Cleaning is key

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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 dentinal 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. 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 mainstream 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 5 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 they 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—this is by way of physical removal of tissues where bacteria reside, while also facilitating the dispersal of the irrigant into the canal. Siquiera and colleagues found that enlarging the canal from size 30 to 40 resulted in a significant decrease in endodontic pathogens.

It seems that irrigation and instrumentation are both highly interrelated in canal disinfection. Take washing your car for instance, purely covering it with soapy water 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 begs a further question—how would your patients feel if they knew that, more or less, the same or very similar liquid they use to clean bathroom suites is the same that we use to clean the inside of their teeth? On recent evidence of a dentist to the “stars” appearance on national TV not much—he advocated using charcoal to whiten teeth, which you may be able to buy from your local petel station for barbecues.

Hypochlorite is an effective bactericidal but does not remove the smear layer. The smear layer is a mix of organic material (protein, pulp remnants, saliva, microorganisms) with an inorganic components consisting of minerals from the dentine. The smear layer prevents bacteria residing in the dentinal tubules from being exposed to the irrigant as well as reducing the contact between the dentine and sealant during obtura-
Bacteria and the biofilms

Unlike what we once thought, bacte- ria do not tend to just sit alone and remote from each other. If only they were this antiscocial 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. Over the last 10 years or so. Much in the same way a pressure washer can clean more quickly and efficiently than a sponge, energising the disruptants result in improved cleanliness.

**Fig. 1:** Pre-operative radiograph of case 2. (B)(C) Of note, another lateral canal was present in the right side mandible. The radiograph reflected (Fig. 6). The provision of a coronal restoration (if provided optimally) can protect the root from future recontamination. If the restoration is well-fitted the root is protected from microorganisms from reentering the root canal system (if provided optimally) can protect the root from future recontamination. If the restoration is well-fitted the root is protected from microorganisms from reentering the root canal system.

**Fig. 2:** Specially hardened surface of the HyFlex EDM file under the microscope. (B)(D) The latest technology and treatment auxiliary also has the potential to make the root canal treatment significantly easier to perform.

**Fig. 3:** Cutting in the canal using a HyFlex EDM 25/.12 Orifice Opener. (B)(D) In our second case, a 65-year-old female patient was referred to our practice with chief complaint of pain in the right side mandible. The radiograph showed defects in two teeth. The root canal treatment had led to a perapical lesion in the neighbouring molar, a deep rootal lesion which was clearly visible. Tooth 46 was therefore diagnosed necrotic pulp (Fig. 7). The case resulted in a tight, durable seal of the whole root canal system, as the final radiograph reflected (Fig. 6).

**Case 2:**

**Fig. 4:** HyFlex EDM. A bioactive 3-in-1 obturation material combines fluid gutta-percha with a suitable sealer at room temperature and bioceramics to transport or changing the natural path of the root canal. After gaining access with the orifice opener, we once again used the HyFlex Onefile to get to the apex. A few finishing procedures were provided with the help of a 40/04 EDM file.

**Fig. 5:** Cleaning the canal using a HyFlex EDM 25/.12 Orifice Opener. The case resulted in a tight, durable seal of the whole root canal system, as the final radiograph reflected (Fig. 6).

**Fig. 6:** Cleaning the canal using a HyFlex EDM 25/.12 Orifice Opener. The case resulted in a tight, durable seal of the whole root canal system, as the final radiograph reflected (Fig. 6).

Obliterating all portals of exit turned out to be particularly challenging in our second case, therefore a modified three-dimensional obturation technique was applied using Gutta-percha bioseal. The 3/y abutment material combines fluid gutta-percha with a suitable sealer at room temperature and bioceramics in an autopolymer (Fig. 6). This composition results in an easy to handle material with excellent flow properties and working times of 10 to 15 minutes. What we call three-dimensional obturation is, in fact, an efficient and reliable way to fill even complex root canal structures.