The ultimate goal - clean canals

Michael Sultan discusses the challenges of getting root canals clean

Nowadays dentists have such a wide range of exciting gadgetry at their disposal to help prepare root canals quickly and easily that sometimes the biological focus of treatment is somehow overlooked.

Of course, the latest NiTi systems can certainly help improve efficiency in the surgery, but they don’t necessarily help us achieve our ultimate goal - clean root canals. Even if the post-treatment radiograph does reveal a beautiful shape, without fully disinfected canals, the treatment will fail.

When we look closely at the complex structure of the canal systems in cleared teeth it is immediately evident that it is impossible that our files can even come close to cleaning the intricate shapes. It doesn’t matter which NiTi system we use or how cleverly we can manipulate a rigid stainless steel file - we are just deluding ourselves. For this reason, irrigants are the weapon of choice for eliminating bacteria that are harboured in the intricate channels of the root canal systems. The irrigants work in inflamed teeth by dissolving the organic pulp tissue and in infected teeth by killing and removing bacteria. This is further enhanced by opening up tubules and removing the smear layer using chelating agents. The files are merely making space for our irrigants to get in.

The importance of a rubber dam cannot be overestimated. The rubber dam is a brilliant tool to prevent the inhalation of files, protect the airways and maintain a clean, dry area in which to treat the patient. It is also vital for medicolegal reasons and moreover ensures that the irrigants stay in the tooth and are not swallowed. If a rubber dam is not being used the only thing the tooth is being irrigated with is probably saliva. Some studies have shown that the success rate of teeth treated under rubber dam is double those that are poorly isolated.

Sodium hypochlorite is the irrigant of choice for disinfecting root canals. The solution works by dissolving pulp tissue, killing the bacteria and flushing debris away to prevent canals from becoming blocked during instrumentation. This, in turn, helps prevent ledging and other procedural errors so that the canals can be thoroughly cleaned. Sodium hypochlorite also happens to be a very cheap solution. Also recommended is chlorhexidine solutions (two per cent): This, like sodium hypochlorite, is strongly anti-microbial but cannot dissolve pulpal tissue; it is also expensive.

The concentration of bleach that is used varies from country to country.

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A complete range of irrigants for root canal treatment

Gluco-Chex 2.0%
Chlorhexidine digluconate 2% - antibacterial dental preparation for rinsing the root canals. It is more efficient than sodium hypochlorite in destroying such microorganisms as E. faecalis which are often responsible for unsuccessful endodontic treatment.

Chlorax 2% or 5.25% (Sodium Hypochlorite)
Chlorax dissolves organic matter. It has cleaning properties and has a bleaching effect on tooth and hard tissue.

Endo-Solution EDTA
Endo-Solution is used during mechanical preparation of the root canals. The preparation supports widening and cleaning of the root canal, removes the smear layer and exposes the dentinal tubules.

Citric Acid 40%
Citric Acid 40% removes the smear layer from the root canal walls, allowing precise penetration of root canal sealer.

Isopropyl Alcohol
Reduces the surface tension enabling Sodium Hypochlorite to penetrate the tubules.
to country. In Scandinavia the issue of toxicity and possible problems with bleach have led practitioners to err on the side of caution and concentrations of 0.5-1 per cent are traditionally used. In the United States on the other hand, dentists tend to use concentrations of 5.25 per cent, arguing that solutions of 5.25 per cent are traditionally used. In the United Kingdom we generally use 2.5 per cent but can increase effectiveness by either heating it or using ultrasonics. The bleach can be warmed in a bottle warmer and its effect is further increased by constantly flushing the solution through the canals rather than just letting it sit passively in the canals.

Nickel Titanium instruments can lead us to falsely assume that we have fully prepared the canal. However, often the walls have not even been touched due to the files staying very centred. The speed at which the canal system is prepared also means that our irrigants may not have had sufficient time to be effective. The optimum soaking for this should be half an hour to ensure that the tissues are fully dissolved and the bacteria are killed – no matter how quickly the canals are prepared with the NiTi files. Recently a new file system has been launched – the SAF (self-adjusting files). These are hollow files shaped as a thin metal lattice that are very flexible and prepare all the walls especially in very irregular shapes. Sodium hypochlorite is continuously pumped through the canals as the walls are being prepared and the published data is very promising. The manufacturers recommend four minutes preparation per canal.

No matter which system is used it is important to remember that sodium hypochlorite is a very toxic fluid. If it is extruded out of a canal under pressure it can cause severe complications. There have been recent cases of severe hony necrosis and nerve damage but even small amounts can cause pain, bleeding and marked bruising.

If a hypochlorite accident occurs the patient will get sudden pain and bleed profusely. The best plan of action in this situation is to remain calm and if necessary top up the local anaesthetic. The canal should be rinsed out with saline and the contents aspirated to dilute the irritant. Antibiotics may be indicated as well as analgesics and ice packs for the bruising.

As previously mentioned, high concentrations of bleach are used to dissolve tissues. Obviously, the higher the strength of the bleach, the higher the danger it potentially poses to the patient. But for the bleach to be effective it needs to be placed within 2mm of the apex and so precautions have to be taken. I always inject bleach slowly, under low pressure, always ensuring that the needle is moving so that it doesn't become jammed. I am always very cautious with short teeth and immature teeth with open apices and tend to place a rubber stop on the needle so that I always know where I am.

As is the case in all treatments, prevention is always better than cure. I advocate the use of sodium hypochlorite as the only effective way of disinfecting root canals, but it must be used with care and caution to avoid problems from occurring.

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