

Editorial

"In My Experience...Reverse Shoulder Arthroplasty"

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The author reviews his experiences with reverse total shoulder arthroplasty.

This editorial regarding my experience on innovation is about reverse shoulder arthroplasty. And it's funny, but when I was training as a Shoulder and Elbow Surgeon at The Mayo Clinic, we had no reverse shoulder arthroplasties. The need for the reverse was for patients that did need a replacement of the shoulder but had no functioning rotator cuff. In those patients, the only operation that we dared to do was a partial replacement or hemiarthroplasty. One of the first papers I wrote at Mayo Clinic was about Dr. Cofield's (my mentor) experience, on how the patients that had arthritis and no rotator cuff did with a hemiarthroplasty, and they did very poorly: one of every four had worse pain than before, and the average motion was approximately 70 degrees. In the past, North American surgeons had tried to use more constrained implants, but they did not work because the constraint led to the implant loosening. Then, there is this French surgeon, Paul Grammont, who, even in his French society, was not believed upon early on. He thought that if the geometric center of rotation of the implant was medial to the bone to implant interface, there would be no shear, forces would be compressive, and the deltoid moment arm would increase tremendously. Initially, people thought he was crazy, but then his innovation actually worked. When other surgeons tried his design, they were amazed about how quickly patients recovered motion and had pain relief.

So, suddenly, in Europe, people are using more and more reverse implants. We're talking about between 1985 and maybe the mid-90s. Then Mark Frankle, who is a very well-known American orthopedic surgeon, happens to travel to Europe and discusses reverse replacement with Gilles Walch and Pascal Boileau. And based on Dr. Frankle's own words, he came back home and basically started to do custom reverses for his North American patients and was amazed about how well patients were doing. The use of reverse was not approved in North America until 2003. Back then, if you wanted to do the procedure, you had to actually go to San Antonio, and take a course to be "certified", which I did!. It turns out I was the first surgeon that did a reverse at Mayo Clinic, because I was from Europe, so, I had seen early results and believed in it. And I still remember showing that first case in our weekly conference and my mentor, Dr. Cofield, went like, *"Oh, my God, this is going to fail!. It's a constrained implant"*. And then five years later, he was doing more than a hundred a year. So, it's fascinating to see how this innovation exploded over time.

From 1985 until now, 2024, as you can imagine, reverse arthroplasty has changed dramatically in terms of implant features like glenoid lateralization, the angle of the polyethylene, and other aspects. So, I think for a younger surgeon that wants to get into these types of procedures, maybe with less training, it's important to know your im-

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Dr. Joaquin Sanchez-Sotelo MD PhD was born in Madrid, Spain. He graduated as Medical Doctor from Universidad Autonoma de Madrid, and obtained the #1 position in the Spanish National Exam for Medical Graduates. Dr. Sanchez-Sotelo completed his Residency in Orthopedic Surgery at Hospital Universitario La Paz and his PhD Program at Universidad Autonoma de Madrid. He was then selected for a fellowship position at Mayo Clinic and completed a two-year program in adult reconstruction. Dr. Sanchez-Sotelo has published over 450 articles in the peer-reviewed literature in addition to over 50 book chapters. He is co-editor of the most widely read textbook on elbow surgery, "The Elbow and Its Disorders". Dr. Sanchez-Sotelo has also published Mayo Clinic Principles of Shoulder Surgery. He is actively involved in the design of implants for joint replacement, shoulder sports medicine, and fracture fixation. Dr. Sanchez-Sotelo serves as course co-director for the Mayo Clinic Annual Elbow Course "Teach the teachers", the AO of NorthAmerica Sports Course on Shoulder Tendon Transfers and Complex Rotator Cuff Tears, and the International Advanced Course on Elbow Surgery (IACES). He has presented his research in numerous occasions at national and international meetings.

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plant, because now there is in the market more than 50 reverse implants, and they are all a little bit different. You have to know your implant. That's very important.

Secondly, we have understood that for surgeons, conducting a thorough preoperative plan based on the CT scans is very important for the shoulder. The glenoid is a very small bone to begin with; with pathologic bone loss, it's even worse, so there is very little room for error. Almost every reverse implant company now offers software where you can get the patient a CT scan, place it in the software, it makes a 3D rendering of your patient's shoulder, and you can accurately plan your surgery.

Something that I think is newer, but very important, is that we now know that we should probably execute reverse different based on patient diagnoses, for example. Reverse arthroplasty should probably be executed differently in rotator cuff arthropathy versus primary osteoarthritis. And what about patient height or habitus?. 2 mm in a small patient is different than 2 mm in a six-foot five patient. We should also consider the patient's position of the scapula based on kyphosis and even obesity; that can also have an impact. So, surgeons must combined understanding the

features of whichever implant brand they choose to use and also the features of each patient receiving the implant.

I think the future goes two different ways. Number one, even though we have all these planning software programs that are very accurate, believe it or not, we don't really know the targets. For example, in total knee some surgeons have a clear understanding of what the targets of a tibial cut should be. For reverse, there is a lot of opinion but less clarity. And the problem is that we still haven't married outcomes with targets achieved. So, one frontier will be to understand what are the implant position features that predict outcomes and decrease complications for a specific patient and a specific implant; that's one. And the second is advances on execution. Hip and knee arthroplasty surgeons have pioneered robotic surgery and navigation. Now we're seeing shoulder companies preparing to release a number of products that allow to navigate or do robotics for reverse replacement. Once we do that, if we know what our targets are, and we get them perfect, I think patients will do much better, and complications will decrease.

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