Season 2 – Episode 3 – Dr. Taufik Valiante
Transcript

CHRISTIAN COTÉ:
Welcome to behind the breakthrough, the podcast, all about groundbreaking medical research and the people behind it at Toronto's university health network, Canada's largest research and teaching hospital. I'm your host, Christian Coté. And joining us today, Dr. Taufik Valiante, award winning neurosurgeon and scientist at UHN's Krembil research institute. Dr. Valiante has invented a first of its kind implant, a device that can sense an epileptic seizure before it occurs andthen stops the seizure from ever happening. Dr. Valiante, welcome to behind the breakthrough.

DR. TAUFIK VALIANTE:

Thank you so much, Christian, for having me.

CHRISTIAN COTÉ:
Before we dive into this invention, help us understandwhat is epilepsy?

DR. TAUFIK VALIANTE:

so you can think of epilepsy as an electrical storm in the brain. And these electrical storms happen at unexpected times. So, theyare very, very scary, of course, for, for the patients themselves, because they are unpredictable in a way. In epilepsy by definition is, you know, having seizures that are occurring over a person's lifetime. In Ontario, epilepsy is considered to have the lowest or portends lowest quality of life among all self reported chronic conditions. So, it's a very disabling disorder. It's also a prototype of a chronic neurological condition which affects people in all three spheres of their existence, biologically, psychologically and socially.

CHRISTIAN COTÉ:

And how do you mean biologically?

DR. TAUFIK VALIANTE:
So biologically, we know that the seizures themselvescan affect various aspects of cognition so they can affect memory and learning in children. For example, when children start to develop their seizures, you can see a regression in their milestones. Their grades can start to precipitously drop, so it can really affect an individual's cognition. It also we know that seizures beget seizures in the sense that a seizure occurring in one spot of the brain can cause seizures, then to begin

In another spot in the brain. And we think that's another biologicalconsequence of having epilepsy.

So, we tend to think those are sort of the more like the organic phenomenon of epilepsy, that they're affecting the structure and function of the brain. And then psychologically, individuals with epilepsy have very high rates of mental health problems, in particular depression. So, a third of patients will have clinical depression. We know that individuals with epilepsy are more socially isolated, so they tend not to seek out social interactions. We know that they have an inordinate amount of social stigmatization. So, individuals with epilepsy in Ontario, for example, have the same average education as the average Ontarian, buthave much higher rates of unemployment and underemployment.

So, you can kind of see that, you know, this condition really affects people in sort of every facet of their existence. And then, of course, we live in families. You know, we live in communities. And so, our families, their families, of course, are affected. These individuals often require people to drive because they can't drive. They're often fearful of going out in the parents or family members are fearful that they go out. So, they're kind ofoverprotected in that way. So, it's sort of a sort of curtails their autonomy. So, it's, it's a pretty devastating disorder.

CHRISTIAN COTÉ:

Do we know how we get epilepsy? Like, what causes it?

DR. TAUFIK VALIANTE:
Yeah. So, it's interesting that epilepsy is kind of considered seizures themselves, are considered sort of final common pathway of so many disorders. And so, there's, of course, genetic conditionswhere there could be an abnormal gene and this could be inherited. It can also be acquired as a new mutation. These types of epilepsies are often very, very severe. They often manifest very early in childhood. That's a general class of sort of genetic forms of epilepsy and there’s acquired forms. So, you know, a good example as a neurosurgeon i can provide is, for example, a tumor.

So, a low grade tumor that grows for many, many years, a decade or so, can then start to cause abnormal activity in the brain and cause seizures. Traumatic brain injury is another example of an acquired epilepsy, where there is a scar that develops following some kind of traumatic head injuryand then seizures develop many years later. So that's why it's really considered a disorder. It's not a disease per say, because there's so many different things that can affect the brain that ultimately manifest as seizures. And that's why epilepsy also coexists with other kinds of neurological condition. So, for example, autism is an example where, as a spectrum disorder, it also includes epilepsy as sort of another sort of manifestation of that disorder.

CHRISTIAN COTÉ:

And what's on offer to patients with epilepsy in terms oftreatment?

DR. TAUFIK VALIANTE:

So, the mainstay is really medication. So, pharmacology,you know, we always in medicine is do no harm. So, we start with the least invasive types of approaches. And so medications have been over the last 100 years, the mainstay of treatment, interestingly, having just reviewed this because one of my students is completing his Ph.D. recently, is that, in fact, when we look at medical pharmacological treatment of epilepsy since time immemorial, it seems that there's always this one third of patients who do not ultimately respond to medications. And it speaks to the biological complexity of course, it also speaks to probably the brain becomes resistant to the pharmacological treatments because the brain isreacting, adapting not only to its environment, but to the pharmacological agents that are existing in the body.

And so, there is this persistent one third of individuals who, no matter what you do, they don't respond to medications. And those are the kind ofindividuals that i ultimately see as a surgeon for the possibility of some form of surgical therapy. If to be totally complete, there are other treatments that we'll often try before surgery. So, i think many have heard about dietary approaches like the ketogenic diet, which in certain individuals can have significant benefit. You know, we have a study on music therapy. So that's something else maybe we can talk about at some point. And also, you know, various forms of mindfulness, you know, changing life patterns.

We know that, in fact, that epilepsy is very significantly affected or the frequency receives affected by sleep patterns and stress, fatigue, emotional states. And so, for example, we can see in young people who develop a form of epilepsy that is the most surgically amenable form of epilepsy, which i deal with, which is temporal lobe epilepsy, that the seizures often become manifest in the late teens when they're very formative years. They're just you know, getting into university or startinguniversity and then all the stress of life and cramming for exams, you know, they bring out the seizures. And so, it curtails their ability to actually proceed with their education. But at the end of the day that when all these things have been tried, then we look to surgery as a potential option.

CHRISTIAN COTÉ:

So, by the time they're coming to you for a surgical solution, they've exhausted all medical treatments. Any other kind ofalternative treatments.

DR. TAUFIK VALIANTE:

Yes. So actually, that's a great point actually to make, is that in the past in the community, patients would be told that surgery isthe last resort. You would never want surgery. And so, what happens is that individuals are strung out on medications year after year, decade after decade. And in fact, although we're trying to chip away at these numbers, is that a person who comes to me with the most surgically amenable form of epilepsy, it'll often take them 20 years to get to me from the time they had their first seizure. And so, when we look at chronic disease management, then we really think about providing all the options up front. So, they're well aware of what the potentialities are given theircondition.

So, for example, now we have very clear guidelines in Ontario that if you failed two first line medications in succession, you are deemed medically refractory and you should be sent to a surgical center like ours. And whatthis means is that it would reduce the time from 20 years to maybe two to three years, you know, when somebody comes to see me. And that's a critical point because as we spoke about right at the beginning about the organic or biological changes that happen in the brain due to seizures, we know that the longer you have seizures, the less likely you're going to benefit from the surgery, the less likely you'll be able to reduce your medications following surgery. And so, from a chronic disease managementpoint of view, it's very different than, for example, hip and knee surgery where you wait until that knee is completely gone. We, of course, don't want your brain to be completely gone, you know, when, when you come to see us.

And so this is part of the knowledge translation component, which we're doing as part of the provincial epilepsy strategy. We really hope that we can see people early on, you know, two to three years within them being sort of medically refractory, because we also know then their life hasn't been completely disorganized by their epilepsy because of its significant impacts psychologically and socially. We hope that will change this, the sort of the profile of the individual rather than somebody who's 20 years now into their disease, who's never worked, who's, you know, really socially isolated to somebody who's looking you know, to their future andis at this kind of beginning of their life where we can help them, you know, get past this hurdle.

CHRISTIAN COTÉ:

You've been at this for close to two decades, performingsurgeries. What have you seen over this time is the unmet need when it comes to breaking new ground in the field?

DR. TAUFIK VALIANTE:

That's a great question. I just would preface that by in many ways, you know, the needs arise with what tools are available to you. And i think we're at a very unique time in history. From a you know, computer science-y point of view and an engineering point of view and, you know, when I started a long time ago in university, I always kind of felt that, you know, math and physics were the language of the brain. And, and I think it's kind of cool that that's kind of emerging where really the world's attention now is captured by an aging population. And this desire to understand the brain and, and epilepsy is really a condition which lends itself, you know, it's very tantalizing because, you know, the seizuresoccur you know, in these very specific time periods and, and kind of the dream or the holy grail that i talk about really now in epilepsy research, and for those people particularly who i cannot offer them an operation where i can remove an area of the brain to help stop their seizures, which is really what we want to do is what can we do? And this falls in sort of what can we do is now increasingly understood in the context of the term,which is called neuromodulation. And this is this idea that we can modulate, alter brain activity in a way to push the brain away from states that are bad for it. And epilepsy is just an example. It's a very obvious example because you can see it very clearly when somebody has a seizure and we can see it very clearly when somebody has a seizure and we have electrodes implanted on their brain or on their scalp or placed on their scalp.

So, this has been sort of the dream for, for a long time, is that it's such an obvious problem. It's like, wow, we can see this brain activity. It would be great if we could detect it somehow and we could stop it. You know, it's almost like, you know, it's like this carrot and the carrot is kind of right in front of you. And you chase it and it just always seems to come a little bit closer, but just not as fast as you want. And, you know, I can obviously speak to all the nuances associated with. But that's really the dream that I think drives so much of epilepsy research.

CHRISTIAN COTÉ:

And to that end, your lab trying to fill this gap. You cameup with something called nurip, which I understand stands for neural interface processor, which is a fancy term for what?

DR. TAUFIK VALIANTE:

It's a fancy term for a computer chip. It's an acronym.And, and really the problem we're trying to solve is with nurip is the general problem that is trying to apply to other conditions, including epilepsy for things like, for example, parkinson's disease, which is a

Movement disorder that also has associated with it abnormal electrical activity. And the general problem or the general engineering problem we're trying to solve is we're trying to create a device that can decode brain activity so it records activity and in real time. So as the brain activity is evolving over time, is to decode it and understand the difference between what's normal and what's abnormal. And then when itknows that something is abnormal is to know how to stimulate the brain in a meaningful way to push the brain from having a seizure. And so, this is the general engineering problem.

If there's any engineers are going to listen to this of basically control itscontrol theory and its control theory where they were trying to apply to the brain. The hard part about the brain, and i think everybody can attest to this, is that it's super complicated. We don't have a model of it. And so, for example, somebody might say, hey, well, you know, in engineering, you guys can like do create autopilot and whatever. And like,how do you do that? That should be, you know, you should be able to do that with brain. And it's like, sure. You know, creating a plane that can flyitself is because we actually the laws of physics are well known and you know we can compute things very, very exactly because we have all the equations to do that. So, we have a really great model of the physical world. And when you have a great model, then you can actually make predictions as to if i do this, then this will happen.

And unfortunately, with the brain, it remains, you know, this really enigmatic structure which we struggle with, understanding it for two reasons. One is that we just can't sense enough of this activity. If you can imagine, you know, there's 80 billion neurons and 200 trillion connections and then we don't have a model that tells us that if you stimulate at this strength, with this frequency at this location, then why will happen. So that's the hard problem we're trying to solve with nurip. And, you know, innurip has, you know, an older brother or sister or younger brother or sister or a new version of nurip has come out. So that's the general problem we're trying to solve with nurip, yeah.

CHRISTIAN COTÉ:

and so the premise of the chip nurip is first to determine when a seizure is about to happen and then second to somehow stimulatethe brain to prevent the seizure from taking place, which would in this case, prevent an epileptic seizure. So, in terms of what you know about nurip so far, what do you have in terms of measures to, to show that it's worth continuing to pursue the development?

DR. TAUFIK VALIANTE:

so, there's a large, large amount of data that we collect at Toronto western hospital from epilepsy patients as well as international databases, and these are sort of benchmarking databases.

So, they're the data that are labeled by experts they're labeled when the seizure starts, when the seizure ends, where the seizure is occurring. And we use this data and we sort of pretend that it's coming in real time to nurip and we tested nurip is actually able to do what we expected to do. The long and short of it that is nurip exceeds kind of our expectations andis better than, you know, anything out there that we're aware of…

CHRISTIAN COTÉ:

This is in terms of detecting an epileptic seizure before ithappens?

DR. TAUFIK VALIANTE:

Detecting an epilepsy before it happens. How specific it's detections are, how it's not fooled frequently by other types of brainactivity, which is not a seizure, which would be more insensitive to false positives.

CHRISTIAN COTÉ:

The location of the seizure as well.

DR. TAUFIK VALIANTE:

Absolutely.

CHRISTIAN COTÉ:
Wow. So in terms of testing the efficacy of, of nurip, tell usabout your relationship now with the veterinary school at university of Guelph.

DR. TAUFIK VALIANTE:

so that's a very exciting opportunity that arose, I think, in part through crania, through a collaboration with a local industry partner called synoptek, where they are partnering with animalhealth partners, which was developing a relationship with university health network around comparative medicine.

And the concept is experimental treatments and devices are deployed in naturally occurring disease in animals to sort of optimize these approaches and these treatments for improving human health. And the really incredible thing is, is that epilepsy occurs in dogs at approximatelythe same rate as it does in humans. Forms of epilepsy are very similar to humans. The electrical signals and patterns that occur during dog epilepsy, seizures and in dogs is very similar to humans. And so, they actually are very good model. I use model in the sense of sort of not so much that we create that epilepsy, but it's naturally occurring.

CHRISTIAN COTÉ:

Right.

DR. TAUFIK VALIANTE:
To actually test out new approaches for epilepsy. Andthe really other interesting thing is, is that animal health partners, in fact, has within its surgical suite the very types of sort of surgical tools that we would use on the human side of things and as well are very willing to actually implement new approaches, new devices, new surgical techniques. And so, this is an emerging relationship that we have. And our first step is, of course, we always you know, work our way to invasivenessis to start with an implantable device that uses nurip at its core. So nuripis going to be the heart of this of this device, the guts of it, the brains of our guts of it, although there are more neurons in the gut than in the brain, but anyway, the brains of it.

And it'll be an exercise for us to create a fully implantable device. And so that's something that we're, we're super excited about. Of course, it's a learning process for us, but that's our next big step. And i think one of thereally amazing other opportunities, which, again, you kind of wonder if this is by design, is that, you know, we have the world expert in canine epilepsy here in Ontario, which is pretty remarkable. So, i think we're very,very excited with the opportunity.

CHRISTIAN COTÉ:

So, the table is set, have you reached the first stage interms of a safety trial?

DR. TAUFIK VALIANTE:

We actually have our first device prototyped, so we haven't got yet to the implantation. We've also building a company aroundthis approach. And that's another sort of learning experience for us.

CHRISTIAN COTÉ:

Sure.

DR. TAUFIK VALIANTE:
And, of course, with, with getting the capital to startthe company, we'll actually have the capital to start to build these devices. On the other hand, there's a lot of surgical nuances. And so, we'reworking with the neurologists on the animal side to develop the surgical protocols to do these type of trials. And the next step being, of course, that when we move to the brain, we're actually developing the robotic devices to actually do the implantations with another. A local Canadian startup and a colleague of mine, victor yang, with a company called 7d, which develops surgical navigation devices and robotic approaches to implanting devices. So, so that's kind of our incremental step.

CHRISTIAN COTÉ:

Potentially groundbreaking, a game changer for people with epilepsy. Would it be for treatment resistant patients or everyone?

DR. TAUFIK VALIANTE:

This is really for the medically refractory patients. And these are actually a subset of those patients whom we cannot offer asurgery to remove a part of their brain to help them with their seizures.

CHRISTIAN COTÉ:

And the genesis of this idea, like how did the notion of achip that could detect and then stop an epileptic seizure. How did that come to you?

DR. TAUFIK VALIANTE:

This is actually been an idea that, you know, probably been around since the 30s or 40s. In fact, when you look at some of the pioneering work by wilder penfield, you know what they do, epilepsy surgery while the patient's awake, they'd have electrodes placed on theirbrain. These individuals would be engaged would be talking about, you know, their life and everything like that. And you can often evoke a seizure and, and you could stop a seizure too by electrically stimulating the brain. So, there was this realization that you can electrically stimulate the brain to cause a seizure and you can electrically stimulate the brain to stop a seizure.

So, this idea really has, has been there for a very long time. It's kind of whyit's such have such an emotional component, i think, for many of us in the epilepsy field, because it's been such a longstanding idea. I think what's really exciting from from our point of view is that, you know, i really think we have an incredible nucleus of people here at the university of Toronto who are really leading on the engineering side to sort of implement things that are typically not implementable in real time. And i think that's a big thing to distinguish for in people's minds, is that, you know, we talk about machine learning and artificial intelligence and these types of computational approaches take a lot of time.

So, it takes many hours for computers to churn through this data. And we don't have we we're not afforded that luxury in somebody who is having a seizure. And so, the engineering problem is, is how do you sort of take thesesophisticated, difficult computational problems and make it run in real time on hardware? And I think that's where really, we excel.

CHRISTIAN COTÉ:

I'm curious, in your travels, how is Toronto perceived interms of being a med tech innovation center?

DR. TAUFIK VALIANTE:

You know, one would be have to be myopic not to realize what's happening. And so, we have, you know, incredible endeavors like crania. We have the max planck center that's developing at university of Toronto around neuro technology. We have new collaborative programin neuromodulation being developed at the University of Toronto. In addition, we have the vector institute here, which is really a machine learning mecca for all these sort of advanced computational techniques. We have a world class engineering faculty. And i think really when, when we put crania together as sort of this center for advancing technology, i think the realization was we have all the pieces. I think the other really important thing, which i didn't mention i should, which is just incredible legacy we have here in Toronto around clinical trials, around neuromodulation.

And really the pioneering work done by Anthony Lang and Andres Lozano around parkinson's disease, you know, has positioned us as an incredible place to do clinical trials. And that's really one of our big strengths on the epilepsy side now. We have one of the largest programs in Canada. I would argue we have one of the, the most academic programs in Canada. Now, epilepsy is part of crania. It's part of this whole you know tech environment. So, i feel there's an inflection point when it comes to these types of devices. And i think we're exceedingly excited. And, and then whenwe look at our partnerships on the comparative medicine side, you kind offeel everything seems to be aligned. The stars seem to be aligned to, to realize all these things and so on.

CHRISTIAN COTÉ:

It’s amazing.

DR. TAUFIK VALIANTE:

Yeah.

CHRISTIAN COTÉ:

And, look, we cannot leave your research without touching on something you hinted at earlier in our discussion. Another initiative with promising results for people with epilepsy. Tell us aboutthe potential of Mozart sonata for two pianos in d major k 448. Sorry, that's a mouthful, but tell me about that?

DR. TAUFIK VALIANTE:

Yeah, I mean, that's, that's a wonderful story too which has a very deep rooted history and a lot of math and a lot of computation, and i think the really thing that, you know, many people have been enamored by is that, you know, music is a universal language andit seems almost impossible. And, you know, I kind of joke in the lab now thatpretty well everything in our lives is neuromodulation. I mean, this podcast is neuromodulation. You'll remember something from this podcastand your brain will have changed.

CHRISTIAN COTÉ:

Let's hope so.

DR. TAUFIK VALIANTE:
Let's hope so,

CHRISTIAN COTÉ:
For the better, I hope.

DR. TAUFIK VALIANTE:
Exactly. Yeah. So, this is actually an interesting storythat sort of is borne out of the Mozart effect, which I think people are probably aware of, and, and was kind of debunked in a way. But it has a very interesting protagonist, a guy named Gordon Shaw, who is a very strong computational person, who kind of developed the model around how different types of stimuli can affect brain activity. And he was very interested in Mozart's effect on spatial learning. And his model actually evolved, displayed some type of activity, which when people looked at it, thought it looked like seizures. And so, he developed this idea that maybe external stimuli, and particularly Mozart, which appeared to have specificeffects on spatial reasoning, might have effects or beneficial effects for people that epilepsy.

And so, this kind of like a 20 year literature, which, you know, we do reviewin the paper. And our contribution to this story is that we, we sort of tooka very rigorous approach to using the piece in a clinical setting, but developing the appropriate what we feel is the appropriate control piece to really test hypotheses. Is this piece doing something? And so given sort of my computational bent and the lab's computational bent, what we did was we took the Mozart piece k 448, the first six minutes of it, and we scrambled it in such a way mathematically that it had all the same components of it that the original piece had, but it lacked the rhythmicityof the original piece.

And so, then we used that as our, our control piece and individuals were exposed to the original and the control. And we liked the design. It's a powerful design, was a crossover design, so the same individual as their own control. We also did electrical recordings during the exposure to theMozart piece as well as control piece. And we did this over a year. And i have to admit, I was pretty nihilistic about it. You know, I'm sort of like thevery hard core, basic science person, like, wow, this is not going to do anything. And i was incredibly surprised. You know, we showed an almost 50percent reduction in seizure frequency in individuals while they listened to the control piece for three months.

CHRISTIAN COTÉ:

What spectrum were the epilepsy patients on?

DR. TAUFIK VALIANTE:
These were all medically refractory patients who,who are not well controlled on their medications.

CHRISTIAN COTÉ:

But pre-surgery,

DR. TAUFIK VALIANTE:
Pre-surgery or not actually deemed to be surgicalcandidates.

CHRISTIAN COTÉ:

Wow.

DR. TAUFIK VALIANTE:
Yeah.

CHRISTIAN COTÉ:
So, would you take this into the clinic?

DR. TAUFIK VALIANTE:
Absolutely. And of course, we have a lot of theories which are well grounded in science of why this music might have something quite unique in it, as opposed to other composers, other formsof music and other pieces.

CHRISTIAN COTÉ:

Do you know yet what that is, what that component is?

DR. TAUFIK VALIANTE:
Yeah. So, it's kind of a hypothesis that we're working on. I'm working on this with a postdoctoral fellow in the lab, Marjan Rafiee. And one of the unique things about the Mozart piece and actually just more generically to talk about music is that enjoy ability of music there's really two components to that. And one is the surprise component of music. So, when something surprising in music, it adds to enjoy ability and also, it's balanced with predictability. We actually listen to our favorite song because it's predictable. We know what it's going to sound like, probably has some emotional component, nostalgia component. But that particular is just why some people watch the same movie over and over andover. They know what's going to happen, but they love watching it.

And so, it's this balance between predictability and unpredictability, which is thought to contribute, to enjoyability. And interestingly, there's actually literature published from a group in Montreal which has shown that the Mozart music, the way it was composed, is very highly unpredictable. And the interesting thing about that is, is that when you look at seizures in the brain, the seizure is in electrical activity. It's a departure from activity in the brain that looks seemingly random. It's a very organized activity. So, you're going from unpredictable activity whichcharacterizes normal brain activity to something highly predictable.

In a highly predictable brain, can be thought of as a pathological brain when you look at the electrical activity of it. So for a great example, is not even epilepsy, parkinson's disease, where individuals have a tremor. And that tremor is associated with a very clear. A sinusoidal oscillation within the basal ganglia deep in the brain, and that's not the way the brain likes to work, it doesn't like to create, these kind of predictable type of signals. So, Mozart is very unpredictable. So, it's very much like brain activity. So, we're working on this type of hypothesis in that it's theunpredictability of music that induces the unpredictability in brain activity, which actually potentially suppresses seizures.

CHRISTIAN COTÉ:

So, it's maintaining the natural state of the brain, which isunpredictability.

DR. TAUFIK VALIANTE:

Exactly.

CHRISTIAN COTÉ:
Preventing the predictability of a seizure.

CHRISTIAN COTÉ:
You're listening to behind the through the podcast all about groundbreaking medical research and the people behind it at Toronto's university health network, Canada's largest research and teaching hospital. I'm your host, Christian Coté. And we're speaking today

With dr. Taufik Valiante, award winning neurosurgeon and scientist at UHN's Krembil research institute. Dr. Valiante has invented a first of its kind implant that can sense epileptic seizures and stop them before theyoccur.

His research is supported in part by the Toronto general and western hospital foundation. Now taufik you were born in Montreal, raised in Toronto, you said you grew up on sci fi tv shows like star trek and the six million dollar man and dreamed of being part of that world and that you always wanted to understand the brain and epilepsy. That desire, in part, i understand, was inspired when you were just a boy playing softball. Do youmind telling us that story?

DR. TAUFIK VALIANTE:

Yeah, you know, I was an avid sports person, but baseball has sort of been a staple for me ever since I was a kid. And, you know, i think our life experiences do shape our paths, maybe either consciously or subconsciously. I always joke that, you know, the, the bedtime story my mom probably told me was that you're going to be a doctor. So maybe that's how that happened. But I think I've always been very sensitive to sort of the plight of individuals. I've always been sort of that, that kind of person when i was young and i remember one of my coaches, his son had epilepsy, and i always distinctly remember his son coming to our baseball practices wearing a helmet because he had a form of epilepsy where individuals without any warning fall. They lose all sortof tone in their body. They fall. And these individuals have very severe fractures of their face and their teeth and their skull rest. And it's terrible.

And I remember distinctly a time when his son stopped showing up. And I'm not sure how I learned about it or whether I asked my mom or but I ultimately learned that he had died from, from epilepsy.

CHRISTIAN COTÉ:

oh!

DR. TAUFIK VALIANTE:
Yeah. And I think that's kind of left an indelible mark and for some strange reason, and I don't know where this came from, but inmy early teens, I kind of felt that. And I don't know why the brain perceived and maybe because of this experience with this young guy was I develop a fascination with the brain. And i thought that epilepsy was a way I could understand the brain. That's how those two things kind of got merged into one. Yeah.

CHRISTIAN COTÉ:

You mentioned your mom reading you bedtime stories and that it's every immigrant families dream for their kids to go into medicine.

For your parents, what did it mean to them that you fulfilled that dreambecause they are first generation immigrants to Canada?

DR. TAUFIK VALIANTE:

I think the general parents' dream is probably that the kids are happy. And I think I always took to sort of academic things and I had a very significant interest in science. And, and I think that they gave me that freedom to kind of explore everything that I wanted to, whether it was, you know, my scholastic stuff or music or sports and everything like that. And I think, you know, at this point in time, because we can always look back now and i do chat with them, you know, they're getting older. And, you know, I would give them full credit for what I have done because they've created that environment to create the

opportunity for me. And I think that they are just you know, very, very happy. I think that, you know, my mom comes from a very strong sense of social, social activism.And medicine is a form of social activism.

It's about giving back and taking care of people. And I think for her, that's always been kind of the overarching medicine is but one way of doing that,you know, which, of course, I love. And I think the other thing that was kind of left, which is a very big part of my life too are community involvement, and I think she loves that aspect as well. I think that that's kind of how she exercised her sense of community. And, you know, she, she would always say there's nothing's not negotiable except for being born and dying. And so, everything could be changed. And so, you try to change things, of course, to the best in whatever environment you're in. And so, I think that's kind of that general framework was kind of really imprintedupon us. My brother is actually an environmental policy guy, and so he's very you know interested in green policies and on plastic reuse and, you know, and recycling and stuff. So, we kind of had this, you know, ingrained into us about creating social change. And I think medicine is, you know, I think a very a very nice way of doing that.

CHRISTIAN COTÉ:

you know, we should add, because i think the story is amazing, your mom's story, we should, you know, give a shout out to herbecause she was orphaned as a teen, left her native Pakistan with her older sisters, sails to England to make a new beginning, and then afterhigh school, set sail again for Canada to be a chartered accountant in Montreal, the courage of your mom to uproot her life and start over twice. How does that experience shape you?

DR. TAUFIK VALIANTE:

Well, it's kind of funny. I think at the core question, if ireally think about it, i think that it speaks to her adage about sky's the limit, which is almost like, you know, whatever you put your mind to, you know, you will do. And I think that, you know, I've kind of recreated myself a number of times in my professional career, and i sometimes wonder if that kind of, sense of excitement you get from change or embarking on something new overrides the fear or overrides that status quo bias. You know, i think the one cool thing about mentors and of course, parents are always mentors is that when you look at them, you realize what's possible.Right. In a way, they've done it. And so you go, wow, ok, you know, that can be done. You can you can struggle and you can recreate yourself. And I think the mentorship, that example for us, you know.

CHRISTIAN COTÉ:

so as a leader in your lab, how do you inspire possibilitywithin your team as a mentor?

DR. TAUFIK VALIANTE:

I love the feeling of autonomy. I had that when I was a PhD student, had that as a child growing up from my parents, you know, thefreedom to do kind of do things, of course, within the scope of, you know, hopefully being, you know, meaningful to society, et cetera, et cetera. So the thing that I encourage most in my lab is to have a why? To have a question that drives you. I don't want to be that mentor that says, you know, I have this idea and I want you to do these experiments and I want you to make this figure. I don't want to be that micromanager. I want people to explore and I want people to come up with their own ideas. So, I really encourage people to have their why. And I think that that comes partly, too, from something that I've learned in my life, which is, that, you know, life is not linear and there are hardships that face you that you don't predict.

And if you're very focused on the utilitarian nature of what you're doing about if I do this, I get this rather than some overarching sense of meaningand purpose, then those barriers and hurdles and obstacles can almost beterminal for you. And so, when, when somebody comes to my lab, I tell themthat I don't want to be that person who gives you a project. Come to me, read your stuff, come to me with your why. And I think that they will be happiest then if they're exploring their why. And I really, really believe now that in my position now and hopefully, you know, this will continue the success of the lab and the funding that we have is to really create an environment for young people to come and truly flourish in many ways. I guess kind of what i was given as a child, both at home as well as in the labwhen I was a PhD student, that freedom to explore. And I'd love to create that environment for the next generation.

CHRISTIAN COTÉ:

So, you know, as a role model, people are watching youconstantly to try to model themselves after you. So, when you face failure in the lab, how do you navigate that challenge?

DR. TAUFIK VALIANTE:

Yeah, I think it's you know, I think it kind of goes back to the idea of a negative result. And, you know, both types of results and failure, if you want to call it that, is evidence to you about how things work and how you perceive, how you perceive your current state. And so, you might have failed because of circumstance. You might have failed because your expectations might have been incorrect. You might have failed because your formulations may have been wrong. But regardless of one way or the other, they provide you information about the process that you're undertaking. And I think that, strangely enough, I find failure as a little bit exciting in the sense, because I think if you've been fortunateenough to have success in your life, you develop these kind of rose coloredglasses, which you think everything's possible.

And I think, you know, failure reorients you to help you understand what can or cannot be done. And I think also, too, that as a mentor, if somebody comes to the premature conclusion, something can't be done, then it's my responsibility to say, hey, well, maybe, you know, maybe you could try it this way or do it that way. And failure is it sounds like a negative term in away. But I think that when I see somebody struggling in the lab, my first thought is that this is a young, productive individual that might be facing something personal or interpersonal or something like that. And I tend towant to always explore kind of what are maybe other factors that might be at play at that time, so.

CHRISTIAN COTÉ:

Well, failure, negative result is we are not really taughtin life how to deal with failure.

DR. TAUFIK VALIANTE:

Yeah, well, I have a favorite saying in the lab. I alwaysjoke with them. I say, you know, in adversity there's opportunity. So that's my favorite line.

CHRISTIAN COTÉ:

That’s a good one. Well, ok, so you see patients almost everyday. You're keenly aware of their need for better treatments. I'm curious if that puts pressure on you?

DR. TAUFIK VALIANTE:

I think it's a healthy pressure. It's kind of like, you know, people ask me now, like, you know, when you when you go operate, what makes you excited about the surgery? And, of course, you know, by thetime that you've done something for 17 years now, the surgery itself, the technical aspects of it, are not the things that, that excite me per se. It's the hope for that patient. I tend to think more about what's it going to be like for them, you know, two years from now or, or three years from now.

So as a physician in the clinic. I feel compelled in a positive way, in a hopefulway and a very

grateful way that in fact i can translate their needs to something in the lab and something concrete. So, I feel super grateful allthe time. I feel grateful for that responsibility. I also feel very grateful that they would trust in me that they can say, hey, you know, how is your chip coming along or when is that going to be ready? And so, it's like, yeah,that's right. You're right. We've got to push harder on that. And so, I thinkit's, it's a healthy thing, I think.

CHRISTIAN COTÉ:

The flip side, of course, is the chip. Your research for anyone in research, it takes time. Like how do you reconcile the urgency ofthe patient with the rigor of science?

DR. TAUFIK VALIANTE:

I think the one way, one reconcile, I mean, for myself asan individual is to, to potentially try to create influence in a number of spheres. So, you know, I think at the end of the day, as human beings, you know, our satisfaction in life is really for us to define. You know, when you look at salk, philosophy, buddhist philosophy, our reality is the way wechoose to perceive it. And so for me, the reward system that i developed is about creating change. So, like, am i part of things that are leading to change? And so i drive great satisfaction on purple day, for example, when the lab is out there or when we, you know, pre covid, when we turn the atrium all purple and the patients would come because they know that those are also beneficial and healthy for the community as a whole.

And so maybe my mental trick around it is to be involved in multiple spheres or multiple levels so that if something's not moving in one area, not because of the lack of effort, but just because of the nature of the exercise, then there are other things that bring one satisfaction. And i think that as a clinician, one is very, very fortunate, too, because on an individual by individual basis, that act of giving in the sense of giving of your time to somebody is really always reciprocated by that patient through their gratefulness and their and their thankfulness. And I thinkthat these are the sustaining aspects, i think, of the profession and of science.

CHRISTIAN COTÉ:

to take this down that road a little further. You're obviously very passionate, especially about your patients as well as your work and the fact that for you, this work is all about being in the serviceof others. Does that drive and always wanting to improve things? Does it have a downside?

DR. TAUFIK VALIANTE:

yeah, I mean, I think I think I went through a phase in my professional career where. I think I lost that for a time because I got very caught up in other metrics or other sense of value, another sense of reward, which is kind of a sense of value reward that academic and institutions sort of place upon one. In regard to how many papers have you

Published, how many grants have you captured, et cetera, et cetera, and these kind of very objective things when in fact, when a student will askme, you know what science do you like, it's like chocolate ice cream. I justlike the taste of it.

And, and if it changes to something which is external to you, then it feels like a terrible pressure because it doesn't feel like it's originating from inside of you. At least that's for me personally. So, I struggled a lot in my professional career. I went through a significant period of time where I was, you know, pretty unhappy overall. But and I think you need critical events. And that's where I where I joke about, you know, in adversity is opportunity. Because in adversity, then you're ask yourself once again, am I applying the principles that have brought me that always brought me to this point. And I think that when that happened and i kind of got back to sort of understanding, then I, I reached out to the community instead of saying, oh, well, all I have to do is sit and write papers. I was like, well, howis the community doing? So, I started reaching out to the community. I started getting very involved.

I got on the various boards of the various community organizations. We started to think about how do we create standardized care through the province? And that became an enriching and rewarding experience for me. And I tell the residents this, that amongst many of my professional, what I would say, the things that brought me the greatest value has been my community involvement, which coming into an academic role, I would have never thought of that as being the sustaining aspect of my profession when things were difficult.

CHRISTIAN COTÉ:

so Taufik this period, would you call it a burnout ordepression?

DR. TAUFIK VALIANTE:

Yeah, I think it was definitely a combination of both. I think it was the combination of having a set of expectations which were unmet and, and not knowing how to meet those. And also, a sort of a sense of fatigue that I didn't feel like i was up to the task because whatever I was trying didn't seem like it was going anywhere. So, you have this kind ofsense of hopelessness and hopelessness is a very big component of depression where you feel no matter what I do, I'm going to be stuck in thisstate. And so, I think it was definitely a combination of the two that sort of brought me to a point where it was really that, that adverse state, which I would describe as having components of both of those for sure.

CHRISTIAN COTÉ:

I'm sorry to hear that. So today, because this may be instructive to others. How do you take care of yourself? How do you guardagainst that?

DR. TAUFIK VALIANTE:

I remember when I was in the thick of it, a good friend of mine asked me, so what do you need to do right now? What's the most important thing you need to do? And I said, I want to be connected to people. And, and it sounds so I don't know, maybe cliche or I don't know howto do it, how it sounds or how it sounds to the individual listening, but these pursuits in general, academic and whatever, can be isolating, and particularly in the medical profession where if you're struggling, you never want to show a sense of weakness. Right. Or I can't handle this. And particularly as a surgeon, you know, you'd never, never sort of say, oh, I need help for something. I mean, god forbid. Right. And so it really was this almost just this just switch in my brain, which was like instead of trying todo everything on my own, was this new realization, first and foremost, that everybody struggles, that everybody struggles with something and that it's ok to, to talk, it's ok to reach out. It's ok to connect on a level where you can, you know, talk about how you're feeling and what you're struggling with.

And the way that translates to this time for me is unlike the old me, whichwas largely grown up in a very military type of training, which is, you know, neurosurgery and the sort of whole surgical, especially in of itself,is that, you know, when I see people struggling in the lab or even when they're not struggling, for me, the most interest that I have is in the well-being of that individual. Because the assumption is that I've chosen this individual to be in the lab because it's based on merit, that they've demonstrated ability, et cetera, et cetera.

Probably the thing that's impeding them is probably some extraneous factor, some life factor, something that's happening. Covid is an incredibleexample of just showing how life can be turned upside down. And how do you adapt this to your young person? You're here alone. You're an international student. You have no family here. And so in the past, I'd be like, well, the person is not working hard enough. I mean, that's what I understand. I mean, as a surgical resident, you just work harder and harder and harder.

And I think for me, what's it created is that is creating a community for me.So, you know, it's not only the people, but it's my, my lab is my community in a way. And, you know, my colleagues are a community. So that's kind of one of the most important things was that you can reach out and talk to people. You can share these things because everybody struggles. Everybody's human. These are natural parts of life. There's, there's nothing wrong with them. And I think the other important thing that I learned, which is that I think very high functioning people, not

Necessarily that I put myself in that category, but others who are veryhigh functioning, you know, have a way of beating themselves up.

So, you know, the reason why they got there was because it's a litany of stuff going in your brain. Like, I should have done this, I could have done that better. Why didn't I put this in? Why? And it's this idea of, you know, this buddhist philosophy about, you know, gentle, loving kindness, where you kind of accept yourself for what you are, you accept, you know, thingsyou might have not done. Right. It doesn't mean that distracts you from actually applying yourself.

But, you know, you just take it easy on yourself. Right. So, so be kind to yourself. And I think that that's something which I think is so critically important. And I think what that teaches you to do then is that you then ifyou can be kind to yourself, you can be kind to others. You, you understand that you yourself went through a difficult time. You yourself are human and that you need to afford that to the people around you. And I think that for me was a difficult lesson to learn just because of how hard life was when I was not feeling that well. But it's been one of the strangest one of the best lessons I've learned in life, so.

CHRISTIAN COTÉ:

It's an amazing story. And i wonder if, you know, health care workers in general struggle with self care and getting to that pointwhere you are is so important.

DR. TAUFIK VALIANTE:

I think so, I think that, you know, I'm very active now, increasingly active in wellness in our division, I work with an individual in general, internal medicine, tariq abdelhaleem. I'm working with him to hopefully sort of combine sort of the surgeon medical side sort of to show that it's just one profession. It's really not medical surgical. And I think when you start to talk to people about these things, you just realizejust how much people struggle with. Yeah, I mean, I think it's, it's just it's, it's kind of weird that a profession or something you profess to be can actually prevent you from kind of being well, yourself. And I think that the one thing which I learned is that insight is not a function of intellect.Right.

CHRISTIAN COTÉ:

It's hard work.

DR. TAUFIK VALIANTE:

Yeah.

CHRISTIAN COTÉ:
You got to work at it. Well, thank you for sharing that. Iappreciate it.

DR. TAUFIK VALIANTE:

My pleasure.

CHRISTIAN COTÉ:

Wrapping up here.

DR. TAUFIK VALIANTE:

Yeah.

CHRISTIAN COTÉ:

It sounds like you spend every waking moment consumedwith your work. Why does this matter to you so much?

DR. TAUFIK VALIANTE:

I think it's a value it's a value that I grew up with, it's, it's this weird, emotional or healthy, I hopefully healthy emotional attachment to creating change. And so, I think that that's the thing that gets me most, most excited. I think I've been very fortunate to see some of the effects of things that I do be it at a small scale level, with the individual patient at the community level. And I think the feeling I love the most is when I'm in clinic and I can say I can't do this for you, but I thinkwe can might be able to do this for you in the future. And I just love that feel. I feel obligated. I feel responsible. You know, I feel purposeful in thatway. I feel committed. I mean, I say almost a pact between me and the patient right, it's like, ok, I'm really going to try to do this.

And, and I think also, too, is I mean, I've talked a bit academically about it, but it's just I love it. I just I love, you know, every facet of, of intellectual pursuit and knowledge generation and, and the puzzle of the brain. I thinkit's I can't get enough about reading about it or trying to figure it out. And I'm very lucky that I have a lot of great collaborators who I get to bounceideas off of from psychology to engineering to material science to, to you name it. So I feel like a bit of a kid in a way, like, you know, it's like I can kindof explore things i want that the idea comes like, hey, let's try this out. It'sso so it's almost kind of like this regression in a way of, you know, kind of having your ice cream all the time i guess in a way.

CHRISTIAN COTÉ:

Dr. Taufik Valiante award winning neurosurgeon and scientist at UHN's Krembil research institute. Thanks for sharing with usand continued success.

DR. TAUFIK VALIANTE:

Thanks so much. Thanks for having me.

CHRISTIAN COTÉ:
Dr. Valiante's research is made possible in part thanks togenerous donor support. If you'd like to contribute to this groundbreaking medical research, please go to www.tgwhf, that's tgwhf.ca forward slash podcast.

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I'm your host, Christian Coté. Thanks for listening.