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 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 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 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 pet shop 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-
By Dr Alfredo Iandolo, Italy

As usual in the human anatomy, root canals come in all forms and sometimes develop in very random structures. This is why 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 disrupted! However, when irrigating this is needed, as the majority of bacteria are both next to no time. In this article, we will compare three different endodontic approaches. Tailored nickel titanium (NiTi) files allow us to prepare and clean the canal in next to no time. In this article, we will compare three different endodontic techniques. Nickel titanium files can quickly cut through a tooth and a thorough and efficient root canal preparation is easy with the right set of files. The Cordis OneFile is a “highly flexible” NiTi file, which 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 microbial organisms. They not only share resources, they also share information that promote each other’s survival. The shape of a kitchen knife you use for cutting bread to make bruschetta (Fig. 2). The abbreviation “EDM” stands for Electric Discharge Machining. It can be difficult to assess the “quality” of treatment when a radiograph of a “plastics” instrument is requested. As we know, not all bacteria are removed or killed during treatment. Dressing the canal with calcium hydroxide may continue the process of eradication of the residual microorganisms over a 2-week period. In practice, the two schemes sometimes boil down to the presenting factors of the case. Where a tooth is difficult to instrument, has a large lesion or is quite obviously chronically infected with a history of pain, then dressing may be more of a consideration. If a tooth is treated in a 1-day manner and treatment goals are achieved with no history of pain then a single visit treatment could be utilized.

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 outwards of the canal and exacerbate symptomatic progression. A common consideration.

We also have to remember that a beautiful obturation of a canal achieved without rubber dam and utilizing saline or local anesthetic irrigation is sub-standard treatment. It can be difficult to assess the “quality” of treatment when a radiograph of a “plastics” instrument is requested. As we know, not all bacteria are removed or killed during treatment. Dressing the canal with calcium hydroxide may continue the process of eradication of the residual microorganisms over a 2-week period. In practice, the two schemes sometimes boil down to the presenting factors of the case. Where a tooth is difficult to instrument, has a large lesion or is quite obviously chronically infected with a history of pain, then dressing may be more of a consideration. If a tooth is treated in a 1-day manner and treatment goals are achieved with no history of pain then a single visit treatment could be utilized.

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Keeping the canal clean

Once irrigant has been placed, the clinician has a choice—to obturate or to dress. Some may argue that the decision is based on the complaint. The pre-operative investigation is the 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.

Case 1: Straight down to business

A 48-year-old female patient introduced to our surgery complaining of pain brought on by chewing in the maxillary left side. We quickly found that the necrotic pulp of tooth 24 caused the complaint. The pre-operative radiograph revealed a deep caries as well as a medium sized periapical lesion (Fig. 1). The root canals were positioned in a comparatively straight, almost parallel way with hardly any curvature. Quick preparation with a reduced sequence of NiTi files should consequently be possible in that particular case, as there were no contraindications to a root canal therapy in general.

To provide a clean and dry operating field, dental dam was applied to isolate tooth 24 for the following treatment. First of all, we handled the main canals up to ISO size 10. We were thus able to create a suitable glide path, before the actual preparation took place.

In our endodontic practice, we normally use the latest generation of nickel titanium files by Swiss endodontic specialist COLTENE for cleaning and shaping the canal. As the name already indicates, the Hyflex EDM is a “highly flexible” NiTi file, which proves to be incredibly fracture resistant. In close cooperation with their instruments and international endo-specialists, the renowned research department of the innovative provider of endo equipment developed a literally sharp solution for their clinician clients. What we call a new, powerful tool they employed was a diver idea that is widely used in other industry branches to dentistry. The abbreviation “EDM” stands for Electric Discharge Machining, more commonly known as a “biofilm”, which has a thin but robust layer of mucilage that adheres to a solid surface housing the community of microbial organisms. They not only share resources, they also share information that promote each other’s survival. The shape of the canal itself.

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 a lack of tissue bulk and regardless of the risk of fracture increases. Where both mesial and distal margins have not been corrected, the available cementing cavity is confined to the occlusal surface. A “plastics” root restoration may be required. Once a margin is breached the tooth is more likely to flex and result in cracks or fracture. A commonly asked question, “What should the crown be provided? Soon after the root canal treatment or when the treatment has proven to be successful in the absence of residual bacteria, the root canal system 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 microbial organisms. They not only share resources, they also share information that promote each other’s survival. The shape of the canal itself.

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 radiographic showed defects in two teeth. Although the patient’s history did not hint on a significant difference, both roots may be more of a consideration. If a tooth is treated in a 1-day manner and treatment goals are achieved with no history of pain then a single visit treatment could be utilized. If a tooth is treated in a 1-day manner and treatment goals are achieved with no history of pain then a single visit treatment could be utilized.

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Case 2: Energising the irrigant

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Severe double curvature

Case 3:
sealing of the canal (Fig. 11).

a favourable side effect to the actual bone and dentine tissue, which was added to the regeneration process, place. The bioactive components

Of tooth number 45 showed the ob-
tivation system B heat source. For our purpose, we decrease the tempera-
ture to 130 degrees from the aver-
age 200 degrees, as this totally suf-
fices. Penetration depth is reduced to 3 seconds as well compared to the usual 5 seconds with a heat carrier to 4 millimetres from working length.

This way the GuttaFlow does not set, but keeps a sticky consistency which allows us to push it further down the canal with a plugger, if necessary.

However, with a few new features the gutta-percha itself does not have to get inside the accessory canals, as the bioceramic sealer will already flow into any hidden canals.

In previous test settings, you can see that the modified obturation tech-
ique allowed the sealer to advance deeper inside lateral canals in com-
parrison to a traditional single cone technique (Fig. 9). Inserting the obtu-
ration material with more speed also generates higher pressure: you do not have to reach the desired work-
ing length in one go, but can use another stroke until you reach the desired length. The sealer sets only around 2 minutes earlier than nor-
mal with the reduced heat settings and fast penetration. Thanks to 3D obturation, you let the sealer do its job in areas which are hard to reach, while it gets pushed further down into the canal by the slightly melted gutta-percha on top. The fine white line in the postoperative radiograph of tooth number 45 showed the ob-
turated small lateral canal leading away from the main canal (Fig. 10).

Moreover, in the follow-up session, we noted that healing of the affected teeth 45 and 46 had already taken place. The bioactive components of the obturation material further added to the regeneration process, as they stimulated the rebuilding of bone and dentine tissue, which was a favourable side effect to the actual sealing of the canal (Fig. 11).

Case 3:
Severe double curvature
to finish off

Last but not least, we come to the extraordinary S-shaped canal as mentioned in the introduction. With strong curves it is always good to know that NiTi files with a so-called “controlled memory” (CM) effect can be pretreat like classic stainless steel files, but do not bounce back. Using their unique material properties, you can work comparatively stress-
free, even under difficult conditions.

This time, the patient with the rath-
er challenging canal anatomy was a 40-year-old female patient with complaints in her right side mandi-
ble. In our analysis, the clinical diag-
nosis revealed an irreversible pulpitis in tooth 47. The radiograph indicated that we needed to get around a very sharp angle in the mesial root (Fig. 12), endo specialists know how dis-
tal molars are notorious for their winding root canal system! We used the following sequence to get to the length very quickly without straight-
ening the canal at all.

Hyflex E0D 25/12, 10/09, and the afore-mentioned Hyflex E0D Oste-
File 25/7 (Figs. 4, 13). The flexible files can even find their way around tricky anatomies and are virtually unbreakable. They move perfectly in the centre of the canal, therefore I have never come across any perfora-
tions or ledges during my numerous treatments so far. After using “CM”-
treated NiTi files, they can be quickly regenerated by autoclaving and are ready for their next application until they reach the end of their life cycle by displaying an unevent, bent shape. As long as they are not unwound they can be re-used safely, otherwise they have to be discarded.

After drying and successfully obtu-
rating the canal, we were able to do-
miss the patient with a very prom-
ising prognosis. The immediate postoperative radiograph showed the naturally formed, filled mesial canal with its striking double curva-
ture at the end (Fig. 13). We are very glad that even in more challenging cases like the present one we can rely on the versatility of the latest genera-
tion of rotary instruments.

Conclusion
The latest generation of nickel tita-
num files adapt easily to all shapes of root canals thanks to their flexible
design and unusual cutting power. Whatever way you choose to reach the apical, prebent NiTi files like the Hyflex E0D help you to follow the natural path of the root canal and quickly remove debris for chemical cleaning and long-term obturation of the various root canal structures.

The extremely fracture resistant files are literally “cutting edge” technol-
ogy which make an excellent travel companion on virtually every road.

Dr Alfredo Iandolo, Italy
Dr. Alfredo was awarded Doctor of Dental Medicine by the University of Naples Federico II in 2006. As Professor A.C. he has continued speaking on endodontic courses at his home university since 2014. Iandolo is a certified member of the EES (European Society of Endodontics) as well as an active member of the SI (Italian Society of Endodontics) and AGAI (Italian Academy of Microdentistry). As winner of the "Riitano Award" 2016 for best research in Endodontics Iandolo is a regular speaker at national and interna-
tional congresses. The inventor of the Iandolo Gauging File (SG-F) and a new protocol in irrigation activation is widely published both nationally and internationally.

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