband and children appreciate that I can be active with them instead of sitting on the sidelines.

No longer on the sidelines: Linda Frey, MD, and her husband, Allen Greenberg, enjoying the sights in Madrid on a family trip with their son and daughter.

I'm a physician myself. I've interacted with lots of fine clinicians over the years, but Dr. Charles Engh is a cut above. I've sent him several patients over the years, including one woman who had been told by many that nothing could be done for her. She and the others improved vastly and are now living much fuller lives.

So to Dr. Charles, thank you, thank you, thank you. You have made a big difference, and I know your ongoing research will continue to help untold others.

Able to Dance

Born with Developmental Dysplasia of the Hip in 1940, Dawn Hydock-Anderson exhausted available treatments by the time she was 30 years old. Then she heard about Dr. Charles.

When I started trying to walk, it was discovered I had been born with a dislocated hip (Developmental Dysplasia of the Hip). The doctor told my mother that only 1 out of 100 people were able to walk with this condition. After talking to three more doctors, one asked if she would consider experimental surgeries involving the repeated breaking and setting of my legs. I spent the next two and a half years at the hospital, but when I left, I was able to walk and lead a somewhat normal and active life.

When I was in my late 20s, however, my hip dislocated again, requiring more pelvic surgery. By my late 30s, I was having great difficulty walking and caring for my home and children. Doctors told me that nothing could be done.

Over the next years, I walked with a cane. The pain was excruciating, and my younger children learned to help me do things like tie my shoes. The older ones helped with the younger children.

Then in 1984, I learned about Dr. Charles and his new porous-coated hip replacements. When he said he could help, I was elated. I had the total hip replacement on September 24, 1984, the day of my 23rd wedding anniversary.

The results were almost immediate. When I went home, our children said I looked 10 years younger. That is what relief from pain can do.

In many ways the hip was a miracle for our family. Little more than a year later my husband passed away unexpectedly. Because of the hip replacement, I was able to go back to work full-time. Since then, I have been able to dance at my children's weddings. I have remarried, and I can do activities with my grandchildren.

I will miss Dr. Charles. I send my best regards for a well-deserved retirement.

Being able to dance at her children's weddings is something Dawn Hydock-Anderson has cherished. Here she is with her youngest son, Glenn.

The Nurse Always Knows

Pat Charette, RN, has worked side-by-side with Dr. Charles and Dr. Andy as their clinical nurse for over 20 years. Pat's words capture the sentiments of many of us who have worked with Dr. Charles, whether in patient care or in research.

Working with Dr. Charles was always interesting. He loved to teach. He encouraged me to ask questions, and I did. When I had a question, he would always stop what he was doing, sit down and listen to me with undivided attention.

He would explain. He'd pull out old x-rays. He'd draw pictures and talk about what research has taught us. Every time I worked with him I learned something, but Dr. Charles was also completely open to new ideas, too.

If I had an idea or concern, he wanted to know about it.

"This is a collaboration," he would say.

He believed we were all on the same team and had the same goal – to provide the best possible care and outcome for our patients. He knew he couldn't do it all by himself, and he respected and wanted not only my input, but also the input of everyone else on the team.

The Surprising Answers Dr. Charles Gave a Young Surgeon

An Anderson Fellow in 1995, Dr. Bill Bugbee, currently with the Scripps Clinic in California, went on to earn a reputation as an outstanding reconstruction surgeon and an innovator in biological restoration. He also has a way with words.

I THINK ABOUT THIS EVERY DAY. What I learned from Dr. Charles and Dr. Jerry was less about figuring out if a person needed a joint replacement and more about how the surgery would change the patient's life.

During my fellowship, it struck me that treating a patient was more of a journey than a means to an end. Determining the solution to the patient's pain was relatively simple. But for both Dr. Charles and Dr. Jerry it was also about making sure they understood each person as an individual.

WHEN DR. CHARLES WOULD WALK INTO ONE OF THE PATIENT rooms at the clinic, he would look at the person's x-ray and know at a glance whether he or she needed a hip replacement. Rather than talking about the necessity of the surgery, he would spend the next 10 to 15 minutes getting to know the person. It was uncanny how he could remember personal details about a patient, and if he knew any of their friends or relatives, he would spend time asking about their mutual acquaintances.

One time I asked Dr. Charles what I needed to do to be successful. He said, "You'll be fine because you know how to get along with people. How you treat people is more important than what you know."

Another time I asked him, "Why don't you treat a thousand patients a year?" He said, "I never wanted to run a factory. I wanted to get to know people and learn how I could affect their lives."

I have always remembered that. I'm not trying to set any records in my practice either. The best moments are when a single patient expresses his or her gratitude. Recently one patient gave me a rare bottle of wine he had been saving for 25 years. He felt compelled to give it to me because of how much I had helped him. The satisfaction we orthopaedic surgeons receive from helping our patients is immeasurable.

Dr. Charles reconnecting with two former Fellows, Dr. Bill Bugbee (right) and Dr. Eli Kassapidis, at an annual Anderson Fellow Reunion.

As a young man, I chose the Anderson Clinic for my fellowship partly for the big adventure of moving across the country from San Diego with my wife and two kids. While there, my son got ill and was hospitalized. When I asked for time off, Dr. Jerry told me not to worry, 'Family comes first,' to take as much time as I needed. Then and there, I knew I'd made the best decision possible in choosing their Fellowship.

THAT FELLOWSHIP TURNED OUT TO BE THE MOST IMPORTANT YEAR of my life in terms of my career, and not simply because of the surgical, research, and patient skills I gained. It was also because of the lasting connections I formed with the Enghs and other fellows. Years later, we Anderson Fellows still share a kindred spirit.

Before going into medicine, I had considered sports. It seemed the life of a professional athlete would be great: doing something you love while being applauded by hundreds or thousands of people. I have come to see that the life of an orthopaedic surgeon is quite similar. I get to do something I love, but the audience is one patient. Dr. Charles and Dr. Jerry taught me how to do my best for that one person.

Back to Her Traveling Shoes

As a little girl, June Daab dreamed of traveling to exotic places. By the time she was 27, she had checked off the first place on her list, Hawaii. In the years since, she and her husband have traveled to 55 different countries. We share her letter.

Can you believe on the six-month anniversary of a hip replacement that a person could climb 1000 steps to the top of a peak of the Great Wall of China? I did!

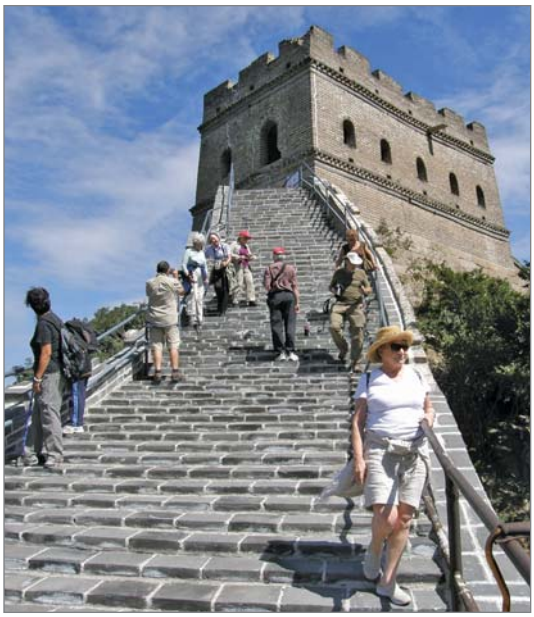
As a young girl, I poured over the photographs of far-off places in *National Geographic Magazines*. Places like Tanzania, the Nile, the Amazon, and the pyramids. To visit these wondrous places seemed impossible, but I could dream, and so I made a a wish list of the places I wanted to visit someday.

Still a long ways to climb. June and Ford Daab take a breather to enjoy the beauty of the Great Wall of China's wild section.

With pain a thing of the past, I couldn't help but think of earlier days when people had no choice but to live with it .... as constant pain diminishes the joy of life.

As unlikely as it seemed then, by the time I was 70, all of my travel dreams had come true — with one exception, the Great Wall of China. Unfortunately, at this point my hip screamed, "No more!"

I couldn't ignore the constant pain. I went to Dr. Charles, who looked at my x-rays and advised against our scheduled trip into rural China. With regret, we cancelled the trip and scheduled surgery instead.



Everything went smoothly. Soon the new hip was part of me. With pain a thing of the past, I couldn't help but think of earlier days when people had no choice but to live with it. I felt for them, as constant pain diminishes the joy of life. How lucky we are.

Within five months I was back to my traveling shoes. That final little-girl dream — walking the wild section of the Great Wall — was going to be mine. We arrived on the six-month anniversary of my surgery. Using a dirt path from the base, we climbed some 100 rugged stone steps through the brush. Once on the wall, we rested. Just looking at the steep climb of 1000 steps lying ahead made my heart beat faster.

I began the climb. The steps were uneven, the cane a must. Slowly I made my way up and up. I was almost there when a Chinese soldier came from nowhere to take my arm and help (pulled) me up the final hundred or so steps. What an angel! I was there. My heart sang.

My deepest thanks to Dr. Charles. No doubt I speak for all who have benefitted from his life's work. Because of him, we are able to go on with our lives without constant pain.

Continued from page 1

Results on Quality of Life Issues

As for the ability to work after a hip replacement, the survey results indicated that most patients employed before surgery can expect to return to work. The vast majority returned to their pre-operative occupation. Only 2.3% were limited in their ability to return to work due to the operative hip.

Two prestigious awards went to the researchers in this study in 2011. The James A. Rand Award went to Dr. Andy Engh for coauthoring the manuscript, *Do Patients Return to Work Following Hip Arthroplasty Surgery?* The Orthopaedic Research & Education Foundation & Current Concepts in Joint Replacement Award was presented to Dr. Nunley and co-investigators for the study on sexual function.

"I want to thank the patients from the Anderson Clinic who participated in this study," says Dr. Andy. "Their efforts are helping others know what to expect about daily activities after surgery, especially those activities patients and physicians are often shy about discussing."

Sexually active after surgery?	Active: 89.5%	Not Active: 10.5%	10 patients (1.4%) not active due to hip
Frequency after surgery?	More Frequent: 43.5%	Same: 52.0%	Less Frequent: 4.5%
Quality after surgery?	Better: 69.9%	Same: 28.0%	Worse: 2.2%
Hip Instability	No Instability 96.7%	"Slip out" sensation 3.3%	

Responses from 943 patients on sexual function after hip surgery

Yet Another Award

When Dr. Andy Engh and his father, Dr. Charles, started a study in 1999 comparing the wear resistance of two types of plastic used in hip replacements, orthopaedists were keen to know the results.

This November, the American Association of Hip and Knee Surgeons presented Dr. Andy with the Lawrence D. Dorr MD Award in recognition of this long-term study.

When the study began, a new type of plastic called cross-linked polyethylene was attracting the attention of many joint surgeons because of its potential for improved wear. At the time, a leading cause for hip revisions was polyethylene wear, not just because worn liners had to be replaced, but also because wear debris led to osteolysis, or bone loss, around the implants. More than 200 patients consented to participate in the study, knowing that either the conventional liner or the new cross-linked one would be randomly selected for use during their surgeries.

By 10-year follow-up, it was clear that the winner was the cross-linked liner. It had lower wear and a significantly lower incidence of osteolysis.

Based on these results, cross-linked liners have become the preferred option for most hip replacements done at the Anderson Clinic. Due to the Enghs' diligence in establishing this prospective, randomized, long-term study, other surgeons are using its conclusions, as well.

A Day in Retirement

Readers may remember Fran Preidis from her years as a physical therapist with the Inova Mt. Vernon Joint Replacement Center. "Dr. Charles gave me the opportunity to learn and grow as a physical therapist," she says. Fran continues to work with joint replacement patients in Columbus, Ohio, where she now lives.

"Dr. Charles is a physician who has shown more compassion, more drive in his work, more interest in his patients, and the ability to do a job well done...."

Fran Preidis,
Physical Therapist and Friend

Research in Review

AORI research continues to influence clinical treatment and orthopaedic research. Below are three more studies presented or published in 2011.

What Factors Contribute to A Failed Knee Revision?

WHEN A KNEE REPLACEMENT NEEDS to be revised due to implant wear or osteolysis, surgeons have several treatment options. They can revise all the components or just the tibial or femoral component (a partial revision), or they can exchange the polyethylene insert. The question remains, is one treatment better than the others?

Addressing the paucity of research on this question, Dr. Andy and Dr. Jerry led an AORI study in which they compared the failure rates associated with these procedures. They assessed 135 knee revision cases that had been treated with one of these options at Anderson Clinic.

RESULTS: At five-year follow-up we found that the three types of procedures had similar probabilities of success: 88% for full revisions, 89% for partial revisions, and 82% for polyethylene exchanges.

The most important factor influencing the need for another revision was the method of sterilizing the polyethylene inserts. Inserts that had been sterilized by the manufacturer using a process known as gamma-in-air radiation had a survival probability of 73%, whereas knees sterilized without gamma-irradiation or using gamma irradiation in barrier packaging had a 92% survivorship probability.

OUR CONCLUSIONS? The success rates for the various treatments are similar when the components are well aligned and well fixed, but the method of sterilizing polyethylene inserts can influence outcomes and should be reported when investigators publish their results.

Treatment Advice for a Hip Complication

AS THE USE OF METAL-ON-METAL implants (MOM) for total hip replacements grew during the last decade, it became apparent that some patients had adverse reactions to the minute metal particles produced by implant wear. Patients presented with a spectrum of reactions that often were difficult to distinguish from infection, according to Dr. Kevin Fricka, who worked with AORI to develop procedures for diagnosing and treating such reactions. This past February Fricka presented his treatment algorithm to surgeons at the annual meeting of the American Academy of Orthopaedic Surgeons.

RECOMMENDATIONS: "Differentiating the symptoms from infection is crucial, as the treatment for these problems is very different," says Fricka.

"Our recommendations are based on our experience with 13 patients who had reactions in the soft tissue around their implants. Seven patients were among the 1327 patients who received MOM hip replacements at our clinic. The other 6 were referred to us for work-up and treatment."

According to AORI's database, about 0.5% of patients who received MOM implants had evidence of a local tissue reaction at an average 2.6-year follow-up. Symptoms included varying degrees of groin pain, swelling, and, occasionally, limping or mechanical symptoms such as clicking.

Fricka provided surgeons with a series of steps to determine the cause of such symptoms. Diagnosis starts with blood tests "to analyze for the presence of inflammation and metal levels in the blood" and includes "an MRI to evaluate for fluid or inflammation about the hip." If an adverse local tissue reaction is indicated, the next step is replacing the metal bearing with a polyethylene (plastic) one.

"To minimize tissue damage, we treated our patients with minimal delay. We advise other physicians to do the same," says Fricka. "Due to these concerns, we no longer use MOM implants, and their usage has dropped dramatically elsewhere, as well."

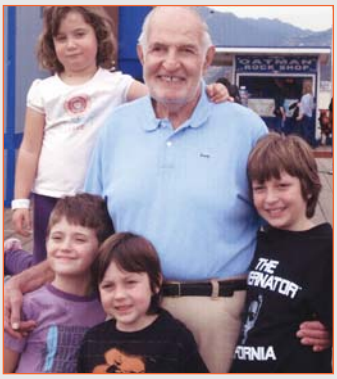
An Answer That Begs For More Answers

TYPICALLY, OSTEOLYSIS, OR BONE loss around a joint replacement, is associated with implant wear, but not all patients whose implants exhibit high wear develop osteolysis. So why do some patients develop it when others do not?

To gain insight into whether some patients have a propensity for osteolysis, Dr. Charles Engh led an AORI study evaluating the occurrence of wear and osteolysis among patients with bilateral hip replacements.

RESULTS: We found that patients with large osteolytic lesions around one hip were more likely to have large lesions around their other hip replacement. This indicates that patient susceptibility is a factor in the development of osteolysis, perhaps, even as important a factor as polyethylene wear. These results beg for further investigation on the causes for such susceptibility.

Let's Keep the Legacy Going



As we celebrate Dr. Charles Engh's life work, a question remains — how do we ensure that his legacy continues to benefit joint replacement patients of today and tomorrow?

The need for clinically-focused research is as great as ever. When promising new components and materials are introduced, physicians and patients need to know their merits according to scientific studies, rather than marketing materials.

We at AORI plan to continue contributing to the evidence-based clinical research that enables patients and surgeons to make informed decisions.

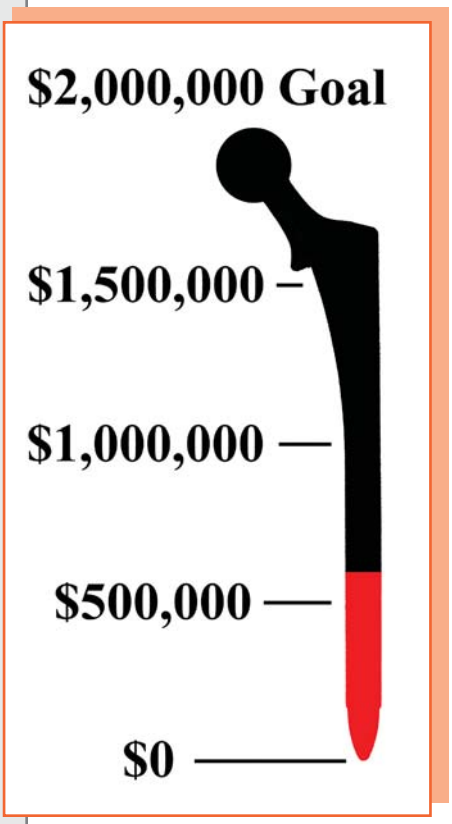
But scientific studies take funding. That's where AORI's Joint Legacy Campaign comes in — giving us the means to sustain research over the long run. A year into our two-year campaign, we have topped the one-quarter mark on our way to our $2 million goal. It's still uphill, but with your support we can get there.

As we work towards this goal, every donation and every estate gift makes a difference. We are grateful to all of you who have brought our campaign this far.

And we note people like Edna Cheshire, Gabriel May, Ellen Johnson, Doris Slater, Ren and Marianne Jacoby, Paul Abbate, and David Kruckenberg, who made AORI a part of their personal legacy through estate gifts. They have lit the way for this campaign.

We thank you in advance for joining the effort.

All gifts to AORI are tax deductible.



Many thanks for partnering in AORI's Joint Legacy for Pain-free Movement!

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It's A Classic

One way of measuring a study's impact is by counting how many subsequent publications reference it. In a recent listing of the most cited orthopaedic research publications, a 1987 study led by Dr. Charles Engh was ranked number 29. And that's among *all* orthopaedic publications, not just those about joint reconstruction.

Truly a landmark study, at the time of its publication this paper set the stage for the wider use of porous-coated hip replacements in the United States. It demonstrated that bone-ingrown femoral stems had excellent clinical results and durable fixation. Dr. Charles and his co-authors also established clinical methodologies for surgeons by identifying the factors associated with bone ingrowth, the clinical results associated with porous-coated stems, and methods for classifying biologic stem fixation.

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