Academy of PHYSICAL MEDICINE

Broadcast Transcript

Nick Birch FRCS (Orth)
Spondylolistheses and Sports-Related Back Pian

- Well this evening once again I am joined in the studio by Nick Birch who is a consultant spinal surgeon, Sorry, he was a consultant spinal surgeon, he's now a spinal consultant. He's got years of experience in surgery. He's stopped doing the surgery itself now and he operates as a consultant offering people advice to a large extent on non-surgical management of back problems, but he works within this fantastic multidisciplinary center in Moulton, just outside Northampton. I think this, Nick, is your third time back with us now?

- Yeah it is.

- Welcome back.

- Thank you very much.

- Great to have you here.

- Thank you for the invite again.

- And we're gonna talk about spondylolisthesis. Have you got a particular interest in spondylolisthesis?

- I do, 'cause I treat professional sportspeople. Quite a few of them, particularly cricketers and of course we know there's a high incidence of spondylosis and spondylolisthesis in elite athletes.

- Do you get these from Moulton College? Because there's a sports therapy course run there. So do you get a lot of sportsmen coming as part of that to your practice?

- Partly, partly, but over 20 years as a consultant having started off originally setting up the orthopedic services for Saracens in the pre-professional era in rugby, and then going into professional rugby and then with the Saints when I moved to Northampton, so my sports medicine practice has been going for 20 years. And it's drifted into cricket particularly and I have a liaison with the ECB, and the CMO of the ECB is a friend of mine so we have quite a significant network there and doing quite a lot of stuff. Quite a few counties send me their players.

- So do sportsmen make up the bulk of your practice?

- No no, it's a proportion. It's maybe 10, 12% of the practice. The majority of my practice is degenerate neck and back pain with a little bit of stuff thrown in else where.

- Is this the more interesting stuff?

- It can be, it can be challenging. Sports people are, you know they function at a very high level and that means that if you start to talk to them and say, "Well, you know, you can accept "a bit of this or a bit of that, "maybe not functioning at such a high level." They come back and say, "No. Because actually that's my job." So you have to be really tuned to what they are going to do in their careers and their life, and if you don't get that right then they'll go somewhere else which is fine, but also Nick Birch then tends to be sort of known, "Well he's not very good is he?"

- Well possibly, I doubt that myself. We had a discussion about this last Wednesday, didn't we, about some people with contrary opinions to your own.

- Yeah, well you're allowed contrary opinions, that's fine.

- You had a presentation recently on spondylolisthesis in juvenile athletes I think didn't you.

- Yes we had a whole day in London at the Royal College of Surgeons at NSpine which is a big educational event, lasts for a week and I chaired the sports spine day last Tuesday. So we had a lot of people coming along, talking from the point of view of managing spondylolysis and spondylolisthesis conservatively all the way through to investigation and then the operative management if they need it, that minority of patients. And we talked about other things as well. Rugby players' necks, football players' backs. So we had a fantastic day, it was really very exciting.

- So what are you gonna tell us about spondylolysis and listhesis?

- Well I thought what we could do we start off by actually defining what spondylolisthesis is, and spondylolysis, and looking at the various types of it. But I only want to talk about one type of it. There are five basic types. So the developmental type is when a child will get a spondylolisthesis early in life, usually before the age of about 10. Before they start their puberty. Going on from there they get the lytic type which is what we're gonna talk about today. That's the pars fractures. The degenerative type which a lot of people watching this are going to be seeing very frequently because it really is common and over 50 years old in women one in 10 will get a degenerative spondylolisthesis and for us over the age of 60 it's about one in 1 as well. We just lag behind the women a bit. Then there are the traumatic types and the pathological types which we don't need to discuss today. But in reality it's a big topic. Lytic spondylolisthesis affects teenagers, because that's when it first presents but also the adult population so increasing frequency from about the age of about 35, 40 onwards.

- I'm actually quite surprised that it does affect young people. And you haven't talked about the incidence in young people yet and certainly the incidence in the under 10s.

- So we know it's not congenital. You don't get born with it. The incidence at birth is zero. But by the age of 6, 4.4% of the Caucasian population will have pars fractures. So it's quite high, one in 20 really. So there's a big genetic component to it. So for instance, in people of Afro-Caribbean descent, it's really quite rare but Eskimos, Inuits, 50% of them will have pars defects. So the congenital element is not there but it's developmental and about 4.4% as I say by the age of six. By the age of 15, 6% of the general Caucasian population will have pars defects. Now it's higher in elite athletes. So if you've got a rugby player, cricketer, gymnast, et cetera, that could be up as high as 15%.

- Is that the number that has been found in that population or has that been extrapolated from studies because,

- That's been actually found, There's been some fantastic longitudinal studies that looked at that and derived those numbers over the last 50 or 60 years so we know that those numbers are representative.

- And the ones that go without being diagnosed, beyond 15 whatever, what are the consequences? You're probably going to cover this later.

- Nothing, the majority of them, you may have pars defects in your back Steven.

- How dare you!

- You wouldn't know it. Well given that, if you think about it, 6% of the population by the time they reach skeletal maturity have got pars defects. So in a population of 53 million in England at the moment or the UK, that's about two and a half million people. Well two and a half million people aren't running around saying, "My back hurts because I've got some pars defects." The majority of them don't know they've got it. So they're found coincidentally. So nowadays we scan people more, in the old days when we used to do x-rays, you actually see people who've got pars defects and they'll say, "I'd no idea." It's a bit like spina bifida occulta. Which is also about the same sort of incidence, about 6%, so you tell somebody, "Well you've got spina bifida occulta." And they go away and say, "I've got spina bifida, "I must have something really wrong with me." Actually they don't have, they just have this thing that's been there ever since they were growing up as a small child. So these sorts of congenital problems like spina bifida occulta, the developmental problems like spondylolysis are only really important if they cause symptoms.

- Right, and presumably then there's a danger later in life someone gets back problems, we're associating the back problems with the pars defect and they may not be the cause at all.

- Quite right. And actually there's some good work that shows beyond the stage of skeletal maturity, the pars defect itself is rarely a cause of back pain. In fact, hardly ever. What it can do is you can begin to get a pseudarthrosis in the pars defect so you really get a false joint and that then becomes arthritic and when that happens you can start to get encroachment on the frame end, so you start to get neural compression and usually it's the L5 nerve root because the majority of these cases are at L5 S1. And that then is the pseudoarthrosis that's doing that, but that's leg pain as opposed to back pain.

- You were gonna talk to us I think about how these present in clinic. Are you gonna concentrate mainly on the younger population in this?

- Well I thought we could split it up into two. Because the younger ones really interest me because I see those in clinic. They're the ones come from Moulton through the Sports Sciences. They come from the local clubs. And the problem with that is you're not just dealing with the child or the adolescent, you're dealing with the parent and the coach. And that's a real problem, not necessarily because they're difficult but actually because you've got, there are issues with consent so you've got to have people in that room who are happy to be there. You've got to put it on a level that all of them will understand.

- Do you often get the coaches coming too?

- Occasionally, occasionally, about one in, well one in five consultations the coaches will come. The other side of people are the physiotherapists. The physiotherapists come with the professionals usually but the coaches often will come with the you know, the elite sportspeople. And they really want their adolescent to do well, they don't want them to be out of sport et cetera. So when they,

- So are they, Sorry.

- Sorry. I was going to say, because their ambition is that person is going to go on and get an Olympic medal. My ambition is that they get well.

- Does the coach generally come with the aim of devising a training routine which will best suit this injured athlete, or do they come to try to minimize any impact that your recommendations will have on the training regime?

- The latter, to begin with and the former after they've had a bit of education. So the reality of this is that a lot of coaches don't know about spondylolysis or spondylolisthesis. They don't recognize that 15% of their charges could get it. They don't understand that actually they need a period of rest. They've got to stop doing whatever it is that's causing the problem which is repetitive extensions and flexion. Once they've done that they need to have a graded return to their sport. So they've got to manage it. Now I talk to these youngsters and say to them, "If you are going to be a professional sportsperson, "bank on a fifth of your time being spent "either being injured or recovering from injury "and only four fifths of your time playing sport. "If you do that you won't be disappointed.

"Now you might be very lucky "and it may well be that you'll go through your career "and you'll be absolutely fine, you won't have a problem. "But that's pretty unusual." What the coaches want is perfection all the time. They don't want an injured player so they're not really interested in rehabilitating the injured player. They're interested in the injured player saying, "When can I come back to play sport "at a high level, so that my times, my Pbs "are not coming down et cetera." So trying to get them involved in that rehabilitation process is a process of education.

- It seems odd because every coach, every sportsman's well aware of the RICE protocol aren't they? And the variations on that, and rest being a primary component of that. But yet you're saying that actually the whole business of graded return to sport is a difficulty for some of them. Is it just because the graded return is much longer in a case like this.

- Yes, at the end of the day it comes down to first of all making the diagnosis because if you've got a team sports player who's developing back pain, gets worse through activity, gets a bit better with rest, so they've got an intermittent problem to begin with, that's tending to be pushed under the carpet, they themselves won't admit to the coaches often that their back's hurting. But then it gets to the stage where they actually can't perform so the coach notices it because they can't do PBs, they can't actually you know, get their interval times going. And then they come along and you've got the process of investigation. Now we have the problem in this country of course, that you know investigation can be quite slow. If you've got an NHS practice and you're going through that slow process, the NHS, to get the scans, x-rays, and all the other bits and pieces it can take quite a lot of time. In the private sector, okay, that's fine. But we can argue about the politics of that another time. So it might be slow, sometimes it's fast, but it's gonna be a few weeks. So already you've got a kid who's got a few weeks of time where he's not performing very well. Then he's got the investigation period and then having made that diagnosis you then tell the coach, "Actually you know what, this guy or this girl "has got to stop doing whatever they're doing "for six or eight weeks." And then they can come back into the graded program and that might take them two or three months so you're really talking about four or five months so a good example is a 16 year old girl up at Wrexham school who I was treating. She's a tennis scholar, she was heading towards the upper echelons of British tennis, developed bilateral pars defects and after six weeks we got a message from the coach saying, "Well why can't she come back to tennis, "everybody else I've ever seen who's got a pars defect "got better after six weeks." So what I had to do then was actually get the coach down and sit him down with her and her parents and say, "This is why not." and then they begin to come round and say, "Okay, fine." And actually it took her nine months, but she's back to playing completely normally now. She's a bit behind where she would have been but she's still got great potential. So it's the buy in really, that's the key with coaches.

- And was the process for her non-surgical?

- Oh yeah, I mean the vast majority of these are non-surgical so it's really rare to operate on an adolescent. If you've got pars defects, just themselves, if they're fresh, then they've got a 70 to 80% chance of mending as long as you treat them properly. If you've got established chronic defects they rarely mend, and if you've got a bilateral one, so a unilateral pars defect, 70 to 80% chance of mending. Rest the player, give them the right treatment, get it mended up and then get them back to sport. And they go a strengthening hardening process where actually once that bone is healed using effectively Wolff's law you've got to put pressure through that to build it up and actually to make it stronger so it doesn't go again under the same loading. When you've got a bilateral defect there's only a 20% chance that'll heal and usually that's because we've caught it later on so it's a more chronic condition. If you get a really acute bilateral problem, okay so you can just stop them doing what they're doing, hope it heals up, if it does, one in five chance that's fine then they're okay. But, once the pain's gone, even with bilateral defects, there's no correlation between the radiological appearances and the pain. So actually, if you've got an established defect, as I said earlier, the pars defect itself once it's established and sorted and once you've got to the stage of sort of late teens where they've finished their growth, there's no suggestion that actually that will actually cause pain. So it'll be other things that cause pain, the disc or muscles or whatever else.

- Okay. Do you think these are easy to recognize when they present?

- Well they are to me, because they've been filtered. I was thinking a lot of us, chiropractors and osteopaths, we're getting people and thinking, my God, we don't want to do any more damage.

- Okay so in general practice, what are you looking for? You're looking for the sort of typical candidate, if you like, is a sporting youth who comes up with an aching back pain, low back pain. It's usually across the lower back. Can be unilateral but usually it's bilateral. Might go into the buttocks a bit. They rarely present with any leg pain, they rarely present with any neurological symptoms. So if you see a child aged 11, 12, 13 or whatever else who's in the growth period and get that sort of history be very wary. Because actually if they haven't completed their growth they can then, that's the time when they can progress. So if you treat them as though they've got just a bit of back ache, a bit of muscular strain whatever else and you go on for six months, 12 months and then they turn up with a serious problem, you think, oh, should I have done something differently. So I think that there's an age group where you are going to have a higher level of suspicion, that's around puberty, just afterwards in the growth spurt. If they're 15, 16, 17, finished their growth actually, you know what, you can treat them symptomatically, that's absolutely fine. If they don't get better then well then you do the usual thing which is where you say okay. The pressure comes if you've got a high level athlete in the post growth period that if you're treating, they're not getting better and the parents and the coach and the athlete themselves are saying, "Why aren't I getting better?" so they'll drive that process of referral.

- We've had question already from Matthew Davis. Matthew's one of our prolific questioners on these broadcasts, so thank you Matthew. He wants to know the top ten reasons that pars defects are acquired. What's the most common reason for it?

- Well, no, there's only one and that is the acquired pars defects are repetitive extension and flexion of the spine by whatever mechanism that is. In boys in this country, cricket is the commonest cause and that's fast bowlers basically. In girls it's gymnastics. But anything that produces repetitive bending and flexion, strain on the back, can produce pars defects. In athletes it's about 15% of them will get that and if you look at the professional sportspeople at any one time 35% of them will have some sort of stress reaction on either MRI scan or a bone scan. So if you think about it, somebody comes in, they're presenting with back pain, bit of radiation to the buttock, better with rest, comes back with activity, in that age group, you know, you're thinking, well what's your sport? And if they say, "I'm a gymnast, "I've been doing it since I was six" Be very suspicious.

- Ballet dancers?

- Yeah ballet dancers can get them so that's because of the extreme they put their bodies into. And runners, shall we show the pictures?

- Please.

- So this is the picture of an 11 year old girl. She's an elite runner. As an example of her training schedule, on a Monday she'll do a rest day, so that means that she'll be doing a little bit of interval stuff, maybe a couple of kilometers running. On a Tuesday she's looking at a five, six K run. On a Wednesday she may be doing a hill climb. Thursday, resting. Friday, then getting ready for the weekend when she'll have an event on the Saturday and on the Sunday she'll go with her dad and run between 11 and 13 kilometers.

- She's 11.

- She's 11 years old and she's about four foot nine. But she's a superb runner. So she presented to a colleague of mine with heel pain about a year ago and the diagnosis was Sever's disease, so that's osteochondritis of the growth plate, of the apophysis. That settled down, that was on the right side, and then she got the same about October or November last year on the left side. And that hasn't got better, to the extent she can't put weight through the left side. So she's been on crutches now for many months. She hasn't run obviously, and at some point then they realized that there might be something else going on so they did a scan and this is the scan.

- So how long between realizing there was a problem, getting on crutches and finally getting some analysis done?

- A number of months, a number of months, because she didn't have back pain,

- Right, she just couldn't bear weight.

- So what she had was pain in her left heel with tingling and pins and needles and she couldn't bear weight on it. Now, you know, because I'm a suspicious person I just deal with the spine. To me that just says, "Oh well that's a nerve root problem "in the back." but if I was a foot and ankle surgeon I'd say, "Well that's Sever's disease, "and that's a heel problem." So you can see where the difficulty is because if it presents like something else then you're not going to think about something else. And I think she even had changes on the MRI scan of her heels, which you kind of expect in that age group anyway, if they're doing a lot of running.

- Sufficient changes for a specialist to say, "Yes, this could be Sever's?"

- Yeah, yeah to begin with. And of course the radiologist would have said, "Probable Sever's" So you know earlier on. And of course it's once you've actually treated them and they're not responding that way, then you start to think, oh actually maybe this could be something else. But the real issue here, and the x-ray, the MRI scan shows that this is a grade two slip here, where there's about 30% there between the back of S1 and where the back of L5 is and on top of that if you look at the back of the sacrum here there's no bone. So she's actually got quite a significant spina bifida occulta. So she's got a combination of a congenital and an acquired problem. But the reason why she's got leg pain is if you look at the foramen, look at the foramen up here, L2-3, L3-4, L4-5 you can see the nerve root.

- Yeah, that's the white blob or the black blob inside the white blob?

- The dark gray blob and inside, and the bit around it is fat. Come down to here and there's a slit where the slip is and that's the right side and that's the left side. And you can see that L5 nerve root is just a ribbon. And that is why, because when she stands up there's a bit more pressure on that so effectively that nerve root's got nowhere to go. So she is one of the rare cases that's presenting who's going to need surgery. She will not be able to manage. She hasn't hit her growth spurt yet. So we know that progression occurs when a child is post-pubertal and then into the growth spurt. If they've already got grade two, there's a very high chance that she could get a grade four with that. So she's going to go off and see a pediatric spinal surgeon in the next few weeks and then talk that through and then decide to, you know, how that's to be managed.

- And what's the prognosis for an instance like this, in an elite athlete at 11?

- Well the problem is that she's got that change already at L4-5. So the answer she's actually got a two level problem. And the prognosis for then going and having a high level career is poor.

- How did that go down with the coach and the parents?

- The problem is so far that only mum's been to visit us, father and coach have not accepted that there's a serious problem that might then impact on her future sporting career so we have that conversation to come, or at least somebody else has that conversation to come when they go and see the pediatric spinal surgeon so yeah it's a really problem.

- And how is the child herself taking this? Because if she's set on a career as an elite athlete it must come as a bit of a blow, even at 11 you must realize that this is serious surgery.

- Well the good thing about being an 11 year old is that you just like running. And that's what's fun, all she wants to do is get off the crutches and be able to run around with the girls in her year again. She's not worried about making PBs at this stage. That's not her major concern. She loves running, yes she's very good at it which is very nice to be able to beat the other girls on sports day or at the meetings or whatever else so that's not her concern. The concern of her father and her coach is that she's not going to achieve her potential. That's their worry. So actually, the girl's fine, she just wants to be able to get better so she can get off the crutches, not have pain in her heel, walk normally and then run again. And she'll be able to run recreationally but she'll never be a high class runner if she has a two level fusion.

- And that two level fusion will completely immobilize which joints? 4-5, 5-S1?

- Yeah, 4-5 and 5-S1.

- And that'll be done by what method? Last time you came in I think you showed us some videos of keyhole surgery and drilling out discs and shoving in screws.

- You can do it through keyhole surgery but the long and short of it is you make little stab incisions in the back of the spine and put screws down into the vertebrae through the pedicles, link them together with rods. The big problem with these grade twos is what happens to the disc at front because if you reduce that back to a normal alignment, if you imagine it, you've got the spine slipped forward like this, you've pulled it back, well what's happening at the front? There's nothing at the front. So then you have to put something at the front. So occasionally you have to something from the back and also a second operation through the abdomen to get into the front and give another bolt to the front. Now it's possible that you might get away with a single level fusion and at the L4-5 level, if it's all put back into the right alignment might actually, over the next few years as she's developing more it may well mend itself and get better. That's always a possibility you know, you just never know. But at the end of the day it's fix it, fuse it, make it solid because she's lost the mechanical tether at the back of the spine, that's the pars defect. So that's got to be repaired.

- And what, assuming she has a two level fusion, what then is the process for her? You like your graded return to some form of exercise. So how long will it take? And who would you send her to?

- Well she's got to mend first, so the bone has to heal. And that's going to take somewhere in the region of 16 to 20 weeks. So assuming the fusion goes well, everything's fine, no complications, you're looking at about four or five months before you can really start to do any impact but during that time they can swim they can do a bit of cycling, they can walk obviously, we get them going into the hydropool quite early so they can do none weight-bearing activity and do their cardiovascular stuff and then keep things moving which is fine. So what I'd normally do would be to get them walking from day one and they'd have a walking program at the start with just say three, 400 meters twice a day. Do that for a week and then go up to five, 600 meters twice a day and gradually increase that until they're doing two and a half kilometers twice a day. Once they've got through that, that's about six weeks then they go into a formal physiotherapy program, reeducate all the muscles, that'll be then hydro. Once they've gone through hydro for a six or eight week period then they're coming out, then they're starting to do a little bit of gym work, a bit of cycling and a bit more swimming actually in the open pool Then by six months, that's when, if everything's all healed up then you can start to do some impact work.

- Right, that's sort of a long time isn't it?

- Yeah it's a long time.

- But she'll be back in the playground with her friends relatively soon, not running perhaps but maybe a bit more like a normal 11 year old.

- Yeah, I would keep her off school for about six weeks and then let her go back after about six weeks. So homeschooling for those six weeks and then that's fine. The reason for that is actually, if she's feeling well, the temptation is to do stuff. And if she hasn't quite healed she could retard the healing. As a a result of which then the longterm outcome might not be quite as good as she would like.

- Is she likely to be receptive to her telling her that?

- Well it won't be me, it'll be the surgeon who she sees.

- Yeah, I was going to ask, you talked about patients in that condition being able to go swimming. Do you have any concerns about what stroke the do? I always advise my patients against doing old ladies' breast stroke where there's lots of extension of the spine.

- So old ladies' breast stroke, I think you're absolutely right and that is a terrible thing to do to your back and of course all these old ladies who do it, you see them lane swimming up and down with their heads up here, keeping their hair out of the pool. It all looks very graceful but it's not actually because they've all got degenerative backs and they're all putting lots of pressure through their facet joints. And when you see them actually get out of the pool they're all going like this:

- You have an edge on me, I don't sit at swimming pools watching old ladies get out of the water.

- I taught my two boys to swim years ago in a pool down at the local leisure center which is a constant temp pool, which is great so they could then swim, and these old ladies were really really hacked off that two young lads were coming and having a good time. But they'd swim anyway. So I did observe them because I tend to do that. But you're right, in people who've got back pain in general then swimming flat is fine, swimming in extension often is gonna produce some facet joint pain if you've got that. But with a pars defect, that will then, particularly in the early stages when those pars defects are still active, that's what you want to avoid. You do not want them to go into that forced extension. So that's why when in the past people used to use an extension brace, stopping them going into hyperextension, keeping them in a flexed position, because that stopped them irritating that pars. So yeah, you're right, front crawl's usually okay, butterfly absolute no no, so that's just repetitive flexion and extension. Backstroke's all right, as long as they do it properly, but breast stroke, with your head down, goggles on, breathing to the side or once every six or seven strokes up and breathe in that way, as long as you're not going into hyperextension it's fine.

- There's not many people who can do that are there?

- No, it was described to me once by an ex-international swimmer and she said, "You can either swim like a saucer "or you can swim like a teacup." If you swim like a teacup you're gonna have a bad back but if you swim like a sauce you'll be fine. And that was actually quite a good description, because if you swim like a saucer and you're flat, swimming like a teacup, and you've got hyperextension, that's pretty useless.

- That'll go down well in the notes from this broadcast. You said back braces used to be used, extension braces.

- Yes, so extension braces, they've looked at that now and there's been quite a good review of the literature and there's no evidence at all that extension braces have any beneficial effect in the acute management of pars defects. What they do.

- Post surgically though?

- No, extension braces aren't, I used to put people into really rigid orthoses after a fusion and I gave up once we'd got really decent implants and you could fix the spine internally very solidly. If you then wrap them up in something that just stops them moving, all that happens is three months down the line they start to try to move and they're stiff as anything, then you've made the rest of the spine stiff so they have the devil's own job of actually getting going again and that's a real problem. So extension braces particularly in pars defects, the evidence there, and there's good high level evidence, shows that that's not effective but it's quite useful to remind somebody that they've got a problem so we use it as an aide

memoir, not as a therapeutic tool. Post-surgery, then again, it reminds them that they've had an operation, that realistically they just shouldn't go mad.

- Okay, rather like tubigrip. I always think, you know, that tubigrip over soft tissue injury, there's a little bit of proprioceptive feedback probably but at least it reminds you that there's problem with your elbow or your knee.

- Yeah, I think you're absolutely right. I mean, I don't know what the evidence is for tubigrip but having had a torn calf muscle many years ago when I was playing rounders all I found the tubigrip did was it actually made my leg swell up more because it rucked up and didn't allow anything to circulate.

- That's rounders for you isn't it.

- Yeah, so there we are.

- So you've just brought some more images. Is this the same, it's not the same young lady is it?

- So what we're looking at here is the progression of how pars defects develop. So to begin with, you don't just get a fracture, you begin to get stress reaction within the bone. And the great thing about MRI scan is it's allowed us to then diagnose stress reactions and stop these things at an early stage. So if somebody's coming up with back pain and you do MRI scans, so they've had five, six, seven weeks of back pain, they're in the right age group, they're a sporting person so there's a high index of suspicion, they go and have the MRI scan, what you'll see often is this pale stuff on the T2 signal in the pedicle and the pars. That stuff there. That's edema within the bone. So that's a stress reaction. Now at that point, if you say, "You've got a stress reaction, you need to stop your sport "for six weeks, then get back into graded over six weeks, "in three months, as long as the stress reaction "then settles down, you can get back, which is fine. "If you go on for the next six weeks, "the likelihood is you've got a pars fracture. "In which case you might be off your sport for six months." So identification early of a stress reaction can be quite useful in reducing the amount time that they actually are off their sport. When you look a bit further, here's the stress reaction there but at the back of it you've actually got a defect in the pars there. You can't see the bone there, that's the established pars defect. So here, that wedge there, that's the edge of the pedicle, and there's the pars there and you can see there's just no bone there so you should be able to see a nice raft of bone there and you can't. And then on the axial views, these sort of great big masses there, these are the stress fractures that you see on the axial. That's the typical axial view of the stress fractures and that's usually L5-S1, is the L5 pars is where almost 90% of these pars defects occur.

- And in that particular image, the black is the fracture.

- Yes, yeah it is. So what you've got here is the sclerotic bone, these are unhealed pars fractures so in an adult you might see some high sigmoid there because they'll be the ones where you get the pseudoarthrosis, so they literally get

synovial fluid in there, so that's the separate picture you get, but in kids then you see this. We call this an elephant's foot, because it looks a bit like an elephant's foot. That's a non-union that's been trying to heal, hasn't managed it, just the same as you'd get in a normal long bone fracture. It's got an exuberant amount of callous around it but it hasn't gone on to unite, so you get this big swollen elephant's foot appearance.

- Just out of curiosity, assuming someone goes for an MRI, is it common for any of this sort of stuff to be missed by radiologists?

- No.

- I'm not trying to put down radiologists, but obviously they do miss some statistically.

- A lot of it comes down to the information you give them. So if a clinician writes on the form, 15 year old, back pain, the radiologist has got no context. But if you write down, 15 year old, elite athlete, fast bowler, query spondylolysis, they're going to look for it. So the more information you give the radiologist the more likely they are to be able to pick it up. And occasionally if you don't give them lots of information and if the scan is technically not a perfect scan and if for instance, there's a lot of teleradiology now, so you've got a scan that's been done locally and it may be, you know, reported on the other side of the world and if they don't know about cricket or whatever local sport it is they're not going to think about it. If they don't think about it, they might miss it. So it's not common. But the other thing of course is that if you're a spinal specialist, you should be able to read lumbar spine MRI scans, those local MRI scans really as well as a radiologist. So if you've got a clinical suspicion that there's a problem then if you miss it, then really you're not doing your job.

- But we saw in our clinic certainly, and I suspect I speak for quite a lot of the people watching, we don't get to see the images very often.

- No you don't.

- What we get is the MRI report. That has been generated from a GP's referral in most cases.

- Yeah, so the big problem there is that the GPs, they've got access to MRI and they don't have the ability to interpret the MRI and make sense of the report. So all they get is a report. Now the problem with a report, is it's going to say, there's all these things on this scan. So it could say nothing, could well be that the patient's got no structural problem but they might have a functional problem like a muscle problem. Or it could be that they've got a really degenerate spine. And the MRI report will come back this long with every single level having something. And the GP looks at that and goes. "Ahh, "it's a disaster, you'll end up in a wheelchair." and that's been going on. Now one of my other roles is I sit on the United Kingdom Spinal Surgeons' Board which is effectively the sort of liaison group for all the spinal societies in the UK. And what we've been trying to do as

part of the new national lower back pain pathway, the introduction is to stop primary care access to MRI scan. Not because we don't want GPs to be able to make a diagnosis, but what we don't want them to do is to be in the invidious position of being faced with these reports by anonymous radiologists who they don't interact with, who've never seen the patient, they've not got the context, and all it does is it creates havoc. So you're right, and you as an osteopath, you may or may not see the report. Now, I get to see every scan, I never rely on, what I do is cross-correlate the MRI with the report. And occasionally I'll find stuff that actually is quite interesting because I didn't expect it. You've got to have a level of clinical suspicion of course, and actually if we've time there's a couple of cases where things are thrown up which are quite interesting for me, not necessarily for the patient and you think okay, well I saw something on the scan that didn't quite fit in, so I asked for something else. Now if you're doing teleradiology and you've just got a report you're not able to do that so it is a real problem not being able to see the report and not being able to interpret it and then put it into context for the patient.

- I think that would be really useful and I hope we do have time. I think a lot of my colleagues probably I speak for some, if not all of the chiropractors watching, they'd really appreciate that. I've had one person already ask could you go back to that pars fracture and just point out the relevant, important details again? The one that's on the screen at the moment, because you've got on the one hand,

- Can I go on?

- Okay.

- And I'll tell you what, let's find one that's a bit more representative. What about looking at a CT because that's a bit more representative.

- Okay.

- Would that be all right?

- Yeah, absolutely.

- Okay, so on here, the big black arrow shows where it is. So what we're looking at, the nice thing about, the MRI scan as a screening tool is great because it's not ionizing radiation. But it doesn't show the pars defects as well as the CT scan, which is a great way to look at bone but a poor way to look at soft tissue. So if you suspect a pars fracture you would get a CT scan. Now you might see one that's very obvious. That last one was acceptable, you know, I could see it, but you know, if you're not really trained.

- So is that your first port of call. Someone has actually asked the question, what's the best image for this.

- MRI, the reason for that is because they've got an acute problem. What you'll see is you'll see the edema within the bone around it, so you'll see the stress

reaction round it and I'll show you some pictures of a professional cricketer in a little while that you see just that. There's this halo of edema around the developing fracture. So if you've got a person with back pain and they've got the right context, a non-ionizing radiation investigation is a great screening tool. Now we can argue about using MRI as a screening tool but in reality it's actually very very good in this population, not for general back pain, but in this elite adolescent population. So you do that, once you've seen it, what you've then got to do is say okay, have you got a stress fracture or have you just got a stress reaction? If it's just a stress reaction you can just leave it at the MRI scan. But if there's a stress fracture, then you need to characterize that because you want to know is that fresh, is it developing, is it chronic? Because that's going to tell you how the reaction will be when they start to heal. So for instance here, what you see there, there's a stress fracture across the pars of L5, as you expect. and here's another one in a slightly different position. And on the cross sectional view here, what you can see, there's a lot of sclerosis round there, so there's the fracture, so that's a chronic fracture that isn't gonna heal. There's very little chance that will heal. If you can see no sclerosis and just fresh bone and also if that correlated with a lot of inflammation on the MRI scan that would be fine, then you could say that's gonna heal. But this won't heal, and this one here that's a slightly different one, that's a more vertical one there. But that is healing, and you can see there's not a lot of sclerosis around there. So there's actually some bone beginning to fill in there. So if you can see on the CT scan that they've got a fresh fracture and it begins to get bone grain across it and then you do another CT scan about three months later and then it's healed, fantastic. That's what you want. That's the right outcome. If they've already got a chronic defect then we know from the evidence that that is unlikely to heal. That's fine, you manage in a slightly different way because actually don't worry about getting it healed. What you need to do is just control the pain and then get them back to their sport as pain allows. Because the past fracture has no longer got a relevance as long as they finish growth. If they've got a past fracture on both sides and it's chronic and they haven't finished growth, you have to be very careful, 'cause they're the ones that can progress.

- What then is the procedure for us? In our practices we get somebody in who's reasonably elite athlete getting back pain, perhaps similar to the one you described. We need to get the GP to do the right thing. Do we need to say to the GP right, we would like an MRI first of all to look for edema evidence of damage.

- Yeah, I think it's entirely reasonable for you to recommend to the GP, 'cause the GP's not gonna be a specialist in this area. People listening to this program are going to have now, a level of specialist knowledge that GP's won't have. So if you then say this is a 14 year old girl who's just finished her growth spurt, who's a high level gymnast who's had 10 weeks of back pain and she's got a high risk of having pars defects that are now symptomatic. I would recommend that she's sent for an MRI scan because it's not ionizing radiation, it's relatively straight forward, et cetera. And it will have the highest pick up for whether there's a developing pars or a pars that's there and is this some stress reaction. So if you give the GP the information, you give them the tools. All they have to do is say, oh that's fantastic, thank you very much, write the form, away you go. Radiographer

or radiologist at the hospital looks at that and says yeah, high risk child, fine. Off you go, do that. If you don't give them all the information what happens is you get barriers. So the GP then sort of says well who are you Mr. Osteopath telling me what to do? That's fine, give them some help and they're usually pretty helpful.

- 'Cause actually they probably feel the same way a lot of us do in that they don't want to send an inadequate brief to the radiologist, do they? They wanna give the information that's required rather than just saying I want an MRI 'cause there's some pain.

- Absolutely, and I mean I think the other thing, of course is that it used to be that adolescent back pain was a red flag. It's become less so as years have gone by. But if there are other things going on, for instance in a sport with repetitive flex and extension, that really is a red flag for these sort of things and since you can do something about it by activity restriction and getting it healed up, then I think GPs are interested in it. And certainly, I mean around here we've got some really good sports orientated GPs who are very very happy to do that and to, you give them information and they'll be very happy to do that. And what they'll do is they'll expedite it as well. They'll do their very hardest actually. You know contact the hospital and say this person needs to have this scan done quickly, because, That's really important for the athlete and for the parents.

- We have a question here from somebody who remains anonymous, is it easy to palpate from the spinous processes and what other conditions could be confused with pars defect?

- No you,

- From a palpating,

- You can't palpate a pars defect. If you've got an acute pars defect, and you push just off the spinous process, so it's just paraspinal, in that age group they're not gonna get facet joint pain. So if you press where the facets are and they squeal, then you've been pretty sure they've got an acute pars defect. So in particularly in thin athletes.

- So you'll get a reaction even if you can't feel it.

- Yeah, you will and often they're actually it's in spasm, so you feel it over there. So multifidus, the mengismus are in spasm. If they've developed a grade one spondylo that is active, then the evidence is that the palpation of the spinous process because the spinous process is now loose effectively. It's not really loose, it's a bit loose, but you can feel it and it'll hurt if you move it. So that's got quite good evidence to show that's only sign that reliable will predict a spondylolisthesis. And often you'll feel the little step. You know you feel down their back and you feel that little step and then you rattle around with the spinous process and they'll yelp a bit.

- Do you put them in to spinal flexion to feel that or?

- You can do.

- Is that the best way to bring out the step if there is one?

- It depends, I mean you want them at least in neutral. You don't want an extension 'cause they're closed down. So that's fine, so at least neutral, and a little bit of flexion would help that's fine. But what you really want is just a thin person. So you know the biggest problems we had are 13, 14 year old front row forwards. You know, these are big blokes already at that age. They're often my size, you know, and trying to feel their spinous processes can be really quite difficult 'cause they've done a lot of strength and conditioning already. So they got really quite bulky muscles and actually be able to feel that through those muscles, you know even someone in that midline can be quite a challenge. So if it's there, if you feel it, it's fine. If you don't feel it, don't worry about it. It's the history and everything else that goes with it. But most of these people, they come up with tight hamstrings. You know, that's the other thing, the classic sign is the tight hamstrings. They've been flexible up till now, and suddenly they can't bend forward. And that's usually a give away for there's an acute problem down there.

- Okay. Slight digression, you surprised me the other day when you told me that one of the patients I'd referred to you won't fit in an MRI scan.

- It's true.

- I mean, how big do you have to be not to fit in an MRI scan?

- Well, it depends on the scan. So, the usual, there are two parameters. One is your size, your bulk. Because it's a defined tube, which is fine. So you'll get into an MRI scan, any old supine MRI scan you like, I gotta squeeze 'cause I've got big shoulders a big chest which is fine, I will, that's okay. And my weight is you know, it's just 100 kg, so that's not a problem. But if you're getting up to somewhere in the region of 140 kg, not only do you have a bigger squeeze, but the motors that make the gantry work that takes you in and out of the machine, they only work to a certain tolerance. And it used to be about 21 or 22 stones, which is around about 130, 135 kg. So on a normal supine machine, you've got these two parameters that would stop you having an MRI scan. One, sheer bulk, and two is the ability of the machine to work. But in those, it's easy, because you just send them to an open upright machine. So there are three in the UK, well in England. There are three that I know of, there's another one in London. But the long and short of it is, open upright, you sit in it, it'll take up to 175 kg, yeah you'll squeeze in and it's a bit like sort of being sandwiched into it, but you're open that way, so if you're squeezed in this way, then your tummy goes there which is fine. And some of them are sort of, you know, they just lay back almost like it was an arm chair and they're fine. But the open upright will go up to 175 kg which should take care of even most of the high BMI people that we might see.

- Sure. Question again, do patients realize when they've caused a spondylosis traumatically? Do they feel or hear any sensation of these going in your experience?

- No, because it's a repetitive injury, so it's a stress fracture.

- Right, yeah.

- So what they're doing is they're just doing their sport. And then they start to get back pain. And the back pain often is intimate to begin with, and then as it goes on it becomes more persistent. So there is actually a type of spondylolysis and listhesis that is traumatic. But in those it's usually very high energy, road traffic accidents or falls. And they get very severe pain and usually they've got neurological symptoms and signs and that's pretty obvious. So and there's only really, there's more than a handful of cases that it's shown, but it is a few thousand in the literature over the last n number of years. Whereas what we're dealing with here is millions in the population.

- Question, an observation from somebody, and again this person's anonymous. I have been diagnosed with at spondylolisthesis, MRI'd with no arthritis or loss disc height. I have severe compression to L5 S1 unilaterally due to the complete body separation with intimate and a completely sensory loss to the foot when I'm at my worst. My specialist has been very pushy and is insisting that I have a fusion, but as I'm in my 30s this is not something I really wanna go through. I've found that medical acupuncture to the LESQL and glutes along with glute and hip flexor stretches really keeps the majority of my symptoms at bay and I've now returned to competitive sport with only the the occasional use of non-steroidal and regular stretching to keep both the pain and the surgery away. I've several patients with a spondylolisthesis and treat them the same way. They're also now fairly symptom free.

- Yeah, I thoroughly agree with that. You know, I don't think there's, surgeons shouldn't be pushing anybody to have a spinal operation if they don't need it. You've got to explore all of the conservative measures. I had a case recently of a patient who was operated on when they were symptom-less, just in case it slipped. Outcome? Disaster, negligence. So, anonymous is absolutely right. If you've got severe pain that is not getting better by any other means, if you've got significant neurological loss, so a foot drop. And a bit of numbness doesn't matter. We can all put up with a big of numbness. But if you had a foot drop and you can't run and you can't do anything, that's pretty disastrous. So if you've got those and the pain doesn't get better by physiotherapy, by osteopathy, chiropractor traction, osteo, acupuncture, et cetera et cetera. And you've done it for six months or eight months or a year or whatever else, and you're at your wit's end, fine. An operation those circumstances very good. And actually for spondylolisthesis surgery is very successful if it's done well and everything fuses up, then it's fine. This condition is the best one to have if you're going to be doing an operation for back pain. All the others are marginal. Now, that's fine. I'd add into that get on an inversion table.

- Now we had last week the discussion with people in the room, so there's a chiropractor sort of telling me that I shouldn't be talking to people about inversion tables because other people have got different experiences, but actually with spondylolisthesis, because this is a gravitationally induced problem, you've got the slip, but then it's causing compression in the L5 nerve in the foramen, turn it upside down, take gravity off it, and you might find that it's really quite good at taking away symptoms. And it's not going to mend it, but as a mechanism of managing symptoms effectively EMS, it's below the spine isn't it? As a mechanism of doing that, then it can be really quite helpful so a few minutes on a traction table, inversion table, and if you're really very sporty and want to get six pack as well, inversion Pilates is a really good way to make things very very strong. So that actually is the only thing I've added to that. But I would agree with that. This is a person who is managing their problem perfectly well, they do not need anywhere near a surgeon.

- Limits your risk for worsening it.

- Well, you know if you're worsening it, aren't you? Because what you're looking at are do you have worsening pain, worse than neurology? If the answer to that is no, then you don't get the operation. So if your pain is controlled, and you've got a little bit of numbness, but no motor loss, fine. And neurological pain or neurological damage, you know when that's happening because you'll get increasing leg pain or neurological symptoms and when you've damaged your nerve is when that pain doesn't go away. It's when it's with you for 24 hours. So all the while that you can do something, lie down, get inverted, be in a position whereby you are symptom free, and I used to say this with people with sciatica, if you can do something that makes you symptom free, you can't have nerve damage. You cannot have damaged a nerve. Because it's fine. If you, whatever you do, you've always got sciatic pain down your leg, well, that's a time if you've got a, certainly a slipped disc you know, that's the time you should be going for having surgery. Because actually that's a bad sign because your nerve is therefore damaged. In this situation he's absolutely right or she's absolutely right. And that is actually that the symptoms are controlled which is fine, they're not progressive, there's no neurological loss beyond a bit of minor stuff. Fine, monitor it, if it works out like this, back to high level sport, no deterioration, perfect.

- That's actually quite reassuring. And we've had some interest from the special interest groups here, what's the incidence with elite rowers, is it common with horse riders and is competitive diving particularly related to pars defects and so on?

- I'll deal with the last one first and that is with competitive diving, only if they're doing it badly. 'Cause most of the diving actually doesn't involve going into hyper extension.

- Right, I didn't read the whole thing, it says, particularly related to spondylo given that hyper extension mostly happens in non-weight bearing, excluding

extremely bad over rotated injuries. It's Matthew again, right? Do you find fusions at one level are associated with later problem adjacent levels?

- Well, yeah that's a different question. So if we just go back to those three sports. Horse riding, no. And the reason for that, if you're a good horse rider, you're sitting well and actually you're not going into repetitive flexion extension. Now, it's very interesting 'cause when you look at people who show jump, they going from neutral into flexion, neutral into flexion, and it's only when they're actually doing badly they go into extension. So there's a minority of people. So I don't see that many, there isn't an increase instance in show jumpers and horse riders compared to the norm population.

- It's only been at the incidence in horses, having this weight bouncing up and down on your back.

- No no no no, horses don't get spondylolisthesis so, no other mammal gets spondylolisthesis. It was wondered whether kangaroos might, but they don't. But it was interesting 'cause I was at this site and back pain research a couple of years ago. And we were down at Bournemouth at the College of Chiropractic there and Alan Breen who's the director there, he gave us all the faculty, a little fossil which was two vertebrae, they were dinosaur vertebrae, one shifted on the other but he said, this is proof that the dinosaurs had spondylolisthesis. So the diving, I think that if you are, if you think about diving, you're jumping and you're wanting to be in flexion all the time. You're in a pike or a tuck whatever else, it's all flexion. It's not flexion and extension. I don't see divers as people have a higher instances than--

- So it would be just the coming out of the tuck and hitting the water badly that might cause the over extension there.

- If you hit the water badly, yeah, but your coach should be saying look, you know you shouldn't be doing that too often, that's what I say, that's a bit of a disaster. Trampolinists do. I've seen that and they, because they do flexion extension. What was the first one? The was a sun sport.

- Rowers, elite rowers.

- Rowers get a huge source of problems with their backs. And we see that. A lot around here from Bedford, there's a lot of rowing, kids at Bedford school, both the boys and girls. And the rowing clubs down on the Ouse down there. They don't tend to get, they get a combination of disc degeneration. Early disc degeneration, particularly in teens and lysis, the lysis rate is slightly higher than the background rate, it's not as high as cricketers or as gymnasts or other repetitive sports.

- So some reassurance for the rowers that way.

- If you have an L5 S1 fusion, do you have a high chance of having adjacent level degeneration, Matthew said. So the answer to that is that we know from a really

good study that Rob Fraser, who was the professor of spinal surgery in Adelaide did some years ago. He did a whole bunch of people who had an L5 S1 problem, and he did an anterior fusion on them. And he followed them up with a whole bunch of people who had exactly the same presentation who he didn't operate on and he followed them for 20 years. And it's an amazing study. The work involved in that was amazing. The numbers were good enough to give you statistical relevance which is fine. And what it showed was that there was a 12% rate of adjacent level degeneration at the end of 20 years in both groups. So fusion, if done well, and rebalancing the spine in the correct sagittal profiles does not predispose to adjacent level degeneration, but, and here's the but, one of the things I used to do was be involved in a project for the geno disc project. And what we were looking at were the genetic influences and inheritability of degeneration in the lumbar spine. And there was this big multinational study. And we put 10% of the patients into it from when I was at my practice in Kettering. And what we showed was that 75 to 80% of the variation in disc generation is heritable. And we've then repeated that now with the Guys and Thomas Twin study, so there's been a lot of studies out now that show that. So the majority of the reason why people have disc degeneration is inherited. If you have just a pars defect spondylolisthesis it doesn't seem to be about the disc. So what you're saying is that if you fix the spondylolisthesis in the pars defect any change in a disc that's secondary to that is not primary due to your genetic inheritance. You can't blame your mom and your dad. Not for the disc anyway. But if you've actually got degenerative disc disease, inverted commas, I don't believe in that term, but that's what it's called, DDD. If you've got degenerative discs and you've got back pain and you operate on that and they've got no other reason for it, then they've got a high level, a high chance of adjacent level degeneration because they're pre-programed genetically for their discs to go bomp bomp bomp bomp bomp up the spine and that's that pattern that we saw going back into the 60s, 70s, 80s when people didn't understand it, we didn't have MRI scan and we couldn't see that. So it'd be all willy nilly fusing them, and then they come back three or four years later, bang another disc gone, don't know why, fuse that et cetera, et cetera until you've just go up the spine and you've wrecked the spine. Once we know about the MRI scan, of course we could just see that and now we've done all the genetics of it, we've worked out what it is. So, the most important thing is with spondylolisthesis as long as they haven't got a genetic predisposition to degeneration then there isn't a higher rate of adjacent level degeneration. If they have, they need to be warned.

- Okay, so more observations here. GPs see an MRS, MRI result with lots on it, maybe degenerate, but I don't think they panic, worry about it, they just tell patients it's degenerate and nothing can be done. GPs often won't refer to a spinal consultant but surely they're not there for suggesting there is something that can be done.

- Well, okay, so the answer to that is actually that's a very important observation 'cause it's quite true. So we look at an MRI scan, it's a picture of what you look like, not what you feel like. And you can have as many different things on it as you like. Now if you've got a report that's three pages long that details degenerative change at every single level, with facet joint this, and compression

of that, and whatever else, then you're more likely to have a GP who'll look at that and say I can't work out what's going on here. But if the patient sits there and is symptom free, it doesn't matter what the report says, does it? Because actually it's irrelevant. So we know that degeneration is genetic. We know it's all part of what we are as human beings, which is fine, you've got to put into context. So I think that observation is absolutely correct. There are a lot of GPs who'll take these reports and look at them and say actually well, you've just got wear and tear, normal frays et cetera. But the problem with that is if you've then got something subtle in that report that says well you know what? You've got a facet joint cyst at L4-5 on the left side it says here with a lower grade degenerative spondylolisthesis compressing the L5 nerve root. And if the patient's then complaining of lateral calve pain or whatever else, and if they ignore that that patient's consigned to a whole bunch of trouble before they actually get referred, so I think the problem is easy enough to state. It's difficult to sort out, but if you stopped GPs having to have the responsibility of ordering an MRI scan, when they can't access the pictures, that takes that problem away. Now, there is a, just being introduced now through the NHS England, the national low back pain and radicular pain pathway. This is being run by specialists. And they're usually physiotherapists, can be osteopaths, can be chiropractors that's fine. We all sit on the same board. And I hope you'll all come to the Society of Back Pain Research annual meeting here in North Hampton second and third of November, big waving flag there which I'm the local host for. Because that will be part of that. And people will sort of beginning to be talking about that. But the point about this is that these are specialist physios, osteos, chiropractors, nurses who are trained in interpretation of MRI scans. They're not gonna be relying upon the radiology report. They're not going to be then having the GPs referring for an MRI scan. That's not gonna happen. The patient will present and go into the pathway and they'll be dealt with by specialists. Not people who have a vested interest in spinal surgery. Yeah, they're gonna have a very level playing for all that. So they'll only get to a spinal surgeon if there's something that needs an operation. So they'll have all this treatment investigation et cetera by people who understand what it really means what the context is, and that takes it away from the GPs which is a good thing. Most GPs don't want that responsibility, because actually they say well how am I supposed to make sense of this? So yeah, they might say it's just degenerate, get on with your life. But the real worry is is there a cauda equina type compression there? If they miss that, that's a hell of a smack to your indemnity. That's a big black star so, and that's what they're really frightened of.

- Has your attitude to surgery changed since you ceased to be a surgeon? Were you sort of a vested interest in getting some surgery done when you were operating, or?

- No, I mean, my conversion rate is what model surgeons talk about, how may new patients have you got, and how many end up in surgery. There's usually about four or five percent. So one in 20 people I saw would end up in an operation.

- And now?

- Even those,

- Sorry.

- It's about the same. I refer about the same number to neurosurgeons or orthopedic surgeons locally who do a good job. No, I think I've just become a bit more creative in the sort of rehabilitation that we can offer. And that's more to do with being at the Chris Moody Centre. Because we've just got everything around us, you know. It's like a sort of kid in a toy shop really, isn't it? If I want somebody to see an osteopath and come to see you, or a physio, or do some hydro, or do some massage and manipulation, bits and pieces,

- And Pilates as well.

- And Pilates, and we've got the therapist MDT every three months which I find is amazing and I hope other people do as well. But it's certainly, I see in that this great collaboration between therapists. You don't want surgeons in there, 'cause that's not what this is about. Mr. Chop-a-lot, the sort of surgeon who wants to operate, he can go and do that somewhere else. We need to feed him that sort of stuff. But I was very much the sort of, my real practices have been you know, trying to make sense of back pain, psychologically informed practice and doing that for the last 20 years. But it hasn't really changed very much. I just, you know, I'm happier not having to do an operation 'cause it means I don't have to go and see them post operatively.

- Nothing spoils an operation like a follow-up, is that it?

- No, exactly, I mean, I said to Claire earlier that the biggest stress in spinal surgery isn't in the surgery itself. It's that if you've done something and there's an unexpected outcome, however well you've done, you're beating yourself up about why is, why somebody got more back pain why they've got more leg pain, et cetera. What have I done? And that's the really stressful bit. So I was very happy to give that up, which was fine.

- We all feel the same way about that it's just that it's a bit more serious in your case,

- Yeah it is.

- with surgery isn't it?

- Yeah, and sometimes it's permanent and that's a real problem so,

- Somebody asked about upright MRIs which we talked about earlier on and whether the image quality is as good as a conventional horizontal scan.

- No, by definition. Because the magnets in the upright MRI are only .6 tesla sometimes as low as .3 tesla so in a standard MRI scan you get 1.5 tesla magnet

in a round configuration, which means you got a coherent magnetic field across the body and you've got the various cause you can do with that. In an upright magnet, you're getting magnets coming across the side, so you don't get that. So the first answer is no they're not as good, but they're a whole lot better than they were and much of it depends upon how good the software is, because the long and short of it is, if you're taking bits of information and you're putting it through a very good computer and out of it you're getting a picture. The image quality these days is very much better than it was, so if I look back in my career the sort of images we were getting in 1998, 99, 2000 on our standard supine round magnet is what we now get on the upright magnets. The benefit of the upright magnet is you can do functional imaging. So you can sit, you can stand, you can extend, you can flex, you can do it with any joint you like. So you can do it with the spine. So for instance, if you've got somebody who you think has got some sort of instability that changes, the position changes, I had a case of this recently. Where if he stands up he gets pain going down the leg. But if he sits down he's fine. Good, with an upright magnet, you can get him stood, get him to sit, and is there any difference between the two? And there was. There was a foraminal disc problem that came on when he stood up, that disappeared when he sat down. 'Cause he flexed forward when he sat. So what we could do then is say to him, okay, this is why you've got the pain. It hasn't responded to rehabilitation. Go back to see the neurosurgeon 'cause this is now the target, this is the surgical target. You can go and see the neurosurgeon, you can do the operation and you've got a very high chance you'll be fine. So that's the benefit of the upright. The other downside is that they take longer, acquisition times are much longer, about twice as long, and they're more expensive. So, there's pros and cons.

- Someone wants to know what the best way of getting the right information from the radiologist or radiographer, we have to get the radiologist I presume. If you have a GP, apparently this person's been told they're not allowed to see the reports.

- That's a local policy that's very difficult to understand.

- The patient presumably is entitled to ask for the,

- Yeah, so the patient should be, should have access to their report because there's transparency. So that's their information, which is fine. So you get the patient to get from the GP the report, dear doctor, please give me a copy of my report.

- Can they get the images as well or?

- No, because the GPs won't have the image.

- If they go back to the MRI center?

- They can go back to the MRI scan and pay for the images to be put onto CD which can then be put into OsiriX and that's fine and you can have a look at them

and that's okay. Usually it'll be a fee of somewhere between 10 and 35 pounds to get that burnt onto a CD.

- Okay. Somebody's actually asked about the event in North Hampton. And I was gonna go into that. I mean we don't use these CPD discussions as sales vehicles or anything like that.

- I was being cheeky.

- No no, not at all. I would have been delighted if we can put up the information later on the website, because if people can come along, is it open to anyone to attend or?

- It's open to everybody, so it's the Society of Back Pain Research. Which is the oldest of the spine societies in the UK. It's made up, it's actually a very small number of surgeons, it's made up of researchers, physiotherapists, osteopaths, our secretary is the Steve Vogel who's worked very high up in the British field of osteopathy et cetera. So he and I are good mates and we sit on the board together. Our press at the moment is Nadine Foster who was at the event of the start back to work heals, so we've got a huge scientific focus there. And we've just been looking at the abstracts. There are fantastic abstracts for the meeting in November, there's a lot of science. There's some really good clinical science and we've got basic science. It's a very friendly meeting. Everybody's absolutely invited. Just that they're web site at the moment's having a little bit of problem. They're getting it all sorted out, but it's the Society of Back Pain Research, if you put that into Google, end of next week, beginning of the week after that, then you can have a look and see it it's interesting, that's fine.

- Well, we'll put a link up on the website definitely.

- Yeah for students it's only 90 quid for a couple of days. And I think the full whack is not much more than 170, 180 pounds and you know, there's a nice dinner. It's in the Park Inn hotel that's North Hampton. So it should be fun.

- Another question about rehab. Exercises that can be incorporated into training programs for youngsters?

- Yeah, so that's a real important part of it, so if we go back to how these youngsters are presented, we've stopped them doing the exercise that's caused the problem, we've given them something to do because what you can't do, in particular with the boys is you can't stop them doing everything 'cause these guys are testosterone laden. All they want to do is get out and play sports. So you have to give them something different. So I give them cycling, because it's just flexion. Which is fine and they can cycle away as much as they like. In the winter they're on a turbo trainer, in the summer they get out and cycle on the road, which is obviously fine. Water walking. Particularly you can do it with a flotation vest. So if you've got someone who really wants to spend some energy, just get 'em into pool with a flotation vest and say I want you to run up and down that pool n number of times. Because gravity's taken away and they don't have that

repetitive flexion extension, that tends to be a very acceptable exercise. The other thing they've got to do is a Pilates type program. Now you know from our meetings over the last three years how important Pilates is. Now to begin with, anybody who's an exercise specialist needs to get them to all the core work. So they've got to get their core engaged. But then once they've got that, then going into Pilates as a maintenance is actually quite important because that's gonna stop them hopefully then deteriorating and then having a recurrence of the problem later on. So, early exercise, non-weight-bearing, non-flexion-extension, going into progressive exercise program to make sure that everything's working perfectly particularly during that important healing phase. And then Pilates as maintenance.

- The bit I missed off that question actually was is there anything you can do to prevent or minimize the incidence of spondylolisthesis?

- The answer to that is yes of course. If you could educate the whole population and tell them that if you want to do gymnastics at the age of five, then what you've got to do is on top of that, 20 minutes of core exercises every day. And when you are doing your gymnastics, you gotta make sure you don't go too far over to one side or the other side and that's fine. Reality of it, I mean the instance is so high in the population that there's no way that we can actually institute a medical intervention of any sort. So, I think the answer to that is it would be lovely to try, but in reality I don't think it's possible.

- I was saving this question as observation. It comes from one of our favorite members, one of our longest standing members, Susan. Who has recently had a hip replacement. And you made me bring it up now when you started talking about core exercises. And there are different schools of thought about core exercises as opposed to functional rehabilitation and she's actually said that her post-op experience has led her to return to the core camp and away from walking which is so popular with surgeons. Physio for the hip has been mostly core work, very effective and last week changed the emphasis to distance and proprioception with core taking a much less prominent role. She says, after four days her pelvis was unable to take the daily walks into town and back, and both hips and legs were very unstable and off key. So she rejigged herself and did a bit more core and it made a big difference in 24 hours. I don't know what she, I don't know which specific exercises she means by core exercises, but,

- I think hip replacements and spine surgery are slightly different.

- Yes, sorry, it was a diversion.

- That's the first thing to say. The biggest problem you've got with joint replacement is exactly what she alludes to and that's proprioceptive loss, so you've got to try and get that proprioception back and you can do that by doing local exercises around the hip so you've basically got different structures of giving your brain the feedback is where that hip is in space, so that's really important. Now if that's a core exercise around the hip, as opposed to walking, then I completely understand that and subscribe to that in the same way that

once you've had an operation on your back you're not the same as you were before. So there's been destruction there. All surgery is by definition destructive, it's not reconstructive whatever surgeons say. So if you've had a destruction there, you've got to replace what was there, and of course there's collateral damage. So you know, you've done the bit that was bad, but you've caused some collateral damage, so you've got to replace that. So my walking program after surgery was all about getting the muscles to send messages to the brain and getting them to do it quite quickly. If you look at people walking on the beach, now you're not allowed to look at girls walking on the beach in bikinis because I think actually your wife might not like that so, At my age I'm allowed to do it, 'cause you're a young guy. But long and short just look at anybody who's walking on the beach and look at their back muscles. They repetitively in rhythm, contract relax, contract relax. We know that, that's easy enough. So that occurred to me 20 odd years ago that if I actually just got people walking after spinal surgery or after they had a back problem then that would help them. Then of course we knew in the 1990s. I mean there was all these stories about just get out and walk, just get out and walk. And over the 20 years since that time, it's been one of the core focuses of exercise for quite a lot of clinicians, which is fine. It has its place. But I did it, to begin with, in the six weeks post surgery just to get people out of the house. Just to keep them getting mobile. Because then they did all their core work after that. So I don't think they're exclusive. I think one's got a role early on to get you mobile. Get you over your operation. We know that mobility generates endorphins, they feel better et cetera, they're not locked indoors and all that bits and pieces. Once you've done that, then you're in a fit state to do your proper rehabilitation, which is under the control of a therapist who's gonna get everything working again. So I think actually what Susan said is absolutely right. And that is there's a place for both of them, and that if your hip's not feeling quite right, and your legs feel a bit jelly-like, go back to making them work better 'cause that's proprioception.

- Well actually that's very useful. You've given me a good idea for a future broadcast actually. If we can find a beach where we can get the cameras hooked up.

- Could do.

- Filming ladies in bikinis will go down very well with 50% of our audience, it might.

- Well, you have to actually sort of be sort of quite diverse about it, and then you've got to look at some of the BMIs et cetera et cetera, 'cause actually some of the people, high BMI you're not gonna see that muscle contraction alternatively so.

- Yeah right, I know where this is going. We've got just under 15 minutes left. You've talked all about young back problems, did you want to move on to old ones? Did you want to teach us how to use OsiriX or did you wanna share with--

- Let's teach you how to use OsiriX, 'cause I've got some pictures. Right so when you fire up OsiriX, the first thing is that it'll give you all the guff about not being licensed, and all that business, just ignore that. That's absolutely fine, so,

- The actually the MD version costs $700, doesn't it?

- It does. I bought the MD version, and that license last for a year. And then they want another n number of dollars off you each year after that. I haven't paid it again and all that happens is I get another message up saying this isn't fit for your operating system. I've upgraded now to whichever is the latest Sierra, I think, on Mac. It works perfectly well, you just ignore that. Occasionally crashes and you just fire it up again, which is fine. OsiriX has the, OsiriX lite as the download is fine. All that happens of course is that when you actually want to look at films, it just has that sort of little window that--

- Not for medical purposes.

- Yeah, but it says, can't can't can't, wait wait wait wait wait, and then you have, so it's just compliant with the FDA that's all. So this first screen you come to has got everything you need in it. So when you first look at the lists of your patients, they get a big name up on patient name. The ID is generated through the DICOM files, so that's the standard digital communication file that these all come with. It'll tell you what that investigation is, what the modality is, this is MRI scan, if it's a CT it says CT, if it's x-ray it'll say x-ray, et cetera. If it's SPECT or PET or whatever, that tells you that. Tells you where it's been done, when it was done, how many images and this is important. And we'll get to that in a second. And then what's the date of birth. So if you come with a CD, you put your CD in, as long as OsiriX is loaded up, it'll see that CD and it'll come up with a dialog and says would you like to do something with these. It's identified, say on CT scan, it might be 2000 files. So what I always do is I just copy it. So you can run it off the CD but it'd be slow. But if you copy it to your database, then it's there, so as long as you've got the permission of the patient to keep it on there, now you can always wipe it off afterwards which is fine. Just get rid of it, but it just processes it very much more quickly if you actually copy it onto your hard drive even temporarily. And when that happens, what you see here is down here in the bottom left, activity. So it's saying copying. Now if it says there are 2500 files on your CT and then it's copying and then you come up with Malcolm Campbell and it says 250, you know that it's not copied across 2250 files, so something's not right. So then you've got to put the CD in again. 'Cause it'll chuck the CD out. Now I'm assuming of course that everybody uses a Mac, because that's by far the best type of computer around. Which will auto eject. If they're using the other type of computer that might not auto eject, so I don't know how it works on that, but anyway.

- Is there an OsiriX version for PCs do you know?

- I don't know. So, but, I mean, there is? Yeah, okay. So I mean, most of these, if you get a CD from a radiology department, they will have their own image analysis, they've got their own packs software. But every one's slightly different.

There's a bit different, so OsiriX is actually quite a good default to look at and to work out. So we've copied it in, you're happy that the right number of files have been fit across. So then, you can either click on the name here, or just click on one of the images. So this is our painful little notice that says the FDA doesn't want you to use this for medical diagnosis and then there we are, and now you agree, which is fine. So what you've then got is your main imaging screen. Now most of us look at images side by side, so we'll look at the sagittal and axial. So the first thing to do is to decide how many windows you want, so go up to this and decide, do you want two windows? It says two there, but we'll do three. That should give us two, okay, so now we've got three. There's something wrong with the latest version of OsiriX, because when you click on here, that should give you two windows, but actually if you looked, I'll go back again. I'll just close that down. If we click there, go to two, nothing happens. Now it used to be you click on two, and you get two windows. Now, you have to click on three and then you get two windows.

- Right.

- So, just a little glitch in the present version of OsiriX, they will sort that out in due course. But having done that, what you then do is you scroll through. Now on a Mac keyboard it's actually the right and left arrow that scroll through. So I'm scrolling through here, this brain, so that's fine. If anybody's not seen a T2 coronal view of the brain before, this is the most surprising picture you see, just the eyeballs. So that can be quite interesting. Quite a lot of people get a bit freaked out by that.

- That's a good Halloween image though.

- It is actually, it's very nice. That's right. So you scroll down the side. And all of the investigations that this person has had that's in the OsiriX database will come up in your side pane here. Now if it looks like, this is actually quite a bright image, it looks like it's a, yes, an ADC map, so this is one of the more recent sequences. They're all designed to be a bit fuzzy, but they're looking at neural activity in a slightly different way. If you want to change that, these are your control buttons there. So click on your, this is the shade button. If it looks like it's a bit too light, right click, sorry, left click and you can change that. Then you do all sorts of things. So play around, find out what suits you best. So for this one here, that will suit me very well, it's showing the CSF very nicely there. And then the brain parenchyma and then the bone around it. So on this one here, so we can do that, make it brighter, darker et cetera. So that's the shade, that's brightness and contrast. If you then go to the crosshatch. That's going to move your image around. Usually right click will give you a zoom as a default. On the mouse, super mouse.

- Magic mouse they call it.

- Magic mouse. Just right click, that'll give you zoom in, whatever else you're in, that's fine. So you can go directly to zoom if you want to. But you don't have to. This is quite interesting. The green line is your measurement tool. Now that's

actually really quite useful. 'Cause what you've got here are all these measurement tools. Length is actually quite useful because if you want to, say for instance somebody's got a tumor in their head here, and you wan to see how big that tumor is, you can put two lines on it and if they've got it in that bit there as well, you can put two lines on it. And suddenly you've got the dimensions of the tumor in three dimensions and you know how big it is. Which is fine. And you can do it down to .01 of a millimeter.

- You were looking at some lumbar MRIs the other day, and you had the two pictures linked, didn't you? So as you zoomed down the sagittal, it means the axial was moving as well, is that easy to do?

- Yeah, so, if you go, have you got a lumbar spine?

- I don't know that we have actually.

- Lower down in this.

- Oh lower down, so okay there is one.

- Okay so we've got some viper spine. So, here, you see that green line there?

- Yeah.

- As I scroll down from the axial views, what it's telling you is exactly where. So we'll just go to that mid-sagittal view, so here we are. Got a person that's got a disc herniation, you see that there. Okay so I am now scrolling down on the left pane, on the axial view, so that's at C2-3 and coming down to C3-4 so the area of interest is going to be either here at C4-5 or down here at C6-7 which is where you've got some bulging discs. And you know when you get there, because there you are, there's the bulging disc here. There, and you know where you are there 'cause you've got the cursor there. So if you then go on to this one you can then go across so you know where you are left or right. So that's now comping across the left side. And you see down here, there's more of a left bulge. And on this level here then that's gonna be more right side of the bulge which is what you've got there. So that gives you the cursor gives you orientation, left, right, up and down. Which is really quite useful, so that's fine. You can't damage the computer by playing around with it through the keyboard, and you can't damage the database by mucking around with it. If you do something and the image disappears, so for instance, I've done that. I have no image, how do I get it back? You reset it, go to edit, is it that one, no 2D viewer. And where is it, where is it, where is it? Reset image view. So okay, so on the Mac keyboard it's command R and it comes back. That gets you back to where you were. You haven't damaged anything, you've not lost anything, it's fine. When you close it down. Let's just see if we can do, Do you wanna see it do some 3D rendering?

- Okay.

- There ya go.

- We've got one minute left.

- Yeah, this is now the 3D version. It's taking that volume information, put it in 3D and you can turn it upside down, around, around, around, and of course that's lovely.

- Will give us our information.

- And the thing to do is to just have a set of images and just play with it. Use one thing, see what it'll do, do another thing, reset set it back to neutral, deal with it, and just get used to playing with it. And that way it's a really useful, but in reality there's only three or four buttons at the top there that most people would use for 95% of their activity.

- Okay, thanks Nick. Final follow-up comments. Matthew's come in again with there are a few free DICON viewers on the PCs which work pretty well and they're free and they're not nasty American based Mac extortionware he adds.

- This is Swiss and it doesn't cost anything.

- No, this is OSiriX lite and we'll put up the link for that on the website as well. Claire, oh Claire's told me suddenly there was an interruption in our stream when we started talking about beach volleyball, I think she's lying but,

- Well, funny enough we didn't mention beach volleyball, but that doesn't matter, that's okay.

- I hope you found that really really useful. If you've got more questions, send them in, I will get them to Nick one way or the other. And as we said before, if you've got interesting cases that you'd like to discuss with a wider forum, get those to us, preferably with the images and we might even tempt Nick to look at a couple of those as well for us. We'll give you details once again on the Chris Moody Center, the East Midland Spine Center because I can't recommend the center highly enough. I don't know that there are any others comparable in the country, Nick, you wouldn't admit to it if there were, would you?

- I don't think there are.

- It is a phenomenal multidisciplinary resource. And Nick is great of you to come down here talk to us about this and tell us all about the East Midland Spine as well.

- You're very welcome, it's been--

- Thank you again.