

# Cervical Scans - Ref 113RSDC

*with Rob Shanks and Darren Chandler*

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## TRANSCRIPT

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**Steven Bruce**

I'm joined today, as I have been on several occasions in the past, by Rob Shanks and Darren Chandler from Go 2 Imaging. Welcome, guys. How are you two?

**Rob Shanks**

Thank you, Steven. Yep. Very well, thanks.

**Darren Chandler**

Very well, thank you, Steven, good to be back.

**Steven Bruce**

Well, it's interesting to see how your business is developing, obviously the business of the MRI stuff, because I know you're now doing regular online courses in how to interpret MRIs and you're offering a support service for people as well, aren't you? Is that going well, for you?

**Rob Shanks**

Yeah, we've had a lot of requests now to do some one-to-one training, plus the SS, right. So, we are offering an ongoing support service now whereby people become members of a closed Facebook group that we can then just give them ongoing support through there, interpreting scans, they can post questions, they can look at little bite size updates and stuff that we've put up and posts that we put out. So yeah, it's proven popular again, which is nice.

**Steven Bruce**

Well, I don't imagine anybody's in any doubt that that's a valuable service. We'll come back to it later, I know, because anybody who's looking at MRIs and referring for them probably needs some support from experts like yourselves. Anyway, we're gonna be looking at cervical MRIs today, and I heard you two debating who was going to go first. So, who's it going to be?

**Rob Shanks**

I think I think I want to kick off, and then Darren's gonna follow really quite, quite soon after.

**Steven Bruce**

Okay, you've got this slide about why.

**Rob Shanks**

Absolutely. So, I think last time we were on, we predominantly were talking about lumbar spine and obviously as manual therapists, musculoskeletal therapists we see plenty of necks and cervicogenic pain. And yeah, again, because of some requests, we thought, well, this would be good to do, to give a talk on cervical spine this time. So yeah, in terms of why, that's always the first question, isn't it? Why? Why would you want to have a scan done of the neck? Well, the obvious ones really are people who have persistent pain that you can't quite get to the bottom of, you want to diagnose and know whether or not you are within the

realms of be able to treat them, whether they do need some sort of referral on. So kind of the common ones are cervicogenic pain, so they've got a pain in the neck that just will not go and you want to know whether there's significant facet joint pathology, whether there's significant disc pathology as well, that could be the source of that pain that may need some other sort of intervention other than yourselves. And then following on from that, obviously, cervicogenic headaches is another big topic and a certain percentage of headaches will be coming from the neck, whether that be facet joint referred pain, myofascial referred pain. And again, you want to know the state of the patient's cervical spine for that. And then the other big category obviously is that is the radiculopathy pain, so the people who have the shooting pain down the arms, the nerve root entrapments, pins and needles, numbness, weakness even, in the arms and hands.

### **Steven Bruce**

Can I just ask you about the cervicogenic headaches business? I just wanted to clarify, are you saying that this is a diagnostic tool to say yes, there is a possibility that the cervical spine is the cause of the headaches or are you saying that having already worked out that they're cervicogenic, this might tell you what the actual cause is within the cervical spine?

### **Rob Shanks**

So you cut out slightly there, Steven. But I think you're saying I'll use this as a diagnostic tool for the cervicogenic headaches, is that right?

### **Steven Bruce**

Yeah, could you use the MRI to say, ah, yes, I can see why this is probably a cervicogenic headache? Or would you use the MRI when you already suspected cervicogenic and look for the cause?

### **Rob Shanks**

I think you have to be careful; you never never pin your hat on just one test. And I think we also have to remember as well that a certain number of people are going to have degenerative conditions on their neck anyway, regardless of whether that's symptomatic or not. So as with anything you do, any intervention, any diagnosis you make, and any investigations you do, you always have to put that into context. And it's a judgment call, isn't it? But let's say for example, you had a patient who had very isolated pain to one side of the neck and you feeling the neck, you felt things were really degenerate and they'd had a history of trauma or whatever it would be, and they're getting headaches on that side. You'd be asking yourself the question, do I think, could this be a facet joint referred pain to the neck? If you then scan them, if the scan comes back and it's clean as a whistle, you then perhaps, are then ticking that off the list rather than on the list. But the opposite to that would be they've got then a really raging isolated facet joint, that's absolutely different compared to the others and it's right where you felt with your hands and your fingers were, well, then you're kind of more inclined to think that is the cause of their headaches. But again, it's not a black and white thing. It's a judgment thing every time.

### **Steven Bruce**

Sure.

### **Darren Chandler**

And sometimes, sorry, Rob, sometimes, Steven, you would use the MRI to give you, like Rob says, just to clarify that there is potentially anatomical changes in that area. And if there is a hypertrophic facet, it would then lead us to then potentially go for maybe more imaging like a SPECT CT, because some patients might have five or four facets which look grossly arthritic and again, anatomically, yes, you see it, but it doesn't give you what one of them is the source. So, we would then maybe go further and do a SPECT CT to highlight potentially the source then. So, it's just kind of almost a category of testing and diagnostic examination to then go towards potentially the source of pain long term. It's just a tool.

### **Steven Bruce**

You've given us an overview here of cervical anatomy, which, of course, is quite important, because working out what's what on an MRI is far from clear, isn't it, to many of us.

### **Rob Shanks**

Yeah, absolutely. And I think it's fair to say, interpreting images of the cervical spine, I would say slightly harder than the lumbar spine, I think that's a fair thing to say. You have the same structure, you have discs, facets, joints, nerves, muscles, all that sort of stuff. But there's different, slightly different, not rules that apply but when you're going about looking at the images. On the previous lumbar spine courses we were teaching, we were teaching this kind of ABC approach in a certain order that you would go through for the easiest way of interpreting it. It is slightly different with the cervical spine, maybe the order in which you go in and in terms of looking at, for example, giving you an example, a very good way of looking at the facets on a lumbar spine, would be with the axial image. So, what we're seeing here, on the right hand side of the screen is an axial image, slice through the transverse plane. And then as I say, the lumbar spine, you get a good idea of the facet joints pathology with that, but on the cervical spine, it's harder to interpret that facet joint pathology with the axial slice. And actually, probably what you want to do is maybe look at the sort of parasagittal slices, the length way slices, and you'll see the facets in a slightly better way on the neck in those situations.

### **Steven Bruce**

I should say, Rob, all those people watching at the moment that even with this full screen, it's going to be very hard for them to read this here. But in the handout that we've got for you, your original slides, all of that will be much clearer. But as you say, I'm looking at the facets in here, well, that to me, would have been much clearer on the lumbar spine. In fact, I wouldn't have even guessed that that was the facet joint.

### **Rob Shanks**

Yeah, that's it. Yeah. So, you're right. Yeah, the labeling there isn't as precise or as clear as it could have been. But as you said in the handout it should be. But let's do a quick little tour around this. So obviously, on the left-hand side, what we're looking at here is a sagittal slice, mid sagittal slice, in this case, right through the center of the body. And as we've labeled there the vertebra, the very top one, normally what you would see right at the top is actually C2, that's the first kind of obvious lump of bone that you'd see, if

you like, so then you'd be counting down terms of disks, you always remember that the first disc that you see is actually going to be the C 2/3 disc, okay, obviously, because you've got the occipital-atlanto joint above. So, then you're thinking in terms of the nerves which are coming out from that level, you've got C1 obviously starts above, and again, you've got to remember you got the eight nerves and the cervical nerve roots. So, from above C2 you're going to have to C1, 2, 3, 4, 5, 6, and then 7 and then C8. So, you've got to kind of get your head in gear for which nerves are passing by which disc. Now also, what we can see obviously is the bottom of the brainstem and you've got the spinal cord running down then. So that black kind of thick line, if you like, that's running down the center is the spinal cord. And that's a very important part to look at, because for a lot of these central disc prolapses for example, you want to know whether it's impinging on the spinal cord. Now, the white that's in front and behind that darker line there is the cerebral spinal fluid. So yes, you might have some indentations coming in towards that space, but the question really often on this sagittal slice is, how much impact is it having on the cord and also is there swelling around the cord? So, at the moment, we can see it's fairly dark. Now if we had a disc protrusion that was pressing in and causing swelling, we'd then see some lighter shading almost around where it was indenting. So again, these are the couple of things which you want to look out for initially on these sagittal slices. And it's always nice again, we'll perhaps try and we'll go through some slices later where we can see like we've done here, where you always want to try if you can and bring up a sagittal slice next to an axial slice and on the software that comes with the CDs, the MRI CDs, they'll often have the measuring tool whereas you're scrolling through the transverse slices, you can see on the sagittal slide which level you're at. And that's always a very nice thing to try and get into the habit of using when people are in the habit of looking at their patient's MRI scans, because obviously it orientates you as to exactly which vertebral level you're on.

### **Steven Bruce**

Is there a default number of slices that they would usually apply in this?

### **Rob Shanks**

Well, yes and no. So as a general rule, you tend to find that, the more expensive the scan, the smaller the slices are, or the closer the slices are between each other, if that makes sense. So, it all comes down to time, doesn't it? Time is money and money is time. So, if you're going for the slightly cheaper end of the scans that are trying to get you into the 20-minute, 30-minute slot, and you've only got a certain amount of time to get a certain number of slices in. So yes, you can sometimes have situations where very subtle pathology is actually going between the slices and you haven't fully seen it. I mean, it's relatively rare but you just again, have to have that in the back of your mind as well. And bear in mind that one scan isn't always the same as another scan, and then that might be down to the number of slices, it might be down to the sequences that they've used. And again, we're going to talk about later on some actual sequences, and things like STIR sequences and coronal STIRs.

### **Steven Bruce**

I'm glad you said that, because somebody has sent me a question saying, please could you run through that, because he watched the previous ones and he's asking for a friend this time, he says. So Robin, I hope your friend will be satisfied with what you asked later. He's not getting away with that. Go on, on you go, Rob.

### **Rob Shanks**

So yeah, let's just quickly go through the axial slice there. So, on the image on the right-hand side now, so we're looking obviously through the middle of the neck, sliced left to right so this is the right-hand side. And your eyes automatically would always go to the center of the image, so let's just talk about that initially. So obviously, I mentioned the spinal cord, which again, we're seeing in the middle there that round kind of, that's it exactly there. Thank you, Steven. That's the spinal cord and obviously, then you have the sort of thecal sac and the fluid around the spinal cord, circumference around the area. And then immediately, if you like, in front on the 12 o'clock position to that you've got the vertebral body in this case, or depends on where you'd be, it could be the vertebral body or it could be the disc, but this is where you'd be finding the disc if it was protruding, either coming in centrally or coming in posterior laterally. And if you look at now what's coming out, the structures that are almost coming out of the 10 o'clock and two o'clock position, these are the nerve roots. Okay, so where it says spinal ganglion on the label there, that's where you'd be having the cervical nerve roots coming out from the sides, that'll be exiting down into the arms potentially, so depending on which level you're on. And again, you always want to be looking at, well, how is the space there and how is the space on the left compared with the right? And remember that we'll be looking at this, what's on the left, is actually the patient's right, because always looking from the bottom upwards, okay. So again, you have to just get that in your head, the left of the screen is actually the patient's right side, okay, and obviously vice versa. Then, as we've already said, the facets then are just sitting in, if you like, in front of, slightly lower than that. Exactly there, that's it. So they're the facet joints in that transverse image. And again, they can encroach into that frame as well, so they can cause that foraminal stenosis, as well as disc osteophyte bars coming from above, you can have facet arthrosis coming in from below as well. So that's kind of what you're looking at and often is a very important thing to look at, when your suspecting nerve root impingement. And then slightly further towards the back obviously, if we orientate our anatomy, we have the spinous process coming down in that six o'clock position. Absolutely. And then either side of that obviously we're gonna have the cervical erector spinae muscles and again, they're also worth looking at. And you always want to think about not just looking at the spinal structures in the vertebral body the spinal cord, but also take a moment with all these all these scans really, just to look at the periphery as well, to see if there's anything going on in the periphery. Particularly in the lower, well, the lumbar spine particularly you can often see other things going on, so you can see, if you look for them, sometimes you'll spot kidney stuff and that sort of thing. But obviously we're concentrating on the neck in terms of now. So, the superficial structures, the peripheral structures, then as I mentioned, you've got the trapezius muscles, the splenius capitis muscles right at the extremity and then in front, we got the laryngopharynx and the vertebral artery as well, another important thing to think about there as well.

### **Steven Bruce**

A couple of things for you before you move on: when we are looking at the lumbar area, quite often you can see perhaps an imbalance in the size of the psoas muscle, do you attribute much weight to any imbalance in muscle size in cervical spines?

### **Rob Shanks**

Yes, again, for the same sort of reasons as we'd look at the psoas. You're looking at have they got- Well, again, we're going to come through some slides later on where we'll see one of my patients who did have a scoliotic posture of their neck, similar to what you might see in the lumbar spine. And again, you do want to take a moment to think, well, how does that muscle look compared with the other side? And is it in spasm or is it atrophied? Exactly the same reasons that you would do for the psoas muscle it's all information at the end of the day for us as musculoskeletal therapists. So yeah.

**Steven Bruce**

Jumping ahead, just slightly, Franco has asked whether this is a T2 weighted scan?

**Rob Shanks**

Correct. Yeah. So, these are both T2 weighted images. And again, just the reason why we know that is with T2, the way to think of it is T2, H<sub>2</sub>O, water, so water is showing up as bright. Okay, so we know that on the T1 and the T2 the fat shows up bright, so we can see on the subcutaneous posterior aspect of the sagittal image, we've got the subcutaneous fat, that's bright. But also, we can see very clearly the cerebrospinal fluid around that cord area. So therefore, we know the cerebrospinal fluid is water, it's aqueous. So therefore, the fact that it's so bright means it has to be a T2 image. And the same is on the axial as well. And obviously, on a T1 that would be reversed, where the water would be dark and the cord would be kind of the lighter of the two.

**Steven Bruce**

And the fat?

**Rob Shanks**

And the fat as well, yes. So, with a T1 as well, the fat would also be bright. That's correct. So, the way the way to remember is, don't get too obsessed with the fat initially, but just think about the water. The things that you're thinking of being water, as in the cerebrospinal fluid, what color is it? If it's bright, or white let's say, then it's a T2.

**Steven Bruce**

Okay. Right.

**Rob Shanks**

Over to Darren's patient. So, we'll let him do this one.

**Darren Chandler**

Yes, so what we have on the left on this screen, we're looking at a T2 sagittal on the left, and on the right, again, we're looking at a T2 axial. So, we have a professional dancer here who presented in clinic, they had a long standing left sided neck pain, along with a C8 radiculopathy. So, they had the classic tingling in the fifth digit, fourth digit, sort of running along the ulnar border, up under the arm, and they were getting a lot of discomfort, especially in flexion, rotation to the left-hand side. So, I sent her for an MRI scan. So again, as I

think a lot of the viewers know, the reason Robert and I got into this because we sort of studied it under a couple of radiologists. And we started to just see so many differences in the style of reporting and so many things were getting missed. So hence, we started to run these courses and bringing up to talks like we are today. But this is just a classic, really, because if you look at the sagittal T2, if like what you see very top, where Rob was saying the first disc, you see is C2. So the next one down would be C3/4, then we've got C4/5, and then we get to C5/6. And if you look closely, you'll see that there's a very, very small high signal. So, there's a little bright bulge, I don't know if you can get your cursor to go along the back part of the, that's it, stop, just there, just there. So, you can see there's a very small bulge, and that's at the level of C5 and 6. So on the sagittal view, we see that there's a very, very small C5/6 bulge. And if you look at the one below, you can also see that the C6/7 also has a bulge as well. So we're looking at two very small disc, and they're contained annular protrusions and we can see that because there's no high signal, the annular casing is still intact posteriorly. Now, if you look to the right of the screen, we're looking at two axials, as we said, and the top axial picture would be the C5/6, and the bottom one is C6/7. So, can you see if you look at the posterior aspect of the disk on C5 and 6, you will see that there is a little white line, that's perfect, just go a little bit higher, stop there. So, you'll see it almost looks like a hyperintense white line, which is in the back of the annulus, and that would indicate that there is an annular tear. So, it means that there's nuclear fluid inside the annulus, which would indicate that the nucleus pulposus has a slight crack which is allowing that fluid to then leak into the annulus section. And there's a very, very small, and we would class this as a sort of paracentral left sided bulge, because if you were to draw a line down the center aspect of that disc, you would say that the tear and the bulge are just slightly more towards the left of the midline, as you look at it. But you can see also that the ovalness of the spinal cord has a slight little concavity to it. But there's no major compression, a very mild indentation due to that disc bulge. And because all of our viewers will know our anatomy, the C8 nerve root is not in that paracentral area or lateral recess. So, if we're looking for a C8 radiculopathy, we're not going to see it at that segment. So, we dropped down a level and we go to the bottom axial view. And you can now see that at the level of C6 and 7, there is a slightly larger disc bulge. And you can see it's also hyperintense, which indicates that it's an annular tear. But there's no disc material outside of the annulus, nothing has been breached, so we have two small, annular protrusions coupled with two annular tears. But you can see at 6 and 7, there is slightly a little bit more indentation of the spinal cord, more or less the thecal sac rather than the spinal cord. So again, what nerve potentially would be compressed in that lateral recess area, it would be your descending C7, okay, at the C6/7 as it comes out. So, we also know that this can't really cause any C8 distribution numbness. So, we got the radiologists report and if you go to the next screen, you will clearly see that the radiologist's conclusion was that there is only one mild disc bulge seen and that's at the level of C5/6, which we've discussed, and this isn't causing the impingement of the thecal sac, ie the casing of the cord, but there is categorically no canal stenosis and there's no foraminal narrowing. So ultimately, this would decide that there's no nerve root impingement. So, it kind of then gets the practitioner or myself scratching their head and then, if you can tell, we would then digress now and go over to potentially is there a C8 thoracic outlet issue here? Is the patient suffering with an ulnar nerve palsy? Is there an ulnar nerve entrapment at the elbow? So, you can quickly see how you would start to change your diagnostic approach as such, or how you would then go in to start testing other things. But if you bring up the next slide of that MRI scan, you will start to see that on the sagittal view on the left-hand side, where I've put the arrow, it looks completely normal. And you can see why the radiologist

has missed it. Because the back of that disc and the back of that annulus looks completely normal. It's well contained, but have a little look now on the right-hand side at the axial view. Now first off, let's have a little look at the right-hand side of the lateral foramina. So, I don't know if you can see, at the back of the disc on the right-hand side. Well, as you look at the screen, we're going to be looking at the left-hand side of the screen. So, if you can put your cursor. That's it perfect. Now between that cursor, and the facet joint, if you come back a little bit to the edge of the facet joint. So, there's the edge of your facet joint. So, can you see there is a lovely canal between that edge of that disc and the beginning of the facet joint? So that is the lateral foramina on this patient's right-hand side. And that's giving free access to the exiting right nerve root, okay, to C8. But now let's look at the right-hand side of the screen which would be the left-hand side of the patient. Can you clearly see here it is much more narrowed, okay, it's much more stenotic. And if you look at the corner of the disc with your cursor, can you see there's a black- go up a little bit for me, stop, just there, to the left a little bit, stop- just there is a piece of disc osteophyte bar. So that is a little piece of annulus/the endplate, just an osteophyte that has grown out towards the lateral foramina and that unfortunately, is going to occlude the hole, which again is going to affect the exiting nerve root at that level. So, this patient has an obvious lateral left C8 nerve root impingement coming from a disc osteophyte bar. So, I asked the consultant radiologist to take a second look and the next slide will show the addendum to that. So here is his conclusion, there's evidence of cervical spondylotic changes at three-disc levels. So, it's interesting how when he was picked up on it, he then went from a one-disc problem to now there's three-disc problems and he clearly states that the left C8 exiting nerve root is being impinged upon by a disc osteophyte bar. And you can't really make this up and as we've said on previous talks, we've seen so much of this. And I think it's a disservice for the patient because they're going round and round and seeing multiple practitioners because they're now being told it's an ulnar nerve entrapment and they're having treatment with shockwave and laser and steroid injections at the epicondyle and then they're having to have lots of treatment for the traps and the first rib and the clavicle, because it's a thoracic outlet problem, when really all along the evidence was there. But obviously, if you're not trained in looking at this kind of stuff, it gets missed. And it's kind of something we're seeing constantly. And I believe we're going to be talking in a week or two's time and I saw a case last week that is so mind boggling that the NHS have failed to sort of find, I will present it when we come on in a week or two's time, but it's very similar, but it's just a big disservice to the patient really,

### **Steven Bruce**

Darren, I've got some questions for you if I can interrupt slightly. Iqbal has asked two: first of all, how old was the patient, the dancer, we've been looking at?

### **Darren Chandler**

The patient was 23.

### **Steven Bruce**

Right. And he also said that the disc bulges that we saw, here and here and there, he said, they look really insignificant. And I think you've covered this, but he probably sent the question in before you answered it,

he's saying is a disc bulge here likely to have more consequences than a similar sized bulge in the lumbar spine?

### **Darren Chandler**

Do you know what, it depends, Steven. I mean, it's an interesting question, because this chap, or this lady, sorry, she has two very small, insignificant disc protrusions. But you know, in some patients, these could be very painful. And because there is a tear present in both discs, if the tear is active- so we tend to talk about annular tears as being active tears and non-active tears- if you get an active tear, this person could be 10 out of 10 on the pain scale, but obviously for her they were non active, they were insignificant really. So, yes, similarly, in the lumbar spine, you can have this type of feature, it would be terribly painful for one and yet for another completely asymptomatic. So, this is where what Rob was saying clinically, you've got to be on your examination and to be able to correlate the two findings in order to make your judgement as to what the source of the pain is.

### **Rob Shanks**

My input on that would be in terms of you'd want to have a bit of a guidance as to kind of what you're looking at, you don't want to be just going on the size of the bulges. So, it's not all about how big the bulge is. It's about really, well there's a few categories we look at, is what that bulge is interacting with. So, you can have a relatively big bulge that's tolerated quite well, if the patient has a large, natural, naturally has a large spinal canal dimension, or their foramen is quite large, or if the orientation, the particular direction in which it's bulging, isn't actually occluding anything. So that will definitely vary, just things like spinal canal size can vary a lot in patients in the lumbar spine, and similarly in the neck as well. We all have different anatomy, we were born with different size of vertebra and hands and feet, and that's the same as your spine. So that's one thing. The second thing is also to look at, you want to get this idea of wet and hard disc protrusion. So, again, you can have a large nuclear extrusion or protrusion, let's call it, but the actual material that's bulging is largely made of water, it's the nucleus. Yes, it will give a very large initial acute inflammatory reaction. But in terms of how compressive it is, it's nowhere near as compressive as those harder fibrocartilaginous annular protrusions, they tend to be more chronic and they tend to be more compressive. So, it's not just the size, it's the quality of that bulge and also the relative size of those bulges to the neighboring anatomy.

### **Steven Bruce**

Not surprisingly, we've had a couple of questions about this specific patient. Kathy has said is there a history of trauma and it occurred to me as you were talking about it, what's the etiological process for those osteophytes developing that you mentioned earlier on?

### **Darren Chandler**

It would be just increased wear and tear, really, over the segments. So being a dancer, this one was a particular breakdancer, so there was a lot of spinning on their head and lots of jumping up and down. So, you'll generally find as the annulus and the disc bulges, then you'll get the endplates start to grow along the side of that disk. And then it forms these projections known as osteophytic spurs. And then hence, unfortunately for this patient, it has grown towards the foramina, where quite often they're far lateral, so it

doesn't really affect anything, and they can be anterior in nature, and they grow forward and they can be massive two to three centimeters in size, they're not a problem, but if they go towards the foramina, unfortunately, you then potentially run the risk of a nerve root impingement.

### **Rob Shanks**

Just coming back to annular tears as well, specifically, Steven. The general concepts now are that one person's tear can be different to another person's tear, just from the nerve ending point of view, from an innervation point of view. So, the idea, this sort of new and innervation idea of different people have a different amount of nerve endings in the posterior structures of their disc and also that can change over time in the same person as well. So, you can have somebody who's potentially got an annular tear that then starts to become symptomatic, because, as I say, there's new nerve endings that start to grow in the area, and then they start to feel the pain.

### **Darren Chandler**

Yeah, I don't know if any of you have heard of, there was a study and I can't recall it. I don't know where I could get hold of it. But they did a study in Japan some years ago, where they took 2000 cadavers and they counted how many pain sensory nerve endings, such as the sinuvertebral nerve, were present at the posterior aspects of the L4 and L5 discs. And it worked out that in some, they had up to about 4000 to 5000, and the others, they add up to 60,000. So, it's kind of would tell us, although we've got two ears, two eyes, neurologically, we're completely different. So, one person's perception of pain can be completely different, depending on the amount of neurons affecting the pain sensory pathways, etc. So, the chemical irritation you get with an annular tear, it just it differs in so many people according to that neurology, so very difficult to say who is and who's not based on an actual scan, again, it comes back to the clinical evaluation as well.

### **Steven Bruce**

Fenula lost another question about the spinous process here, she's noticed that it's deviated to the patient's right, and whether you think that that is a significant finding, does it have an influence? Could you palpate it?

### **Darren Chandler**

Again, there are various anomalies that you'll find and it's that question of adaptation, is it normal for the patient? Is it not normal? Is it their norm, depending on how the- you'll see on the left hand side on the screen, on the sagittal, that this person has a relatively straightened cervical lordosis? The lordosis is absent in this patient. Now, is that the case because there's a muscle spasm due to the underlying issue? Has it become her norm? Is there a little bit of anterior wedging of the C5 disc which is causing that micro flexion? And is that then causing a problem with the rotation in that segment, which would then potentially cause a rotation of the spinous process? So, you can see how you can go down a lot of roads? You know, it may be, it may not be. But again, it's a good pick up and yes, there's definitely a slight rotation there, but I would say you see this on many, many, many patients. And you see it a lot in a lot of asymptomatic patients. So, it's worth taking on board especially if the patient's painful in that area.

**Steven Bruce**

We need to move on fairly soon. But just a couple more, if I may, Robin's asked whether you'd be able to see if the nucleus was sequestered?

**Darren Chandler**

Yes. 100%. So, on a sagittal, on an axial view you would see high signal and the high signal would sit within the cerebral spinal fluid, it has a gray type appearance. So, within the white area of the CSF, you would see a gray lobule and if it sequestered it generally goes cordally or cephalad, it will kind of move up and down and you'll see it sitting within the spinal canaö.

**Steven Bruce**

And one I suppose which intrigues everybody here is, someone calling themselves Osteo has asked how your findings here would guide or otherwise govern your treatment of this patient?

**Darren Chandler**

Okay, so, me personally, I would be looking as an osteopath to massively concentrate locally at C7 and T1, I'd be looking to do a lot more localized traction with the patient, I would spend a lot less time with the patient prone because that would tend to create more extinction, so would close the foramina. So, I'd treat this patient a lot more in a supine position, with a lot of side lying to the right-hand side so it opens up that left hand side foramina. I would needle down a little bit more maybe into those tissues. I'd just be a little bit more focused in my traction, distraction and local soft tissue work in comparison to not having, for instance, you would spend a lot of time looking at the first rib and the clavicle and the traps, if you felt it was a C8 impingement from that level. So, it just homes you in more, I suppose as an osteopath, to work,

**Steven Bruce**

I suppose the other thing is exactly as you said, the other way it's going to govern your treatment is that you won't be treating the elbow.

**Darren Chandler**

Exactly, exactly. Which a lot of others would if they didn't review this, or they took the consultant's word for it.

**Steven Bruce**

Yeah. We've got some images of Damian here, is this?

**Rob Shanks**

So, this is one of mine. And I just thought I'd put this in as it's slightly unusual in the sense that this is a relatively high, so most disc pathology happens around the C5/6, C6/7 it's a bit like the L4/5, the L5/S1 in the lumbar spine. But this this chap here, so he's, what is it, 2/3, 3/4? Yeah, he's kind of 5/6, but that's quite large for what he's got going on there. And this is now in contrast to the previous one, we can see how this

protrusion is now encroaching on the spinal canal area. And also, in addition, a little bit over towards the patient's exiting nerve root on his left-hand side. So, it's a similar thing to the previous one but it's just the protrusion is a little bit more advanced, let's say. But the interesting thing about him, the reason I put this chap in, is this was post traumatic. So, this was, he had a whiplash injury. And what we were keen to know is whether, well, he was quite keen to know, whether the whiplash injury had contributed to his symptoms, he was getting radicular pain down his arm, pins and needles, etc. And he had had a previous scan, I think it'd been five or six years before. So, we were looking to see whether this was there five or six years ago or whether it wasn't. And what we found on the previous scan was that it was present, but it wasn't as big. So, he did basically have some predisposing degenerative changes around this area but on his most recent scan, he'd progressed to the point where you can see here on the left-hand image that back of the posterior aspect of the disc is actually abutting against the spinal cord now, it's almost deforming it slightly. Not severely so, but it is still now looking like it's impinging on it, and similarly, on the axial image. Whereas on the previous scans that we'd seen, we could see that there was cerebrospinal fluid between those two structures. So, there wasn't cord impingement. Now he hasn't got symptoms of cord impingement, his lower extremities are fine, but he's one I'm keeping an eye on certainly and his main symptoms, as I say, were left sided radicular pain. But, it's a slightly unusual one in the sense that it's a little bit more severe and it's just a little bit higher in terms of the disc spaces that we would normally see.

**Steven Bruce**

Rob, how old is this patient?

**Rob Shanks**

This chap is, I believe, that's a good question, I think he is in his early 40s. I think he's 43, I believe.

**Steven Bruce**

And I'm assuming that this bright signal is subcutaneous fat.

**Rob Shanks**

Yeah. He's a relatively large gentleman.

**Steven Bruce**

I was going to say, it's an unusual pattern. It looks a bit as though it would be a buffalo hump of some sort,

**Rob Shanks**

Yeah, he's got quite a lot of subcutaneous fat this chap. That's what that is. Yeah. As you say, there was the previous patient that Darren was looking at, the dancer, you can see there's hardly any subcutaneous fat in that level, they were very slim. But you kind of know about that before you send the patient into the scanner.

**Steven Bruce**

Here's a \$60,000 question for you. Ellie has asked, should we ever take the consultant's word for it? I presume in this case she means the radiologist.

**Darren Chandler**

No, no.

**Rob Shanks**

No, listen, I think it comes down to knowing your radiologist. And I think it comes down to being on your guard and trusting your own judgment really, and look, take Darren's example that he put up there. Clinically, he found a C8 nerve root impingement and he was convinced that there was one, even though the report said or didn't report it, let's say. So, he had a high sense of suspicion that the report was lacking something. And I think as long as you're, and that's why we're so keen on people knowing how to and being prepared to look at their own scans, because you will pick this stuff up all the time. And that's not to say every single reports wrong, that's not what we're trying to say, but you just gotta be on your guard, I think, and trust your judgment

**Steven Bruce**

Shall we move on and have a look at Jeremy?

**Rob Shanks**

Yep. So, Jeremy is a patient I've been caring for the last couple of weeks and again, it's just a kind of relatively interesting one that I thought I'd put up. Now the reason why I put Jeremy up is because he has actually, well again this another left sided radicular pain, he's actually got a C7 distribution this chap. So, he'd been seeing some previous therapists who were basically treating for essentially thoracic spine dysfunction. And the interesting thing with him is when I when I tested his reflexes and neurologically, he was okay actually, his triceps jerk was present, he wasn't complaining, he was kind of complaining a slight little bit of numbness and tingling, but he was absolutely acute. I mean, as soon as he even attempted to sidebend his neck to the left or to extend, the pain was down the back of his arm, he was really, really in agony. And it was all in the triceps area and he kept complaining of his middle finger, like this pain and pins needles going through his middle finger. So, I was quite suspicious that he had a C7 radiculopathy. And he'd actually been suffering ever since beginning of lockdown and nobody had really got to the bottom of it in terms of diagnosis, so I said, look, let's send you for the scan and let's see if we can see any evidence of that C7 radiculopathy. Now what came back was quite interesting. Okay, so if we just count down the levels again. So, starting on the left-hand side, we can see the top one is the C2/3e disc. Okay, so we've got C3/4, C5/6, C6/7 and then we've got the C8/T1.

**Steven Bruce**

What happened to C4/5?

**Rob Shanks**

Sorry, did I miscount? Okay, 2/3, 3/4. Yeah, 4/5, 5/6, 6/7. Sorry, yeah, right. So, we're on the C6/7. And he was actually quite degenerate on this level on both sides. Now we're getting a hint of it, if you look at the axial image on the right now and we're looking to see, can we see daylight on those exiting neural foramen? And actually, you'd have to say, at an initial look, actually do what he looks, it looks worse on the right. So, what's on the left of our screen, you can't see any daylight and it looks like there's no nerve root space there at all. Now, I can tell you for a fact he's, at the moment anyway, he's got no pain on his right-hand side at all. No pain down his right arm. And the report that came back basically mentioned that he had foraminal stenosis on both sides, so left and the right. But as I say, symptomatically, it's all on the left. And now the reason why I'm mentioning this is because again, it's not all just about the scan. So, the scan is telling us he's got potentially pain going down both arms, but he hasn't, in reality, he's only got pain down one arm. And this comes down to various different reasons, it could be the way he's sleeping, it could be that the actual nerve root is more inflamed or irritated on that left hand side, he's potentially got more muscle spasm. And there's a whole lot of other reasons why he's symptomatic on that side and not the other. And we're picking up, yes, there's potential for it but in reality, the patient was only symptomatic on one side. Now the other the other thing when you go back to that image, you've got to remember is as well, that we're assuming that this is absolutely clean, this axial image is clean right through the middle of both foramen and it might not be, we haven't got the benefit of having the live scan in front of us to go up and down the images. But partly what's going on here is that we're on the patient's right-hand side, we're kind of seeing a bit of a pedicle coming in before we seeing it on the patient's left-hand side. But what we can see, and what I suspect where he's getting his impingement from, is again the areas we've been pointing out on the previous scans. You can kind of see on the, yeah, just move your cursor to the right bit more there, Steven. That's it there and just come down slightly. So, there we've got this disc osteophyte bar here that is encroaching into that- just up very slightly to the gray area, very slightly. There we go. That's it there right on the edge. Now I'm interested then in the shading so how dark is it, how light is it? It's relatively lighter compared with the body of the vertebral disc/body so we're starting to think this is, yes, it's an osteophyte bar but it's not ultra-hard, it hopefully is relatively malleable and squidgy. So, with him I've actually have been, now that I have this scan, I've now, a bit like Darren was saying, I've now started to focus my treatment really closely into this area. And last week he's managed to get the first full night's sleep that he's had for months. And that's simply from the benefit of me confirming, well yes, that is what's happening, I'm not gonna waste my time, too much treating the thoracic spine or too many other things and thoracic outlets and inlets and all this stuff and angiotomy from the thoracic spine because I know that's where it's coming from. And when I focus that treatment to there, it is now for the first time in several months he's now starting to get a little bit of progress. But I've also got a plan in place that if he doesn't get there, he really is at his wit's end, he really is super acute this guy, he's getting to the point where he can't sleep for very long, or had been. So, my next plan is, if I can't turn him around very quick, I will be sending him for a second opinion and potentially for a nerve root injection on that level to try and get him out of pain to start to allow him to sleep better, whilst at the same time probably still caring for him and treating him. It's just about fine tuning your treatment and your diagnosis and knowing what to do with the patients.

**Steven Bruce**

Rob, I can't believe that time flashes by so quickly. We've got loads of your slides left, including a quiz slide I noticed. And we are out of time. I haven't asked all the questions that have come up on my list, if you don't mind, I'll send them to you after the show. And Elspeth, we will try and get the link to that research that Darren mentioned that you've asked for about the number of numbers of nerve centers in the disc. But that's actually all we've got time for today. I don't want to leave without just reminding people, and again, this is not a sales pitch at all but it's just that I think your service is an incredibly valuable one that you're offering to teach people how to do this level of interpretation and you're offering that support service as well, and that's all it goes to go2imaging.com. But we'll put those links up. And of course, the links will also be in the handout pack that comes with the recording of this when we post that, probably today or tomorrow. Darren, Rob, I'm sorry that we've had to cut you short, but it's gone two o'clock and we promise that we do these things for 45 minutes. I'm sure we'll get you back in again, because you're always very, very popular, but thanks for your time today. That's been it's been great. Very informative.

**Rob Shanks**

Thanks, Steven. Great to have been here. Thanks a lot.

**Darren Chandler**

Thank you