

Speaker 1:

Welcome to Optimal Neuro Spine Podcast. A podcast about optimizing our brain and spine in health and disease. Each episode, leading neuroscientists, neurosurgeons, educators, patients, spine care, and quality improvement experts discuss their research, experience, emerging science, surgical advances, and insights about how to optimize neurological and spine care. Now, here's your host, Dr. Max Boakye.

Dr. Max Boakye :

Welcome to the Optimal Neuro Spine Podcast. Today, I have my distinguished guest, Dr. Zoher Ghogawala, Zo as we like to call him. We are going to talk about his exciting research, developing the evidence basis for spine surgery, perhaps the most knowledgeable person in the area of spine surgery regarding clinical trial design and some of the most critical randomized clinical trials to date as well as knowledge of the spine registries.

Dr. Max Boakye :

Dr. Ghogawala is currently the chairman of neurosurgery at Lahey Hospital & Medical Center in Burlington, Massachusetts, as well as a professor of neurosurgery at Tufts University School of Medicine. He has served in enough American Spine Society Board of Directors for 10 years, where he's served also on the research council chair and also health policy chair. In addition to serving as secretary and more recently as the second vice president. He also has recently served as chair of the American Association of Neurological Surgeons, Congress of Neurological Surgeons joint section on disorders of the spine and peripheral nerves.

Dr. Max Boakye :

Dr. Ghogawala leads multiple non-industry funded peer reviewed clinical trials that aim to understand the effectiveness of spinal procedures. He served as national principal investigator for the PCORI sponsored cervical spondylotic myelopathy surgery study, which compared ventral versus dorsal surgical approaches, the results of which was just published in the Journal of American Medical Association. He also served as a national principal investigator under recently completed slip study, which we're going to talk to him about. A randomized controlled trial published in the New England Journal of Medicine that compared lumbar laminectomy alone to lumbar laminectomy plus instrumented pericostal fusion for treating grade one lumbar spondylolisthesis. We're going to talk to him about these clinical trials that he designed and led and other aspects of spine surgery. Dr. Ghogawala, thank you very much for joining us today. Welcome.

Dr. Zoher Ghogawala:

Thanks so much, Max. It's a pleasure to be with you.

Dr. Max Boakye :

Awesome. First, I want to start with your clinical practice. What is your clinical practice like?

Dr. Zoher Ghogawala:

So I have a practice that involves degenerative spine, both cervical and lumbar spine disorders. I also treat some cervical deformity patients and I also do some work in transsphenoidal surgery or pituitary tumor and carotid endarterectomy.

Dr. Max Boakye :

Awesome. So you're doing some cranial neurosurgery and some spine. What is the ratio? What percentage would say spine and what percentage is cranial?

Dr. Zoher Ghogawala:

About 80% of my practice is spine surgery.

Dr. Max Boakye :

I see. What is your research on currently?

Dr. Zoher Ghogawala:

I focus on comparative effectiveness research as well as on clinical trial design. My goals in doing clinical research have been to try to help, for patients and doctors, understand the complications associated with treatments for spinal disorders, as well as the patient reported outcomes of treatment for spinal disorders.

Dr. Max Boakye :

Let's talk about two clinical trials, which you led, which have been very much discussed in the literature. First was a research and clinical trial on spondylolisthesis. Let's start with spondylolisthesis and then we'll talk about a cervical spondylotic myelopathy. What was the major findings of your study on spondylolisthesis? The take home message and how has it influenced your clinical practice?

Dr. Zoher Ghogawala:

The slip study was a multi-center study randomized control trial that was designed to compare patients with degenerative grade one spondylolisthesis. Being treated with either decompression alone or decompression and an instrumented pedicle screw fixation. The major findings of the trial were that patients treated with decompression along with an instrumented fixation had superior health reported outcomes that two, three, and four years after randomization, that after surgery was performed, compared to patients treated with decompression alone. I think there were two really important takeaway messages from this. One was that both patients treated with decompression alone and patients treated with decompression and fusion did well. Both groups of patients had significantly improved functional outcome after surgery.

Dr. Zoher Ghogawala:

However, 30% a little over 30% of patients treated with decompression alone had a failure of that operation within the four year study time period, where they needed a fusion performed at the level that they had the decompression, at the level of spondylolisthesis.

Dr. Zoher Ghogawala:

So this told me that while both operations are quite satisfactory for treating patients with grade one degenerative spondylolisthesis with stenosis, the decompression alone option has a failure rate of at least 30%. The challenge for us as clinicians is to try to see if we can determine which patients are likely to become destabilized after a decompression alone. The reason why I say this is that the patients treated with instrumented pericostal screw fixation infusion did well, but those results were very similar to the patients who were treated with decompression alone, who had durable results from that

operation and didn't develop instability. The patients as population who were treated with decompression alone did worse than those patients treated with fusion because such a large number of developed delayed instability.

Dr. Zoher Ghogawala:

So one of the big take home messages that I have gleaned from this research is that not all patients with a grade one spondylolisthesis necessarily need to be treated with a fusion. As we both know the Europeans, as well as many surgeons across the world, treat these patients with a decompression alone. However, we need to be able to sort out and classify patients in the office up front on whether they're likely to develop delayed instability or not. If they are, they should be treated with a fusion. If they're not, I think that a decompression alone is a viable treatment option for these patients.

Dr. Max Boakye :

I imagine the focus of your research would help us understand how to select these patients.

Dr. Zoher Ghogawala:

Yes. We now have a subsequent trial called slip two, which has been registered with clinical trials.gov and is funded, which aims to take a look at all patients. So a registry type format, all patients with grade one spondylolisthesis that are being treated in 15 major American medical centers. The idea is to have an expert panel review each case. What we're trying to learn is that if there are patients where 80% of experts say this patient should be treated with a decompression and a fusion and in a similar way, if there are patients where 80% or more of experts look at the case and say, this patient should be treated with a decompression, what patterns are these groups of experts seeing?

Dr. Zoher Ghogawala:

We've formed a collaborative relationship with some machine learning experts to look at the data that the surgeons have been looking at when they review these cases to see if we can better understand these patterns. Doesn't necessarily prove that the patterns that they're recognizing are correct, but we believe at least that as a first step, it gives us a greater insight into understanding which patients may be stable and which patients may be likely to develop delayed instability.

Dr. Max Boakye :

That's great. Now let's turn our attention to cervical spondylotic myelopathy. Can you describe the trial there that you did and what are the major findings and the take home message and how has it influenced your practice?

Dr. Zoher Ghogawala:

Sure. So the cervical spondylotic myelopathy surgical trial was an effort again, randomized controlled trial to compare ventral versus dorsal surgery for cervical myelopathy. As you know, this is a debate that goes on and has been a major source of discussion. National meetings for the last 50 years. People who are big proponents of anterior surgery will get up and argue their points, cite their studies, largely retrospective studies or small case series to support their point of view. People who want to do posterior surgery will get up and use papers from those literature to support that point of view. We haven't had a randomized controlled trial on this issue. So we designed the randomized study to

compare anterior and posterior surgery. We also recognized that the rest of the world practices a little bit differently from North America.

Dr. Zoher Ghogawala:

Whereas we're always debating anterior fusion versus posterior fusion. The Europeans and the Asian surgeons have largely moved to performing a laminoplasty for many patients with cervical myelopathy. We recognize that in the United States, at least, we don't really have equi poise for randomizing patients to laminoplasty versus posterior cervical fusion or anterior cervical fusion. We thought we'll do a randomized study with a waiting, such that there would be a two to three waiting so that we would have more patients in the posterior arm to allow us to compare laminoplasty versus laminectomy infusion, as well as laminoplasty versus anterior cervical fusion, even though those patients were not being randomized.

Dr. Zoher Ghogawala:

We completed the randomized study after accruing 163 randomized patients over a four year period. We concluded that patients treated with vitriol versus dorsal surgery had very comparable outcomes using a patient reported physical component summary, physical functioning score. However, we observed that the patients who were treated and selected for laminoplasty in the dorsal cohort of the trial had superior outcomes, superior health related quality of life outcome at two, three, and four years after surgery.

Dr. Zoher Ghogawala:

In addition, these patients treated with laminoplasty had a substantially lower complication rate. Had less health resource utilization and had a faster time to return to work. So in terms of how this affects my practice, myself, as well as many of the surgeons involved in this trial, have been impressed with the results of laminoplasty. I am more likely to offer laminoplasty to patients that I believe are candidates for laminoplasty.

Dr. Zoher Ghogawala:

One of the things that you mentioned at the outset was that I spend a lot of time and energy thinking about the trial design before we get underway. So one of the thoughts that I had here was that, if you've got a patient with a segmental kyphotic deformity, an SVA of say six centimeters and so forth, this is not a randomized patient. There are patients with gross cervical deformity or substantial cervical kyphosis that need an anterior approach to reestablish their spinal alignment.

Dr. Zoher Ghogawala:

So we designed this trial with an ecocorious type population where patients were truly ethically randomized to an anterior posterior approach at the outset. I think it is those patients that are suitable for laminoplasty. They're non kyphotic, they don't have a substantial structural OPLL the so-called hill type OPLL deformity. They've not had previous cervical spine surgery and they have a normal SBA.

Dr. Max Boakye :

So let me ask you. I have a patient he's 70 years old. He's on my or schedule for tomorrow, actually. He's got cervical stenosis, C three to six central and bilateral from no stenosis at those levels. He's got good

cervical lordosis. Do you think he would be a candidate for laminoplasty and how would you address the bilateral from no stenosis if you did that?

Dr. Zoher Ghogawala:

Great question. So I believe that these types of patients are good candidates for laminoplasty, but one needs to be aware that when doing a laminoplasty on these patients, one needs to do frame anatomies in addition. I think that for some who are initially starting to do laminoplasty they're not as comfortable doing the frame anatomies. In addition, particularly on the hinge side for fear that they may compromise too much of the hinge section of the bone. It's very feasible to do a frame anatomies one knows, exactly where the neuroforamen is and I think it should be part of the operation when there is foraminal stenosis, particularly when there's C4 C5 foraminal stenosis, even if it's asymptomatic.

Dr. Max Boakye :

Thanks for talking to you because I had been debating, I went back and forth. Laminoplasty or you know, and initially.

Dr. Zoher Ghogawala:

Absolutely.

Dr. Max Boakye :

Yeah. I booked it for laminoplasty and then a couple of days later, I said, no laminectomy fusion, because I needed to treat it for no stenosis. Thanks for talking to me. I think I will probably go back to laminoplasty.

Dr. Zoher Ghogawala:

Terrific.

Dr. Max Boakye :

Let me talk about, you've kind of touched a little bit on your work in clinical trials, but maybe a little bit greater detail on your work, on the equi poise in clinical trials and your work in improving clinical trial design. Which is relevant to spine, but also relevant to other surgical clinical trials.

Dr. Zoher Ghogawala:

Yeah, delighted. So one of the things that I think has been a real problem in a spinal surgery and in many of the surgical subspecialties has been the inability to get randomized control trials done. Part of it is a bias that we as surgeons have that we need to have a definitive answer for patients and our acknowledgement that we may not have the definitive answer for patients is going to lead to patients going someplace else to get their treatment.

Dr. Zoher Ghogawala:

In many ways, part of our DNA is to be definitively correct, or to assume we're definitively correct about something. So there's a surgeon bias that's inherent. I think. Also, I think surgery is irreversible. So when you talk about doing randomized control trials, it's not like randomizing a patient to medicine A versus medicine B. and if there's some issue with medicine B, they can cross over and they can get, medicine A for example. In surgery, once you've had the operation done, you cannot cross over.

Dr. Zoher Ghogawala:

The other thing that we've seen in the sport trials for example, is that before surgery, if we're trying to compare surgery to non-operative care, there is crossover because sometimes if you're randomized to a non-operative care and you have severe symptoms and both you and your physician know that there's a surgical option, you're likely to cross over to get that surgical option. If you feel like you're making progress with the realm. So it makes it very hard to analyze the data as you well know.

Dr. Zoher Ghogawala:

So my thought here was, we as surgeons can work to identify and establish population of patients for which there is equipoise. I think that for surgeons, as well as for patients, we need proof that there's equipoise. So the way that we've structured this is to say, okay, if you're going to enroll in this clinical trial, no matter which site you're at in this clinical trial, you're going to have your case uploaded and reviewed by the panel. Which includes surgeons, who are involved in the randomization of patients in the trial, as well as contact experts who are outside the trial.

Dr. Zoher Ghogawala:

If you, as a physician, see that, say in the case of the cervical myelopathy trial, we sent each case out to 15 investigators. If you saw that nine surgeons said that they would do an anterior operation and six surgeons said that they would do a posterior operation, we call that realtime equipoise. You've got people who are committing their opinion, but you see that across the country, there was a mix of opinions.

Dr. Zoher Ghogawala:

Patients were very impressed by this. I saw this in the early days of the slip trial, where we were talking about randomization to pinnacle screw fixation fusion versus a decompression alone. You can go home in one or two days at that time in the trial, now it's outpatient or you could be in the hospital for two or three days with a longer time of recovery.

Dr. Zoher Ghogawala:

So patients very impressed by this, and we've seen patient consent to randomization change from a 20% rate of acceptance of randomization to a 60 to 70% acceptance of randomization. Making it much more likely that the trials that we do, if we use this type of process, are actually generalizable because we're talking now about 60 to 70% of a study population, as opposed to 10 to 20% percent of a study population.

Dr. Zoher Ghogawala:

So that's been, I think, very helpful tool for us. It's also been very interesting because patients outside of trials now are interested in getting these kind of expert panel reviews to confirm what their surgeon is recommending to them, are also representing the opinions of multiple other doctors, or to understand why there might be such a difference of opinion amongst surgeons and what the rationale for those differences might be. I found it to be a very useful clinical tool, but most importantly, to establish that population of clinical equipoise.

Dr. Zoher Ghogawala:

One other point that has been important from my perspective is involving non-traditional stakeholders in the study design. One of the things that we did is we went to the PCORI for the cervical spondylotic myelopathy trial and in our approach, we involved patients in the study design. At first glance one might look at this and say, how does that make sense? We're struggling ourselves in our field to design good studies and good trials. How are patients going to be able to contribute to this? What the patients have done for us is established very clearly what the priorities are from their perspective. One of the things that we heard loud and clear when we did this with patients and we went to Washington, DC, sat down with NIH experts and PCORI experts and let people say their stories.

Dr. Zoher Ghogawala:

Okay. One of the things that we heard was that surgeons don't pay attention to swallowing difficulty. They either say that's expected, it's going to get better and they rarely even record it in their clinical documentation. What patients told us was that when we have an operation on our neck and we can't swallow properly, and it's true, we don't need a G tube or a liquid diet or anything, which is what the surgeon needs to be concerned about be a complication, but when we can't enjoy our food the same way, because we had our operation done to fix our spinal cord, that bothers us. We would like to see doctors appreciate and recognize that's a complication. So we took that to heart. We said, okay, we are not going to rely on surgeons to document dysphasia. We're going to have this independently verified.

Dr. Zoher Ghogawala:

We use that methodology for all of our complications to say, we should do that. We should have an independent type of person assessing complications of the study. The other thing that we heard about was, and patients didn't describe it as we would as C5 paresis. But patients talked about other patients who've had cervical spine surgery who couldn't use their arm for few months and were also told, oh, that's not a complication. Your nerve works just fine. Your nerve is just stunned. It's going to be okay. What we heard from them was, I couldn't shave for three months. I couldn't drive a car for several months. I couldn't go back to work and with physical therapy and so forth, things got better, but they felt like this has not become part of our assessment of these operations. We found that complications' assessment and the types of complications that were really important to patients an area where we really wanted to focus as we designed the trial.

Dr. Max Boakye :

That is fascinating and really awesome. Going back to the panels, is this something that is only available in the research setting or for now if a patient wants to access a panel to see what let's say, 15 surgeons think of their case or their imaging, or let's say even not a patient, let's say a surgeon wants to query the panel for their opinion on a case. For example, the case I just described to you.

Dr. Zoher Ghogawala:

Yeah.

Dr. Max Boakye :

How available is this sort of thing? Is it even available now? Or

Dr. Zoher Ghogawala:

One of the things that we did as a result of this cervical myelopathy trial was we heard from patients that they're interested in this independent of a research study. So we have made it, I would say in its early phases, we have made it available. We call it a nidus review, but we've done is we've made it commercially available for patients and their treating doctors. If they want to get their case reviewed by 15 experts, there's a mechanism by which that can be done. Essentially one is just going to this web platform, which is designed, analogous to how we did the research study. It's called www.nidusai.com and patients, and their doctors, can go to that site. It's very easy to get the images uploaded and then sent for review.

Dr. Max Boakye :

So both that patient and doctor can do that?

Dr. Zoher Ghogawala:

Correct.

Dr. Max Boakye :

Oh, that's fascinating. So we will put that link on the study notes as well. That's really a terrific service you're providing there. Let me ask you about registries. Actually no, let me ask you about PCORI, because you mentioned that. As you know, many attempts to obtain PCORI funding for trials, for surgery, to see if surgery is effective for degenerative disease and back pain have hit roadblocks. I don't know if they've funded one recently, if they haven't, what do you think can be done?

Dr. Zoher Ghogawala:

Yeah, I think this is an area where we, as the spine community, both operative surgeons and non-operative surgeons need to become closer to PCORI Organization and work with them as societies to help them understand what the critical questions are that we need answers to in spine surgery. I think one of the roadblocks is that there's not a clear understanding of the types of clinical dilemmas that we face and our patients face in the office. I think getting that to these types of individuals is really, really important.

Dr. Zoher Ghogawala:

The second piece, I think, is we as surgeons that I mentioned it briefly with the cervical myelopathy trial involving the patients in the process need to feel more comfortable doing this in the future. There's so many things that we, as surgeons can learn from what we're hearing from patients. For example, with the PCORI, I was very interested in doing some cost effectiveness type of work, knowing for example, that laminoplasty is a very low cost option for treating cervical spine disease.

Dr. Zoher Ghogawala:

When we sat down with patients, it's not that patients don't care about cost. They do, but by in large, these operations are covered by insurance. What we heard from patients is that things like outpatient, physical therapy are time consuming, have substantial copays that are not trivial for a lot of patients and required time off of work. As we looked at it that way and had patient input and PCORI saw that patient input, they felt that, well, we don't want you to do a cost effectiveness analysis because we don't want this type of research to be used to potentially limit access to patient care. We do think since patients say

that the amount of money that I spend on copays is important, or the amount of time that I take to do some of these treatments that doctors are recommending is relevant to them.

Dr. Zoher Ghogawala:

We want you to be able to measure that health resource utilization as part of the PCORI funded study. So that's what we did. We altered our approach to be very relevant to patients as well as to ourselves. Ultimately looking at health resource utilization is more universal in many ways, because then we don't have to be tied down to, what's the reimbursement for a cat scan or an MRI in such and such year in such and such country, which changes from region to region. We can look at this as we're reporting the results of trials that this type of work is relevant wherever you are in the world, because increased health resource utilization prescribed by your surgeon is likely to happen no matter where you are. Therefore, I think has just more meaning to multiple stakeholders.

Dr. Max Boakye :

I should mention PCORI to my audience. PCORI stands for Patient Centered Outcomes Research Institute, and is the primary funding agency for comparative effectiveness research in the United States. You've worked a lot with the N2QOD and it's now shut down and it's now the American Spine Registry. What are some of the most important things and knowledge that we accrued from the N2QOD. It's kind of registries, are sort of like the alternative to randomize clinical trials, in generating the evidence basis for practice?

Dr. Zoher Ghogawala:

Yeah, I think also another great, great question. I think that we've learned three things from the N2QOD or the QOD efforts and the realm of the American Spine Registry. One, I think we've learned that real world practice demonstrates that spinal surgery is effective and it's not any randomized controlled trial to say that real world surgery versus real world non-operative care shows that surgery's better. But we have substantial evidence with thousands of patients to show that when patients are prescribed surgery in this country, they have an objective measurable improvement in their health related quality of life. I think that's probably number one.

Dr. Zoher Ghogawala:

Number two is we've been able to show that patients and doctors can work together to get patient reported outcomes completed in a reliable way. Multiple centers across the country have just changed their practice to incorporate patient reported outcome assessment as part of their practice workflow. That's been really important.

Dr. Zoher Ghogawala:

,Third, I think we've been able to understand that while surgery is very effective for treating patients with degenerative spinal disorders, we also have learned that there is a relatively small but measurable population of patients that just don't benefit from spinal intervention. I think an area that needs to be really explored further is to determine what are those factors really and truly. I don't think registries are very good at identifying those factors because we collect some demographic details, but we don't collect the imaging data as part of the American spine registry. We don't collect real information about mental health burden from these registries.

Dr. Zoher Ghogawala:

These are the types of things that we've got to, I think, dive in and explore. If we learn, for example, that there's a certain type of mental health profile that just doesn't do well with certain types of spinal interventions. Then perhaps we can do things for these patients to get them more optimized for surgery. In a similar way are there certain types of radiographic imaging findings that are just unlikely to benefit from surgical intervention? We can learn more about these things.

Dr. Zoher Ghogawala:

That's for the future. Right now I think our registries don't allow us to do that, but they do allow us to say, I think, or identify that there's about 10 or 15% of the patients that we treat today that probably don't benefit as much from surgery as we would like to think that they could.

Dr. Max Boakye :

As you know, there are significant geographic variations in spine surgery. So the 15% that did not do well, that varies across the country, right? What are some of the solutions to this problem?

Dr. Zoher Ghogawala:

So that's a big question. The variations in spine care may represent also some variations in our population. The US population, for example, has a lot of differences in different parts of the world. One of the things that I've heard people say is that, well the Europeans are finding that there's no difference between fusion and decompression when patients have spinal stenosis and spinal esthesis. If you look at the BMI numbers from the European trials, their BMI is like 25. That's not America. There are many parts of America where that BMI is much higher.

Dr. Zoher Ghogawala:

So we've got to understand and recognize the patient populations that we treat that may drive some of the clinical variation that we see in US practice. There are, however, I think many examples of areas where there's just more utilization of fusion amongst a particular part of the surgical practice in a particular region of the country.

Dr. Zoher Ghogawala:

Some of that may be appropriate, but some of that may not be appropriate. Having outcomes that we can share across different regions will allow, I think, surgeons who are operating in say a different way to see that there are other ways of treating the patient population that can be as effective. I genuinely believe that most American spine surgeons approach their patients with the desire to do the best thing that they possibly can for their patients. Accumulating this data from registries may help people change their practice and change their minds about what represents best practice for patients with spinal disorders.

Dr. Max Boakye :

So you mentioned that one of the benefits of the QOD was to show that perhaps most of the time spine surgery is effective in a significant percent of cases for a clinical practice or for your own practice, and maybe this advice for other practices. What are some of the best things that you have done to improve your spine surgery outcomes? What can other practices or institutions do to improve the spine surgery outcomes?

Dr. Zoher Ghogawala:

So I think one of the things that's so important, we have a registry here at Layhe. We look at the outcomes of all of our spinal fusion patients. I think that one of the bars that I've tried to establish for people is that, I think we all recognize that not every single patient of ours is going to have a home run outcome. There's just so many factors that come into play. If we, as surgeons, can look at our practice and say that 80% of the patients that we treat are achieving the minimal clinically important difference in validated patient outcomes, we're probably doing a pretty good job. So I've tried to help establish that as a benchmark for us as a group of surgeons. It allows for each and every one of us to perform our own quality improvement assessment to ask ourselves, are we meeting that standard? By having the data available in a transparent way, we can see how our patients are doing and not rely on our memory to assess whether our patients have done well or not.

Dr. Max Boakye :

In our remaining minutes, I got a couple of quick questions for you. One is what do you know now that you wish you knew 10 or 15 years ago? The second question is my magic wand question, which I ask every guest, if you had a magic wand, what question or questions would you try to answer that would have the greatest impact in spine?

Dr. Zoher Ghogawala:

So great questions. I think that for me, I don't think that I appreciated as early in my practice, as I would like to realized that the way that you have trained in neurosurgery represents one way of practicing in neurosurgery and that you're likely to get out into practice and see that other parts of the country practice differently.

Dr. Zoher Ghogawala:

I guess what I would like to have seen is see more approaches to spinal surgery early in my career, during residency, for example, have the opportunity to travel to different sites and see highly trained surgeons approaching the same types of disease processes, but in different ways. I think for example, if I had had the opportunity to travel to Europe, or if I had the opportunity to see Dan Rue practice, who's an internationally respected spine surgeon in a great proponent of LA rhinoplasty.

Dr. Zoher Ghogawala:

I might have observed that earlier in my practice, for example. Then the magic wand question, I think that the biggest area that needs to be understood is what is the genetic basis for the development of degenerative disease in the spine? What is the science and technology for changing that genetic environment for the benefit of patients? There's obviously there's a lot of work being done in stem cell work and understanding the environmental biology of the disc space and so forth. I think from a magic wand perspective, if we made substantial progress in that arena, it would change and transform the way that we treat patients with spinal disorders.

Dr. Max Boakye :

Wow, that is really awesome and fascinating. This brings us to the end of our interview. We're going to put a link to the case review for patients who want to get an opinion from the surgeon panel. This has been a really excellent and wonderful conversation with Dr. Zoher Ghogawala, who is chairman of neurosurgery at Lehe Hospital, and professor of neurosurgery at Tufts, and also current vice president of

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the North American Spine Society. Dr. Ghogawala, its been a pleasure speaking with you. Look forward to bringing you back at a future date to talk about some other aspects, really appreciate taking the time to speak with us today.

Dr. Zoher Ghogawala:

Thank you so much. I really, really enjoyed it and grateful for the opportunity. So thank you.

Dr. Max Boakye :

Thanks.

Speaker 1:

Thanks for listening to optimal neuro spine podcast with Dr. Max Boche. If you enjoyed this episode, we hope you share it with others. Leave us positive reviews on social media or leave a rating and review on iTunes. Check out our website, maxwellboakye.com/podcasts for show transcripts and other information. Join us next time for another edition of optimal neuro spine show.