

# Pectus Excavatum and Carinatum - Ref 133SW

*with Sam Walmsley*

17<sup>th</sup> December 2020

## TRANSCRIPT

*Please note, this is not a verbatim transcript:*

- Some elements (repetition or time-sensitive material for example) may have been removed*
- In some cases, related material may have been grouped out of chronological sequence.*
- The text may have been altered slightly for clarity.*
- Capitalisation and punctuation may be erratic...*
- There may be errors in transcription. If something appears odd, please refer to the recording itself (and let us know, so that we can correct the text!)*

**Steven Bruce**

Today I'm joined by Sam Walmsley from the London Orthotic Consultancy, before he talked about how foot orthosis could help people with cerebral palsy, which was new to me and in the course of that discussion, we talked a little bit about pectus excavatum, and pectus carinatum. And I had no idea how orthoses could help those conditions either. Also, they are conditions which are very rarely seen in our clinic, but they do have other knock-on health effects. So, I've asked him to come back. And I'm delighted he's here to join us today. Sam, glad to have you with us. And thank you for agreeing to a second dose of the Academy Of Physical Medicine.

**Sam Walmsley**

Yeah. Hi, Steven. Thanks for having me back.

**Steven Bruce**

No no, it's our pleasure. As far as these conditions are concerned, as I say they are fairly rare, I actually only knew one person who has pectus excavatum. Are they actually common amongst the general population? Or?

**Sam Walmsley**

I think they are more common than you think, that if you look at the literature, it's about one in 1500 people with the condition. Certainly, my mentor, a chap called Dr. Hodge, he did some study in Brazil and he looked at, I think it's around 7000 people and found it as almost as high as one in 100 who has a chest deformity. Now, that might be very mild and they may not know that they've got it. Certainly, there were players in my football team who had slight chest deformities that didn't know that they had it, in one of our offices here, had a chest deformity, they didn't know he had it until he started working here. So, it can be something you've got and you just don't know and to be quite honest, then you don't treat it, you know, you only really treat the conditions which people are concerned about.

**Steven Bruce**

Can you, you might need to explain to people what exactly is going on in excavatum and carinatum.

**Sam Walmsley**

Well, both conditions are problems with the growth plates within the chest. So typically, there is a growth disturbance that normally happens in pre adolescence or adolescence. And so that when there's that rapid onset of growth, the chest grows either asymmetrically or can grow symmetrically and out. So, you get a convex chest or it can go in concave chest. So, the pectus carinatum is out, pectus excavatum is in.

**Steven Bruce**

If I get Justin to bring up slide number eight that's got the carinatum pictures that you shared with us on it. So that might help too. Right?

**Sam Walmsley**

So here we go. This is the excavatum. So here we've got two different types of excavatum. So, excavatum what we call localized and excavatum wide. Both have rib flaring as well, you can see that the sort like concavity to the ribs and then the apex of the ribs is prominent. And quite often these conditions can be mixed as well. So, you can get a little

bit of carinatum and also an asymmetry to the excavatum as well. So, there are some subtle differences within each presentation.

**Steven Bruce**

Right? Could you bring up the next one Justin as well. So, we can have a look at the carinatum slide.

**Sam Walmsley**

There we are, there we are, that's the carinatum. So here we have the inferior, which is by far the most common thing we see in clinic, which is generally a symmetrical deformity around the line of the nipple. And it's by far the most common and by far the probably the easiest to treat. But the condition which causes the most distress often. We have a case carinatum matter which obviously is the asymmetrical version, and where the sternum is tilted to one side, and then the superior which is quite rare, and much higher up in the chest. And as a result, much harder to treat. And you have to treat it a lot early and catch it earlier.

**Steven Bruce**

The central one there, the lateral one, difficult to work out exactly what's going on that one. Could you explain that?

**Sam Walmsley**

So, one side of the sternum is twisted so that you have prominence of the ribs and the sternum on one side. So, we get a rotation like this.

**Steven Bruce**

Yeah, okay, I see. Right. And I suppose one of the obvious question is, what point do you decide to treat these things? I mean, presumably that they could develop in later life and become more serious than they are in youngsters?

**Sam Walmsley**

Yeah, so I mean, really, you're treating for, because someone becomes concerned about it. And the difficulty is, it's always easier to treat younger because the chest is obviously more flexible. So, in the superior carinatum, really, you need to be thinking about it at age eight, but often it goes unnoticed until it's a little bit too late with that category. With pectus carinatum inferiors, you know, treating around between 12 to 15 is perfect. And the laterals may be a fraction early if you can catch it earlier. I mean, the main point is, is that a 12-year-old doesn't want to enter into treatment and a 15-year-old does. And that's the difficulty and a 17-year-old is desperate for treatment. So, you're really trying to convince the 12-year-olds that it's a good idea to be wearing these braces and they're not easy to wear, it's a very difficult treatment to deliver without complete compliance from the patient. And that's the way in which I was taught was it's all about compliance. So, we can provide the tools, we can provide the, you know, the expertise, but really the main skill that we deliver is convincing that patient that to keep going and what can be quite a long-term treatment is seen to its fruition.

**Steven Bruce**

That's an interesting point you brought up about compliance, because I would have thought that as you get into your mid-teens and later teens, both boys and girls are going to be very, very conscious of their appearance. And I would have thought perhaps even less likely to want to wear a brace of any sort.

**Sam Walmsley**

You've got to have the driver, haven't you? So, if you've got the driver of quite a large deformity of your chest, which, you know, socially causes problems, you know, parents first see their children not wanting to go into the swim team anymore, or not wanting to play football and not wanting to take their shirt off in public, it becomes quite a socially disabling condition. And, you know, traditionally the way this was dealt within the healthcare profession was a slap on the back and say it doesn't make you any less a man, get on with it. And now, you know, even more so, when we first started doing this in 2010, it was very much the case. And people sort of, I think, in some respects, sneered at it. Because we were the first people to bring this into the UK at the time. And now with, you know, the mental health of us all, but often, you know, adolescence as well, it's so important, giving them just the chance to not have to live with a condition which is treatable, is so important.

### **Steven Bruce**

I've just had a question come in from Christina, but it's sorts it's similar to what I was asking, when we have people come into our clinic, and let's say we have a young patient come into the clinic, what is it we would notice, would it be a fairly mild deformity that we might notice and we just need to alert the parent to the possibility that they should see someone expert in the condition?

### **Sam Walmsley**

Yeah, I mean, you know, a sternum and a rib cage should be, you know, should be flat and should be convex. So if you are noticing a protrusion or an asymmetry on the chest, first of all, that's, you know, a little bit of a red flag that maybe nice looking at. Secondly, you know, if you're if you ever see a protrusion higher up in the chest here, that's certainly something in the younger child that should be directed to an expert to have a look at and see if that is a pectus carinatum superior. You're looking for rib flaring, so there's a little bit of concavity and then at the distal end of the ribs, you've got that prominence of the rib cage, that can be a sign that something is developing in the rib cage. Also, in the slightly older children you get a lot more protraction of the shoulders and then posturally they deteriorate quite a lot as they try and shrink their chest into their body. So that a lot of them can hide it actually very well with a T-shirt and pulling their t-shirt a little bit baggier and wearing jumpers and things and they're slouching and they, you know, the lumbar lordosis is very flat, they have an increased thoracic kyphosis to mask it and pull their chest away. And, you know, we want to, you know, stand up and get them straight. When you do that the chest really is very prominent. So, it's amazing how, how people can hide it. The excavatums obviously are hidden much more easily and they are more obvious, I would say, you know, word of sort of warning as well, you know, tread very carefully when you find these things. Very gently, I mean, even, you know, offer some advice to parents when the child's left the room, because so many of my older patients, you know, the 30-year-olds, you know, talk of an incidence when a medical professional either in A&E or at the time they saw a top GP, wait, oh, that's pectus carinatum, you know he's going to have to live with that. And in a very blasé way that child lives with that for the rest of their life and can be very upsetting. So, dealing with it very subtly and gently. I mean, when we treat younger children, it's about it's like brushing your teeth. It's something you're going to do every day. We don't wear the braces all day every day. And we're trying to, it's like, you know, we play games, you blow up balloons, you really try and introduce it very gently and carefully to a child because it is quite a, psychologically it can be quite damaging.

### **Steven Bruce**

Yeah, dare I also ask that I don't know what the prevalence is between the two sexes, but presumably as a girl is developing through puberty, the condition might be more easily mask, and so parents might not notice. I imagine that the child would notice themselves, they would feel there was something strange there.

### **Sam Walmsley**

Yeah, I mean, you know, I think it can be masked in both boys and girls. So, it's about four to one boys more than girls, I wonder if it's masked so we think it's four to one. And it's actually not. But with girls, obviously, as breast develops, it looks like increased cleavage sometimes and so, but you can tell through the flared ribs. And to be quite honest, if the child's not worried about it, there's not really a big problem. However, if you're noticing, it's like a scoliosis. If you notice it at age nine, by the time they've gone through the rapid growth, it's going to be quite bad. If you notice at age 13, 14, they're a little bit more mature, maybe it's never going to develop into anything too significant. And it's worth just monitoring. But yeah, I mean, I think, I mean, I've met women who've been into clinic about something else. So, they came to the clinic about their flared rib. And actually, they've got quite large excavatum, but they never knew. And one of the most striking things was when I first started the treatment back in 2010, I was at a retirement do for my mum, and my cousin was there and he was a boy who'd never, you know, went swimming with us never liked to go to the beach with us. And underneath his t-shirt he had a huge excavatum that he had never told anyone about, I just happened to be saying what I was doing next week with this Brazilian doctor, who trained me and he said, I've got that look. And it still to this day is probably one of the largest excavatums I've seen. His parents didn't know how bad it was. His parents had not seen his chest, he was a teenage boy, he covers up, he wouldn't let them see it. And so, I think that boys and girls can mask it. And so being, it is a very, very sensitive subject for boys, to bring it out and to get them to talk about it. And then to want to have, to come into treatment.

#### **Steven Bruce**

I've got some more questions of my own but let me come back to the ones that are coming in from our audience. Christina said that she has a patient who has the problem. And his young daughter also shows signs. So, she's asking whether it is hereditary.

#### **Sam Walmsley**

Yeah. So, we see a lot of sort of familiar traits with it. And often, the parents who have it will be just so, you know, on the lookout for this with their children. And if I ever see a young child, it's because the parents or siblings got it. One of the first boys I've treated back in 2010, I've seen three of his siblings, so, and they got younger as the mom got more aware of the condition. So yeah, it's very, we do see traits, brothers, twins, and parents. Yeah.

#### **Steven Bruce**

I guess my question is that you mentioned that you know, that as recently as 2010, people will say, you've just got to live with that. Does that mean that if someone were to take their child to a GP or if they themselves will go to a GP and say, look, I'm concerned about this, the GP might just dismiss it and say, Well, you know...

#### **Sam Walmsley**

Yeah, that certainly still happens today. So, and even if they find a way through to, you know, a thoracic consultant, in some areas, that can still happen. There are, it is much, much better than it was. And certainly, we receive referrals from thoracic consultants now, it's, you know, it's not treated under the NHS, I think, to this day, I mean, surgery was recently pulled by the NHS as it's considered a cosmetic condition, which is so short sighted for these patients, given the issue of mental health. And also, you know, one of the reasons people say it is just cosmetic is because it has no physiological problem. But around the age of 25, 26, I get a lot of patients who come in complaining with the excavatum, complaining of a tightness in their chest and a shortening of their breath. And they can't quite do the same exercise as they once did. And I think, you know, I remember, when I used to play football long ago, and I was 18, I used to bounce off the floor. And when I was 25, I didn't bounce it hurt, the floor suddenly got a lot harder. And I think when that skeleton gets tougher, it's harder and stiffer and you have an excavatum that's quite deep, you don't

have the same lung capacity. So, I do think there are some physical reasons for treating this and allowing patients to grow up with a normal chest shape other than just the psychological benefits.

**Steven Bruce**

It puzzles me that actually there is no physiological damage done by this. I mean, if you have an excavatum then presumably the organs have to accommodate that sort of changed shape of the chest, whether it impairs lung function or heart function or...

**Sam Walmsley**

Well, again, your members probably sometimes I think will be better placed to decide on that than the broader medical community which sort of look at very wide ranges of normal on issues. And sometimes, you know, can't see the wood for the trees with conditions like this, I think. So, I certainly think that there could be other associated conditions that could be linked to it. And over the years, people have complained of certain things. But also, you know, if it's a, you know, an arrhythmia or something to do with the heart, which often people will be concerned about, you know, there aren't enough patients out there who don't have excavatum who have that condition as well. So, who knows? And, you know, I'm not an expert who could tell them whether or not that it is a problem. Certainly, the cardios who I've dealt with have said that it's fine to treat patients with excavatum if they have a heart condition, or well, specific heart conditions.

**Steven Bruce**

Yeah. Charles has said that he had no idea it's such a common condition. And he had chest reconstruction at the age of 23. And he was told that surgery wasn't an option until skeletal maturity, so 18 plus. And that was a surgeon at Guy's and St. Thomas'. He says, is that still the case?

**Sam Walmsley**

Well, I'm not certain, I don't know what surgery he had done. Was it for a pectus condition?

**Steven Bruce**

He hasn't told me. He just said he had chest reconstruction. But of course, I haven't seen your slides. You're not into reconstruction.

**Sam Walmsley**

So we're not surgeons, we're trying to do this non-invasive treatment to fix the chest wall. And there are some very good surgeons out there who do treat pectus with things like the, for excavatum, the Nuss procedure or the Ravitch procedure. And, you know, carinatum is also treated as well. I mean, I have to say, I wouldn't ever treat carinatum in a teenager. I think that that's crazy. I think that, you know, you can brace it, and it can be treated very quickly and very well.

**Steven Bruce**

You wouldn't you wouldn't treat it surgically in a teenager?

**Sam Walmsley**

Surgically yeah, sorry. You know, I would brace and I would, and it's also, to be clear, it's a bracing treatment and it's a physio treatment as well, the two things together to get the maximum benefit. But with excavatum, there are some patients who certainly benefit and have done very well with surgery. And I'm not 100% sure about the age ranges for those that the best time for those conditions to be treated with surgery. I know some of them are in, you know, teenagers.

**Steven Bruce**

Yeah. You talked about two procedures, the Nuss procedure and one other.

**Sam Walmsley**

There's a Ravitch procedure as well. Yeah.

**Steven Bruce**

What are they?

**Sam Walmsley**

So Nuss is when you put a bar into the chest underneath the chest wall and then, you know, before surgery, and then you flip it to then recreate the chest wall into the correct position. And then it's bolted to your ribcage. And then it's in for a couple of years, three years maybe and then and then it's removed. And if there's any surgeons watching this, I'm sure I've got the errors in that and I'm not a surgeon. So, it's a very layman's description, but, and the Ravitch is when, surgically, they go in and almost do osteotomies on the ribcage and the sternum to put it back together again. It's far more invasive the Ravitch procedure and less common now I think, but, and for some chest wall problems, I think it's probably still the only option. But I think the Nuss is by far the more common and I think widely done and successful. But you know, there are issues you can't play sport for, contact sports whilst you're undergoing that period of treatment. And results don't sometimes take into consideration all of the rib flaring, which can be quite a problem because you fix the ribs you get lovely flat chest here. But then you end up with two flared ribs. So, and we have sometimes seen those patients come through after their surgery.

**Steven Bruce**

Charles has sent in a follow up saying that it was for pectus excavatum that he had the chest reconstruction. And Scott has asked why NICE don't recommend the Nuss procedure.

**Sam Walmsley**

I think it's because. I think they did, I think NICE were, but I think they have pulled it because it's cosmetic surgery. And again, I'm not up to date with the reasons behind it. But I know that there are a lot of patients and there's a lot of pressure on them to reinstate it. And I think they should. I think, you know, we're here to offer patients who don't want surgery, but I think there should certainly be a surgical option for patients as well.

**Steven Bruce**

Earlier on you made it sound as though the superior carinatum was a serious condition that had to be treated as soon as it was spotted. And then you went on to say well, none of these things have a physiological effect.

**Sam Walmsley**

Yeah, but it's quite psychologically I think for the superior carinatum patients. It's a problem. You know, if you, you know, posturely, it's a little bit easier to hide a carinatum. So, if you decide not to treat it, you can just protract your

shoulders, you know, you can end up with a back problem but you know, you can hide it a little bit more and clothes tend to hang a little bit better lower down and things like that. The superior carinatum, especially in girls, is very difficult. I mean, they can't ever wear a top that comes down. It can be quite a very, very obvious condition with a big bone protruding out of the top of your chest. And the patients I've met with it are really quite upset by it. Fortunately, it's the rarest. But yeah, so it's more, again, the psychological impact, I mean, it should not be underestimated that impact. It can, it can be life changing. I've had patients say to me, they've never been on a holiday with their friends, they never go swimming, they stop playing sport, you know, and they've never, they don't go to the beach with their children, you know, and they've got a wife and children, and they still are very, very emotionally upset by this.

### **Steven Bruce**

Stating the obvious it's going beyond the mental health, isn't it? Because if they've stopped exercise because of it as well, then they're going to have an impact on their overall health, not just their mental health.

### **Sam Walmsley**

Absolutely, absolutely. And one of the, you know, posture, I think it's very important as well. One of the first things our patients see is an improvement in their posture, you know, sometimes they're exercising for the first time. Sometimes our patients are incredibly fit, because they have exercised to try and get rid of the condition first. But sometimes if they haven't exercised, they start exercising, they start concentrating on their posture, we give them advice on that, of course. And the first thing that their friends, family, parents notice is the shoulders come back, they're standing up taller, their heads, the chins tucked in. So, it can have a significant effect on posture straightaway.

### **Steven Bruce**

Yeah. Two related questions for you. Somebody called Puli. I'm not sure that's one of the nicknames that people are giving themselves on our forum and someone named Jane, who, that's definitely a nickname. But both asked about the age range of which this can be treated, Jane more specific, she says, how can she help a 25-year-old who has rib flare? And the other question is kind of, can these conditions be treated at all ages.

### **Sam Walmsley**

So, age is important. But flexibility is the key thing. So, if you have a flexible chest, in theory, at any age, it can be treated. Now, so obviously, we have a more flexible chest, when we're younger and that flexibility decreases as we get older. And as I said, we have treated younger children with both excavatum, especially excavatum in fact, because if you can treat that younger with something called the vacuum bell, which is a suction cup that pulls the chest out along with a brace, you can sometimes never have to really go into the high intensity treatment of the 23 hours a day. And of course, this is a long-term treatment. So, starting in 2010, we've only got a handful of patients that we've really taken full, you know, through who were younger at the time and now, no 16 for example. But, you know, I tell a story often to my patients, I once had a very large muscular patient come in who was a, quite a robust chat, a bodybuilder and he had a pectus carinatum. Now to most people, you can probably describe as like a barrel chest, historically, big barrel chest, but for him, it was quite upsetting. And when he came in, I thought, oh, this is going to be tricky, because I have to tell him, he's not gonna be treatable. Because if you've done a lot of working out, and you're in your 40s, which he was, it's highly likely, your chest is gonna be rigid, because of the stress you put through your chest and your age. And then when I felt his chest, it was hugely flexible. I was just, this is incredible. This is, you know, this is one of the, he's like a 16 old chest. He says, yeah, I lie on a brick every night, I put a brick on the floor, and I lie face down on it underneath my chest and I keep it flexible, which was incredible. But he got a great result.

### **Steven Bruce**



We'll have to tuck that one away as special exercises for our patients.

**Sam Walmsley**

I wouldn't advise it but also, he was the type of bloke you weren't going to argue with so he got a great result. And it just goes to show that flexibility is key, not age.

**Steven Bruce**

And, Justin, if you could bring up slide number 13 I think this is quite an interesting one, because we talked a little bit earlier on about how pectus deformities can change with age. And this one shows I think excavatum, and I think it shows both of them actually changing.

**Sam Walmsley**

There we go. Yeah.

**Steven Bruce**

Yeah, there we go. So that one, so some of those, the top two looks quite severe, actually. I mean, they look, I can't imagine there is no physiological difficulty in either of those patients.

**Sam Walmsley**

Well, you will be told, if you go to your consultant, you'll be told that, you know, it's just cosmetic, but I quite agree with you. Why would you not treat that. The important thing about those pictures is that, you know, those are the same patients and then that's them four years later, no six years later. So, at the top and because when we started, we said that this is a problem with the growth plates, there are lesions within the growth plates of the chest. So, as you grow, it gets worse and often the first thing is that you know that 10-year-old would have been told, you know, don't worry, you'll grow out of this. They never grow out of it. You don't grow out of this condition. You get fat, that's what helps. So, you know, if you've got carinatum and you get really chubby, you can hide it. But I also think, you know, the healthcare professional that is telling you grow out of it has never reviewed the older patient, they perhaps send the patient away and just assume all their patients grow out of it.

**Steven Bruce**

I have to see that that lower picture, the 11-year-old to 15-year-old picture, just on the basis of those images, you wouldn't necessarily say there's anything going wrong there, would you? I suspect if you saw them in real life, you would notice something interesting.

**Sam Walmsley**

So that sternum should really be vertical. So, you know, almost, you know, you could if you drew, if you drew a line down from where that right shoulder is, you could probably bring that chest almost straight down. So that's quite a large protrusion. That's why it's masked within the body type quite well. But if you rotated that round in 3D, you would see it, and you, yeah, actually, it doesn't, it just doesn't look correct. And those patients, you know, will be very upset by that condition. Also, with that type of chest, what's often masked is the rib flaring, as you push that rib flaring in and correct it, you see the ribs protrude more. And so those patients would need two braces to correct both areas.

**Steven Bruce**

I think we've actually got an image of that, I think it's slide number 17. We've got flexibility tests, 16 and 17. We've got flexibility tests for the ribs, which might be interesting to look at. I'm not suggesting that on the basis of 45 minutes CPD we're going to be experts in testing for these things. But if Justin could bring those up, that will be quite good. So, there's your first flexibility test slide. It's compression, anterior posterior compression, I take it?

**Sam Walmsley**

That's it. Yeah. So, it's very easy to do, you, the patient generally is not in pain when you're doing this at all. And when you do it, you can see how flexible the chest wall is. And also look at the rib flaring, how you can see, how you can begin to see that concavity and then the prominence of the ribs. One word warning with these tests is that, you know, I treat lots of different conditions. And I've only ever had patients go lightheaded and faint on me with this condition. It's very strange. And sometimes it's even before these tests. If you start discussing it there's an almost like an anxiety with these patients that, and they're teenagers often, so their feet are big and their stomach churning away and you can visibly see the color drain from their face, they get white, then they go green, and then they keel over. And so quite often I'm putting them, before they do that, and I'll ask them you okay, you okay, you okay. Yeah, and they will never admit, obviously, that they're feeling faint. And so, I have to lie them down, put their feet up, and you can watch the blood rush back from their gut.

**Steven Bruce**

But it is nothing more serious than a faint. There's nothing really to worry about?

**Sam Walmsley**

It's just a faint. Yeah, it's nothing more serious than a faint. And it happens, almost, you know, one in four patients. Yeah, so it's quite so if you do, if you do decide you want to test it, and you do decide you're going to talk about it with a patient, then just be mindful of keep an eye on their color of their cheeks. Because if they started looking pale, lie them down, put the feet up.

**Steven Bruce**

Presumably, you could do the test in a sitting position, couldn't you?

**Sam Walmsley**

Yeah, you can lie them down as well and do it. I think it's still, yeah, you could do but it's often quite good for them to be standing so that you can see that rib, those ribs really flare. And also, you can ask them to stand and push their chest into the posture.

**Steven Bruce**

Can we bring up the slide after that one, please, Justin, because there's a different aspect of flexibility testing on this when you're doing a sort of a lateral compression of the ribs, I think on the patient. With a Valsalva, it says on the slide.

**Sam Walmsley**

Yeah, so this is a deep breath in and you're looking to increase the intrathoracic pressure by taking a breath in and really forcing the air into your lungs. And that actually pushes the chest all out. And so, what's happening there is the ribs are being held with the thumbs to just further prevent any increased movement of that rib cage. And you can see

that the difference in the chest will shape from the left to the right. This is how Dr. Hodge first treated excavatum. I mean, treating excavatum is, you know, without surgery, is rare anywhere in the world. Treating excavatum with a brace is a bit of anathema to people. How you treat concavity with a brace, but you brace the ribs in a specific way, and then you get them to do an exercise program. And Dr. Hodges did this, you know, way back, started in the sort of 80s and 90s with this treatment and it was all about exercising wearing the brace. We, after we sort of learned it from him, we introduced the vacuum bell as well to that treatment. So, you're sort of getting this three-pronged attack of physio, bracing and vacuum bell treatment to really get the correction on the chest wall.

### **Steven Bruce**

Camelia has asked us, I'd imagine a lot of people are quite keen to see what the braces look like. So, if Justin can bring up the next slide, which is the braces then that might be helpful.

### **Sam Walmsley**

Yeah, so at the top we've got a brace for pectus carinatum. That's a typical inferior carinatum brace or central pad. Quite often, we will obviously adjust the size of the pads, obviously to a specific area that we're trying to put pressure. And also, for the size of the patient, and bottom ones is a brace to correct the rib flaring. They have a ratchet strap and so they're dynamic. And you know, the patient can push in and loosen the brace, depending on how they are tolerating it and often described to patient, you push it in and hold it there. It's like this over time, you're pushing in and slowly, slowly, but surely, you're increasing the pressure, so that you get to a point where you are wearing those braces 23 hours a day and you're not feeling them, which sounds crazy. But actually, in my carinatum 13, 14-year-olds that can happen in a couple of weeks.

### **Steven Bruce**

Really and they're wearing them at night as well.

### **Sam Walmsley**

At night. Yeah, at school, 23 hours a day. They take them off for contact sport, it shouldn't interfere with their sport, it's a big thing that I feel, you know, our children have to play sport, it's again, it's a lifelong skill that they learn and they love. And so, taking kids away from their sport, I think is, you know, you have to do that very carefully. So, so the braces are taken off for sport, we minimize the time they're out of it. So, they might take them to the changing rooms take them off in the toilets beforehand. Or if their mates are fine take them off in the changing rooms. And then play the sport and come back and put them back on again.

### **Steven Bruce**

Yeah, there's actually I think quite a useful sequence of slides coming up immediately after that last one. Where you take us through a sequence of somebody being treated for pectus carinatum. If Justin could bring those up, that'd be quite useful. So, this particular patient, I mean, that superior view, looks quite...

### **Sam Walmsley**

Yes, it is. Yeah. So that's, and that's it. So, I always say this to patients, when I take a 3D scan of their chest, I always show them that view on a 3D scan. And because, you show them that, that sort of front on them view, and they go yeah, yeah, yeah. And then you say, and this is what you're looking at. And that is it, isn't it, they're looking down all the time going, oh, my God, this is awful. So. So treating it for them is far more important than the rest of the world. And so that's why we've got that slide in there, that's the patient's view.

**Steven Bruce**

And then the next one shows where you actually applied the pads and two slides ago, I got the impression that the rib flare pads were only for excavatum, this one's for carinatum.

**Sam Walmsley**

Yeah, so as you press, as I said earlier, as you press that carinatum in, you will then see the rib flare, I mean almost 90% of my carinatum patients have rib flare. Sometimes the swimmers, the really good swimmers will have such strong abs and obliques that they've held the ribs down and it's not a problem. But, you know, most have some sort of rib flaring that occurs.

**Steven Bruce**

Dare I say this without and I don't wish to sound in any way critical, I mean, that looks very basic and mechanical.

**Sam Walmsley**

Yeah, it is.

**Steven Bruce**

Pads and steel straps.

**Sam Walmsley**

Yeah, so it is essentially, you're just, it's like a piece of torture initially. And it is, it's still, we need to have a gap all the way around. Also, the brace needs to last them sometimes, you know, four years if we started treating at age 12, but we want it to last to 16. So, it needs to be robust. And also, we need to grow it. So, I've got a brace here. So, this brace, I will then, each time I see them, I will then bend the steel. Now you can, you can do that in, you could do that in different ways. You could adjust it with straps and bars, but to keep it as sleek and as slim as possible, steel is pretty good. Yeah, it's a very, very good material, medical grade steel, obviously, but it is very good material for holding its shape and then being able to put it into a new shape and re-bending it and then it holding its shape again. So they are, they have some weight to it that, you know, they're not light, but when they're strapped to your body, you don't feel that way. And also, it means that if they're not strapped on tight, they will fall down which again is a, is a good thing, really, cause you have to hold them on tight.

**Steven Bruce**

And we bring up the next slide actually, there's a good illustration of why this could be, why patient compliance could be quite good because you can't tell that guy's wearing a brace, can you?

**Sam Walmsley**

No, you know, so if you've got a child with a shirt and a blazer, you know, you can't tell often. Yeah, so I have kids coming in and I'm thinking, oh, why aren't you wearing a brace and sure enough it's on so I can't tell. You know, a shirt and a tie is fine, I will explain it to a patient if you bend over and pick something up off the floor, you'll see the outline of it on your back. It's not invisible. But if you're standing up chatting to people, you know, unless they give you a big hug that you, they're not going to know you've got it on.

**Steven Bruce**

Yeah. So, can we quickly look at pectus excavatum and what do you do for them. So, Justin, the first slide, I think is somewhere around 25 on the deck, because it's slightly different, isn't it? You've got a sink plunger on the front of this one.

**Sam Walmsley**

That's it, yep. So that's a vacuum bell. So, the vacuum bell is silicon suction cup, which comes in different sizes and that is put onto the chest and then we apply a vacuum pressure to pull that, to pull the chest wall out. And at the same time, which I think is quite unusual, I don't know if anyone else is doing this anywhere that I've seen, we then apply a rib flaring brace to the bottom of the ribs. And you can, you can often get a child with, you know, an excavatum, that boy will be standing with his chest wall in a normal position there. And so, you can sometimes do that day one, you can put their chest into a normal position, this whole treatment, we haven't spoken about this. But this whole treatment relies on something called Wolf's law, which is bony remodeling. And so, as you, the first stage with these treatments is to increase flexibility. So, you know, that chest is being pulled out every day, every day until such time as you start to notice that it's taking longer and longer in between vacuum bell sessions for it to go back in until it stays out until you put the vacuum bell on again. And so, at that point, that chest is remodeling, it's that the bones are now changing their structure, so they sit permanently in that position. And as long as you maintain that until the driver, that growth driver has stopped. So, 16, 16 and a half for boys, you get a permanent correction.

**Steven Bruce**

So that, that bell then is not being worn all the time.

**Sam Walmsley**

No, so that bell is worn for minimum two to three hours a day. So, homework, computer games, reading, whatever, but I've got more and more patients who are wearing them to sleep and they're upping the hours, sometimes six, seven hours a day. You know, the more you do it, the better result you get. I've got more patients, especially during the lockdown was like, you know, to go through this treatment during the lockdown was, a happy group of patients for a worldwide pandemic.

**Steven Bruce**

You reassured me because of course, looking at the picture of the bell in place, I thought that's a lot more obvious underclothing than the...

**Sam Walmsley**

So, the bell yes, so the bell is only worn for periods of the day, often in the house, I've got the odd patient who wears them in work, some people just don't care as much as others. And so, but as long as you're getting that, that sort of, you know, that minimum sort of two, three hours a day, but I like to see more if I can and those patients will get a quicker, faster result.

**Steven Bruce**

Yeah. Christina, I don't want you to think I'm ignoring your question. Christina asked earlier on whether that Nuss treatment brace, shoving the ribs out of alignment would impinge on nerves, which she says is why the patient came to her. I wonder that may not be a question for you. I'm not sure.

**Sam Walmsley**

Yeah, it's probably not. I mean, but you know, my experience is yes. I've had patients who've come in with pain. I've had patients who nearly didn't make it through surgery. It's not, it's a big surgery, you're going just past the heart with the bar. There's lots of complications that can occur. So, you know, there are doctors out there. And it tends to be an international thing, you know, and patients from the UK might travel to Denmark, there's a very eminent guy and there's in Berlin, but there's some, there are some good people in the UK who do this. But when there are complications, they're pretty nasty and they can live with lifelong pain, which is one of the considerations, if you're not in pain, you know, and you go for this surgery. It's a big, big decision.

**Steven Bruce**

Okay, Trudy sent in a long, lengthy question here. Her son has an inferior carinatum, which is asymmetrical and was brushed off at the age of 12. An orthopedic consultant as cosmetic, they told him, he'd be fine. In the same breath, he was offered surgery, which would involve pulling open his chest, accompanied by graphic demonstrations by the consultant. And he was really bothered by that. Of course, as a 12-year-old, he was horrified and declined. Now as a self-conscious 16-year-old, he thinks he should have taken the option, could you suggest a resource where you might look to get him more help? And I bet you can?

**Sam Walmsley**

Well, that's exactly what we do. Yeah. So, you know, first and foremost, you have to approach that very gently. But you know, it is a classic story that we hear. So inferior carinatums, had a bad experience with a pretty poor bedside manner. And, and you know, it has to be done very gently and carefully. But at 16, you can certainly treat, it's far better than leaving it to 17 and much better than doing it when you're 20. And, you know, when we go back to the compliance, to be doing it, when you've got the love and support of parents at home, rather than all the distractions of university, for example, is far easier for patients to see compliance.

**Steven Bruce**

Trudy, I would have thought, if you share some of this presentation with your son, you know, particularly that sequence of pictures where, you know, we had an excavatum with the brace and then clothes over the top of it, given that he already wants to get some treatment, I think he'd be a good candidate for you, Sam.

**Sam Walmsley**

It would be great, yeah, I mean, we offer a free online consultation. So, if, you know, if she wants to contact the clinic, we're more than happy to have a chat and discuss how we can help and like I say we can do it. We can go at your pace and do it very gently. And we can explain exactly what the treatment's about. Also, if you want to talk to existing patients, we can do that. So, and we can share the pictures and images of patients standing in their t-shirts or jumpers to show it isn't so bad to wear.

**Steven Bruce**

Actually, it's the London Orthotic Consultancy, but if you can share with us your email address, we can probably find it from our records, but I'll make sure you can be put in touch with you is that alright, Sam?

**Sam Walmsley**

Yeah, absolutely great. I'll be doing it. Yeah.

**Steven Bruce**

Yeah. Andrew said, is there a massive bruising with the bell technique?

**Sam Walmsley**

Yeah, you can get, I mean, in the adult, again, the adult men that we treat, they will try and finish it in three weeks, instead of, you know, 18 months. And so you can get, what is essentially a huge love bite on your chest for quite a considerable amount of time.

**Steven Bruce**

I think I as a 16-year-old would have been proud of a great love bite on my chest.

**Sam Walmsley**

Exactly. Now we talk about, you know, getting full pressure and full, full time in three months as opposed to week one. So, we're very, very gentle. It's like any kind of manipulation or stretching of soft tissue. And you're just gently doing it day by day to get more and more range of movement in that area. So, and if you do that, then there's less pressure that's needed to pull on the skin. We're using the skin as an interface to pull the chest wall out. So, it can be, there can be some quite nasty bruising that can occur, you know, and that's also the risk with carinatum if you get the pad position wrong or use too much of an aggressive pad or they do too hard too fast, you can also get some nasty bruising. And that's why it's important to get these things treated. Because we're often changing the focus of the pressure on the brace, we're changing the direction of the force, we're adding a softer area for a while and then removing the softer area. So, if you've got a very prominent xiphoid process, sometimes they can be very sharp, we just gently incrementally increase the pressure on it. So that we slowly push it back down into position because you can't, they're so superficial to the skin, that you can't put huge amounts of pressure on it.

**Steven Bruce**

Sam we've got about a minute left. So, you've got 30 seconds on these two questions. One is, Pulé has asked whether a 30-year-old patient with an excavatum would be suitable for treatment with bell and brace.

**Sam Walmsley**

Depends what they're looking for. We have to ask him about that what are their goals, full correction's probably not possible, we have to look at their flexibility. So, if their goals are I wanted to feel, take a deeper breath, certainly, that can definitely help. If their goals are, I want to look like, you know, Arnold Schwarzenegger, probably not. So, we have to clearly define their goals and then find out about their flexibility.

**Steven Bruce**

And the second question is, overall, how long does a course of treatment take for a suitable correction to occur.

**Sam Walmsley**

So, you know, really compliant, you know, 13-year-old can have a flat chest inside three months and they're starting to wean them out at three months. A very compliant 26-year-old with me, with a lateral carinatum, so stiff, quite a stiff, difficult chest, he was weaning out in nine months, they are my exceptions. And I talk about a year to all my patients. And if I am seeing an adult patient, certainly I'll talk about 18 months of, you know, knowing them and being in treatment with hopefully the intensive period being a year.

**Steven Bruce**

Sam, I'm really glad we did this, I'm glad it cropped up during our last show that we could talk about it because it's not something I would have considered talking about on one of our CPD shows before, but it's clearly somewhere where we do have a role because we might be the first people to spot it, we might be in a position to reassure the patient or the patient's parents and point them in the right direction to get something which will do them a lot of good, both physiologically and in terms of mental health.

**Sam Walmsley**

Certainly, and I'd welcome any, you know, questions and comments, you know, after this but also, I think there is a, there's almost some joint working. I've often thought about posture, mobilization, you know, treating these patients in a joint way as well. So certainly, it can be a very useful relationship to build.