

Dr. Stephen Abrams - View from the Chairside - Detecting Cracks in Teeth Using the Canary System

Chiraz: Hello and welcome to CDA Oasis. My name is Chiraz Guessaier. Today I welcome Dr. Stephen Abrams, general dental practitioner with over 37 years of clinical experience. In 2006, Dr. Abraham's founded Quantum Dental Technologies to introduce the Canary System to the dental profession. And today he is here to present a case challenge where that system was implemented. So, Dr. Abrams, thank you very much for taking the time to present the case and welcome to this Oasis conversation.

Dr. Abrams: Thank you very much. And it's always a pleasure to participate on Oasis because I do view it often. It's a great platform for keeping up with clinical research and clinical findings.

Chiraz: Thank you so much. It's good to hear that. So, before we go and see he case, can you tell our audience what are the main points you're going to be, that they need to take away with them. And in a nutshell, what is this case about?

Dr. Abrams: Well, the challenge that we face or I'm facing in clinical practice is the increasing incidence of patients coming in with cracked teeth. And the question is, how do you detect it? That's the first question. And the second question is, once you detect it, how do you manage it and how do you explain it to a patient? And so those are really the three clinical challenges. And in my clinical practice we're seeing at a really high increasing incidence of cracked teeth both on teeth with and without restorations. And so when a patient comes in with some sort of diffused pain that you can't identify, where do you go and how do you do, how do you deal with it, how do you detect the problem? And then how do you explain it to a patient who will say, I don't grind my teeth.

Chiraz: Yeah, I was thinking about that. How do you convince the patient that they do? In preparing this case, you have actually undertaken a literature review. Can you tell our audience what it was about and why did you do it?

Dr. Abrams: Well, again, this is a common problem in clinical practice. And the case we'll present shows a patient who we've been taken care of for about 25 years and has a very healthy dentition and suddenly comes in with diffused pain, which we'll talk about in a minute. But then the question was why and how and what caused the problem. And the lit review indicates that cracked teeth can be caused by a number of situations. They can be caused obviously by parafunction or grinding or bruxism, but it also, they talk about the type of restorations that are placed, the size of the restoration, whether they undermine the cusps as well too. And those, and so the literature says that these are the factors that may cause it, but what we're seeing in our clinical practice is that parafunction is increasing and on unrestored teeth or teeth with smaller restorations,

we're finding cracks. And so, the question is how do you find them and what's the best way of doing that?

Chiraz: Quite interesting. So, without further ado, shall we go and see the case?

Dr. Abrams: Sure. One second. Let me get that for you. Here we have a typical bite wing radiograph taken on this patient of mine we've had the pleasure of treating for over 25 years. And you can see they have small amalgam restorations and these were taken three months before the pain occurred. And so, you can see that there's good bone support, there are small restorations. And here's another bite wing that's taken just showing the right side. And this is the situation that we have. So, we have a patient with a pretty healthy dentition and she's in her sixties and she comes in and she says, I'm feeling some pain on the right hand side. So, you look around, I took some images and you can say, Oh look at that mandibular, left second molar.

Dr. Abrams: Oh, there's some stained ridges there. That must be the problem. Well, if you apply, if you apply load on there, there is no pain. There is some moderate pain. I took a picture of the tooth just in front of it. There's a little bit of pain on that marginal ridge. But if we go back to the radiographs that we took three months ago, you'll see that there's nothing doing there. It looks to be a nice, strong, strong wall of enamel on both sides here and nothing doing on the distal marginal ridge at all. So, what's the cause of the pain? Is it this tooth? Is it possibly the upper second molar? And you can see, again, it's got a little ridge here that's stained. But if we're looking at things that may be this little crack here, we think, or is that a crack or a stain group, but what we're seeing atomically these are lots of stain and the first thing that we don't do is I don't pick up an explore and go poking at it.

Dr. Abrams: The reason is that the literature indicates that by taking an explorer and probing at grooves, what you're doing is actually destroying some of the enamel in the walls of the groove and also taking bacteria that would be found on the surface and just bringing it into this groove where it's nice and safe and warm and you can have kids and toothbrush and toothpaste aren't going to get rid of them. And so the literature in the cariology community indicates don't do that. So then how do we figure out which tooth is the problem, or do we just go ahead and start removing all the amalgam restorations and placing composites? Well, what we ended up deciding to do was to pick up a device that looks at imaging the defects in the crystal structure of teeth and using that in addition to visual exam, periodontal examination and the radiograph as well too.

Dr. Abrams: The devices called the Canary system. And it uses what's called PTR LUM. It's a pulsed laser and it's able to take a look at changes in the crystal structure of the tooth up to five millimeters below the tooth surface. And there's a large amount of research that's been done both in company independently that says that it can find decay or caries in a number of clinical situations. And as well it can detect cracks in addition. And the way that it works is that a pulse of laser energy in the red end of the wave, of the wavelength is delivered to the tooth. And the way I describe it to patients is imagine

you've got a laser pointer at a nice crystal ball and you shine that laser pointer at the crystal ball. Where there are no cracks, the laser light shines right through it. And so it looks clear, but where there's a crack, the laser light gets trapped and it glows red. And so, we know that using this right wavelength of light, this red end of the spectrum, we're able to direct laser energy in. And when we shut the laser light off, the energy has to go somewhere, and it comes back out to the surface as a form of a slight increase in heat and a change in some of the near surface glow or luminescence. And that's a simple way of describing some very complex technology. And so, what that means is that during an examination of a particular section of tooth, there are four signals that are measured. The strength of the heat that comes from there, the time delay, the surface, the near-surface glow or luminescence, and its time delay. And we've done some work and we now converted those four signals into what's called a Canary number, which gives you a scale of zero, which is healthy to 20 and then 21 to 70 means there is something doing, there's been a breakdown or change in the crystal structure of the tooth; and above 70 there's a very large defect lying at the surface or below the surface.

Dr. Abrams: And that's how Canary works. So now what does Canary do in this clinical situation? Well, we picked up our Canary and we can take an image and we can then apply our examination numbers to those sets of the images, and you can see we have a 53, a 54 and a 52. So, we scanned in this area here, right in this area here. I'm right on the ridge and what these numbers are telling us is that there is a defect or an area of tooth structure that has been destroyed or defective in these three areas. We also took a scan out in this edge here because it looked like a healthy piece of enamel and that it also helped to validate that yes, everything was working the way it was. And so now with this information I now know that I can, should cut a slot here and a slot here and something here to see what's doing beneath the enamel surface and with the patient frozen, she'd seen the Canary's numbers and understands it.

Dr. Abrams: These are areas of concern with this tooth. We went ahead and removed first the central part and you can see there's beginnings of something. There's the distal wall, which was where our 54 was. There's the mesial wall and then we went a little bit further and there it is finished. So, we've cleaned everything up. But you can see now on the distal there's the stain from the amalgam, but there's also this large crack along the floor and another crack here on the proximal bonds. And these were areas, if we go back to the radiographs, which we'll see back to for a second, the radiographs don't show us that. And so, one of the problems is that these cracks are small, and radiographs are excellent tools for taking a look at bone level and for taking a look at large defects and teeth, but cracks become the challenge. And so now the question is what do we do? Do we go ahead and continue to drill away? Should we put in a bonded composite? Should we put in an inlay onlay? Well, the decision was made with this particular patient that we will put in a bonded composite and see how the tooth responds, especially since we were concerned about this area here, and the next step was how come it occurred? 20 patients, 20 years, nothing's going on, shallow restorations. And so the discussion started, well if you've got a crack, there must be some sort of occlusal loading that's going on that's well in excess of what you would

normally be putting on this and other teeth. I think you're grinding, and the patient says, I don't think so. And that becomes, well how did this happen? How did this happen? Was it you woke up one morning and had a mint and bit down on it, which is what patients always say. And we say, no, this is long term load and we need to look at beginning to control it because otherwise you're going to crack other teeth. And so, the debate went, we restored the tooth with a bonded composite, we reduced the load on the lingual cusp. And a couple of weeks later she said, make me up a bite splint. And that's what we did and it's now nine months later and our tooth is looking fine.

Dr. Abrams: We're monitoring this area of the tooth in front of it as well as the opposing dentition and she's wearing her bite splint and she now admits, yes, I do grind and I didn't realize it. And what's interesting is on the bite splint, we're now starting to see on this side of the bite splint signs of wear and grinding. And so, the end of the story is we found a crack, we restored it conservatively, but we also were able to find the underlying problem and the underlying problem was parafunction of bruxism and the bite splint is now working to help maintain it.

Dr. Abrams: So, in conclusion, really this is really what I see as critical. You need a good clinical history; you need to have a very good system that can detect changes in the crystal structure of the tooth. And we feel the Canary System is one of those good tools to have. And then the next thing is once you find the cracks, you've then got to figure out what's the best way of treating them short, medium, and long term. Because remember, even a full coverage restoration on a patient who is still grinding and bruxing also leads you to troubles too. And then once you found it, you need to figure out why did it happen and then get the patient to understand that this is what the problem was. Here's how we treated it, and here's what the long term is going to be about. So, thank you very much.