Mayo Clinic Q & A - Dr. Michael Taunton - Augmented Reality

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SPEAKERS

Dr. Halena Gazelka, Narrator, Dr. Michael Taunton

N **Narrator** 00:01

Coming up on Mayo Clinic Q&A, for those who are suffering from severe arthritis pain in the knee joints, knee replacement is a viable option to improve a person's quality of life. Today on Mayo Clinic Q&A, we'll look at augmented reality and how this new technology is helping patients achieve long-term success from knee replacement surgery.

D **Dr. Michael Taunton** 00:21

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D **Dr. Halena Gazelka** 00:39

Welcome, everyone to Mayo Clinic Q&A. I'm your host, Dr. Halena Gazelka. Osteoarthritis is the most common form of arthritis affecting millions of people worldwide, and most commonly affects joints in your hands, knees, hips and spine, and the symptoms can often be managed with non-operative treatments, but damage to joints cannot be reversed, and sometimes joint replacement is necessary. Orthopedic surgeons now have a fascinating new tool in the OR, augmented reality knee replacement. And I can't wait to learn about this with you today. So, we have orthopedic surgeon Dr. Michael Taunton from Mayo Clinic, here to talk with us. Welcome, Michael.

D **Dr. Michael Taunton** 01:22

It's good to be here. Thank you for having me.

D Dr. Halena Gazelka 01:25

I just love the things that I learn doing this podcast. And so, I'm very excited to ask you what in the world is augmented reality? And what does it have to do with knee replacements?

D Dr. Michael Taunton 01:36

Well, so augmented reality, think of a fighter pilot in a jet that has a visor over their eyes that's displaying electronic data that is overlaid over what they're seeing in the real world. So, don't confuse this with virtual reality that your kids have at home, that they're playing video games with their eyes covered. This is typically some sort of glasses or helmet-based visor that's displaying information in front of your eyes that's rendered digitally that is being processed from a computer to give you additional information or for entertainment purposes, you know, some other display in front of your eyes.

D Dr. Halena Gazelka 02:21

So, do you wear goggles?

D Dr. Michael Taunton 02:23

So, for this particular system that I use, it is a helmet-based visor that is placed over part of our vision. So, as a surgeon I definitely want to have an unobstructed view of what I'm seeing while I'm operating. This system has a visor in front of my eyes also that's projecting digital information in front of my eyes outside of the area where I'm specifically operating.

D Dr. Halena Gazelka 02:53

So, how does augmented reality help you do knee replacements, Michael?

D Dr. Michael Taunton 02:58

So, for a while we've had computer assisted surgery where we've been able to take data from the patient's own leg and enter that into a computer and have it display some of this information displayed for us to help us understand how best to remove the correct amount of bone in the right angle to make the knee replacement fit better and have better alignment of the limb after surgery. The problem with some of those computer assisted programs is that there is a screen that we're looking at across the room, or a computer that we're looking at across the room, so that we're having to take our eyes off the patient. And also to collect some of that data, we're having to use instruments or a computer across the room and cameras across the room, that we're having to take our eyes off the patient to collect data. In this system all of that information is being gathered by the helmet-based system. So, there's

actually in addition to a projection from the helmet-based system, there's also cameras that are recording information from sensors on the patient's knee, so that all of the information is being gathered by the helmet-based system and then displayed to me on the helmet-based system.

D Dr. Halena Gazelka 04:27

That's truly fascinating. The anesthesiologist in me, as a resident I remember watching many, many knee replacements and thinking how incredibly, I was amazed at how precise you have to be with the angles and the cuts that you make so that the replacement fits. That sounds amazing.

D Dr. Michael Taunton 04:50

Yeah, it's really, you know, the next step, what we see in in orthopedic surgery is the ability to get real-time feedback in what we're doing, while keeping our eyes on the patient, and not having to have, you know, large pieces of machinery come in and out of the room to help us with our surgery.

D Dr. Halena Gazelka 05:12

Does it make it more precise then, Michael?

D Dr. Michael Taunton 05:15

Well, that's hard to say right now. So, this technology used in knee surgery has only been around for the last couple of years. We did the first augmented reality case with this system this fall here at Mayo that had never been done before. So, this is, you know, really innovative in that we don't have data to say long-term this is going to, you know, change the patient's outcomes. We need more information.

D Dr. Halena Gazelka 05:47

So, Michael I imagine this is an area you're still studying. So, how do you decide if an individual might be a candidate for an augmented reality knee surgery versus the more traditional way you've done this?

D Dr. Michael Taunton 06:00

Yeah. So, let me explain a little bit about how traditional knee replacement is done. People say, well, okay, you're using this, how was it done before? Well, in traditional knee surgery, replacing mechanical alignment jigs on the leg, and then using those to determine the alignment and the sizes of the implants. So, in augmented reality, and these computer systems, we're collecting digital data, the shape of the bone, the alignment of the leg, and then the computer is assisting us with that information, and then displaying where we should cut

back onto the screen. So, those mounts and angles are being determined by the computer. So, right now, for just about any first time knee replacement, any patient would be a good candidate for augmented reality. In some more complex situations or revisions where we haven't been able to test the system on these situations, or there isn't enough bone to make these measurements that we need to make, then they wouldn't be a very good candidate.

D Dr. Halena Gazelka 07:12

Michael, I'm curious, I'm trying to picture this. And I'm curious if it's inside your helmet and you're seeing it does movement of your head make a difference when you're looking at the knee?

D Dr. Michael Taunton 07:27

Yeah, so the system is really incredible in that when you move your head it moves with you, and you can set through the system where you want your information to be displayed. But it knows when you move your head. So, it's moving the information to keep it in the same area of your visual field no matter where you put your head.

D Dr. Halena Gazelka 07:51

That is absolutely fascinating.

D Dr. Michael Taunton 07:53

And you can actually move the cursor with your head so that you can select menu items by moving your head. It's also really cool because it incorporates voice recognition through an artificial intelligence algorithm so that it knows what you're saying. So, I can tell it, go to the next step, or go back a step, or I'm ready to place the guide. And it will go, you know, through the menu. I can tell it to turn the light on because it has additional lights to help illuminate the field. I can say, turn the light on, and it will turn on the light.

D Dr. Halena Gazelka 08:33

Michael, what are the benefits of using augmented reality for knee replacement or for a patient undergoing that procedure? And are there any potential downsides?

D Dr. Michael Taunton 08:44

So, the benefits of this augmented reality system is that we can make more precise and accurate bony cuts and make the angles more correct to make the limb more straight than we did before. Not that we weren't before. But what we want to do is reduce the outliers and make that precision more. So, that's where patients can benefit as we can more efficiently and more precisely do their knee replacement. The downsides? Well, it's new technology. But we actually

feel like this is a technology where we can become more efficient with the surgery and actually it not take us as much time because we're not having to use all the mechanical guides. So, we think with time it's actually going to be a time saver. And then if we can prove later on that the outcomes are better. Well, if we reduce further surgeries or, you know, complications with patients, we can, you know, improve their ability to return to their activities of daily living for a longer period of time, and then reduce healthcare costs as well.

D Dr. Halena Gazelka 09:53

Speaking of which, do you see any differences in length of hospital stay, recovery, or rehab for people who undergo augmented reality versus traditional knee replacement?

D Dr. Michael Taunton 10:05

It's really hard to say at this point, I would say thanks to our collaboration with our anesthesiologists, who are wonderful here at Mayo, we've been able to reduce the length of stay through multiple different things through our post-operative protocols, pain management, and the spinal anesthesia, etc. We've been able to make huge strides. So, we hope that reducing the length of surgery, and the amount of tissue trauma that we have to create through using these kinds of systems, that we can further increase their outcome and reduce their length of stay, and pain, and rehabilitation.

D Dr. Halena Gazelka 10:46

Michael, is this technology widely available at this point?

D Dr. Michael Taunton 10:51

No, it's not. We are one of the few centers that is working on this at this point. So, this is a limited access. At this point, I'm one of the few surgeons in the world that's doing this.

D Dr. Halena Gazelka 11:03

Oh, fascinating. And it strikes me as so many things in medicine, and in surgery in particular, the more of them that you do the better you are likely to be at it. So, patients would want to go to a center where someone was gaining quite a bit of experience?

D Dr. Michael Taunton 11:21

Yeah, I think practice makes perfect. And, you know, I focus my entire practice on hip and knee replacement. That's all I do. And we've been able to show in our data that we're able to do these types of procedures more efficiently with a lower complication rate than if you're not doing as many, or if you haven't done as many.

D **Dr. Halena Gazelka** 11:44

Will this be coming to other joint replacement surgeries as well?

D **Dr. Michael Taunton** 11:48

Yeah, so we were focusing on knee today, but I'm also using it on hip replacement surgery to help more accurately place those implants and recreate the leg length and offset in hip replacement, you know, the length of the leg and the position of the femur relative to the pelvis.

D **Dr. Halena Gazelka** 12:07

Wonderful. Thank you for sharing this with us today, Michael. It's fascinating.

D **Dr. Michael Taunton** 12:12

Yes, it is. And thank you for having me.

D **Dr. Halena Gazelka** 12:14

Our thanks to Mayo Clinic orthopedic surgeon, Dr. Michael Taunton, for being here today to talk about augmented reality used in knee replacement surgery. I hope that you learned something. I know that I did. And we wish each of you a wonderful day.

N **Narrator** 12:30

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