Academy of PHYSICAL MEDICINE

Transcript

Concussion -Recognition, Treatment and Advice - Ref 296

Steven Bruce
Good evening, and many thanks for joining me once again. I've got another fascinating show for you tonight because we're going to be looking at concussion. Of course this is in the news in a big way at the moment in sport with players having been suing the Rugby Football League recently over brain injuries caused by the sport. And of course, there's concern in rugby union, as well as in soccer, where repeated heading of the ball could be a cause of longer term damage. Now, I know what you're thinking, people don't come to us for concussions. So unless you do pitch side assessments for a local sports club or something, you might think this is all a bit irrelevant. But I wonder, first of all, I wonder how many patients we see who have undiagnosed concussion from their weekend sports or their other activities, but also we see the parents or later children who were involved in sport and it could be really useful to us if we can offer them appropriate advice about keeping that children safe. And I'm sure there's a whole host of other things which are important to us as well. And we're about to find out what they are, because I've got three guests this evening. The first is Cameron Marshall, who's a director of sorry a Doctor of Chiropractic in Canada. And Cameron has specialised in concussion and post concussion syndrome for many years now. He's also a past board member of brain injury Canada, which is an organisation devoted to helping those with brain injuries as well as their carers. And not surprisingly, he couldn't make the trip to the studio this evening, but he's joining us via the video link. In the studio. However, I have two chartered physiotherapist, I've got Donna solace and hull and Nicola hunt, both of whom have worked closely with Cameron and are involved in concussion training in the UK. Donna is actually Donna you were telling me everyone you work with the Minister of concussion minister for concussion in sport having quite elevated level. And Nicola, you are a specialist in neurological and vestibular aspects of physiotherapy, aren't you? So, you know, we've got some we've got some real experts with us in the studio and virtually this evening, Cameron, I don't know how much of what I said, is completely accurate or tells the whole truth. You want to fill in some gaps until this hill, clever practic and concussion work together?

Dr Cameron Marshall
Yeah, I mean, I think that one of the first things I just want to kind of point out that you said is that is that you know, patients don't come to us for concussion. But in in kind of the mission that we're on right now is to try and change that because there's actually a lot of things that chiropractors osteopaths physiotherapists can offer to concussion patients both from acute care as well as from persistent concussion symptoms, which is a huge issue plaguing you

know, both athletes, motor vehicle accidents, you know, workplace injuries, that type of thing. So, dealing with those persistent symptoms, there's, there's a whole bunch of things that osteopath chiropractors physiotherapists can offer, and kind of our mission at at organisation complete concussions is to kind of change the narrative around that and kind of educate these healthcare professionals as to what they can be doing to help these kind of patients out.

Steven Bruce
So, Cameron, you mentioned a different organisation that you mentioned, complete concussion, which I think is an organisation that you found it, haven't you? Yeah, what's up for?

Dr Cameron Marshall
Ya. So I, I did my doctor of chiropractic in Canada, and then I specialise in sports medicine after that. And with that, I actually be like, you're supposed to do research in a particular field. And so my topic of interest became concussion, because at the time, a very famous hockey player in Canada was getting treated for his concussion by a chiropractor. And I thought, well, that's weird. Well, you know, how do we even fit into this picture. And so it became my topic of focus for my research project. And I ended up working with some very prominent researchers here in the concussion field, and it became my entire thesis and I worked on it for three years. And in going down the rabbit hole of examining the concussion literature, you start to realise that concussion isn't this kind of abstract thing, it actually is a treatable entity. And the treatment is rehabilitation. The treatment is exercise, and putting people on treadmills and providing dietary advice, and doing vestibular rehab and ocular motor rehab and also cervical spine treatment, manual therapy, adjustments and that type of thing. And so that just opened my mind up to go, oh my god, we actually are the treatment for this and yet nobody in my field knows this. Nobody in physiotherapy knows this. And so I started training people in Canada after going through kind of, you know, self teaching myself all of this stuff, and and creating a network of clinics so that patients could actually find appropriate care, get the right treatment, get the right rehab. And so we formed a network now and now we have we're the largest concussion organisation in the world. We started in Canada we have about 400 locations in in, in throughout North America, Australia. And we're just kind of starting up in the UK now in forming a network throughout the UK.

Steven Bruce
So fascinating stuff and and interesting to hear how recent it all is I can speak being personally as having personally suffered concussion twice. And I can distinctly remember getting absolutely no treatment for it whatsoever. I was just left to see when I got better. How much of how much of the treatment or the treatment protocols that you mentioned are would be new to a physio Cairo osteopath, and how much of it is just knowing which of our existing skills we use, we adapt to treat concussion patients.

Dr Cameron Marshall
That's the interesting thing. A lot of it is stuff that's already kind of within your skill set. It's just Applying it properly and knowing when and how to apply it and when to push forward and when to pull back. So a lot of it is stuff that is already in the repertoire of most professionals. The kind of flipside of that is there's also a bunch of kind of net new stuff that is more concussions specific that that kind of needs to kind of create some some additional training in that in that regard.

Steven Bruce

Right. Okay, so we're probably getting ahead of ourselves here, but I'm assuming that anybody in this country who wants to train specifically for treating post concussion syndrome or concussion patients, I mean, there was a cool setup here already.

Dr Cameron Marshall
Yes, there is. It's and it's all online. We have we have a course for chiropractors physiotherapists, and osteopaths, which is kind of more of the physical rehabilitation course. And then we have an occupational therapy course as well, which is more so on cognitive rehab, return to school return to work. And then we also have a physician and specialist course, which is for physicians, but also mental health professionals, neuro optometrists, and vision therapists. There's a whole bunch of courses, and they're all and they're all online. So they're available for everybody.

Steven Bruce
Yeah. And you earlier on, you mentioned a couple of things that I didn't which could give rise to concussion you talked about, well, not least not least hockey, but workplace injuries, and car accidents. So as you say, there's no head injury assessment, applied strictly for someone who's had a car accident. I mean, people tend to make an assumption, you've got a whiplash injury if you've got any pain. But as far as I'm aware, there's no automatic assessment for concussion in this country, maybe Niccolo, do you know better?

Donna Sanderson-Hull
Well, essentially, what tends to happen is that people will visit the accident and emergency and, you know, their huge focus is making sure that somebody hasn't got a skull fracture or a brain bleed. And so what often we find is that when people come to our clinic, and they say, Oh, it's okay, I've been, you know, I've been cleared, I've just got a concussion. And so the injury itself is downplayed to be something actually fairly low key and insignificant. And yet, that's what catches people out, because they end up with these huge symptoms that could be fairly catastrophic for their work in terms of not being able to drive a car, or, you know, every time the windscreen wipers go, they have to pull over and vomit or, you know, some really extreme symptoms, or we have parents that will come in and say, My son was a straight A student. And since he had a concussion, he can't read a book, but no one believes me, is this related to his concussion? And so we can then put some treatment into place and give them reassurance that actually is related. And it actually is an injury that needs to be treated.

Steven Bruce
So Cameron, if you've got any examples you could share with us of people have come to you in clinic for something perhaps completely unrelated, who you have discovered through normal case history taking that actually, there's a concussion element in their in their history.

Dr Cameron Marshall
Well, I mean, my, my practice is probably a bit unique, because, you know, they're all concussion patients. So that's all I see. So they're usually there, because they know that they have have a concussion. But I think the problem with concussion and just the way we think about it is, is that concussion is very nonspecific, in terms of its symptom presentation. And so you can have a variety of things where, you know, somebody may or may be identifying some some symptoms that they're having with, with something other than concussion. And it turns out, well, there could be some remote history of concussion that's kind of in there. So I think it's important just to keep that in mind when you're when you're

working with, you know, any type of patient, particularly after any type of, you know, traumatic event,

Steven Bruce
give us a bit of science behind this, what's actually going on in somebody who suffers concussion.

Dr Cameron Marshall
So we used to think of it as being some sort of bruise to the brain, right, we used to call it the coup contrecoup injury, where the brain kind of bashed up against the skull and created some sort of, you know, bruising on the outer part of the brain. And what we now kind of think about it as is is a stretching of axons. So when the brain is is kind of impacted, it goes through acceleration and deceleration. So that's really what a concussion is, it's not the impact itself, it's the acceleration of the brain. And when the brain has kind of accelerating and moving around and shaking within the skull, provided it has enough acceleration behind it, you actually are going to get stretching of the axon. So the individual kind of brain cells are going to stretch and they're porous. So they're not kind of we think of an axon as like a tubular structure, but they're actually porous, there's pores kind of throughout it, and if you stretch it to a great enough degree, those pores will become opened. And inside of if we get back into our kind of intro physiology type type stuff, you have high amounts of potassium and sodium, both had to sell and you're gonna get ion exchange. Well, normally that's closed and those are meant to go through for specific gated channels. Now If the brain gets accelerated and decelerated, and those pores stretch, they can actually open enough where you're going to get potassium coming out sodium rushing in creating an action potential. So if you want to think about concussion in a simplistic term, concussion is just millions of brain cells that all at the same time get tricked into thinking that they've received some sort of signal. So they all start going under action potentials. So there's actually no physical damage to the brain that we can see it's actually a functional injury, it changes how the brain functions for a period of time. So we get this kind of electrical storm. And that's the initial symptoms that someone may experience that could cause someone to lose consciousness, it could cause somebody to have a seizure, it could cause somebody to just kind of be a little bit disoriented and out of it, you may have people off balance. And this is just because there's so much activity happening inside the brain that you can't make sense of it, everything is just kind of going on, it's chaos. So that's the, that's the first phase, that's called the excitatory phase. As part of that excitatory phase, you also as long as you know, you get the sodium and calcium exchanging, you get sodium rushing in, but you also get calcium rushing into the cell. Calcium is the big problem. Calcium gets into the mitochondria, and it affects our ability to produce ATP. So if we again, going back to intro physiology, if you have an ion exchange, that's kind of passive transport, right, those are going down a concentration gradient, there's, you know, it does that fairly kind of risk free, there's, it's fairly easy to do that. But then coming back and resetting that balance, because you're going against the concentration gradients, you require ATP. So calcium getting into the mitochondria affects our ability to produce ATP. So what you have here is a situation where you've created an imbalance. You've had the initial kind of symptom onset, usually that lasts for like, just a few seconds, right? So you see somebody get hit on maybe on the rugby pitch, they get up, they're disoriented, they're all off balance, and then they kind of, you know, they look normal after that. It seems to be a very short duration event. But the problem is the event has already occurred. And this is where I think sideline therapist has to be really, really vigilant on this, because are diligent, I said that wrong, diligent, if, if a player gets hit and looks to be off balance or out at all, and then they start to look okay, the person might think, well, they're fine. The problem is, the concussion has already occurred, the initial

excitatory phase may have passed, because that's usually very short duration. The problem now is that calcium has gotten into the cell, it's affected our ability to produce mitochondria. And then you get the second phase of concussion, which is called spreading depression. And what happens is, you're burning more energy to reset the balance, right? You're using ATP to get all the things kind of sorted, but you're not making any. So you end up losing this energy, you get this drop in ATP that happens over the next days, to potentially weeks. And in that kind of low phase of energy. This is when you have, you know, potentially persistent kind of symptoms going on. This is when you're also very vulnerable. So any type of secondary impact. Can you know, if you think that your energy is up here at 100%, you get concussed, it drops down by about 20%. You're now down to 80. If you get concussed again, well, now you're way down here. And now you're potentially creating a situation where you're getting repeat concussions, now you're leading into kind of permanent damage and kind of all of those facts. So concussion by itself is a short term, functional deficit. If we look at it on MRI, it's normal. If we look at it on CTE, the brain looks normal, because structurally, everything is still there, it's still intact. It's this temporary, functional deficit that occurs, and if that functional deficit is taken care of, and we allow that energy to kind of restore back up, this is why we used to prescribe rest, rabies tell people Oh, just rest, you need to rest your brain. Because the thinking was, well, you're you're burning more ATP than you're producing. Let's go and have complete brain rest, and don't use your brain for a few weeks, and let that energy restore back up, we now know that it doesn't actually work that way. But so rest is actually not recommended anymore for you know, beyond like a day or two. But if that was the thinking behind it, is let's restore that ATP back back up to try and kind of get those levels back to back to where they're at. So it's just a functional short term injury, but we take care of it. We don't end up with these long term kind of neurodegenerative consequences. I think the big problem that we're seeing now in professional sports, is that there's such a drive for me to play the next game and for me to finish the half and for me to, you know, be a part of my team and that, and especially at the professional level, we're not allowing that recovery to take place. And so you end up with this low energy state that then you get hit again and now you're dropped down here, and now you're creating permanent damage. And now you're having all sorts of problems. So, you know, the kind of quote I always say is, do we have a concussion problem? Or do we have a king Question management problem. And I think it's the latter. I think that if we actually took care of our concussions, we would not end up and we would not see what we're seeing now in professional sports.

Steven Bruce
Yeah, that was that was fascinating. Personally, I have no idea how elastic an axon is. So how long does it takes an axon to revert to its normal length, shape and porosity?

Dr Cameron Marshall
You can think about it almost instantaneously, right? It's, it seems to be just really short duration piece. And we don't actually, you know, have the timeline on that. But it is, it does seem to be a very short duration piece just enough for that pores to stretch and come back. What we do know is how fast that actually happens. So we know the acceleration needed in terms of linear terms as 70 to 120 G's of acceleration, whereas G forces being the force of gravity. So you have 70 to 120 G's, which is actually quite substantial. So if you look at something like a header in soccer, that's only about 18 G's, so it's well below the threshold that's actually needed to create this axon stretching and shearing. Right. So that's why most headers don't cause concussions, I mean, if you get hit the wrong way, or you're not expecting it, then that's a different story, because the head can whip back and forth and kind of cause that. Now the acceleration, most of the studies are done in sports, like football and

hockey. And if you have instrumented helmets on football players, you find that the the peak acceleration happens within the first six to 20 milliseconds of impact. So it's literally like if this person has no idea this hit is coming, it is instantaneous, that the concussion occurs basically, as fast as the hit, you know, occurs. So you really have no chance. But that's about as much as we know on that.

Steven Bruce
Why is concussions such an issue in what we would call football, and you would call soccer, then if Heather's don't generally cause enough G force to induce concussion,

Dr Cameron Marshall
player to player contact. So anytime you get a number of people running around chasing a ball, you know, they're kicking each other in the head, it's not necessarily hitting the ball, but it may be going up for a header and smashing heads with somebody else. 75% Plus, of the concussions that happen in the sport of football, are actually player to player contact, less than 10%. So it's between, I think it's 6% in males and 9%. And females have concussions in you know, more the youth level. So the youth to amateur level are actually from ball contact with the head, the rest are just our player to player contact.

Steven Bruce
Right. Okay, so, Nicola, then I don't know, Nick, look in the middle. I don't know. Thank you. incredibly rude. When I suffered my concussion, and when I was working with sportsmen, the basic tests for concussion was whether you could tell it was Wednesday or not. That was you get asked a question like that. And if you can answer the question accurately, then you'd probably be allowed to carry on playing. I'm assuming we've got better protocols now in sport. Yeah,

Donna Sanderson-Hull
I mean, there is absolutely no doubt there is a lot of time energy energy going into how concussion is managed in professional sport. And all the National Sporting governing bodies are working extremely hard on that at the moment. So obviously, the rugby union have now had HIA, or head injury assessments. So if anyone has a concussive incident, that will be managed appropriately. They also have independent match doctors now so it takes away some of the onus on the pitchside medical staff making those huge decisions. And also the pressure when I was working at Bristol, rugby back then, as it was, it's Bristol bears now. You know, you'd have your mic on and you'd run on the pitch. And you'd have some angry coach saying, Don't you dare take him off even though that you know, he was clearly concussed. And you know, I remember many years scenario and if that player saw this Now he'd know who he was, you know me hanging off for the Shirttails of players trying to pull them off because one of the signs and symptoms is you know, a little bit of aggression and you'd know that they'd had a concussive there is there from the ICU, I knew he was like a puppy dog in the clinic room normally, so I knew that there had been an incident but you know, their player would want to stay on so there was player pressure to stay on. The coaches would want them to stay on the medical staff would find it incredibly difficult to pick bring people off

Steven Bruce
was a very public incidents incident of that wasn't there in the recent World Cup. There's a goalkeeper went up for a ball and got head contact with another player. They kept him on the pitch and I think everybody watching said that man's got concussion.

Donna Sanderson-Hull
I feel very sorry for for the Football Association at the moment because at least with rugby, they have made an intent to make that safer with the independent match doctor and taking that sort of onus off the hands of those pitchside medical staff. In football, they've really, really pushed hard to get what they call temporary concussion substitution so that they can take a player off and make accurate and safe decisions. But unfortunately, they haven't done it yet. And it's still it's still not crossed the line. For them to do that. I

Steven Bruce
think it was evident to everybody in that particular case, there's no way he was coming back on the pitch, and he certainly wouldn't have come back on in a rugby match what he was just obviously had concussion. I've had a couple of comments in already. I mean, one of them is from the anatomy nerd who says that she's loving all the mitochondria and ATP levels of detail. It's lovely to remind to be reminded that it is relevant to what we do, which is Yeah, I thought this would be and, you know, I'm gonna come back to that question I asked earlier on Nicola, in a bit. And so you know, what's come through your doors as physiotherapists that you wouldn't have expected they weren't expecting it to have anything to do with concussion? But let me do with the questions First, if I can, Stacy says he says his question for the speaker. So I'm presuming she means Cameron, because he's been speaking most. What can help someone who has long term post concussion syndrome? Her mother's had it now for two years and her brain can't multitask.

Dr Cameron Marshall
That's a, that's a really big question these days, but I'll do my best to summarise it. So concussion is a short term, temporary injury, from what we know from the physiology that I just went through, we have this kind of drop in ATP, most of the research on that shows that that ATP recovers within about three to six weeks. So somewhere in that, that timeline three to six weeks, you're gonna have recovery of the underlying kind of what it was called a neuro metabolic cascade. So you're gonna have recovery, that mitochondria gradually kicks that, that that calcium back out, it gradually comes back online and starts producing ATP. And we're able to kind of flush out the rest and reset the balance, and we're good to go. And in the majority of cases, 70% of cases, the symptoms go away within you know, 10 days or so, in the in the kind of 30%, the remaining 30%, the unfortunate 30%, they end up with what's called persistent concussion symptoms, it used to be called post concussion syndrome. So now it's called persistent concussion symptoms, same acronym PCs. So we have this metabolic dysfunction that happens initially. If you still have symptoms beyond a month, you're called PCs, persistent concussion symptoms. Well, why would that happen? If the mitochondria and all that stuff has recovered? Within that period of time? Why would we have this? Well, there's five main kind of reasons that this could be, number one is dysregulation of the autonomic nervous system. So the autonomic nervous system is fight or flight, right, which is your sympathetic side. And then it's your rest and digest. This also controls your heart rate, your heart rate variability, but also the blood pressure, and the response to oxygen and co2 levels in the brain. So it's what regulates blood flow throughout the brain, we know that this system is impaired after concussion. So if you have ongoing impairment of the autonomic nervous system, things like you know, increasing your cognitive load, increasing physical activity, if you start to exercise, it may bring on your symptoms. And that's actually the test for this we do an exercise test to try and figure out what's your threshold. If you get symptoms, and at what point you get symptoms, that right that shows dysregulation, the autonomic nervous system. Number two is inflammation. So after concussion, you're gonna get inflammation of the neurons and also the supporting structure in the brain in the nervous system. So neuroinflammation, get activation of these, these glial

cells, which are support cells in the brain, and they're kind of the macrophages of the brain, if you will, there's also dysregulation in the hormones. So the pituitary gland just based on where it sits, can get like kind of a cross shearing as well. Also blood flow dysregulation, and also, you know, stress, lack of sleep, you know, financial things, all these things put pressure on the hormone system. And we've seen, we've seen reductions in growth hormone and all sorts of other pituitary based hormones after concussion, and that can bring on similar symptoms as concussion. Number three is visual and vestibular dysfunction. So obviously, you know, we know what the vestibular system and the visual system does. People that have dizziness or trouble with crowds or navigating their environment may have some visual vestibular issues that requires rehab. So again, this is why our professions should be the ones kind of leading the charge. There's nothing really that a neurologist can do beyond ruling out some of the red flags that may be going on. But beyond that, the treatment is more diet, exercise, rehabilitation, and also education and kind of following the right protocols. Number four is cervical spine dysfunction. So with concussion you also get a whiplash. So concussion I mentioned before the forces are 70 to 120 G's of acceleration, whiplash or mild cervical strain injury only takes four and a half G's. So that means that anytime there's any type of concussion, there's always going to be a whiplash. And the literature has shown us that 100% of the time, there's always an overlap, the symptoms of whiplash, and the symptoms of concussion are identical. You cannot tell them apart. So somebody's had a concussion and a whiplash. They think they've had a concussion, they haven't really considered the whiplash portion. They're walking around in their life wondering why they can't navigate their environment and why they can't think properly. Meanwhile, all the same symptoms come from neck dysfunction. The neck influences your visual function, the neck influences your vestibular function. The neck is associated with light sensitivity and sound sensitivity and tinnitus and ringing in the ears and cognitive function. And this is all based on neck stuff, which is why chiropractors osteopaths physiotherapist, should be kind of leading the charge in this area. So that's number four. Number five is the psychological and end of things, right, the unknown, anxiety, depression, post traumatic stress, all of these things overlap directly with concussion as well. And so a lot of times when people think, Oh, I have a concussion, I can't think properly, they start finding things in their environment, which kind of reaffirm that same belief, especially now with the media attention put on to it, it kind of can create heightened awareness and heightened levels of anxiety. And they think, Oh, I can't pay attention at dinner parties, and I can't, you know, concentrate on anything. And what that does is as soon as that they're in an environment where they're in a conversation, they start going, Oh, I can't pay attention. I'm not thinking about this. But meanwhile, their mind is drifting towards ruminating on the fact that they can't think about it, rather than actually trying to like spend their time focusing. So there is this overlap of kind of the mental health piece where we need to educate patients to kind of bring that level down that concussion is no longer after a month. Right? If you think about it this way, concussion is initially a brain injury, that also causes a whole cascade of other events happening outside of the brain. The brain kind of recovers, right. But people have this fear that oh, this is my brain. And this is, you know, this can't be fixed. But all of those things I just mentioned, those five things that drive PCs, and persistent symptoms, those are all treatable. Those are all treatable autonomic nervous system, we do things to balance it, you know, rehab diet, so and so on the inflammatory side of things. It's it's diet, it's supplements, it's repairing, you know, gut issues. And sometimes you end up with a change in what's called dysbiosis. Where you have, you have a proliferation of bad bacteria and not so much good bacteria. So it's resetting your gut, it's, you know, doing things to stimulate your vagus nerve and your parasympathetic nervous system to try and bring down the sympathetic, these are all treatable things. So it's a 100 treatable condition.

Donna Sanderson-Hull
Yeah, I just wanted to add in there cam that is really important to get across when you say that people do come into clinic with, you know, this catalogue of symptoms. And often they'll say, Well, you know, I was told that I didn't have a concussion because I didn't hit my head. And you know, there's a real misconception that because there wasn't a contact with the head, that they hadn't suffered a concussive injury. And I think it's really important that we, we can educate the patient when they come in, we see a lot of people with, you know, high levels of anxiety around their injury. And you know, that the the lady that's, you know, talked about her mum, you know, there's always this sort of overlay of anxiety about the fact that they, they, they keep asking people for advice, but they keep being told me, you haven't got a concussion, you didn't hit your head, or this isn't related. And actually, it's a real pleasure for us to be able to come in and really educate them about what's happened, the fact that you didn't need to hit your head, it was the acceleration and deceleration of that grey and white matter have been different densities. And that's why that sort of sharing of the brain has caused them your initial symptoms, but there's no doubt that the ongoing situation can be treated, because it's likely to be based in one of those subsystems that Ken was talking about.

Steven Bruce
Robin sent in a question a short while ago. He's asking what are the indicators we might look for if a patient to tell whether a patient is at risk of he's saying chronic traumatic encephalopathy? I guess we could just save concussion concussive injuries. Could we is it just high frequency injuries like sports athletes or boxers? Or is it the magnitude of injury as a bigger as bigger risk? I'm not quite sure what he means by that.

Dr Cameron Marshall
Yeah, this is a whole can of worms. You know, we're laughing about this because it is it is kind of a can of worms. It's quite a political issue. It's a very divisive topic. To be honest, it throughout the concussion space, it's very kind of polarising. But what CTE is or current Traumatic Encephalopathy is the long term neuro degenerative brain disease that's associated with concussion and also just context words. Now, the I think a lot of the contention around it is that the the media reports on it don't necessarily match the level of evidence we have in the literature. So the way that it's portrayed in the in kind of the media reports is that this is a foregone conclusion, we have overwhelming evidence that concussion leads to CTE and leads to these neurodegenerative issues. But the reality of it is the research is still very, very early days, we have, you know, basically a case series of donated brains, we haven't really done very good trials looking at, you know, what, what the prevalence of this particular condition is, in the general public. We've assumed that it's related 100% to head trauma, yet, we don't know all the other variables, right? We're looking at a brain at the end of someone's life. And assuming that, well, they played rugby, they have this neurodegenerative disease, it must have been the contact, but we don't think well, could it have been? You know, were they taking any, you know, illicit substances throughout their life? Like, what was their diet? Like? Like, you know, there's so many other factors that can lead to

Steven Bruce
experiences the rug, professional rugby players, and perhaps not professional but rugby players take illicit substances in vast quantities such as beer, it sort of goes with the territory.

Dr Cameron Marshall

Yes, yes. And so another one that's affiliated. So for example, the the disease is in the categorization of what's called a tauopathy. So it's a deposition of tau protein, which is the same category as Alzheimer's. Alzheimer's is also a tauopathy. There's different structures. So it's not the same as Alzheimer's, it affects different parts of the brain. And there's kind of less beta amyloid than you would see in Alzheimer's. But there still is some but with CTE specifically, there's other tauopathies that look very similar to CTE. And so we have to really separate out is this related to, you know, brain trauma? Or is this something that's genetic? That just you we're finding it, we're just discovering this new disease, we haven't done a lot of work. There was a study that was done a couple years ago, by a guy named Grant Iverson that actually took a case series of brains that had no exposure to sport at all, and no exposure to head trauma at all. And they found CTE in six out of eight of them. So the same pathological diagnosis. So the question is, how prevalent is this in the general population? And a lot of times when they have these donated brains there, they had, like the symptoms don't necessarily match with the pathology? So how much is this pathology actually driving some of the symptoms that are experienced? There's just so many question marks that that we still have, obviously, it could completely turn out that yes, head trauma is leading to this neurodegenerative disease. And I think that the proposed pathophysiological mechanisms do make sense, right? It's just chronic inflammation in the brain and what's causing chronic and well, head trauma, but also maybe some of the other factors. And could we eliminate that by taking care of these injuries? These are all these are all kinds of questions. And so I think there's still a lot of work to be done in this in this space.

Steven Bruce
Yeah. I've got a couple of questions here from David and I'm not sure if it's the same day really, but it's quite likely is he was talking in regard to what we were saying about professional rugby and so on. And he says all well and good in professional rugby. But what's the protocol in amateur rugby or schools rugby, how was it looked after there? And if I just go on, he's in the other David, if he is another David says, so many concussions get missed, and he gets parents ringing him and asking if their child mostly in rugby is concussed. And his answer is always if you think he or she may have been concussed, then they probably have been so don't take the risk. Yeah. What are your thoughts? So

Donna Sanderson-Hull
again, another massive topic to talk about today. But one of my, when I trained with complete concussions back in 2018, one of the big things that I tried to put across to my local club is that we need to be managing these concussions a lot better than we are doing, you know, kids are being pulled off weekend, weekend in weekend out, my husband was the director of rugby, a private school and one of my clinics is based within a private school. So trying to put these protocols out into grassroots sports was very, very difficult and impossible have to say as a one man band, that's how I got involved with love of the game, which is the organisation that's headed up by the Minister for concussion in sport, with the whole idea of if we can't do it at a sort of my level, just one person talking about how we need to, you know, bringing complete concussion management put grass roots level. So we went to the top we went to that level and very, very soon, I can't divulge too much information about it. But on the seventh 17th of April, there's new national guidelines on how to manage concussion and were in in in the UK, right and they're, you know, they're going to be Hot off the press on the 17th of April. So this is not your sport. This is what NICE guidelines. No, these are these on government guidelines on how we should be managing concussion in sport with a particular bias towards grassroots sports. And that's what love of the game we're trying to, to really improve on

Steven Bruce
here, which I printed off earlier on the scat, three and scat five assessment things which are used in football and professional rugby. And we're not going to go through them because they're horrendous, the lengthy and complicated and I thought a bit confusing as well. But are they useful?

Donna Sanderson-Hull
So So essentially, there's scatter stones for sports concussion assessment tool. Yeah. So essentially, the there is a group of researchers and experts in the field that get together every four years to devise the this assessment tool. And the last one was in Amsterdam in September cam, October, and there will be a new scatter, I imagine from all the research that's coming into play. And yes, it is the most standardised assessment tool, but it is not foolproof. And we need to, to widen the assessment of concussion. And again, this is what what we do at complete concussions, we use the scalp as part of that process. As cam alluded to that, you know, concussion is very much a functional brain injury. So scat goes some way of assessing the functions of the brain, but it doesn't do all of it. So what we're trying to put into place, is it a better system of looking at pre injury baseline test of the brain, including the scat, but adding in neurocognitive tests and other tests to give a much more comprehensive idea of what a normal brain function is. So that if they get injured in grassroots level, there is some way of having more objective measures of seeing whether the brain has actually recovered by comparing those two,

Steven Bruce
I was gonna say so much of it is terribly and I've used that word deliberately subjective at the moment, isn't it, you're relying on a player who wants to get wants to get back to sport to give you his opinion of how well he feels he can function and parents who either want their kid to continue or don't want their kid to continue, or coaches who want the player to continue.

Donna Sanderson-Hull
This is this is why we are in my clinic. We do these baseline tests using the software tools that complete concussion management have put in, just to give you some context in Canada, is around about 15,000 baseline tests that you're doing on kids per year. I think currently we've done 25 this year. So you can see the difference in you know, in we've not just got a concussion management problem, we've got a cultural problem around concussion, I think the British tend to be very reactive, when the concussion has occurred, we'll go and seek out some treatments. I actually think that in Canada, people are a little bit more proactive. And we'll go and have these like almost like an insurance policy around the brain, we're gonna have their kids have functional testing first pre injury, so that should they get injured, they have something to compare with that is more objective. And you're absolutely right, we need to improve on that in this country.

Steven Bruce
So let's give Nicola a go. Because Sam, she's sitting there very patiently waiting to say her piece over the phone. So tell us about your experience in dealing with concussion at whichever level you you care to.

Nicola Hunt
Yes. So I mean, I see a lot of people that come in with concussion, I have a vestibular clinic. So some of them will come in purely as thinking that they have a vestibular problem, they may have been to see any anti consultant who told them they've gotten it has to be a

problem. But when you actually dig back through the history, it all started when they had maybe a sort of fairly sort of moderate speed via then shunt in the car. You know, they went to see somebody over here for their whiplash, they went see somebody over here for their vestibular problem. And you know, they've maybe had some anxiety. So the GP gave him some anti anxiety medication. And it's bringing that all together and sort of sitting down. And as you know, as we've said earlier, concussion doesn't have to be caused by a hit to the head. So they don't consider it to be a concussion, because they didn't have a hit to the head, they can remember the method of impact, it was the event jumped in the car, so therefore, it can't be a concussion. And I've just got all these different problems that nobody's really making any progress with because they're not addressing sort of the different five elements that contribute to the ongoing concussion symptoms, and then bringing it all together as one sort of treatment and rehabilitation package.

Steven Bruce
And Cameron was talking earlier on about different aspects of treating this including sort of nutrition and so on. How much evidence is there behind all of this? Because of course, while you're going through any sort of treatment protocol, you're also adding in time, and so people might well argue, Well, is it the time that's causing solving the problem or is it feeding your patient appropriately? And all the other things

And there's a lot of evidence to support it. But I very recently saw somebody who she is four and a half years post injury still got ongoing symptoms. And she followed the persistent concussion, symptom diet advice and supplements for two weeks. And she was like, I can't believe the difference. In symptom scores came down so much. And I want to

Steven Bruce
go through advice in outline.

Very much clean diet. So you know, avoiding the triggers of that cause inflammation, so no alcohol, you know, really good hydration not allow just drink my six glasses of water, but sort of two to three litres of water a day, no processed food, no sugar, and then adding in sort of supplements depending upon their individual diet, whether they're following vegan diet vegetarian, looking at their different supplement needs.

Steven Bruce
So probably actually answers a question that came in from Bess, who said, how should we manage someone who's had a persistent concussion? Symptoms for three or more months? I guess you've got to do a decent analysis to make sure he's concussion you're dealing with, which we would learn if we did the complete concussion training, the online training, how long is that training?

Donna Sanderson-Hull
So it's a 60 hour course. And you know, I'm not gonna lie, it's intense, there's a lot of information, but you, you do come out with a really good framework. So in answer to that question, how would you treat PCs? I would be looking to find out what was the driver of that PCs, what was the subsystem that wasn't, wasn't functioning properly, whether that being as yours cam alluded to earlier on those five different pillars, is it you know, something that's related to Spiker, genic, or vestibular or or dysautonomia, or, you know, a blood flow issue. So, you know, the lots of tools and tricks that will, will allow us to assess that properly, and

then we can put the right treatment into place. Another example, one of my very first patients, and I can mention it, because he put it all over Twitter, the beginning, he was a professor of psychology, and he'd been chopping wood in the garden, and the axe snapped and hit him on the head. And he kind of almost knocked himself out. And he'd been around probably lucky, the blunt end who didn't? Yeah, exactly. He'd been around the country, you know, seeing all the best professors and looking for advice about what to do. And he really struggled to work out, you know, you know, he's obviously a very academic fellow himself, but it was just being able to talk through, you know, those sort of subsystems with him and actually really get to the nitty gritties of the assessment. And, you know, he was pretty much sorted within weeks and had been, you know, struggling for a long time. So it's very, very treatable,

Steven Bruce
because everybody responds so readily.

Donna Sanderson-Hull
I had a lady who had been kicked in the face by a horse. And you know, there are times when there is an element of PTSD that will go alongside it. And you do have to be very aware of the fact that, you know, at some point, it's out of my scope of practice, if they need help. And Cameron mentioned that there are courses now for psychologists that, you know, can also do the course. So we're all on the same page, so that we've all done the same courses. So I now know when to refer. And at that point, I knew I needed to get a specialist in thankfully, in my area, I had somebody who was complete concussion strain, so she knew exactly where I was coming from. And she was able to take that patient on from me. So

Steven Bruce
probably people are there in the UK who are complete concussion trained.

Donna Sanderson-Hull
There's a lot training at the moment, I think, as well. So we have at the moment, eight clinics, we're just about to have a university come on board with us and some schools. So it's it's, it's, it's growing. It's growing. I think once these Amsterdam, the new concussions, consensus guidelines come out, usually in around about May time, and the new guidelines from the government. I know on those guidelines, it will be requesting that people have timely access to evidence based concussion care. The problem we have at the moment is that we don't have that structure from primary care level right the way down to private clinics, we need to have that structure in place.

Steven Bruce
Let us know if that's not coming out as a nice guideline, how is it going to reach GPS?

Donna Sanderson-Hull
So this is again what the Minister for concussions sport is working on. And I think at the moment, they are now trying to set up what they call regional concussion centres they've got around about 20 regional concussion centres earmarked The idea being that there'll be adequate training in a&e departments in primary care, then if anyone has a concussion they will be signposted to these regional concussion centres. The problem is Once they get to regional concussion centres, there's going to be a huge number of people going to those centres, because people will now know how to diagnose it correctly and and signpost, the problem is from those regional concussion centres, they then need to go to what we call local concussion centres. And this is where we need help. Because both Nicola and I were

discussing over, over dinner before we came here, the volume of patients that we get through our doors, we can't cope with we, you know, we get inquiries from Denmark, and, you know, around the

Steven Bruce
everywhere. And Cameron said his books are full with just one question.

Donna Sanderson-Hull
And the problem is that, you know, we in private practice, I can't advertise concussion services at the moment, because if I do, it will sink my practice, we, you know, we're a muscular skeletal clinic as well as concussion clinic, we only have a certain number of rooms and a certain number of practitioners. So if we start advertising, and we can't deliver the service that we're, we're promising as a problem. So that's why we're on a bit of a mission at the moment to say help, we need

Steven Bruce
you. Here's another nerve there as well, haven't you? Because one of the first things that people say when the word advertising is mentioned, is where does one stand with the Advertising Standards Agency? Are you allowed to say you can treat concussion? Is there sufficient evidence for that to be acceptable?

Yeah, there is, you know, this is evidence based practice and how to treat concussion and persistent concussion

Steven Bruce
know what they're like up there. If it's not written on their list of things you're allowed to talk about, then

Donna Sanderson-Hull
there's no doubt that that the course that we've done, and the way that it's structured is that we get from Cameron every month, what we call concussion, research update. So every month, the research is analysed and put into an applied form. So that then that gets put through to us as practitioners so that we are working at an evidence base level the whole time. And it has to be said that we don't work outside of our scope of practice, this is all within our scope of practice. And we also know how to refer on to the right individuals that hopefully will all all be part of the same education piece,

Steven Bruce
this is a piece of string question. But if someone comes to you, and having done your assessment, you say, right, this person has got some form of concussion, whether it's post concussion syndrome, or whatever you might term it, how many? How many times are they likely to have to come back before they're, they're resolved.

Donna Sanderson-Hull
So that would be we'd have different different clinic here, because I suppose me being a sports medicine clinic, I'm more likely to see the acute concussion and very worried parent. So from an acute perspective, we you know, we follow a set protocol on making sure that they are safely returned back to school and safely returned back to any any sporting activity. And you can actually do that probably within three sessions. Because as cam says, the brain

will recover. And as long as you give it the appropriate rehabilitation in the amount of time, there will be no issue. So

Steven Bruce
I remember children, it's gonna be really critical to get that time to get that

Donna Sanderson-Hull
right. And, you know, they've got to, you've got to look at professional sport, if they're trying to turn around people with a concussion seven days. And we know that the recovery levels are 22 is trying to tell a youngster who's 15 that wants to be like his idol. Whoever I'm on TV. Well, he'd got back in seven days, why can't I? You know, that's quite a challenge. So we have to educate them and the parent. So we'll see them within three to four treat treatments. Max. Nicola, on the other hand, you may see more PCs. Yeah. Well,

it takes longer than those. But you get you get a very steep drop off of symptoms very often after the first session, because they've got somebody who can explain to them why they're getting their symptoms. They can explain to them, you know, what the management plan is, you know, we're going to look at these five pillars that drive persistent concussion symptoms, we're going to assess them, we're going to put in treatment plans from that, and just the education around you know, that it is a concussion, it's a functional brain injury, the fact that you've got a clear scan does not mean that there is nothing wrong with you, oh, it's all in your head, any more than obviously, it is in their head because it's a concussion. But I think a lot of the people who have had these symptoms for longer time, feel very unheard. Yes, or very dismissed because they keep going back and back and back.

Steven Bruce
Now that we need to get off on bottoms in a minute, but I've got a question for you, Cameron. I think this one comes from an osteopath. So there's a joint interest in this but he says, Have you ever come across a long term concussion which could be related to poorly executed cervical manipulation, high velocity, high velocity thrust.

Dr Cameron Marshall
So I think it'd be very challenging for someone to actually provide the amount of force required for a concussion, but I think a lot of patients may ask assume that they have a concussion. If you think about whiplash neck dysfunction causing the same and similar symptoms as concussion, oftentimes patients will have this happens all the time, patients will have a manipulation. And they will, you know, feel dizzy have headaches and all of these things. I look at that and more so as likely just, you know, cervical dysfunction, right, somebody's maybe gone a little bit too hard with the manipulation, you know, maybe, maybe done a little bit of damage in there, and they start to have headaches, it's hard to feel dizzy and all that stuff, I just I find it, it would be very difficult for somebody to reach the level of acceleration needed to cause an actual concussion injury. But I think meaning creating neck dysfunction is totally possible. And in those patients, oftentimes when you start poking around their neck, you're able to recreate all their all their symptoms. And so I think it's more so that

Donna Sanderson-Hull
I think, I think there's also the issue that if you're doing hivelocity, MIPS, that there is going to be a response from from muscle tissue. And that may alter the way that the the afferent input then the muscle spindles are reacting around the neck. So you may then get you know, as a

consequence of, of increased mobility in the joint, you might get increased tension within the muscle. And that tension within the muscle then can create some of the problems with maybe cervicogenic, dizziness or headache.

Steven Bruce
Okay, so last one, before we move d has asked whether there's any link between post concussion or whiplash and arterial dissection or increased risk of aneurysm?

Dr Cameron Marshall
Yeah, I mean, with any with any type of head neck trauma, that's a concern. Because just of you know how those fat those vessels run, anytime you're gonna have like a whiplash mechanism injury, it's got to be high on your differentials. That's part of what we go through. So in doing kind of our initial evaluation, the number one concern and looking at any acute concussion patient is ruling out the red flags, right. So typically, based on your history, and your and your examination, the things you're doing are cranial nerve examinations or doing seller cerebellar. Testing, you're looking for signs of potential arterial dissection. And in those cases, you're obviously immediately referring that to, to to the hospital. So yeah, obviously a concern and it's something that we cover throughout our training of just like patterns of both vertebral artery dissection as well as Carotid Artery Dissection because they do they do happen frequently in these injuries.

Steven Bruce
Okay, I think that segues very neatly into what you're going to show what are you gonna show us, Dona Nicola?

Donna Sanderson-Hull
Well, I think Nicola is going to show you how to do a vestibular ocular motor screen voms. And I'm going to show you a little bit of testing for potential cervicogenic dizziness,

Steven Bruce
should we go into that?

So we start with the bombs, okay, that was to be the Oculus motion. So when you have a concussion, then you can get a disturbance of the reflex between the vestibular system and the eyes. So we can learn a lot by looking at the eye movements as to whether there is a sort of pathology going on there. So best weigh heavily in craft sticks or the really high tech stuff. Okay. So, billing, okay, so there. So, we're gonna start just keeping your head still, and I'm going to ask you to just do some eye movements. Okay. So the first thing I do is can you see the X nice and clearly? Yeah. Okay. Can you keep your eyes? There was an X on the X on the stick? Yes. So.

Donna Sanderson-Hull
And just to just to point out, what we tend to do when we're doing this BOMs test is to just ask the patient, what their current symptoms are. So some of the symptoms we might ask them is, do they currently feel dizzy? Do they have a headache? Do they have any nausea? Or do they have any fogginess?

Yes, and we'd score those out of 10 for each symptom. So then we'd start with Smith's a suit. So if you can clear that you keep your head still, you follow with your eyes. So we do two, and then we'd go

Steven Bruce
again to

that's where we hold to do that, because if you keep going for a long time, everybody's going to feel a little bit nausea, Szalai muscles very small, they fatigued quite quickly if you were to sort of keep your head still and move your eyes side to side for any length of time. And again, for that reason, we're not sort of going back over here. We're just doing a small movement across from there because again, we don't want to be getting right into em gaze. And then you'd say, you know, has that changed your headache now? Has that changed your dizziness? Has that checked, but on any nausea, and any sort of fogginess brain fog? Okay, And then we would do the same thing going vertically. And then we would just go through the questions again. So headaches, dizziness, nausea. And that would be smooth pursuit, then with this category movements, so we'd get two sticks, I've got an x and a y on mine. So again, if you can, again, just keeping your head still, if you just look towards the X and the Y, X, Y, and keep moving your eyes back and forth between those, so you would do those odd movements. And then again, we would score, headaches, nausea, dizziness, and fogginess out of 10 for each one,

Donna Sanderson-Hull
and it's really about making sure that there have the ability to look their eyes onto a target, and to unlock and then look again onto another target. And sometimes you may detect little issues with that what we call saccadic. dysfunction, they're not able to look into a target. So and the issue with that is when you people will say oh, and I'm reading my eyes skip, or they're skipping words, because they can't look on Yeah, to

say what you what you're looking for is it goes to this target and to this, rather than it stops short and then corrects or overshoots, and then comes back. So that's what you're clinically looking for. Okay, one thing to kind

Dr Cameron Marshall
of add on there, too, if I can. A lot of times Donna mentioned it real briefly there. But a lot of times visual dysfunction is is misperceived as cognitive dysfunction. People are saying I can't read, I can't focus, I can't concentrate on things. I can't watch the TV, I'm losing focus and memory. But really, it's because their eyes are missing words, potentially, they're skipping over words, they have to reread sentences, they attributed to a cognitive problem. But actually, it couldn't be an ocular motor visual function problem. So

Donna Sanderson-Hull
again, just to reiterate that when when, because I'm working within a school environment, it will be the parent that comes in and says, you know, he was a straight A student, and now he's really depressed because his grades dropped. And actually, it could be something based in the ocular motor function.

Yes. So then we're looking at convergence. So how well the eyes can work together. So if you want to put that on there, okay, so are you happy with me holding it? Yeah. And then if I bring this in, so I want you to just focus on the some letters on this card, so we're just going to bring them in, I want you to focus on it nice and cold. Tell me when it goes double. And then you would take that measurement. So you would look at the measurement for that as to how many centimetres. So that was mad centimetres,

Steven Bruce
assuming you want your patient wearing their eye correction? Yes.

Yes, vision vision corrected. Okay.

Donna Sanderson-Hull
There's some normative data that you know, for normal is around about five to seven centimetres for convergence. But you know, if they do wear eyeglasses, because you've got age related eye problems, then they must do that test with their eye.

And one of the things you may say, you know, you can get it and they will bring it right the way up to their nose and say, no, no, I can't see it double. And that's why you need to make sure you're watching the eyes and are the eyes actually coming in and converging. Because if the eyes aren't converging, you won't get a demo image. So if one eye is moving across, and then again, that leads further investigation if they're not able to converge, because convergence is part of your cranial nerve screening. So you would need to do that. And we will repeat that I'm not going to go through it today. But we'd repeat that one three times and take an average of the three. So then the next one of the voms is to look at the vestibular ocular reflex. So the stimula ocular reflex happens at speed. And it's the ability to keep our eyes still with our head moving. So to make sure that we are getting the vestibular ocular reflex, we set a metronome setter to beats and what we're going to do is get you I'm going to hold this out in front, I want you to keep your eyes focused on it and turn your head side to side with your eyes focused on it. And if you can turn your head in time with the metronome

and again, you would ask for any increase in headaches and he changed the dizziness, nausea, dizziness

Donna Sanderson-Hull
to up 10. Okay.

And then you would repeat that by getting you to nod your head this time

and again, you would score the dizziness. Yeah.

Steven Bruce
I don't know about you. I don't think that excuse me thought it was nodding our head as fast as

slightly behind the metronome.

Steven Bruce
Okay, if someone doesn't know it in time with a metronome, is

that a problem? Again, it depends if they're close, then you're close to getting into vestibular ocular reflex. The issue is if they're going too slowly, is it because they don't want to because they know it triggers symptoms and they're inhibited. thing. And again, you know, the psycho ocular reflexes is a slower speed. So you could be looking at disorder, dysfunction of the cervical ocular reflex rather than the vestibular ocular reflex. So if they can't do that comfortably, there is another test that we could look into as more vestibular test to assess vestibular which is passive where the therapist would do a quick head impulse test, which they don't control the speed of the movements the therapist does. So that would be the other way of doing that. And then the final one of this will be the visual motion sensitivity. So you can either get them to use a stick or focus on their thumbs. And we just take the speed of the metronome, because going side to side, so what we're going to do is just focus on your thumbs and swing your upper body side to side, with the metronome beat, doing that 180 beats a minute is going to be a little bit quicker. So we just do this one. So from side to side for each beat.

And you're getting fired. And then again, you would ask them any change to dizziness, nausea, headaches, and that will be your voms. So it's a screening one vertically, then pattern, you don't do that one. But again, that's something that you do take into consideration. So particularly with sports people if they're saying that they're having issues with running, and that's that up and down test. And then you know, that's something that you want to look into further, the vamos is a screening test. And it indicates that you know, you need to go on and do more vestibular testing and vestibular rehab, based on the findings of your palms.

Steven Bruce
Okay.

Dr Cameron Marshall
So it's also become somewhat of a, sorry, it's also become somewhat of a diagnostic as well. The evidence that's that's emerging on this is finding a pretty good categorization of concussion versus not. So in the event that you don't have really objective, you know, good baseline testing the voms has kind of become a bit of a stop gap in that in that regard to try and use it as a bit of a diagnostic tool. So I can somewhat categorise people concussion versus not.

Steven Bruce
So we move on to a chair on the laser now.

Donna Sanderson-Hull
So so now we're moving on a little bit more to being specific to see whether actually muscles around the neck or an issue or if there's some psychogenic issues for for the the onset of some of the symptoms. So we'd be looking at trying to put the neck into different positions to

see whether that brought on any of their dizziness or dysfunction. One of the easiest ways to do that is to get somebody into a swivel chair. So if I just get you to sit down there, Nicola, so we want to take out the element of the vestibular system, but just look at whether the neck is bringing on any other symptoms. So I would stabilise Nicola's head in this position and just ask her to rotate 45 degrees and back again to the other side. And now just do that a little bit faster, Nicola, so you can just spin from one to the other. And I probably get her to repeat that, you know, 10 times or so. And if she was dizzy in that situation, then, you know, that's a pretty clear indication that the only thing that's happening there is neck torsion, and that she's going to get your Michael ripped off. Is and you know, essentially what you'd be looking for then is, you know, what are the tissues that are being sort of stretched and moved in that situation? And could it be the stretch or the contractions of those, those muscle tissues that are creating this sort of altered cues to the visual and speical ocular motor reflexes, and then giving rise to that that sense of dizziness or just feeling off. I think some of the cervicogenic dizziness symptoms are much more subtle. People will describe it can will probably cooperate this but that, you know, they'll describe it as I can't, I wouldn't say I was really dizzy, you know, the rooms not spinning, but they just feel that, you know, the floor feels like it's coming up towards them, or they just feel just off kilter. So it's not quite as you know, as important. I had one lady recently that that came in with a had a car accident, you know, some time ago, and she was still suffering with a lot of dizziness, and she thought it was because her brain was, you know, injured. And again, we do quite a lot of testing when when I was talking to her in the assessment, she spent the entire assessment like this. And I said, you know, can you put your head into a neutral position, she said, I am in a neutral position. So her joint position sense was really off kilter. So so that gave me the indication that that perhaps proprioceptive ly, she was getting the wrong cues. And so we've got a nice little test here I can show you for looking at what's called the the joint position error test and we use a snazzy little laser to just give the patient an idea of where their head is in space. Because if she's spending majority of the day thinking that this is neutral, then you know, the information that her eyes are getting in the vestibular system is getting is all off kilter. So she's been not able to interpret that. And she's not able then to get the correct sensory motor information. So we've got our laser fixed your forehead. Yep, yep. So the idea is, is that that we want to have this just about a metre away from from the patient. And we just get them to put the laser pointer and you can see we're aiming for the centre of the bullseye there. So that's what we want them to do. The idea now is to get her to do a little bit of rotation work with her eyes closed, this is actually quite a difficult test even on the the uninjured individual, I have to say, but it does give people a real indication of where they are in space. So I'd be asking Nicola to close her eyes, and to just take her head 45 degrees to the right back to the centre. And the idea is that she hits somewhere around that Bullseye and anything for sort of like five centimetre distance away from the bull's eye, will be considered as normal. But we take a sort of mean of six goes at that. And then if they're way out of that, and they can't get to the middle, we have no idea where they are in space. That is a rehab tool for me. So I spent lots of time with this lady

Steven Bruce
to say, Is this also a remedy as well? Yeah, exactly. So

Donna Sanderson-Hull
what they think she's cheating. Yeah. So, you know, like, with all MSK, what they fail at actually becomes the exercise. And, you know, people say, oh, yeah, but it makes me dizzy. When I do that. Well, for this particular lady, the first thing I needed to do was to do some active work on her cervical musculature to allow her to get into that position. So I did lots of manual therapy, lots of active release techniques to try and get her to be able to have the

right information going into the ocular motor system, we did some retraining with this little tool. And it was like a real process. And you know, people worry about feeling dizzy during the treatment. But again, like with any musculoskeletal, it's all about graded exposure. So we're saying, look, it's okay to be dizzy, you know, it's okay, if you've got sensory motor issues, and then we take you to a shopping mall. Just go and do that for five minutes. But then, if that takes you 10 minutes to recover, let us just sit like that for a while until you get more resilient. And then you can build up the graded exposure. That about right count? Yeah, exactly. Yeah. I

Steven Bruce
mean, exercises. Yeah,

Donna Sanderson-Hull
I mean, again, we're just just quickly if Nicola just sits at the end of the bed, you know, just taking those smooth pursuits that we looked at from the ocular motor function point of view, we can also look at that, again, in what we call the neck torsion position. So again, just putting some of those muscles sternocleidomastoid, your suboccipital muscles all under a little bit of tension, and seeing whether the convergence changes, and whether actually the distance starts to change. Because she's now in a tool in a torsion position, and the neck muscles are giving the wrong information. And similarly, you could do smooth pursuits in this position, and see whether actually, she had no symptoms when she was in neutral. But actually smooth shoots were a problem when she was in that neck rotated position. Yeah. And again, great, I can then get my neck treatment going for that

Steven Bruce
slide He wants us to look at as well.

I'm seeing somebody with exactly that issue with no problems with sort of smooth pursuit in neutral. But as soon as you add in neck torsion, then has moved pursuit is abnormal.

Donna Sanderson-Hull
And like, like cam says, This is our bag, this is where we can, we can really make a difference to patients and they walk out and go. I've been dizzy for nine months. And you've just done two treatments on my neck. Got me practising this kind of stuff at home. And I'm no longer dizzy. I mean, that means a lot to people.

Steven Bruce
Can Do you want to talk to us about these slides?

Dr Cameron Marshall
Yeah, there's just a couple of things that I wanted to do while you

Steven Bruce
do that. We're gonna get back to our seats and the slides will be up while we do that then you carry on talking.

Dr Cameron Marshall
Sure, yeah. And I don't know if you can appreciate this but I did a I just recently got back from Dallas, Texas, I did a presentation on the association of of neck dysfunction and visual

function and I gave it to a group of neuro optometrist so it was actually a vision training neuro optometry conference and I presented on all of the evidence that shows how neck dysfunction actually influences ocular motor function and ocular motor function is huge test in the in the concussion world you know, we look at the cards, we look at smooth pursuits, we do all these vor testing and, and so the eyes are a big kind of gateway into the central nervous system. But what people don't realise is how much they're influenced by the cervical spine. So I don't know if you can appreciate this, but this is a video of me just demonstrating this. If you take a patient and you guys can try this in your own practice if you haven't done this, but take a patient who isn't Lying supine on the table and have them look to the to the right just with their eyes, just have them look right. And then you try to turn their head, and it'll go very, very easily. But if you tell them to look right, and you turn their head left, there will be a tonne of resistance. It's because your eyes are wired with your neck. So when you try to when your eyes go one direction or the other, the muscles that go that same direction will engage in preparation, anticipation of turning that direction. So I don't know if you can appreciate this. Can you hear this video? Or is that only me?

Steven Bruce
I'm not sure if the audience can. And it's only okay.

Dr Cameron Marshall
So I'll just, I'll just I'll just kind of talk talk through it. So I don't know if you've able to appreciate this, but I'm going to turn his head to the left. And he's going to look so he's going to look right. And I'm going to turn him right. But now I'm going to happen do the opposite. So I have, do you see how there's that kind of glitch where it? It resists. So that's just kind of one thing. Now this, this just shows like neck dysfunction associated with visual symptoms. This is 50% of people with neck pain and dysfunction will report these types of symptoms, concentrating harder to read visual fatigue, sensitivity to light, blurred vision, words moving on the page difficulty judging distances. Now a lot of times in the PCs world in the post concussion world, if you're going to your neurologist and saying, Oh, I have, you know, trouble seeing things and my eyes are hurting, and I have sensitivity light. And i It's because I had this concussion, they're going to immediately think, Oh, it's just a brain injury, there's nothing we can really do about it go home. But in reality, there could be a neck issue here, there could be an ocular motor issue, there could be a VISTA issue. But that could be a major neck issue that needs to be addressed. And this is kind of the big thing we're harping on is that we are the treatment for concussion, whether you know it or not. And so I want people to be encouraged not to shy away from this, but just to learn more about it, develop the skills, develop the repertoire, because there is a massive, massive, massive patient population that desperately needs our services for this particular issue. And so I just wanted to kind of highlight that as things you wouldn't think are neck related could actually be neck related.

Steven Bruce
Sure. I'd like to turn to a few more questions from our audience if I can, because we've got very little time left. So the first one that came in ages ago actually from Die who sounds as though he's from the valleys. He says he's followed the rugby football and now the Women's Rugby Union return to play protocols for rugby teams that he works with two weeks rest plus graduated return to play, which relies on player honesty. What are the current thoughts on should World Rugby rethink return to play protocols, especially in amateur sport? Well, of course, you kind of touched on that.

Donna Sanderson-Hull

Yeah, we well, rugby are rethinking those protocols. The issue is, is that you know that they're very much symptom lead, in terms of the return returns play, and it does require quite a lot of honesty. You've also got the the concussed patient advocating for their own health, they're having to manage their own symptoms. And sometimes, you know, if you've got somebody who's pretty switched on and intelligent, that's actually quite easy to do. But actually, those return to play protocols can be pretty confusing for people. I think he even said, All of this gets really confusing. It can be really confusing, and yet we're expecting people to manage their own return to play guidelines.

Steven Bruce
We have an amateur level. Yeah, exactly. These things are highly paid doctors trying to do it for them.

Donna Sanderson-Hull
And you know, as Ken said, right at the top of the talk is a functional brain injury, we surely have to be looking at the functions of the brain to make correct judgments about whether they are safe to return to play with good functional, objective measures. We use neurocognitive testing. So there's a an app that complete concussions of have I've got which is got inbuilt neurocognitive testing that can be done. Right on the phone. You know, it's really easy. The one thing I will say about the scat, although it is part of the baseline testing that we use, you know, as a standalone tool, some people do use that as a baseline test. So they'll, they'll do those questions beforehand, but the problem with a scat, it's it normalises after about 72 hours. So if you've got somebody that comes and sees you in clinic, and you're sort of comparing their scat pre injury to post injury, it's it's at actually useless. And so the return to play guidelines are slightly lacking. Really.

Steven Bruce
Excuse me, David sending was a useful question here because I think because we've talked about, you know, your clinical testing regime over there. He's asked about, what do you look for in terms of Signs and Symptoms apart from the obvious, and I think he's talking sort of immediately postinjury because as I said, in the old days, it was really you answer a simple question, who is the prime minister or whatever it might be? That's pretty difficult in this country, perhaps at this time, because it might be vary from day to day. But you know, you, you ask them a simple question. But now we've got better protocols, but what sort of things are being commonly missed by people checking for concussion, particularly in amateur sport?

Donna Sanderson-Hull
I think in amateur sport, it has to be said that all you need is a mechanism of injury. And one of the 22 signs of concussion, an amateur sport level, they should be off.

Steven Bruce
Regardless. 22 signs are readily available, I'm sure somewhere.

Donna Sanderson-Hull
Yeah, absolutely. But you know, the key thing is, is that the Scottish rugby union have got a lovely slogan, if in doubt, sit them out. There should be absolutely no questions asked. No Prime Minister questions on what's your name questions in amateur sport, any mechanism or any one of the 22 sides, they're off? And if in doubt, sit them out, it's just not worth it? I think in terms of professional sport, then you could then go on to ask a few questions. Obviously, on a pitch side situation, your primary thing to look for is if it's particularly if

they've lost consciousness, or they're lying flat and unresponsive, is, you know, are they breathing? Have they got a cervical spine injury? Those are the first two things that you should always be looking at. I think one of the questions that we always ask first was certainly when when I was a physio back in the olden days, when I could run on the pitch, was just to simply ask what their name is, you know, and at least you know, that they're responding to you.

Steven Bruce
Depends on you knowing what they

Donna Sanderson-Hull
feel. Yeah, I don't know if that's right or not. And then then you may go on to ask a series of what we call Maddox questions. And you, as I say, once you've ruled out that there's any cervical spine injury, you might then get them up into sitting, but you're then looking for one of those 22 signs of concussion as well. So you might sit them up, they might answer all the questions perfectly, they get on their feet, and the first thing they do is run in the opposite direction to where they're playing. And then you think, actually, they haven't got a clue which way they're going. And you see this a lot on some of the fantastic videos that the NFL put out where, you know, they'll be huge collisions. And the first thing that happens is players get gets off and then sort of stumbles and collapses. And his mates are holding him up, and they kind of try and carry him on. So that's what you should be looking for. Okay.

Steven Bruce
Kim says, so if you don't have an actual knock to the head is the force for example of a roller coaster ride, okay. It might give an adrenaline rush in some in an extreme anxiety and another.

Donna Sanderson-Hull
My husband is a classic for this, he can't go on the waltzes without having extreme nausea. Normal shortly. But also any any kind of roller coaster ride. And that was since a, you know, a pretty big event for him. Yeah, I think

Steven Bruce
you've got a slide up. Tell us what this one says.

Dr Cameron Marshall
Yeah, just for comparison. So I'll do the first one first. So this is looking at all the studies that have been done with instrumented helmets, looking at concussion, G forces. And and basically, you'll see here that the average or the mean is usually around 100 G's. And then the range of that is 70 to 120. As I've mentioned previously, so this is a systematic review that's kind of gone through so

Steven Bruce
as it says in the small to small print up there, those were in clinically diagnosed concussion cases. Yes, so those those D forces aren't directly associated with concussion.

Dr Cameron Marshall
Yeah, so these are, these are, what they'll do is they'll put instrumented helmets on, you know, teams and teams of players, and they'll follow the data. So they'll look at every impact over a 10 g threshold. And and then the ones that get diagnosed with concussions, they'll look back at the data and say, Okay, well, how much force was that? And then they'll they'll

take all those concussions and kind of bucket them and so you have that you have that here. And if you look at the comparisons, so standing at sea level is one G a sneeze is three G's space shuttle launch and reentry is only three G's, which is surprising roller coasters high G roller coasters only 3.5 to 6.3 G's well below the threshold required for for concussion injury. Now, if you have that GeForce and then smack your head off something there, there may be obviously more GeForce there because you're coming to an abrupt stop. Hearty greetings slap on the back. This one happens all the time. They'll say I was out with my friends at the pub and somebody came up and said, Hey, John, I haven't seen you in a while and give you a smack on the back and then they think they've got a concussion. Well, it would be very unlikely.

Steven Bruce
We will, we might have to we might have to speed through this because we are running out of time, but the way it stands out for me, the one that stands out from me is that an Olympic boxer all out punch to the face a jab is only 58 G

Dr Cameron Marshall
Yeah, interesting. Right? I

Steven Bruce
thought that would be up with the boxer with that The football players.

Dr Cameron Marshall
Yeah, that's that's kind of like a straight on, you know from the shoulder jab. Yeah. You know, you don't see many boxers get knocked unconscious with a jab, right? Usually it's a hook. And if you look at the G forces in a hook, the rotational acceleration far surpasses the concussion threshold. And that's usually where are those those those injuries happen? Yep. So that's it.

Steven Bruce
Yeah. Okay. So it's Interestingly, though, some of those things that you were talking about earlier on, I mean, soccer head, it was way down the list there. And yet, you can't rule these things out as potential causes of injury, I guess. And one sort or another.

Donna Sanderson-Hull
I think no, and, you know, the whole topic of sub concussions, you know, sub concussive injuries. So, no, no necess symptoms necessarily, but they are getting repetitive head trauma. Well, that's just a another topic in itself. But yeah, and that's going to be pretty difficult with the research to monitor that with sub concussive impacts.

Steven Bruce
Yeah. Mark has asked a question, which I suspect we can't answer here. It says Would a physio or chiropractor or osteopathic approach differ regarding the C spine elements of concussion?

Donna Sanderson-Hull
No, because or I don't think so. From a physio point of view. You know, I'm, I've been trained by complete concussions, which is very chiropractic LED. But still, I, you know, I'm trained in in being able to deliver adjustments. I'm also trained in dry needling, and manual therapy. And I would guess, that someone who has a primary clinic of doing a lot of adjustments is also trained in dry needling and soft tissue release techniques and rehab. So I think our

paths do cross quite a lot. It might be that I'm not doing the volume of adjustments in my clinic that perhaps a chiropractor or an osteopath does, and they might not be doing the volume of rehab. But I think that in this situation with a standardised training protocol, and this is what we're trying to get is a standardised evidence based treatment protocol around the country that we're all singing off the same hymn sheet. Yeah.

Steven Bruce
Yeah, I think there's such a vast spectrum within each of those professions as well that it's hard to, I always think it's very difficult to say, this is what an osteopath would deal with. This is what a chiropractor does. There's a huge variety and within the professionals isn't that Mike, Mike has asked if we after the show can send out references to the current evidence, which is using for using physical therapy to treat concussion. Now, again, I think that might be quite difficult, because presumably, you can use physical therapy to treat concussion, provided you've been taught how to do it incorporating some of the tests that we were looking at earlier on, am I am I right? Or could we just get

Donna Sanderson-Hull
a stack of evidence? I think there, there is. So many articles, I think you even have the stats on how many articles per month are coming out in the concussion space cam, there are stacks and stacks of research and articles supporting with supporting evidence for what for what we do from a physical therapy point of view. So yeah, and I'm sure Cameron would have those to his fingertips as well.

Steven Bruce
There's a couple of recent ones you could share with me camera prompts, I can send those out to the audience.

Dr Cameron Marshall
The issue is that there's like our course for example, it probably has about 2500 references to it, right. So like we have a research team that goes through the research every every single month and kind of compiles at all, you're not going to find one or two papers that say, you know, I guess you probably could now I could probably find a systematic review that says physical therapy, but it's not really going to give any of the audience really an idea of what to do with that because physical therapy is a broad definition. What you will find is if you start looking at what's the rehab, well, what's the research on sub symptom threshold exercise and concussion treadmill testing, you'll find hundreds of references on that showing that sub symptom threshold exercise testing and rehabilitation is good for concussion. So that would be in the bucket of physical therapy, then you'd look up concussion and neck and how many research articles show that neck therapy is good for, you know, I mean, so everything is kind of categorised and compartmentalised. But they all would fall under the realm of you know, physical therapy, physical medicine, chiropractic osteopathic medicine. So it's hard to necessarily find one or two, unless I found you a general systematic review that said that physical therapy there was a recent one that said physical therapy within the first 10 days after injury is associated with improved outcomes for concussion patients. So this hasn't happened pretty early on. But I don't think that really helps your readers other than giving them a little bit more credibility towards either patients or GPS in their area to say that, hey, this is something we should be dealing with.

Steven Bruce
Yeah, I suppose in some extent, Mike was probably working on that basis that, you know, we need to be able to justify that we can do things Probably the last question here, past

whether any of you and I think are directed at you, Cameron is Have any of you come across evidence for cranial osteopath, three opera osteopathy, or the chiropractic equivalent, of course sacral occipital therapy as a treatment for concussion.

Dr Cameron Marshall
There's not much specifically on those modalities. But if you look at you know, if you just take cervical spine as as a whole, some papers will use cervical spine rehabilitation exercises, and they'll show positive benefit. Some will show manual therapy and they'll find benefits, some have acupuncture for headaches post concussion, and they show benefit. So it's very kind of compartmentalised. And so the specific technique of cranial sacral doesn't have much evidence on it at all or specific with like, with cranial bone manipulation, there's not much on that either. With respect to concussion, unfortunately, but there's a lot of evidence on each compartmental, you know, piece showing that these elements are involved.

Steven Bruce
Thank you. And I made an assumption that that would be more Cameron's partnership than yours, but that's correct. We kind of we kind of run out of time. So I want to thank all three of you very much, Cameron, great view giving it what I imagined must be the middle of your day to be with us and, and deliver so much useful, interesting information. I know the ladies in the studio wants some of those polo shirts that you're wearing because they look pretty funky. You might have to send a couple

Dr Cameron Marshall
of them. This is our logo. This is our this is our complete concussions logo. Right.

Steven Bruce
Okay. Thank you, too, for for coming up here. And yours was a bit more of a hike, wasn't it than the Nicholas. But yeah, I agree with you to give up the time to come in. And there's clearly quite a lot of interest in this from from our perspective. One thing, Cameron, I'm sure you and I talked about whether you had anything which might twist the arms of osteopaths and chiropractors to do the complete concussion course.

Dr Cameron Marshall
Actually, we do we're running a sale right now. I'm just going to bring it up the link right now.

Steven Bruce
Especially for my viewers, that's what you're supposed to say.

Dr Cameron Marshall
Yeah. It is it is. Where is it?

Donna Sanderson-Hull
Welcome. Just quickly looking at that I can't reiterate enough. For everyone that's watching to look at the news in the next two weeks, it will really, you know, put the emphasis on that. We need more therapists.

Steven Bruce
So here we go. We'll push this out instead of 2000. US dollars. It's 1500. US dollars.

Dr Cameron Marshall
Yeah. And that's and that's for the 60 hour course. Now I put a QR code. I don't know if you can show your viewers just full screen of this. But if they just hold their phone up over this QR code.

Steven Bruce
I'll send it out. I'll send it out from anyway, Cameron. Yeah.

Dr Cameron Marshall
Sounds good. But you get $500 off for the month of April.

Steven Bruce
Okay, thank you.