Cementoenamel junction of deciduous teeth: SEM-morphology

E. CEPPI**, S. DALL’OCA*, L. RIMONDINI***, A. PILLONI**, A. POLIMENI*

**ABSTRACT.** Aim The aim of this study was to investigate the cementoenamel junction of a group of 11 primary sound mandibular incisors extracted for orthodontic reasons. Materials and methods Eleven caries and defect-free human inferior deciduous incisors were extracted for orthodontic reasons and the cementoenamel junction was investigated by scanning electron microscopy (SEM). The types of tissue interrelations were classified in four possible categories: 1) cementum and enamel edge-to-edge, 2) cementum overlapped by enamel, 3) enamel overlapped by cementum, 4) presence of exposed dentin between enamel and cementum. Results In our observations root cementum and enamel edge-to-edge interrelation was the most frequent feature observed in overall sample, root cementum overlapping enamel tissues was observed in more than one third of the cementoenamel junction area, exposed dentin was a rare observation. In few, small and rare areas enamel overlapped cementum. Further studies could determine statistical prevalence. Conclusion The cementoenamel junction of primary teeth differs from that of permanent teeth, the scarcity of gaps between cementum and enamel, the epithelial junction at the equator of the crown and the globosity of the crown are probable protective factors toward decay susceptibility.

**KEYWORDS:** Cementoenamel junction, Deciduous teeth, Cervical tooth wear, Cervical decay, SEM.

Introduction

The cementoenamel junction represents the anatomic limit between crown and root surface. In this area three types of mineralised tissues are present: enamel, cementum and dentin. In permanent teeth the distribution of these hard tissues is unpredictable and irregular in any one individual tooth. Three types of possible tissue interrelation have been described: enamel overlapped by cementum, the most frequent condition (65%); enamel and cementum edge-to-edge (30%); cementum and enamel not in contact with a strip of exposed dentin [Neuvald and Consolaro, 2000].

The morphology of the cementoenamel junction in permanent teeth is of great interest as it is correlated with dental sensitivity, susceptibility to non-caries cervical loss (erosion, abrasion and abfraction) and adhesion problems in restorations [Rees, 2006; Staninec et al., 2005; Vanuspong et al., 2002; De Las Casa et al., 2003; Dejak et al., 2005; Larsen et al., 2005, Walters, 2005; Ceruti et al., 2006; Tanaka et al., 2006].

Information on cementoenamel junction of primary teeth is limited. Leonardi et al.[1996] investigated this area by means of scanning electron microscope (SEM) and highlighted, in the specimens they observed, 26 carious and non-caries human maxillary and mandibular primary teeth, a prevalence of overlapping cementum on the enamel and an edge-to-edge relationship. No gaps between enamel and cementum were observed. The cementoenamel junction appeared as a sinuous band 40-60 µm broad and the cementum was reported to be acellular, as in permanent teeth, but thinner and rough. Near the cementoenamel junction calcium spherites were observed with diameter from 2 to 10 µm. Bimstein et al. reported that on the root surfaces of 2 primary teeth without evidence of periodontitis and extracted for orthodontic reasons, no resorption lacunae nor cuticle or bacteria were found. At the cementoenamel junction area of teeth from children with prepubertal periodontitis they highlighted dense colonies of short and long filaments, resorption lacunae and crystals of calcium oxalate dihydrate (4 to 5 µm) [Bimstein et al., 1998].

In permanent teeth the cementoenamel junction is
placed at the bottom of the gingival sulcus, in deciduous teeth the junction is more apical as the epithelial junction is at the equator of the crown. This anatomical feature and the ultrastructural peculiarities of cementoenamel junction could be protective conditions toward decay of the cervical region and dentinal sensitivity that are in fact rarely observed in primary dentition [Leonardi et al., 1996].

The aim of this study was to investigate the cementoenamel junction of a group of 11 primary sound mandibular incisors extracted for orthodontic reasons from healthy children.

Materials and methods

Eleven caries and defect-free human inferior deciduous incisors were extracted for orthodontic reasons with no inflammation of the periodontal ligament and/or the pulp from patients not affected by systemic or genetic diseases. The teeth selected presented more than half root not yet resorbed.

The teeth were gently washed in NaOCl 5% solution for 60 seconds and then in 3% H2O2 in order to expose mineralised tissues and provide disinfection. Then, the specimens were washed with water, dehydrated in ascending ethanol concentrations (70, 80, 90, 100%) and finally dried in air.

The specimens were mounted on aluminum stubs, sputter-coated with a palladium-gold alloy by means of the Sputter Coater device (Coating unit E5100, Polaron Equipment Ltd. Watford Hertfordshire, UK) and investigated with SEM (840A, Jeol Corp., Tokio, Japan).

Microphotographs were taken at different magnifications (1000X, 2000X, 4500X) of the cementoenamel junction all along the circumference of the teeth.

The types of tissue interrelations were classified in four possible categories: cementum and enamel edge-to-edge; cementum overlapped by enamel; enamel overlapped by cementum; presence of exposed dentin between enamel and cementum.

Results

The distribution of the mineralised tissues that composes the cementoenamel junction was irregular. In our observations root cementum and enamel edge-to-edge interrelation was the most frequent feature observed in overall sample (Fig. 1), root cementum overlapping enamel tissues was observed in more than one third of the cementoenamel junction area (Fig. 2), exposed dentin was a rare observation (Fig. 3a, 3b). In few, small and rare areas enamel overlapped cementum (Fig. 4). The cementoenamel junction appeared as a sinuous line. Cervical cementum appeared rough owing to the presence of calcified Sharpey’s fibers that Leonardi et al. called calcium spherites [Leonardi et al., 1996]. No resorption lacunae were observed in the enamel or in the cervical cementum.

Discussion

The selection criteria for the collection of the teeth to be investigated by SEM in this study were chosen in

![Fig. 1 - SEM 2000 X. Cementoenamel junction in inferior deciduous incisor: enamel (E) and cementum (C) are edge-to-edge.](image1)

![Fig. 2 - SEM 2000 X. Cementoenamel junction in inferior deciduous incisor: cementum on enamel.](image2)
order to describe the ultrastructural morphology of the cementoenamel junction in sound deciduous teeth. Teeth affected by pathological conditions such as infection and trauma were excluded as these conditions can cause resorption areas on the root surface [Heithersay, 1999; Sahara and Ozawa, 2004]. Furthermore, previous studies highlighted that localised and generalised juvenile periodontitis, prepubertal periodontitis, hypophosphatasia, Papillon-Léfevre syndrome and leukocyte adhesion deficiency are related to irregularities in the cementum surface, cementum hypoplasia/aplasia and cementum width [Waldrop et al., 1995; Sixou et al., 1997; Yawaka et al., 2003; Bimstein et al., 1998; Baroncelli et al., 2006]. Another exclusion criterion was resorption of more than one half of the root as the cementoenamel junction can be altered prior to shedding by the deposition of cementum-like tissue on the resorbed cementum and enamel [Rolling, 1981; Sahara and Ozawa, 2004].

Information on cementoenamel junction of primary teeth is limited [Leonardi et al., 1996; Bimstein et al., 1998] and it is generally focused on pathological conditions. As reported in previous studies regarding permanent and primary teeth [Leonardi et al., 1996; Neuvvald and Consolaro, 2000], the distribution of the mineralised tissues at the cementoenamel junction was irregular on any one individual tooth observed. The results of our investigation are slightly different from that of Leonardi, as root cementum and enamel edge-to-edge interrelation was the most frequent feature observed and root cementum overlapping enamel tissues was observed in more than one third of the cementoenamel junction area. Leonardi et al. observed no gaps between enamel and cementum, whilst in our samples exposed dentin was a rare observation. Further studies could determine statistical prevalence. A wider sample is necessary to confirm the data gathered in this study. Further studies should also be performed to evaluate the cementoenamel junction of superior incisors, canines and molars with a particular attention to selection criteria for the collection of the teeth to be investigated.

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References


