Cleaning is key

By Aws Alani, UK

Completely disinfecting the canal system is challenging when all factors are considered. If we are looking at the nano level there are approximately 76,000 dental tubules per square millimetre of dentine. Each of which can harbour a colony of bacteria. Then there may be inaccessible anatomy such as lateral canals, apical deltas or fins.

It seems that irrigation and instrumentation are both highly inter-related in canal disinfection. Take washing your car for instance, purely covering it with soap and rinsing won’t remove the motorway bugs and bird produced projectiles. A good scrubbing with a sponge is needed, or if you are really serious about cleaning, a pressure washer! This can be achieved through applying a GP point into the prepared canal to displace and disperse ultrasonic irrigation transmits energy by an oscillating instrument. This results in shear stresses to tear the biofilm apart.

Energising the irrigant

This can take many forms. The simple and straightforward form ensures appropriate exchange of the fluid and displacement into the recesses where airlocks may reside. This can be achieved through applying a GP point into the prepared canal to displace and disperse.

Once irrigated and prepared, the clinician has a choice—to irrigate or to dress. Some may argue that the canal is cleanest at the end of treatment. The presence of cultivable bacteria does not necessarily mean we have failure—it merely means that there may be a cohort of bacteria that have resisted treatment. Mechanical instrumentation does reduce bacterial load by itself—but this is by way of physical removal of tissues where bacteria reside, while also facilitating the dispersal of the irrigant into the canal. Siqueira and colleagues found that enlarging the canal from size 30 to 40 resulted in a significant decrease in endodontic pathogens.

These are factors that need considering outside of canal curvatures that may or may not be entirely visible in the plane of the radiograph. It is clear that outside of the contact our files make with the walls of the root canal there needs to be chemical disinfection to further reduce bacterial load. Irrigants disinfect as well as lubricate instruments and they dissolve the pulp. Sodium hypochlorite has been the mainstay irrigant for decades.

During the 1980s, Bystrom and colleagues investigated the effect of mechanical instrumentation with and without adjunctive use of hypochlorite. They found, unsurprisingly so, that when compared to pure mechanical instrumentation, the use of hypochlorite in combination with hand filing significantly reduced bacterial load. As such chemomechanical instrumentation was shown to be crucial for endodontic success. They compared irrigation with saline, 0.5 and 5% hypochlorite over a sequence of 9 appointments. Interestingly, they found no difference in the reduction of bacterial components consisting of minerals adhering to a solid surface in combination with hand filing significantly reduced bacterial load. As such chemomechanical instrumentation was shown to be crucial for endodontic success. They compared irrigation with saline, 0.5 and 5% hypochlorite over a sequence of 9 appointments. Interestingly, they found no difference in the reduction of bacterial load between 0.5 and 5% hypochlorite. Despite what was likely to be a comprehensive protocol for these teeth, 7 of the 15 specimens in this study still had bacteria that could grow at the end of treatment. The presence of cultivable bacteria does not necessarily mean we have failure—it merely means that there may be a cohort of bacteria that have resisted treatment. Mechanical instrumentation does reduce bacterial load by itself—but this is by way of physical removal of tissues where bacteria reside, while also facilitating the dispersal of the irrigant into the canal. Siqueira and colleagues found that enlarging the canal from size 30 to 40 resulted in a significant decrease in endodontic pathogens.

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Bacteria and the biofilms

Unlike what we once thought, bacteria do not tend to just sit alone and remote from each other. If only they were this antisocial and could be picked off one by one! Bacteria join forces and create symbiotic groups, share resources and protect each other from external influence. This is commonly known as a “biofilm,” which has a thin but robust layer of mucilage that adheres to a solid surface housing the community of microorganisms. They not only share resources, they also share information that promote each other’s survival through RNA or DNA. As the majority of bacteria will be encapsulated in this layer, purely irrigating without disrupting this layer is inefficient. The word disrupting is a bit kind really—it needs to be destroyed to reveal all its contents and expose it to the bleach for chemical action. It is the methods of disruption of the canal biofilm that has seen a lot of development over the last 10 years or so. Much in the same way a pressure washer can clean that more quickly and efficiently than a sponge, energising the disinfected results in improved cleanliness.

Keeping the canal clean

Once irrigated and prepared, the clinician has a choice—to irrigate or to dress. Some may argue that the canal is cleanest at the end of treatment and that for convenience, obturating in a one visit arrangement is the best option. As we know, not all bacteria are removed or killed during treatment. Dressing the canal with calcium hydroxide may continue the...
The goal of obturation is to seal the canal system to prevent any reinfection and entomb any bacteria not eradicated by chemomechanical debridement. If the obturation is through the apex, this can have significant implications. GP through the apex can carry bacteria outwith of the canal and exacerbate symptoms. A foreign body reaction could also develop.

We also have to remember that a beautiful obturation of a canal achieved without rubber dam and utilising saline or local anaesthetic irrigation is sub-standard treatment. It can be difficult to assess the "quality" of treatment when a radiograph of a "failed" tooth is examined in this context. Indeed, an obturation that is short of the radiographic apex having been treated under rubber dam and with copious amounts of irrigation is more likely to be successful than the previous scenario. Attaching too much significance to the radiographic appearance of the obturation is short-sighted. Indeed, Katebzadeh and colleagues in the late '90s witnessed healing in the absence of obturation where teeth were instrumented and irrigated optimally under isolation. Sealants are also antibacterial and aid filling the voids between the GP and the canal system. One further option would be to provide a sub-seal to each of the canal orifices. This can be achieved by removal of 1 mm of GP and packing a good thick mix of IRM packed with a plugger.

Covering the cusps

The provision of a coronal restoration (if provided optimally) can improve the coronal seal while also structurally protecting the underlying tooth tissue. Due to endodontic treatment, resulting in reduction of tissue bulk and stiffness the risk of fracture increases. Where both mesial and distal margins have not been breached and the access cavity is confined to the occlusal surface, a crown restoration may not be required. Once a margin is breached the tooth is more likely to flex and result in cracks or fractures. A commonly asked question, "When should the crown be provided?" Soon after the root canal treatment or when the treatment has proven to be successful? If the success of endodontic treatment is significantly in doubt then this should be communicated to the patient and a well compacted direct restoration may be the best option, otherwise an onlay or if tooth tissue is significantly reduced, a crown should be provided soon after completion.

Conclusion

Bacteria are public enemy number one in dentistry. Disinfecting the root canal system by irrigating in combination with mechanical instrumentation is key to success in root canal therapy. Preventing further re-infection or persistence of residual bacteria after the formal stages of treatment through dressing initially and a quality coronal seal subsequently is as important as the root canal therapy.

Editorial note: Awa Alani is leading a two-year postgraduate diploma in operative dentistry at King's College London Dental Institute www.restorativedentistry.org. More information is available online at www.kcl.ac.uk/study/postgraduate/sought-courses-operative-dentistry-pgdip.aspx.
ROOTS SUMMIT is coming to BERLIN

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The patient reported on in this article is a student in dentistry and his parents are both dentists. They referred their son to a good endodontist, who then referred the case to me. As always, peers are more than welcome in either of my practices, in Rome and London, so when I treated this case, I had three dentists watching me, a future dentist on the chair, placing a great deal of pressure on me.

The 22-year-old male patient had a history of trauma to his maxillary incisors and arrived at my practice with symptoms related to tooth #21. The tooth, opened in an emergency by the patient’s mother, was tender when prodded, with a moderate level of sensitivity on the respective buccal gingiva. Sensitivity tests were negative for the other central incisor (tooth #12 was positive), and a periapical radiograph showed radiolucency in the periapical areas of both of the central incisors. The apices of these teeth were quite wide and the length of teeth appeared to exceed 25 mm.

My treatment plan was as follows: root canal therapy with two apical plugs with a calcium silicate-based bioactive cement. The patient provided his consent for the treatment of the affected tooth and asked to have the other treated in a subsequent visit.

After isolating with a rubber dam, I removed the temporary filling, and then the entire pulp chamber roof with a low-speed round drill. The working length was immediately evaluated using an electronic apex locator and a 31 mm K-type file. The working length was determined to be 28 mm.

As can be seen in the photographs, the canal was actually quite wide, so I decided to only use an irrigating solution and not a shaping instrument. Root canals are usually shaped so that there will be enough space for proper irrigation and a proper shape for obturation. This usually means giving these canals a tapered shape to ensure good control when obturating. With open apices, a conical shape is not needed, and often there is enough space for placing the irrigating solution deep and close to the apex.

I decided to use only some syringes containing 5 per cent sodium hypochlorite and EDDY, a sonic tip produced by VDW, for delivery of the cleaning solution and to promote turbulence in the endodontic space and shear stress on the canal walls in order to remove the necrotic tissue faster and more effectively. After a rinse with sodium hypochlorite, the sonic tip was moved to and from the working length of the canal for 30 seconds. This procedure was repeated until the sodium hypochlorite seemed to become ineffective, was clear and had no bubbles. I did not use EDTA, as no debris or smear layer was produced.

I suctioned the sodium hypochlorite, checked the working length with a paper point and then obturated the canal with a 3 mm in thickness plug of bioactive cement. I then took a radiograph before obturating the rest of the canal with warm gutta-percha. I used a compomer as a temporary filling material.

The symptoms resolved, so I conducted the second treatment only after some months, when the tooth #11 became tender. Tooth #21 had healed. I performed the same procedure and obtained the same outcome (the four-month follow-up radiograph showed healing).

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Irrigating the root canal: A case report

By Dr Vittorio Franco, UK and Italy

Dr Vittorio Franco is an endodontist who runs an endodontic referral practice in Rome and a practice in London. An active member of the European Society of Endodontology, Franco is also the President-elect of the Italian Society of Endodontics.
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"The immense variability of human tooth anatomy"

An interview with Dr Craig Barrington about his technique for capturing high-definition endodontic images

With his high-definition photography of complex root canal systems, Dr Craig Barrington, who practices dentistry in Waxahachie, Texas, is developing quite a name for himself. Just check out his presence on Facebook, at craigbarringtondds.com.

In an interview with DT America, Barrington talks about how he captures these high-definition endodontic images and how he uses them to increase his knowledge and help improve the level of care he provides to his patients.

Please tell our readers a little bit about yourself and your dental practice.

Dr Craig Barrington

I graduated Summa Cum Laude from the University of Texas Health Science Center in San Antonio in 1996. I am a general dentist in Waxahachie, Texas, and have been in my current location for 20 years.

What do you like best about practicing dentistry?

I must enjoy the science, the biology and having a front-row seat in and around the ability to interact with, affect and watch the human body function and heal. I appreciate the ability to solve problems and the ability to work on problems that are yet to be solved. I have always been a part of a “past, present and future” continuum that is the overall profession of dentistry. I enjoy having the ability to affect an individual person, from patient to fellow practitioner to dental student, all the way up to having the ability to have a positive effect on humanity across the globe.

Who influenced you most in your career?

First, I would thank Dr Joel B. Alexander. He was an endodontic professor when I was in dental school who encouraged and taught the value of recalling your cases in order to assess your treatment outcomes.

Secondly, I would thank Dr Terry Pannuk. After much awareness, pursuit of and concentration on the topic of mentorship, I certainly believe he is the best doctor alive today. He has done much for our profession from a philosophic standpoint to the actualities of clinical healthcare. He sees the value in this tooth clearing and diaphanoscopy project I am involved in and consistently has provided more support and encouragement than anyone else. He has kept me motivated even if it is just by simply saying “wow, that result is amazing.” I can’t say enough about what he has done for me personally or in my career as my friend and mentor. I continue to learn from him daily and I hope that somewhere along the way, I reciprocate some of the support he has given me over the years.

You have become known for your high-definition photography of the root canal anatomy. How did you become interested in this area?

That too goes back to Dr Alexander and Dr Pannuk. Both of these doctors influenced me to recall my work in endodontics and truly take a scientific approach to the question of whether endodontics actually works and whether it actually works in my hands. After recalling many of my own cases, I started to see failures and problems that I was not satisfied with. I started to postoperatively evaluate my ways of thinking that there were clinical aspects I could change to improve my outcomes. It was via the internet that I met Dr Arnold Castaleasing. After the interactions we had, I saw the cover of his textbook.

The paper on the tooth put me in awe. This was the first “cleared tooth” I had ever seen. It is from there that my interest in clearing teeth originated. I just had to figure out what was going on and how and why it worked. Fifteen years later, I am still manipulating processes in the diaphanosination of human teeth in search of the “answers.” I have a patent pending in the clearing process, and the knowledge it has provided has become one of the most valuable tools in pre-operative and post-operative evaluation of the internal anatomy of human teeth.

Can you tell our readers a little bit about how you go about capturing these images? It must take some technical skill.

The photography is actually not difficult. It is oil immersion oblique illumination light microscopy, which has been done in histology labs for years. It is, however, a new realization in this area for dentistry. In dentistry, we are familiar with the study of microscopic histologic sections. Teeth, on the other hand, are gross histologic specimens that can understandably be seen via the naked eye; however, viewing of the internal anatomic structures is greatly enhanced with microscopic evaluation. Any photographs of the tooth I work with are simply obtained through my “artist”-ar

Today, I see characteristics of the internal anatomy of human teeth that I never thought possible or knew existed. Visualizing the immense variability of human tooth anatomy has changed my clinical practices and improved my clinical results, which benefits the patients I treat.

Do you perform endodontic therapy yourself or do you typically refer cases out?

I do all of my own endodontic treatments in my office. It has taken me years to identify the area of dentistry that I love. Perhaps one day I will take the necessary steps to specialize, but life is currently focused on my family and my children.

Is there anything you would like to see changed about the way dentistry is practiced today?

Absolutely! More than you can imagine or can be covered in this session. In short, we need to work on our ethical standards within the profession itself and move back toward being true, real doctors over the business-focused patient treatment we are seeing overwhelm the practice environment today. The actual care of the patient is always in competition with and in direct contrast to the business and profit. We have to get back to patient-centered practices. The profits are there in mass quantities if we can just take the time to follow our rolls as doctors. Doctor by definition means “to teach,” and proper teaching is not going to take place via advertising. Marketing is one aspect. Advertising is another. We have to start the movement toward patient-centered treatment, with the true healthcare providers taking the first step away from any notion of what would or could be considered advertising in healthcare.

Is there anything you would like to add?

I am respectfully honored by this opportunity, your questions.
ROOTS SUMMIT: Registration open for 2018 edition

By DTI

BERLIN, Germany: Seats for the next ROOTS SUMMIT, the premier global discussion forum dedicated to endodontic dentistry, are still available. The event, featuring lectures and workshops, will be held at the European School of Management and Technology (ESMT) in Berlin from 28 June to 1 July 2018. Approximately 500 visitors are expected at the international meeting, which is again being organised in collaboration with Dental Tribune International.

Although the 2018 ROOTS SUMMIT will mainly feature presentations on the latest techniques and technologies in endodontics, the organisers are inviting dental professionals in all fields, as well as manufacturers in the industry, suppliers of endodontic products and anyone involved in the practice of endodontic treatment, to attend.

It has been announced that foremost opinion leaders, including Drs Steve Buchanan, Frederic Barnett, Gergely Benyecs and Elisabetta Cotti, will be speaking at the conference next year. There will also be the opportunity to participate in hands-on workshops, speak to industry professionals on-site and engage with new equipment, procedures and protocols in endodontic dentistry. A number of dental companies specialising in endodontics, including META BIOMED and FKG Dentaire, have already confirmed their participation.

The ROOTS SUMMIT, which started as a mailing list of a large group of endodontic enthusiasts in the 1990s, has grown significantly over the last few years. With currently more than 24,000 members from over 100 countries, it evolved into one of the most prominent global learning forums in the dental industry.

Previous conferences have been held in Canada, the US, Mexico, Spain, the Netherlands, Brazil and India. The 2016 ROOTS SUMMIT took place in the UAE and was one of the most significant events in endodontics that year, drawing over 300 dental professionals to Dubai. These meetings have been known for their strong scientific programmes. An early bird discount of 20 per cent is being offered and dental students too will be granted a 20 per cent discount. Additional information and online registration can be found at www.roots-summit.com.