Academy of PHYSICAL MEDICINE

Transcript

Electrotherapy: The weird and the wonderful

With Tim Watson

APM: First of all there, I mean getting back to the basics of this, are there any changes in the science behind tissue healing or…?

TW: Yeah, I think…I mean I did a Keynote presentation up in IFOMPT up in Glasgow and there were lots of physical therapists and physios —

APM: IFOMPT?

TW: IFOMPT, I-F-O-M-P F-T. It's a manual therapy conference and there were osteos and chiros and physios there and they said to me, "Go on then, just tell us what's new about repair," and I kind of ended up doing a presentation which said there's a possibility that there's one phenomena that links the electrotherapy, the manual therapy, the exercise therapy, the massage therapy, the stretching, the PNF. They've got one thing in common and that's really that they play with the chemistry of inflammation and the chemistry of repair. That's a bit reductionist and a lot of the manual therapy guys were, "Oh, no, you know, you can't blame it all on the chemicals. That's the old biophysical model, you know. We like biopsychosocial," and I'm not knocking the biopsychosocial in the slightest. All I'm saying is that when you do massage…not you. When one does massage, it has an effect. When a patient does exercise, it has an effect. We know what the therapy is. We know what the effect is and we haven't quite got around to filling in the gaps, whether that's in the osteopathy world, the physio world, the sports therapy world or whatever. So I was looking, I have been looking for 10 years now to see if I can fill the gaps and I'm pretty sure at least some of those gaps can be filled by a story of chemical mediation. So there's lots of chemicals involved in inflammation. That's not a secret. We've known that for donkey's years and even when I was training back in the '70s. 1970's, please, not the 18. I'm sure most students think it was the 1870's but in the 1970's…but they used to say things like, "Oh, it's histamine and stuff like that," and they never got around

to saying what stuff like that was. So I've been digging around for quite awhile now and there's an awful lot of things like that, whether is the prostaglandins or the interleukins or the whatever. There's families of chemicals out there and in fact, there's a slide there, if you want to have a look at that slide. On that slide, if it's going up on the screen, there's kind of some indication about the families of those chemicals and we can add up…I don't know, we can find 100 different chemicals within those families without any trouble at all and we know they're involved in inflammation. We know inflammation is a driver of healing and repair. So we can't do without it.

APM: So you've got nine mediators up there.

TW: Nine families of mediators.

APM: Families of mediators, I beg your pardon. So do they differ in their effects or —

TW: They differ in their effects. They differ where they come from. They differ what stimulates their release. They differ in what they do but they all have an effect on that inflammatory, healing cascade and in one way or another, they're all necessary. What I found from looking, and that list grows and grows and grows, is that when you do manual therapy to me, you influence some of those chemical mediators. When I do ultrasound to you, I influence some of those mediators but ditto, everything else in your repertoire and everything in my repertoire. So the one thing that might just link all our therapies together might just be the common denominator between cause and effect, might be those mediators and that to me is pretty damn exciting.

APM: I'm thinking that this takes you down a route of under which circumstances is which of those families is most effective and which of the therapies stimulates the right one. So are you getting there?

TW: That's where we're going. That's where we're heading next. So for example…and I just worked out a fairly simple…we talked about it. Was it the last time or the time before we talked about shockwave?

APM: I think it was last time.

TW: So from the evidence out there, we know that there are a range of those mediators the shockwave does overly influence. We've got clinical trial evidence. There's a lovely paper. It came out last year. It's the one I talked about when I was here before. We got papers out there that show that when you do shockwave, part of what it does is it stimulates those mediator releases. We know those mediators help in tendinopathy. They help tendinopathy to recover and therefore, there's a mechanism by which we now know the shockwave which we know is effective with filling in some of

the gaps and it may be that shockwave is most effective at stimulating the release of…don't take me literally on this but maybe interleukin 6 really comes into its own when you hit it with shockwave and maybe VEGF, vascular endothelial growth factor, maybe that comes into its own when you use ultrasound, you know. There's a lot of refinement to do but I was surprised, when I started looking, just how many therapies I could find with evidence of an effect on that mediator system. There's a broader one. I won't bore you with slides because everyone are going to go to sleep but essentially, without looking at sort of mechanical stress and bone healing, if you've got a fracture, lets assume you haven't, but if you had a fracture, we know and we've known for decades that if you just sit there with your leg on the settee, waiting for the fracture to mend, it will mend. If you do some activity, not too much but you do some activity, we know you'll mend more effectively, more efficiently, faster.

APM: Activity which does what? You mean loads the bone.

TW: Loads the bone. So free active exercise or very gentle loading. When we say, you know, stand up and just put a little bit of weight through your leg, that kind of stuff.

APM: It's probably all you want to do, isn't it?

TW: Absolutely. If you do that, we know that enhances your healing and that's not a secret. That's been known for 20, 30, 50 years. What we now know is that when you do that loading, you stimulate the release of these chemical mediators and we know that stimulates the bone healing. So we're filling in some of the gaps. Now when you're stimulating bone healing, we can stimulate bone healing with ultrasound. We know that stimulates the mediators. You can stimulate bone healing with electrical stim. We know that stimulates the mediators and with exercise and with loading and with…so it might just be common to those things. I think that's potentially really quite exciting.

APM: What specifically are those families of factors doing in terms of influencing the inflammatory process? Because we don't want to stop the inflammatory process at all, do we?

TW: No, absolutely no. Stopping the inflammatory process will be a nightmare on legs and luckily in therapy…I can't find anything in therapy that actually is anti-inflammatory. What we —

APM: But people still get told to take anti-inflammatory —

TW: And the therapist still say, "I'm doing this to get rid of the inflammation," all right? What they're doing is right. They're not, however, trying to get rid of the inflammation. They're actually helping the inflammation.

APM: Moving it along.

TW: Move it on, move you into the next stage. So they're pro-inflammatory treatments rather than anti and what that looks like, you know…there are some of those families which are more potent things like the prostaglandins, things like the interleukins, things like VEFG, vascular endothelial growth factor but we know what they do to the inflammatory stuff, the inflammatory cascade and we know that that helps that transition into repair. So we should…we're not there yet. In my view, we should be able to maximize that effect and therefore, you should be able to choose the therapy that you're going to do to me and whatever else you think that therapy does, you should be able to maximize the benefit to my repair sequence and when we get to that stage, we should be better than we are today and that's good.

APM: How long is that going to take you?

TW: I don't know. I would retire by the time we got the answers to all of that lot but —

APM: Who's actually doing that form of research? Because I imagine that if I sell ultrasound machines, what I'm looking at is exactly what the ultrasound machine would do and selling that benefit to my potential patients.

TW: The people doing the research are primarily not therapists. They're not physios. They're not osteos. They're not sports therapists. Most of the people doing that research are the cell guys and the animal model guys. I mean I don't do animal research and I don't do cell research. I do gross, you know…clinical research, gross physiology, gross clinical but…so a lot of the foundation work is coming from outside the therapy world. What we really should be doing, and we're not very good at it, we should be soaking up that research and saying, "Hang on, you know, if mechanical stress stimulates that chemical that stimulates repair and if we're applying manual stress, why aren't we playing that game?" So most of the research is coming from outside the therapy arena.

APM: Do you think we're ever going to get to that state of precision that you suggested earlier on where we know exactly which particular elements of the inflammatory cascade we want to promote or reduce given, you know, our limited abilities to diagnose exactly at what stage —

TW: I think so but I don't think you'll ever be able to reduce it down to the absolute recipe because back to that psychosocial reductionist argument, that's what I'm talking about. It's very reductionist. You do X, it releases chemical Y that influences cell Z that has physiological effect, you know, J. That's reductionist and patients don't behave like that because they've got

brains and they've got moods and they've got depression and they've got excitement and they've got dogs that they've just been kicked by —

APM: And they're drinking coffee and beer and taking other drugs and —

TW: And they're not hydrated and they had a burger last night and crazy things like that are going to influence the system but behind…if you lift the lid on all of that stuff, there is still a pathway through which therapy A has effect B and I don't want to reduce it to that and I don't think we ever will reduce it to that but I want to know what that pathway is. It should make us better and I don't want to take out the psychology. I don't want to take out the holism. I don't want to take it down to recipe, you know. Patient comes in with sprained ankle, here's the recipe because none of us are going to need to train. We're just going to, you know…just given to a robot with a sheet, you know. I don't mean a bar sheet, I mean, you know, a sheet of instructions and I don't want to get to that stage. All I want to want to do is if there's a mechanism, I want to know what it is because I think it's exciting.

APM: So what do you think then about…and what does the evidence tell us about the great dependence that everyone has on non-steroidal anti-inflammatories these days? Is the evidence saying that it reduces the healing process, spoils the healing process or just delays it or it doesn't do anything at all?

TW: I think if you take enough of them, they certainly delay it. There's a good range of papers out there and again, I looked at them for another conference paper maybe a year back now. The evidence out there says if you've got musculoskeletal tissue injury and if you take non-steroidal anti-inflammatories, you will inhibit…you'll have an inhibitory effect on the repair sequence. You'll either slow it down or you'll reduce its quality and if you take enough of them, you'll slow it down and reduce its quality. There's an argument that says if they go…if someone goes to Asda and get some Asdaofen because they can't afford proper Nurofen…the same stuff. Just comes out of a different packet but if they go to Asda and get some Asdaofen or some ibuprofen, is that over the counter dose enough, strong enough to have an inhibitory effect? That's the questionable bit. Certainly prescription level, it is inhibitory. I think there's enough evidence that home buying over the counter level is probably going to have a measurable inhibitory effect but most people take that medication because whatever they've done hurts. They've torn a muscle or dislocated a shoulder or whatever they've done, it hurts and then most of them are taking it for the pain. They're not taking it because the inflammation is getting in the way. It's because it hurts —

APM: Which brings us back to that logical conclusion —

TW: Logically, you should take a pain killer and the evidence says take a pain killer. Now, the adverts on the telly don't say take a pain killer. The adverts

on the telly say, “Rub in gooby gel and it goes straight to the point.” Well, you know, with all due respect, no, it blinking doesn’t.

APM: But rubbing it in probably has an effect.

TW: Rubbing it in probably has quite a nice effect but actually rubbing the gel in, you know…no more gel goes in by rubbing it. You could just look at it and blow it a kiss, the same amount of gel would go in but they don’t put that on the advert.

APM: No. So in clinic then, I mean in your own clinic, when someone comes in with a relatively acute injury and they say, “Right, I’m taking ibuprofen because this hurts,” or some other non-proprietary name or what it might be, what’s your advice? “Well, stop taking that. Take some paracetamol and —”

TW: I think professionally, I’m not suppose to give them advice because professionally, I’m not a prescriber and therefore professionally, I’m supposed to say —

APM: But it’s not being prescribed because they bought it over the counter.

TW: I’m not supposed to give advice about medication. Now it might stop me and therefore, I say, “If I were you, I’d stop taking that and I’d take some paracetamol,” but I guess if my professional body wanted to and they’ve got it on film, so they probably will, they’re probably going to strike me off because technically, I shouldn’t be giving that advice out but that’s…if it was me, if I’ve got a pain and the pain is due to an injury, I will not use anti-inflammatories. I will use a paracetamol. I use a straight coated whatever or pain killer.

APM: First question is would it be better to say co-codamol? Thank you for that, whoever asked that question.

TW: Paracetamol, co-codamol, codeine, something that deals with the pain that does not inhibit the inflammation because we know we need the inflammation to recover. If I’ve got the nerves in my neck playing up…you can fix them later. The nerves in my neck playing up because I’ve got an absolute neck at C3, it’s wrecked and every now and then, I catch it wrong and my nerve roots play up like doodas. That does not need to mend. There’s no repair to do but it’s inflamed and it’s irritated to hell. I’m going to take an ibuprofen because it’s the fastest way of knocking that on the head. Now, therefore, my decision, me being Tim, you know, if I’m injured, take a pain killer. Don’t inhibit the recovery. If it’s hurting, take ibuprofen if you want to. You’re not going to inhibit the repair. There’s no repair to do.

APM: Now a lot of the audience —

TW: We could go all night on this one.

APM: Well, a lot of the audience are going to be saying, well, why am I asking this question because this is what we've all known from years ago in training colleges or more recently in colleges. The reason I'm pursuing it is because I'd like to know whether the evidence still supports that attitude of stop anti-inflammatory —

TW: The evidence supports the…yeah, absolutely. I would say the evidence supports that attitude and the evidence supports that clinical decision. I don't think practitioners necessarily follow that evidence and I do talk to GPs and I love having this conversation with GPs or with orthopedic surgeons because, you know, with all due respect, they may not have gone looking for that evidence because where do most GPs get their drug related information from? It's not necessarily the systematic reviews.

APM: Well, it does puzzle me because GPs are, as I often said and I've often said very bright individuals, most of them are very well versed in looking at the research even though they haven't got the time to read it. So they understand that the inflammatory process is necessary. So why is it…is it just fashion that they've moved on from aspirin to paracetamol now to anti-inflammatories in order to kill pain?

TW: Yeah, I think so and I think it is partly, at least partly a fashion thing. There's probably 2 or 3 things tonight we could talk about which are fashion things and I think anti-inflammatories are part of that fashion thing and there's actually nothing wrong with paracetamol as a good straightforward musculoskeletal pain killer. It does a darn fine job and for most people, even in fractures, an awful lot of fractures, patients will get adequate pain relief with paracetamol. You don't have to go for the big and the ugly and if you do, you're going to slow down your recovery and if it was me, if I had a fracture, I want to mend as fast as possible. I do not want to be slowing down that fracture healing by taking a painkiller, which gets rid of the pain but actually slows down my recovery. No, thank you. I'm sad; I want to get back to work.

APM: You mentioned anti-inflammatory gels earlier on and one of our audience has asked, "Are you saying that anti-inflammatory gels don't work —"

TW: I'm not saying they don't work. I'm saying they don't work as well as the adverts would have you believe. If you look at how much of that gel actually goes into the tissue, how much of that gel reaches the tissue, which is actually damaged, it's a pretty darn small amount. We were doing some research on it awhile ago because people were using ultrasound…this is way off the topic tonight, never mind. People were using ultrasound. We talked about that in the first of the four sessions and they were using the ultrasound to push the anti-inflammatory gel in, phonophoresis, driving in the drug with the ultrasound and the idea was the ultrasound, vibrating away, push the

drug in, more of it will get in there. The reality is no more goes in with the ultrasound than goes in by rubbing it. So that's —

APM: And in any case…we don't, in most cases, want the anti-inflammatory effect anyway.

TW: We don't want it going anyway, yeah.

APM: It's the rubbing that's the good bit.

TW: The rubbing, potentially the good bit and yeah, I'm not convinced and people use the gels…and we're back to placebo versus real versus whatever. I've never hung much though by them personally but I know an awful lot of people who use them, an awful lot of patients who swear by them and they will say, "Look, I rub some gel on, my back stopped hurting. I can go another round of golf." If we actually measure that objectively in a randomized controlled trial where some people got real gel and some people just got gel with nothing in it, I'm pretty damn sure we wouldn't come up with much of a difference but that's not a popular way of looking at it but that's the reality but there's a fantastic great marketing machine behind that lot because there's bucks to be made.

APM: And actually, when it comes down to it as a clinician, we don't care, do we? And we want the person to go away feeling better. If they feel better from rubbing in, you know —

TW: There's an argument, isn't there? There's an argument that says clinically, if they go out of the clinic feeling less pain than when they came into the clinic then that's a happy patient —

APM: It doesn't matter how you achieved it, yeah.

TW: Get them across the car park, you know. That's really cynical that's how I operate but there's an argument that says if you stick an ice pack on them for five minutes, you'll reduce their pain enough to get them across the car park. It doesn't make it a therapy. It just means I've numbed them off for five minutes.

APM: Now you're either preempting my questions very cleverly or you're —

TW: I doubt it.

APM: You're just leading me down this very useful path. Sarah from Colchester. Thank you for the question, Sarah. It's nice when people introduce themselves on camera. Sarah has asked whether we should be advising people not to ice. She's saying actually, the information —

TW: No, ice is fine. Ice is fine because a lot of people were taught, myself included that ice is anti-inflammatory. If you look at the physiological effects of ice, they are the same as the physiological event of the inflammatory process. So ice is pro inflammatory, just like ultrasound, just like manual therapy, just like exercise, just like everything else in our book. We haven't got an anti-inflammatory treatment. So people often ask me this, exactly that question and I wasn't leading up to it but I get asked it a lot because they are taught that ice is anti-inflammatory and therefore, that now sits at odds with what I'm saying. I don't think it's at odds at all because I think ice is pro inflammatory and it's entirely consistent with everything we're talking about here -

APM: I can't remember if it was you and I who talked about this before or whether I talked about it with Colin Brown when we were dealing with Deep Heat and other ice products or therapeutic products. I do remember though when I first attended one of your lectures, I'm convinced that you said the first five minutes—

TW: First five minutes.

APM: --ice is vasoconstrictive and after that, it's vasodilator and that's a pro inflammatory effect. So do you advice a difference in terms of the acute nature of the injury?

TW: In time. Absolutely. So if a patient has just got injured…when I say just, I mean like within the last couple of hours, you want to apply the ice for a short time because you want vasoconstriction because you want to limit the bleeding. It's not going to change the inflammation. We're limiting how much bleeding goes on in the tissue. The more bleeding there is, the more mess there is to clear up, the longer it takes to recover. So you've just got injured, you've got a hamstring tear, you've got a gastroc tear, you come and see me because I'm your club physio and I'm sitting at the side of the pitch, I'm going to stick ice on you. If I leave that ice on for more than 10 minutes, you will get vasodilation. Therefore, there's more blood going to the area, therefore I've just made you worse. You would've been better sitting there doing nothing and I would've been better going and having a cup of tea.

APM: So what are you doing —?

TW: That's short ice treatments. Repeated short ice treatment's good. Constriction that limits bleed. That helps recovery.

APM: But if you look at certainly a lot of sports clubs that I've been to, and I'll tell you, a guy will be sitting there at the end of a rugby pitch with his leg swathed in —

TW: Icepacks?

APM: Icepacks, all strapped on, yeah and that's bad. They shouldn't be doing it?

TW: I wouldn't go so far as to say it's bad because they're the physios for their club and I'm not. I wouldn't do it. If I was a player, I wouldn't want someone doing it to me. I am an athlete. I'm just in disguise tonight. My normal athletic prowess, I don't want to show off.

APM: We won't ask what the athletic prowess is in. OK, so that's useful to go over that argument because it's always something people ask in clinic. So now we've done ice, now do heat.

TW: Right, OK. So before we leave the ice…I don't want to leave the story half finished and it's just 10 seconds. So if we're doing post-injury and we're talking the first 4 hours, the first 6 hours, that's when you want those short ice treatments. Once you get to 4 hours, 6 hours post-injury, the bleeding should've stopped, all right? And therefore, inflammation is what happens. We need inflammation and if you're doing ice during the inflammatory event, you want your ice to be 10 minutes or more because you want the dilation because the dilation gives you the result you're looking for.

APM: And for the most part, people coming to our clinics will be well beyond the 4 to 6 hours.

TW: Well beyond, unless you're involved with a sports club and seeing them in that first 4, 5, 6 hours, you know, that's the only time. The first aidy is when you want the 10 minutes on, 10 minutes off when you get to see them. When I get to see them, they're well down the line. Well down the line and therefore, long ice treatments are good. They're pro inflammatory. Sorry, I digressed because you wanted heat.

APM: No, you —

TW: It's an obvious slide, isn't it?

APM: It is, yeah but you've made me —

TW: Can I slurp?

APM: Yeah, you can. You've made me think some more about that. I mean what's your preferred method of application? There's a number of icepacks you can get, moldable ones, gel ones, reusable ones, instant ones. What's the —

TW: There's actually been several pieces of research on that which I wasn't lining up for tonight but there'd be several bits of research on that and it says there are a difference. It says actually one of the least effective ways of delivering cold is with those gel packs and the cold packs and the chemical packs. The

most efficient way of delivering cold is either crushed ice in a wet towel or damp towel or an ice cube rub. An ice cube rub is remarkably good, you know. It's what I used to do. When I used to work with the sports clubs, I just get those, you know, polystyrene coffee cups. I used to get one of them, lolly stick in the top and I used to make a big ice…literally an ice lolly and I used to get the player to use that. That ice cube, fantastically efficient way of cooling down the tissue. Crushed ice or ice cube smashed up in a wet nappy not a used one, a clean one, you know, wet nappy, a tea towel —

APM: So your clinic must be a really exciting —

TW: It's a great old place to be. I bring in, the but that's the most efficient. The cold sprays absolutely don't do any of that cooling at all. All they do is they numb off the skin for a few seconds to get Freddy up and running around the pitch. I used to do that. I used to do physio for the Judo squad and the rugby teams. I get out the cold spray but it did not have the effect of ice. It just numbed it off because I'd done a quick assessment. I reckoned they weren't actually that badly injured, I want to get them back up and running, he wants to get back up and running, quick spray, rubdown, that's not treatment. That's —

APM: But using a cold spray when someone is injured is clearly putting them at risk.

TW: That's why you should do…in my humble opinion, you should do your assessment first and suss out if this is a real injury, pull them off, all right? If this is just a knock and they're rolling around for a bit of drama then the ice spray's fine.

APM: So they're a football player then.

TW: I did not mention football or Premier League or anything along those lines but they both fall in the same sentence.

APM: I've got some more questions for you.

TW: I though you might have.

APM: Before you get on to heat and before you get me ranting on about football —

TW: We're never going to finish, are we?

APM: Now this is a great one from somebody, Mark in Sweden, a great place to ask about ice. He wants to know if ice is pro-inflammatory, it's very useful to know, is it helpful to have an ice bath after rugby matches then? Given that that's necessarily treating an injury, isn't it?

TW: No, that's a different version. That's cold immersion and cold immersion is not the same as ice. It's not pro-inflammatory. The idea of cold immersion…we're way down another track here now, aren't we? The idea of cold immersion is that when you have had a hard training session or you had a match, especially rugby, taking a few knocks, if you have a cold immersion dunk after the match or after the training, your recovery is enhanced. In other words, you can get back to the next training session with a shorter recovery time. Every clinical trial, every randomized controlled trial, every controlled trial I've seen actually says, "We can't find a measurable difference." Now all the football clubs and the rugby clubs and a whole lot of other clubs have now got cold water post-match dunking pools, post-exercise, post-training dunking pools and they come off the pitch and they get in their dunking pool and they go for a good wade through some deep cold water. Not pleasant. I wouldn't choose to do it and I would…in fact, I would choose to stand on the edge and avoid it like the plague but the idea is that if you've got a little injury, micro injury, all right, you'll get better faster. If you've just got lactic acid and all the other stuff building up in your muscles, it will help to remove them faster, lovely idea, very trendy, sexy on legs but the evidence says can't actually find a measurable difference.

APM: Is that a big question mark over the whole lactic acid theory?

TW: Right, yeah, there's a massive…but that's back to DOMS and is it lactic acid? Is it micro trauma? Lots of people doing work on DOMS and no one —

APM: Still?

TW: Yeah. I was an assessor for a PhD, it's going back a few years, and the guy who compared 10 different treatments for DOMS and not one of them was better than placebo. Not one of them was better than placebo. That was…must be probably 18 years ago, 20 years ago now and people are still doing that research and every now and then, there's a little chink of, "Oh, this works for DOMS," and the manufacturers and their kit just love telling people, "This is great for DOMS," but actually, when you lift the lid and have a bit of a dig around in there —

APM: Just like compression clothing as well —

TW: Compression clothing, compression vest, cool dunking, heating, microcurrent, rubby, rubby gels, anything you like, people will go for DOMS. We've got 500 questions coming in.

APM: More questions coming in from the audience and I've got hand some time over to them. This one is if a joint is badly swollen and the pressure is there for preventing proper fluid exchange, are anti-inflammatories then appropriate, do you think or should you just —

TW: I think there's an argument. I think there's probably a better way of getting there because if encouraging fluid exchange is the right thing to do…in that kind of scenario, spot on because the only way you're going to get that fluid in the joint out is by reabsorbing it and therefore, you want to encourage maximum fluid exchange between the synovium and the synovial membrane, you know as well as I know and therefore, encouraging that transition, that activity at the membrane level is great. I don't think anti-inflammatories help that. They make the joint less painful and therefore you can do the exercise but it's the exercise that will actually help the fluid to go, not the anti-inflammatory.

APM: I guess the theory is that if you take away that inflammation, the swelling and the tightness in the joint then it will enable that fluid exchange —

TW: Yeah. If you're going to go to Asda and buy some…sorry I'll go to a different supermarket Tesco and you buy some Tescofen, is the Tescofen that you're going to take at home, over the counter, is that enough to actually stop the inflammation post-traumatic knee thing? Probably not, so, you know…but the exercise…so if you did ice and exercise, if you did ice and movement, if you did ice and loading, questions flying in. That would probably…no one's done a direct comparative trial. What you need is 100 people with post-traumatic knee effusions, half of them get…a third of them get anti-inflammatories, a third of them get some kind of active management and a third of them gets something placebo-ish and we'll track their recovery. I'd put my money on the activity with the ice, thank you very much but I don't recall anybody…it's not my field but I don't recall anybody doing that trial. There you go, that's another one we can do.

APM: So you want to come back for a fifth one —

TW: No, no, no, no. Just the research.

APM: There's some complex stuff in this. Simple part to start with, how much gel does get into the tissue and is the active ingredient delivered the same thing as the gel —

TW: You would need to speak to a pharmacologist about this because I'm on the edge of my field here. I know what it does when it gets in there. The evidence I've looked at says I don't think very much that active ingredient from the gel gets far enough in to reach the tissue. You know, if you tore a muscle, it's going to go centimeters. You tear your hammy, that gel active ingredient has got to go a centimeter 2 centimeters in, maybe 5 centimeters in. Big boy, you know, deep hamstring tear, does the stuff in that gel go five centimeters in? I really would be surprised if it did but I'm hovering on the edge of…I'm going to get clouted now what I'm talking about. So, you know…

APM: A question from Matthew Davis and I don't do modern abbreviations. He says, "What the fuck is DOMS?"

TW: He made me go blank.

APM: Delayed onset muscle —

TW: Delayed onset muscle soreness. It's the post-exercise pain. So you don't do anything for ages. You go and have a game of squash. You go and have a game of tennis and 2 days later, 48-hour muscle pain, that's DOMS. That one that, in creases you up.

APM: And we've got an established theory about how it happens but no established mechanism for fixing it.

TW: We haven't even…no. We haven't even got an established theory about how it happens because that's still up in the air. Some people argue it's inflammatory. Some people argue it's micro trauma. Some people argue it's lactic acid but some people say it's something else but we don't know what it is. So no, they haven't even sorted out what it is. Therefore, it's not surprising that we don't know how to get rid of it and everything they've tried to get rid of it doesn't work. That's DOMS.

APM: Right. Again, it's really useful stuff to be able tell a patient, isn't it? Because all sports men are interested in what you should do with it.

TW: They've all got a cure.

APM: And is DOMS harmful?

TW: No.

APM: No, so —

TW: It's just not nice.

APM: This is uncomfortable, so —

TW: Not nice and we use it in experimental pain. So we deliberately…wicked, wicked people. We deliberately create DOMS because if we're doing pain research on healthy subjects, they haven't got any pain. So therefore, we've got to hurt them all and we got to get it past the ethics committee and we've got to hurt them all just enough without actually doing them any damage. So DOMS is a great one because we can make everybody hurt with DOMS. We then got a nice 48-hour pain. We can treat them with treatment A, treatment B, treatment C to treat the pain I've just created and then they come back

next week and I do it all over again. Fantastic research model. Don't come near my lab.

APM: So that's your lab and your clinic —

TW: It's gone. I'm gone.

APM: How does anti-inflammatory gel interact with anti-inflammatory by the oral route? OK, so do they work together —?

TW: That's another Pharmacology one.

APM: Do they potentiate each other? Is there an additive effect or does one make the other redundant? Is —

TW: I don't think the one will make the other redundant. If there's anything, it's either additive or no benefit. I would have though, in theory, it should be additive. Both —

APM: Could you overdose?

TW: I don't think so because I don't…because I genuinely don't think the amount of anti-inflammatory agent that gets through the skin and into the deep tissues…I don't think it's enough to actually make any difference and your 200-milligram thing tablet that you're getting from Asda is only half of what you're going to get if you get a tablet off the doctor anyway. So because it's over the counter, you're probably underdosing in the first place.

APM: You're assuming that people are following the directions on the packet, of course.

TW: That's a radical assumption. I mean if I'm taking anti-inflammatory, I, well I can't say that I'll get killed. I double the dose me, but that —

APM: But you didn't hear that here.

TW: I didn't hear that here, did you? I don't read the label.

APM: We're still not going to get off ice because this question is about what's the optimum time to spend applying the ice after the six-hour period? So you've waited your six hours, you've got —

TW: Well, you need at least 10 minutes and the optimum appears to be…for blood flow post-injury inflammatory kind of effects world, you're really looking at 10 to 15 minutes. Do less than that and you're wasting your time. If you go 15 minutes, that's beneficial. If you go 15 up to 20, from what I can see in the evidence, you don't gain anything by sticking an extra five minutes

on there. So if you want blood flow effects and inflammatory effects and recovery effects, you're probably looking at around about the 15-minute mark. If you want neuro effects and…that's way off track today. I'm really not going to go down that route but if you wanted, you know, the patient who'd had a stroke or a spinal cord injury that spasticity…not muscle spasm from injury. Spasticity as in head, spinal cord, whatever spasticity, you probably need 20 minutes, 30 minutes to actually reduce the tone of that muscle so that you can then move but that's a different realm altogether.

APM: Post-injury then.

TW: Post-injury —

APM: I've done my 15 minutes. How often are they going to do that?

TW: If I were you…if it was me, I'd be doing that at least three times a day. So 15 minutes, three times a day, that's useful. That's enough to be useful.

APM: I've always thought we tell that to our patients because that's what we think they're most likely to actually do whereas…actually, if they were to do it every two hours, would that be better?

TW: Would that be better? No one's every gotten around that I can remember…could be wrong here. I can't remember anybody comparing the three times a day with the every two hours and if you're out there and you've done that research and I've missed it, I apologize. I don't remember that research.

APM: But you need to give the muscles or the tissues time to warm up and then —

TW: Yeah. You don't want to be doing one ice treatment and then before the muscles warmed up, hit it with another cold treatment because the reaction to the ice is just the body trying to protect itself. I put a cold pack on you, to start with, you shut your blood vessels down to keep your blood warm. After the 10-minute mark, you're thinking, "Crikey, he's not taking that cold off. That tissue under there is now getting colder and colder and colder. So I'm going to flood the area with blood to stop tissue damage happening." So all you're doing is your fighting an imposed tissue damage and you don't want to do that again and again and again and again without leaving time for the tissue to recover in between. You're pushing your luck.

APM: Now I've got a very useful question from Anne in Surrey because we need to get off this subject of cold. She said, "If you want pro-inflammatory, why don't you just use heat?"

TW: Well, that's one of the areas I was thinking about talking about tonight but yeah…if you want the rough and ready evidence based guideline, the

evidence based clinical practice, evidence based guideline would say up to the end of the inflammatory phase, we're really talking 2, 3 weeks down the line, ice has the advantage over heat in terms of outcome effectiveness, treatment benefit. Once you get to the three-week mark and beyond, heat has the advantage over ice. And it's really difficult to come up with an absolute rule and I'm sure there are exceptions which are perfectly valid exceptions but the rough and ready rule for me would be first 2 or 3 weeks, I'd use ice and I'd advise the patient to use ice.

APM: There's good evidence for this?

TW: Reasonably good evidence for that and then three weeks plus, heat kicks in on it's on, heat as a therapy tool when I was training back in you know when. We used to use heat. We probably used too much heat on too many people. We did heat to loads of people who really shouldn't have had heat but the pendulum swung so far the other way now that almost no therapist use heat and yet —

APM: And this is more than just fashion.

TW: Well, no, it's not fashion…fashion is the problem because the evidence says that heat is effective and it reduces pain, it increases tissue mobility. It increases blood flow. It improves fluid exchange. It increases lymphatic return and the tissue, the tissue extensibility stuff, really, really effective but you've got to get enough heat in there and you got to get it where you want it and if you do that, it has a real effect but it's out of fashion.

APM: But if you apply it in the acute stages or sub-acute stages then it's not as good as ice.

TW: No, ice —

APM: So three weeks in is best.

TW: If you actually had a choice…

APM: It won't be harmful.

TW: No, no, well. It will aggravate the inflammation. What you'll do with the heat…if you were inflamed post-injury or, you know, you had an injury, your tissues were in an inflammatory state and I put heat on those, it will be pro-inflammatory but it will be way, way, way too much pro-inflammatory. So it's the right idea but I think the reason we don't use heat in the acute stages is it's provocative. We don't want to be provocative. We want to help the inflammatory process to do its thing. So cold for the acute, up to your 2 weeks, 3-week mark, 2, 3 weeks onwards, I'd be going down the heat route.

APM: We're going to come on to heat in just a second. I want to read this out. This is from Maria in London. Thank you, Maria for this. She's not exactly asking a question but to say could we possibly get some rugby players in to demonstrate the immersion therapy, which may appeal to 50% of our audience. I'm not sure. A question, again, from Matthew Davis, "What about contrast therapy, cold, hot, cold, hot? Should we start with cold, finish with cold or should we not do it at all?"

TW: Don't do it at all. There's been about three systematic reviews. There's been probably 4 or 5 pretty decent RCTs on this and not one of those has shown that contrast bathing, the alternating hot and cold has gotten advantage over either heat or cold. Either use heat or use cold. Don't do the contrast bathing and I know it's still popular out there and the athletes love it and the sportsmen love it and therapists love it but there's no evidence that says it's got an advantage. So therefore, it doesn't matter whether you do the heat first or the cold first.

APM: Could you be more precise? Can you say there's evidence to say that it has no advantage?

TW: Yes, there is evidence and systematic review evidence that says there is no advantage. Now I know its still being taught —

APM: No advantage over what?

TW: Either doing heat or doing cold. So do cold when it's acute. Do heat when it's chronic and at no point does contrast bathing give you a better result.

APM: It gives a worst result.

TW: No, it doesn't give you a better result.

APM: I was just trying to clear that point up because that's a significant issue because you said don't do it.

TW: I wouldn't do it.

APM: Actually, it just doesn't do anything better.

TW: Actually, hang on. Hang on. No, I think it's fair to say that you're disadvantaged. If you do contrast bathing, you are disadvantaged because you will get a better result either by using heat or by using cold. It's widely used. I looked at the evidence a couple of years back because somebody asked me to do it, some conference paper on it and said, "Look, you know, can you tease these apart and actually tell us…not what the manufacturers tell us, just tell us what the evidence says." So that was about three years ago. So unless something stunningly big has come out in the last three years

and I keep an eye on it, I haven't seen it. So, you know, the idea that contrast bathing gives you an advantage is not held up any evidence.

APM: This question is way off the topic that we were going to discuss but I mean I'm going to read it anyway. This member of the audience wants to know if you've heard of a guy called Wim Hof and his method of practically living at very low temperatures.

TW: Yeah.

APM: And does being cold more of the time boost the immune system as some claim? Do you know?

TW: It's certainly claimed. I can't tell you how good the evidence is but the idea…and there's lots of things that spin off this living at cold temperatures, reducing your metabolic rate, boosting your immune system but then there's all the stuff about the cryo chambers, the whole body cryotherapy. I mean you go in a chamber at minus three squillion degrees. It's cold in there and you're going to only last about 15 seconds before you cave in and apparently, that stimulates heaven knows what but I can't find any good evidence for that at all. It's another trendy but then hyperbaric oxygen was a trendy and, you know, the cold-water immersion is currently a trendy and you and I ought to invent the next one. Just get on the bandwagon, invent something trendy.

APM: We'll do that, whatever program. We'll invent a therapy.

TW: Yeah, we'll have a program.

APM: And we'll sell it. It's, watch this space.

TW: We'll invent some evidence —

APM: We're going to stop there. Maria in London, you asked about whether we could go back down the ice and the neuro route. I think we'll probably have to save that for some other time, won't we? Because we've got quite a lot of things to cover.

TW: We've got plenty of things to cover.

APM: We'll come to it later but thanks for the question. We were talking about heat. You said it's gone out of fashion but you brought some heat in with you.

TW: Well, I have brought some heat in with me. Maybe not classic heat. The point about heat…and, you know, to some extent, it makes no odds to me but the point about heat is that if you get a big enough change in temperature in the

tissues and you really need to raise the tissue temperature…right between about 3° and 4°C. So whatever your thigh temperature is now, you know, your quads temperature, to have a real effect on your quads, I want to raise your quads tissue temperature by about 3° or 4° —

APM: At the point of injury.

TW: No, at the point of where you've got tight muscles or whatever and I'm trying to get some mobility. If you get that kind of temperature change, there are real physiological effects. Those physiological effects are of sufficient magnitude to be useful. There are real therapeutic effects that spin off the back of that and therefore, using infrared…we used to use infrared but the penetration depth of infrared is about half a millimeter on a good day with the wind in the right direction. You might as well just go in the sunshine, all right? But if you actually heat the deep tissues at sufficient level, now you're starting to talk serious physiological effects and you can get that down to a centimeter, maybe two. You can get that with those wheaty bags, you know those wheaty bags you put in the microwave, give it three minutes. Ding-a-ling-a-ling-a-ling. End of three minutes, put that on for 20 minutes, that will actually start to give you that amount of heating but only down to a centimeter or so. If you want to go…your deep hamstrings, deep inside your knee, deep around the back of your lateral rotators on your hip…we're not going to expose them today but I mean, you know, with all due respect, they're more than a centimeter down and your wheaty bag ain't going to touch it. So therefore, there is a real clinical benefit to producing significant heat at depth and we've been researching this for the last maybe 3, 4 years. Four years, I think it is now.

APM: So if that's the case, if, you know, your hot wheaty bag won't get heat below a centimeter —

TW: Or two, yeah.

APM: Or maybe two, how deep will the cold go? Because you said this is good in an acute injury

TW: Well, I said…

APM: If I stick a cold pack, it's only going to go two centimeters or…?

TW: It's not going to go much further. It goes a little bit but if you do a cold pack, i.e. crushed ice in a wet towel…back on ice again, aren't we? You're probably going to go to…heading towards three centimeters but it's still not that far whereas your cold spray is only going to go a fraction of a millimeter, you know. Anyway, so your heat works but you got to get enough heat. We're talking 3°, 4° and you got to get it to the tissue, which is your target. There's no point just heating up the skin. If you want increased blood flow at depth,

heat will get you there, fantastic but you got to get enough heat and enough depth to get you there. If you want tissue mobility…so you've got…and I had an email today from a therapist, I won't say where but in place X, she's got a patient who's got…he's lacking the last 20^{o} of elbow extension and she emailed me with a lot of clinical questions about, "Can I use electrical stim? And can I use laser and can I use ultrasound?" and all the rest of it. She said, "I know it's soft tissue. I know it's not bony. I know it's soft tissue and it's restricting his last 20^{o}." And I said to her, "Have you tried heating the flexor aspect of his elbow and then doing your passive stretching and your mobes and your manips and getting him to do his exercise?" And she said, "Oh, no, hadn't thought of that, didn't think heat worked." That's exactly what he does. Stunningly good at it but it's no good just heating up the skin. You got to get the heat into the tissues that count and, you know, there are methods. We used to use shortwave and shortwave is I guess big, cumbersome, expensive and out of fashion. We use pulse short wave. I think we talked about that in some previous edition but we're looking, at the moment, at another radiofrequency application. When I first came across it, I thought, "Oh, god, here we go. Here's another one," you know. Another machine, claims all over the place and then we started doing some research on it and we've done…maybe the first 2 ½ years was lab research and just finding out what does this machine do. Does it actually increase blood flow? The answer is yes. Does it increase blood flow in the skin? That's easy. I can do that, excuse me. Don't take this the wrong way but I can easily increase the blood flow in your skin just by giving you a bit of rubby, rubby but if I want to increase the blood flow at depth, how do I do that? And I've got another PhD student looking at that. Deep heat will do it. So does this kind of —

APM: Deep heat meaning heat at depth, not Deep Heat —

TW: Yeah. No, I don't mean Deep Heat the advert. "Oh, put some Deep Heat on," you know. No, this is heat at depth. Maybe I should use that phrase. All right. So heat at depth does increase blood flow and if increase in blood flow stimulates repair in your damaged tissue which absolutely it does, stimulates angiogenesis, stimulates scar tissue formation, gives you good quality scar tissue then increase in blood flow and increase in temperature at depth has a really significant therapeutic benefit but you just got to use the right method to get the right amount of heat, the right amount of depth and that's what we're looking at and this machine I brought along is one of those. I'm not saying it's the only way of doing it. I'm not saying shortwave is a waste of time because shortwave does it but this, based on our measurements…we've done direct comparison with shortwave. This does it. The effect lasts for longer, all right? And therefore, it's therapeutic potential is bigger.

APM: When you say longer, how long —

TW: Longer, we're talking…if I did shortwave to your hamstrings…you've got tight hamstrings, your knee won't extend properly. I want to heat your hamstrings

up. Then I'm going to do a load of stretching with you and we're going to do the stretching in that window after I've heated you up. We know that works. Do a shortwave treatment; I probably give myself 10, if I'm lucky I'd give myself a 15-minute window, all right? When we were doing the early work with this, we were measuring how long do the effects last and we were doing a follow up experiment and we got permission to do knee experiment and then follow them up for 90 minutes, hour and a half. So they poor people, lying on the bed and we just keep taking all these measurements for an hour and a half after the treatment and then hour and a half after the treatment, the temperature still had not gone back to where we started. So that's like…what's that? Two, 4, 6. That's 6, 7 times longer effect than shortwave and I was really surprised. I thought that was just hype and it's not. It's real.

APM: Bearing in mind that you're probably not going to treat them for longer than 15 minutes, is that important?

TW: If you were working at the sports club and you had a sportsman, sports person… sports man, can't say that can I… sports person and they…you were going to do some treatment to them. After the treatment, they were then going to go out and carry on doing their stretching and all the rest of it then that might be really poor. I don't think we need to do an hour and a half treatment. All I'm saying is I was actually really surprised at how much more effect it had, how much bigger the effect was and how much longer it lasted. So that was my issue. I was genuinely surprised. I thought it was just going to be another way of doing shortwave and it's not. It's radiofrequency like shortwave is radiofrequency but the effect appears to be different and I'm still working with the physiology research to try and find out more.

APM: While we're chatting about it, let's have a look at this machine, which has been provided courtesy of duo medical, which is very kind of them. It's 25,000 quid I'm told.

TW: Is that right? I didn't pay for mine. So that's probably why I didn't.

APM: And you've had one of these for four years.

TW: Three or four years now and I've only got it in terms of working in the lab. I mean working in the lab is what I'm trying to do. We've got a clinical trial, which is just about to finish, and we haven't got the results yet. So I can't give you the results of the clinical trial because that will be wrong. We haven't even crunched the numbers yet. Suffice to say that the numbers are looking good but we've done lab work, we've measured blood flow, we've measured temperature, we've measured all the things that we want to measure in the lab and we know the effects are real. We know the effects are not…we'd done double-blind, placebo-controlled, compared it with shortwave, compared it with everything else we've got and I was genuinely surprised…sorry, I need to stand up just for a sec. I was genuinely surprised

that the effect was better. Of course, I got you a towel. I didn't get myself a towel but that's OK. So it's radiofrequency. So we've got to get a current through you. If you can take your watch and ring before we get —

APM: I'll take my watch and ring off, all right, OK.

TW: If not, all your viewers are going to see Steven sparking and that might be quite good fun for them.

APM: I can't get my ring off, that's bloody hard enough.

TW: You're not going to appreciate it.

APM: So there we go. This is our first precaution, getting rid of all the metalwork.

TW: Yeah. Excuse me; I'm not rubbing your knee. I'm just trying to get the goop off my hand.

APM: Is that therapeutic?

TW: It is, you know. Rubbing your knee, it's well therapeutic.

APM: So I'm sticking my hand —

TW: Effectively, yeah, it's a bit of cream on their and that's just to get the currents through you, all right? So effectively, what I'm going to be doing is I'm going to be using an electrode… I've got myself in knots before we even started it. So we're passing a radiofrequency current from here to here. So therefore, it's going to be more concentrated at this point and therefore, the heating is going to be dominant under here. Now this is a fairly pathetic setup but it was probably safer than getting you to drop your trousers. So if we imagine, we can put that under your foot and we can be doing the hamstrings. We could have you lying prone on the bed that plate could be on your quads and I could be doing this on your hammies and your glutes or your tensor fasciae latae for your iliotibial band. That —

APM: Or it could be on the lumbar erector spinae —

TW: Or it could be lumbar or we could do the abdomen and we could be doing this lumbar. If we wanted heat in your back, A, it produces pain relief, B, it gives you increased blood flow, C, it stimulates healing in damaged tissue and then if you then want to do exercise after the heat, you will get an enhanced effect of the exercise. I'm not using this instead of exercise. That's crazy. I'm using it in conjunction with rather than instead of. So another dollop of goop. Sorry, this is very non-clinical, professional behavior here but hey, another rub of your thigh. I just can't resist it.

APM: We're not asking him back.

TW: I don't think anyone's going to ask me back after this lot. So what effectively I'm doing is I'm putting radiofrequency through you and at some point, you should start feeling some heat coming through under there.

APM: Yeah, I'm feeling some heat under there all right.

TW: Is that okay? It's not supposed to be burning.

APM: No, it's fine.

TW: The interesting thing about that is we could do that with a wheaty bag couldn't we? We could do that with a hot water bottle. We could do that —

APM: I'm feeling it on the palm of my hand though.

TW: You will do because the radiofrequency's going all the way through that tissue. What we found was that not only do you feel that heat but actually, when we measure the heat deep in the tissues, when we measure the blood flow deep in the tissues, it's producing a really significant heat at depth, all the way through that tissue.

APM: So why are you rubbing this around and around?

TW: Well, purely because if I kept it still, there will come a point where the amount of energy—

APM: Heat blisters.

TW: --is going to start getting uncomfortable. So by moving it around, I'm simply making it more comfortable but I thought that was just another way of ripping off the therapist, all right? And therefore…I'll turn that down.

APM: Interesting. I'm feeling most of the effect down here. I'm not feeling very much in here but there must be quite a deep therapy —

TW: But there's a deep…see, because the current…excuse me. I won't rub your thigh this time. I'll rub my thigh with a bit of towel on it the current is going in here. It's getting constrained through here because we effectively got a narrow conduit and then it's spreading out and then getting to the return plate. So yeah but if we put a bit more cream on there and your belly and then did that rubbing on your back, you would most certainly feel most of that heat on your back.

APM: So are we done with this now?

TW: Yeah, I mean I was trying to demonstrate the fact that without being dramatic, you can actually have a really useful…I don't mean dramatic but a really useful heat effect at depth and if that is the key to your treatment outcome, whether that's for pain relief or for blood flow, tissue mobility, etcetera, etcetera then it's a way of getting there.

APM: So who's using these machines? Because at £25,000 a pop, you got to do a lot of treatments to get your money back —

TW: No, I think 25,000…if you're going to buy your number one, top end machine… I've probable just dropped that on the floor, wait no I haven't. Yeah, if you're going to buy your top end machine, it's £25,000 but you don't have to buy £25,000. I don't know. I don't do sales. I don't do advertising. I don't do promotion and I keep out of the commercial side on purpose but the sports clubs are using it. The professional sports clubs are already using it. On the continent, widely used, football, rugby, tennis, golf, cycling, France, Spain —

APM: So it's going to be in areas where there's a lot of money involved in keeping your athletes healthy rather than —

TW: But I was surprised again, certainly in France, in Germany, in Spain, in Italy, most…that's not fair. Maybe half the private practices out there have gone in for this and they're really using it on their chronic, long-term patients, the ones who they've tried just everything but everything but everything and if nothing else, it's kicking in on them. So interesting, interesting idea. I'm genuinely fascinated to see what they'll…because it was a randomized controlled trial with chronic OA knee patients and results for that should be out within a matter of weeks. So that will be fascinating to see

APM: Excellent.

TW: The impression is it's looking damn good but I wouldn't want to say that without the numbers behind me and I haven't come across the numbers yet.

APM: Well, just for a second, I'm just going to have a quick chat, Tim's going to get his shoes and socks off now.

TW: Oh yeah, Forgot about that.

APM: As we move on to the next piece of equipment but I just want to point out or emphasize what Tim said a moment ago and that is the fact that he's not here to promote any individual pieces of equipment. What he does at Hertfordshire, University of Hertfordshire is he analyzes the research. He looks at equipment and checks out whether the claims made by the manufacturers are good or bad and what we're going to look at now is a footplate, you know, intended to stimulate circulation made by Revitive

which…I think you said, Tim, you looked at this and you thought this is rubbish, didn't you?

TW: Yeah. It's another one of my "Tim thinks it's a load of rubbish" machines and it's —

APM: So Revitive is the manufacturer and not the name of the device, isn't it?

TW: Right, yeah, I think…no, Revitive I think is the name of the device —

APM: We'll put a link up on the website.

TW: I think there is a link up on the website. Effectively, I came across it because it was being sold over the counter, Boots. You can get it on Amazon. You can get it in Boots. You can get it Lloyds or whoever the chemists are and patients were coming to their therapists and saying, "Is this for real or is this just another rip off-y machine?" The therapist didn't know, so they were asking me. So I went looking to find out what's this all about then, expecting five minutes later to be able to just junk it, you know, right it out and actually, it's rather more impressive than I thought it was going to be and that's, again, nothing to do with advertising. That's just a reality on how it is. So what it is is…we talked about muscle stim last time.

APM: We did.

TW: Because I was plugging your arm in and you were…giving you a bit of do-de-do. This is like a muscle stimulator, all right? I've got it on battery at the moment and effectively, you've just got a couple of foot plates which are conductive. You don't need gel. You don't need cream. You don't need stuff. You literally…and my feet are fairly damp so it'll work just fine. You literally put your feet on there, that's your mouse, lets not do it with that, let's do it with a remote controller. You put your feet on there and as you turn that up…

APM: You're turning as you would a TENS machine. Turning up the intensity of the —

TW: Turning up the intensity of the current. There's more and more current at some point, which is just about now. I start to feel tingling in my feet. If I keep turning it up, that current…you really don't want to see my legs but I'll…my last visit, I'll show off the ankles. Right, so if I keep turning that up, just coming on now, we're going to get to the point where my calf muscles are going to contract and all the muscles in my foot are going to contract which they're doing and it comes on, contraction, let go, contraction, let go.

APM: So that's not you deliberately rocking that plate.

TW: No, there's a rocker under there. So of course, every time my calf contracts, it's pushing my foot into plantar flexion. That gives me a bit of forward rock and…it depends. The idea is not can you get to the maximum before you die and cry and all the rest of it but you want to turn it up enough so you get a decent contraction and effectively, that's just going to give you a sitting there, rocking action. They talked about it…and this is where I got really skeptical. They talked about it as for people who can't exercise. In fact, Circulation Booster I think was the first name of the machine before it got called Revitive. So they called it the Circulation Booster and it was all about people who can't exercise, people who've got swollen ankles, people who've got puffy feet, people who've got tired legs, people who've got varicose veins and it's a way of them doing exercise while you're sitting there watching EastEnders followed by Corrie followed by whatever and that's when I thought, "Yeah, right." Actually, you look at the blood flow results, you look at the swelling results, it actually does —

APM: But it is for the geriatric or the disabled —

TW: Well, it's for the more infirm. They're now doing clinical trials…we've done a bit but they're doing clinical trials on patients with chronic venous ulcers, with chronic venous insufficiency, diabetic polyneuropathy because these are all patients for whom long-term circulation problems are a real issue and they can't get up and do a load of stairs. I got called in to some TV interview over in Denmark about this a while ago and it was like…what's the Anne Robinson program?

APM: Point Of View, is it?

TW: No, not Point Of View. No, it wasn't that —

APM: I know what you mean.

TW: Consumer program where they're sort of trash things. Anyway, so it was the Danish version of a product trashing and they said, "Look, you know, wouldn't it be better to go and do a five-mile run?" I said, "Yes but Doris who's 82 and got a chronic venous ulcer is not going to…with all due respect, they're not going to go and do a five-mile run."

APM: its just lack of determination, isn't it, really?

TW: Well, yeah. Pathetic, isn't it? I mean yeah, most of us do everyday.

APM: Look at the pair of us—

TW: Well, precisely.

APM: Sitting with your trousers rolled up like your in the paddling pool.

TW: But effectively, that is not as good as a five-mile run. If you compare doing that with doing nothing, which one's giving me more exercise? The machine has and therefore, it's got that value.

APM: Do we know what it costs?

TW: A hundred and something. It's low cost —

APM: So it is affordable.

TW: It's over the counter and the only reason I mention it is, A, it links with last time when we're talking about the muscle stim and B, patients are getting a hold of these and bringing them in.

APM: And they want to know whether they're any good.

TW: And they want to know if they're any good. I was skeptical. My initial view was, "Yeah, yeah, yeah, another patient rip off." My view, having looked at the research and done a bit myself…I mean I'm doing this. You can get pads like the electro pads we had last time. You can attach electro pads to this. I was doing that and I was getting blood flow changes, 600% changes in blood flow.

APM: Wow.

TW: By sticking that stimulation through my arm instead of through my feet because I couldn't measure my feet at the same time as doing the stim as I was working the machine. I was blown away.

APM: Precautions? Is it —?

TW: Ah, usual stuff. If you've got a pacemaker, don't do it. If you're pregnant, don't do it. A couple of other ones but really, pacemakers and pregnancy.

APM: Any concern about thrombosis or —

TW: If you've got a DVT, you're a bit daft doing that. If you've got DVT, it'll shift it quite nicely. You'll end up with a PE and you'll get a lot of pain relief. Patient would be dead you know. Yeah. Anyway, but, you know, joking aside…let's turn that off before my feet start rocking to far, they recommend…and again, clinical trial evidence on the back of that, they're talking about doing that for 30 minutes once a day and if you do that for 30 minutes once a day, there's measurable increase circulation, independent evidence. There's measurable decrease in swelling, independent evidence. Measurable pain relief, independent evidence and therefore, A, I was surprised, B, I'm now happy to…if patient asked me, I'm saying, "Give it a go if you want to give it a go."

APM: Especially those patients who you know are not going to go and do some exercise for whatever reason.

TW: They're not going to do the exercise…

APM: They can sit and watch EastEnders with that thing on.

TW: You can do that with…you can EastEnders and Corrie and you can get a good blasting and you'll feel tired at the end of it.

APM: Very quickly before we move on.

TW: Am I OK without my socks on —

APM: You're OK. We'll keep the camera off your feet, don't worry.

TW: It's not the camera I'm worried about. It's your nose.

APM: Before we move on, a couple of questions have come in. First of all, how do they measure the heat and blood flow deep in the tissues? Are we sticking sensors —?

TW: Well, we either stick sensors in the tissue… which is fairly unpopular, but it's pretty accurate. Most of all, we're doing…at the moment, we're doing it with ultrasound, sonography. So we're using sonography. We're using thermal camera imaging. We're using sensors on the skin. So we've got skin temperature at spot points. We've got skin temperature in the whole limb from our camera and then we're using the ultrasounds for doing the deep blood flow and the deep temperature changes because you can actually monitor deep temperature changes with sonography if you do a bit of clever math which is more popular, understandably than drilling a hole and sticking a probe in which is the old way of doing it. People still do that and I still do that when we need to but that's not my method of choice.

APM: I'm dotting about a bit here but somebody sent in an observation that when they had a mangled hand, which they tell us it's 40 odd years ago, their physio used to treat them with one-hour sessions of hot wax dipping. It seemed to get pretty hot for a long time. Is it still done? Is there any value in it? Does it have any evidence behind it or…?

TW: Yes, yes and yes. It's still done, very infrequently compared…when I used to work in the wax room, God I did a six-week placement in the wax room that was all you did. Everybody came in and wax their feet and wax there, you know not hairy wax but you know, treatment wax. That, you dunk your hand in molten wax and you dunk that in half a dozen times. Effectively, you get a glove of wax that gradually goes solid on you. You wrap that up in towels to

keep the heat going in, not dispersing out. That genuinely raised the tissue temperature to the amount we wanted but it won't go very deep but in the hand, you don't need to go very deep. So your patient's post-Dupuytren's, your post-traumatic hand where you've got effusions, you have metacarpal fractures, your Bennett fractures and all that kind of stuff, OA in the first carpal, metacarpal, A, it works, B, there's actually evidence that says…but when we used to then start doing it ladling it on the back. Oh, grow up, you know. There's no point ladling it on the back. It's never going to go deep enough but certainly in the hand now in common practice, in hand therapy units, I do a lot of work with hand therapy units, it's still used. It works and it's out of fashion but actually, for that isolated application, it genuinely works with evidence.

APM: Sounds as though actually it's quite an effective way of getting heat into the tissues as well because you're covering the whole hand —

TW: You've got massive conformity because however I heat you, even if we've done that heat we were doing just now…actually, if I want heat down in your web spaces, how am I going to heat in your web spaces? Because you're lacking your abductions. I want to do that stretching, I want to warm you up first. I want the heat in there. Fantastic way of doing it with wax but its well out of fashion.

APM: I'm told the program was Watchdog.

TW: Watchdog, thank you very much.

APM: Point of view, who said that?

TW: Yeah, Point Of View and you said Point Of View but I couldn't remember it either Danish Watchdog, whatever that was.

APM: We're moving on to SCENAR. You brought one of these things and the reason I asked you to bring one of these because I first encountered one through a physiotherapist probably 10, 12 more years ago. It's been proven by Russian astronauts which means it must be good and it's good for just about everything I think.

TW: Apparently but if you read through various web pages of various things, everybody's either claiming that their product was either invented by Russian astronauts or NASA. Putting Russian astronauts and NASA somewhere in the explanation of the story seems like a pretty trendy thing to do. I came across a new product today, nothing to do with tonight's conversation but somebody said, "What's this?" and gave me a website. I went there and it said on there it was developed by the Russian astronauts to treat themselves and NASA have said it's an excellent thing and they wished they'd have

invented it. Now where does this stuff come from? They just make it up. Anyway…

APM: Now just to clarify, SCENAR, S-C-E-N-A-R, is that the product…is that the manufacturer's name or is that —

TW: No, it's an acronym. Like laser but it's an acronym and I really can't tell you what it stands for. I didn't look it up earlier to make sure I knew but that was like minutes ago but SCENAR is a way of doing treatment. So you've really got an electrical stimulator. The big difference is…and this is just…and I'll keep my thumb over the name. I'm not even sure if you can still buy this one but the idea is that…how it's sold to you is that when you do this, the machine listens to what your body's saying. It then delivers the treatment that your body wants and therefore, it's most effective because it does that. Right and then they talk about biofeedback. With all due respect, it's not biofeedback. Biofeedback is a different thing all together. Biofeedback is me measuring how tight your quads are contracting. I tell you how quite tight your quads are contracting and you do something about it. That's not biofeedback. Anyway, they call it biofeedback, listening to the body, delivering what the body wants. That's the idea. So the idea is…OK, let's pretend you've got some chronic… have you got a wristy think.

APM: yes, I can have a wristy thing.

TW: That's fine, you don't need to get undressed again, embarrass the world So let's just put this on some kind of fairly ordinary setting here and the idea is I'll turn that up and I want to get some contact. You'll start to feel that buzz at some point. There we go. All right, it's like TENS. They make a point of saying it's not TENS, all right? But at some point, if I keep turning that up…

APM: Yeah, Ok.

TW: So I do that over the tissues and then as I go on different tissues, I get different numbers appearing on my little screen, all right? And when those numbers go high, I think "Ahh, There's the injury, there's the injury," and I hold it still and there you go, you're cured. All right? So I'm going to go and find another injury now. "Oh, you've got one here" and it's going to now treat you and you're cured. Now, I'm being ultra cynical and it's not quite that but that's the principle. What it's delivering is electrical stim. I know it's not TENS. I know it's not interferential. I know it's not muscle stim but it is electrical stim of some kind like that. Quite secret, they won't actually tell you what it is. So —

APM: You mean you haven't taken it apart to find out?

TW: So I'll put it through a siloscopre to see what it does because I'm a complete ass but that's, you know…I want to know what it does. I don't want to read it

from a handbook. I want to trust my own machines. So I know what it delivers and I know a guy doing a PhD and he was comparing, you know, this machine with another machine with another machine, all claim to be delivering SCENAR therapy and we were going to compare A with B with C and compare how effective they were but unfortunately, his funding caved in. So at the moment, he's had to stop which is a bit of a shame because I quite liked to know the answer. Anyway, so the principle…I don't have a problem with the principle. The principle is that I'm delivering electrical stim to your injured tissue. The idea that the machine makes a measurement and tries to use that measurement to help me put the electrical stim in the smartest place for your injury, I don't have a problem with that. I do have a problem with how it actually happens. I do have a problem with the evidence that the machine can find your problem. I don't have a problem with the fact that if I stick electrical stim into your injured tissue, you will get a better recovery.

APM: So we've got some proper research behind it? Your PhD student whose looked at —?

TW: He's looked and he was sort of wading through the research but once you get past the website-y, "This comes from Russia. This was invented for Russian Cosmonauts who needed something when they're on the moon," or whatever it was that it was invented for, you know, so Russians could treat themselves in space…I think that was the story for that one. Once you get past that and you actually get past the literature which you can access in published journals, beyond the website and beyond the "this is secret research but we'll just tell you what it says", you know, once you get beyond that, there is some research but I don't think that research says it will find your injury but if you compare doing that as a treatment versus a placebo version of that treatment, there's a difference. So I think it's doing something, which is why we're doing the research because I really quite like to know. If it works, I want to know scientifically that is works and then I'll go investigate it some more but I'm not at that point.

APM: So you've not compared it against other forms of treatment —

TW: We were going to compare it against TENS and we were going to compare it against, you know, variety of different electrical stims. So in other words, if we put TENS…because that electrode's really quite different. It's like two concentric electrodes. So if I put TENS through that electrode, does it now work like TENS or does it work like SCENAR? If I put SCENAR through TENS' electrodes, does it work like TENS or does it work like SCENAR? No one's ever done it, which is what we were going to do, and we were getting damn excited until someone pulled the money plug but that's inevitable, you know. We'll get there one day. So the reality is I know a lot of therapists who use it and anecdotally, they are very, very comfortable using it. They think it gets them good results. There are patients out there who swear by it and

therefore, I'm trying not to rubbish it. I don't want to rubbish it. I think the electrical stim bit of it has the potential to do good. I'm not convinced by the story but then I'm not convinced by lots of stories. I'm a cynic until someone —

APM: But this is designed to be used by a therapist, not by individuals.

TW: Yeah, this is…

APM: You can't buy this over the counter and take it home with you?

TW: Well, you can but you need…I don't know what this was. When I got a hold of this, it's about £4,000 or £5,000 or something

APM: OK.

TW: So it's not a patient TENS-y machine, over the counter but if you want TENS to get pain relief, go to Boots and buy a TENS.

APM: Incidentally, while you're on the subject to the cost of that, one of our very helpful audience has told me that the price of that particular Revitive—

TW: Revitive, yeah.

APM: --is £189.99 on eBay. They don't know if it's the most expensive or not.

TW: No, you can get it cheaper than that. I go shopping.

APM: Yeah, well there you go.

TW: I don't know what it is but I —

APM: But we know a sort of ballpark we are in, if we're advising patients and so on.

TW: Ballpark. Yeah.

APM: Somebody —

TW: Anyway, sorry at the end of the day—

APM: Oh sorry…

TW: --I'm not rubbishing it. I think it's got potential. Therapists use it and think it works, very limited amount of evidence. Patients think it works and therefore, I'm pretty sure something in there is real. I haven't got to the bottom of it. Nobody else has and the research we were doing to get to the

bottom of it, unfortunately, is now no longer funded so therefore, we'll have to wait until I can find —

APM: So if you've got 5,000 to spare, it's worth a go then, if you don't mind —

TW: Again, you can buy for less than 5,000. Go shopping on those channels but yeah.

APM: Very quickly, someone wants just to have you remind us what electrical stim does, what does it mean? I mean electrical stimulation —

TW: Well, electrical stimulation can mean all sorts of things. So TENS is an electrical stimulation whereby we're putting an electric current in to stimulate sensory nerves to get pain relief. The muscle stim we looked at last time, NMES, neuromuscular electrical stimulation is muscle stim in that we're putting electric current in to fire the motor nerves to get the muscle to contract. Now, to me, they're all electrical stim because you're using electric impulses to have an effect. You can gear that up to be sensory. You can gear that up to be motor. You can gear that up to be whatever you like by choosing the stim that makes the nerve work that gets you the result you're looking for but I'd put them all under an electrical stim banner.

APM: On the subject of electrical stim, one of the things I kept prompting you to talk about this evening in our exchange of emails, which I promised our audience, is some sort of comment on the role of electrotherapy in treating incontinence because we talked —

TW: We did mention that before, didn't we?

APM: First of all, is this something that is a workable option for both sexes?

TW: Yeah. It's a workable…it's been used longer. It's been used since the '60s really, might be earlier, 1960's.

APM: Are we talking muscle stim here with —?

TW: Well, they've gone through various incarnations. It started off with faradism. You probably haven't tried faradism is a type of electrical stim which is pretty damn uncomfortable. It's not the most uncomfortable but it's pretty damn uncomfortable and they were doing that to the pelvic floor back in the '60s for patients with stress incontinence. In other words, it was trying to make the muscles in the pelvic floor work, went from that to interferential which we talked about a couple of sessions ago, which is a kind of way, a less barbaric way of getting there. People still use interferential but actually, the best results with incontinence, certainly on the female incontinence side is, with the genuine stress incontinence, using the muscle stim. We talked about it last time. Either with pad electrodes or in fact, with internal electrodes

which are…sounds a bit horrible but actually, they work really well. You can do that for fecal incontinence. You can do that…you can guess where the electrode goes. You can do that for genuine stress incontinence using an internal electrode. You can get both of those treatments done with external electrodes and in the last five years, I guess that's been done a bit more now in male post-prostatectomy incontinence issues and actually, there's really good evidence for all of those therapies. They all have evidence. They all have systematic review evidence. They all have RCT evidence.

APM: Where is it being done? Is it only being done in the hospital departments or is it done in physiotherapy clinics?

TW: No. There are physio clinics around who actually make a specialist, you know, venture out of doing that but yeah, historically, NHS. Your physio departments in the NHS are doing it and again, we're not saying…I'm not suggesting that you're using it instead of exercise. If you've got genuine stress incontinence, the pelvic floor…doesn't have a very layman's term on it, the pelvic floor is weak. It's a bit saggier than it ought to be. Not enough control. You want those muscles to strengthen. Exercising the pelvic floor muscles is a damn fine good way of getting there and we know that from the evidence. There are some patients who just don't know what to do to make their pelvic floor, you know —

APM: Or won't do it?

TW: Sorry?

APM: Or won't do it, can't be bothered?

TW: Some can't be bothered. Some just can't suss out what the, do I need to do to make my pelvic floor do what you said it should do? We have people who try biofeedback. So you use a biofeedback and you say, "Right. When you do that and you see that twitch, that's the right thing to do," so they're just, bit or everything, bit of grunting, breathing in and eventually, they'll do something that gets the biofeedback to twitch. The muscle stim is a way of making the pelvic floor contract, A, the patient says, "Oh, my god, that's what you mean," right? So the muscle stim, nothing, nothing, nothing, nothing, just like we did with your arm last time. Here comes the contraction, hold, hold, hold, hold, let it go. So when I'm doing that pelvic floor wise, you feel your pelvic floor start to contract, you join in and all the time the machine is stimulating your pelvic floor, you know you've got to keep joining in, and keep. When you feel the machine letting go, you let go. Now if nothing else, it's a supplement to the exercise. It's an adjunct to the exercise. So the patient's coming in and they might be getting that in the hospital or in the clinic maybe once, maybe twice a week. When they're not in the clinic, they're still doing the exercise at home. That's when it works. Just the stim, by itself, putting minimal effect. I wouldn't —

APM: So they're doing this at home. Are they taking a stim —?

TW: Some of them do. Some clinics now actually teach the patient how to use this. Personally, I would. I think that's the way forward. Get the patient to use the stim at home but historically, it's been "I would do this to you in the clinic" because the machines have historically been expensive and cumbersome. They're now small. They're portable. I was looking at one the other day, well under £100, patient friendly, press it on, press it off. But it's real, its genuine stress incontinence, better than the urge incontinence, better than the mixed incontinence and it's been used on men especially post…I can't even say it.

APM: Prostatectomy.

TW: Especially post-prostatectomy with good effect.

APM: You said it was particularly good on women. By that, did you mean that more women are seeking treatment because post-partum, they —

TW: The number of people with incontinence issues post-partum; I don't think the numbers gone up. The number who are admitting to it and talking about it and therefore seeking help has gone up. So there was a study done, again, a PhD that I was examining over in Ireland and they were talking to Irish women post-partum. One in three had urinary incontinence. One in five had fecal incontinence, post-partum but nearly all of them would not talk to their doctor about it because they said it's not the kind of…you just put up with it. It's what happens to women after you've knocked out 15 kids or whatever and the reality is they were trying to get past that and saying, "Look, if you talk about it, we can help you," and I think that…not just in Ireland, that's happening.

APM: Now I don't know whether there are members of the audience who might think this is a useful treatment to offer their patients but there are, presumably, lots of us seeing women with this problem whether they're admitting to it or not. Is this something you need in depth training to use one of these machines? Is it something that you would suggest it's worth getting a machine or a number of machines —

TW: I think it's one of those things that you really got to know the difference between a genuine stress incontinence, an urge incontinence, a mixed incontinence and if you're not on the level of being able to tell the difference between one and the other, it's probably best left to somebody else and I'm not saying, you know, you got to go see these specialists because they need the money but the reality is if you know what you're doing…just like with the pelvic floor exercises, just like the biofeedback, just like the stim, if you know

what you're doing, it's stunningly effective. If you had a dabble and get it wrong, you might just make things worse, more leakage, unhappy patient.

APM: Question about SCENAR. I know, we have to dot around the question's coming at random intervals.

TW: Yeah, that's fine.

APM: This member of the audience has asked whether it's similar to electrical acupuncture or do you not know?

TW: No, it's not. Electrical acupuncture is another piece of research we're doing. You're feeding me some lines tonight. Electrical acupuncture is like doing TENS down the acupuncture needle. So it's not like SCENAR at all. It's like TENS but imagine you've got the TENS going down the needle. What we're comparing that with at the moment is something called TEAS, T-E-A-S which is use a TENS machine, use a standard TENS electrode but put it over an acupuncture point. So instead of sending the current down the needle, can patients do this at home by simply putting electrodes over the acupuncture points and TENS at acupuncture points, been researched for years, we know it works and we're saying…what we expect, putting the current down the needle will be the most effective thing to do. Sticking the current through a TENS electrode over the acupuncture point will be less effective but it will still work but SCENAR is SCENAR. It's not that no. So the answer to the question is SCENAR is different from TENS, genuinely different from TENS and it's not like electro-acupuncture either.

APM: I've not come across this but the person who asks this question is talking about an electro-acupuncture pen, which I'm…are you familiar with this?

TW: Yeah, there's electro-acupuncture pens. Actually, I had one with me last time but we didn't get to talk about it but I did bring one in last time. Effectively, it's like a little clicker. You know the old gas lighters for your fire? When you have that piezoelectric click you get that little spark. Well, they're like that and you…it's like a pen with a plunger on the top. You find the acupuncture point you want to stimulate. You hold this thing over the acupuncture point and you effectively click it. So that's delivering a TENS-like electric…every time you click, you get one shot.

APM: So again, it's not SCENAR.

TW: That's TENS without the machine. You're just doing a mechanical click.

APM: We have a few minutes left and part of the purpose of what we're doing this evening is so that we can offer advice to people who come in with stuff they've bought from the internet or from their local clinic. What have you got? What examples have you got —?

TW: Well, I've got one left and the idea is probably not too far away from good but I'm not convinced about how it's being marketed. We talked about laser probably fairly briefly and probably I think in session 1 or session 2. The idea of laser is you put light energy into the tissue and that has effect. We know that real, real laser light has real, real effect on the tissue. We use it on ulcers. We use it on soft tissue injuries. LEDs, let's just give this a bit of LED, Woo, bright or what? I don't know which camera that's going to annoy. Is that going to annoy the camera quite nicely? There you go, right, OK. So there's a bunch of LEDs and the LEDs there are simply producing light, red light which we know works but they're producing red light which is not laser and the amount of red light coming out of here is not enough to actually do what the therapy effect is. So it is nearly but not quite, isn't it? Because you've got a machine that's producing light which is not quite at the right dose to have the effect we know it's capable of. That machine is supposed to be used for one minute a day. The amount of light coming out of there in one minute is not enough to do what it says on the box, which is to get rid of inflammation.

APM: So patients coming in to the clinic will say, "I've got this thing —"Are they coming in, saying it's working or…?

TW: No, they're coming in and saying, "I bought this. Do you think it should work? Does it work? Should it work?"

APM: Is it not better for injury prevention? Because if you're riding a bike at night, it looks to me as though —

TW: If you're riding a bike at night, it's probably an excellent thing. Stick it on your helmet and you can do a Darlek impression.

APM: Well, if you're facing backwards, yeah.

TW: Yeah, right. Well, annoy the drivers. Put it on the front but yeah…and I'm not knocking light because we know light works. I'm not knocking LEDs because we know LEDs work. All I'm saying is in one minute per day, you can't get enough light out of here to actually do what it says on the box and that really frustrates me because patients are spending money on that and they spend £100 on that. My view is they're being ripped off and that's not fair. Not fair.

APM: No.

TW: I don't like rip offs.

APM: No. We had one other device I was going to go on to. We don't have time for that so I'm going to finish with this question, which is any thoughts on vagal

stimulation, I imagine, to inhibit proinflammatory cytokines TNF for chronic inflammatory conditions?

TW: Yes, it's being used. You've got to be pretty damn careful. If you start stimulating the vagus which controls a whole lot of things including the heart and a lot of gut things…but yeah, people are using it as a great way of trying to control gut problems with electrical stim but they're also finding, if they stimulate the vagus, you can actually have an effect by like reverse conductivity, have an effect on things like epilepsy but I love electrical stim. I'll play electrical stim games from now until dooms day but I'm pretty darn careful hovering around over the vagus with a stimulator because if you get it wrong, very messy, very expensive and not popular. Joking aside now, yes, it works, yes, there's evidence, yes, there's clinical trials. Had a dabble? No.

APM: Tim, we can find an awful lot of this stuff on your website, electrotherapy.org?

TW: That's the one. It's —

APM: Which is free access.

TW: Still there. It's still free.

APM: It's there designed to inform people on what is good, what's bad, how to use ultrasound and electrotherapy and I will recommend it as being an excellent resource for anybody.