Root canal treatments overhauled through new device to detect untreated bacteria

By King’s College London

A new method of detecting bacteria during root canal treatments could eradicate the need for follow up appointments and prevent treatments from failing, according to a study published today in the Journal of Dental Research. The SafeRoot device, created by a team of researchers at King’s College London, enables rapid bacterial detection inside the root canal, ensuring the procedure has been successful and reducing the need for tooth extraction or surgical intervention.

Root canal treatments remove bacterial infections from the root canal space, while retaining as much of the natural tooth as possible. Around a quarter fail over time due to secondary infections, and most procedures require one or two visits to the dentist.

The first appointment is used to remove infected material in the tooth, and to administer an antibacterial treatment. During the second appointment, dentists visually assess the canal to check if the infection has been removed, but this process cannot guarantee that treatment has been successful. Each visit involves drilling and the removal of part of the tooth.

The SafeRoot device was created to detect any existing bacteria once the root canal treatment has been completed, with the aim of eliminating persistent or secondary infections and reducing the need for further treatments. Through fluorescent dyes and fluorescence microscopy/spectroscopy, SafeRoot can optically detect minute amounts of residual live bacteria in the root canal space. Indeed, during trials the team were able to successfully detect bacterial cells after just three minutes of testing.

Using conventional sterile endodontic paper points which are routinely used in root canal treatments, the process is performed during the treatment, preventing any impact on clinical treatment time and minimizing additional clinical steps.

“The resilient nature of bacteria, combined with often complex root canal structures, make disinfection challenging, leading to a considerable number of persistent infections. This is one of the main causes of root canal treatment failures”, explained Professor Francesco Mannocci, Professor of Endodontics from the Dental Institute at King’s College London.

“SafeRoot will reduce the time for root canal completion and will increase the success rate of treatments by letting the dentist know when it’s safe to proceed with filling the tooth. This should produce fewer acute flare-ups and failed root treatments, as any residual infection in the root canal will be identified,” said Professor Tim Watson from the Dental Institute.

One million root canal treatments are conducted under the National Health Service each year, costing the General Dental Service £50.5 million.

“The treatments are not only time consuming and painful for the patients, but cost the NHS a significant amount. If we can reduce the number of root canal treatments and re-treatments required, it could mean substantial savings to the NHS,” added lead researcher, Dr Frederic Festy from the Dental Institute at King’s College London.

“SafeRoot could be applied to a wide range of biological infections as well, ranging from wound or respiratory...
to implant related infections and contaminations.” Funding for this project was received from the EPSRC, CSO studentship and the Guy’s and St Thomas’ NHS Foundation Trust.

Notes

The SafeRoot project was chosen by the Design Council to participate in their 2016 Spark Programme, a funding and support programme designed to help entrepreneurs turn their bright ideas into commercially successful products. Over the course of 16 weeks, the research group were provided with specialist expertise and one-to-one mentoring.

The SafeRoot project has been a collaboration between the Biophotonics Research Group in the Dental Institute and clinical specialist endodontists in Guy’s and St Thomas’. Dr. Frederic Festy, Senior Lecturer in Biophotonics • Prof. Francesco Manconi, Professor of Endodontics • Dr. Nevern Hosney: Research Associate • Dylan Herzog, PhD student • Prof. Tim Watson: Professor of Biomaterials & Restorative Dentistry • Dr. Federico Foschi: Consultant Endodontist • Dr. Gurtt Koller: Research Associate • Dr. Richard Cook: Reader in Oral Medicine

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Rediscovering operative dentistry

By Avni Alani, UK

The first thing to come to mind among the majority of the public when dentistry is mentioned is the delivery of fillings or the need for crowns, the management of the bite or the improvement of colour or shape of teeth. This is our core business and is the basis upon which the public is likely to measure the skill of the dentist. Indeed, many a dentist may uncover the X-ray machine if it or she overhears a patient complaining in the waiting room that “the filling fell out an hour later.” Nothing hampers us more than this sort of dissatisfaction.

Operative dentistry appears to be a lost art among a contract that does not reward and more lucrative cosmetic procedures are preferred. Indeed, fillings or crowns or methods of achieving maximal benefit from minimal intervention are not marketed as “sexy” in the same way as Botex or aligners are. Despite what the dental spindlers want one to believe, restoring teeth optimally and properly will forever remain our utmost and required skill set. Conserving tooth tissue and protecting the remaining tooth tissue after root canal treatment is a reachable where implants are less successful than we thought and veneers are more invasive than we would ideally like to provide.

Selling health as opposed to selling a product is the successful business model shared across all professions. Indeed, the value of health is priceless for a patient. The maximally invasive movement is often more acute and life-threatening situations than dentistry ever was and could be in the future. How many of us would truly prefer openheart surgery through the slow splitting expansion of a ribcage, like a cook- ing oyster, as opposed to a stint fed through the femoral vein with the wound the size of a plaster? Destro-uctive dentistry sells because there are those among us who prefer to let our technical (or more talented) colleagues do the creative work while they vomit teeth to oblivion.

“Ask yourselves what your patients would choose if they understood the difference between destroying tooth tissue and conserving it and the associated biological costs.”

Photograph: maroonbr/PixaBay

Like many paradoxical things in life, ignorance is bliss. Ask yourselves what your patients would choose if they understood the difference between destroying tooth tissue and conserving it and the associated biological costs. They would gladly pay more for a procedure that will guarantee less pain and likely prolong the longevity of the tooth as opposed to the restoration. We have to be wary of the root canal treatment crisis at the current time. Secondary care units are oversubscribed with referrals, and primary care is remu- nered poorly for a procedure that is cost- and technique-prohibitve, but essential. Saving teeth and pre- venting pulp necrosis is where the profession should be, but not necessarily can be, in the current climate.

In addition to the threat of bacte- ria, patients are overcoming their muscles and destroying their teeth in the process. Parafunction is rife. From the stressed to the hypoam- biter, temporomandibular dysfunction is highly prevalent. Indeed, the French care for me some bruising recently.) Owing to the intricacies of the joint, patients can present with a multitude of symptoms and its associations with mental well-being means there is a high possibility of psychosocial factors to boot. As such, diagnosis is one conundrum, but treatment relies on being aware of the indica- tors as well as the skill set at the clinician’s disposal.

From advice and exercises to aro- scopic procedures, the spectrum is wide and vacuous. Personally, I have found the tried and tested sta- bilisation splint (otherwise known as Michigan splint) a sensible op- tion when advice on changing life- style and self-administered physi- otherapy fails. Those patients who have succeeded at abating their symptoms with these devices can- not live without and swear by them. Once again, the minimally invasive prevails over the “occlusalists” (il- lusionists?) who aim for the perfect patient occlusion among the poten- tially most imperfect of minds. Take heed and beware of the patient who wants him or her bite fixed so that the jaw does not click.

Patients want to retain their teeth however heavily restored. Root ca- nal treated or not, we are all about crowns to teeth to protect remaining tooth tissue. Against a background of widespread parafusion and even increasing cracking teeth, the need for crowns is higher than ever. Prepara- tion of a tooth for a crown takes a great deal of skill and awareness of the patient occlusion that is represented. The core skills of cutting are important and need not be abused.

Coping with the patient in its entirety with the aim of providing technical colleagues with enough physical and written information to deliver an optimal restoration is fairly challenging too. Alas, the best crown preparation is only as good as the crown cemented to it. In a num- ber of cases, many a dentist’s head has been scratched when the crown fits the model perfectly, yet looks alien to the patient’s mouth. Un- derstanding why things have gone wrong is as much importance in operative dentistry as knowing how to do things correctly.

When teeth are lost despite our best efforts, tooth replacement can seem a straight choice between an implant and a denture, as an un- conventional bridgework will need- lessly destroy the abutments. I still feel conventional bridgework has its place in operative dentistry, but it has been eclipsed by the emergence of resin-bonded bridges. These res- torations have had a mixed recep- tion historically, but I maintain that they are the most predictable method of replacing a single tooth. Good longevity without any tooth preparation whatsoever is money for old rope and any solotor snuffing is tempered by the lack of any harm to teeth or the patient. The recipe as always is being aware of the indica- tions and sticking to the rules.

As we become progressively en- grossed in the digital age, patients are increasingly requesting aesthetic improvements. This bad, bad word (starts with a ‘v’) can still be advocated, but there are easier, kinder and more predictable techniques we can provide for our patients. Whit- ening and bonding worry always have the same gloss finish as veneers (sorry!), but in the majority of cases, patients have more than a well-planned and executed case. Where residual spacing is closed, the outcome is improved and the incisal edges are uniform and straight, the flaws are difficult to find. The kudos attached to operative dentistry will slowly experience a rebirth as the undoubted need for these skills rises among our patients. One would hope that the foresight to realise that an optimally restored and cared for tooth actually prevents the future need and cost for a crown, molar root canal treatment, molar root canal re- treated to a syed: a complicat- ed surgical extraction or a prosthesis.

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Making endo work in practice: is it worth it?

By Dr. Bob Philpott, UK

When we look at our outcomes in endodontics, ‘is it actually worth it?’ is a question I often ask myself. Having worked in NHS, private, general and specialist endodontics both in the UK and abroad, I understand the stresses and strains on practitioners and my aim is to try and apply some of this knowledge in order to come up with solutions for dentists to see how we can improve efficiency during endodontic treatment.

Endodontic ‘four-handed dentistry’ requires reassurance and efficiency. With patient expectations set pretty low, endodontics is a rarely appreciated discipline. There’s no doubt that root canal treatment is a ‘hard sell’ and we have to make the experience for patients as pleasant as possible. Involving your team to help reassure patients helps to reduce stress, improve efficiency and deliver better outcomes. Ensure your set up is simple, minimise your kit and have your nurse working closely with you. Think of endodontics as ‘four-handed dentistry’, especially when working under magnification, without your nurse on board you’ll struggle to do a good job.

Ethically bound to our patients – know your ability and limitations. If endodontics is the best treatment option, we are duty-bound to carry out that treatment for our patients, maximising productivity in practice in order to get the best possible outcomes. A good starting point to achieve this is knowing your own ability and limitations – only take on cases that you can comfortably treat and refer cases that you can’t. For accurate diagnosis you will not only need reliable eyes, a periapical probe and pulp tester, but also good light, magnification and a DG16 endodontic probe to locate canal orifices.

Creating an adequate glide path. Clamp the tooth and quickly apply the rubber dam. This offers several advantages, including keeping the area free from bacteria and saliva, improving visibility and stopping the patient’s cheeks encroaching forward. Look at Waveone Gold tips (Dentsply Sirona), as they offer a wide choice of options and are much less likely to break than diamond-coated tips. You need to be efficient in the use of instrumentation and understand how your endodontic tools work to avoid instrument fracture. Nickel titanium files offer huge advantages over stainless steel hand files, as the taper enables removal of coronal interferences. They’re also more resistant to cyclic fatigue and allow you to work in a safer, more professional and effective way.

Rotary or reciprocation? For me reciprocation is the way forward. Look at Waveone Gold (Dentsply Sirona) – one of the best improvements in endodontic file systems I’ve ever seen. Reciprocation also helps to reduce costs as the majority of cases can be completed using just one single primary file. For the correct obturation strategy you will need gutta percha, the gold standard for filling the canal, with hand clinical evidence behind its success.

Think about the patient. The restorative phase of endodontics has a big effect on the final outcome and no root canal treatment is complete until the restoration is placed. Indirect composite restorations may offer a secure outcome, in which it’s easier to control the margins and contacts, but one question remains: do we want to leave the tooth uncovered? You must think about the patient, the particular case will determine whether you use composite or amalgam, how badly broken down the tooth is, how much dentine remains, and importantly, what the patient’s occlusion looks like are all important considerations.

I usually find it’s better to prepare the post base at the obturation stage, because you’re more familiar with the actual root canal system. For me personally fibre posts perform very well as opposed to metal posts and cores. They preserve the aesthetics of the tooth and provide a fast and efficient sealing procedure. In practice I only use Radix fibre posts (Dentsply Sirona). I love their simplicity, the taper of the posts and the fact that they tend to fit the vast majority of root canals very well.

To help ensure successful clinical outcomes and patient satisfaction I look for comprehensive restorative solutions, which is why I use Cerec X-flow (Dentsply Sirona), consisting of a base and catalyst, which when mixed forms a dual-cured, highly filled composite resin core build-up and post cementation material, which is very easy to apply. Using ceramics on top gets a good, easily polished aesthetic restoration. I could not practice without a sectional matrix system for placement of restorations in the posterior region and I also like to use IOD (Dentsply Sirona) bulk fill as a base in class I and II restorations.

What I love about modern endodontic systems is their simplicity and ease of use, making straightforward endodontic treatment a real option for the majority of general dentists. By knowing your limitations and only treating the cases you can do efficiently, you can adhere to biological principles and most importantly, you can get the best technical and healing outcomes for your patients.