Protecting and managing pulps in primary teeth
Rai·son d ê·tre for primary teeth pulpal inflammation
Pulps of primary teeth can be inflamed due to iatrogenic, non-iatrogenic (Yu & Abbot, 2007) or physiological reasons (Monteiro et al, 2008). Non-iatrogenic reasons include microbial, traumatic or chemical. Microbial ingress can be through coronal or radicular route. Traumatic causes include fractures, concussion, subluxation, traumatic occlusion. Chemical reasons include restorative materials and erosion (due to acidic food stuff, reflux disease, asthmatic medication). Iatrogenic causes include cavity preparation, restorative procedures, general anaesthesia (trauma during intubation), electrical (galvanic reaction) and local anaesthesia due to vasoconstrictor induced reduction in blood flow. Some pulpal inflammation is also seen in primary teeth with physiological root resorption, but this is not as profound as anticipated with teeth retaining ability for sensation, healing and repair until advanced stages of root resorption (Monteiro et al, 2008).

Goals in restoring primary teeth (Cameron & Widmer, 2008)
Objectives of restoring primary teeth include limiting damage of dental caries, protect and preserve remaining pulp and tooth structure, ensure adequate function, restore aesthetics and provide ease in maintaining good oral hygiene. Restored primary teeth are the best space maintainers and can thus avoid malocclusions such as midline shifts, cross bites, crowding (Pedersen et al, 1978).

Procedures for managing primary pulps
Include indirect pulp capping, direct pulp capping, pulpotomy and pulpectomy (Cameron & Widmer, 2008)

Indirect Pulp Capping (IPC)
Stanley (1989) noted that pulps have an amazing capacity to heal. IPC is recommended for teeth with deep carious lesions approximating pulp but no signs/ symptoms of pulpal degeneration. Zinc oxide eugenol or calcium hydroxide is used (Cameron & Widmer, 2008). Reduced metabolic activity resulting from hermetically sealing the lesion appears to be the key (Pinto et al, 2006). The objectives of IPC (Eidelman et al, 1965) include (1) arresting carious lesion (2) promoting dentinal sclerosis (3) stimulating formation of tertiary dentine and (4) re-mineralise carious dentine. Kerkhova et al (1967) has noted success rates of higher than 90% in IPC of primary teeth.

Direct Pulp Capping (DPC)
DPC is a procedure when a healthy pulp has been inadvertently exposed during an operative procedure or due to trauma. The tooth should be asymptomatic and the exposure site should be of pin point diameter and free of oral contaminants. Direct pulp capping of carious pulpal exposure is not recommended (Cameron & Widmer, 2008). Success rates of DPC in primary teeth are low. Failure of treatment may result in internal resorption/ dento-alveolar abscess. High cellular content of primary pulp tissue may be responsible for increased failure rate of DPC in primary teeth (Kennedy & Kapala, 1985). Other authors consider odontoclastic differentiation from undifferentiated mesenchymal cells and subsequent internal resorption as the primary reason for failure (Fuks, 2000). Materials used include MTA, calcium hydroxide. Use of dentine bonding agent has been advocated but others (Araujo et al, 1997) found micro-abscesses adjacent to exposure site with no dentinal bridge. They have been successfully used in reattachment of fragments (Kance, 1993). There is inadequate evidence to support the use of other materials currently used. Currently DPC is recommended for older children only as failure of treatment would not need space maintainers (Fuks, 2000).

Pulpotomy for primary teeth
Pulpotomy procedure is based on the rationale that radicular pulp tissue is healthy or is capable of healing after surgical amputation of affected or infected coronal pulp (Fuks & Eidelman, 1991). Indications include carious pulp exposure, asymptomatic tooth or mild
transient pain, restorable tooth or preoperative radiograph confirming absence of radicular pathology. Contraindications include periapical pathology, swelling, root resorption, pulp calcifications or excessive bleeding from amputated radicular stumps more than 5 minutes (Cameron & Widmer, 2008). Therapeutic agents for pulpotomy include formocresol, ferric sulphate, electro cautery, lasers and MTA. Nadine et al (2003) concluded that based on available evidence all the above agents have similar efficacy.

Formocresol- Widely used Buckley’s formulation aims at creating a superficial layer of fixation while primary vitality of deeper pulp is preserved. Clinical success rates of 70-100%. In 2004 International Agency for research on cancer concluded that chronic exposure to high levels of formaldehyde causes nasopharyngeal carcinoma (IARC Monographs, 2006). Ferric Sulphate pulpotomies show success rates of 74-99%. Ferric sulphate is thought to react with pulp tissue forming a superficial layer of iron-protein complex. Mode of failure is internal resorption. Ferric sulphate is hazardous and can decompose to form sulphuric acid which can cause burns (Cameron & Widmer, 2008).

Electrosurgery uses radiofrequency energy to produce a controlled superficial tissue burn. It is both hemostatic and antibacterial and has success rates of 70-94%. Excessive energy can cause necrosis of radicular pulp and internal resorption. If bleeding occurs beyond total cumulative application time of 2 seconds, pulpectomy is indicated.

MTA shows success rates similar to formocresol, ferric sulphate (Cameron & Widmer, 2008). It is a mixture of tricalcium silicate, tricalcium aluminate, bismuth oxide and calcium sulphate with a ph. of 13 and excellent induction of dentinal bridge.

Erbium lasers are used in paediatric dentistry. Advantages include shallow depth of penetration, high affinity for water, lack of thermal damage (Hibst, 1988). Laser instruments produce favourable results when used for pulpotomy (Liu et al, 1999). The laser seems to provide adequate hemostasis and leave vital tissue at apex (Kotlow, 2004).

Pulpectomy
Pulpectomy involves complete removal of all pulpal tissue from tooth. It can only be considered for primary teeth that have intact roots. Indications include pulpal necrosis, restorable tooth and intact non resorbed root on radiographs. Pulpectomy in primary incisors is more successful than ferric sulphate pulpotomy (Cameron & Widerman, 2008). Materials used include Zinc oxide eugenol paste (ZOE), iodoform and calcium hydroxide.

ZOE paste is the most commonly used filling material for primary teeth. Overfilling may cause a mild foreign body reaction. Another disadvantage is the difference between its rate of resorption and that of tooth root (Allen, 1979)

Calcium hydroxide is used as a mixture of calcium hydroxide and iodoform (Vitapex). This material is radiopaque, resorbs at a slightly faster rate than that of roots and has no toxic effects on successor (Machida, 1983)

Definitive restorations
Include composites, compomers, stainless steel crowns and amalgam. Composites can be used in anteriors as well as minimal class 2 and class 1 in posterior teeth. They perform satisfactorily in primary teeth (Garcia-Godoy, 2000). Compomers are derived from composites and glass ionomers; they are polyacid modified resin based composites with no significant acid base reaction during setting process (Mc Lean et al, 1994). Their mechanical properties are superior to Glass ionomers but less than composites (Peutzfeldt et al, 1997). Stainless steel crowns are the most durable and cost effective restorations and improves success rate of pulpectomy. They can be used in children at high risk of caries. Pre-veneered stainless steel crowns can be given for anterior teeth (Seale, 2005).
Conclusion
Restoring deciduous teeth plays a major role in improving quality of life. With improvements in material qualities advances in treatment of the primary pulp can be anticipated.

References


