Nickel-titanium instrumentation

Dr Michael Sultan discusses the instruments he prefers to use when preparing canals in three dimensions in preparations for endodontic treatment

Canal preparation has always been difficult in endodontics. The aim is to prepare canals in three dimensions removing both organic and inorganic material to enhance cleaning and to facilitate a three-dimensional seal. The greatest advance in preparation has been the use of NiTi instruments.

It has to be emphasised however, that mechanical preparation alone cannot fully clean a tooth. For that we need irrigants to really disinfect teeth-chemo-mechanical preparation.

In the past, preparation was slow and laborious using instruments made out of stainless steel. These instruments were used in a filing and reaming action and progressively larger instruments were used to prepare canals, remove debris and provide a shape that could be filled. Canals that were curved were difficult to prepare and if care was not taken or too little irrigants used they often got blocked or the preparation deviated from the actual canal causing ledges.

The greatest advance in the last 15 years or so has been the use of NiTi a super elastic alloy with 3-5 times the flexibility of stainless steel and shape memory. This coupled with an electric motor controlling speed and torque has revolutionised Endodontics leading to faster more efficient preparations. The correct usage and careful technique has led to the reduction in the original problems of instrument fracture.

The cost of these instruments is relatively expensive compared to the much cheaper stainless steel files and can easily add £50 to each procedure, especially in light of the new government guidelines that Endodontic files should not be sterilised but discarded. However, the time saving element of the instruments and the quality of the preparation that can be achieved more than compensates for the added cost.

Every major manufacturer has bought out their own system and with it claims that their system is the best. The general features include fracture resistance, flexibility and debris removal. In move to make the systems more attractive there is a current trend to use fewer instruments with the

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**Fig 1: Broken down molar. A decision needs to be made; retreat, restore or extract.**

**Fig 2: Smooth preparation and observation using nickel instruments.**
Holy Grail being the single instrument that can prepare a whole canal.

Each system is slightly different; therefore it is important to follow the manufacturers’ protocols to avoid ledging and fracture. It is also recommended that any new systems be tested on either extracted teeth or Endo-Vu blocks. It is still important to remember that whichever system is used the canal should always first be negotiated using hand instruments to provide a glide path before introducing the rotary instruments.

There are a number of claims of the manufacturers:

- Canal transportation is minimised: this is key to the success of the NiTi files and used carefully the files can follow the canals without straightening them too much or deviating.

- Reduced extrusion of debris through apex: with stainless steel files and reaming/filing there is inevitably debris, which is extruded through the foramen. This can lead to afterpain, which may be reduced with NiTi. The shape of the NiTi files means that the debris is removed via the flutes and although this is generally true, in reality a lot of debris is spun out laterally.

In addition, as the debris is removed so effectively these canals are less likely to be blocked during the preparation.

- Canal walls are smooth – NiTi files can produce remarkably smooth shapes, however it is very easy to be seduced by a 2D dimensional representation of a 3D space. In reality the files tend to stay centred in the canals. Most canals are not round in cross-section so there will inevitably be areas that are touched by the files and others that may be filled with debris.

- Preparation is easily obturated: this is only true if matched GP points are used together with a technique such as using a system B or thermafill. If the taper is small, lateral condensation can actually be very difficult.

Whichever system is used, the results especially on curved canals can be far better than anything that could be done with the earlier, very rigid stainless steel instruments. The time saving is certainly significant and more than compensates for the increased cost.

Dr Michael Sultan BDS MSc DFO is a specialist in Endodontics and the Clinical Director of EndoCare. Michael qualified at Bristol University in 1986. He worked as a general dental practitioner for 5 years before commencing specialist studies at Guy’s Hospital, London. He completed his MSc in Endodontics in 1993 and worked as an in-house endodontist in various practices before setting up in Harley ST, London, in 2000. He was admitted onto the specialist register in Endodontics in 1999 and has lectured extensively to postgraduate dental groups as well as lecturing on Endodontic courses at Eastman CPD University of London. He has been involved with numerous dental groups and has been chairman of the Alpha Omega dental fraternity. In 2008 he became clinical director of Endocare a group of specialist practices.

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