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Does Every Knee Need a Meniscus?

MENISCAL TRANSPLANTATION IN THE KNEE JOINT.

<_____> medial meniscus, what are the latest research and treatment modalities orthopedic surgeons are using for meniscus deficient patients. You are listening to ReachMD, The Channel for Medical Professionals. Welcome to The Clinician's Roundtable. I am your host, Dr. Mary Leuchars and joining me today from New York is Dr. Scott Rodeo. Dr. Rodeo is Professor of Orthopedic Surgery at the Weill Medical College of Cornell University. He is Co-Chief of the Sports Medicine and Shoulder Service at the Hospital for Special Surgery. He is also a clinical scientist and team physician for the New York Giants. Today, we are going to discuss meniscal replacement in the knee joints.

DR. MARY LEUCHARS

Welcome Dr. Rodeo.

DR. SCOTT RODEO

Thank you.

DR. MARY LEUCHARS

Describe what we know about the function of the meniscus in the knee.

DR. SCOTT RODEO

Menisci are very important structures. Essentially, they act as shock absorbers, they transmit load across the knee and there is a meniscus on the inner and outer side of each knee, so the meniscus injuries are very common, tears of the meniscus occur, and the problem with meniscal injury is they have very little healing potential. So, surgery is often required to remove the torn piece of meniscus, although that improves the current symptoms, the problem is with loss of the meniscus, may have lost some of the shock absorbing function of this tissue, and overtime, there is the distinctly increased risk of arthritis. So, the menisci served to protect the joint surface and prevent arthritis.

DR. MARY LEUCHARS

What are the symptoms of a meniscus-deficient knee?

DR. SCOTT RODEO

Typically pain and swelling, really you talk about kind of an early arthritis type of picture, activity related pain, weightbearing activities cause pain, certainly impact activities, in particular in recreational athletes, in runners, and things, as well as mild swelling.

DR. MARY LEUCHARS

And how do you assess the patient before considering a meniscal transplant?

DR. SCOTT RODEO

Right, meniscal transplantation is something we have been doing in recent years in an effort to essentially replace the lost function of the meniscus. We have learned the results can be good if it's done early in the process. By that I mean before there is advanced arthritis in the knee. So, a careful evaluation is really imperative. So, we start with a careful physical examination and then to make sure that there are no other problems in knees as far as ligament instability or malalignment, but then the evaluation is really carried out with imaging studies, x-rays, as well as the MRI and the things we are going to look for is to make sure that there are no advanced degenerative changes in that area of the knee, so, we look at MRI to look at the cartilage, we look at the x-ray to look at the alignment in the leg, so that everything else is normal, or other things may be identified and need to be addressed in addition to meniscus transplantation.

DR. MARY LEUCHARS

When was meniscal transplantation first described in medical literature?

DR. SCOTT RODEO

The first one was done in the mid 1980s; this was over 20 years ago in association with transplantation of the upper part of the tibia in the setting of tumor reconstruction. So, the first one was done in that setting, three meniscus transplantations in the setting of what we are talking of kind of early arthritis in the late 1980s.

DR. MARY LEUCHARS

And was that done in the USA?

DR. SCOTT RODEO

First done in Germany. The first one done in this country rather in 1990 that is when we started doing these at the Hospital for Special Surgery here in New York.

DR. MARY LEUCHARS

When was the first one you did?

DR. SCOTT RODEO

When I started my practice in 1996.

DR. MARY LEUCHARS

And we were talking about assessing the patient before considering meniscal transplantation, what are the contraindications, what patients you want to do this procedure on?

DR. SCOTT RODEO

The biggest contraindication is too much arthritis. Once there is too much wear in the knee that the patient is probably beyond that point where meniscal transplantation will survive and do well inside the knee. Once there is lot of arthritis, the mechanical environment on the joint surface is kind of harsh and the tissue doesn't do well, so you realize the degree of arthritis is the most important thing. Second would be malalignment, so a knee that's think of kind of bow-legged person and that person has much more load going to the inner side of the knee. In that setting, you would not want to put in a meniscus in that area rather you should do what is called an osteotomy to cut the bone and realign the leg to normalize the alignment.

DR. MARY LEUCHARS:

Can we talk now about what materials do you use for meniscal replacement or transplantation.

DR. SCOTT RODEO

Traditionally, we have used human cadaveric tissues, so these are used with allograft tissues, human meniscal tissue, which is okay, but has its limitations. Its limitations apply because these need to be sized appropriately for the patient's need. We can take anywhere from 3 to 6 months to identify and obtain an appropriately sized meniscus. We work at various tissue banks to get this tissue. So, for that reason, there has been a lot of effort and investigation into synthetic materials for meniscus replacement. There is a device being used in Europe, is not yet fully FDA approved in this country, but is called a collagen meniscus implant, which is basically a collagen scaffold, kind of a meniscus shaped material that is synthetic material that kind of supports a reparative response and this can be transplanted into a meniscal defect. It has been used in Europe. The results have been modestly good, but it's not yet FDA approved in this country. There are number of different groups working on other approach. We have done some work with an industrial company using polyurethane, an absorbable polyurethane material again as a synthetic meniscus and there is some promise with these different types of synthetic material. The nice thing they are off the shelf, they are available immediately versus having to wait to identify suitably sized meniscus transplant. There are other issue with transplant with human tissue is the small, but real risk of disease transmission that

comes with any tissue transplantation. So, there is real potential with the synthetic material.

DR. MARY LEUCHARS

How critical is the size of the graft.

DR. SCOTT RODEO

It probably is quite critical. We don't truly know what the tolerance of the joint is for size mismatch, but we think that it should be within 2 mm of your native meniscus. So, what we will do is, we can size the meniscus based on your bony dimensions as well as looking at the meniscus in your other knee to identify that the size it should be and we would like to be within 2 mm of that, so they probably have fairly tight tolerances.

DR. MARY LEUCHARS

You mentioned earlier polyurethane as substance for meniscal replacement, what sort of evidence is there for long-term wear and tear of the knee using this polyurethane.

DR. SCOTT RODEO

Not good long-term evidence. Good question. There is some animal data demonstrating that the material is well tolerated by the joint. It will not lead to abrasive changes on the adjacent cartilage. It does support kind of cellular cells kind of infiltrate this material and then they can self -synthesize a new matrix, new material within the polyurethane. So, they can work and they can support tissue formation, but long term results, very little. So, that's where we need, that is going next step and they are being done in a limited number now in Europe as well and in the trial, so we hope to look at that data to learn more about how this material performs in the joint.

DR. MARY LEUCHARS

If you are just joining us, you are listening to The Clinician's Roundtable on ReachMD, The Channel for Medical Professionals. I am Dr. Mary Leuchars, your host, and today I am speaking with Dr. Scott Rodeo from the Hospital for Special Surgery in New York. We are discussing meniscal transplantation in the knee joint.

Dr. Rodeo, what is the exact surgical technique used to replace a meniscus.

DR. SCOTT RODEO

Well, through arthroscopic assisted approach. So, it's done with an arthroscope inside the knee, to kind of prepare the joint and the surfaces and everything to put the meniscus in, we are going to transplant the meniscus with small pieces of bone attached to each end, the front and back part of it. We will make small 9-mm drill tunnels in the knee. That is all done arthroscopically, but we do need a small incision in the front of the knee to actually bring the meniscus in, just about an inch, inch and a half long incision, the rest is done arthroscopically inside the knee. So, that's why we call arthroscopic-assisted approach.

DR. MARY LEUCHARS:

Do you ever do it in conjunction with an anterior cruciate reconstruction?

DR. SCOTT RODEO:

Absolutely. Yes. Many of these are often done sort of complex knees recombined with some else like an ACL reconstruction as you say or a procedure to kind of resurface or cause defect on the joint surface. I have even done some in conjunction with osteotomy where we are cutting and realigning the bone to kind of normalize the alignment. So, it can be a part of a complex procedure of the knee.

DR. MARY LEUCHARS:

Do you usually replace the lateral and the medial meniscus or just one or the other more common?

DR. SCOTT RODEO

Usually one or the other, it is uncommon to do both, I have done on occasion where I have done both sides, but usually it's one or the other.

DR. MARY LEUCHARS

And how does the rehab postop differ for a patient who has had the meniscal transplant versus someone who has just had a regular ACL reconstruction and meniscectomy.

DR. SCOTT RODEO

Right, it does seem much more conservative after, it's a slower rehab after meniscus transplant. We keep the patient essentially nonweightbearing for 6 weeks' time to let that meniscus graft heal whereas in contrast after simple meniscectomy they can weightbear right away, after ACL surgery, the patient is partial weightbearing for 10 to 14 days, and then kind of full weightbearing by 2 weeks. So, it's definitely slower after meniscus transplantation.

DR MARY LEUCHARS:

Can elite athletes, for example, your New York Giants footballer's get back to elite competition after this procedure, have you ever done it on someone like that?

DR. SCOTT RODEO:

We haven't. It may be that I have done in so many athletes, you know, they have gone back to high-level activities. In general, this has been done in the patients that have, you know, a little bit of wear in the knee and your goal is to kind of get them back to more lighter recreational activities that said as the duties in earlier in good healthy knees, I have <_____> get back to high-load activities, so certainly it's possible.

DR MARY LEUCHARS:

Is the goal of surgery sometimes also just the pain relief?

DR. SCOTT RODEO

It is, frankly, the more predictable goal of surgery is just that, its relief of current symptoms, pain, and swelling. The other goal of surgery if you will would be to try to prevent degenerative changes overtime over the years. It makes sense theoretically that restoring the meniscus can do that, but we frankly don't have great evidence yet to truly prove that statement, but we do know, we can improve current symptoms.

DR. MARY LEUCHARS

Is there a patient age that you would not consider performing meniscal replacement on?

DR. SCOTT RODEO

There are no absolutes, but in general, over age 55 or so, in that setting, often times little bit more wear in the knee, usually not going to do it, that said, we have done in patients up to that age and so really lot of it depends on the health of the knee.

DR. MARY LEUCHARS

What are the signs of failure of the transplant are any of them clinically silent?

DR. SCOTT RODEO

Yeah they can be honestly. Typically, the failure will manifest is pain and swelling, kind of recurrence of symptoms. We have used MRI to carefully evaluate the human meniscus transplant, sometimes they are kind of clinically silent where you will see a breakdown and sort of what you probably will call a failure of the transplant, yet the patients do well symptomatically still. We don't entirely understand that mismatch between symptoms and the objective findings on MRI, but it definitely can exist.

DR. MARY LEUCHARS

And what are the exact biological changes that occur in a meniscal transplant.

DR. SCOTT RODEO

The tissue that is transplanted is essentially a dead piece of tissue, most of these are frozen, the most of us using, so, the patient's own cells will invade that tissue and repopulate the transplanted meniscus, so you are own host cells will invade into the tissue and essentially begin to proliferate and synthesize matrix protein, so it's dynamic, this remodeling or incorporation process, which happens with all transplanted tissue, definitely affects how the meniscus graft functions and performs.

DR. MARY LEUCHARS:

How did you develop a personal interest in meniscal transplantation?

DR. SCOTT RODEO

Well, I had interest in complex knee reconstruction including cartilage injury, ligament, as well as meniscus and so kind of followed from that and then the idea of especially of trying to really replace a lost function, is attractive because we have such a common problem with lot of patients that are active, the demand and expect an active lifestyle well into their later years, but at the same time, they have lost the meniscus and we know the natural history of meniscus loss is not good, is one of gradual degeneration, so the huge clinical need and so the ability to do something kind of force lifestyle changes is attractive and can help a lot of patients of this area.

DR. MARY LEUCHARS:

Do you think the availability of transplantation in the future will make more surgeons perform meniscectomies rather than meniscal repairs?

DR. SCOTT RODEO:

Hopefully not, because it's still again an act of prevention is better than a pound of care. It is much better to preserve the native meniscus and I will say it's a complex procedure, it's technically fairly difficult, again graft availability is an issue with the slow rehab, so it's boy, it's something that' seen as you know as last step quite often, so I still make the point that we should try to salvage and repair the meniscus when at all possible.

DR. MARY LEUCHARS

How do you see the future of this procedure, what would you like to see happen?

DR. SCOTT RODEO

I think we will see development of novel synthetic materials that will be available off the shelf if you will. They will be able to size these perfectly for the patient; they will avoid any of the issues associated with rejection or disease transmission from transplanted tissue. I think that the way this will probably go in the future it will be a combination of new materials plus biologic enhancements, by that I mean using stem cells or growth factors, I think eventually we will probably have some material that we seed with cells outside of the body and

then transplant this material. Now, we have a material synthetic that has contained cells that are all kind of revved up and started to synthesize the appropriate protein so we can now have a kind of tissue engineered approach to meniscus replacement.

DR MARY LEUCHARS

How many countries in the world at the moment are developing synthetic meniscal replacement?

DR. SCOTT RODEO

Only a handful. There has been some work going on in a couple of countries in Europe as well as here in the United States, so you need an interested individual, you need the appropriate biomaterial expertise as well as the ability to test these things, as well as you know the startup capital and things that are important in any of these new approaches.

DR MARY LEUCHARS

Well, my thanks to Dr. Scott Rodeo. He has been our guest today. We have been discussing meniscal replacement in the knee.

I am Dr. Mary Leuchars. You have been listening to the Clinician's Roundtable on ReachMD, The Channel for Medical Professionals.

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