Regular tertiary dentin formation in response to low stimulus

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ABSTRACT

Background: The nature and severity of stimuli that reach the dental pulp vary and the response to protect the challenged pulp will vary accordingly. The aim of the study was to evaluate pulp response to low stimuli, histologically.

Materials and methods: Maxillary molars teeth of albino rats were subjected to 0.05% of citric acid for 12 hours/day for 3 days duration, histological evaluation was done in 7, 14, 30 days interval period.

Results: After 7 days, proliferation of new blood vessels in the pulp with congested blood vessels were identified in sub-odontoblastic layer. After 14 days, new dentin deposition with hypocalcified areas was identified. After 30 days, regular tertiary dentin formation was seen with demarcated line separating it from adjacent secondary dentin.

Conclusion: Low stimuli resulted in regular tertiary dentin formation.

Keywords: Dentin, enamel erosion, pulp response. (J Bagh Coll Dentistry 2007; 19(1) 47-49)

INTRODUCTION

The dental pulp may be induced to produce calcified material in addition to its usual primary and secondary dentin by a variety of outside stimuli including caries, attrition, erosion, cavity preparation, micro leakage around restoration and trauma.(1)

Stimuli of different types applied to teeth; result in a response tissue that may vary in appearance and composition. It may resemble secondary dentin in having regular tubular structure, or having few and/or irregularly arranged tubules or it may be relatively atubular. Therefore continuity of dentinal tubules between normal dentin and tertiary dentin will be lost in many instances. (2) Because of this wide range of presentation, this response tissue has been given a variety of names including irregular secondary dentin, reparative dentin, reactionary dentin, osteodentin. Although the term tertiary dentin for all hard tissues deposited on pulpal surface in response to an external stimulus can be used.(3,4)

Recent studies suggest that, primary odontoblasts may be involved in the initial stages of tertiary dentin formation and production of newly differentiated mesenchymal cells from pulp similar to odontoblast cells may share too in production of collagen (5).

MATERIALS AND METHODS

Nine Swiss albino rats of six months old age, weighing 500-650 mg, were used in this study. The animals received citric acid solution in 0.05% concentration (PH 5.5) in drinking water, twelve hours/day for three days duration.

Animals were sacrificed for 7,14,30 days interval (3 rats for each period).Maxillary molars teeth were fixed by immersing them with 10% buffered formalin and then decalcified by 10% formic acid, for 3-5 days for histological study. The sections were stained with hematoxylin and eosin and examined with light microscope. (6)

RESULTS

After 7 days, the primary odontoblast cells showed normal histological features, arranged as a palisade-like layer on pulpal surface with their odontoblastic processes extending in dentin. Proliferation of new blood vessels in the pulp can be detected; congested blood vessels were identified in sub-odontoblastic layer (figures 1-3). After 14 days, vacuoles were detected in odontoblast cell layer and some nuclei of cells were displaced into the dentinal tubules. New dentin deposition with hypocalcified areas was identified.(figures 4,5)

After 30 days, regular tertiary dentin formation was seen with demarcated line separating it from adjacent secondary dentin. Normal appearance and arrangement of odontoblast cells, with normal pulp tissue feature was also reported. (figure 6)

DISCUSSION

The present study applied low stimuli on molars teeth of rats, using low concentration of citric acid. It seems that citric acid deminerlized
enamel which exposed dentinal tubules, causing irritation to pulp tissue. This is represented by induction of blood vessels formation and as pulp response recognized as congested vessels seen in sub-odontoblastic layer.

Progression of pulp response detected after 14 days of experiment showing vacuoles identification in odontoblast cells and initiation of hard tissue deposition. This result coincides with Takeda et al results in 1999. The response to the outside stimuli is manifested in the structure of dentin the pulp produces. In the present study, we found regular dentin formation after 30 days resembling secondary dentin with continuity of their dentinal tubules distinguished from secondary dentin by demarcated lines. This may be attributed to the uses of low constant stimuli represented by its duration and concentration.

REFERENCES
Figure 4: Photomicrograph of newly formed dentine (D) with displaced odontoblast cell (OB) after 14 days of experimental period. H&E x 40.

Figure 5: High magnification view of previous figure 4 shows newly formed dentine with hypocalcified area (arrow), vacuoles (V) present in odontoblast cell. H&E x100.

Figure 6: Photomicrograph of fully formed tertiary dentine (TD) with demarcated line (arrow) separated tertiary dentine from secondary dentine (SD), primary dentine (PD) can be detected too. The view illustrates pulp response in rat for 30 days duration after experiment. H&E x 100.