

Editorial

"In My Experience...Transformation from Medial UKA to Medial Sphere KA: Where the data leads"

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The author reviews his transformation from unicompartmental knee arthroplasty to kinematic alignment with medial sphere total knee arthroplasty.

I have been, for 20 years, plus or minus, in the unicompartmental medial mobile bearing camp—one of the first surgeons to learn it, first surgeons to teach it—have a personal surgical experience with the most implants in the world. At one point in time, over 50% of my knees were unis. And that was about 10 years that it plateaued. It plateaued at approximately 50% of my knees. And then I started getting into kinematic alignment with the medial sphere implant. At the same time, we looked at the results—our 15-year minimum follow-up of the Oxford mobile-bearing uni, and survivorship was not as good as I thought it was. It mirrored that of the registries, and the outcomes of the kinematic alignment (KA) medial sphere knees, were substantially better than my primary total knees after 20 years of practice. So quickly, that curve flipped. Now, my utilization of unis is down, more like the normal practice of 6 to 12%, depending on what you see in the office. As part of that journey, I had just finished combing through minimum one-year data that showed that the Patient Reported Outcomes Measures (PROMs), specifically KOOS JR, are basically the same between my unis and my KA medial sphere knees. And so the data begs the question, "Why keep doing unis with a higher long-term failure rate if the purported benefit of the UKA was better function and better PROMs?" The data suggests that we have equalized the PROMs, the function, and the satisfaction; while the revision rate is significantly less with total knee. And so, it's brought my utilization of unis back down into the normal range.

Let's start from the beginning. I was 2 or 3 years into practice with Adolph Lombardi, who's one of the most well-known and highest volume knee surgeons in the world, and was looking to find my niche. I had the opportunity to start

working with the Repicci unicompartmental knee system at the time and did not find that, at least in my hands, that was a great device for me and my patients. With an early burgeoning relationship with Biomet, specifically one of the knee folks named Lance Perry, we were working on some knee designs and some ideas around knees. I was invited to go to England to take part in the first train-the-trainer experience when the Oxford was going to be approved by the FDA in the United States in 2004. A dozen of us, went over to become the trainers to come back to the U.S. and train surgeons on the Oxford partial knee. Sitting in that classroom in Oxford and watching David Murray, Goodfellow, and O'Connor talk about this operation, honestly, a lot of it originally seemed pretty extreme, pretty silly. The indications they presented, the radiolucent lines, how do you manage pain? At the time, I was doing the usual 6% or so of my knees as unis. I had the opportunity to go over and train on the Oxford. I came home and was invigorated with the idea of unis and started doing the medial mobile bearing device. My percentage of utilization quickly increased for two reasons. One, it was my part of the practice. Adolph does a ton of unis, but it became my part of the practice. It became what I was known for—both within our community and within the orthopedic community and within the industry. Second, when directly compared with TKA, the early results mirrored that of the Oxford group.

From 2004 to 2010, I continued to ramp up. The results were phenomenal. The early results were significantly better than total knee replacement in terms of recovery, function, range of motion, manipulation rate, and complication rate. We published on all of these early findings with great excitement. Around 2010, I was doing about 50% unis in my

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patients with osteoarthritis with medial, 90%; lateral, 8%, and 1 or 2% patellofemoral.

I kind of considered myself to be a real "compartmentalist." The same time, I had started working with Steve Howell in 2005–2006 on what, at the time, turned out to be the Signature device—the Patient Specific Instrumentation (PSI) guides for Biomet. Steve was working on that project on his own. He ended up branching off because we had some disagreements. I said he was nuts. The knees are all crooked. This makes no sense. This will never work. What do you (Howell) know, as the super-experienced knee surgeon, that I don't know (K Berend), as a completely inexperienced knee surgeon, and so on and so forth. That was right about the same time that I was really ramping up my uni utilization. So, from 2010 to 2020, for a decade, I did more than half of my practice as partial knee replacements. With recent excitement around cementless fixation, and without having the availability of the cementless Oxford, I started using another cementless device that was available in the U.S. We had some early problems which we subsequently published. That experience pulled me back a little bit with my uni excitement. I realized at the time I've done almost 5000 partial knees. The typical, patient does great. Look at everything we published. But I started to look at the publications and they were all from 10 years prior. They were early results. They were early outcomes, minimum 2 years and perioperative complications. We had not yet reviewed our mid-term experience and registry data, while not perfect, was showing 3 times higher revision rates around the world. We started our minimum 15-year study looking at our results of medial mobile bearing partial knee replacement. Nearly the same week, I got an email from Steve Howell when we had published our minimum 10-year results with primary total knee, and our survivorship was excellent. We reported 92% (CR lip-type bearing) to 99% (ultracongruent) minimum 10-year survivorship of a cruciate retaining knee (CR), all using traditional mechanical alignment (MA). Survivorship outstanding, but we had 6–8% manipulation rate, in that series. which is high. We had previously and subsequently published MUA rates of 6.5%, 7.2% in our TKA. End result, the survivorship of TKA was great but was the overall function was not doing as well as what we had thought.

If you know Steve Howell, the godfather of kinematic alignment (KA) knee replacement, he sent me a not-so-gentle message telling me that I was doing it wrong. I pulled up all of my old emails that I had saved when he first started the idea of kinematic alignment using Eckhoff's method of trying to figure out the cylindrical axis. Howell had been working on this concept for nearly 20 years. Recent data suggested to me that he was correct the entire time. That got me really thinking that I needed to reconsider my approach to total knee replacement. I consider it my midlife crisis, January of 2022. Friday, I did my last mechanically aligned cruciate retaining total knee replacement. That next Monday, every knee that I've done since then has used true unrestricted, caliper verified, kinematic alignment with a medial ball and socket/medial sphere device. Until recently, all have been cemented and all patella

resurfaced, trying to narrow in on the variables of KA and medial ball and socket only. The immediate thing that I saw, and we published, was the manipulation rate dropped. It became incredibly rare. Instead of MUA one in 10, or two or three people every week, MUA went to 1–2 in 100 (2%). As much as I've heard it from surgeons around the world, I found myself telling the same story: My physical therapist came to me and said, "What are you doing differently?" Not knowing what I was doing differently in the operating room. There was a substantial difference, at least in the early recovery.

Meanwhile, we finalize our study on the minimum 15-year results of the medial mobile bearing of which again, I'm one of the huge zealots worldwide, and found that our survivorship was 84% 15 years. Just worse than a 1% per year failure rate at 15 years in the hands of someone who's done more of them than probably anybody else. Despite ongoing research, development and publishing on UKA, our results were no better than that of nearly every registry. It got me thinking about my indication which identified 50% of knees as candidates instead of Kozinn and Scott in the 6 to 10% range.

My kinematically aligned (KA) knees, and it is important to clearly define true kinematic alignment: not inverse, not restricted, not personalized, not patient-specific, the true Steve Howell method. In true, unrestricted KA, you cut out what you're putting back in with metal and plastic, ignore the alignment, the knees were doing better. And so, earlier this year, we looked at my minimum one-year results of kinematically aligned, unrestricted, caliper-verified total knees using a medial ball-and-socket, flat lateral component with a trochlea that's specially designed for kinematic alignment and compared them to my medial mobile bearing unis. Minimum one year for both groups, prospective data collection. My uni utilization in that study was just under 20%. So, it had gone from 50% to 20% in the last three and a half years. And now it's down to around 10%.

The prospective results showed the KOOS JR score was identical between the two groups. The delta improvement was slightly higher in the total knee group because they started slightly worse from a KOOS JR standpoint. The minimum clinically significant, or MCID was equal. The number of patients that did not improve or were not satisfied was identical, and it was less than 5% in both groups. It really got me thinking. 1% failure per year versus 96% survivorship, KOOS JR scores the same, satisfaction scores the same—at least early. I came away from that thinking, and now have rethought, my utilization of unis down to mostly younger and middle-aged males of normal weight with normal patellofemoral joints. And that narrows it down. That's all. It's a little bit like Kozinn and Scott. That's the process that I went through and all the data that we traditionally at JIS have used to support our decision-making, with the exception of jumping off the cliff and going over to KA just completely blind in January a few years ago.

Interestingly The only epiphany that I had was the email—the wake-up call from Steve Howell. Those of us that know Steve and love him, like many of us do, we're accustomed to getting the "Steve-o-gram" in the mail. Well,

Steve you were absolutely right. I had been thinking about what I can do differently, and I was really encouraged. Several years earlier, I had seen a presentation where one of the implant manufacturers was doing Stephen Howell's technique, and a young surgeon that I'd not heard before gave a presentation that was very compelling. But those instruments weren't widely available, and the implant manufacturer—as many of them are still doing today, or even more so—was really encouraged or enthusiastic about the robot use. And I truly wasn't. It's not my space that I'm really into. I was looking for a place to land in terms of thinking about kinematic alignment, the way that Steve Howell thought about it, but had not had the nudge, I had not yet reached my midlife crisis. That email from Steve saying, "Hey, good job, but do you really need a manipulation rate that's that high? What are your satisfaction scores? Survivorship's one thing, but how are your knees doing?" It was also the same time that a couple of really good randomized prospective studies came out that supported the same thing—forgotten joint score way better, same implant, KA versus MA. The studies looked good. It was also right at the same time that Steve published his minimum ten-year results with survivorship of KA knee, unrestricted caliper-verified. The survivorship was just as good as anything else published in the literature.

It wasn't like, "I'm going to just swim out in the ocean by myself here on Monday morning." It was a pretty long process of thought, backed up by, "I need to do something." I don't think that changing to an MC bearing or an instrument, doing something small, is going to make a dramatic change. What can I do to make a change? It was KA as defined by Steve Howell, and an implant that appears to do substantially better, given the stability that is afforded with it when it is done with KA.

My Physician's Assistant sees most of my post-op patients, he's in the OR with me on every case, so he knows what we've done differently. He started super early in our KA experience, sending me pictures of the X-rays and giggling about how crooked they look. The knees are in varus, the tibias are in a lot of varus, but he would also comment, "No one says their knee feels tight anymore."

There were two things that happened early: manipulation rate went way down. It's super rare to do a manipulation now, and patients do not complain that their knee feels tight. As I said, there's still 5% of patients that are unhappy. I wish I could make it 99% that are happy, but there's 5% that are unhappy. But even those 5% don't say it feels tight. If you think about what we're doing, and the number of MA knees that I did, and the number of tensioners, gap balancers, robots, OrthoSensors, and all these different things—everyone that's doing that today is driving for a rectangular flexion gap. If you take the trapezoidal gap and make it a rectangle, it has to be too tight laterally. That's number one. Geometrically, you have tightened it laterally. And then when you try to flex, because you have raised the joint line medially, you've tightened it laterally, you do not get internal rotation. And then you make up for stability with a dish, ultracongruent, whatever, that is not fully conforming medially. So it's unstable in flexion. Additionally,

you don't get internal rotation in flexion with any other knee besides a medial ball-and-socket. That kinematic conflict and literally overstuffing the flexion gap to make it a rectangle makes people feel like it's tight. That, to me, is number one, first and foremost.

Number two: when you do unrestricted KA, caliper verified, your femur is really internally rotated to what we consider to be Whiteside's line or the epicondylar axis. It's very much internally rotated because you've taken the same amount of bone and cartilage. You're taking the same amount of bone and cartilage posteriorly and distally. But posteriorly, that internally rotates the femur. You actually rotate the femur to get a rectangular gap in flexion. If you actually rotate the femur, everything we do is to make the femoral trochlea run over lateral to get to the patella. We don't get any internal rotation with an MA knee to pull the tubercle medial. And so, you have to chase the patella laterally by medializing the patellar button, externally rotating the tibia, externally rotating the femur, and making a rectangular gap. If you think about all those things, while the patella may track, the VMO is now pulled way more lateral. The patella is medial, tracks fine, but the VMO, when you close the knee, or if you do a subvastus, regardless, the VMO is now under tighter tension in flexion than normal because you've moved everything over lateral to the patella. And so between the flexion gap being rectangular, elevating the joint line in flexion and extension, and externally rotating everything, everything is tight. We call it stability in the OR. Patients feel that. Well, maybe you don't see it with the knee you're using, but with an MA knee and an ultracongruent poly, the number of patients that have 135 degrees and say, "My knee feels tight, it's stiff." We say, "no, it's not stiff. You've got perfect range of motion." "Yeah, but there's a rubber band around it. There's a vice around it." You simply do not hear that complaint anymore with KA knees and a medial Ball-in-socket.

You get the inherent stability when you remove the same amount you're putting back with metal and plastic. I give my patients the little sample bones in the clinic. You take any other knee on the market and then hand them this knee—you almost can't dislocate it in flexion, as hard as you try with the model. That's how stable these things are. And patients feel that. They want that stability. And the MC bearings don't have that stability in flexion. They're still super lax in flexion. Just recently, there was an article, a commentary on LinkedIn about flexion instability.

The biggest barrier to the way I am doing it now is the bias that surgeons have been doing it the same way for many years. Additionally, very few companies have the implants. That narrows it down. And by the way, the three that are available, none of them are of the big five companies that have a lot of podium presence. To me, that's number one, first and foremost. I think number two is this feeling that I also had with my unis, that they all do great. My unis do great. If you would have asked me before we looked at the data, "What's your 15-year survivorship of your OxforDs?" I would have said, "Oh, 92-93%." No, it's 81-84%.

If you had asked me before I looked at the actual data—"What's your manipulation rate?" I'd have said, "Oh,

3-4%." No, it was 11% in one study. And so they don't all do great. That to me, is number two. Really looking at your information, looking at your data, not, "You're doing great, aren't you? You're not having any pain, are you? See you next year." I think for residents and fellows and early in practice, that's where you need to spend your time, listening to your patients and how they're doing and what they're feeling, and then try and figure out what you're doing or what you could do different to change what you're seeing and feeling.

Finally, I think the dogma, that knees that are crooked on an x-ray are going to fail, or they failed because they were crooked. I love going back, and Dr. Lombardi, my partner, is a world-renowned surgeon technically, but he also is one of the most knowledgeable people in terms of history of knee replacements. It's just a pleasure to listen to him speak about history. I've had the opportunity to get to know Merrill Ritter very well. He was my brother's partner. Same story. He's got all the stories and all the tales. But if you really think about, what was the battle in the 80s and 90s? CR versus PS. New York versus Boston. Why was that? Well, there's a reason. If you take the same approach and you say, at the time it was called anatomic technique. It was as close as we had: anatomic alignment versus mechanical alignment. So Krackow and Hungerford versus Insall and the team. Why did we abandon anatomic alignment?

In my opinion, it is not because of the alignment. It's because the PCA knee design and Howmedica had really bad polyethylene. The polyethylene failed catastrophically. The only implant that was being used at the time with that technique was Krackow and Hungerford, and the PCA knee—and it failed. Well, what's the difference? At that time, we didn't understand the science behind heat-pressed

gamma-in-air poly versus direct compression molded gamma sterilized in an inert environment—that was the IB1. Well, look, we're right. We've got a PS knee put in straight—never fails. You guys put them in crooked with a CR, and they all fail. Well, we better throw that baby out with the bathwater because you have to do it this way.

And on it goes, perpetuating the dogma. My brother Mike and Merrill and his team published multiple times. I remember CCJR debates between Mike Berend and Pagnano about anatomic alignment versus mechanical alignment. Pagnano's Mayo Clinic: outliers don't fail. Ritter: if you don't get it straight, they all fail. Well, why is that? It's the implant. It's not the technique.

The journey for me has one of trying to follow the data; our own and the published literature. Additionally, trying to optimize what I offer in surgery for the patients' outcomes and longevity of the device. That journey led me to incredibly high utilization of medial mobile bearing UKA and a very large experience with that device. It also led me to search for a better way to do TKA and seek the best implant design for my patients. Continually evaluating results, reviewing the literature, and seeking to improve, has led me to Caliper Verified, Kinematically Aligned, Medial Sphere, with a Flat Lateral bearing and optimized trochlear design as my go to device and technique. I don't think I am at the end of the journey, but the iterative changes in practice, technique, and implant continue to move the needle forward.

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