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The Next Horizons in Reconstructive Microsurgery

Narrator:

Welcome to Medical Breakthroughs from Penn Medicine: Advancing Medicine Through Precision Diagnostics and Novel Therapies.

Dr. Johnson:

This is ReachMD and I'm your host, Dr. Shira Johnson, and with me today is Dr. Joseph Serletti, Chief of the Division of Plastic Surgery at the University of Pennsylvania and today we'll be discussing reconstructive microsurgery.

Dr. Serletti, welcome to the program.

Dr. Serletti:

Thank you.

Dr. Johnson:

Can you share with us a little bit, Dr. Serletti, about your area of expertise?

Dr. Serletti:

My area of expertise is primarily breast surgery within plastic surgery and the majority of that is in breast reconstruction.

Dr. Johnson:

And, for our audience, can you tell us a little bit, what is reconstructive microsurgery?

Dr. Serletti:

Reconstructive microsurgery is really a field within surgery, primarily within plastic surgery, but it's also shared with some other fields. It's basically a technique where we take a block of tissue, what we refer to as donor tissue from some distant site in the body, and we perform what we call a microsurgical transfer to a recipient site where it's needed. So, a good example is when our otolaryngology colleagues resect an oral tumor that involves the mandible, a good option for mandibular reconstruction today using reconstructive microsurgery is to go to the fibula and harvest the fibula with the peroneal vessels, we may take some muscle, typically we'll take some overlying skin, and we can completely separate that from the leg, we bring it up to the head and neck region, and then, at a minimum, reconstructive microsurgery to be successful requires the reattachment of arteries and veins. So, in the case of the fibula, we are taking the peroneal artery, the peroneal vein, we'll typically, in a head and neck case, hook it up to, end-to-side, into the internal jugular vein and then, either end-to-end or end-to-side into some branch of the external carotid. What that does is reestablish the blood supply and then the fibula is molded to reconstruct the mandibular defect and the skin island is used for oral lining. And that really represents the essence of reconstructive microsurgery. And so, that technique is used primarily in plastic surgery, but it's also used in orthopedic surgery and in otolaryngology.

Dr. Johnson:

Yes, this is really, really interesting because these options were never available to patients in the past. To put it in historical perspective, could you tell us a little about the history of microsurgery and why Penn Medicine is on the forefront?

Dr. Serletti:

Prior to reconstructive microsurgery, we were basically limited to what we could do in terms of moving tissue around to a particular defect. So, to go back to the head and neck analogy, when a tumor of the oral cavity with the mandible would be resected, there's really no local bone that we could move to reconstruct the mandible. So, in those cases, the mandible was not reconstructed and what would be used is the pectoralis myocutaneous flap, basically to just fill in some of the soft tissue. In days before that, there were staged reconstructions where tubes of skin would be harvested from the chest, **waltzed 3:32** up to the neck and then used for lip reconstruction. Same is true for lower extremity reconstruction. Defects of the dorsum of the foot, there was no good local solution, and so the solution was either an amputation or to do what's called a cross-leg flap and what that would be is using some healthy tissue from the other leg, would be elevated and sewn into the defect of the dorsum on the opposite, the injured leg. The patient would be basically with their legs attached to one another for about 3 weeks after which that would then be divided. So, the advent of reconstructive microsurgery, which really sort of took traction in the early 1990s, was a great solution because instead of limited to what was locally available, locally available around the leg, or the head and neck, or even the breast, we now had the entire body as our inventory of solutions for complex reconstructions, and that's how it is today. We have, actually, the largest reconstructive microsurgery program in the country and that's something that's happened only in the last two years, in terms of us being the largest. We performed, essentially five of us, five surgeons, performed 736 free-tissue transfers last year. We did them for really all the typical defects that reconstructive microsurgery is used for, and that is breast reconstruction, and head and neck reconstruction, and extremity reconstruction.

Dr. Johnson:

Are there other types of patients that will also benefit from reconstructive microsurgery that we haven't already mentioned?

Dr. Serletti:

I'm sure that many of the listeners are familiar with hand transplant and face transplant and that's really sort of the next horizon in reconstructive microsurgery. What I said a moment ago was that for complex defects, reconstructive microsurgery allows us to use the entire body, but it's the patient's own body to have as an inventory of tissues. But, obviously, for devastating facial injuries and for someone with a bilateral hand amputation, there's not good solutions like that. Sort of the next step has been to do transplantation and, as you know, a fair number of hand transplants have been done worldwide and a smaller-but-growing number of face transplants have been done and Penn Plastic Surgery along with Orthopedic Surgery here have done two hand transplants, two bilateral hand transplants, one in a child, the very first one ever done worldwide in a child, and we are really on the cusp of getting our IRB approved to start a face transplant program. That's sort of the next horizon, but again, the primary use of reconstructive microsurgery for most of the major programs including ours is number one breast reconstruction. The popularity of autogenous reconstruction has continued to grow. Patients, I think, are less interested in implant-based reconstruction, and so the primary autogenous reconstruction is to use tissue from the lower abdomen, basically what was typically a pedicle TRAM flap, which was a pedicled flap, which is still done today by many people, but our preference is to do that as a free flap. And what we do is we harvest the lower abdominal skin and fat with a feeding artery and vein, trying to preserve all of the muscle and all of the fascia, and then divide it, and then it bring it up to create a breast mound. And because breast cancer is so ubiquitous, most microsurgical programs, this is their primary use of reconstructive microsurgery. So, for example, in the 736 free flaps we did last year, over 500 of them were for breast. And, in fact, Penn Plastic Surgery, where we are the largest reconstructive microsurgical center by volume in the United States, we are not in the world, but we are the largest in the world in terms of doing free-flap breast reconstruction. There's no place in the world who does as many of these as we do on an annual basis. And then, following that, it's head and neck head and neck reconstruction for cancer, and lower extremity reconstruction usually from trauma, occasionally tumor, and occasional congenital defects. So, that's the broad spectrum of the patient population.

Dr. Johnson:

And that's quite an array. If you are just tuning in, you're listening to Medical Breakthroughs from Penn Medicine on ReachMD. I am your host, Dr. Shira Johnson, and with me today is Dr. Joseph Serletti, Chief of the Division of Plastic Surgery at the University of Pennsylvania.

So tell us, Dr. Serletti, about the research and fellowship program in microsurgery at Penn.

Dr. Serletti:

We have a very prolific clinical research program, the basis of which is primarily our very large reconstructive microsurgery program. As I said a moment ago, we did over 700 free flaps last year. Since we started this microsurgical program in 2005, we have done just shy of 5000 free-tissue transfers, in an 11-year period we're, again, just shy of 5000. That gives us a tremendous database in terms of sharing with the plastic surgery world what we have learned in doing this very high volume and sort of unique experience in reconstructive microsurgery. We have had, since 2009, a dedicated annual clinical research fellow and beginning two years ago we expanded that to two, full-time, annual clinical research fellows each year. The clinical research fellows are typically medical students taking a year out and those are folks who are usually applying to plastic surgery, but we've also had general surgery residents who take a year out to do the research. What it does is, these two folks work, really, five days a week on a host of research projects that are primarily looking at patient outcomes with our very high-volume reconstructive microsurgery and we've written so many different aspects about how to do free-flap breast reconstruction in a variety of clinical settings, how to do head and neck reconstruction, comparing the costs of various reconstructions, comparing implant to autogenous reconstructions. There's really no limit. And I can tell you, we looked at the clinical research productivity of our group and the publications in our number one impact factor journal which is *Plastic and Reconstructive Surgery* and we compared it to our peer institutions and over the last two years, the productivity of this clinical research program is that Penn is number one in terms of publications within our number one impact journal. We're number one in terms of being cited by that journal in other papers. And just looking at our papers that are cited, again, comparing ourselves to the Harvard group, to Hopkins, to Georgetown, to Pittsburgh, we also lead the pack in papers that are cited. So, it's one thing, which is wonderful, to build a very busy clinical program like we've built here, but I've always felt that if you have the wonderful opportunity to have such a voluminous clinical experience, we have an obligation to share with the rest of the world what we've learned through that. And so, that's really what this clinical research program is all about. It's sharing with all of our colleagues what we've learned. What works and what doesn't work.

And then, from an educational perspective, we have a wonderful plastic surgery residency program here. They really are the ones who get the bulk of the experience in the reconstructive microsurgery and, again, about 10 years ago we started a one-year microsurgical fellowship and this is for someone

who has completed plastic surgery, who wants to get a year of expertise in reconstructive microsurgery. Five years ago we went from one fellow to three fellows. We keep it at three fellows right now. I'm proud to say, and I'm not the program director, Liza Wu is the Program Director of our Microsurgical Fellowship, but it is, without doubt, the most sought after microsurgical fellowship of any in the country. Each of the fellows do over 200 free flaps a year, which is way beyond what the fellows in the other well-known microsurgical fellowships do. The starting of this clinical program in reconstructive microsurgery has led to a tremendous amount of research growth and a tremendous amount of educational growth. So, it's been absolutely terrific.

Dr. Johnson:

So, as you may know, we have many physicians of all paths and walks and specialties listening to the show today, what should a referring physician know before sending their patient to Penn for a second opinion?

Dr. Serletti:

Really, we will look at anybody who is having a problem, whether it's a problem with their current breast reconstruction, whether they are newly diagnosed with breast cancer, if it's someone who has a new head and neck cancer, we can get them seen by our colleagues in otolaryngology, and then team up to do their reconstruction. One of my partners, Steve Kovach, is nationally recognized as really one of the leading experts in lower extremity reconstruction. He gets patients from the extended region. These are folks with chronic osteo from open tibia fractures, ischemic lower extremity wounds. He's got incredible orthopedic colleagues; they work together. I think that we enjoy the challenge of taking on problems that some people may not be that interested in taking on and we take people regardless of their insurance. We're fortunate that we're so busy that we really can do something like that.

Dr. Johnson:

Dr. Serletti, thank you for being with us today and sharing your insights regarding reconstructive microsurgery. I'm your host, Dr. Shira Johnson, and thank you for listening.

Narrator:

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