Dr. SHIVES: Dr. Andrews, it's good to have you with us. And you know, Karen is someone that I have worked with for-- we haven't been there not long, have we?

DR. ANDREWS: Just 20 years.

Dr. SHIVES: 20 years. She and I worked together with amputees. And it's interesting that 20 or 30 years ago when both of us started here, when I started here, you're not that long, we were doing amputations for kids with bone cancer. And that's actually how I started doing amputations. And interestingly enough, over time, the number of patients that we amputate for bone cancer has markedly decreased. And that's because of the advent of chemotherapy and we're able to save these kids' lives as well as their limbs. But what has happened over the years is that there has been an epidemic of diabetes as well as atherosclerosis, or hardening of the arteries.

So 80% or so of the amputations that we do today are now for vascular disease, diabetes, or atherosclerosis. And it's relatively rare that we end up doing an amputation for someone with bone cancer. So although we're doing more amputations, the reason that we're doing them has significantly changed over the years. And once we've done the amputation, then the rehabilitation specialists, the physical medicine and rehabilitation specialists pretty much take over in terms of-- particularly once the wound is healed. And so Dr. Andrews is here to talk about that. And I can tell you that in my lifetime, in my career, there have been huge advances from the rehabilitation standpoint. And Dr. Andrews, tell us about those.

DR. ANDREWS: Well there have been advances in components that we use and there have been advances in the surgical technique. It's a pleasure to be part of Tom's team, because he sees amputation surgery as a plastic reconstructive procedure. So we have a great residual limb to fit with a prosthesis.

Dr. SHIVES: We call it a restorative procedure, not an ablative procedure.

DR. ANDREWS: Exactly.

Dr. SHIVES: And really, what we're really trying to do is improve function.

DR. ANDREWS: Exactly. And so we're following along. We work as a team, it's really an integrated team working together. But as soon as Doctor Shives mentioned, as soon as the limb is healed, then we take over and prescribe the prosthesis and prescribe the therapy for people to learn how to walk with the prosthesis.

TRACY MCCRAY: How long does that usually take? If someone has to have the lower leg removed until they can be walking on it like they did, or maybe even better than they did before, how long does that process take?

DR. ANDREWS: It's about a two month process. So it takes about six weeks for the incision line to heal and about two months to learn how to walk with the prosthesis.

TRACY MCCRAY: Huh.

Dr. SHIVES: Now a fair number of the amputations that we do are around the foot. They're a toe or they're a mid-foot amputation, and those patients don't really require much in terms of a prosthetic device. Usually just a shoe insert.

DR. ANDREWS: Yes, exactly.

Dr. SHIVES: But one of the more common applications that we do for diabetics and for patients with atherosclerosis, or hardening of the arteries, is a below knee amputation. And in fact, that rehabilitative process starts much sooner.

DR. ANDREWS: Exactly. And Doctor Shives uses his knowledge with kids, and so we're pretty aggressive on getting people up. We use immediate post-operative prostheses and usually, people are in their prostheses three days following their surgery. But that's a temporary leg, that isn't the definitive leg, which is what I was talking about them getting up and walking at two months. But they're usually walking with some type of very rudimentary device three days after surgery.

TRACY MCCRAY: Because I don't know anything about this, it would seem that it would take longer for that wound to heal so that they could start using a prosthesis. But they can start right away?

DR. ANDREWS: Well it's sort of like getting around with a broken leg in a cast. So they're in a cast, they can't bend their knee, and they can't be full weight-bearing. We wait until the incision line's totally healed before we fit them in prosthesis that's more lifelike. But this rudimentary, what we call an early post-operative prosthesis, is like getting around in a cast in a broken leg. So they're not getting irritation to the surgical incision and they can get up even before the incision has totally healed.

Dr. SHIVES: So in these diabetics, in the people with vascular disease, blood vessel disease, I usually wait a few days after we've done the amputation, to look at the wound and make sure it's healing satisfactorily. Then we put the cast on. And the cast has a little device on the bottom of it that will accept a temporary prosthesis, a temporary leg. This is a huge advantage for the patient and their family, to see them and to see themselves getting up and walking relatively soon after this amputation. And not infrequently, these patients have been struggling with ulcerations of their foot and pain for years before they ultimately make the decision to have the amputation and--

TRACY MCCRAY: So they haven't been as active before the surgery as they can be after the surgery.

DR. ANDREWS: Very frequently. It's a huge loss. People say losing a limb is sort of like losing a loved one. And so a lot of times, people are very, very hesitant to proceed with that amputation surgery. But frequently, after they finally decided to go ahead with the surgery, they see it as a way to get on with their life. They wish that they'd decided a year ago to have the amputation, because now they can walk. They can walk better than they have in years.

TRACY MCCRAY: Well I'm glad that you touched on the emotional piece of that, because I've always wondered about that as a non-surgeon, as a non-doctor, if people do have to mourn for their foot. I mean, is that something that a patient does, the emotional impact of losing a foot?

DR. ANDREWS: It's a big deal. If you think about if you hit your thumb with a hammer and that pain, it's a big deal. But this is a much bigger loss. But people do so well that at the end of the process, they do very well, and the emotional issue isn't as big of a deal. It's right after surgery, when they don't see how well they're going to be doing, that I think it's helpful for us to have them meet with people that have had amputations and discuss the process, and really go over the timeline, to let them know that in six weeks, we anticipate you'll be up walking again.

TRACY MCCRAY: So do you have former patients that volunteer to come in and talk to you?

DR. ANDREWS: Yeah, they do. It's very helpful. And actually, the Amputee Coalition of America is very good at also being an advocacy group for people with amputations and trying to pair people with amputations with people going through a similar process.

Dr. SHIVES: You may find it hard to believe, but some of the most grateful patients that I have are patients whose limbs I have removed.

DR. ANDREWS: Is that right?

Dr. SHIVES: Because they're so much better than they were with the painful, infected extremity after the surgery than they were before. But they're extremely grateful. And it's partly because of the advances that you talked about. These patients' ability to walk with a prosthetic device, particularly below the knee, it's truly incredible. You couldn't tell that they have a prosthetic device.

DR. ANDREWS: And we've had significant advances in the higher level, like a hemipelvectomy, did we want to talk about those also?

Dr. SHIVES: We do, we do. But before that, I know the question, the other question that's on your mind is what do you do with the leg?

TRACY MCCRAY: I wasn't going to ask that. But I thought I'd wait till the microphone was off, but not that you've said, what do you do with that limb?

Dr. SHIVES: Yeah, a lot of people ask that question. And in most instances, the limb is cremated. But there are certain religions where you have to be buried with all of your body parts. So there are certain people who request their extremity. And in that case, the extremity is embalmed and they take it home with them. So it doesn't happen very often.

TRACY MCCRAY: Do not lose that luggage.

[LAUGHTER]

Dr. SHIVES: Take special care for it.

TRACY MCCRAY: Well, when we were at the Chicago Marathon, there were a few, a handful of marathon runners who walked past our table with artificial legs. There was one man who walked passed with two artificial legs, he looked like he was about 30 years old. And he looked like he was the bionic man. I mean, they were really above the knee. What is that called, you just mentioned it?

Dr. SHIVES: Above the knee, exactly.

TRACY MCCRAY: But really impressive. I mean, I couldn't believe-- he was obviously going to be running a marathon.

DR. ANDREWS: That's really impressive.

Dr. SHIVES: So then you mentioned the higher amputation. Now as long as you're able to save the knee joint of the extremity, these patients do extremely well. When you get higher than that and you have to go up above the knee joint, which occasionally happens, it's a much more difficult proposition, right?

DR. ANDREWS: With the knee joint, you're able to par yourself up. So once you don't have the knee joint anymore, you have to use your sound leg to use to stand up. But still, having that hip joint helps a lot, because you can position your knee in space so that you keep the knee extended and you don't have to worry about the knee buckling. But that's another advance. With these microprocessor knees that are out, you actually have a computer in the knee. So the computer knows what weight is loaded on the prosthesis, where the knee is in space, and it can avoid buckling. And people can actually walk down ditches, walk down ramps, walk down stairs, without having to worry about the knee buckling.

Dr. SHIVES: So that's the above knee amputation. Now occasionally, we have to do an amputation at an even higher level. And some of these patients are for vascular disease like diabetics or patients who have severe atherosclerosis, some of them are also tumors. And so the amputations at that level are called a hip disarticulation, meaning that you remove the entire extremity including the hip joint.

TRACY MCCRAY: Thank you.

Dr. SHIVES: Or a hemipelvectomy. And hemi refers to half, pelv means pelvis, ectomy means you remove it. And so the operation is removal of the extremity plus half the pelvis. And there are a fair number of people who do not realize that there are prosthetic devices for these people, so that they have the opportunity, and a significant number of them seize that opportunity, take advantage of it, get a prosthetic device, and are actually able to ambulate. And that's one of the areas where there has been huge advances, wouldn't you say?

DR. ANDREWS: Yeah. And we had-- you reminded me of one of our patients who his wife was a physical therapist and he was seen elsewhere. And his wife asked about rehabilitation following amputation. And he was told by the surgeon, there is no such thing as rehabilitation following this level of amputation. So his wife, being a physical therapist, thought, I want to have a second opinion, came down here, and as part of our team process, they were scheduled to see me in addition to the surgeon the same day. And they said, we want to have our surgery here. We can see that there's a team approach, there's an integrated process, and that rehabilitation is discussed here. He was a hockey coach. He wears his prosthesis, he puts it on first thing in the morning, and he wears it all day long. And he has been able to go out in the yard and shoot pucks with his sons and he has been able to resume being a hockey coach. He doesn't skate, he doesn't put on his skates, but he's even walked on the ice a few times with the hemipelvectomy prosthesis.

TRACY MCCRAY: But previously, I imagine, a patient that needed that would have not been able-- would have been in a wheelchair, right?

Dr. SHIVES: Ambulate with crutches or a walker. But also use a wheelchair.

DR. ANDREWS: Yes. And some of our patients still do use a wheelchair at time or crutches, but the advances have been huge. It used to be that the hip joint was underneath the socket, so you really couldn't control the hip joint, you couldn't control the knee joint. And the socket was called-- the advance in the 50s was something called a Canadian bucket prosthesis. So a huge big prosthesis that the socket was-- you were contained in the socket and it was uncomfortable. Now, not only do you have a socket replacing your leg, but you have a socket containing your body. But then more recently, with the advances of a microprocessor knee, we use a microprocessor knee on our high level people with a hemipelvectomy or hip disarticulation. And there's a new hip joint too. So the hip joint has some torque, so you resume normal gait mechanics, it helps to advance the limb, and it speaks to the knee for stabilization with the joints.

Dr. SHIVES: Talks to the knee.

TRACY MCCRAY: What do you do when that computer goes out? I mean, you said earlier there's a computer in the knee. What do you do when that computer has issues?

DR. ANDREWS: Well you plug it in every night so the battery doesn't wear out. But there are those issues. And what it does is when the computer goes down, it locks. So you have a very stable leg rather than something that's loosey goosey.

Dr. SHIVES: And we don't want to overstate the advances here, because there are certainly-- the gentleman that you were talking about is what, in his 40s? So he's young. He was fit to begin with and he is able to use a prosthesis, despite the fact that he has lost half of his pelvis and his entire extremities, without external support. Now a fair number of these patients who have an amputation at that higher level do still require some external support, like crutches or at least a cane. So he's a little bit unusual in that case, but it truly is amazing how these patients, after an amputation at that high a level, are still able to get around and ambulate. It didn't used to be the case. Remember when we looked these patients up 15 or 20 years ago, and only half of them wore their prosthesis for even eight hours a day?

DR. ANDREWS: Exactly. We're actually looking into that again, because I think it's just totally changed. I just saw somebody this morning, and one of our patients has a YouTube video of her walking. And she was one of our patients, she's not one of our stars. I mean, she was young, fit, and did real well. But the patient that I talked to this morning said, I couldn't get one of those processes, could I? That's just too fancy. And I said, no, that's exactly the prosthesis that we would want you to have. And he said, I never thought of that. I thought I'd have this big, bulky, horrible thing. And we always see people before their surgery, to reassure them, to talk about the timeline, to let them know what to expect from the rehabilitation. So we're involved the whole way.

TRACY MCCRAY: Well part of this meeting, this annual meeting, is there's all kinds of booths and there's a lot of people here talking about the latest and the greatest and for PM&R. And what is it on the horizon? I mean, you've already started to say these advances that have come along, but what are some of the new things that you think you're going to see?

Dr. SHIVES: Can it get any better?

DR. ANDREWS: Well, I just been so surprised at all the advances that have been made so far. In the past, we've done studies and people were more efficient walking with crutches than with their prosthesis. I think if we studied it now, and I'd like to study it, I think that people are more efficient walking with their prosthesis than walking with crutches and hopping. So that would be-- but there have been advances in robotics, advances in brain-nerve connection, it's just really exciting all the advances that are being made for people with disabilities.

Dr. SHIVES: It is truly a huge help to have someone like Dr. Andrews on the team, because if someone is considering an amputation, they want to know about the rehabilitation process. And that's where Dr. Andrews comes in and visits with these patients pre-operatively and their families. So they know what's going to happen and how long it's going to take. And most of them, I think, are pretty amazed that within six weeks, they're going to have a permanent limb and they're going to be walking, and hopefully, without anything to support them, cane or crutch. And I want you to tell our listeners about your life after lower limb amputation that just won a big award. Isn't that on YouTube?

DR. ANDREWS: That is on YouTube. And it's great. I still get goosebumps when I watch it. We asked our patients, about five patients that had had amputations, just to talk about their experience. We didn't give them a script, and the only complaint I've had about the video is, don't you have any grumpy patients? They're phenomenal. And they're all talking about life following lower limb amputation. And it's so rewarding to show it to people as they're about to have an amputation, because they'll say, wow, swimming, I didn't know I could swim. Or wow, really, can you drive a car? And just to be able to see people doing their daily activities has been very, very helpful.