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ReachMD
www.reachmd.com
info@reachmd.com
(866) 423-7849

Surgical Options for Spinal Disorders

Narrator:
Welcome to “Medical Breakthroughs” from Penn Medicine: Advancing Medicine Through Precision Diagnostics and Novel Therapies. Your host is Dr. Lee Freedman.

Dr. Freedman:
Especially given our aging population, lumbar spinal stenosis is a problem being increasingly seen in physicians’ offices today. What are the latest surgical approaches to this disabling problem?

I’m your host, Dr. Lee Freedman, and with me today is Dr. William C. Welch, Vice Chair of the Department of Neurosurgery at the University of Pennsylvania Health System and the Perelman School of Medicine. Dr. Welch, thank you so much for being with us.

Dr. Welch:
Dr. Freedman, thank you and ReachMD.

Dr. Freedman:
Well, we are very excited to hear your insights on this common problem. Are you seeing more of lumbar spinal stenosis as the population is aging?

Dr. Welch:
Without a question, I think it is exactly as you said; it is related to the fact that the population is aging, but as a group they certainly appear to be healthier than I remember much of the population in this age group when I would see them in the 1980s when I was a resident. Their lives are being restricted frequently because of spinal stenosis and they would like to know if there are treatments that are available to them.

Dr. Freedman:
And I think of spinal stenosis as presenting primarily with leg pain. Do we see back pain or other presentations with this?

Dr. Welch:
There are 2 components to, at least lumbar, spinal stenosis. There is the central component, where the canal—the cross sectional area of the canal—becomes reduced. The canal itself can then be shaped like a smaller circle, if you will, or it can be shaped like a trefoil, a Napoleon hat trefoil. Very commonly, when it is shaped like a trefoil, the lateral recesses—the sides of the neural canals—get narrowed so the nerves exiting the spinal canal get narrowed. That causes the “lateral recess syndrome” which can certainly manifest as sciatic-type pain or femoral neuritis, neuritic-type pain, as opposed to the more standard cross sectional area narrowing, which presents as neurogenic claudication, specifically, the patient’s legs get heavy or feel heavy after walking a distance.

Dr. Freedman:
And in terms of distinguishing the latter, the neurogenic claudication from vasculogenic claudication, are there some things on history or exam that should point us one way or the other?

Dr. Welch:
In my years of training, I have been told that there are. I have been told that patients with vascular claudication have a set distance, but the truth be told, I know of no specific or even particularly sensitive physical exam finding that differentiates the two. I will tell you that this aging population is healthier and they have smoked much less, if at all, and I will tell you that it is very rare today that I see a true

vascular claudication. If I have any question, I will feel the patient's pulses and of course look at their feet and send them for Doppler studies of their lower extremity arteries or arterial brachial indices. But it is quite rare today, to be perfectly honest.

Dr. Freedman:
Very interesting. And if I have a patient who has claudication symptoms and they have a non-focal neurologic exam, is it appropriate to empirically treat with an NSAID or a steroid, or would you recommend making a firm diagnosis with imaging?

Dr. Welch:
I do not image unless I am willing to act on the images. I wholeheartedly support clinical treatments unless there are red flags, fevers, sweats, chills, anything that would suggest an epidural infection or a discitis or weight loss, suggesting, perhaps, cancer. But assuming those red flags aren't present, then I absolutely agree with nonsteroidal anti-inflammatory medicines. Frankly, physical therapy—we did an NIH-sponsored trial about 10 years ago looking at physical therapy in the elderly population, and it was effective at least in the short term, and it is quite reasonable to offer to the patient.

Dr. Freedman:
So if, in the absence of the red flags, it is appropriate to empirically treat with physical therapy, NSAIDs. Do we ever, then, go to a Medrol Dosepak, that type of thing, orally?

Dr. Welch:
Medrol Dosepak, even epidural steroids, tend to work better for reticular type symptoms, as long as the patient understands that. My personal experience is that these provide temporary relief for the patient. Either an epidural or an oral steroid is, if the doctor feels it is appropriate, it can certainly provide temporary relief but it is, generally speaking, short term.

Dr. Freedman:
And if someone has failed therapy, they are not getting better, then think about more procedural approach and imaging?

Dr. Welch:
Exactly correct. The best study, of course, is an MRI and that is frequently the only study that we obtain.

Dr. Freedman:
And that can be done without contrast for this indication?

Dr. Welch:
Exactly correct.

Dr. Freedman:
And if we do see some significant spinal stenosis, are there some procedural options that patients have?

Dr. Welch:
Right. Well they certainly have the epidural option but again, I would expect that to be temporary. Then there are a host of surgical or minimal surgical options available to the patient. One hallmark feature that many of the patients have is that they will improve with lumbar flexion. They will describe pushing a shopping cart while shopping and the fact that they are bending forward over the shopping cart allows them to walk nonstop for longer periods of time. That group of patients may—and I say may—benefit with surgical procedures that include interspinous process devices. These devices force the interspinous processes apart. They, to a certain extent, replicate the idea that the patient is bending forward, and they have been examined in the short term, 6 months or so, in the more medically infirm patients and they are reasonably effective in certain groups of patients, and some physicians do recommend those. So that is a lesser surgical type procedure to be considered.

The other surgical procedures involve removing material that is causing nervous system compression, specifically the cauda equina and nerve roots. The most common operation I do is a laminectomy, an incision, then removal of bone in the ligamentum flavum and arthritic overgrowth, facet overgrowth. You can do that surgery in any one of a number of different ways. You can do it through a tiny incision; you could do it through a medium-sized incision; you could do it through a very large incision, but the goals are all the same, no matter what the incision size is. The goal is to increase the circumferential diameter of the spinal canal, when possible, and decompress the lateral recesses more so on the side that the patient has radicular symptoms.

Dr. Freedman:
And the extent of the incision depends on the number of levels involved, or what other factors?

Dr. Welch:
Preferences of the physician, preferences of the patient, number of levels involved, how extensive the surgeon wants to be or how

extensive the procedure.

Dr. Freedman:
And with minimally invasive procedures, are any of these being done on an outpatient basis, or are they all at least one night in the hospital?

Dr. Welch:
If it's very limited, 1 level, perhaps even 2 levels, they can be done as an outpatient. Typically, we like to watch the patients overnight for any one of a number of reasons, mostly because they are more sore the next day than they are the day of surgery. But also these are older patients and they can certainly have complications related to their age, even if they are in very good health.

Dr. Freedman:
If you're just tuning in, you are listening to "Medical Breakthroughs" from Penn Medicine on ReachMD. I'm your host, Dr. Lee Freedman, and I am speaking with Dr. William Welch, Professor of Neurosurgery and Professor of Orthopedic Surgery at the University of Pennsylvania Hospital.

Dr. Welch, why don't we move things up the spine a little bit? How do things differ when we are talking about stenosis in the cervical area?

Dr. Welch:
Particularly the patients with cervical stenosis present with the gradual onset of gait disorder or the loss of the fine motor skills in the hands if they have central narrowing of the spinal column with spinal cord compression. Those are very subtle findings. Many of the more sophisticated patients will note, especially the women, that they can no longer put their jewelry on, they have lost the fine motor skills required to assemble jewelry. Men will notice that they can't button their buttons as well as they used to. Both groups will notice that they can't play cards or manipulate the newspaper edges quite as well. Frequently, the ability to sign one's name, type, play the piano deteriorates and it occurs over time. Some patients, depending on where the problem is and how severe it is, will actually present with ambulatory troubles—they will walk, they will use the expression "walking as though I am intoxicated, and I haven't had a drink." Sometimes the spouse will notice that the patient is having subtle tripping, trouble getting in and out of a car, sometimes trouble climbing stairs.

Dr. Freedman:
So a subtle, gradual development of these kind of symptoms should alert us that maybe there is something going on with the cervical spine?

Dr. Welch:
Exactly, and very well stated.

Dr. Freedman:
And on physical exam, are we looking now for clonus and hyperreflexia?

Dr. Welch:
Exactly. The clonus, in my experience, is fairly advanced. This tends to be a group in their 50s, 60s and later, so the key differential for the physicians is to as best as you can tell, and sometimes you simply cannot tell with certainty, to try to be certain that the patient doesn't have another upper motor neuron disease, such as a demyelinating disease or amyotrophic lateral sclerosis. So we certainly look for any cranial nerve deficits which might indicate that the patients have multiple sclerosis, intracranial lesions. We look for tongue fasciculations or muscular fasciculations which can be a hint that the patients are having amyotrophic lateral sclerosis as opposed to cervical stenosis, and then of course, the neurologic exam. If the patient has stenosis at C6, C7 and we examine their reflexes, we would not expect brisk biceps reflexes necessarily at the C5 level. But we are looking for increased reflexes. We are looking for upper motor neuron findings such as pectoral responses, deltoid reflexes, Hoffmann's signs, Babinski signs, ankle clonus and the such.

Dr. Freedman:
And Dr. Welch, we see these findings and we get the MRI and it does show cervical stenosis. Are our treatment options the same as for lumbar stenosis?

Dr. Welch:
Dr. Freedman, in general terms they are, but with some subtle differences. The real difference is that in the lumbar spine most surgeons today will only fuse something on the order of 10 or 20% of the patients. The reason we do fusions in the lumbar spine is if we believe that the patients have instability or that we have created instability through the process of the surgery itself. The instrumented fusions are the addition of bone screws and rods plus bone placed over the transverse processes to strengthen the spine and, we hope, get a

solid bone union. This can certainly help with back pain, and it can certainly help or even correct slippage of one vertebral body on another spondylolisthesis. I will not infrequently, if I have any concern about spondylolisthesis or instability developing in these patients, I will just take the bone that we removed during the laminectomy and use that on the transverse processes and place the patient in a brace for about 6 weeks. That is a non-instrumented fusion and that is quite effective as well.

In the cervical spine, many of the patients at the point that they present have some evidence of spinal cord injury. Usually on the MRI scan we will see changes in the spinal cord T2 signal changes in the spinal cord, which may be consistent with bruising of the spinal cord, scarring of the spinal cord, or just injury of the spinal cord. In many of those instances, we believe that fusing at that segment or the segments above it and below it as well, afford the spinal cord some form of protection. Now that is not 100%, but many surgeons feel this way.

The other option we have in the cervical cord and cervical spine is that we have a fairly easy approach to the patient either anteriorly or posteriorly, or rarely both. So if we think that the compression is mostly from the front and is hitting the ventral aspect of the spinal cord, or if we think the patients are fairly kyphotic—have a forward flexion of the neck—it is not uncommon that we will take an anterior approach to a discectomy, put bone or other material into the disc space and put a plate on in front to keep the patient's neck in a neutral or slightly extended position while affecting decompression of the spinal cord. From the posterior approach, it looks similar to that of the lumbar spine. We will do a laminectomy generally today with instrumented fusions, screws and rods, to essentially protect the spinal cord.

An alternative for some patients, even with myelopathy, is disc replacement. I don't do many of these, but these have been shown to be at least safe and reasonably effective, just as all the surgeries are that I just described in the cervical spine. Patients who have myelopathy, that is to say, spinal cord dysfunction, or myeloradiculopathy, spinal cord dysfunction and nerve root irritation.

Dr. Freedman:
Very interesting. When you do the anterior approach, is there a lot more soft tissue—the carotids, the thyroid—a lot of other tissues that you have to consider versus the posterior approach?

Dr. Welch:
There was an editorial, an opinion piece, written when the anterior approach first became popular, and the editor basically described all the structures that the surgeon needs to go past to get to the spine. If you read it, it is one of the scariest things in the world, but typically it is rather straightforward. Typically, it is a straightforward dissection typically done with your finger; the platysma muscle is cut then it is an interfascial dissection. Protecting the carotid artery, protecting the esophagus and just retracting tissues as needed, it is a common procedure and if there is any question, we will have an ear, nose and throat surgeon assist us.

Dr. Freedman:
Dr. Welch, as we look forward to the next 5 to 10 years, are there some advances you see coming with the surgical techniques?

Dr. Welch:
Dr. Freedman, there, I believe, will be continued technique development for the minimally invasive procedures. I think there is a continued refinement and I think there is a continued understanding as to which patient groups might best benefit with the minimal procedures and which patient groups, frankly, simply need larger surgical procedures, including stabilization. There is a continued understanding that, for specific problems of the spine, surgery is the more effective technique in the long term, whereas for other problems, surgery is equivalent or perhaps even a lesser technique than nonsurgical techniques. So I think it is a continued definition of the patient population and the application of surgical techniques in general. With regards to the surgery itself, we have made great strides over the past 20 years in reduction in infection, complication reduction, really performing the surgery more safely, for instance. Many of these I perform with spinal anesthesia—I have done over 1,000 with spinal anesthesia—so the patients don't even get a general anesthetic. So, I think there are no tremendous discoveries in the next 5 to 10 years, but without a doubt, there is a continued refinement and a continued understanding of the application of surgery and nonsurgical techniques for these patients.

Dr. Freedman:
Well, I very much want to thank Dr. William Welch, the Vice Chair of the Department of Neurosurgery at the University of Pennsylvania Health System and the Perelman School of Medicine for outlining for us today both the approach and the therapy for these common problems of lumbar spinal stenosis and cervical spinal stenosis. Dr. Welch, thank you so much for your insight.

Dr. Welch:
My pleasure, thank you.

Narrator:
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