

## Cervical Spine Injuries in Sport

### Dr. Ulrik Sandstrom

Hi, all. I'm Ulrik Sandstrom, I'm a sports chiropractor from Sheffield in the UK. I've been working in sports chiropractic for over 20 years, and I'm here today to talk to you about cervical spine injuries in sport. I have worked in professional rugby for the past 10 years, so cervical spine injuries is certainly something I've seen quite a lot of.


We're actually going to look a little bit at specific mechanisms of injuries. A lot of has been done about this, I'm going to go into very little details because actually, the general consensus now is that the specific mechanism of injury predicts very little of what we're actually going to do to the patient. The speed of impact, the direction of impact, whether there was a coup or contre-coup, certainly in terms of managing cervical spinal injuries, they're of very little value. Only really in acute pain, or in acute management, when you're looking for red flags, and possibly some prognostic value in the mechanism of injury, but again, the research jury is certainly out on that.

Essentially, you treat what you assess, so you assess the player or the athlete in front of you, and, based on that assessment, findings, those assessment findings, you treat accordingly. That's much more important than knowing how they were hit, what direction they were hit from. So yes, there is some value in getting this information, but don't forget that the actual basis on which you determine what you treat, as long as you've ruled out red flags, is very much based around what you see in front of you.

I'm going to talk briefly about the Quebec Task Force Classification. I'm not going to go in to any great detail because it's all out there. I've put a little reference down at the bottom here, as you can see. It's a great reference there, you can go and read up on the Quebec task force classification.

There's actually two of them. There's the original classification as we've got it here, rating from zero to four, zero is no neck pain. You're not gonna see a lot of those in-- with impact in sport, but Grade I is neck complained of pain, stiffness, and tenderness, but without any physical signs that you can elicit. Grade II is musculoskeletal signs [INAUDIBLE] with a neck complaint such as decreased range of movement and point tenderness. On the Grade III we now go into significant neurological signs, so USRM signs are now reduced, sensorimotor and reflexes. And Grade IV is the more catastrophic event, so you now have very significant structural pathology such as a fracture or dislocation.

The modified Quebec Task Force Classification now takes into account sort of global sensitization, hypersensitivity. It takes into account sympathetic nervous system disturbances and psychological and post-traumatic stress. When we start looking at possibly concussion symptoms, then these become a lot more important. There's again a reference at the bottom here.



Briefly going through that, Grade 0 and Grade I are identical to the standard Quebec Task Force Classification. But as you can see in Grade II, they now expanded Grade II to include IIA, IIB, and IIC, where IIA we now have sensory impairment, local cervicomechanical hyperalgesia, we - in Grade IIB, we now get psychological impairment, elevated psychological stresses as tested on some of our questionnaires.


Grade IIC, increased joint positioning error, so these are the tests where you sometimes see people sitting with lasers on top of their heads, closing their eyes, turning their head, repossessing their neck again, and you measure the error of essentially proprioceptive input from the cervical spine. So Grade IIC, we're starting to see error and generalized hypersensitivity, and again, significant post-traumatic stress. Grade III, the modified task force now again looking at, as we can see, sensory impairment here, psychological impairment, so similar to what we saw in the Grade IIC.

I'll talk briefly about the Canadian Cervical Spine or C-spine rule, essentially, when should we image cervical spine trauma? We should basically look at high risk factors. High risk factors are over 65 years of age, we may not see a lot of those in, certainly, elite sport, paraesthesia in the extremities is a high risk factor, and also dangerous mechanisms. As you can see here, the dangerous mechanisms are put a little addition to the slide here are hyperflexion, we'll see an example of that later on in this presentation, and axial load, so essentially anything that hyperflexes the cervical spine, or any axial load here as a mechanism of injury. We need to seriously consider getting a radiographic examination.

Again, low risk factors, if they have any of the following, again, we look at neck mobility, and most of the time we will actually choose to not take radiographs. But there's, again, a lot more information on this out there, but certainly cervical spine rule is one to be aware of. We'll see example later on when that was used in a real live patient that I saw.

Any acute cervical pain with traumatic event, always consider concussion. If the force was big enough to cause a neck injury, it may also have caused a concussion. We now know that the line between a whiplash injury and concussion, in terms of symptomatology, is very, very blurred indeed, and we now are starting to think that most concussion has a very, very significant cervical component to it, and they're the other way around, too. So certainly be aware of checking for concussion symptoms in acute cervical pain. Don't just think, oh, this is the neck injury. Always consider, if there was a significant enough force, that it could have been-- that they could be suffering concussion symptoms also.

Again, we saw in the cervical spine, the Quebec Task Force, we saw that some of those symptoms in the modified version was tight taking into account symptoms that could be attributed to concussion also. Classic example here from a rugby final that we were playing in. Again, you can see Number 10, [INAUDIBLE] gets tackled here, quite a significant injury, and he actually goes down and suffers concussion, as well as a whiplash injury. So always consider concussion in acute traumatic cervical pain.



In terms of management, pain management, reassurance is big in acute cervical pain. People, even elite athletes, often think that they're making a fragile structure. If you can reassure them that they will get better, again, we now know increasingly how important that is for recovery. Consider analgesia, consider taping, spinal manipulation, possibly consider low force or Activator to begin with, very much, again, to patient tolerance. Our goal is to restore joint function, because we know improving joint function improves pain modulation.


So again, spinal manipulation, mobilization, consider again into least painful range, so if they're very restricted in one direction, consider adjusting them the other way. Again, as before, consider using Activator. We'll see briefly later on, those of you who have heard me speak before will know I'm a very big fan of functional muscle testing, and I will very often based my initial adjustment decision and direction around what I find on muscle tests. We've got a couple-- we've got a slide on that later on, as well.

Soft tissue work, whatever your preferred acronym is, we have dry needling therapy, instrument-assisted soft tissue manipulation, massage, active release techniques. Again, whatever's in your tool box in order to improve soft tissue function can be relevant here. We know that things such as cupping is becoming more and more used, and I have seen and also personally experienced very good effects with that, too. And then, of course, rehab. The acute cervical pain rehab, I-- getting back to function is active mainly based around range of movement stuff rather than necessarily strengthening at the acute stage.

Radicular pain, obviously always check for sensorimotor and reflex changes. Consider imaging or surgical evaluation if a patient is either non-responsive to your treatment, or finding that there are unremitting and, obviously, if you have downgoing SMR findings, then a consideration for imaging evaluation should certainly be done. Try and find the source of neural irritation. Remember double crush, so you can have a double crush injury, they could have an irritation of that neural pathway at any part of the pathway through the caudal tunnel, the ulnar nerve behind the elbow.

Couple of tests here that are useful, doorbell test is one I use a lot. Literally get in front of the IVF, palpate through pressing. It'll be tender, but of course what you're looking for is, does it reproduce the peripheral either upper arm pain, axillary pain, lower arm pain where the patient is complaining of. The arm squeeze test is actually now being shown as one of the most valid and sensitive tests out there. I put a little link down at the bottom here for you to go and check out. If you Google "arm squeeze test" on YouTube, you'll find ways to perform that. I use that test a lot now, and it's a very, very valid test to distinguish radicular arm pain from musculoskeletal arm pain. Neural tension test, again, you'll find those out there. You should be aware of those already, but there's plenty of work out there for you to go and check out.

A stinger is something we see a lot of in rugby or any sort of tackle or impact-based sports. The guy getting the stinger here is not-- although the facial expression on this guy is not great, the guy who is actually getting the stinger is the guy who's tackling him. So it's a traction injury of



the lower cervical nerve routes and/or brachial plexus, usually caused by sudden depression of the shoulder girdle, i.e., you go in for a tackle, your shoulder gets depressed, you may even be forced contralateral, lateral flexion of the cervical spine, again, essentially tractioning through the brachial plexus. Usually associated with paraesthesia, pain, sometime neural deficit as well.

This is where you'll often see a player in an impact sport getting tackled, they drop to the floor, you'll get the medical team coming in, and you will often see them immediately testing muscle strength, and essentially checking for neural integrity after a stinger. It can last from seconds to several months. They're often fragile for quite a long time, so once you've had one stinger and that neural sensitivity, it often takes a lot less impact for them to experience another stinger, so be aware of that.


Management, cervical and thoracic adjusting, soft tissue release, particularly through pec minor and scalene muscles overlying the brachial plexus. You get really good results with-- don't just go in adjusting the spine and nerve roots. Have a very good look at the soft tissues on top of the brachial plexus. Releasing in there will often have great effects on your athletes.

Neurodynamic mobilization, you can do that with instruments as well. Inhibition, kinesiology taping of pec minor. Very briefly, the way that I do that is I will stretch the pec minor out as much as I can, and I will lay kinesiology tape along-- basically from the tip of the shoulder along the clavicle with zero tension on. So zero tension on the [INAUDIBLE] so make sure you get it off the backing tape, lay it down with full stretch so that as you release the muscle into neutral, you should get little convolutions in the tape. When you get in convolutions, that essentially is an inhibition taping, and it'll reduce muscle tone. It's fantastic for neuron pain because essentially it just relaxes that pec minor down, and gives really good release.

Look at breathing patterns. If people got very poor diaphragmatic breathing and they're breathing from a lot of their accessory muscles, that will keep irritating that brachial plexus, too, so one to look at. Again, obviously, anterior head carriage, forward posture, will be a factor in recovery from a stinger, too.

This is myotomal testing. Essentially, if I find a weak muscle on particularly shoulder girdle stabilization, I will try and see if any cervical mobility or cervical movement will change my muscle tests. So very often we'll find that shoulder flexion or shoulder abduction is inhibited in a cervical spine injury, and if rotation to one side makes that muscle test strong, that's the way that I will tend to adjust them. Again, the level I will find with motion palpation usually, but you often find if you adjust it that way, you can only test with increased-- or test after your adjustment, and you'll often find immediately change-- immediate change in strength there.

Anterior translation is another one that often you see, if you get particularly SMR findings. If you find that someone has, say, a weak wrist extension, and you then do anterior translation of the spine and you find an improvement in strength, it's often to me an indication that you have a



discal compromise. As you translate forward, you essentially open up the IVF behind the disc, creating more room for the nerve, and therefore more neural firing.

So we're going to finish with a real-life story. I-- as obviously we should always have, I have written consent from our player, who is the guy coming in from the right here. So Tom Croft, wearing number six, gets tackled in a game about five, six years ago. Let's see if we can just replay that. So Croft comes off the back of the scrum just here, and goes out and tackles the number eight. Number eights are normally pretty big in rugby, and he somehow manages to come across. You can see in terms of the cervical spine rule, apart from the fact that scrum half knees him in the face afterwards, in terms of the cervical spine rule, we pretty much got the two risk factors here. We got a hyperflexion injury and an axial compression.

So Croft drops down. Immediately, the physios and the doc are on the scene. Rugby physios are incredibly quick at getting to players who go down. Players in rugby in particular generally are shouting swear words at this stage, saying, I am fine, I can get up, I need-- you know, I can-- they'll often claim they can play on, but they certainly want to walk off. If nothing else, they hate being spinal-boarded off.

However, the medical team basically suggested that he failed C-spine tests. Significant point tenderness of C-spine, so he was immobilized, ended up at a hospital where he-- two years earlier, after a game, had a glenoid fracture. So he was handed over to the hospital department. We have to hand over control to the hospital department, so we're not allowed in. The hospital department examined him, took the necessary X-rays, reported back, and said, X-rays are clear.

No fracture found, returned to the team in a sling. He came in to see me the next morning, and I assist him. He had essentially shoulder-tip pain and a little bit of paraesthesia but nothing presented but a very stiff neck. I did a full SRM, full workup. Cervical compression was negative, upper limb reflexes, sensation, muscle power was normal, pretty sensitive over-- the doorbell test suggested that there was subneural tension in there. Essentially I diagnosed a stinger, particularly with a view of knowing that his X-rays were clear.

Then he didn't get any better, and two days later we decide, well, I can't do that, I adjusted his C-T junction very gently. I'm pleased to see, or I'm pleased to report, because he was pretty tight, so I didn't-- I wanted a little bit of stimulation in there, but I adjusted his C-T junction, I did a lot of soft tissue release. He actually felt quite a bit better after my treatment, but two days later wasn't improving overall. So medical team decided, let's get a scan done, and as you, can see this is a pretty scary scenario. He-- since he had an unstable fracture at C6-C7, including a true subluxation, not in the chiropractic word.

This is his MR finding, and as you can see he's got significant structural deficits around, including the disc, significant core pressure, you can see the fractures through the pedicle just here. And this is Croft post-surgery. So of course the first thing we thought was, well, how on earth did they miss this at the hospital? How did they miss a spinal fracture when he was X-rayed

at the [INAUDIBLE] hospital immediately after the injury? So [INAUDIBLE] we requested the X-rays, X-rays came through, and the X-rays were, indeed, perfectly clear of his right shoulder.

So essentially they had taken no cervical spine X-rays because Crofty came in, probably linked to the fact that he already had a history of shoulder problems two years earlier, they sort of neglected the fact that he had actually hit his neck, and the neck was the issue when our team took over. So somewhere along the lines, as he actually presented to the radiographer, they decided, right, he's complaining of shoulder pain. We X-rayed his shoulder, so as the report came back to us, it was just, yep, radiographs are clear, nothing to report.

So there's a couple of things that you can learn from this. Obviously, never assume and always check, always request radiographs where they've been done, keep good dialogue with the medical team. I obviously had to do a report on why I was manipulating someone who was later found out to have an unstable fracture of the cervical spine. Again, luckily, my decision at the time was to go very gentle and to do very light stimulation, mainly because of soreness and tenderness. There was still nothing, and in hindsight, obviously, reviewing the case, there was nothing on my initial examination to suggest that he had a catastrophic injury at all.

The conclusion to this, and another learning curve, is that this is "Crofty's" first game back. You can see him here. This is our trial line just behind him here, and we've got Danny Care, number nine, scrum half [INAUDIBLE], ironically, the same team that we were playing when Crofty got his injury. So this is about nine months later after cervical fusion, and Danny Care sees the try line, jumps over to try and score [INAUDIBLE] and Tom Croft decides to tackle him [INAUDIBLE] to try and prevent this try being scored, and with his head.

We were sat on the bench, pretty much most medical team, through this and saw this happen-- saw what happened on the big screen, and thought, Christ, what is he doing? I guess it's a way of testing your spinal-- your cervicospinal fusion. The great news of obviously seeing this is that-- here it is again-- is that actually the outcome of this was the try was not given, it was a try saving tackle from Tom Croft in his first game back after a catastrophic cervical spine injury.

So apart from, obviously, the learning that we saw from the previous slide, [INAUDIBLE] make sure that you never assume, that you check and always double-check and make sure that people actually get their diagnosis and the correct radiographs. The other lesson you can learn from this, if you ever want to tackle someone with your head, go for the nine rather than the eight, because the nine is considerably lighter and easier to tackle with your head. You can see Crofty here looking pretty smug, because he's pretty smug and happy, and not lying on a spinal board, so it was a very effective way of testing his-- cervicospinal fusion.

So that was a real-life example of how C-spine rule was appropriately carried out in 40, didn't quite get through to hospital, and they took the wrong X-rays. I hope this has been useful to you. It was a fairly brief whistle-stop tour for acute cervical spine injury, but hopefully you've had some useful learning out of that. Thank you very much.