Melanie Cole: Welcome to this podcast series from the Experts at Penn Medicine. I'm Melanie Cole and today we're talking about spinal deformities and treatment options at Penn Medicine. Joining me in this panel are Dr. Ali Ozturk. He's an Assistant Professor of Neurosurgery at the Pennsylvania Hospital and Dr. Vincent Arlet. He serves as Chief of Adult Spinal Deformity Surgery within the Department of Orthopedic Surgery at Penn Medicine and he's Co-Director of the Spine Surgery Fellowship at the Hospital of the University of Pennsylvania. Gentlemen, I'm so glad to have you join us today, Dr. Ozturk. I'd like to start with you. Please help us understand the spectrum of spinal deformity that you see in practice at Penn Medicine?

Dr. Ozturk: Most commonly we can divide spinal deformities that we see in adults into two groups, one of which is scoliosis. That's an abnormal curve of the spine. Many of these are asymptomatic and they don't necessarily require an intervention. However, if they progress, it can be very painful. In addition, the pain can radiate to the legs if nerves are compromised or manifest as severe back pain.

The second major category is a sort of a kyphotic deformity where patients start leaning forward. This can be just due to aging, but most commonly we see that deformity following surgery.

Dr. Arlet: Yes. And I would like to add as well, we see a fair number of patients who had previous surgeries and after some years the degenerative process adds on the developing deformity above their previous surgery So it's not uncommon to see a patient who had a previous surgery would develop scoliosis, kyphosis, and or flat back.

Host: Dr. Arlet, do we know what the cause is?

Dr. Arlet: So most commonly, at the scoliosis is associated with the degeneration process of the spine. What happens is you have an asymmetric disc disease that means the disc is going to collapse on one side in an asymmetric fashion, and it's going to induce local Kyphosis and the patient is going to develop significant deformities. So one thing that was minimal initially with this asymmetric disc degeneration can become a bigger problem as the years go by with further degeneration of the spine. So that is one of the accepted mechanism of the adult scoliosis.

Host: Dr. Ozturk. Tell us about some of the recommended imaging studies for patients with spinal deformity and about the advanced diagnostics available at Penn Medicine that you use.

Dr. Ozturk: We like to be very thorough in our workup with these patients. This is when surgical treatment is to be considered, it’s a very complex decision, since many of these patients are old and the surgeries are usually fairly involved, both in terms of the length of the operation and in terms of blood loss. And it's a long recovery. So preoperatively we typically get an MRI of the lumbar spine. Possibly the thoracic as well. We like to have a cat scan of the same areas. This shows us the bone better, in addition, it shows us any of the prior screws or fusion constructs if they are solid or if there's, for example, been a nonunion, we always get what's called standing films with our EOS machine. We have the only one to my knowledge in Pennsylvania at Pennsylvania Hospital. This is a very low dose radiation that takes an X-Ray of the entire body from head to toe. And we can appreciate if patients are compensating for their forward posture, say, by flexing their knees and their hips. So it gives us really a complete assessment of the body and the skeletal alignment.

And lastly, we have a very low threshold to get DEXA scans to appreciate the bone quality. Again, we like to make sure that the bone quality is good, should we use a lot of screws for our correction. And so the screws, like any screw is about as good as the wood we put it into. So that's sort of the last piece of the puzzle. If a patient has a pacemaker or you know, can't get an MRI for good reason

or if they have too much hardware from a prior surgery, sometimes it will get a CT myelogram which can substitute for the MRI and show us the nerves.

Dr. Arlet: Yes, I would like to add that we have had these EOS machine, Dr. Ozturk was talking about for the last four or five years and I think thanks to this machine, we have a much better understanding of the problem the patient has and how to achieve the goal to get a better surgical outcome. I think there's definitely a big advance in the quality of a surgery thanks to this machine. So it's big plus we have at Penn Medicine treating this patient with their spinal deformities.

Host: Dr. Arlet, neuro and ortho? Do they work together right from the get go or is there a point at which there's a handoff? Tell us how that works.

Dr. Arlet: I think it's a case is a really specific just to the symptoms of the patients. But definitely, yeah, we work as a team. We have a combined conference. We have once a week where we discuss our cases. And we have some cases where we want the surgery to go faster to be expedited in a timely manner. And we have both teams, neuro surgical team and orthopedic team work together.

Host: Dr. Ozturk, as we're talking about surgical procedures now, before we do, are there any non operative, nonsurgical help for these issues? And then if you would, please let us know some of the approaches that you might use surgically.

Dr. Ozturk: Our principle and spine is to always start with nonoperative treatment. There are certain red flags of course, for example, a profound weakness, unbearable pain, bowel and bladder symptoms, are things that merit urgent surgery. In the absence of these things our approach would always be to try a course of physical therapy and then subsequently to try pain management. If patients fail conservative therapy is when we would consider surgical options. It's extremely important that we get an accurate assessment of the patient's symptoms. Someone might have a severe scoliosis, but their only problem might be a single nerve root that's being pinched off. That patient might just benefit from a simple decompression. In other cases, the patient needs a complex reconstruction.

This is usually done with multiple levels of pedicle screw instrumentation, the levels of which vary very significantly based on the imaging and the patient's needs and several levels of osteotomies. That's when we remove certain elements of the bone so as to loosen it up. In addition in terms of scoliosis, we don't worry quite as much about correcting the curve necessarily as that at the end of our treatment to have what we call for the spine, spine to be in harmony, meaning the head resting over the patient's pelvis, both in the coronal and sagittal plane. These are priorities and I think. Dr. Arlet would agree, it's very patient-specific based on the surgery they've had before, where the deformity is, the severity and so forth.

Dr. Arlet: Yeah. Then we always start with a conservative treatment. We have our pain management team and all of them help us to treat the patient conservatively. Now when it comes to a surgery, we use the skills of general surgeon to access to the spine and most of the essential surgery nowadays done in minimally invasive fashion. So, I think with the team we have of neurosurgeons access surgeon and orthopedic surgeon, we're very well versed into tackling the most complex spine deformities in the adult population.

Host: So Dr. Arlet, you just brought up second opinions and referral and your expertise. Tell us about the expertise of the specialists at Penn Medicine in the spine center and what would you like other referring physicians to know about referral and the specialists available there?

Dr. Arlet: I mean we have the larger specialists I was talking about and I said, physical medicine, the pain medicine doctors. We have a radiologist who help us read some complex MRI or Milo CT scan when it's difficult. We have our physiotherapists that take care of our patients, so there's no question we have a larger group of specialist who help us to decide by the surgery. Other things we should look into is some of these patients have a severe osteoporosis and they're required to have a treatment of their osteoporosis before we can think of doing the spine surgery. So we mythologist or endocrinologist are there to help us maximize the borne strengths of our patients.

In the same manner, as this surgery are quite invasive, when the medical treatment conservative treatment has failed, we need to optimize and the patient to the surgery. And that's done with what we call prehab. And that means we want the patient to get to the surgery and the best step physiologic state doing exercise, so physiotherapy and maximize his nutrition status, stop his smoking, try to cut down on his opioid medication. All this require a team approach, which is going to maximize the outcome of the surgery. So I think it's very important to work as a team and I think as a surgeon we have to listen to everybody. Yeah. Everybody's input is important when we decide to treat a patient's spinal deformity.

Host: Dr. Ozturk, Would you like to add anything else in the area of technical considerations you'd like to share with other providers?

Dr. Ozturk: The main technical considerations when we think about the spine is that first, how to get to it. As Dr. Arlet mentioned, we can access the spine from an anterior, posterior or lateral approach. There are several considerations when considering which is the best approach. Very frequently in deformity patients it needs to be a combination of an anterior or a lateral and a posterior. Other times we can address it all posteriorly obviously that's the most direct access to the approach. The other thing we need to decide is how much to fuse and if so, how many levels? Sometimes if the patient's principle problems are in the legs, indicating nerve compression, if we can identify that clearly we can offer just a decompression, in which case we don't necessarily put in screws, we're not doing a fusion. The recovery from those operations tend to be a little quicker. And they can be very rewarding. Again, if the principle complaint is chiefly in the legs.

When there starts to be more of a structural issue, meaning the patients sort of lost their posture and the back pain is severe is when we need to consider doing fusions again, in which case we can go from multiple routes to access the spine. Coming from a front approach an anterior approach has the advantages of we're much more able to straighten the spine out. So we do like to do that cause many of these patients tend to be leaning forward and that that leads to quite a bit of back pain. And then lastly, where to stop our fusion, while we try always try to do the least amount possible. We at the same time want every one of our surgeries to be the last one.

In spine, it's very possible to kind of address the patient's issue right at that instant. But the patient might be back six months later. And that's not what we want. We want to reach a point where we don't think the patient's going to have any more surgery. That's our ideal goal. In terms of our outcomes, these are very complex cases. And you know, as Dr. Arlet mentioned, we have an excellent team here. We have to be very calculated in who we offer surgery to. So we do an extensive workup, preoperatively. We discuss as a team which patients we're going to operate on and we make sure that they're in the best shape that they can be before we offer the surgery.

And that following the operation, we have an excellent ICU, with complex surgeries like this, it's extremely important to be done at a hospital on a team that has extensive experience and that's what we're so happy to be able to offer here. This isn't just routine back pain and we're not operating on routine back pain here. This is absolutely life altering. A lot of these patients aren't able to leave the house due to their pain. And so when we get them straightened and their leg and back pain

improved, it can be at three to six month process. But with life expectancy constantly lengthening in this country you know, someone who comes to you at 70, 75 might have 10, 15 years of life expectancy and that's who we try to pick. They are absolutely some of our happiest patients and we're just so happy to restore them to a functional lifestyle for that long.

Host: Dr. Arlet, before we wrap up, what research avenues are you currently exploring to advance treatment for spinal deformity?

Dr. Arlet: I think there's, so we have lots of exciting avenues. Just one is the robotic surgery, which I'm not sure applies yet to complex spinal deformities, but definitely some of the robotic or advanced imaging techniques may help in the future to treat this spine deformity. We've made a good advance in terms of biologic in terms to achieve a fusion. Then the artificial intelligence is going to be probably the next step to really be able to tell us what we have to do when we see a patient. So I think the artificial intelligence is going to be the next step forwards to be able to have a much better understanding of what would present the best outcome, how to get to the best outcome, and have a much better understanding of how to optimize the patient outcome.

Host: Thank you gentlemen so much for joining us and sharing your incredible expertise on this comprehensive and complex topic. Thank you again. That concludes this episode from the Experts at Penn Medicine.

To refer your patient to a specialist at the Penn Medicine Spine Center, please visit our website pennmedicine.org/refer or you can call (877) 937-PENN, for more information and to get connected with one of our providers.