

# ENDODONTIC MANAGEMENT OF TEETH WITH OPEN APICES

DR. SAW LIP HEAN

**E**ndodontic treatment of immature teeth presents extra difficulties to clinicians. This is because the immature teeth have apices that are wide open, short root length and thin canal walls (Fig. 1). Without a good apical stop, it is difficult to obturate and seal the root canal system in three dimensions adequately. Poor obturation will compromise the long term success of endodontic treatment. A tooth with short root length is not as firm and stable as a tooth with longer root while a tooth with thin canal wall is prone to root fracture at a later time.



Fig. 1

Figure 2 shows a central incisor that had suffered dental trauma previously. Failure occurred in this case because the canal could not be sealed adequately due to its open apex. Periapical surgery with retro-filling was then placed over the root end in order to provide an apical seal. This did not help and the surgery failed as well. Periapical radiograph shown that in fact the retro-filling has been dislodged from the apex. There is an associated large periapical lesion (note : the lateral incisor is vital). The tooth was later found to have suffered from root fracture as well. The prognosis of this tooth is bad.



Fig. 2

In order to overcome the inherent problems associated with teeth with open apices, some interim measures must be carried out. These techniques are described as apexogenesis and apexification. Apexogenesis is described as the endodontic procedure that allows continued formation of root apex. This technique can be carried out if there is vital pulpal tissue or the presence of epithelial root sheath. When successfully carried out a tooth will have a closed apex, a long root in length and a thick canal wall (Fig. 3).

Apexification, on the other hand, is described as the endodontic procedure that encourages the formation of an apical barrier over an open apex. It is indicated if the pulpal tissue

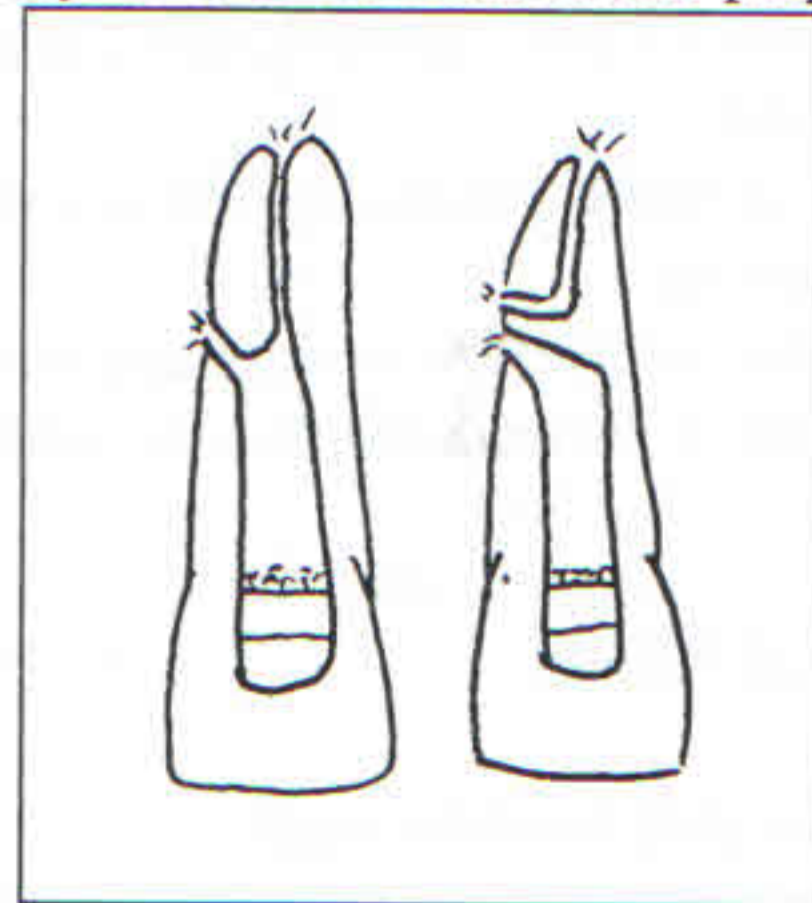


Fig. 3

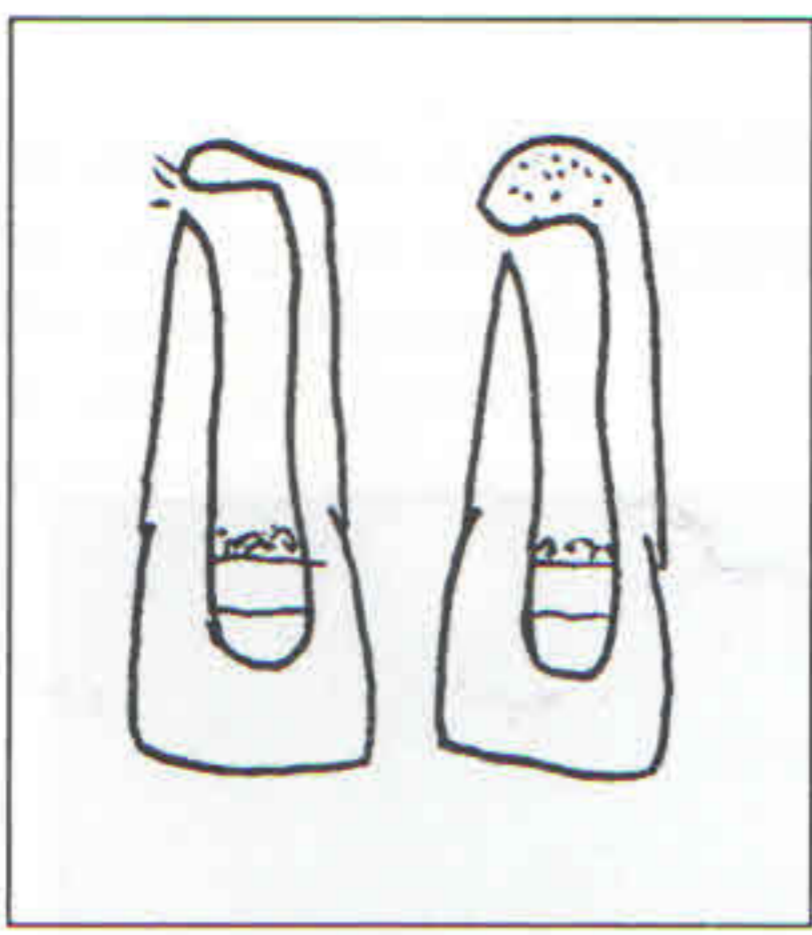


Fig. 4

has become necrotic. When successfully carried out the root should have a closed apex that facilitates good obturation that will ensure successful endodontic treatment (Fig 4). (note : Figures 3 and 4 are diagrams taken from a paper by Dr. Heithersay, 1975).

Apexogenesis and apexification involve the use of calcium hydroxide as dressing material. Calcium hydroxide has a very high pH (~12.4). Its action is mainly due to its strong anti-bacterial property and its ability to induce the formation of hard tissue when contacting with vital tissues. In both techniques non-setting calcium hydroxide paste (eg. Pulpdent) is recommended to be used as dressing material.

### Management strategy of teeth with open apices

Assess the vitality of the pulp in the teeth involved.

- If pulp is VITAL, apexogenesis should be carried out.
- If pulp is NON-VITAL, apexification should be carried out.

Once the respective results are achieved, obturation of the teeth can then be completed.

### APEXOGENESIS

- \* the apical pulp has to be vital!
- \* remove the superficial part (~2-3mm) of exposed pulp with a high speed bur. DO NOT

- use a barbed broach or other types of root canal instruments to remove the vital apical pulp.
- \* if the superficial part of the pulp appears unhealthy, a deeper layer of healthy pulp should be sought by going deeper with a high speed bur.
- \* control bleeding by applying firm pressure with a sterile cotton pellet.
- \* once haemostasis is achieved, apply calcium hydroxide paste over the exposed pulp. Make sure the intervisit coronal seal is good to prevent contamination of the canal.
- \* review clinically and with radiograph every 3 months.
- \* once continued apex formation is seen in radiograph, the process of apexogenesis is on the way. Do not disturb it!
- \* the process of apexogenesis may take up to 2 years (i.e. mature apex is seen in radiograph). This depends on the size of the apex when trauma initially occurs.
- \* when the case is successful, the root should have a closed apex, a normal root length and a thick canal wall. The long term prognosis for the tooth should now be as favourable as other teeth.

### APEXIFICATION

- \* the pulp of the tooth is non-vital.
- \* the necrotic canal should be irrigated with copious amounts of sodium hypochlorite. The use of sodium hypochlorite is very important. As the canal is wide, instrumentation of the root canal cannot be carried out properly and has to rely on sodium hypochlorite for its strong anti-bacterial properties.
- \* dress the canal with non-setting calcium hydroxide paste.
- \* good coronal seal.
- \* review clinically and with radiograph every 3 months.
- \* once apical barrier formation is completed, a good apical stop can be achieved and the canal can be properly obturated.
- \* in this technique, though the root is still short in length and thin in canal wall, a closed apex facilitates good obturation and ensures successful endodontics.

## CASE ILLUSTRATION

### Case No. 1

An 11 year old presented with localized swelling on the buccal of lower right 2nd premolar (tooth 45). The tooth was tender to percussion but otherwise no decay can be found in the tooth. A close examination revealed that in fact it was a tooth with dens evaginatus (Fig. 5). This picture was taken from a different patient. The dens had fractured off, providing a pathway for the pulp to be infected). Periapical radiograph (Fig. 6) revealed that the apex was still very wide open (note : it is always difficult to get good mandibular periapical radiograph that includes sufficient periapical view in children without having to give lingual infiltration anaesthesia).

Under local anaesthetic access cavity was made in the tooth. The superficial layer of the coronal pulp was found to be necrotic. This layer



Fig. 5



Fig. 6

was irrigated with copious amounts of sodium hypochlorite. Pus could be seen coming out from the canal followed by copious bleeding. This fresh bleeding indicates that the apical pulp was still vital. Provisional length radiograph was then taken (Fig. 7). (Take note that instrumentation should stop at the level of vital tissue and apical pulpal tissue must not be violated by over instrumentation).

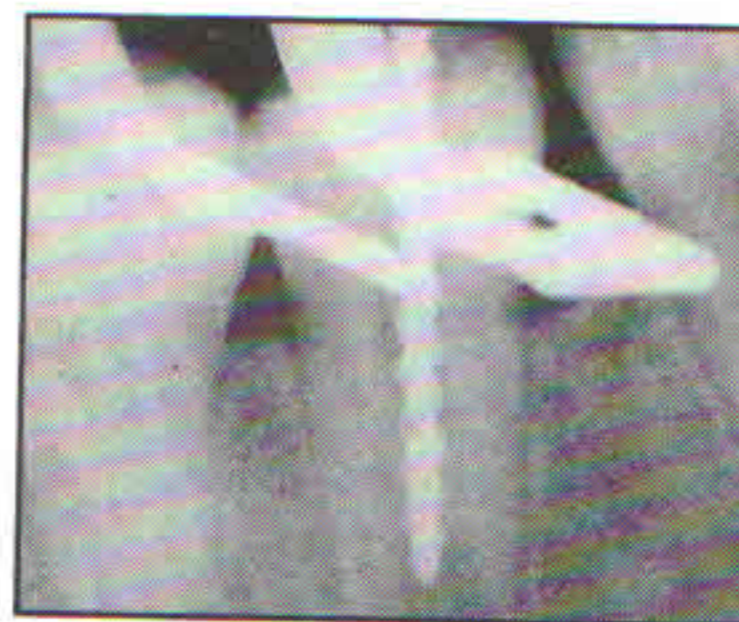


Fig. 7

Haemorrhage was controlled by exerting firm pressure with sterile cotton pellet. Once haemostasis was achieved, calcium hydroxide paste was introduced into the canal with a lentulo spiral. A good coronal seal was then provided.

Patient was recalled after a week. The canal was again irrigated with copious amounts of sodium hypochlorite (this time the bleeding from the canal should be minimal) and re-dressed with calcium hydroxide paste.

The patient was scheduled for a 3 month and 6 month recall. During the 6 month recall periapical radiograph revealed that apexogenesis has occurred well in advanced stage. The root had reached its mature form (Fig. 8). Exploration with a small file indicated that calcified barrier had formed and the periapical areas were found to be healthy (Fig. 9). The coronal section of the canal was then obturated with therma-plasticised gutta-percha.

The tooth was reviewed after another 6 months and was found to be asymptomatic and the periapical status remained very healthy (Fig. 10)



Fig. 8



Fig. 11

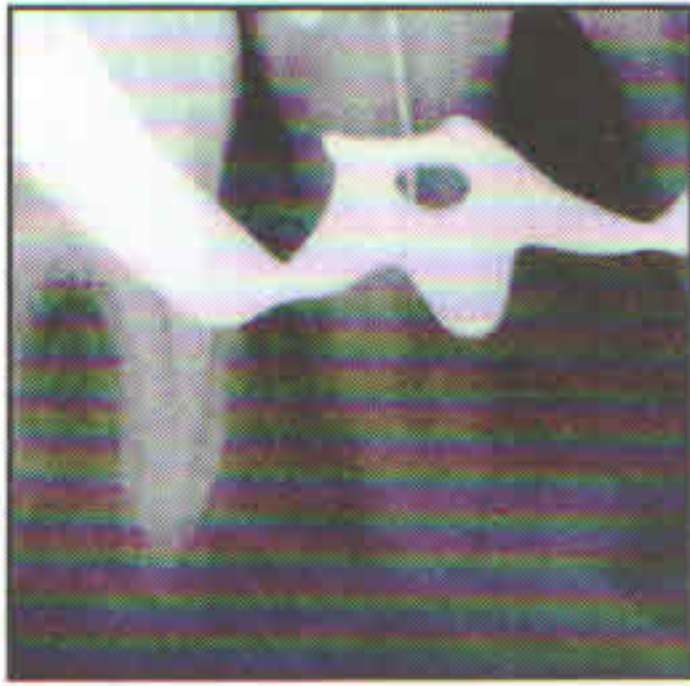


Fig. 9



Fig. 12

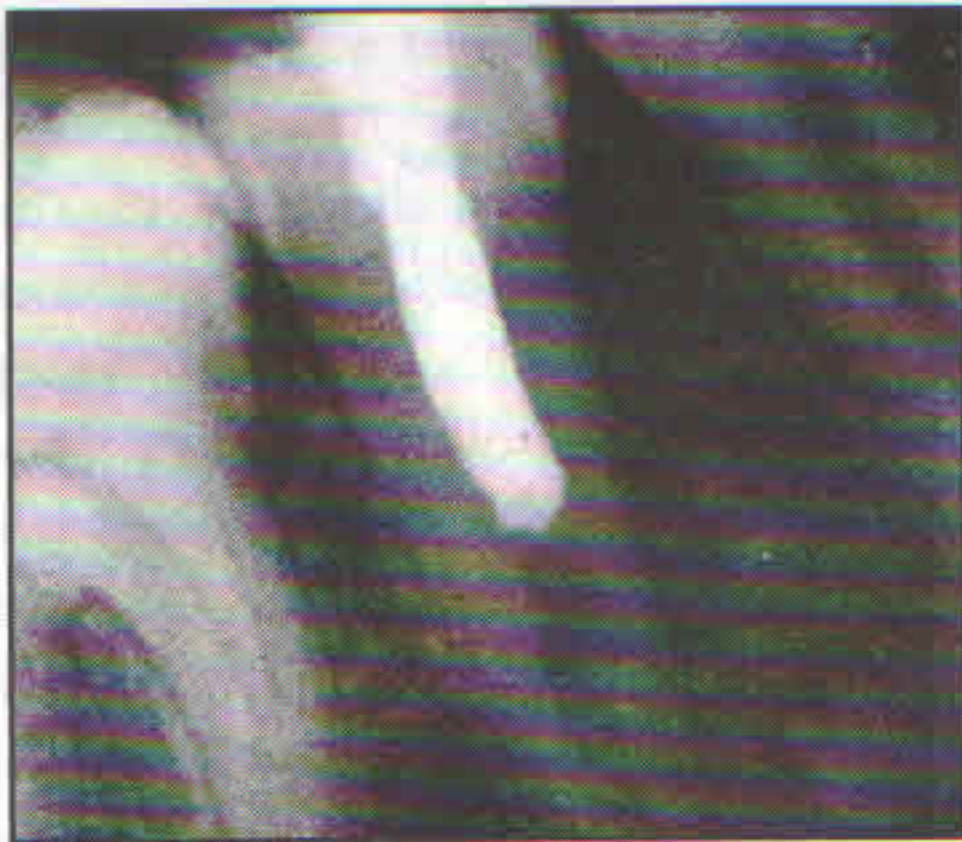


Fig. 10

### Case No. 2

Figure 11 shows a pre-operative radiograph of a different patient who had undergone a similar

treatment. In this case, despite the formation of calcified material at the apical root end, the root did not reach its matured length at the end of the treatment (Fig. 12) (In this case the outcome should be classified as apexification rather than apexogenesis; note the differences between Fig.10 and Fig. 12). Despite that the case still had a good outcome.

### SUMMARY

The techniques described above are very simple to follow. With good knowledge of the biological events in the body every dental practitioner should make use of these events and make sure that endodontics treatment of teeth with open apices is as successful as teeth with closed apices.