

Mayo Clinic Q & A - Dr. Joaquin Sanchez-Sotelo

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SUMMARY KEYWORDS

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SPEAKERS

Dr. Halena Gazelka, Narrator, Dr. Joaquin Sanchez-Sotelo

N Narrator 00:01
Coming up on Mayo Clinic Q&A, a look at custom-fit shoulder replacement.

D Dr. Joaquin Sanchez-Sotelo 00:06
Another is this fascinating technology where you can tell a computer program where is it that you want your implant planned. For orthopedics, it is very important that the implant lands exactly in that location. And then with 3D technology, you can create a metallic envelope that will fill in the defects that are present in the bone.

N Narrator 00:28
Shoulder replacement is one of the most successful orthopedic surgical procedures today. And Mayo Clinic surgeons are using cutting-edge software to create a shoulder joint that precisely fits the patient.

D Dr. Joaquin Sanchez-Sotelo 00:41
And then as a surgeon, you plan the surgery virtually and decide for that patient, where is it that you want the component to land. The benefits are, as I said, you are guaranteeing the patient that the implant is going to fit his or her shoulder, number one. Number two, it decreases the surgical time tremendously.

D Dr. Halena Gazelka 00:59
Welcome, everyone to Mayo Clinic Q&A. I'm your host Dr. Halena Gazelka. Shoulder

replacement surgery is done to relieve pain and other symptoms that result from damage to the shoulder joint. Traditionally, shoulder replacement removes damaged areas of bone and replaces them with standard parts made of metal and plastic. Thanks to new technology, there's another option. Using CT scans and 3D modeling, patients can now receive joint replacements that are custom fit to their anatomy. With me today to discuss this is Mayo Clinic orthopedic surgeon, Dr. Joaquin Sanchez-Sotelo. Thanks for being here today, Joaquin.

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Dr. Joaquin Sanchez-Sotelo 01:41

Of course, Halena. Thank you for having me.

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Dr. Halena Gazelka 01:43

I think this is just fascinating. And I can't wait to hear the benefits of this for patients, which I'm sure are numerous. But first, can you tell us how common is it to have to replace someone's shoulder joint? And who do you do it for?

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Dr. Joaquin Sanchez-Sotelo 01:57

That is a great question, Halena. So the rate of usage of shoulder replacement in the United States has increased dramatically. And I think there are two reasons. One, is that implants are better. And also that patients now are more active with their upper extremities later in life. So they need the procedure because they want to have a life where they can enjoy activities pain free. So currently, there are more than 100,000 arthroplasties of the shoulder done in the United States every year. And the projection is that by 2025, there will be 250,000 replacements every year. So very, very common. You were asking what are the most common reasons. So to be honest, the most common are two of them. One is what we call plain osteoarthritis, where in a ball and socket joint like the shoulder, the cartilage of the joint disintegrates. And that leaves the raw bone exposed, and that's painful. So that's one very common indication. A second, is actually patients that have a long-standing tear of their rotator cuff. And then the joint degenerates secondary we call that cuff tear arthropathy. Of course, there are other reasons, maybe a fracture sometimes or congenital disease, but the two most common will be primary osteoarthritis and cuff tear arthropathy.

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Dr. Halena Gazelka 03:12

So during the intro, I mentioned that traditional joint replacement has involved taking something that is metal and plastic essentially, made in a factory, not specific to someone but made in sizes, and then you replace the shoulder joint. So what are the benefits and disadvantages of traditional methods of replacing shoulders?

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Dr. Joaquin Sanchez-Sotelo 03:34

Yeah, so one issue that we have in the shoulder in particular is that, as I said, this is a ball and socket joint, the socket, that is called the glenoid, is actually very small in humans. So for

people that can see the image if you're not just listening, I'm showing a model of the scapula, which is a very interesting bone. And the socket of the shoulder is at the corner of the scapula. And it's already a small bone to begin with, it is tiny. And not uncommonly, this bone is actually deformed when someone needs a replacement. So I have another model that you may compare to the one I showed and not sure if you can see it very well in the screen, but this particular scapula, glenoid, has been missing on the back as opposed to a normal glenoid. So traditionally, when we had to fit a component in the socket, the only way to do it, is as you said, take an off-the-shelf implant, and then remove more bone to adapt it. And the downside of that is that you're already working on a small bone that already has bone loss, and then you remove more bone to place the implant. So then the implant is now a very deep portion of the joint, which mechanically is not ideal. And if that were to fail, you as a surgeon have already removed all the bone. So now there is this fascinating technology where you can tell a computer program where is it that you want your implant to land. For orthopedics, it is very important that the implant lands exactly in that location. And then we 3D technology you can create a metallic envelope it is called, that will fill in the defects that are present in the bone. So, for example, this is one such component, this is called the baseplate component of a reversal prosthesis. And the part that we know want to land somewhere is the metallic, more shiny part, right? Traditionally, these have a flat back, so you basically rim the bone and place them. But now what you can do is you can place the components virtually in a computer program, whatever you think it has to be, hit a button, and then the computer will calculate this form of metal. And it's interesting because human bone grows very well into titanium. And then the company will send you a model. So, this will be the scapula adaptation that you can confirm that is going to fit perfectly in this patient. So you can see how you will have perfect fit. And they come up with a guide you can use in the operating room for the component. That's exactly where, where you want it to land. And I must disclose that I help Stryker Corporation with implant design for Mayo Clinic, even though I didn't help with this particular design, but that's important for the listeners to know about our potential conflict of interest.

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Dr. Halena Gazelka 06:26

That's absolutely fascinating. And I could see there must be significant advantages, how long has this been available?

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Dr. Joaquin Sanchez-Sotelo 06:32

So it was released to the market, actually this year. So it's completely brand new technology that I think is going to transform our practice. But the benefits are, as I said, You are guaranteeing the patient that the implant is gonna fit his or her shoulder, number one. Number two, it decreases surgical time tremendously. Because in the past, you had to get exposure and then prepare the bone until it fits one of the parts that are on the shelves. Now you know that the part you are getting is gonna fit that patient's anatomy. So you basically open the box, get that plugged in and place it, we're basically done. So surgery time is less. And it's also very cost-effective for hospitals, because then you have only one component per patient, as opposed to having a lot of them on the shelf.

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Dr. Halena Gazelka 07:17

Well, that's really interesting. So, the surgical time is less, but I would imagine there must be

some prep time ahead, and what's the process that you go through to develop a custom joint for a patient?

D Dr. Joaquin Sanchez-Sotelo 07:28

So for this particular system, typically the surgeon will plan the case. So you get the CT scan of the patient, it comes from something called DICOM files that you can upload in the software. And then as a surgeon, you plan the surgery virtually, and decide for that patient, where is it that you want the component to land, and that takes about 5 to 10 minutes approximately, Then you hit the button that gets the metal envelope, and the component is shipped to the hospital within typically one month. You have to plan the surgery at least a month in advance. But the prep time on the side of the surgeon is actually maybe 10 to 15 minutes, so it's not that much. And then when the day of surgery occurs, you basically get exposure, you have to drill the bone to get this back on the post. But everything else all the irregular bone that the patient may have, is perfectly matched to the irregular surface of titanium that the company made for that patient.

D Dr. Halena Gazelka 08:22

Wow. So I think some of the benefits are obvious. And you mentioned them. Are there any disadvantages to this type of joint replacement?

D Dr. Joaquin Sanchez-Sotelo 08:30

Yeah, so the two main ones will be that if for whatever reason, the implant gets damaged or contaminated in the operating room, you can't use it, right? Because they only ship one. So as a surgeon, you have to be careful because if for whatever reason it gets damaged or maybe contaminated, including infection, you have to go back to the regular replacement, which is not a big deal. And then the second, is that as you probably know, in health care, every single adjustment comes with a premium financially. So this component is slightly more expensive than the official one, but not by much.

D Dr. Halena Gazelka 09:03

So I imagine you still, at times, do a traditional joint replacement. And how do you decide if someone is a candidate to have a custom joint replacement versus using a traditional method?

D Dr. Joaquin Sanchez-Sotelo 09:16

Yeah, the main limitation of the custom made prosthesis is that the thickness of the envelope that was approved by the Food and Drug Administration is limited. Because as you know, in North America, the FDA is very careful about only launching implants are for sure going to work. So they didn't have enough testing to be able to create an envelope that will be very, very large. I'm talking about 2,3,4 centimeters. So for people with really severe deformity, this implant cannot be built. So there are patients that come with so much bone missing that the

only way to reconstruct that shoulder is to use bone graft, typically from the waistline like iliac crest or other locations. And then the second limitation can be cost and time. So, if someone really wants to have the operation the day after he or she seen in consultation, of course, you don't have that month of leeway. And you need the CT scan, which is radiation. But today, I will argue that the majority of shoulder arthroplasties, in the United States are done, always, with a CT scan is part of our routine right now. So that doesn't change much the workflow for the patient or the surgeon.

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Dr. Halena Gazelka 10:21

Well, that's just fascinating. I'm curious how widespread this is, Joaquin. Is it available in most orthopedic practices or only at large medical centers?

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Dr. Joaquin Sanchez-Sotelo 10:30

So this is just starting. And I think, as with everything else, we just have to be confident that new technology really helps our patients. But my prediction is that this is going to continue to expand. Right now there is only one company making these for the primary applications. There are other companies making it for more custom applications, for very complex deformities. I think we will expand. But one of the beauties of the podcast you run is that it brings to the patients or prospective patients an idea of how quickly technology is moving and what new things are coming out that have truly potential to improve patient outcomes.

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Dr. Halena Gazelka 11:04

Joaquin, I'm really curious, is custom joint replacement, something that's also being developed for other joints or the shoulders unique in some way that you need this?

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Dr. Joaquin Sanchez-Sotelo 11:13

No, in fact, this initially started in knee replacement, actually. There was one company that basically was created to develop custom made implants for knee arthroplasty. And that, to some extent, has not been used very commonly in the knee because in knee replacement, there is a lot of use of robotic surgery, which is not present in the shoulder. But also, the bones in the knees are bigger, so you have more freedom as a surgeon to maybe remove some more here and there and still fit the implant. The challenge with the shoulder is that the socket of the shoulder is so small, that is really beneficial to not remove any bone, period. So if you can basically build up the missing bone with metallic augment, it is much more superior in the shoulder than removing bone so you can fit an off-the-shelf implant.

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Dr. Halena Gazelka 12:00

We talked about how the surgical time is decreased by using a custom implant. And I'm also wondering about the recovery. Because I'm thinking about some of my older patients in the pain clinic who really are extremely limited. They can't use a walker because they have

shoulder issues and mobility is a real issue. How is the recovery for this?

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Dr. Joaquin Sanchez-Sotelo 12:21

Yeah, the recovery in general, for shoulder replacement “ this has nothing to do with patient matched implants “ I'm talking about in general, has improved tremendously. And to the credit of your specialty, it is mostly because of anesthesiologists and pain doctors. So, when I was a fellow, shoulder surgery was perceived to be one of the most painful experiences that one can go through in orthopedics. And now, thanks to the advances that you and people in your field have done with peripheral nerve blocks, it's incredible to me that most patients tell me, you know, I had no pain in surgery. As you know, we offer patients a block before surgery. And you know this better than I do. But that concept of preemptive analgesia really works, meaning that when the block has been done, as you know better than I do, the brain really doesn't know that there was an operation done because the feeling was blocked. So the thymus doesn't get sensitized, I don't think. And patients have a very pain-free experience. And the other thing that comes as a question in my clinic all the time is people are older 75,80,82, 85 that already disabled. Provided they are reasonably healthy, we have three studies from our practice that showed that the recovery and complication rate is identical to younger patients. So we no longer consider advanced age a contraindication for surgery, provided the patient is healthy enough. And there are some people that, without replacement of the shoulder, they will have to move in with a family member or go to a nursing home. Whereas if they have the shoulder replacement, they can function, they can actually leave a home and enjoy a more independent life.

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Dr. Halena Gazelka 13:55

What wonderful work you are doing. Thank you, Joaquin. Any last words you'd like to share with our audience today?

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Dr. Joaquin Sanchez-Sotelo 14:02

Well, I just want to highlight how beneficial this operation can be for patients that really need it. And also to stay tuned because technology is advancing so fast. You know, we have now electric cars, and smartphones, and I Watches this and things that have really changed in the way we handle technology and that's transpiring into medicine or orthopedic surgery. So I'm just excited to see how many more things are coming out. That can really, really change the outcome of the operation, make it faster, make it easier, and lead to a much better outcome.

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Dr. Halena Gazelka 14:32

It is so exciting to learn all of the new developments in medicine going on. Thank you for being here to share them today, Joaquin.

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Dr. Joaquin Sanchez-Sotelo 14:40

Thank you for having me. It's always wonderful to talk to you.

Thank you for having me. It's always wonderful to talk to you.

D Dr. Halena Gazelka 14:43

Our thanks to Mayo Clinic orthopedic surgeon, Dr. Joaquin Sanchez-Sotelo, for being here today to talk to us about custom shoulder joint replacement. I hope that you'll learned, something. I know that I did. We wish each of you a wonderful day.

N Narrator 14:57

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