Chemical and pharmacological shaping of necrotic primary teeth

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ABSTRACT. Aim The object of this study was the evaluation of the success rate of endodontic treatment of primary teeth with necrotic pulps performed through a partial pulpectomy and a chemical shaping. Materials and methods The study was conducted on 50 necrotic primary molars, with an oral fistula and a clinical and radiographical positive diagnosis. On each tooth the endodontic treatment was performed through mechanical instrumentation for only 2-3 mm beyond the orifices of the canals and copious alternate irrigation with 10vol H2O2 and 3% NaOCl (chemical shaping). After the pharmacological shaping the canals were filled with a slurry mix of powdered macrolide antibiotic (josamicina) and glycerine (or anaesthetic solution). At the second visit the same procedure was either repeated, if an oral fistula was still present, or the canals were sealed with a small amount of josamicina and glycerine paste and zinc oxide eugenol to a working length. Results The overall success rate, considering the first two teeth that were extracted as inappropriate case selection, was 45 out of the original 48 or 93%. While considering all the teeth treated the success rate was 45 out of 50, or 90%. Keywords: Abscess, Pulpectomy, Primary teeth, Pharmacological shaping

Introduction

Root canal treatments for primary teeth have been recommended by many authors [Kopel, 1970; Rifkin, 1980; Rifkin, 1982; Goerig and Camp, 1983]. For years the importance of primary dentition has been underestimated and the clinicians proceeded far too easily to treat by extraction. Lately, as reported by many authors [Kubota et al., 1992; Coll and Sadrian, 1996; Mani et al., 2000], it has been reconsidered that it is most important to maintain the primary teeth until their normal time of physiologic exfoliation. In fact, it is crucial to keep the primary dentition in a non-pathologic and healthy condition for space maintenance, proper mastication, aesthetics and prevention of aberrant habits [Kubota et al., 1992; Coll and Sadrian, 1996; Mani et al., 2000]. However, pulp therapy of primary teeth has remained controversial for a number of reasons and many authors have advocated extraction of pulparly involved primary teeth and placement of space maintainers. Nevertheless, as already mentioned, there is no better space maintainer than the primary tooth [Cohen and Burns, 2001; Gallusi, 1987].

Endodontic treatments of primary teeth may be more or less complex according to the type of lesion affecting it. Primary teeth with carious lesions involving the pulp, but still positive to pulp tests, could be treated by direct pulp capping, albeit with a low success rate as shown in our experience, or a pulpectomy. It is also necessary to make some observations about the anatomical features that influence pulp treatment itself [Gallusi, 1987] (Fig. 1). These factors are as follows:

- exiguous or thin thickness of the floor pulp chamber, that makes the permeation through hard tissues of non-biocompatible chemicals placed in the pulp chamber (medications, sealers, irrigants and dressings);
- curvature of the primary tooth root canal system;
- ovular-shaped canals with discontinuous and unpredictable constrictions;
- endo-periodontal communications;
- impossibility to establish the exact collocation of the apical foramen, either clinically or radiographically, due to the rearrangement occurring in this area during the physiological resorption of primary teeth that is characterised by an alternation of resorption and apposition of hard tissue. Resorption may extend through the roots into the root canals, creating additional...
**FIG. 1** - Extracted primary teeth showing the difficulty in establishing the exact location of the apical foramen due to the changes in structure occurring during the physiological resorption of primary teeth.

**FIG. 2** - Radiograph of a primary mandibular molar with carious lesion and pulpal bifurcation involvement, but still with almost complete roots. The permanent tooth bud is an early stage of development and is evident a translucency in the furcation area with integrity of the bone overlaying the succedaneous tooth. The first permanent molar is still included under the mucosa.

**FIG. 3** - Contraindications to pulpectomy. a) Radiograph showing the presence of internal radicular resorption. b) Radiograph showing radicular translucency with almost sharp edges with discontinuity of the bone overlaying the permanent tooth bud and pathological resorption of the mesial root. c) Radiograph showing extensive internal resorption of the mesial root of the 84, absence of any bone overlaying the permanent premolar, almost in contact with the furcation of the primary molar. d) Asymmetry of the tooth buds of the mandibular second premolars due to an inflammatory process of 85 causing an alteration to the eruption route of the succedaneous permanent tooth; therefore an endodontic treatment of the deciduous molar is contra-indicated in order to avoid a probable malocclusion.

**FIG. 4** - Photograph of necrotic left maxillary primary molar (64). a) Large occlusal cavity with palatal oral fistula. b) Intraoral aspect after the first visit that allows the clinician to move to the second visit procedures.

**FIG. 5** - Photographs showing necrotic pulp in tooth 75. a) Oral fistula. b) Intraoral aspect after the first visit showing regression of the fistula allowing the clinician to move to the second visit procedures.
communications with the periapical tissues other than through the apical foramina or lateral and accessory canals; possible damage to the permanent tooth bud during the manual instrumentation. Furthermore it is also necessary to consider: resorption of any filling materials used in the primary root canals; biocompatibility of any resorbable materials used.

For all these reasons the pulp therapy of primary teeth does not follow the same principles of the permanent teeth. While performing endodontic therapy on primary teeth, due to the factors mentioned above, it is not always possible to effect an adequate cleansing, shaping and filling of the root canal system, according to the principles applied on permanent teeth (Fig. 1). It is impossible to achieve a total pulpectomy that will then become, by force of circumstances, a partial pulpectomy and is then necessary that the use of a chemical and pharmacological shaping, based on antiseptic and antibiotic properties of endodontic irrigants and medications should be used [Cirillo et al., 1987; Gallusi et al., 1991; Campanella and Marzo, 1992; Marzo et al., 1994].

The main factor determining the success of endodontic treatment in primary teeth is a proper case selection, both clinically and radiographically (Table 1, 2) following the correct indications and contra-indications (Fig. 2, 3, 4, 5) [Gallusi, 1987].

The aim of this study, therefore, was the evaluation of the success rate of endodontic therapy on primary teeth performed through a partial pulpectomy and a chemical and pharmacological shaping. The object of this study was the evaluation of a fifteen years old technique developed by the authors for endodontic treatment of primary teeth with necrotic pulps, which therefore have lost partially or totally their vitality.

**Clinical Criteria**
- Crown restorability
- Exfoliation prevision
- General health conditions
- Vacillation (bucco-lingual or vertical)
- Inclusion of first permanent molar
- Orthodontic evaluations

**Radiographical Criteria**

**Indications:**
- Periradicular translucency
- Translucency in the furcation area
- Presence of at least two thirds of the root of primary teeth
- Presence of the bone overlaying the permanent tooth bud
- Root development of the permanent successor between one third and one half of the total root length
- Agenesis of permanent of substitution

**Contraindications:**
- Absence of the bone underlaying the permanent tooth bud that is indicative of close contact of the succedaneous tooth especially if this is in proximity to the furcation of the primary tooth
- Tooth germ asymmetry
- Periradicular translucency with sharp edges
- Internal or external radicular translucency

**Materials and methods**

Pulpectomies were performed on 50 necrotic primary molars, with an oral fistula usually with furcation involvement, determined by a clinical (Table 1) and radiographic evaluation (Table 2). The technique is that previously described [Cirillo et al., 1987; Gallusi et al., 1991; Campanella and Marzo, 1992; Marzo et al., 1994].

At the first visit (Fig. 6a, 6b, 6c): with the aim of a parallel preoperative radiograph, after complete removal of plaque and a debridement of the carious lesions, the access to the canals was achieved. After obtaining access to root canal system, a manual instrumentation is performed, using files, maintaining the working length at only 2-3 mm beyond the orifices of the canals, alternating the instrumentation with copious irrigations with 10vol H2O2 and 3% NaOCl (chemical shaping) of the root canal system. After the last irrigation with sodium hypochlorite, the canals were dried with sterile paper points, and a slurry mix of powdered macrolide antibiotic (josamicina) and glycerine (or anaesthetic solution) was spun into the canal system with a lentulo spiral instrument (pharmacological shaping). The access cavity was temporarily sealed with zinc oxide eugenol paste (ZOE).

At the second visit: if no improvements were observable, the procedure was repeated from the beginning as in first visit. When, after 8-10 days, the
fistula was still evident the tooth was extracted. Otherwise, when at the second visit, if healing of the oral fistula, absence of inflammatory reactions and functional rehabilitation were found (Fig. 6d), the following steps were then taken. It might be observed an increased radiolucency under the furcation (Fig. 7b, 8c). This is a common finding due to the cribrosis of the floor of the pulp chamber and it normally recedes spontaneously during treatment. After cleansing with H2O2 and NaOCl, the canals were dried and a small amount of josamicina and glycerine (or anaesthetic solution) paste was spun into the orifices. Then the canals were again filled with ZOE spun into the canals (Fig. 6c). There is no significant difference between the complete filling of the root canal system and a short obturation (Fig. 6, 7b). At a further appointment a definitive restoration was performed. Another radiograph was taken to assess the obturation validity. The complete sequence of events and follow-up is shown for 4 cases in Figures 6-9.

The clinical and radiographical findings at the pre and postoperative examinations were recorded. These included the presence or absence of mobility, swelling, sensitivity to percussion, sinus tract, determined as

**Fig. 6 -** Case 1. Sequence of procedures for necrotic primary maxillary molar (55). a) Oral fistula. b) Preoperative radiograph. c) Radiograph taken after the first visit medication with the antibiotic paste. d) Complete resolution of the fistula after one week from the first visit. e) Three months follow-up. f) Six months follow-up. g/h) One year follow-up.

**Fig. 7 -** Case 2. Sequential radiographs showing treatment of tooth 85. a) Bifurcation radiolucency. b) One week after second visit; note an enlargement of the translucency in the furcation area. c) Three month follow-up. d) Six months follow-up. e) One year follow-up. f) Two years follow-up. g) Three years follow-up showing physiological resorption proceeding normally, with the filling material resorbing almost at the same rate of the tooth, though a small amount of it can be seen outside the resorbing root. h) Intraoral view after the tooth exfoliation.
based upon an evaluation of the clinical and radiographical criteria described in Table 1 and 2 [Cirillo et al., 1987; Gallusi et al., 1991; Campanella and Marzo, 1992; Marzo et al., 1994].

Follow-up visits were scheduled at 3, 6, 12 months, and yearly thereafter (Fig. 6-9). The observation time varied from 1.5 to 3 years.

**Results**

Of the 50 primary teeth originally treated 38 had a positive result after the first treatment with the healing of the oral fistula and of the infective-inflammatory process. Ten teeth needed a second “first visit treatment” before the healing occurred. Two teeth did not improve, even after the second “first visit treatment”, and were extracted. The overall success rate immediately after treatment was determined as 48 out of the 50 (96%).

Of the remaining 48 successfully treated, 45 exfoliated physiologically after a follow-up period of 1.5-3 years. One patient was lost to follow-up after one year, and the last two treated teeth needed extraction some 5-6 months after completion of the pulp treatment.

The overall success rate, considering the first two teeth that were extracted as inappropriate case selection, was 45 out of the original 48 (93%). While considering all the teeth treated the success rate was 45 out of 50 (90%).

The clinical and radiographical follow-up of the
important in paediatric dentistry to obtain the complete realization and requires short visits. This is extremely malposition due to extraction before their physiological exfoliation, etc.). This treatment modality is easy to alternative treatment options (such as space maintainers, orthodontic treatments for dental malposition due to extraction before their physiological exfoliation, etc.). This treatment modality is easy to realize and requires short visits. This is extremely important in paediatric dentistry to obtain the complete collaboration of the young patient all over the entire treatment and for the future co-operative relationship between patient and clinician.

**Conclusion**

Our evaluation of this technique, based on the experience matured in years of professional clinical paedodontics, enlights the procedure as a predictable success treatment in necrotic primary teeth. In our experience this procedure succeeds in two main highlights: 1) to resolve the inflammatory process caused by necrotic pulps and its pathologic sequelae, 2) to provide to the young patient specific treatments thought to be less traumatic and patient-friendly.

**References**


