

**MANISH**  
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As we all know, lumbar spinal stenosis is one of the really common problems all of you guys see on a day-to-day basis. And part of the reason for that is, like, changing demographic with increasing aging population. And not surprisingly, lumbar spinal stenosis is one of the most common indications for spine surgery in people who are older than 65 years and the increasing aging population is definitely just leading to more and more of those conditions being seen.

And why do we care? As Nick has already mentioned, it's one of the most common problems we see. And in a way, it's not a problem with us because as you get older, you're bound to see these problems. So I'm yet to see any MRI that is being done on a guy who is like 60 years old which is being read as normal.

I mean, every radiology you read, MRI, has some degeneration. So it's not even a problem. It's more of a-- more of an aging condition. And what happens with aging is you get hypertrophy of your ligaments, bone, and all those things that ultimately lead to narrowing of the channel through which the neuro passes leading to impingement and ultimately resulting in symptoms.

So lumbar stenosis is a really, really broad term. And it could be due to a myriad of conditions like a plain, simple stenosis from hypertrophy of the joints and ligaments, but other than that there are other pathologies like scoliosis, tumor, trauma, and infection. All these conditions can ultimately lead to stenosis. So to note, this is more of a final event that would happen regardless of what the patient has once they become symptomatic. And when we generally talk about lumbar stenosis, I would focus more on the things highlighted in yellow, which is like the central stenosis, foraminal stenosis. And if you look at the symptoms for lumbar stenosis, it could be back pain, neurogenic claudication.

So if you look at the symptoms for stenosis, it could be back pain, neurogenic claudication, radiculopathy, and loss of balance, though not as common as Dr. Gordon mentioned. But some people with long standing stenosis can have some balance issues. But I think it's very important to keep in mind that people whose primary problem is loss of balance or weakness, it probably is not the lumbar spine. So if the patient comes in with the main problem, I can't walk, I'm losing balance, and I am actually weak, I think it makes sense to image more than the lumbar spine.

And as I said, people will definitely find some problem in the lumbar spine and we have all seen patients who underwent surgery for lumbar spine where the problem was either in the cervical spine or thoracic spine. So it's important to pay attention to that weakness, generally speaking, which is fairly significant enough to prevent people from walking. Maybe it is not the lumbar spine. So I think that is important.

And the other thing to keep in mind on exam is the neurogenic claudication. And people say that, well, I do feel much better when I'm, like, bending forward into the typical grocery cart sign, which is not a hundred percent sensitive or specific. It's fairly characteristic and these people say that I can walk a little more when I'm bending forward, but I can't walk when I'm, like, either standing straight up or lying when the spine extends. That leads to more symptoms.

These are some of the signs for we can help diagnose stenosis clinically, short of imaging. And even though most of us get imaging with plain radiographs to start with, and they can actually give us some hint of degeneration in the form of disc collapse, and [INAUDIBLE] sclerosis, hypertrophy, and what not, ultimately it is an MRI or a CT myelogram of an MRI could not be performed that will help diagnose lumbar stenosis.

As you can see on this image there is evidence of spondylolisthesis, which is a slippage of one bone or other, resulting in occlusion of the whole cerebrospinal fluid. At that level it's fairly characteristic of lumbar stenosis. And I would not be surprised if this patient has all the symptoms which I mentioned earlier. And it's generally not difficult to diagnose these problems.

And once the diagnosis is made, management actually depends on the type and severity of the patient's symptoms and, of course, the morbidities is of whatever the treatment is going to be. And it is very important to understand the natural history of this condition. Because if you read the literature in your own clinical practice, the naturalist is known as bad. So somebody, despite their MRI looking terribly bad, if they are doing OK with not really that bad symptoms, it's OK to watch them.

I don't think there is any data which says that if you don't do anything on an origin basis, they're going to get paralyzed or anything like that. Really, it's extremely rare. So if their symptoms are OK, I don't think there is any reason to chase the MRI and keep going ahead and treating them with whatever you would want to.

But once they are symptomatic and the diagnosis is reasonably certain, I think it's OK to try non-operative treatment. I won't go too much into that, as we have great speakers. We're going to talk about them later. But these are various options in terms of non-operative treatment for lumbar stenosis.

And generally speaking, it is, most of the time, the first line treatment for lumbar stenosis in the absence of any deficits or weakness. So if somebody who's neurologically intact, which most of these patients actually are, and the symptoms could be controlled with lifestyle modification or non-operative treatment, I think it's OK to attempt that, at least for six to 12 weeks, depending on how bad the symptoms are.

Having said that, once the symptoms keeps on progressing, and non-operative treatment have failed, and the diagnosis is fairly certain and corroborated mostly by an MRI or a CT myelogram, I think surgery is a reasonable option and is fairly valuable in leading to improvement in symptoms.

And again, if you can see this thing, there are a number of options these days, like, decompression alone-- when we say about decompression, it is just removing the arthritic bone or ligament and freeing of the nerves. Then we can go all the way along the spectrum to doing fusions. And again, there are tons of ways we can do fusions these days. But basically, treatment could be the decompression alone, or a fusion, depending on, again, what the etiology is.

And the primary goal of any surgical intervention in patients with stenosis, is to decompress the neural structures. And as Dr. [INAUDIBLE] mentioned, once you free up the nerves, it is intuitive that it likely was going to get improvement in symptoms. And that generally happens in almost up to the 85%, 90% of the patients, provided the diagnosis is appropriate and the right surgery being performed.

And for some reason, people who are left-brained, they do better than back pain. So even though most of the patients we see are being referred for back pain, generally speaking, it's the leg symptoms. And that's what I try to look for. And I'm sure everybody else would want people-- who have leg pain, they do much better than just with back pain.

And again, depending on what the etiology of the stenosis is, the treatment could be just decompression, or with or without instrumentation. And there are enough studies which are done that are clearly showing the value of surgery in all routine degenerative problems, like stenosis, lumbar disc herniation, and spondylolisthesis, where there is slippage of one bone. Which has shown that surgery is beneficial and the benefits has been shown to be lasting mostly, like, eight to 10 years after surgery.

And again, there was a randomized control trial published last year in [INAUDIBLE] that supported the use of fusion, especially in the subgroup of patients who have slippage of the bone. So even though everybody would want to have lesser surgery, but again less is not always better. If you need something more, then you need it.

So patients who have spondylolisthesis, they might be better off having a fusion. Not always, but in general. You know, if they have certain parameters that do fulfill the requirement of fusion.

So anyway, we all know that the surgery works for this condition, especially the ones mentioned here, stenosis, foraminal stenosis, discectomy, disc herniation, spondylolisthesis. So what's new? And when I say new, it's not that new, but it has become very common, so one of that is the development of minimally invasive options. So in the past, and even now, not a lot of the spine surgeries are being done in an open fashion where we open the bag, and visualize the problem, and do a traditional laminectomy.

But now with the development of these tubular retractors, all these things could be done through really small incisions, just like hardly one centimeter, two centimeters, or so. So we have really moved on from what all can we treat to what we cannot treat with minimal invasion now. So pretty much a number of these conditions now could be treated with minimally invasive techniques.

And open surgery has been shown to demonstrate great value in these patients, but there are some limitations that, because of muscle atrophy and whatnot, with collateral damage there has been-- this is the reason why a lot of minimally invasive techniques are developed in the spine. Just like in any other surgical speciality where, for example, [INAUDIBLE]. We hardly see any open cholecystectomy anymore. It's all done through small, small tubes, and whatnot.

And so why we want to do minimally invasive. Well, as I said, through open surgery there is a lot of muscle disruption. And even though not 100%, and some studies have suggested that because of that there is increased blood loss, infection, little more pain, and all those things could be avoided to a certain extent. Not always with minimally invasive approaches.

And the guiding concept is basically to reduce the collateral damage and the morbidity from open surgery that could be done. Again, it's important to keep in mind that you have to achieve the same clinical objective as open surgeries.

And these are the various ways minimally invasive surgery could be done these days, either through a percutaneous cannula, through endoscopes, and through tubular retractors. In my hands, generally, I use the tool that attracts us most of the time. I don't use endoscope that much, but those are a few of the options. And then, again, you have to understand it's a pathway, it's not a procedure. The goal is still the same.

But what we can do now is, like, these are a couple of the pictures of my patients. On the right side is the lumbar discectomy through a smaller incision. On the left side is a lumbar fusion. So even though we do say that while fusions are big surgeries, massive surgeries, you people should not have them if they're not needed. When you need it, even they could be done now with a smaller incision, as shown on the left picture.

And it's like not even a sutures are needed to close those incisions anymore. And these are a laundry list of benefits of MIAs, but the ones highlighted in yellow are clearly the ones which are supported in a number of studies, especially decreased blood loss, reduced infection, and better cosmesis.

And an infection thing is really big. And I will tell you, I do a lot of these fusions, and never was the patient falling the lumbar fusion through minimally invasive technique. I mean, I don't want to jinx it, but it's extremely uncommon. And part of the reason is because there is not a lot of muscle exposure in that tissue.

But once you cross more than one level, then again, I think the different kind of dwindle, but for something up to one level, this thing is clearly beneficial. And again, before we do all these new approaches, it has to be clearly shown that they are as good as open. And there are enough data we suppose that these surgeries are equal, or the same, or superior to the delusion of symptoms. And it does happen, reduction of perioperative tissue, trauma, stress, and disturbance of biomechanics.

The last point, I don't think there is a big difference in the need for subsequent surgeries. I think both open and minimally invasive approaches are fairly effective and do the job reasonably well. It's just that the perioperative morbidity may be a little less with minimally invasive surgery.

But if you fall off this patient like two, three months, six months, one year down the line, I think the outcomes are great, regardless of what you do. So it really doesn't matter. I think it's a personal preference of what you want to do.

I'm just going to run through a few of the simple conditions which you guys see all the time and how we can treat them through minimally invasive techniques. These are like a classical lumbar discectomy, which is for somebody will present with leg pain.

A lot of people will offer surgery right away, especially if there is weakness, but if there is no weakness and if the conservative treatment has failed, I think somebody like this would easily be amenable to treatment with a minimally invasive technique. Where what you do is drop in smaller tubular dilators, bring it in the microscope, visualize the problem, and remove the herniated fragment.

And the patient leave the hospital with that tiny incision the same day of surgery. So why you want to do this thing? Again, minimal blood loss, outpatient, faster recovery, and patient can return to work as soon as a week after surgery, after this technique.

I think even open discectomy is pretty much as good as a minimally invasive discectomy. And part of the reason is that it's such a gratifying operation. No matter how you do it, the results would be the same. It's really hard to demonstrate superiority of one technique over other on a surgery like a minimally invasive discectomy.

The second problem we see often is classical lumbar stenosis. When we stop our lumbar stenosis, you see central stenosis. And as you can see in the right image, there is narrowing in the channel where the nerve passes.

And again, two ways it could be treated. On the left side is then traditional open laminectomy where we make an incision in the midline and go in and remove the bone to free up the nerves. On the right side is a picture cartoon showing a tube, and dropping a tubular retractor, and freeing up the stenosis.

So the goal of both the surgeries is the same, different ways of doing it. And again, there is enough data which have supported and assured that showed the fact that minimally invasive approach is as good as open surgery, with the added benefit of less blood loss and shorter hospital stay.

And again, this is another example of an MRI. The patient having a serious stenosis that was treated with minimally invasive approach. And if you look at the bottom, right image, you can see a restoration of the white fluid around the stenotic canal. And the patients do very well following these decompressions.

And I think the big thing here is the indication. When you have stenosis, you're going to do well, regardless of which way you do it. So it doesn't really matter.

I think you have to pick up the right patient. And anybody who has that bad of stenosis is going to do well once you decompress them, regardless of the way you do it.

And so this is another picture showing how we do this minimally invasive decompression. So what we do, is instead of coming from the center and opening the back a little bit longer, we can put a small tube to-- I generally use a tube which is, like, two centimeters in size. You can drop in the tube and you can decompress the spinal canal very well by preserving the native anatomy.

And this is the type of incision people will leave the hospital with where you can barely see them after, like, six to eight months.

So this is a video like how we do. So this is a tube being placed from the back. And after this really is being done, when we pull the tube out, you can see how the muscle is kind of like falling back in place.

It just shows that how minimally disrupt you the anatomy is. This is following a laminectomy or a discectomy.

And when we pull the tube out-- like [INAUDIBLE] any small [INAUDIBLE] on our way out. And when the tube comes out we can see the whole incision is pretty much closed by itself. So it's pretty much really as much anatomic we could be.

And then there are a couple of patient population where I think these techniques are even beneficial, especially in elderly patients and patients who are medically frail. I know I see patients all the time who are in their 80's or 85. Very significantly symptomatic, but horrified to have any back surgery. Because a lot of times they always think that back surgery means fusions and whatnot, which is not true.

So somebody who's, like, say 80, 85-- again, it depends a lot on how their physiological age is, how fit they are. But having said that, anybody who can tolerate anesthesia for about 45 minutes to an hour, and if they have a pinched nerve at one or two levels, could be easily decompressed with these techniques. And this, too, patient population clearly are somebody where these techniques are very beneficial.

Again, the last condition which we see very often is the slippage of one bone or the other, spondylolisthesis. Again, the problem with that is it also leads to stenosis. So it's not the slippage which is the problem, it's the stenosis from the slippage which leads to symptoms.

But when we treated these patients we are to take care of the slippage also in mind. And again, the traditional treatment for that, if they are not a candidate for decompression alone, is a fusion. Again, it could be performed in an open fashion as shown on the upper, left image, where we just go from the back, open it up, and do the decompression stabilization. Or through using smaller tubes as on the bottom, right image with the same thing. We can drop tubes again these days. And we can do all sorts of instrumentation, like putting cages, screws, and whatnot through those smaller incisions.

This is a feature of one of my patients. What we do is we would put a tube, I show on the upper, left image, and the X-ray during surgery showing the tube being placed. And the incision, you can see there are two small incisions measuring one inch on each side. And those are the X-rays. So all that could be done through minimally invasive approaches these days.

And what makes it safe, is now we have availability of interoperative neuro navigation, where we can use something like an O-arm, which is like a GPS, which would help us to know where we are exactly putting the screws. And then use microscopes and neuro monitoring. So all these techniques during surgery make this surgery way safer now.

This is another picture of a patient who has spondylolisthesis, where there's a slippage of one bone, was, again, treated with a minimally invasive technique. And those are the x-rays after the surgeries. And again, enough evidence to support these days the outcome following minimally invasive fusions.

And this is another way of doing a fusion where instead of going from the back, or using the tubes, people can now-- part of minimally invasive surgery is can go from the side. I think all of the predictions and [INAUDIBLE] all these physicians are really well work with this technique where we can go from the side and do some sort of fusion now.

So again, a different ways of tackling the same problem in a number of ways. And all I want to say is that I don't want you to get home with the saying that everything could be done with the minimally invasive fashion. There are a number of patients who are not candidates for that. There's [INAUDIBLE] people are [INAUDIBLE] who need multi-level fusions.

Again, which could still be done, but again, there are limitations. I won't go into those. But still a significant number of patients would require open surgeries.

And I will just conclude by mentioning that lumbar stenosis is, again, one of the most common problems we see, both open and minimally invasive surgeries are effective options, provided there is a pathology and the symptoms correlate. And minimally invasive procedures, basically for something simple like decompression [INAUDIBLE] and one-, two-level fusions, are basically routine.

I don't think there is any conditions there that need to be candidates for that. So they can have it regardless.

And again, for some patients who are old or elderly and obese I think there is increasing role for these techniques. And I'm sure as we move forward, there will be newer and newer minimally invasive options for taking care of these problems.