

Histopathology of radiolucent furcation lesions associated with pulpotomy-treated primary molars

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Abstract

The purpose of this project was to characterize the histopathology of radiolucent furcation lesions associated with primary molars which had received pulpotomy treatment.

Twenty-four pulpotomy-treated primary molars which displayed radiolucent lesions in the root furcation suggesting unsuccessful outcome were extracted. Pretreatment radiographs were available for 6 teeth and none had evidence of a furcation radiolucency. These 6 teeth were treated with a standard formocresol pulpotomy and restored. The pretreatment condition and the pulpotomy procedure employed for the remaining 18 teeth is unknown. If a lesion remained attached to the root, it was transferred to 10% neutral buffered formalin. The sockets were gently curetted and the tissue transferred to fixative. Specimens were processed and stained for microscopic examination.

Histological examination of the lesions revealed granulomatous, chronic proliferative, and acute inflammation and epithelium. Three specimens were diagnosed as furcation granulomas. Stratified squamous epithelium was observed in 21 specimens which were diagnosed as either a furcation granuloma with epithelium or a furcation cyst if an epithelial lumen was present.

Pulpotomy-treated primary molars should receive periodic postoperative radiographic examination and be extracted if a furcation lesion develops.

A pulpotomy is the standard treatment for vital primary teeth with carious pulp exposures (Troutman et al. 1982; McDonald and Avery 1983). The subsequent degeneration of the treated radicular pulp tissue may lead to failure of the pulpotomy (Rolling et al. 1976; Rolling 1978; Magnusson 1978). A furcation radiolucency associated with a pulpotomized primary molar is a sign of failure of the pulpotomy treatment (Rolling and Lambjerg-Hansen 1978; Magnusson 1978). Limited information is available to characterize the radiolucent lesions associated with unsuccessful pulpotomy treatment. However, cystic lesions have been reported fol-

lowing pulpotomy treatment of primary molars with formocresol, or phenol-containing compounds (Grundy and Adkins 1984; Savage et al. 1986).

The histopathology of furcation lesions associated with cariously exposed primary teeth has been described (Lustmann and Shear 1985; Myers et al. 1987). These lesions are mixed inflammatory reactions with the chronic granulomatous inflammatory reaction being the predominant type observed. These lesions may contain epithelium suggesting the potential for cystic transformation. The purpose of this project was to characterize the histopathology of radiolucent furcation lesions associated with primary molars which had previously received pulpotomy treatment.

Method

The specimens were obtained during the extraction of 24 primary molars from 17 healthy children (8 females, 9 males) aged 4-12 years. The specimens included 10 mandibular second primary molars, 9 mandibular first primary molars, 4 maxillary first primary molars, and 1 maxillary second primary molar. None of the children presented with acute symptoms. Most of the cases displayed evidence of a fistula on the buccal alveolar mucosa. All teeth had previously received pulpotomy treatment and now, upon radiographic examination, displayed a radiolucent lesion in the root furcation suggesting unsuccessful outcome of the pulpotomy treatment. In some cases, the radiolucent lesion appeared to extend beyond the root furcation and encompass a portion of the remaining root structure. Six of the patients were previously treated in the Medical College of Georgia Pediatric Dentistry Clinic. Pretreatment radiographs were available for these teeth and none had evidence of a furcation radiolucency prior to treatment. These 6 teeth were treated with a standard formocresol pulpotomy and restored with either a silver

amalgam or a stainless steel crown (Fig 1).

The pretreatment condition and the pulpotomy procedure employed for treating the remaining 18 teeth is unknown. None of the teeth were considered suitable candidates for conservative pulp treatment. All teeth were extracted in the usual manner with elevators and forceps under local anesthesia. If a lesion remained attached to the root structure after extraction, it was detached and transferred to a specimen bottle containing 10% formalin. The sockets were gently curetted and the contents transferred to the specimen bottle. The tissue specimens were processed for routine paraffin embedding and cut as 5- μ m serial sections. The sections were stained with hematoxylin and eosin (H&E) and examined under a light microscope to differentiate cell type and general features of the lesion.

Results

Histological examination of the furcation lesions revealed a mixed cellular response which included granulomatous inflammation, chronic proliferative inflammation, acute inflammation and epithelium. Granulomatous inflammation is characterized by the presence of mononuclear phagocytic cells, monocytes and macrophages, arranged in an orderly fascicular or circular streaming pattern (Fig 2).

These fascicles often were surrounded by an outer rim of lymphocytes and fibroblasts and occasionally a core of amorphous eosinophilic material. Acute inflammation characterized by the presence of polymorphonuclear leukocytes was evident in most specimens as was chronic proliferative inflammation including lymphocytes, monocytes, macrophages, and plasma cells.

Variation was observed between sections in the relative amounts of the various inflammatory cells. Fibroblasts were evident in most specimens. Foreign body type giant cells were observed in some sections. Granulation tissue was not observed.

Stratified squamous epithelium was observed in 21 of the 24 specimens. The epithelium frequently demonstrated exocytosis and spongiosis (Figs 3, 4 – next page).

The presence of epithelial rosettes or epithelial is-

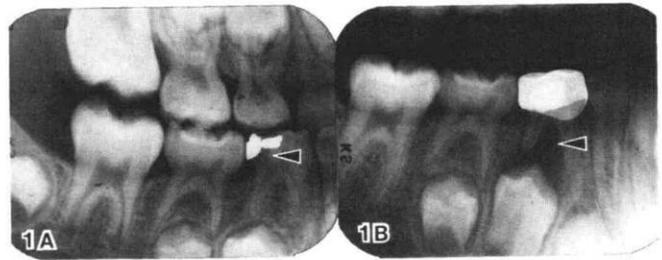


FIG 1. Pretreatment radiograph revealing distal caries exposing the pulp of the mandibular first primary molar (A). Post-treatment radiograph 17 months following formocresol pulpotomy treatment of the first primary molar. Note the furcation radiolucency (B).

lands (Rests of Serres), the residue of odontogenic epithelium, were observed in several specimens (Fig 5).

Three of the specimens were diagnosed as furcation granulomas. Twenty-one of the specimens were diagnosed as either a furcation granuloma with epithelium or a furcation cyst if a definite epithelial-lined lumen was present.

Discussion

The histological picture of the specimens was essentially that of a dental granuloma (Block et al. 1976; Langeland et al. 1977; Weiner et al. 1982). Mixed inflammatory reactions were observed with the chronic granulomatous inflammatory reaction being the predominant type. Epithelium was observed in 21 of the specimens. This finding suggests that most of the lesions were cysts or had the potential for cystic transformation. Potential sources of epithelium include remnants of the dental lamina and odontogenic epithelium (Rests of Serres), or epithelium introduced from the oral cavity.

These histological findings are similar to those previously reported for furcation lesions associated with cariously exposed nonpulpotomized primary molar teeth (Myers et al. 1987). However, a significantly greater number of these pulpotomy-treated specimens contained epithelium than did the untreated specimens. Epithelium was observed in 21 of 24 of these pulpotomy-treated teeth compared to 10 of 21 of the untreated teeth (Myers et al. 1987).

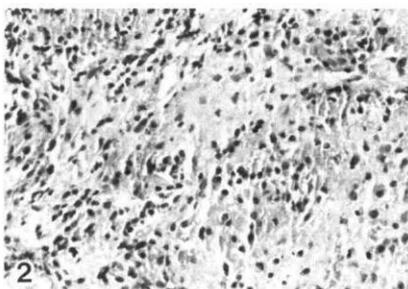
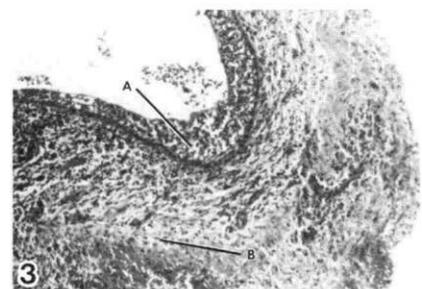


FIG 2. (left) H&E-stained paraffin section from a furcation lesion showing the typical orderly pattern of granulomatous inflammation (1000x).

FIG 3. (right) Cystic epithelium from a furcation lesion showing extensive spongiosis and exocytosis (A). Also note the granulomatous inflammatory response in the underlying connective tissue (B) (125x).



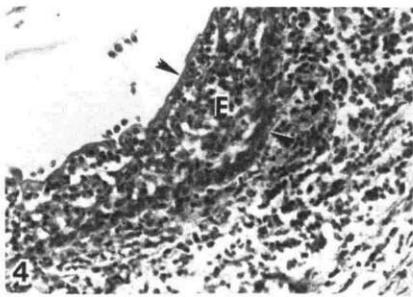


FIG 4. (left) An epithelial-lined cyst cavity (e.g., between arrowheads) from a furcation lesion. The epithelium reveals extensive exocytosis with the infiltration of numerous monocyctic and lymphocytic inflammatory cells (1000x).

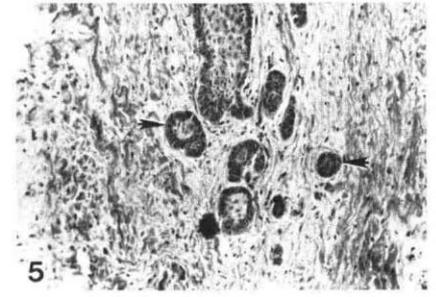


FIG 5. (right) Epithelial rosettes and epithelial islands (arrows) associated with the cystic furcation lesions suggesting remnants of odontogenic epithelium (600x).

Formocresol is the most commonly employed pulpotomy agent in the United States (Spedding 1968). In addition to the 6 teeth known to have been treated with formocresol, it is likely most of the remaining 18 teeth also were treated by the formocresol procedure. Formocresol is absorbed from a pulpotomy site, concentrated in the periodontal ligament and surrounding alveolar bone, and distributed systemically (Myers et al. 1978). The pulp response to formocresol is mixed and ranges from essentially healthy pulp tissue to total necrosis (Rolling and Lambjerg-Hansen 1978). Since these lesions associated with pulpotomy-treated teeth are essentially the same histologically as the lesions associated with primary molars which had furcation lesions without pulp treatment, the lesions cannot be specifically attributed to the use of formocresol. A recent report suggests that cystic lesions associated with pulp-treated primary molars are immune reactions possibly occurring as the result of phenolic groupings (Savage et al. 1986). Possibly, the use of formocresol may have contributed to the increased incidence of cystic lesions associated with these pulpotomized teeth compared to the previous report describing lesions associated with untreated teeth (Myers et al. 1987).

Several limitations are present in this study. The pretreatment condition and the exact pulpotomy procedure employed to treat 18 of the teeth is unknown. It is possible a furcation radiolucency was associated with some of these teeth prior to performing the pulpotomy. Therefore, the lesion could represent a pre-existing condition instead of a lesion resulting directly from a pulpotomy failure. Granulation tissue was not observed because the peripheral areas of the lesion were curetted gently to avoid any damage to the developing premolar. Granulation tissue likely would be present in the peripheral area as the lesion attempted to repair.

An important clinical implication is that a primary molar treated by pulpotomy may develop a furcation granuloma which has the potential for cystic transformation. The absence of clinical symptoms does not mean that a pulpotomy-treated tooth is healthy. Pulpotomy-treated primary teeth should receive a periodic

postoperative radiographic examination. A primary molar which develops a furcation lesion following a pulpotomy treatment should be extracted.

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Soviet dentist profiled

The lifestyles of a dentist living in the Soviet Union and a Minnesota dentist were compared in a June article in *Money* magazine.

What is life like for a prosperous Soviet family? Are they better or worse off than we think? Are their aspirations different from ours? These were just a few of the questions *Money* explored by focusing on the everyday life of the family of a successful Moscow dentist compared with that of an American dentist and his family. The similarities were as striking as the differences.

Both families' income rank in the top 3% in their countries: \$120,000 a year for the Americans, \$22,440 for the Soviets. And both have elegant residences, vacation homes and new cars. But after that the resemblance begins to fade.

Descriptions of the routine frustrations of Soviet life, scarcity of consumer goods, and high income taxes (13% on state wages — but up to 90% on private income), along with the advantages of free medical care and education, give readers some idea of the quality of life in the USSR.

Soviet dentists, or tooth doctors, as they are called, are paid 110 to 150 rubles (less than \$300) a month at state-run polyclinics. But, rather than settle for free but often shoddy care at the polyclinics, many people are willing to pay a good dentist privately. The private practice income of the Soviet dentist profiled in the *Money* story reached 1200 rubles (\$2040) some months before taxes.

The featured American family, while having a high income, has to devote a huge chunk of their annual income to educating their children. Both families face a comfortable retirement with pensions from the government and, for the Americans, from profit sharing plans and IRAs.