Endodontic in children

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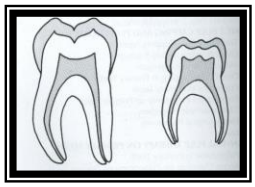
The basic aims of endodontic treatment in children are similar to those for the adult patients: prevention and treatment of apical periodontitis. The relief of pain and the control of sepsis in the pulp and surrounding peri-radicular tissues are secondary aims. An additional consideration when deciding on a suitable treatment plan for primary teeth is the maintenance of arch length; it is generally accepted that primary molar teeth in particular should be retained until they are shed normally.

The treatment of pulp-involved permanent teeth with immature roots also presents special endodontic problems. Efforts should not be directed to maintaining pulp vitality where possible to allow root formation and obturation. Second, successful obturation of the immature root canal can be complicated.

Treatment of primary teeth:

Primary molars have fine tapered roots which are flattened mesio-distally to enclose a ribbon-like root canal. Their pulp chambers are relatively larger, and their enamel and dentine are thinner than in permanent teeth. The single root canal may become partially calcified with age, to produce several intercommunicating canals, thus making instrumentation of the radicular pulp space difficult. Many lateral canals exist in the furcation of primary molar teeth, and these may contribute to the early spread of infection from the pulp chamber to the inter-radicular area.



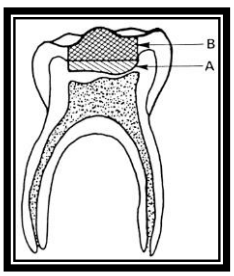
The diagnosis of pulp disease is especially difficult in young patients because not infrequently they are unable to give an accurate account of their symptoms. The diagnosis is dependent on the combination of a good history, clinical and radiographic examinations and special tests.

The treatment techniques which have been advocated for use on primary teeth may be grouped as follows:

1) Indirect pulp capping.
2) Direct pulp capping.
3) Coronal pulpotomy (one or two visits).
4) Pulpectomy (one or two visits).

Indirect pulp capping:

This is the term used to describe the placement of a sedative dressing over residual hard carious dentine to allow

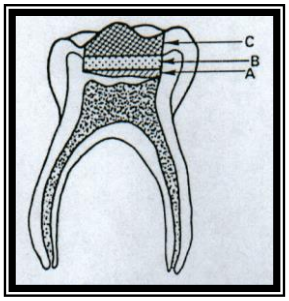


irritation dentine to be formed within the pulp chamber. Thus, pulpal exposure is avoided in teeth with deep carious lesions when there is no clinical or radiographic evidence of pulpal degeneration or peri-radicular disease. Contraindications to this method of treatment include a history of spontaneous pain, associated swelling, and tenderness to biting or mobility. Likewise, preoperative radiographs must be examined for root resorption, pulpal calcifications or peri-radicular radiolucency which, if present, would necessitate more extensive treatment.

At the initial visit, all soft carious dentine is removed with a slow running bur or a hand excavator. The amelo-dentinal junction must be free from all softened or stained carious dentine. The area of dentine over the site of potential pulpal exposure is covered with layer of setting cement containing calcium hydroxide (e.g. Dycal) and sealed with an overlying structural base of a quick-setting reinforced zinc oxide-eugenol preparation (e.g. Kalzinol). The final restoration can then be placed.

Direct pulp capping:

Direct pulp- capping is the application of a material directly on to pulp tissue which has been exposed because of cavity preparation or by traumatic injury. This aims to encourage formation of an irritation dentine bridge below the exposure site, and to maintain pulpal vitality.



It is recommended that this technique is reserved for treatment of clean traumatic pulpal exposures. The exposure site should be gently irrigated with a non-irritant solution, e.g. saline, to remove any infected debris which may impede healing and to keep the pulp moist. The capping material should be flowed gently over the exposure and allowed to set. Various capping materials have been employed. Calcium hydroxide, used alone or together with zinc oxide-eugenol, has been most widely investigated. Other materials, e.g. antibiotic and steroid preparation, polycarboxylate cement and formocresol, have also been used, without notable success. The final restoration should be a stainless-steel crown to minimize subsequent microleakage and prevent fracture of the tooth.

Coronal pulpotomy:

This technique involves removal of the entire coronal pulp which has undergone irreversible inflammatory change or necrosis, leaving remaining vital tissue intact. The cut radicular pulp stumps are covered with

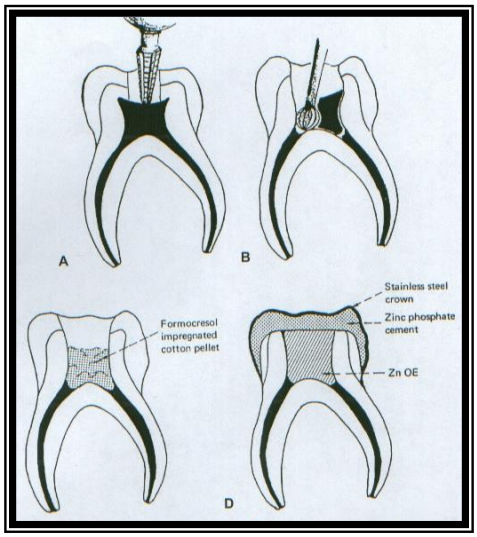
a medicament which will result in either healing or fixation of the tissue beyond the interface of dressing and radicular pulp. Pulpotomy provides the most suitable method for treating carious exposures in primary teeth without a history of swelling, sinus tract or any evidence of internal or external root resorption.

Formocresol pulpotomy:

A commercial solution containing 19% formaldehyde, 35% cresol in a glycerin / water vehicle was developed as a suitable medicament for the treatment of pulpally exposed primary teeth. The aim of this treatment technique is to fix the coronal portion of the radicular pulp and maintain vitality of the remaining apical portion. Formocresol acts through its aldehyde group and binds to the amino acids of protein and bacteria to prevent autolysis and hydrolysis, so rendering tissue inert.

One-visit formocresol pulpotomy:

Originally, a three-to five-stage procedure was described, but since the 1960s it has become preferable to complete the pulpotomy procedure in a single visit, provided adequate analgesia has been achieved. The one-visit formocresol pulpotomy entails the application of a pledget of cotton wool moistened with the medicament to the cut pulp stumps, after removal of the coronal pulp and arrest of hemorrhage. The pledget is left in situ for 3-5 min, although a 1-min application has been recommended. Following this, the amputated pulp tissue appears black. A zinc oxide-eugenol dressing is then prepared and pressed into the chamber, before final restoration of the tooth with a stainless-steel crown. It is unnecessary to incorporate formocresol into this zinc oxide-eugenol sub-base.



Two-visit Formocresol pulpotomy:

With this technique the Formocresol pledget is sealed in the pulp chamber for a period of 1 week, and at the second visit the procedure is completed as for the one-visit pulpotomy. This may be preferable for

uncooperative patients as appointment times are reduced, or in cases where a hyperemic pulp is encountered, or adequate analgesia has not been achieved.

Root canal treatment of non-vital primary teeth:

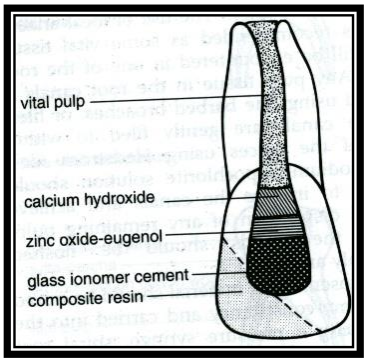
Non-vital primary teeth may be retained successfully when this technique is employed. Pulpal necrosis, alveolar swelling, inter-radicular or peri-radicular radiolucency are not contraindications to treatment; root canal treatment provides the most satisfactory method of retaining the restorable primary tooth where extraction remains the only other option. The whole procedure can be completed in one visit where there is no abscess or over two visits when acute discharge is present. In this situation, a pledget of formocresol should be sealed into the pulp chamber for 1 week, after canal preparation, and prior to obturation. There is no consensus as to the preferred filling material, but absorbable materials based on zinc oxide-eugenol, calcium hydroxide and iodoform paste have been used.

Once any initial pain or swelling has been relieved, an access cavity is prepared under rubber dam isolation. The use of local anesthesia is recommended as some vital tissue could still be encountered in one of the root canals. Any pulp tissue in the root canals is removed using fine barbed broaches, or files, and the canals are gently filed to within 2 mm of the apices using Hedstrom files. Dilute sodium hypochlorite solution should be used to irrigate the canals and achieve chemical dissolution of any remaining pulp. Finally, the canals should be flushed thoroughly and dried.

The chosen filling material should be mixed to a creamy consistency and carried into the canals using a pressure syringe, spiral root canal filler or, if mixed to a stiffer consistency, packed into the canal with a plugger. Various filling techniques, including using spiral filler and the Jiffy tube pressure syringe, have been compared for filling root canals of primary teeth, with the spiral filler performing best. After root canal filling, the pulp chamber should be packed with a stainless-steel crown.

Treatment of immature permanent teeth:

Current treatment strategies for immature teeth in which the pulp has been exposed are conservative and have as their ultimate objective the maintenance of vitality of the radicular pulp to allow root formation to be completed.



Treatment of vital teeth with open apices:

Traumatic pulp exposure in an immature permanent tooth with a good blood supply leads initially to local hemorrhage in the tissue immediately beneath the exposure site, followed by superficial inflammation. The wound is subsequently covered with fibrin. If the inflamed tissue is removed to a level where healthy pulp is encountered, a dressing of calcium hydroxide placed over the cut pulp will ultimately cause induction of hard tissue and dentine formation by newly differentiated odontoblasts.

Pulpotomy:

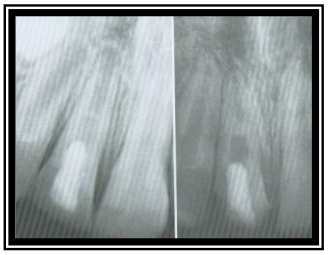
This may be performed at various levels, depending on the size of the exposure and the condition of the pulp observed at the initial exposure site. The classical operation refers to the removal of the coronal pulp to the cervical region with a slowly rotating steel bur.

Partial (or Cvek) pulpotomy:

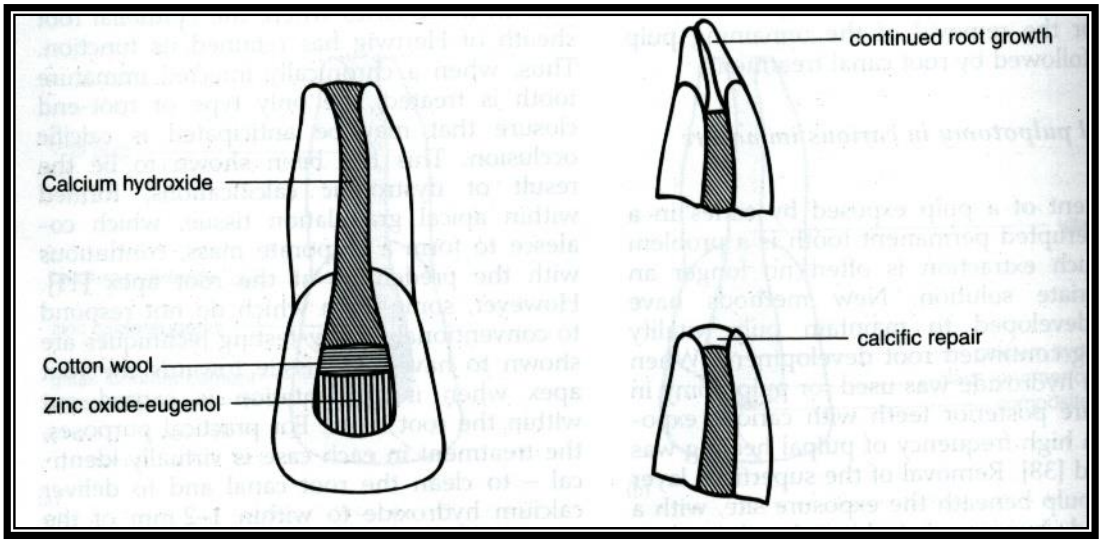
A more conservative approach to pulpotomy in those cases where a small exposure is found has been proposed. In this technique the pulp immediately adjacent to the exposure site should be removed to a depth of 2 mm with an adequately cooled diamond but in a turbine handpiece.

Treatment of non-vital teeth with open apices:

The object of endodontic treatment for non-vital teeth with immature roots is essentially the same as that for conventional root canal treatment, to produce a filling which seals the canal system by means of lateral or vertically condensed gutta-percha in conjunction with a root canal sealer. However, in immature incisor teeth, the root canal may diverge towards the apex and is oval in cross section, with a greater labio-palatal than mesiodistal dimension. The apical foramen is patent to varying degrees, from nearly closed to a widely divergent or ‘blunderbuss’ type. The walls of the root canal are often very thin in the case of a newly erupted immature tooth and may be further weakened during mechanical preparation of the root canal. In addition, a relatively short root presents an adverse crown: root ratio for the subsequent coronal restoration.



Theoretical considerations suggest that continued root growth with histologically normal dentine and cementum is only possible in those cases where the epithelial root sheath of Hertwig has retained its function. Thus, when a chronically infected immature tooth is treated, the only type of root-end closure that may be anticipated is calcific occlusion. This has been shown to be the result of dystrophic calcifications, formed within apical granulation tissue, which coalesce to form a corporate mass, continuous with the pre-dentine at the root apex. However, some teeth which do not respond to conventional vitality-testing techniques are shown to have vital tissue towards the root apex when instrumentation is carried out within the root canal. For practical purposes, the treatment in each case is virtually identical- to clean the root canal and to deliver calcium hydroxide to within 1-2 mm of the root apex so as to encourage either root growth or apical repair.



The tooth is opened on the palatal aspect to give wide access to the root canal, and necrotic tissue removed with barbed broaches or files to within 1 mm of the root apex. The walls of the canal may then be gently cleaned using either hand files or an ultrasonically operated file. It is important at this stage to avoid disruption of the apical tissues, so all instrumentation should be carefully controlled short of the apical foramen.

Various irrigating solutions have been recommended to remove debris and necrotic tissue. While sterile water or saline has been used and has least potential for damage to the peri-radicular tissues, a 2.5% solution of hypochlorite has been recommended as having a proven antibacterial effect. However, when 5% hypochlorite was compared with 0.5% hypochlorite or saline, the hypochlorite solutions reduced the bacterial count

more effectively than saline, but peri-apical healing was significantly impaired by use of 5% hypochlorite. A solution of ≤ 2% hypochlorite is now recommended.

After irrigation and drying with paper points, the root canal is filled with thick aqueous slurry of calcium hydroxide or a commercial product (e.g. Hypocal). Calcium hydroxide is now widely recommended as the sole root canal dressing. The quality of canal filling with calcium hydroxide should be checked radiographically, before sealing the access cavity with zinc oxide-eugenol cement. The patient should be reviewed at 1, 3, 6 and 12 months. It has been usual to replace the dressing at these appointments, but current practice is to do so only if radiographic evidence of dissolution of the dressing has occurred, or the temporary filling has failed. The better condensed the initial dressing; the less likely it is that it will need to be replaced. The time taken for a mechanically detectable calcific barrier to form has been shown to vary between 9 and 18 months.

When a barrier appears to have formed radiographically, the tooth should be re-isolated and opened and the dressing should be washed out and dried, prior to checking for apical closure by probing with a file. The root canal should be filled with gutta-percha and sealer, using a condensation technique which fills the canal both laterally and apically. The available filling techniques are customized gutta-percha point's lateral condensation, vertical condensation and thermoplastic delivery.

The prognosis for root-filled immature teeth depends on the degree of immaturity of the root. The thinner the root canal walls; the more likely fracture is to occur.