RadioMD Interview with Daniel Yoshor, MD

Melanie Cole: Welcome to the podcast series from the Specialists at Penn Medicine, I'm Melanie Cole. And today we're meeting Penn Medicine's New Chair of Neurosurgery and Vice President of Clinical Integration and Innovation, Dr. Daniel Yoshor, here to discuss his research. Dr. Yoshor, it's such a pleasure to have you join us today. You've recently taken part in the development of a neurotechnology that's being called the bionic eye, explain a little bit about what this technology is, where we are in its development? And you've said you hope to see the restoration of functional eyesight to the blind in your lifetime.

Dr. Yoshor: Yes. This has been a tantalizing prospect to neuroscientists and engineers for quite a long time. And the idea is very simple. Think of a roadblock going around a roadblock in patients with acquired blindness, almost always. It's the eyes, the optic nerves, the early part of the visual processing system that's irreversibly damaged. So visual information can't get from the eyes to the brain because usually the eyes themselves are damaged or broken.

What a visual cortical prosthetic aims to do is take visual information from the outside world and bypass the irreversibly damaged eyes or optic nerves, and put that information directly into the visual part of the brain. So the idea is that technology will take images from the outside world, digitize them with a camera and convert that image captured from the outside world into a series of electrical pulses that are used to turn on the brain precisely and activate the circuits in the brain that normally allow us to see by getting information directly from the retina and optic nerve. Instead we bypass the broken retina and optic nerve and deliver the information directly to the brain. That is the concept.

Host: That Is amazing. Now, is there any reason these implants can't be used in children with inherited blindness or is there something to prevent this? Where do you see it going?

Dr. Yoshor: That's an excellent question. The way we envision the technology right now, in order for it to work, the visual part of the brain has to be developed. And development of the visual part of the brain known as the visual cortex, which is mostly located in the back part of the head, those circuits are is not developed without the experience of visual inputs that occur during infancy and childhood. So if someone is born with congenital blindness there's no target for us to deliver the visual information. So the technology we're working on will only help patients with acquired blindness. They have to have had some visual function during their lives. It can be early in their lives. They can be blind for many, many years, but they have to have the latent ability in their visual brain to process visual information. So that would apply to patients who are blind as a result of trauma, for example, or retinal disorders like retinitis pigmentosa, anything that damages the eyes permanently in patients who at one point in their life, were

able to see relatively normally, those conditions would be appropriate for visual restoration, with a visual cortical prosthetic.

Host: Doctor, where did this concept for this technology come from?

Dr. Yoshor: In my laboratory working in this area for over a decade, what we have largely done in the past is work with patients who are undergoing monitoring for medically intractable epilepsy. These are patients who have epilepsy that can't be controlled with drugs.

But it's an opportunity for us to study the brain in patients who volunteer while they're waiting to have seizures to have other testing.

Host: And these Monitoring procedures and surgeries contribute to a better understanding of the visual cortex?

Dr. Yoshor: We've been working on that as I said, for over a decade, what we found and we recently published on this in the Journal Cell, just a couple of months ago in May, If you just try to use a pointillism technique, like a syrup painting and you're right, I'm very interested in the merger of technology and neurosurgery to improve patient outcomes. And in my practice over the past 20 years, the way I do pituitary surgery has changed enormously. And now we do all those surgeries entirely through the nose using endoscopic cameras and special instruments designed for endoscopy. So we do what we call minimally invasive approaches to all these tumors, including some very large and challenging tumors. And the great thing about this technology is how much it helps patients. And as you know, a lot of my research in visual prosthetic technology and visual neuroscience aims to restore vision to patients who are blind, giving the gift of vision back to patients who are in danger of losing it forever. Really one of the most gratifying things you can do as a Doctor.

Host: Dr. Yoshor, as we wrap up as the new chair of neurosurgery and vice president of clinical integration and innovation, what's your vision for the department? What would you like other providers to take away from this episode and what you're planning to do there at Penn Medicine?

Dr. Yoshor: My vision is to have our department be highly sub-specialized with a series of Doctors in neurosurgery that are experts in very specific areas in neurosurgery and focused on those very specific areas. And that those doctors are not only superb experts in technical neurosurgery within their subspecialty, but they're also harnessing the great science and engineering that we have at Penn to advance the field.

So we don't want to just practice medicine at the highest level. We want to innovate and improve medicine and specifically neurosurgery at the very highest level. And that's, what's going to make the difference here is we're going to be highly focused.

Host: Thank you so much, Dr. Yoshor, absolutely a fascinating segment. And thank you so much for joining us today. And that concludes this episode from the Specialists at Penn Medicine. To refer your patient to Penn Medicine, please visit our website at pennmedicine.org/refer, or you can call 877-937-Penn for more information, please remember to subscribe, rate, and review this podcast and all the other Penn Medicine podcasts. I'm Melanie Cole.