

# Cervical Scans

with Rob Shanks and Darren Chandler

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## TRANSCRIPT

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**Steven Bruce**

Today we're going to be doing part two of something we started several weeks ago, which is looking at cervical MRIs and cervical scans. We're doing that with the boys, with Rob Shanks and Darren Chandler. Rob, great to have you with us. Nice to have the boys back in town.

**Rob Shanks**

Hey, good to be here. Thank you, Steven.

**Steven Bruce**

Well, it's been a great day for you, hasn't it? You arrived in your new clinic today to find someone's kicked the door in.

**Rob Shanks**

Yes, unfortunately, yeah, had a boot mark in my front door.

**Steven Bruce**

I'm not gonna make any comments about the merits of setting up a clinic in Essex, that would be definitely unplayable. I'm sorry to hear that, but what are you going to talk to us about today?

**Rob Shanks**

So absolutely, we're going to start where we left off, really, there's a few things we didn't cover in the last lecture, we're concentrating on cervical MRIs in particular. I think cervicals are slightly harder than lumbar. There's a little bit more kind of finicky anatomy that goes on. And there's a few nuances that we need to go through and make the viewers aware of especially when it comes to upper cervical spine issues and what to expect from those scans.

**Steven Bruce**

Okay, and you got a couple of case histories to take us through that.

**Rob Shanks**

Yeah, we got a couple of really, really juicy ones. We've actually got three cases we've prepared, but there's two of them, which are really, really good. I mean, Darren's got fantastic ones to go through it again. So, we must allow him to get in, if I'm running over, please do interrupt me.

**Steven Bruce**

I'm sure Darren will do that.

**Rob Shanks**

Yeah, yeah.

**Darren Chandler**

Get him off.

**Steven Bruce**

So, Rob, do you want to crack on then?

**Rob Shanks**

I'll share the screen. Here we go. So, bear with me a second. Let's start here. So here we go. So, it's part two, as we just said, of the MRIs, we're going to do a couple of case histories. Before we do, let's just go through a few little pointers. So here we have an image of a cervical spine and you occasionally get this and you think to yourself, oh goodness, what's that all about, what's going on there? And this is simply where, particularly on the left, you can see this, that the patient has just been moving in the scanner. So, this is what we call movement artifact. And you'll occasionally see this on the MRI reports, that it may make mention of this, you know, this term movement artifact. And that's simply what it is. It's where the patient's been, you know, rolling around presumably in a certain amount of pain. And the image quality is therefore that much less and it's harder to interpret what's going on.

**Steven Bruce**

There's nothing in there we could misinterpret, then it's just it's fuzzy?

**Rob Shanks**

On the left-hand image that really would be hard to really put your finger on anything, because it is just so difficult to interpret. Obviously, the right-hand image is clearer but it's still not perfect. So yeah, just be aware that does happen sometimes. And be aware that if you have a patient who really is in agony, and if they are not going to be able to keep still at all, in the scanner, is going to compromise your MRI quality and the information you can get from the MRI.

**Steven Bruce**

I actually had a patient just like that not long ago, the one I wanted to discuss with you, in fact, he had a whole-body MRI, which meant he was in the scanner for something like, I don't know, nearly an hour, and he can't extend his neck. And by the time he'd got halfway through this the poor guy was in real agony.

**Rob Shanks**

Yeah, yeah, absolutely. You know, I mean the radiographers do their best, and they try and explain to the patient, right, we've only got one minute to go, please try and keep still, but sometimes it is difficult for the patients. So, it's worth bearing in mind. Okay, so we're going to move on to this one. Now, this is something you would have heard us talking about in the past lots of times, STIR in particular, so the STIR image is this fat suppression image, and coronal as well, coronal view, basically, we're looking from front to back, back to front. And it's well worth asking for these views. We've mentioned it when we talked about lumbar spine, but the same applies for the cervical spine. And often they won't do these unless you ask for them. But if you ask them, they usually will do them and at no extra cost. And it hardly takes them much,

much extra time. And you get again, additional information. So, you can see on here, you can clearly see the patient is side bending to one side. And again, that has a bearing with regards to- and you can even see some slight left to right, maybe shift, kind of in the middle in this one here. And again, it's just useful to interpret, well, you might have, for example, slightly less degeneration on the side here. But if that patient is, for whatever reason, they've got a mild scoliosis and they're encroaching more on that side, that might be why they're symptomatic here and not symptomatic here.

### **Steven Bruce**

Just out of curiosity is there, it's probably an obvious answer, but when we look at a transverse image, we're always looking up the body, with these is the left on this image the left on the patient?

### **Rob Shanks**

Yes, yes. So, you always have to remember, absolutely, so when you go for an axial image, it's always reversed. Yeah, so the left side of your screen, as you say, is the right side of the patient, and the right side is their left side. So, because you're looking from the bottom up. And the same on these sorts of images as well, it's always back to front. And then sagittal STIR as well, again, that's another useful, it's very similar, they'll do these two together. If you ask for a coronal STIR and a sagittal STIR, or even if you just ask for a coronal STIR, they usually include a sagittal STIR as well. And again, really useful sequence to have because of that fat suppression and that therefore means you're going to show the inflammation up, if it's present, much more accurately. Particularly if it's on structures where there's a certain potential for a mixture of fat and water to occur. So, what we can see here again, is we know the left-hand image is a T2 and we know that because the subcutaneous fat is bright, so that we know the fat is showing up bright, but we also can see the cerebral spinal fluid and that's also bright. So that instantly tells us we're dealing with a T2. And then on the right-hand image, it's essentially the same thing, it's a T2 image, but it's had the fat suppressed, so then the fat content under the skin has become darker, it's been suppressed. But what it will also show us is that if there was anything around here that was inflamed, so the interspinous ligaments area, the ligamentum nuchae, etc, if that was showing up bright, particularly bright here, we might not see it here, because you can see there's a certain amount of fat content in those ligaments anyway. And anything bright on STIR around those areas would potentially be significant. So again, a really, really useful thing to have done. And if you don't ask for it, you don't always get these images, and therefore you miss out on that information. Okay, so we're going to move on one, other little snippet, then to remember with cervical spine is that, depends on the center, but more often than not, and particularly with the cheaper scans that around if you ask for a cervical scan, you are not going to get or you'll get some sagittal images, but you won't really get any axials through the upper cervical, sort of cranial junction. So C1, C0, so you're not going to get those axial images. And again, you won't therefore have a report that includes any real comment on those joints. So, for example, you have a patient who's got an arthritic occipitoatlantal joint, you won't know about it unless you have those areas, specifically scanned and often that will be counted as a second scan or a second area. So, a two-part scan if you're going to go for above C2 and you're going to go for the cervical scan, a lot of centers will count as a two-part scan. So, you need to be aware of that. And sometimes you may have to request that.

## **Steven Bruce**

Is there a reason why they miss the top off?

## **Rob Shanks**

I think it's, well, that's a very good question. We're often frustrated by that and we do sometimes do our best to try and say, can you please include that, I think the reality is, it just takes time, it's another set of joints for them to do, it takes time in the scanner, and therefore they're going to have to allocate an extra slot for it. It all comes down to time. So, with some scanning services will allow a 30-minute slot for a patient. And if they allow a 30-minute slot for patient, then more often they're going to include, or they will they will be amenable to including these areas, if you like, in the one-part scan, but they're usually going to be charging a bit more for that 30 minutes. So, Vista and InHealth, they'll usually be 20 minutes slots in the scanners. So, if you ask for a cervical, you're only going to go C2 to C7. And more often than not, if you want to see the occipitoatlantal junction, you have to ask for that as a separate area. Okay, so we move on to our first case study. So, this is a chap called Jeremy and Jeremy came to see me a month or so ago now. And he actually is one of these kind of lockdown patients he's been suffering ever since March. And he'd been having left periscapular pain, bit of arm pain and he'd seen I think, I don't think it's any specialist at that point, but he'd certainly been to a couple of different manual therapists. And initially the idea was it was just kind of scapulothoracic mechanics and all that sort of stuff. And he was kind of really struggling, let's say, some days better than others, but when I saw him, he was in absolute agony and one of these guys had just—you could just see how much pain he was in, he wasn't sleeping very well. And I thought, well, we've got to get him scanned. It was very obvious to me that it was cervicogenic in nature and it seemed like a nerve root type of pain. Although he didn't have, he had some kind of slight loss of sensation, a little bit of tingling in his fingers, the main pain he was complaining of was actually around his shoulder blade and scapula. And I think that actually is sometimes something where we can sometimes get lost, we can sometimes forget, well, this can also be cervicogenic, when they complain, we automatically go to think, well, it's periscapular, there's gonna be something along around his rib joint, it's gonna be something that's gonna be a thoracic inlet, or it's going to be some sort of rhomboid strain. And yes, it can be but with this guy, any slight movement of his neck, any slight tilt of his neck, and he'd be in agony, down the arm, kind of a little bit into the triceps area as well. So, we scanned him and this is what we got back and actually wasn't quite as bad as I was expecting, I was expecting to see a really, really bad nerve root impingement. But nevertheless, there was still some encroachment. And we can see here, for example, actually on both sides of the C 6/7 there's some stenosis on the exiting nerve roots. Now, it's interesting actually, that you would look at this, you'd actually think that his right side is actually worse, but he didn't have any symptoms on the right, all his symptoms were on the left. But I think that comes back to this type of thing, like I was saying before, he also had a certain amount of curvature in his neck and I think that added to the degeneration was what was causing his pain. So, the coronal STIR was quite, the coronal image was quite a useful thing for us.

## **Steven Bruce**

Rob, on the anatomy, and I imagine that most people are familiar with this, the big white blob in your slide, that's spinal cord, the black bit is the disc or vertebral body, is that right?

### **Rob Shanks**

Well, the spinal cord is actually this part here.

### **Steven Bruce**

Yeah, I'm looking at the axial image.

### **Rob Shanks**

Oh sorry, on the axial image, right, so on the axial image here, yep, so in the middle you have the cervical cord correctly, and round the outside, you see, there's almost like a little bit of, not quite a halo but a circle of white, that's the cerebrospinal fluid around the cervical cord. And that's very important. So you want to make sure there is that ring of CSF, if you like, and there's no occlusion and there's no contact with the spinal cord, or no significant contact with the spinal cord. So that would be a myelopathy, for example. So that's one of the important things that we're looking for. And obviously, if that patient was to have bilateral arm pain, particularly if they had leg pain as well as the arm pain, that's something that we're really, really keen to know about. It's that Lhermitte sign, if they're getting electric shock type feelings in all limbs, upper limbs and lower limbs in particular. And the other little tip, I think it's very important as well, when we're examining these patients, even if they're complaining of just neck pain, it's always very important to examine neurologically their lower extremities as well, looking for those upper motor nerve signs, those upgoing plantars, any tonus and clonus in the lower limb, because you can sometimes get those subtle signs of the cord being compromised. So yeah, absolutely. So that's the spinal canal and cord area. And then either side, here, we've got the facet joints, and as you rightly pointed out, this black blob, if you like, is the disc. And that's the essential anatomy we're looking for, but obviously, we've got all the outer spinal structures around there as well, the muscles and the skin and all that stuff. But the crucial thing for any radicular type pain is these exit foramina here. So, these should be clear, I mean, they should be, let's see if we've got a, probably should have brought up a normal, but normally you'd see good daylight coming out of here and nice open exit foramina. And you're getting that impression with here that you can just see there's some sort of mottled and bobbling coming in here. Now the interesting thing with Jeremy is, I initially got stumped by this little, don't know if you can see just at the corner here where my cursor is, it looks like a little spike that's coming out. And you can get misled by that and you think yourself, goodness me that's a dirty, great osteophyte sticking into that foramen. And both Darren and myself have been caught out on occasion thinking that was the case. Now what actually is happening in this particular example, and let's just highlight it here, that's what I'm looking at there. In this particular case it wasn't that, this is actually where he's not lying quite straight in the scanner and you're actually seeing a bit of the bottom of the lower aspect of the exit foramen coming into the pedicle, you're seeing a bit of that coming into view before the other side. So again, occasionally these things, you think big osteophyte, actually, it's nothing, it's benign. But he still did have from some foraminal stenosis this guy and I ended up, because he was in such pain and he wasn't sleeping, and you really felt sorry for him, he really does need some quick pain relief, and I recommend that he went off for a nerve root injection, which he did. And it does sometimes take a few weeks for that to kick in, initially, they'll get some relief from the local anesthetic, but a few weeks down the line. I actually did treat him three times and he didn't really show much improvement and that's why I sent it to the nerve root. Now, I think he's two- or three-weeks post injection now, and I caught up with him last night and he's

actually feeling a fair amount better now. So, he's able to sleep better, and it's getting him on the mend hopefully,

**Steven Bruce**

Rob, I've been asked if you could switch to presentation mode. The images are a little bit smaller. If you put it on presentation, it will fill the screen.

**Rob Shanks**

Absolutely. Yeah, let's do that. How's that?

**Steven Bruce**

Yeah. And since I've got your attention, I got some other questions as well, if I may. Phil's going back to that two-part scan, he asked what the cost of the two-part scan is?

**Rob Shanks**

Okay. So again, depends on the centre but normally, you'll get a discount for the two part versus the one part. It does vary, they won't be paying double, he'll pay something like 75% of the second part.

**Steven Bruce**

And related to that, somebody called Bamboo is saying, if they actually specify, they want to see C1, will that be sufficient? Will that be enough? Will they just do a shifted segment?

**Rob Shanks**

Sorry, if you just wanted to see C1?

**Steven Bruce**

Sorry, if he highlighted that the problem, he expected to find was at C1. Would they just move their scan upwards a little bit and do a single scan?

**Rob Shanks**

Right. It's a very good question. And I know what you're saying, you're saying to yourself, well, don't scan for C2 to C7, just scan from C1 to C5 or something like that. In my experience, it often doesn't happen, unfortunately. And you're a little bit in no man's land when you ask that. There's set protocols with these things, and it tends to be cervical spine protocol or C1 to C2 protocol, cervicocranial junction protocol. So, I think to be sure and to be safe, you really want to speak to the scanning center, rather than just leaving it to the chance. If you ring them up and have that conversation, you might get lucky. But be aware that if you don't have the conversation, there's a big risk, you might get the wrong area being scanned and therefore having wasted some time and money for the patient. Right, let me move on to this one: Carl. So, this was a great one. Now, this is a guy I really felt sorry for. So, he came to see me, again just a few weeks ago and he's a young enough guy, 30 years old, policeman and he's been suffering for three years. Very similar, kind of on the surface to the previous patient I mentioned, Jeremy, and he's getting left sided, again, periscapular

pain and that's what he's really complaining of, levator scap and trapezius and it's really, really bad and it's really getting him down. But when you probe him a little bit more, really say, come on anything else, any other stuff? He does complain of a diffuse kind of pins and needles, slight numbness, around the upper border of the scapula. And the sad thing about him is he's seen so many people over the last few years, actually, I'll come to his summary here. So, he had a scan, way back in 2017 and it did show up some C3/4 stenosis bilaterally, which we can see here. And we can see there's some sort of disc bulge at that level. So, 2, 3, 4. So we instantly know something's not quite right with his spine. And he's interestingly got a slight little listhesis as well of 4. If you look at the way that's lining up to 5 you can see there's a shift. That wasn't mentioned on the report but again, just something we can observe. Now, he had his shoulders checked out, that was fine. No real cuff tears, nothing like that. He reported to me that he'd had an EMG study done and that was all clear. So that almost makes you think well, maybe this is just coincidental and maybe there's no nerve root compression and okay, perhaps that's why he's been told some of the things he's been told, which is there was no surgical target and he's just got to live with it and he had most recently been referred for trigger point injections with a pain clinic. And they'd had absolutely no effect. He told me absolutely zero effect. Pregabalin had been of some use, but this guy when I say he was at the end of his tether, I mean, he literally was at the end of his tether, he broke down in tears in front of me and he said, look, I've lost relationships over this. I'm on the verge of losing my job. He's actually a mounted policeman, so his passion is horses. Someone after Claire's heart, I'm sure. And he was at the stage where he just couldn't do the things he loved doing and the future wasn't looking very rosy for him. So, I went through his case, I actually got all these notes, asked for his EMG studies as well. And the big thing that stood out for me for the EMG studies, they'd only tested C5 and below. So, they hadn't done any EMG studies on C4, which is the one we're really interested in, so C4 is exiting between C3 and 4. And my theory was I thought, strong case that he had to a C4 radiculopathy and when you asked him to extend his neck and sidebend his neck, that reproduced all his symptoms, and he literally said, I'm getting pins and needles now on the top of my shoulder blade, and that pain has increased immensely. So, then you think to yourself, well, goodness, the surgeon's told him we can't operate, there's nothing to operate on. He'd actually seen two neurosurgeons, he'd seen an NHS one, he then paid privately to see another one. And they both more or less told him the same thing. So, he was then seeing physical therapists and being told he had Thoracic Outlet Syndrome and this and that, but again, nothing was helping. So again, I asked for the images, the MRI images, and that's the first one that came across, I thought yep, okay, well, we can clearly see there's a disc protrusion there. But then this is actually slightly parasagittal, so it's just slightly off to the midline. And this is towards the right side, but where he was on the left side, let me just skip to- oh, I haven't included it, oh goodness, don't know where that slide's gone, okay. So, on the other side what he actually has is a massive osteophyte. So, we don't just see the disc here, but we see a huge bony lip, on his left side. And what that is an osteophytic bar. And so, this is no longer on his symptomatic size, no longer now disc material that's compressing the nerve, it's actually bony encroachment. And when I say it was big, it was really big. And to think why he's not being offered surgery baffled me. And I ended up saying to him, look, I'm going to show you this case to a surgeon I know, it was actually Bob Chatterjee, who you've had in previously. And Bob was in absolutely no doubt. He said, listen, this guy has been just totally mismanaged and for him to have surgery ruled out and for him to have been suffering for three years. And again, he's in absolute agony, this guy, day and night. And Bob was aghast that he hadn't actually been offered the surgery, or at least had had surgery



ruled out. So again, similarly, we've sent him off for a nerve root injection. He actually was pain free for 36 hours following his nerve root injection, unfortunately the pain started to come back. And we're waiting to see whether or not the steroid medication in that nerve root injection will kick in over the next couple of weeks. Now, it may do, it may not. It may only give him temporary relief even if it does, I strongly suspect he's going to have to go through and have surgery and he's either going to have to have a cervical disc replacement, or an anterior cervical discectomy and fusion. Bob's suggested he'll probably try and offer him a cervical disc replacement because of his age and to try and avoid the risk of adjacent level disease. But again, unless he had come in, unless we'd gone through his scan, unless we'd kind of realized that actually, he's kind of being a little bit mismanaged here, and second questioned his MRI scan and second questioned the EMG studies, the poor guy would again, be floating around in no man's land and not getting anywhere very fast. So, my message is never be afraid to challenge what the patients have been told before. And get the MRI scans out and if something doesn't look right to you. I'm really sorry, I haven't included that other slide. When Darren's talking, I'll try and find it for you because it's worth looking at. Because it's really obvious when we see this osteophyte.

### **Steven Bruce**

Is it part of the deck that I've got? Because we're sending that out as a handout, so that'll be quite useful.

### **Rob Shanks**

Yeah, I'll double check on that.

### **Steven Bruce**

Can I just go back to that slide, Rob, before we move on? This is not relating specifically to Carl, but obviously, at C3/4 you can see what looks like a disc bulge, there's a fairly big dent in the spinal cord there. I seem to recall you saying in the past that it's perfectly possible for something that looks as severe as that to be fairly asymptomatic. And you're obviously correlating this with symptoms which is different.

### **Rob Shanks**

So, if I'd had the other, so this is actually on his non symptomatic side this is what I was trying to say to you and show you. So, this is a slice just to the right of midline. So, this isn't, like you say, where he's having symptoms. Now this this could be symptomatic, but it's not necessarily going to be symptomatic. But yeah, when you see the one that's just to the left of the scan, left of midline, you can see what the difference is. And they talk about on the report, they talk about osteophytic bar. And that's an osteophytic bar. And it is made up of foraminal stenosis but also the vertebral joints as well. So, they can get arthritic and they're really gnarly and they're enlarged. And then you ask yourself the question, well, why? Why has this guy who's thirty got that level of degeneration in his neck? And nobody was ever, I kept saying to him, have you had any trauma? Have you had a whiplash? Have you had a fall on your head, have you had a blow to your head even? He said, no, no, nothing like that at all. But in the end, we came to the conclusion, I went through all his history, what did you do as a teenager? What sort of sports were you into, any rugby? No, no, nothing like that. But what he was absolutely obsessive over golf. And I said, well, I'm sure golf, he said no, Rob, I was really obsessive. He said, like, literally, I would be out for 12 hours a day, six days a week, 36 holes a

day. And we think probably that's what has led to a lot of this, that he's just really worn out his neck unfortunately. And maybe coupled with horse riding as well, who knows? But it is what it is, but hopefully he's now got at least a path and he's actually feeling a lot more hopeful. He's got some options to try.

**Rob Shanks**

Quick one, before we switch over to Darren, Pietro has asked what the prognosis is for Jeremy?

**Rob Shanks**

The prognosis for Jeremy's good. Let's just go back to his slides. So yeah, it's actually quite good. So, if you look at his kind of disc, better state than Carl, and as I say, the scan wasn't as bad as I was anticipating. And I actually think with Jeremy, what he was mainly suffering was just really inflamed nerve roots radiculopathy. And that's probably why we started to find with him that he had the injection we sent him for is actually starting to work and starting to pay off. And as I was corresponding with him last night over text, he's for the first time actually saying to me in a couple of months, he's now starting to feel a bit better. So, I think with him, he will avoid surgery, I think he probably come in a week or two, once we've got the full knowledge of how those nerve root injections have helped him or not, and then once he's got that result, then I've got to do a bit more with him. He was one of these guys, literally you even just touch him, I could hardly touch him because he was just in absolute agony. But I'm hopeful with him.

**Steven Bruce**

A quick one on this as well, I think: Visby has asked how you differentiated the disc from the osteophytic bar? Because for those of us who are novices at this, it's quite difficult.

**Rob Shanks**

Yeah, I'm gonna find that slide, Steven, because when you see the slide, it's obvious.

**Steven Bruce**

Okay, shall we move on to Darren then, while you do that. You might have to unshare your screen so we can move on. Thank you. Darren, are you still with us?

**Darren Chandler**

Hi, Steven, I'm here.

**Steven Bruce**

Excellent. What have you got to share?

**Darren Chandler**

Well, I've got a nice lumbar spine patient. This is an absolute classic. And one of the reasons why I think all therapists should be looking at scans, because this is at the top of the pile, this patient. Am I going to share my screen now, Steven?

### **Steven Bruce**

Yeah, if you've got the slides up there, that will be really helpful. We're doing it this way because it's much easier for you to highlight things with your pointer than for me to try and do it. But if you can go to presentation mode so we get it full screen, that will be very useful.

### **Darren Chandler**

So, can you all see that?

### **Steven Bruce**

Yeah, that's lovely.

### **Darren Chandler**

Okay, I have got you along the top. I don't know if that's- That's better. Okay, we can all see that? Brilliant. Okay, so we have a 23-year-old male, who's presenting with two year history of central to left lower back pain and this all started around about January 2018. And as per usual, they went off and this particular chap saw four independent private therapists, 2 osteopaths and 2 physios. And they'd been given the sort of diagnosis of discal joint, sacroiliac joint, and one sort of come up with the nonspecific lower back pain based on what the findings were on the scan. So, it's now December 2018 and he presents to his GP in absolute agony and the GP decides to send off for an MRI scan. So, the MRI scan pretty much comes back as what we're about to see and the report is pretty much unremarkable. There's no evidence of any problems whatsoever. So, this is what we're about to look at now. So, on the screen, we have three sagittal scans, and on the far left of your screen, this would be a STIR sequence, in the middle, we have a T1, fat suppressed, and on the far right, we have a T2. And we know the middle one is a fat suppressed, it's not fat suppressed, sorry, it's a T1 which then highlights fat because we can see the CSF and the spinal cord are quite dark compared to the other two. But what I want everybody to focus on, if you look at the bottom left-hand side here around the L5 vertebra, you can see that there is some very, very small high signal present within the L5 vertebral body. If you look on the T1 scan is pretty much unremarkable, we can't really see anything. And there's a slight little bit here on the T2. But on the STIR sequence, we can see it's apparent. And if we go to the next scan over to here, we can start to see that on the STIR sequence, the L5 body's now become even more hyperintense. So, there's more high signal, fluid's brighter. But on the T1 we can now start to see there's a dark image appearing on that vertebral body, and it's bright on T2. So, remember, because we have a STIR sequence present, we know that this has to be a form of fluid sitting within the bone itself. And that fluid generally represents edema, swelling. Now, when a young person, teenage, early 20s, present with this type of picture, we would be thinking straight away that there's been some trauma to the bone, so it could be a fall, or we could be looking at what's known as an undisplaced fracture. Now, if I take you to the next image, you'll see here that the high signal on that L5 starts to track into the pedicle and into the transverse process. Okay. So, this sort of black little ring of bone here, that's the pedicle, and it's going into the TP. And you can see again, if you look at the T1 in the middle, it's pretty normal, it's a normal coloration, there's no white signal. So, we know there's no fat inside it. But there is white present on the T2.

### **Steven Bruce**

This image, I gather, we're just moving slightly further away from the midline with this image?

### **Darren Chandler**

Exactly. So, this is what we would classify as a foraminal or a pedicle view, because we can see the foramina just present here, here, and we've got the nice L5 foramina just here. But we can also see the pedicle as well. And if you look at the superior endplate of S1, there is also some high signal in that as well. So, remember, this was taken in 2018. And the chap has got quite bad lower back pain. Now, I know Rob touched on it briefly a minute ago on the cervicals, but what I wanted to show you, and this is what's so important, is that the orange lines on those two sagittal views represent the slice that we're looking at on an axial view. So, in the middle here, it's not a great picture as I took this off in NHS portal, but you can clearly see here are the two facet joints, okay, and we have the erector spinae here, there's a little bit of CSF and the spinal canal, and then you've got the big black disc, the annular disc around here and the bone the endplate. Now, just look at where that line is. Okay, that line is sitting superior to the L5 pedicle. And you can clearly see it also on the T2. But watch what happens when we go to the next slice. Okay, this is the next slice, you can see that the orange line has dropped below the pedicle, which is quite a large space, we would like to see half a mil, a millimeter slicing of this, and we haven't, it's massively jumped almost a quarter of an inch. So, we cannot see the pedicle. So, this would be the way that the radiographer has taken this particular scan. That said, if you look at the axial view in the middle here, you can see that the inferior body of L5 has a left sided, so remember as we look at the screen, it's this part is the patient's left, you can see if this is the midline, on the left-hand side there is some high signal and you can just about see the inferior pedicle and the transverse process and there is also high signal in that. So, as I say, the alignment of the scan isn't perfect. So, you can forgive the radiographer or the radiologist for maybe not picking the axial image up, but we can still see as complete novices here that there is high signal in that bone. But we can massively see high signal on the T2 and the STIR sequences, so we know something's wrong. But as I say the report came back as this, I took this literally from the report and the \*audio drops\* but no fracture can be seen. So, if you get this finding, as I say, it generally indicates that there could be a non-displaced fracture. So, the next test to do for this person would be to send them for a CT scan, okay. And they were sent for a CT scan in February 2020. So, we're about two months on from the MRI. And here are the findings, so there's no focal lesion in the L5 body, especially within the posterior elements. So, we're looking at the transverse processes, the pedicle, and the pars. And the conclusion is that it doesn't demonstrate that there is any lesion within the L5 body and that it was a completely normal L5 vertebral body finding, basically. And I find this very hard to sort of stomach because, I know us humans all make errors, but this particular radiologist would have had almost an arrow pointing to the L5, because the MRI has shown us that there is high signal. But they've looked and as far as they're concerned, there's nothing wrong. So, I'm about to show you know that in 2020, what six weeks ago, so we'd have been looking at beginning of October, middle of October, this chap came to me, absolutely debilitating pain. And he just said I just can't continue and he's been in bed for about 8 weeks. So, I asked him to bring his scans in because we spoke on the phone and here is that CT scan that he had in February 2020. So if you all have a little look on the left hand side, we've got the L5 vertebra. Now, here for the viewers that don't know, this little area here of darkness, this would be classed as the left lateral foramina. So, in the middle of this, we all know that the L5 nerve will be exiting, and that's that black dot that you see just there. But what we're interested in is the pedicle. Okay, so in the pedicle, it's of normal

coloration and you can see that as you go into the lamina and the pars into articularis, it looks completely normal. But now focus your eyes on to the right-hand side of the screen, you can clearly see that the lateral foramina when you compare the left side, compared to the right side, you can see that the superior S1 facet joint, just there, is now if you like knocked off and we have this kind of shadowing erosion type appearance into the lamina and the pars of the left L5. But if you look in the L5 body, can you also see that there is a slightly higher signal, it looks of a lighter gray or white color in comparison to the one on the right side? So, what we're looking at here is some kind of defect within the bone, there's an abnormality. And if I take you on to the axial view, you can clearly see here, this patient has a hole, okay, inside the lamina. And this hole tracks into the pedicle, into the pars., and you can clearly see into the TP, transverse process, and if you go over to the right-hand side, you can see that there's discoloration as well within the body. And that extends downright the way through. And you can see the facet on this corner also has a change in signal. The right-side facet, look how nice that looks, the cortex here has completely changed. So, what we're currently looking at is we're looking at an osteoid osteoma. So, we're looking at a benign tumor that was failed to be picked up back in January of this year. And of course, one of the characteristics of an osteoid osteoma is that you get quite bad night pain. And around about June, July this year, he started to present with quite intense night pain. So, I kind of sent the scan off back to a consultant, one of the chaps that Robert and I use, and don't forget, this is the same CT scan that the original radiologist was looking at. And you can clearly see that an osteoid osteoma is present in the anterior inferior margin on the left lamina of the L5 vertebra and it's about 1.2 centimeters size, front to back. So, it's just incredible that this was never picked up and I kind of feel for the chap who's 23 because he's been bedridden. And for some of your viewers today, I just want to show you what classes a bedridden patient. Can you see on the STIR picture just here, can you see in the subcutaneous fat just here, he has high signal. So, within his fat, he has water. And the reason this water's there is because he's been bedridden for at least four to six weeks. And this would be a clear indication that he has fluid starting to pool within the subcutaneous fat. So, this is generally a good indication before you even speak to the patient, that they've been in a supine position for some period of time. And in this particular chap it was due to his pain. So thankfully, this chap has been referred to the Stanmore tumor unit and he has undergone surgery. And the reason surgery has had to take place with this particular individual is that it's on the inside of the lamina. So, it's literally intracortical and it's internal. Normally, with an osteoid osteoma, you would go through an ablation technique, where they would burn the blood vessels to stop the excessive growth, but because it's on the inside of the lamina, they've had to surgically go in and then cut this away to be able to do the ablation. So, it's been a little bit more of a procedure than what you would have hoped but at least we've managed to get him into the right road. And thankfully, he's being looked after as we speak. So, yeah, a great case but unbelievable it was missed.

### **Steven Bruce**

Indeed. Darren, if you bring that slide up once again, I've got a question from Martin, who says that on one of the L5 images, it looks as if there's a fracture, and I wonder, if we go to the one that you just had up, the final slide there. If we look at the right-hand image, there's a line running through, yeah, there and the other side. What are those lines?

### **Darren Chandler**

So, what we're looking at there is that this bone just here, this is the inferior facet joint of L5. And this is the right inferior facet joint of L5. And what you're looking at here is this is the S1 as it's coming up underneath. It's just the way the facet joints are orientated, because we're still at the level of L5 here. So, as you scroll down this facet joint on this side and this side will start to come more around in a coronal plane.

**Steven Bruce**

Yeah, I may have got the wrong image there, I'm not sure. It's difficult to know from Martin's question. But I wonder if we've got time to rush back over to Rob, if he's got that image that he was going to show us before we run out of time?

**Darren Chandler**

Yeah, have you got it, Rob?

**Darren Chandler**

Got it, yeah, I was muted. Yes, I've got it. Got it all ready for you.

**Steven Bruce**

We've got about 90 seconds left, I think.

**Rob Shanks**

Okay, here we go. Right. So, let's start the one we had before. So, let's try to do the slideshow as well. So, this is the non-symptomatic side and it's disc material. If we then go to the one that I'm really interested in, it's here, now you see what I'm saying about here with the osteophytic lipping? You can see now it's no longer disc, really, it's bone. That is never going to change in a month of Sundays and that's where his symptoms are coming from, I'm sure. And as soon as I saw that, I just thought to myself, this has got to be a surgical case. If we can just confirm that that is the level of his pain. And I think the fact that he had 36 hours of relief with the nerve root injection is indicative of that.

**Steven Bruce**

Well, he must be very grateful to you.

**Rob Shanks**

Yeah, I think he is. Yeah, thanks. Yeah.

**Steven Bruce**

Brilliant. Look, I'm sorry, we've run out of time. And I'm very sorry, if we didn't get the chance to ask your question, if you sent it in. I've asked as many as I could but obviously, I didn't want to interrupt Rob and Darren, as they were going through that. You've probably seen the logo on the slides there, Go 2 Imaging, Rob and Darren run an excellent, excellent service in helping us physical therapists learn to understand MRI imaging and elsewhere. And I'm sure if they just go to [go2imaging.com](http://go2imaging.com), Rob, they will find the info they need. I'm seriously hoping we'll get them back on again because we're not here to castigate radiologists or

poke fun at them or pretend that we know better, but it's really, really helpful, I think, when we can see that even people who we regard as experts in that specific field can still make mistakes. And it's okay for us to challenge that. Thanks to the sort of advice we're getting from guys like you two.

**Darren Chandler**

Yeah, without a doubt, Steven, like I say, I think more of us take a little insight into it. And some of this stuff is so easy to pick up, you don't have to be an expert. We could all see there was a white area on that bone. Just that alone, go with your gut feeling as a therapist. I think we're all on the right lines, you know.

**Steven Bruce**

Well, many thanks again to you, Rob and Darren. It's been great to have you on the show. We will pester you until you come back and help us again. But that's all we got time for today.