The problems with canals

Author_ Dr Jonathan Murgraff, UK

_As with all problems we confront, a clear methodical approach is necessary to resolve them and to put matters into a clear perspective. The 'where, why and how' approach helps to break the problem down and will help you arrive at a reason for the blockage and feasibility of treatment success and outcome. But where is the blockage?

A mandatory preoperative peri-apical radiograph is best practice, showing several millimetres beyond the apex and above the crown reveals the whole root canal system. Does the whole root canal in question appear patent or sclerosed? Or does only the coronal middle or apical third appear sclerosed?

If the whole canal is sclerosed, are the adjacent root canals patent? If all the teeth appear sclerosed, the radiograph generally is too light and underexposed or underdeveloped. If only this canal is sclerosed, it may well be calcified, but very often overlap of anatomical structures such as the zygomatic buttress will obscure the patent canal (Figs. 1 & 2). In addition, incorrect placement of the radiograph without an appropriate holder for a paralleling technique may result in parts of the image being out of focus, or obscured.

Does the resistance to the canal correspond to the position of the radiopacity? If this is the case, what is the cause and nature of the calcification, what is its position and how far does it extend? Calcifications are primary, secondary or tertiary, irregular and rapid as a result of caries, trauma or cracks in the tooth. Calcifications often develop in the root canal via a process inflammation, bleeding in the pulp and a resultant nidus of calcification.

The calcification may be complete or incomplete. Very often, the calcification may be incomplete although the radiograph may not reveal any canal patency and a .06 file may be gently passed through a fine central canal in this area and then widened. Suffice it to say, high magnification with an operating microscope or loupe is necessary, with copious lubricant and irrigation.


Fig. 1

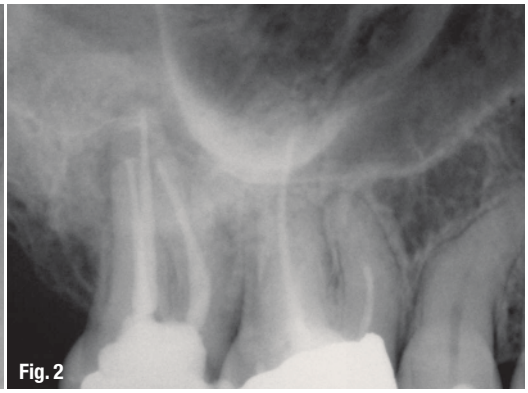
Fig. 2

Fig. 1_Upper-right second molar appearing sclerosed.
Fig. 2_Canals now obvious after obturation.


Fig. 3

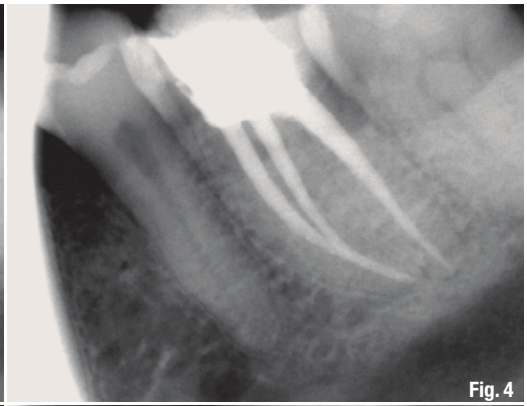
Fig. 4

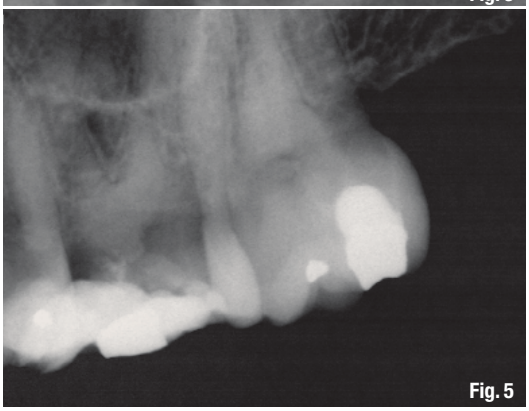
Fig. 5


Fig. 6

Fig. 3_Calcified mesial canals apically where practitioner was unable to prepare canals calcified to the apex.
Fig. 4_Calcified canals now prepared to length.
Fig. 5_Mesial canal on an upper-left first molar, which appears not to have a patent canal.
Fig. 6_Mesial canal on post-operative radiograph now showing the acute bend in the mesial canal.

_Risk of damage

Complete calcification is more difficult to negotiate and is more likely to damage the tooth substance, especially as the root canal space is 3-D and the calcification may be at a curved portion of the canal. Various anatomical guidelines, aids and instruments are necessary for this task.

The straighter and more coronal section of the root canal is obviously easier to negotiate than an apical curved section (Figs. 3 & 4).

Again, an excellent light source and magnification are essential for an appropriate field of vision. In addition, transillumination placed on the buccal cervical surface of the tooth can reveal the orifice of the canal. Dye preparations that can stain organic components of the root canal and act as a visual aid are also available. The central sclerosed canal very often has a much darker brownish appearance and the outer root a whiter hue. There are various instruments that remove the sclerosed dentine and amongst these are the rotary instruments, for example goose-neck burs and ultrasonic smooth and diamond tips.

_Perform with caution

Great care should be taken to stay effectively in the centre of the root and not to excavate or burrow too quickly without reassessing the field by removing the dentine dust and, if necessary, taking a radiograph to ensure you are on course. Any detection of bleeding should be tested using an apex locator to determine whether this is pulpal tissue or perforation of the root. Immediate ringing of the apex locator is not a good sign and with radiographic conformation, the prognosis is reduced if perforation has occurred. MTA repair or surgical intervention can be considered but extraction may be an option at this stage and the patient has a right to know this situation. If the tooth is going to support a bridge, an implant may be a preferable option. Certainly, the issues must be discussed with the patient before the procedure, as the patient must be informed of the risks and outcomes.

As soon as canal resistance occurs beyond a curve, an operating microscope can't be used to see around a curve and tactile filing with pre-bent tips of files becomes the only intra-canal option (Figs. 5 & 6).

Great care must be taken with non-cutting tips to avoid perforation. However, apical perforations have better outcomes than coronal perforations, especially pupal floor perforations, as there is less risk of oral fluids acting as a nutrient source to any root canal infection.

If the canal appears patent, there are various reasons that the file may not go to length. The classic case in point is simple dentinal mud. Copious

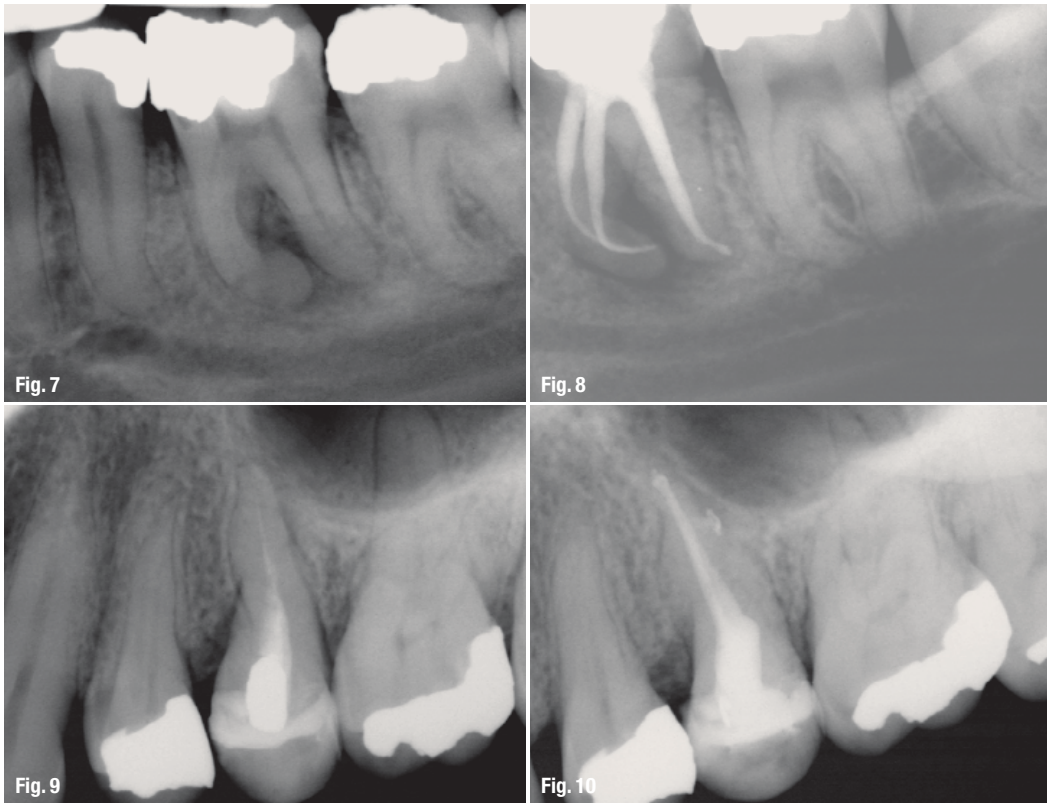

Fig. 7_Preoperative radiograph of lower-left first molar with a calcified mesial root apically.
Fig. 8_Post-operative radiograph showing the extreme nature of the 90-degree acute bend in the mesial canal.
Fig. 9_Upper-left second premolar with incomplete root filling and an acute coronal bend in the canal.
Fig. 10_Post-operative radiograph showing the root preparation and filling to length.

irrigation and patency filing help keep the guide path clear and patent. Creating a false canal, ledging or zipping the canal will result in the damage of tooth substance and cause the file not to follow the natural canal path but rather a falsely created pathway.

The best way of avoiding false pathways is to flare the canals coronally, which reduces the curvature and flexing of the file and will allow free movement apically of the file. Avoiding cutting-tip files will result in less gouging and ledging of the canal and then subsequent larger files being caught on the ledge, making the canal subsequently less negotiable.

Although rotary NiTi files have made endodontics faster in the hands of the practitioner, the metal file has an inherent elastic memory and as a result it is constantly trying to straighten. Ledging can result in curved canals with acute angles (apical and coronal) and from using larger files before a guide path has been created, and subsequent files may not be able to pass (Figs. 7–10).

Finally and rarely, a relatively mild curvature seen on the radiograph may seem difficult to negotiate, for example the mesio-buccal canal in an upper six tooth. On examining the file, much unwinding and work hardening can be seen to have occurred. This may well be the result of the canal not only bending in a mesio-distal plane but acutely at the same point in a bucco-palatal direction, i.e. in three dimensions placing great strain on the file. Again, coronal flaring, straight-line access and copious irrigation and lubricant are essential.

If there is any doubt in any situation, referral to an experienced colleague with recognised postgraduate training is always in everyone's best interest._

_author info roots

Dr Jonathan Murgraff graduated from King's College London and completed a two-year Master's degree in Endodontics at the GKT Institute. He has run an endodontic practice for ten years and also lectured and demonstrated at postgraduate endodontic courses. Dr Murgraff has a practice specialising in endodontics in both the West End of London and Hendon (north-west London). He can be contacted on +44 20 7486 3090 or +44 7974 344842.