

CeraNews



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Richard H. Rothman, MD, PhD



Heinrich Wecker,
Director Marketing
and Sales Central and
East Europe, Medical
Products Division.

Dear Reader,

“Quality first”. This is Prof. Richard Rothman’s guiding principle, and it has made the Rothman Institute in Philadelphia one of the world’s most important arthroplasty centers. In our interview he shares this, and other secrets to its success.

Quality means taking responsibility for the patient. This is also the paramount guiding principle at CeramTec. Our quality standards and more than 35 years’ experience, with over 6 million BIOLOX® components sold, have made ceramics a success story in arthroplasty.

Staying still is not an option for us. We focus all our experience and skills on the continuing development of our products. In so doing, we have never jumped on marketing bandwagons. Our work is defined and guided by clear medical specifications and opportunities for new applications.

The development of BIOLOX®*delta*, which many still consider to be a “new” material, took us more than 10 years. It only came onto the market in 2003, once we were completely sure. At the end of 2010, we have already sold more than one million femoral ball heads made from this high performance ceramic material that is offering convincing proof of its reliable clinical performance.

We wish you a pleasant reading.

Heinrich Wecker

Quality First

An interview with Richard H. Rothman

Richard H. Rothman, MD, PhD, is the founder of the Rothman Institute and the James Edwards Professor of the Department of Orthopaedic Surgery at Jefferson Medical College of the Thomas Jefferson University in Philadelphia, Pennsylvania. He is an orthopaedic pioneer, with an international reputation in joint replacement surgery. The Rothman Institute is among the most successful and highest volume orthopaedic surgery units in the world. CeraNews asked Professor Rothman about the history and philosophy of his institute, the secrets of its success and his views on key aspects of arthroplasty.

When did you start performing arthroplasty?

Immediately after I finished my medical training, I heard about John Charnley’s work and visited him in Wrightington in 1970, together with some other young surgeons from the USA. We brought his principles and techniques to this country. I performed the first contemporary hip replacement in Philadelphia shortly after my return. For roughly the next 10 years, I implanted Charnley total hips. I was very careful to operate on slender elderly females, and for them it was a very good implant, virtually all home runs.

How many joints have you replaced since then?

My best estimate is about 25,000. It’s not such a miracle as I was there on day one and focused on joint replacement ever since. I have lived a long time, I’m working longer than a lot of my residents and fellows who have already retired, and I’m still doing about 800 hips and knees a year.

How did you start the Rothman Institute?

The initial spark, as it’s so often the case, came from a great person, Ambassador Walter Annenberg, a very successful businessman and philanthropist. He had bilateral arthritis in his hips. I replaced them in the early 1970s, and in a private moment he asked me about my goals and what I would like to do most. I told him, I would like to create a hospital dedicated to orthopaedic surgery, and he endowed a multimillion dollar gift which became the starting capital of the Institute.

From then on, the Rothman Institute has a record of continuous success. Would you tell us about its secrets?

Like most good things it’s simple. I’m a simple guy with simple principles, that I adhere to. The first is



Richard H. Rothman, MD, PhD

putting quality first. When it comes to an issue of quality versus profit we always would come down on the side of quality. This may seem commonplace and unrealistic but it's crucial. The irony is, putting quality first becomes profitable in the long run. The second principle is to be compassionate. In the short run, patients can't measure whether they have a good hip replacement or not. But they can measure immediately whether you care about them as a person. We never hire a surgeon, nurse, secretary or telephone operator who's not embracing in his or her personality. To this day people are overwhelmed when they come to this huge office, see hundreds of people in the waiting area and yet are treated with love and affection. That, more than anything else, I think, has been critical in our growth and our success. The third point is affordability. When we started you needed an FDA license to use polymethyl methacrylate, and I had the only license in Philadelphia. We never took advantage of that. We charged the same modest fees to all our patients. In the long run, this also served us well because people were very generous in supporting our non-remunerative activities in teaching and research. We have enjoyed tremendous community support over the years.

“In the short run, patients can't measure whether they have a good hip replacement or not. But they can measure immediately whether you care about them as a person.”

What are the main activities of the Rothman Institute today?

Last year we had 300,000 office visits, over 20,000 operations of which 8,000 were joint replacements. We have become very busy clinically, but I have not wanted to neglect our academic interest. So first and foremost, we are good surgeons, good physicians but we have always paid major attention to clinical and basic science research as well as teaching. We published more clinical papers than any other orthopaedic department in the country.

How is the Rothman Institute connected to the university?

It is very unique to have a private corporation delivering orthopaedic care in an academic medical center. I think we have proven that all three realms – medical care, research and teaching – are better served in private practice or corporate models because we can give our staff the right incentives, even in research and teaching.

What is the manpower behind your research activities?

Our clinical research department, headed by Javad Parvizi, has 14 fellows on the team. The basic science section, headed by molecular biologist Irving Shapiro, works with more than 60 investigators. We have a strong commitment to understanding the basic principles as well as what works in orthopaedics.

Are you personally taking part in some of the research activities?

I'm interested in all and a master of none. I help develop new research protocols, concentrating more on the clinical studies than on basic science,

today. But I have a doctorate and have done a fair amount of basic science in earlier years.

The Rothman Institute also has a reputation for efficiency and a good business model. What are the most important aspects here?

'No margin, no mission', to quote a famous health care administrator. If an institution isn't financially self-sustaining it can't do good work. What's important in health care delivery, is to look at what I do with my time. We have a very effective, low overhead, high quality business model. We have grown about 20 percent a year as far back as I can remember, both in terms of activities and revenue. The senior executive's most important function is hiring. Surgeons earn money by doing surgery, not by teaching or performing research. But if you are good at hiring, you hire people with a DNA that want to teach and want to expand the body of knowledge and they do so even if the model doesn't reward them financially. Again, my rule is very simple: The person you hire should be smarter than you and work harder. If you hire someone less smart and less hard working you end up doing the job yourself. There is always a bell shaped curve of performers when you look at your colleagues. You have to move that curve in the direction of the high performers with every hiring.

But how can you lead such a high profile team?

I always say, to be in the Rothman Institute is a life sentence. Not counting the retired, maybe four or five physicians have left the Institution in 40 years, all others stayed. The secret is: if you want to be an effective leader you should always be number two, should take out less money and less fame than your colleagues and really share with your partners. I've never been the biggest earner in our group and always tried to share the glory, to bring young leadership along. I don't think it's a good thing when a CEO gets 70 times or even more than the average employees get. That's not a good development. But back to management and leadership – to be a good surgeon doesn't mean you have the skills to run a major medical enterprise. You are not trained to think as a business man, you don't have the tools, not even the vocabulary. That's why you should hire the best business talents you can afford. A strong business leadership should be an impartial arbiter for the medical staff, who stabilizes a big organization and frees the physicians to do their jobs.

Still, there is a medical part of the business. What is most important there?

Efficiency in general and operating room efficiency have been a very high priority for us. In most hospitals the operating room is the limiting factor. Our surgeons normally perform eight to ten major procedures a day, running two operating rooms concurrently. And we're mostly finished by 2:30 p.m. Again, the key factors are very simple. We start at

6 a.m., we have a dedicated team where everybody is an expert on his job, just like in an orchestra. We have a separate anesthetic space in block rooms, so that anesthesia doesn't have to be induced in the OR. We stress simplicity and have much less equipment than most orthopaedic ORs. I always say, a good surgeon likes little equipment. You have a lot if you need to compensate for something. We work in parallel rather than series. The nurse can be setting up the case while the patient is in the room; the patient can have anesthesia while the previous case is being performed. Also, we are not waiting for somebody to get something done. If the floor needs mopping, I may mop the floor when I'm not operating.

You have held the Rothman Institute's 1st Annual Meeting on "Evidence-based Orthopaedics" in May 2010. What are your motives to engage in this field?

Even before the founding of the Rothman Institute, when I worked in private practice with a small nucleus of two or three surgeons, we behaved as if we were an academic institution and always recorded every single implant patient on our database and followed them through life. Philadel-

“We always dedicated resources to do research and accumulated knowledge about what was best and how to avoid complications very quickly.”

phia has a very stable population, people tend to live there till they die. Therefore it is a wonderful cauldron to do research. We always dedicated resources to do research and accumulated knowledge about what was best and how to avoid complications very quickly. Today total joint replacement and the choice of materials is spectacularly good, successful and durable. THA at any reasonable center of excellence has a success rate better than 99% at the end of ten years. That is statistically almost the same as 100%. If I look in my data, I see 99.5% after ten years – with the endpoint of mechanical failure – using a ceramic ball head and a highly crosslinked polyethylene liner. It is very unlikely to prove anything better than that because you would need a series of 30,000 cases to prove a statistic improvement beyond 99.5%. That has certain implications. If we decide to do anything other than the classic evidence based approach in joint replacement there is more chance to make things worse than to make them better. So when some new material or design comes up, you have to be very clear about what problem you are solving, and if there is good long term data to prove that this is better than what we have now. At the same time, there is no rush. The surgeon can afford the luxury today of waiting to see 5 or 10-year data. It's a blessing and it's a curse.

“If I look in my data, I see 99.5% after ten years – with the endpoint of mechanical failure – using a ceramic ball head and a highly crosslinked polyethylene liner.”

Do young patients also get the good results you mentioned?

20 years ago joint replacement was targeted on elderly, slender, so called low demand patients. But as the implants and the bearings got better, we started operating on younger people with diseased joints and outcome improved. If you look at older data young patients had the highest failure rates, particularly if they were heavy young males. Now there are series of young patients who have knee and hip arthroplasty with excellent results at ten years because the implants are stronger, they don't break, the bearings are more robust and don't wear out.

What's the conclusion?

During the past century life expectancy increased by 30 years. The data look like there is no slowing down of that development. Joints wear out but the people want to continue their active lives, and they demand more and more. I'm running five miles a day, operating, lifting weights, practicing yoga. At 73, I'd be considered a high demand patient. Patients also expect a very rapid recovery. Some highly motivated professionals go back to work two weeks after their surgery. Even older patients want to ski, run or play tennis. I allow them to do so. I will let hip arthroplasty patients with a ceramic hip ski, play singles tennis and jog. I'm not aware that any ceramic-on-ceramic bearing made of BIOLOX[®]delta has broken. Demands can be independent of age, but certainly our parameters of who can get operated on are expanding every year. It isn't prudent any more to wait for patients to get older before performing arthroplasty.

“I will let hip arthroplasty patients with a ceramic hip ski, play singles tennis and jog. I'm not aware that any ceramic-on-ceramic bearing made of BIOLOX[®]delta has broken.”

Do you have an algorithm for the choice of bearings in hip arthroplasty?

I use metal ball heads only for patients who obviously will live only a short period of time because metal will produce increased polyethylene wear. Ceramic femoral ball heads have far better wear

characteristics and will produce less abrasive wear of polyethylene. It's worth the premium to give that patient the longer lasting arthroplasty. Particularly today with ceramics that don't break, the case is even more persuasive for people in a high demand situation. When you compare metal-on-polyethylene or crosslinked polyethylene and ceramic-on-polyethylene or crosslinked polyethylene it is clear that ceramic-on-crosslinked polyethylene is the best bearing couple in this family.

“Ceramic femoral ball heads have far better wear characteristics and will produce less abrasive wear of polyethylene.”

At last year's EFORT meeting in Madrid, Professor Binazzi made this statement: "We keep seeing patients with maximum polyethylene wear and surgeons in Europe still use metal with polyethylene. This is unacceptable." Would you agree?

It is hard to say what is unacceptable without having specific cases before us. I think if a patient is 85 years old, to have an Exeter-type hip with a metal femoral ball head against thick polyethylene is a perfectly reasonable solution. If you have a 70 year old active patient, running and skiing, it would be reasonable to use either ceramics or XPE. All generalizations are wrong. I would choose metal-on-crosslinked poly for the elderly, and BIOLOX[®]delta ceramic-on-crosslinked poly for active older or middle aged patients. For young patients I would consider ceramic-on-ceramic.

Who is the young patient?

Who is the old patient? It is very hard to give an answer today, because we all may live to a hundred years. Of course, with experience, you can tell a lot by looking at a person – if they don't look well in general, walk slowly, look frail, they're obviously old. I would examine their lifestyle. Do they smoke, is there a family history of longevity or of a short life span?

What is your opinion today about noises in hard bearings?

There are studies showing that all hard bearings make some noise, some audible, some not. There are a lot of variations that I find confusing. The cause of noise is not clear so far, whether it's the design of the shell, where there is impingement of the neck against titanium and titanium debris gets in the interface. Or is it the alloy, the taper or the position? I don't believe it's position, we have done an extensive study which showed it is not related to that. Noise is a complex multi-factorial issue, encompassing socket and femur design, alloys, taper and implant position.

Are you concerned about metal ions created by metal-on-metal bearings?

Together with Ross Crawford¹ and Chitranjan Ranawat² we published an editorial in the Journal of Arthroplasty* just a year ago advising great caution with metal-on-metal bearings because there is a host of flags of alarm out there. In the Australian Registry it is the bearing with the highest failure rate; combining it with resurfacing means even adding to the risk – young active patients have twice the failures in half the time as in THA. We have clear evidence now that revisions of failed metal-on-metal bearings are not as successful as revisions in general. These are three very persuasive reasons for me to pick one of the alternatives that are proven, safe and conservative. I can't imagine why anybody would choose metal-on-metal knowing what they know today.

Which role does the patient's weight play in arthroplasty?

We know that heavy patients have increased risks in most dimensions. We have to educate the patient that he is accepting a higher level of risk if he is heavy. Obesity is a fascinating subject, poorly understood and almost the most incurable disease we treat in medicine today. At the Rothman Institute we offer nutritional counseling for those patients who are interested in improving their dietary habits and the balance between exercise and diet. Though, to lose weight it is more effective to reduce the input, for one donut you would have to run five miles. All the risk factors are not only related to weight but also to the thickness of fat in the operating area. Dr. Ranawat has pointed out in many of his lectures that the number of inches of fat in that area is more critical to wound healing and infection than overall weight. Patients with morbid obesity – 400 pounds and more – are simply not candidates for an operation, as the risk of infection, phlebitis and pulmonary embolism is stupendous.

Will the bearing wear out faster if the patient is heavier?

The evidence is not so clear. Probably heavier people are less active and won't wear out their joints faster. I counsel patients – if you can lose weight, let's wait with the operation. Some patients would get angry and say, 'if I have my new joint I can get active and lose weight'. As a point of fact, after joint replacement a third of the patients lose weight, a third gain, and a third stay the same.

Infection is being more and more discussed. The Rothman Institute has done extensive research in this area. Do you have promising results?

The infection rate for hip arthroplasty is a fraction of one percent, and between 1 and 2 percent for total knees because of the more vulnerable tissues. There is also the possibility of late infection induced from the dental area or other sources. This is a residual risk – small but disastrous to the people affected. One of the approaches, developed by Dr. Parvizi is the so called smart implant which has the ability to respond to a challenge at a later date. For example, two years after THA the patient acquires a dental infection and the bacteria dissipate in the blood stream. They seed and the interface between implant and bone is infected. The smart implant not only has antibiotics linked to its surface but also a trigger mechanism to set them free. If an infection occurs, lowering the pH of that environment, it will break the bond between the antibiotic and the implant, release the active agent and challenge the infection. It is already proven at experimental level. We are also looking at molecular markers in the fluids which would allow us to diagnose inexpensively and quickly whether a joint is infected so that we can treat it aggressively and promptly. Fortunately infection isn't such a great problem where surgery is atraumatic, quick and clean. Bacteria grow greater on dead tissue and collections of blood. And these are results of bad surgery.

¹ Orthopaedic Research Unit at the Prince Charles Hospital, School of Engineering Systems at the Institute of Health and Biomedical Innovation (Brisbane, Australia)

² Weill Medical College of Cornell University, Lenox Hill Hospital (New York, USA)

* Crawford R, Ranawat CS, Rothman RH (2010). Editorial: Metal on Metal: Is It Worth the Risk? J Arthroplasty 25(1), 2010: 1–2

Outcome Of Ceramic-Ceramic Total Hip Arthroplasty In Patients Younger Than 50 Years*

Andrew C. Murphy¹, Simon D. Steppacher MD², Moritz Tannast MD², Stephen B. Murphy MD¹



Fig. 1: Patient is a 49-year-old male with osteoarthritis of the left hip. The x-ray is an 11-year post-op follow-up picture showing pristine interphases and no signs of osteolysis.



Fig. 2: Ceramic-on-ceramic bearing (Wright MT)



Fig. 3: 29-year-old female patient with hip dysplasia, multiple previous surgeries and a hip fusion, was converted to a CoC THA. At 4-year follow-up she presented with a fair clinical result (Merle d'Aubigné score of 14 points).



Fig. 4: 40-year-old male patient who sustained femur and pelvis fractures after a motorcycle accident. At 5-year follow-up he presented with an excellent clinical result (Merle d'Aubigné score of 18 points).

Source Fig. 3, 4:

Steppacher SD et. Al. In: Cobb (ed.). Modern Trends in THA Bearings. Material and Clinical Performance. Springer-Verlag Berlin, Heidelberg, New York, 2010:29f [Copy with kind permission of the Springer-Verlag]

Introduction

Historically, patients who are less than 50 years old at the time of total hip arthroplasty (THA) have had higher failure rates than older patients. The current investigation prospectively assessed the survivorship and clinical results of alumina ceramic-ceramic THA in patients younger than 50 years.

Methods

273 consecutive hips in 233 patients with a mean age at operation of 41 ± 7.4 years (range 18-49 years) underwent alumina ceramic-ceramic THA with a minimum of 3 to 13 years follow-up. The preoperative Merle d'Aubigné score was 11.1 ± 1.6 (6 – 15). The preoperative diagnosis included primary osteoarthritis or impingement in 44%, developmental dysplasia of the hip in 38%, osteonecrosis of the femoral head in 7%, posttraumatic osteoarthritis in 6%, RA in 3%, LCPD in 1%, and SCFE in 1%. The mean cup diameter was 51.8 ± 3.7 (range 46 to 60mm). 31% of the bearings were 28mm, 69% bearings were 32mm, 1% were 36mm. 20% of patients have had previous surgery including a pelvic osteotomy in 8%, pelvic and femoral osteotomy in 3%, ORIF in 3%, femoral osteotomy in 2%, surgical dislocation in 2%, arthroscopy in 2%, core decompression in 1%, and hip fusion in <1%.

Results

At mean follow-up of 5.3 ± 2.3 years (range 3 to 12 years), the mean Merle d'Aubigné score was 17.4 ± 0.9 (14 – 18). There were no radiographic signs of osteolysis. There were 5 revisions for implant-related complications, 1 acetabular liner fracture, 1 femoral head fracture (poly-trauma), 2 failures of osseointegration (1 stem and 1 cup) and 1 cup dislodgement. The 10-year Kaplan-Meier survivorship for revision of any component for any reason is 97.4% (95% confidence interval 95.4 – 99.5%). There were no hip dislocations and no infections.

Discussion and conclusion

Results of THA in patients less than 50 years using alumina ceramic-ceramic bearings at two to twelve years follow-up are promising with no case of osteolysis or dislocation.

* Abstract presented during the AAHKS 2010 in Dallas

¹ Center for Computer Assisted and Reconstructive Surgery, New England Baptist Hospital, Boston,

² University of Bern, Bern Switzerland

Alumina Ceramic Bearings for Total Hip Arthroplasty: A 10-Year Experience*

James A. D'Antonio, MD¹

Background

Despite the great success of conventional ultra high molecular weight polyethylene as a bearing surface for THA, wear and resultant osteolysis became one of the leading causes of failure and reoperation. Three alternative bearings to conventional polyethylene have become popular in the past decade: metal-on-metal; metal or ceramic-on-highly crosslinked polyethylene; and alumina ceramic-on-alumina ceramic. Alumina ceramic bearings are attractive because of their extreme hardness and scratch resistance, their hydrophilic nature with improved lubrication, the absence of metal ion release, far less volumetric wear debris, and their superior wear resistance compared to all other available bearing surfaces.

Methods and materials

In October 1996 a prospective, controlled, randomized, multicenter trial was started comparing ceramic-on-ceramic (ABC² Systems I & II) to metal-on-conventional polyethylene (System III). System I has a porous coated Ti shell (99 hips), System II has an arc deposited HA coated Ti shell (95 hips), and the control has a porous coated Ti shell (95 hips). In 1998 a prospective, controlled, multicenter trial utilizing a third ceramic study group (Trident) was added. Unlike the ceramic acetabular inserts of Systems I & II, the Trident insert was encased in a titanium sleeve and has an arc deposited HA coated Ti shell (186 hips). All patients received the same TiAlV tapered cementless femoral stem. Five surgeons at five independent sites have followed 452 patients (480 hips) divided between three cohorts who received ceramic-on-ceramic and one cohort who received the control metal-on-polyethylene.

The follow-up is now out to 13 years for Systems I, II, and III, and out to 10 years for the Trident population. There was no significant difference in preoperative demographics or in the clinical data and or clinical performance at last follow-up for the four study groups. The average age of the four study groups ranged from 52 – 55 years, males made up 60 to 66%, and the two major diagnoses were OA (83 – 89%) and AVN (17 – 11%) at the time of implantation.

Clinical results

Survivorship, revision for any reason is as follows: survivorship of patients with ceramic implants in Systems I & II (96.6%), was significantly higher ($p = 0.0092$) than for the control metal-on-polyethylene (91.3%); Trident survivorship (97.7%) was also significantly higher ($p = 0.0079$) than the control group. Revisions not related to the bearing surface include: 8 of the 380 ceramic cases (2%) for instability, femoral fracture, deep infection and impingement; 7 of the 95 poly controls (7%) for instability, deep infection, and femoral fracture. Revisions directly related to the bearing surface included: 2 of 380 ceramics (0.5%) for liner fracture at 6 years and a rim fracture at 9 years; 3 of the metal on poly (3.2%) for osteolysis. Squeaking is reported by 1.6% of System I and II ceramic patients and 0.9% of Trident patients and in all cases the squeaking is intermittent, of no clinical significance and has not resulted in a revision. Radiographic review shows that all cementless implants are bony stable and osteolysis is found in 19.6% of the metal / poly control and in 1.5% of the ceramic patients ($p < 0.0001$).

Conclusions and clinical Relevance

Wear debris generated at the bearing surface in total hip arthroplasty can lead to failure and a need for reoperation. Metal / metal articulations generate systemic metal ions that are related to hypersensitivity reactions and pseudotumors. While highly crosslinked polyethylenes (HXLPE) have low wear at 10 years, the 1st generation materials have issues with either decreased mechanical properties or free radicals and 2nd generation products have less than 5 years follow-up. Ceramic-on-ceramic bearings have known long term superior wear resistance without the risk of metal ion issues and provide an excellent alternative for the young and most active patients. We have found high survivorship out to 13 years (revision for any reason) for our ceramic patient population with low risk of complications and high patient satisfaction. Only time will determine whether other alternative bearings will be equal to or superior to ceramic / ceramic articulations.

Contributing surgeons to the multicenter study:

Drs. B. Bierbaum, W. Capello, J. D'Antonio, J. Roberson & R. Zann

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* Abstract presented during the AAHKS 2010 in Dallas

¹ Greater Pittsburgh Orthopaedic Associates, Moon Township, PA

² Editor's note: ABC Systems I&II and Trident™ System are trademarks of Stryker Orthopaedics, Mahwah, NJ

Highlights of the CCJR Winter Meeting

27th annual current concepts in joint replacement,
December 8–11, 2010, Orlando

Over 2,000 orthopaedic surgeons from all states of the USA and 56 countries in total came to the Current Concepts Winter Meeting in Orlando in order to get an update on recent developments in joint reconstruction. The fast paced program covered almost all areas of interest for the practicing total joint surgeons in the audience. The exhibition area highlighted important trends like the management of younger more active patients, techniques for revision surgery, products with an increased range of motion, resurfacing and alternative bearing surfaces. A satellite symposium was dedicated to ceramics in THA.



At the CeramTec satellite symposium "Ceramic Articulations in THA: The Contemporary Landscape"

Issues in focus

A keynote presentation by **Joshua J. Jacobs**¹ (Chicago, USA) summarized the current situation and advised caution when using metal-on-metal articulation systems whether they were large-head or resurfacing designs.

As a result of the negative issues being reported severe limitations on the use were laid out by the speakers. If metal-on-metal was recommended at all, it was only for active male patients with large bony structures and few if any comorbidities.

“New technology is a good thing, but use it wisely”. He then went on to say: “I remember one of my teachers said, ‘to always think about new innovations’, and there were many of these I was involved with and I now have the motto: Be neither the first nor the last to embrace new technology.”

Thomas S. Thornhill, Harvard Medical School at CCJR Winter Meeting Orlando 2010

David W. Murray (Oxford, UK) was the key speaker in this area with little positive information to share with the audience. The resurfacing systems also were discussed negatively. Nonetheless, the market growth in this sector is substantially down with no signs for any chance of recovery.

A clear theme in many of the presentations was the desire for increased implant reliability and longevity. This continues to be the most important thought in the mind of the orthopaedic surgeon, especially when addressing the needs of the increasingly more active and younger patients. Clinical results arguing for earlier and earlier joint replacement and the difficulties faced in revision surgery continue to create a strong focus on alternative bearing surfaces. Ceramic-on-ceramic is more and more considered as a clinically proven and safe product, very much effective in reducing wear in the young and active patient. Concern still exists about its reliability and about squeaking.

Ceramic-on-polyethylene was given much support by many speakers and it was evident that the majority of the surgeons in the audience support the use of ceramics in order to limit wear. Ceramic-



James D'Antonio MD, Javad Parvizi MD, Stephen B. Murphy MD, Ricardo Heros (CeramTec GmbH), Chitranjan S. Ranawat MD, Jonathan P. Garino MD, PhD (from left to right)

on-ceramic continues to be recommended for the very young and active patients by most speakers.

There was some discussion with regards to the recently reported concerns over some of the highly cross-linked polyethylenes showing increased wear after 5 years in vivo. A shift to a new generation with more anti-oxidants is in the works, further highlighting the concerns.

The issue of the noisy hip was treated as a part of the pros and cons debate with **Marc Pagnano**² (Rochester, USA) basically supporting the view that the mechanisms are better understood and seem to be related to the presence of metal in the articulation area. **Javad Parvizi**³ (Philadelphia, USA) presented data which clearly pointed out that acetabular components with metal protective rims and thin femoral components made of a Titanium TMZF alloy appear to be generating the majority of the squeaking incidents. Both speakers recommended careful selection of the implants as an essential way to eliminate squeaking.

Perhaps one of the most significant sessions of the meeting was one in which key surgeons on the brink of retirement were asked to share their advice and lessons learned throughout their careers. The greatest part of their recommendations were centered on the patient and how he should be the focus of all.

Throughout the CCJR meeting there was a dominating feeling that the orthopaedic reconstruction market in the USA has once again recovered and procedural growth seems to be back on track after the economic slowdown of the last year.

Once again the fact that a complete update on joint replacement was presented in one room at one time proved to be the great strength of the CCJR meeting. The result is a comprehensive and manageable learning experience combined with highly intensive discussions.

Satellite Symposium

The satellite symposium was titled "Ceramic Articulations in THA: The Contemporary Landscape"(CeramTec). Its program was focused on sharing the 10- to 12-year results of the 3 initial studies carried out in the USA as part of the FDA approval process, providing a complete update on articulation noise, a review of data on reliability and on expanding on the proper assembly of ceramic components. Globally recognized speakers such as William Capello, James D'Antonio, Jonathan Garino, Stephen B. Murphy, Javad Parvizi and others made the program an intensive learning experience for the participants.

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¹ **Jacobs JJ.** Metal-Metal Hypersensitivity: Houston, Do We Have a Problem? Paper 53, 27th Annual CCJR, 2010:121

² **Pagnano MW.** The Squeaking Hip. Paper 4, 27th Annual CCJR, 2010:23

³ **Parvizi J.** The Squeaking Hip. Paper 5, 27th Annual CCJR, 2010:25

Low Risk of Fracture with BIOLOX® Femoral Ball Heads

The use of ceramic femoral ball heads is becoming increasingly common in hip arthroplasty based on their outstanding tribological properties and excellent clinical results. Ceramic femoral ball head fracture is a rare complication. The literature points out that fatigue fractures in endoprosthetic metal components occur more often than fractures in ceramic components¹ (Fig. 1 – 3b). The fracture rate for BIOLOX®*delta* femoral ball heads is as low as 0.002%.



Fatigue fracture of metal stem and cup (Fig. 1, 2)



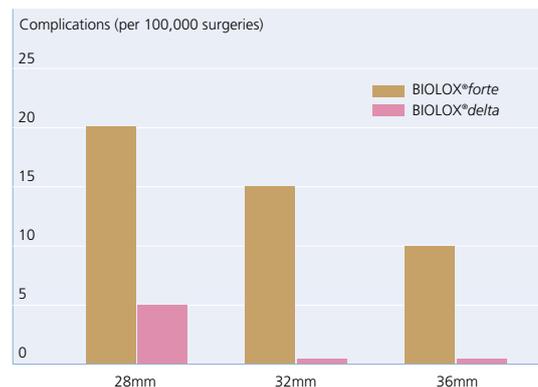
Fatigue fracture of metal condyle with corresponding polyethylene inlay wear (Fig. 3a, b)

The incidence of the risk of fracture for a ceramic femoral ball head is considered to be lower than the risk of a stem fracture, which is approximately 0.27% (270 out of 100,000 implanted stems).²⁻³ Fractures of BIOLOX® components are among the rare complications in hip arthroplasty. This has also been confirmed by the current analysis of CeramTec's complaint database. For over 15 years now, CeramTec has provided those data to the public in order to document the quality of the results. All of the data from the analysis below refer to complications reported to CeramTec during the period from January 2000 through December 2010. From January 2000 through December 2010 approx. 3,600,000 femoral ball heads were delivered (2,600,000 BIOLOX®*forte* and 1,000,000 BIOLOX®*delta* femoral ball heads).

- The complication rate for in-vivo fractured BIOLOX®*forte* femoral ball heads was 21 per 100,000 (0.021%).
- The complication rate for in-vivo fractured BIOLOX®*delta* femoral ball heads was 2 per 100,000 (0.002%).

BIOLOX®*delta* femoral ball heads have a fracture rate that is 10 times lower than the fracture rate for BIOLOX®*forte* femoral ball heads.

The studies and analyses of the results reveal that the causes of fractures in ceramic femoral ball heads are mainly attributed to incorrect handling, component mismatch, and trauma.



Overall analysis from January 2000 through December 2010 based on approx. 3,600,000 delivered BIOLOX® femoral ball heads

The analysis of the in-vivo fractured BIOLOX®*delta* femoral ball heads found that 17 fractures occurred at 2 hospitals involving femoral ball heads designed to customer specifications. 3 complications occurred at 3 additional hospitals involving the same design. This customer-specific design has been removed from the market since 2009.

In addition to patient-specific factors, not only is the selection of the optimal implant important, but also the correct surgical technique is critical in order to ensure quality results in hip arthroplasty. It is especially important to observe the implant manufacturer's product information and instructions for use. Proper handling of BIOLOX® components is also demonstrated on the Live Surgery DVD, which can be ordered free of charge*.

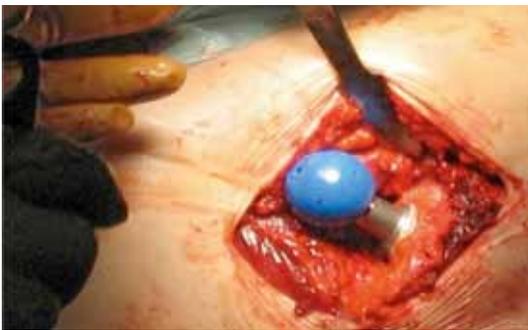
Some important aspects in the handling of ceramic femoral ball heads are presented on the following pages.

1. Use taper protective cap and do not remove until immediately prior to placement of the trial femoral ball head

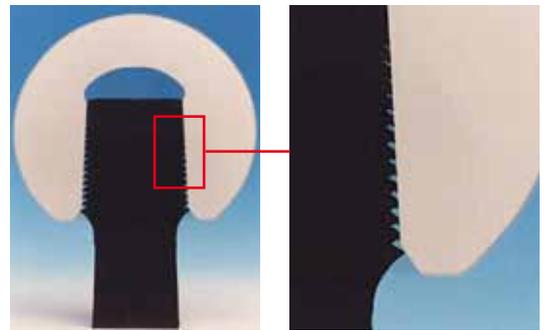


The stem taper could become damaged intra-operatively by surgical instruments.

2. Trial reduction with trial femoral ball head only



When placing and removing the original femoral ball head the defined structure of the stem taper could become damaged.



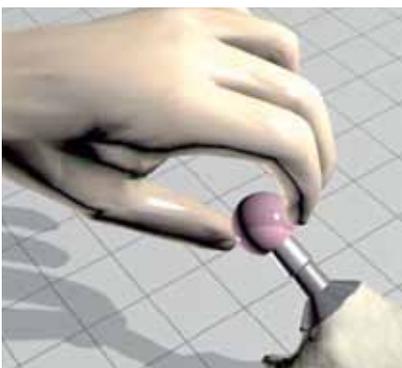
3. Careful cleaning and drying of the stem taper



Third particles (for example, soft tissue, bits of bone and cement residue) in the taper fixation produces selective, non-planar force transmission and asymmetries in the stress-bearing area.

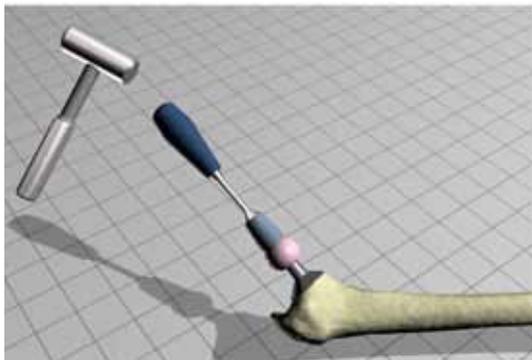
Ceramic-on-ceramic bearing couple (BIOLOX[®] forte), femoral ball head fracture 3.5 years following implantation, staining (cement) in the inner taper of the femoral ball head

4. Correct handling of the BIOLOX[®] femoral ball head

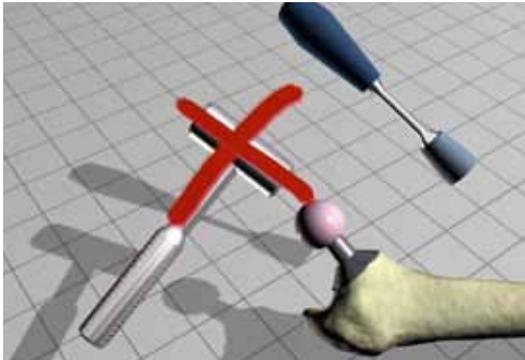


Place femoral ball head with clean, dry inner taper by gently turning it.

5. Fixation of the BIOLOX® femoral ball head



Fixation of the femoral ball head by gently hammering on the plastic femoral ball head impactor (multiple times are permitted) in an axial direction.



Never strike the femoral ball head directly with the metal hammer.

6. Avoid intra-operative damage as well. Do not use any BIOLOX® femoral ball heads that have been dropped or previously used.



We recommend basically:

- Use BIOLOX®*delta* if possible and the largest component size possible.
- For hard hard bearings use BIOLOX®*delta* if possible.
- Make sure that the tapers are compatible.
- Make sure that the taper surfaces are clean and not damaged.
- Carefully assemble the components.
- Confirm proper assembly and then impact.
- Don't combine products from different manufacturers.

What should you do in the case of a ceramic femoral ball head fracture?

Revision surgery means more than just the treatment of aseptic loosening; it also involves rare complications, such as the fracture of a ceramic femoral ball head. This makes it necessary to ensure meticulous pre-operative planning in addition to the identification of the possible causes that resulted in the revision. It should be borne in mind here that the BIOLOX®*OPTION* revision ceramic femoral ball head provides a reliable solution even in rare cases of fractures in ceramic components**.

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- ² **Schmalzried TP.** How I Choose a Bearing Surface for My Patients. J Arthroplasty 19(8), Suppl.3, 2004:514
- ³ **Böttner F.** Orthopädie und Unfallchirurgie. Facharztkompendium 2010 (Orthopaedics and Traumatology. Specialist's Guide). OrthoForum Verlag, Berlin, 2010:41

* The Surgical Live Training DVD can be ordered free of charge by fax or online (www.biolog.com). An order form is also enclosed with this edition of CeraNews.

** See the Surgical Live Training DVD for more information on revision surgery following the fracture of a ceramic component. CeraNews 2/2010 included a report about the BIOLOX®*OPTION* ceramic revision femoral ball head for hip revisions as well as for further applications during primary operations (including case studies). Visit our website (www.biolog.com) for a PDF version of CeraNews. You can also order the publication using the enclosed order form.



Orthogeriatrics Instead of Orthopaedics?

Older patients as a challenge

The percentage of old and very old people, many with complex somatic, psychic, social and functional disorders, has increased considerably in recent decades. This demographic change is also reflected in the rising number of hip and knee replacement surgeries in older patients. Statistical data published by the American Academy of Orthopaedic Surgeons (AAOS) show an increase of 16% for hip replacement surgery and 44% for knee replacement surgery among 65 to 84-year-olds in the period from 2002 to 2007. The increase was even greater among patients over 85: plus 21% for hip replacement and plus 54% for knee replacement.¹ Increasingly required to respond to the needs of older patients, orthopaedics is facing core issues in the area of geriatric care. As early as 1989, the World Health Organization called for the "geriatrification of the medical disciplines."² We asked Fritz-Uwe Niethard, the Secretary General of the German Society of Orthopaedics and Traumatology (DGOU), what this development means for the field of orthopaedics.



Fritz-Uwe Niethard, MD, PhD, is Secretary General of the German Society of Orthopaedics and Traumatology (DGOU). Before becoming a professor emeritus in July 2010, Niethard held the Medical Faculty Chair for Orthopaedics at RWTH Aachen University and was Director of the Orthopaedic Department of the University Hospital. He is the current Director of Outpatient Rehabilitation at the Schwertbad Klinik in Aachen.

Ever since the introduction of the term "orthopaedics" by the French physician Nicolas Andry in the year 1742, the discipline has been characterized by major advances. In light of demographic developments, the field of modern orthopaedics now faces new challenges. You have recently emphasized the growing significance of orthogeriatrics. Do we need a geriatrification of orthopaedics?

At a Pauwels Symposium held on July 30th on the occasion of my departure from the University Hospital, I used the opportunity to take a retrospective look and take stock of the past 40 years of my career in orthopaedics. During this period, the spectrum of our field changed fundamentally. When I began my work as an orthopaedic surgeon in the early 1970s, there were far more children than today and there was a corresponding need for pediatric orthopaedics. Now, there are not only fewer children, but many of the serious diseases of the time can be treated effectively and disorders that were once common are seldom seen today. At the same time, life expectancy has risen and the elderly have come to represent an ever larger percentage of all patients in orthopaedics. Consequently our field will undergo an automatic transformation in the direction of orthogeriatrics. This is especially apparent now that the baby boomers have reached the age of retirement.

Concepts for linking orthopaedics and geriatrics were developed by Evans und Devane in the 1950s. Have specific orthogeriatric treatment models been introduced in the meantime?

There are models in the general area of geriatrics that are tailored to the specific needs of the elderly. The focus here is to combine medical and social services in order to integrate the patients into their home environments after treatment or, if that is no longer possible, to place them in nursing homes. This subject can be expected to gain in relevance in view of the fact that more and more elderly patients are single and no longer embedded in family structures. This represents a major societal challenge. Functioning models that meet this challenge have been in place in Scandinavia for a few decades. While convincing approaches can also be found in Germany, no comprehensive solutions have been implemented. One problem is that the transitions between the various areas of care are very abrupt.

The authors of a review that appeared in 2005 warned that following clinical guidelines for older patients with co-morbidities can have unwanted side effects.³ Moreover, experts in the United States pointed out at the end of the 1980s that the introduction of diagnosis-based prospective payment systems will put pressure on the duration of hospital stays, which may lead to a loss of quality and to increasing macroeconomic costs.⁴ Is it at all possible to manage the complex needs of older patients within formalized procedures?

“In order to ensure a sufficiently differentiated care for the elderly only interdisciplinary approaches make sense.”

Although the existing guidelines leave physicians a sufficient freedom of interpretation depending on factors at hand, there is as yet no standard. Some professional geriatric associations have come out in favor of establishing independent departments for older patients on the model of pediatrics. In order to ensure a sufficiently differentiated care for the elderly one would have to staff such departments with very many specialists that are already present in other departments, however. I think only interdisciplinary approaches make sense in this context.

What is in store for arthroplasty as the mainstay of orthopaedics and are we prepared for it?

The problems of an old patient are not the same as those of a 40- to 50-year-old. When an old patient undergoes surgery a whole range of factors has to be accounted for. This message is already being conveyed today in medical schools where students receive instructions relating to the specific problems of older patients. This knowledge, however, has not yet quite made it into hospital settings. It is easier for large hospitals that offer comprehensive treatment because they are usually equipped with the interdisciplinary specialist knowledge required. They have the internists, neurologists, orthopaedists, traumatologists and others that may be needed in the treatment of older patients. Smaller hospitals tend to face limitations. Here, it is essential to continue to secure specialist knowledge. This is an issue that is receiving greater attention among the professional associations. Hence it is treated more thoroughly at our congresses. There are also more and more special events devoted to musculoskeletal diseases or injuries in older patients.

The degree to which older patients are able to resume their daily routines after becoming sick or suffering an injury has a strong impact on their perception of their health. Take, for instance, the case of an elderly patient who has been admitted to the hospital with hip pain after a fall. Although the examinations indicate that there is no need for hospitalization, the patient may nonetheless continue to suffer for days on account of the pain and an inability to walk. How can this dilemma be resolved?

That is a good example of the problem of interfaces that we addressed earlier. First, we urgently need bed capacity for conservative treatment in orthopaedics and traumatology because surgery is not always necessary. Second, we need to adapt the interfaces so as to facilitate the transition from one level of care to another. This will require established courses of treatment to ensure that the caregivers at every level of care operate with the same knowledge and understanding of the problem and that the goal of treatment is achieved. The courses of treatment established by the professional associations can serve as models. There are major differences in the various healthcare systems throughout the world. Many countries have nothing resembling the comprehensive healthcare facilities available in Germany. Elderly patients in these countries who are unable get by on their own after treatment and have no family members to care for them are relegated to some form of nursing home where medical support is only marginal. In Germany, we are already optimally equipped in this regard. We only need to solve the interface problem. I think that aging industrial societies should be prepared to pay for adequate facilities because this also represents a measure of basic social cohesion.

“Established courses of treatment are required to ensure that the caregivers at every level of care operate with the same knowledge and understanding of the problem and that the goal of treatment is achieved.”

Is an international exchange taking place on the issues of orthogeriatrics?

This exchange is indeed taking place at the relevant congresses. However, these tend to focus on the related scientific questions. The fact that physiotherapy is an academic course of study in most countries, as opposed to Germany, also plays a role. We receive important scientific impetus from other countries in this area. In the field of geriatrics, it is primarily physicians and sociologists who are actively involved in an exchange of information. The structures tend to be very different in the various countries – in Germany it is physicians working in the area of social medicine who are always involved because health insurance companies and social security agencies play an important role in this area.

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¹ <http://www.aaos.org/>

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Clinical Results with Ceramics

5 to 9-year results of CoC THA in young and active patients

In a prospective study, [Le Meur et al.](#) (France) evaluated 108 patients (53 female, 55 male) with a mean age of 55.4 years at the time of surgery. Alumina CoC bearing couples (BIOLOX[®]forte) were used in 111 hips. 32mm femoral ball heads had been used in 75% of all cases. In 10 cases cemented stems were used. The mean follow-up was 6.9 years. Main indications were coxarthrosis (61.2%), osteonecrosis (18.9%) and dysplasia (7.2%). Patients were followed up at 3, 6, 12 and 24 months. 5 patients were revised due to fracture of the femur (2), dislocation (1), loosening (1) and femoral ball head fracture (1). Infections were not observed. The survival rate for ceramic components was 99.1% at 5 years.

Le Meur M, Lecoz L, Tayeb A, Louis ML, Curvale G, Rochwerger A. Analyse de survie d'un couple de frottement céramique – céramique à plus de 5 ans, à propos d'une cohorte de 108 patients. Abstract 329, SOFCOT 2010, Paris

Long-term results of CoP (zirconia ceramic)

[Hamache et al.](#) (France) evaluated 77 patients (84 hips) with a mean follow-up of 10 years. The mean age was 76.5 years at the last follow-up. 24 THAs were cemented, 60 were hybrid. A 22.2mm femoral ball head made of zirconia ceramic* was used in all cases. The Merkel osteolysis (0.5 – 1mm) was observed in 23.52% of the patients at the 10-year follow-up. Osteolysis occurred early with already 9.12% at the 5-year follow-up.

Hamache S, Caton J. Résultats à plus de 10 ans d'une PTH avec couple zircone/PE. Abstract 282, SOFCOT 2010, Paris

* The ceramic product mentioned here was not supplied by CeramTec.

10-year results of CoC vs MoM THA (sandwich) – A comparative, prospective randomized study

[Chatelet et al.](#) (France) evaluated 114 THAs performed by a single surgeon in 2 matched cohorts. The series included 63 MoM THA performed in 62 patients (19 female, 43 male) and 51 CoC (alumina) THA performed in 52 patients (20 female, 31 male). The mean age was 62 (35 – 85) years in the MoM group and 59 (36 – 80) years in the CoC group. 101 patients (102 hips) were followed up at 10

years. The rate of general complications following THA showed no significant difference between both groups. Insert fracture was observed in 1 case in the CoC group at 2 years after surgery. In the MoM group 4 patients showed an asymptomatic femoral osteolysis during the follow-up period. The authors noted that in 2 cases a revision might be necessary in the future.

New findings on such asymptomatic osteolysis associated with MoM bearings were presented by [Huber et al.](#) (Austria)* in another study. They collected components and surrounding tissues post mortem from 7 patients with 9 implants of second-generation MoM THA. 6 patients were asymptomatic at the time of death between 3 and 10 years after surgery. Increasing hip pain was reported by 1 patient. The patients did not show an evidence of an implant-related infection. There was no evidence of gross impingement or corrosion at the head-neck junction. Radiographs of the MoM hips were evaluated for osteolysis. The histological analysis confirmed radiographic findings of asymptomatic osteolysis in 2 cases. In 3 cases histological analysis revealed osteolysis that has escaped conventional radiographic analysis. The authors noted that the detection of small osteolytic lesions may require more effective instruments such as MRI. Joint capsule tissue showed metallosis in all hips and local lymphocytic infiltration in 8 hips.

Energy-dispersive x-ray analysis identified chromium peaks in all hips and traces of corrosion products (phosphorus, oxygen) in 3 hips. Diffuse and perivascular lymphocytic infiltrates were found in all 8 well-functioning hips.

The authors concluded that these post-mortem findings may indicate a relationship between the extent of tissue inflammation and the development of osteolysis following a MoM hip replacement.

They pointed out that the findings showed the extent of osteolysis similar to that with MoP articulations evaluated in previous autopsy studies.

Chatelet JC, Setley L. Étude comparative prospective des couples de frottement métal-métal versus alumine-alumine de 114 PTH à 10 ans de recul. Abstract 330, SOFCOT 2010, Paris

* Huber M, Reinisch G, Zenz P, Zweymüller K, Lintner F. Postmortem study of femoral osteolysis associated with metal-on-metal articulation in total hip replacement: an analysis of nine cases. *J Bone Joint Surg Am* 92(8),2010:1720-1731.

The risk of short-term complications after primary CoC THA vs MoM and MoP THA

Bozic et al. (USA) compared short-term complication rates (deep vein thrombosis, dislocation, infection and mechanical loosening) and revision THA of different bearing couples among older Medicare patients during the first 2 years after primary THA. They performed a matched cohort analysis of 3 separate cohorts of THA patients (CoC, MoM, MoP). The patients were matched by age, gender and US census region. MoM bearings were associated with a significantly higher risk of periprosthetic joint infection when compared to CoC bearings (0.59% vs 0.32%). The clinical importance and reasons of these findings remain unclear. The authors assume that possibly some of these MoM patients may have been misdiagnosed as having an infection when in fact they had a local soft tissue inflammatory reaction. They pointed to the fact that such cases were reported by Mikhael et al.*. No other differences of short term complication rates between MoM, CoC, MoP bearings were identified.

Bozic KJ, Ong K, Lau E, Kurtz SM, Vail TP, Rubash HE, Berry DJ. Risk of Complication and Revision Total Hip Arthroplasty Among Medicare Patients with Different Bearing Surfaces. *Clin Orthop Relat Res* 20,468,2010:2357-2362.

* Mikhael MM, Hanssen AD, Sierra RJ. Failure of metal-on-metal total hip arthroplasty mimicking hip infection. A report of two cases. *J Bone Joint Surg Am.* 91,2009:443-446.

Survival Rates of hard-on-hard bearings (CoC, CoM, MoM)

Zywiel et al. (USA) reported on results of a systematic review of peer-reviewed literature (Level I and II studies) addressing MoM THA of the second generation, MoM hip resurfacing, CoC THA and CoM THA. The 4 studies (Level I or II) of MoM THA reported survival rates between 96% and 100% at mean follow-ups ranging from 38 months to 5 years.

The 2 Level I studies of MoM hip resurfacing reported a survival rate of 94% at a mean follow-up of 56 months and 98% at a mean follow-up of 33 months. The Level II study reported a survival rate of 95% at a mean follow-up of 36 months.

The 4 studies (Level I) of CoC THA reported a survival rate of 100% at mean 51 months to 96% at 8 years.

The authors identified no published studies reporting survival of CoM THA.

They noted that some variability in survival rates may be due to differences in surgical technique, component positioning and implant designs. They concluded that the use of hard-on-hard bearings will increase in young and active patients. The authors pointed out that there has been an increase in concern among the orthopaedic community about the potential for local and systemic distribution of metal debris and for potential adverse reactions after the implantation of MoM bearings.

Zywiel MG, Sayeed SA, Johnson AJ, Schmalzried TP, Mont MA. Survival of Hard-on-Hard Bearings in Total Hip Arthroplasty: A Systematic Review. *Clin Orthop Relat Res*, published online, 05 November 2010.

Acronyms:

AVN = Avascular Necrosis

CoC = Ceramic-on-ceramic

CoM = Ceramic-on-metal

CoP = Ceramic-on-polyethylene

DDH = Developmental dysplasia of the hip

HHS = Harris Hip Score

LCPD = Legg-Calvé-Perthes Disease

MoP = Metal-on-polyethylene

MoM = Metal-on-metal

MRI = Magnetic resonance imaging

OA = Osteoarthritis

ORIF = Open Reduction Internal Fixation

SCFE = Slipped Capital Femoral Epiphysis

THA = Total hip arthroplasty

UHMWPE = Ultra high molecular weight polyethylene

XPE = Crosslinked polyethylene

5 to 10-Year Results of Cementless CoC THA in Young and Active Patients with Dysplastic Coxarthrosis*

Many papers have reported on clinical outcomes with CoC bearings in THA. However, to date there are only very few reports on CoC bearings implanted in dysplastic hips. Recently published studies from Japan, for example by Atsushi Kusaba et al., have focused on clinical experience with CoC THA in dysplastic hips.

Atsushi Kusaba, Kiyohiro Nagese, Saiji Kondo, Yoshikatsu Kuroki¹, Akihiko Maeda², Jörg Scholz³

Hip arthroplasty in Japan

- Dysplastic coxarthrosis
- High percentage of young patients
- High level of activity
- Flat, small acetabulum
- Abnormal anatomy
- Inferior bone quality
- Severe contracture

Medical problem

The treatment of patients with dysplastic coxarthrosis, one of the most frequent diagnoses for hip problems in Japan, constitutes a challenge. Since wear has a major influence on the service life of a hip arthroplasty, we use a CoC bearing in anticipation of a lower osteolysis rate and a lower revision rate. Medium-term results were analysed in a retrospective study.

Materials and methods

In 251 patients with dysplastic coxarthrosis 290 implantations were performed with a Spongiosa Metal II® (SM) cup (ESKA Implants) and a CoC bearing (BIOLOX® forte, femoral ball head 28mm, CeramTec GmbH). In 181 hips the SM stem was used and in 109 hips with a narrow femoral canal an SL Plus stem (S&N Orthopedics AG) was used. The average age was 53. In all the cases the preoperative diagnosis was dysplastic coxarthrosis, including 15 failed osteotomies and 5 dislocations. An anterolateral approach was used. Fixation screws were used in one patient. In 23 hips, acetabuloplasty using screws was performed in addition. In 87 hips, adductor tenotomy was carried out. 10 hips required extensive soft tissue release. The mean follow-up was 6.5 (5 – 10) years.



* Source: Poster, German Congress for Orthopaedics and Traumatology, Berlin, Germany, 26–29.10.2010. The poster was graphically revised for CeraNews with kind permission from Dr. Atsushi Kusaba.

¹ Ebina General Hospital, Institute of Joint Replacement and Rheumatology, Ebina, Kanagawa, Japan

² Fujigaoka Hospital, Showa University, Department of Orthopaedic Surgery, Yokohama, Kanagawa, Japan

³ HELIOS Hospital, Emil von Behring Clinic of Orthopaedics, Berlin, Germany

Surgical procedure

- Resection of sclerotic tissue before reaming
- Reaming up to the internal lamina
→ Largest cup (i.e. a ceramic insert with maximum wall thickness) and medialisation of the hip center
- Removal of osteophytes
→ Avoidance of impingement



All patients

- Semi-lateral position
- Curved skin incision
- Anterolateral approach

Soft tissue release

- Adductor tenotomy 68 hips
- Flexor tenotomy 6 hips
- Extensive soft tissue release 8 hips
→ Reduction of excessive articular stress in concentric joint movements

Correct implantation technique and surgical caution are absolutely essential to be able to exploit the benefits of a CoC bearing and to avoid complications.

Even with highly dysplastic acetabula the surgeon must ensure good primary stability and cup positioning.



Acetabuloplasty with screws (23 hips):

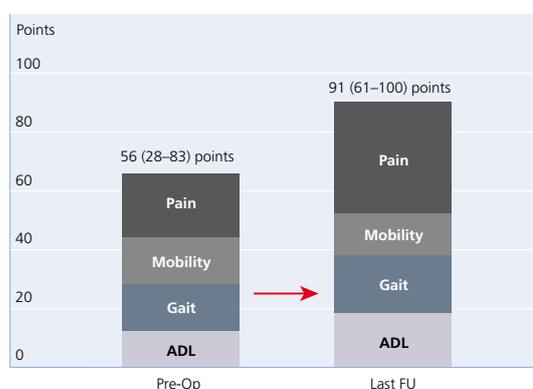
57-year-old female, before surgery (a), 8-year post-op (b). The HHS improved from 51 to 85 points. The acetabular and femoral components were stable.

Results

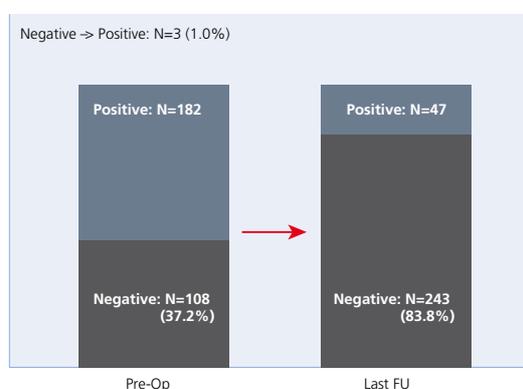
In the observation period all the implants were stable. In radiology, radiolucent lines were found in the acetabular region of 4 hips (1.4%) ($t = 1.09$, $p = 0.30$) with an SM stem. In the proximal stem zones they were found in 8 SM stems (4.4%) and 22 SL stems (20%) ($t = 17.70$, $p = 0.00$). There were no osteolyses. By contrast, when the CoP bearing was used, osteolyses were observed ($13/56 = 23.2\%$) ($t = 63.68$, $p = 0.00$). The mean angle of inclination was 40 (23 – 58) degrees and the mean angle of anteversion was 29 (5 – 56) degrees. No dislocations occurred. 2 patients with an SM stem (1.1%) and 4 with an SL stem (3.7%) reported noises ($t = 1.12$,

$p = 0.29$) but these were not reproducible. It was not possible to establish any significant correlation with cup positioning or range of motion. In 2 patients with an SL stem a revision took place owing to a ceramic insert fracture. With both patients the metal cup had been damaged because an instrument used was unsuitable. The revision rate due to implant-related failure was lower for the CoC bearing (2/1498, $p = 0.1\%$) than for the MoM bearing (10/585, 1.7%) ($t = 15.94$, $p = 0.00$).

Harris Hip Score



Trendelenburg's sign



Cup orientation (no dislocation)

Pre-Op Sharp's angle	Post-Op inclination	Post-Op antetorsion
Ø 50 degrees (39–71)	Ø 40 degrees (23–58)	Ø 29 degrees (8–54)

Range of motion at the last FU (no dislocation)

Flexion	Extension	Abduction	Adduction	External rotation	Internal rotation
Ø 89 degrees (35–120)	Ø 6 degrees (-10–20)	Ø 22 degrees (0–50)	Ø 10 degrees (0–25)	Ø 25 degrees (5–45)	Ø 26 degrees (0–20)

Conclusion

In the case of dysplastic coxarthrosis the Spongiosa Metal II® endoprosthesis allows excellent primary stability. Following treatment with the CoC bearing fewer periprosthetic reactions were observed than with the CoP bearing. The failure rate with the CoC bearing was lower than with the MoM bearing.

From a tribological viewpoint, CoC bearings constitute a basis for long implant survival also in young and active patients with dysplastic hips.

Treatment Options for Osteoarthritis in Dysplastic Hips

Case reports on the clinical experiences with ceramic-on-ceramic bearings

by Atsushi Kusaba, MD, PhD



Atsushi Kusaba is Chief Surgeon at the Institute of Joint Replacement and Rheumatology at the Ebina General Hospital and Assistant Professor at the Showa University (Fujigaoka Hospital) in Kanagawa, Japan. He is a Board member of the Japanese Association of Rheumatology, Supervisory Doctor and Boardman of the Japanese Association of Rheumatology, Board Chairman of the Kanagawa Rheumatism Medicine Association and holds a Specialty Board Certification of the Japanese Orthopaedic Association. Dr. Kusaba is Member of the Société Internationale de Chirurgie Orthopédique et de Traumatologie (SICOT), the German Orthopaedic Society (DGOOC) and the International Society for Technology in Arthroplasty (ISTA). He has authored 5 textbooks, 33 original publications and 105 presentations in English or German, not counting numerous publications in his country. Dr. Kusaba holds medical licenses for Japan and Germany.

Contact:

Atsushi Kusaba, MD, PhD
 Institute of Joint Replacement
 and Rheumatology
 Ebina General Hospital
 1320 Kawaraguchi, Ebina
 Kanagawa 243-0433, Japan
 Phone: +81-462-33-1311 (office)
 Fax: +81-462-32-8934 (office)
 e-mail: weardebris@aol.com

Case 1: Uncemented CoC THA for Kalamchi and MacEwen Type II hip¹

Diagnosis

55-year-old female with DDH and secondary osteoarthritis (Fig. 1). During her infancy, a cast was adapted to reduce the right hip dislocation. The side effects of casting, a hematogenous disorder and developmental disturbances caused a capital aplatanation. She could hardly walk before the surgeries because of the severe leg length discrepancy and contracture. She also complained of severe bilateral joint pain.



Fig. 1: 55-year-old female with DDH and secondary osteoarthritis



Fig. 2: Release of the gluteus maximus tendon insertion



Fig. 3: One year after surgery: normal function and dramatically improved contracture

Treatment

Both hip joints were replaced simultaneously by uncemented implants through the anterolateral approach. Considering her age and activity level, CoC bearing couples (BIOLOX[®]forte) were used. Extensive soft tissue release was necessary for both hips: the adductor muscles (from the femur), the adductor tendon (at the pubis), the gluteus maximus (from the gluteal tuberosity), the gluteus maximus tendon (at the insertion), the quadriceps and sartorius (origins from the ilium), the iliopsoas tendon (at the lesser trochanter), and the V-Y advance of the fascia lata (Fig. 2)² were released. One year later, the patient walked normally and the contracture had improved dramatically (Fig. 3). The leg length discrepancy had been well adjusted (Fig. 4).



Fig. 4: Radiographs of full column lower extremities before (a) and after (b) the surgeries

Case 2: Uncemented CoC THA for Crowe IV dysplastic hip³

Diagnosis

57-year-old female with DDH and secondary osteoarthritis (Fig. 5). The dislocation had not been reduced. She suffered from severe limping and needed a cane for walking.



Fig. 5: 57-year-old female with DDH and secondary osteoarthritis



Fig. 6: Acetabuloplasty to compensate for shallow and small acetabulum



Fig. 7: CoC bearing couple



Fig. 8: One year after surgery a similar procedure was performed on the contralateral side.

Treatment

Through an anterolateral approach, the left hip was replaced by an uncemented implant. To compensate for the shallow and small acetabulum, an acetabuloplasty was performed (Fig. 6). The bearing couple was CoC (BIOLOX[®] forte) (Fig. 7). To lengthen the leg and to balance the muscle tension, an additional extensive soft tissue release was necessary, similar to case 1. One year later, the patient complained of pain on the contralateral side where subsequently a similar procedure was performed. Five years after the second surgery, she could walk normally without support and was fully satisfied with the result (Fig. 8, 9).

References:

- ¹ Kalamchi A, MacEwen GD. Avascular necrosis following treatment of congenital dislocation of the hip. *J Bone Joint Surg [Am]* 62;1980:876–88.
- ² Kusaba A, Munakata Y, Nagase K, Maeda A, Kan N, Kondo S, Kuroki Y. Uncemented Ceramic-on-Ceramic Bearing for Dysplastic Hips – To Advantage the Bearing Property: from a Viewpoint of Surgeon. In: Cobb JP (ed.). *Modern Trends in THA Bearings – Material and Clinical Performance*. Springer-Verlag Darmstadt, 2009:195–201.
- ³ Crowe JF, Mani VJ, Ranawat CS. Total hip replacement in congenital dislocation and dysplasia of the hip. *J Bone Joint Surg [Am]* 61,1979:15–23.



Fig. 9: Radiographs of full column lower extremities before the first surgery (a) and 10 years after the second surgery (b)

Heinz Mittelmeier Research Award for Study on Mix-and-Match

The German Society for Orthopaedics and Orthopaedic Surgery (DGOOC) presented the Heinz Mittelmeier Research Award to Dr. Saverio Affatato (Bologna, Italy) at the German Congress for Orthopaedics and Traumatology (DKOU) in Berlin in October 2010. He received the award for his paper on the subject of "Mixing and matching in ceramic-on-metal hip arthroplasty: An in-vitro hip simulator study". The award, which is endowed with € 5,000, was donated by CeramTec.

In their study, Dr. Affatato and his colleagues investigated the wear characteristics of hybrid ceramic-on-metal bearings (28, 32 and 36mm diameters) in comparison with ceramic-on-ceramic combinations. The ceramic and metal components are from different suppliers. None of those tested components have been released by the manufacturers for use as bearings. In the study, the loss of weight was measured in a standardised wear simulation test. The results show much greater wear for ceramic-on-metal than for ceramic-on-ceramic. Also, in the case of ceramic-on-metal with 32mm femoral ball heads far more wear was found than with 36mm femoral ball heads.

The results of the study confirm that clinical failure can be predicted for bearing components of ceramic-on-metal designs whose design has not been validated by extensive testing.

Literature (extract)

Affatato S, Spinelli M, Squarzone S, Traina F, Toni A. Mixing and matching in ceramic-on-metal hip arthroplasty: An in-vitro hip simulator study. *Journal of Biomechanics*, vol. 42, no. 15, 13 November 2009.

Hinrichs F, Griss P. Retrieved Wear Couple Ceramic-on-Metal: A Case Study. In: Toni A, Willmann G (eds.). *Bioceramics in Joint Arthroplasty*. Thieme-Verlag 2001:99-102.

Steens W, Katzer A. Cobalt-poisoning after failed wear couple in hip arthroplasty. P378, EFORT 2008.

Steens W, von Foerster G, Katzer A. Severe cobalt poisoning with loss of sight after ceramic metal pairing in a hip. A case report. *Acta Orthop* 77(5), 2006:830-832.



Fritz-Uwe Niethard (German Society for Orthopaedics and Traumatology), Saverio Affatato and Heinrich Wecker (CeramTec) after the prize winning ceremony (from left to right)

Dr. Saverio Affatato has been conducting research at the Laboratorio di Tecnologia Medica (LTM) of the Istituto Ortopedico Rizzoli in Bologna, Italy, since 1995. His focus is on developing protocols for the evaluation of wear in hip and knee joint simulators. Apart from his research activities Dr. Affatato also teaches at the University of Bologna, including computerised methods for the postoperative evaluation of total hip arthroplasties. He has published over 40 scientific articles and is a reviewer for journals such as "Artificial Organs", "Clinical Biomechanics" and the "Journal of Biomechanics". Dr. Affatato was a Member of the European committee COST 533 for biomaterials in medical engineering and he belongs to the Italian Tribology Association (AIT).

Call for papers

In 2011, the German Society for Orthopaedics and Orthopaedic Surgery (DGOOC) will again offer the Heinz Mittelmeier Research Award, which is endowed with € 5,000. The research award, donated by CeramTec GmbH, is offered to young doctors, engineers, and scientists up to age 45 for outstanding research and development work in the field of bioceramics and the problem of wear in joint replacements and in combination with clinical results of ceramic implants.

The paper must be submitted to the DGOOC by **31 August 2011** (date of posting). The award will be presented at the German Congress for Orthopaedics and Traumatology (DKOU) in Berlin from 25–28 October 2011.

Further information concerning application details is available at:

Deutsche Gesellschaft für Orthopädie und Orthopädische Chirurgie e.V. (DGOOC)
Langenbeck-Virchow-Haus
Luisenstr. 58/59
10117 Berlin
Phone: +49 30 84 71 21-31
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73207 Plochingen
Germany
Phone: +49 7153 611-828
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Your contact:

Heinrich Wecker
Director Marketing and Sales
Central and East Europe
Phone: +49 7153 611-845
e-mail: h.wecker@ceramtec.de

Paul Silberer
Director International Sales
Phone: +49 7153 611-522
e-mail: p.silberer@ceramtec.de

Dieter Burkhardt

Director Region North and South America
Phone: +49 7153 611-485
e-mail: d.burkhardt@ceramtec.de

Concept and editing:

Sylvia Usbeck
Heinrich Wecker
Florence Petkow

Layout and production:

LoopKomm Infomarketing GmbH
Phone: +49 7634 55 19 46
e-mail: mail@loopkomm.de

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