TOOTH EROSIVE POTENTIAL OF SOME SOFT DRINKS

Thesis

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Introduction

Dental erosion is defined as the acid induced irreversible mineral loss of dental hard tissues without the involvement of microorganisms **Eccles, (1979)**.

The occurrence of dental erosion was reported as early as the 19th century **Royston, (1808)**, and since then the incidence and prevalence of dental erosion is increasingly being reported. Its prevalence appears to be increasing especially among children and adolescents **Nunn et al., (2003)**.

Especially with the decline in caries rates in some countries, erosion is now becoming a focus of increasing interest both in clinical dentistry and research work.

The management of dental erosion is an area of clinical practice that is undoubtedly expanding. The past two decades have seen numerous investigations and reports on the prevalence, etiology, pathogenesis and modifying factors of dental erosion **Amaechi et al., (2003)**.

Soft drinks consumption has frequently been reported to be one of the most important risk factors of dental erosion. It is known that soft drink consumption is very high and may be increasing **Jensdottir et al., (2004)**.

In clinical studies, drinks with low pH such as cola-based carbonated drinks, have often been the drinks most related to dental erosion. Nevertheless in vitro studies have shown fruit juices to have higher neutralizable acidity than cola-based carbonated drinks; this has been used to suggest that fruit juices also may have considerable erosive potential **Edwards et al., (1999)**.

There is, consequently, a need to determine which soft drinks' properties -e.g. pH and neutralizable acidity- are the most important with respect to determining their erosive potential.

Review of literature

Enamel forms a protective covering of variable thickness covering the entire surface of tooth crown, providing the shape and contour of the crown. As it covers that part of the tooth exposed to oral environment, it is the primary site of defense against dental caries **Sharawy et al., (1991)**.

The inorganic content of enamel is crystalline calcium phosphate (Hydroxyapatite) with the chemical formula $Ca_{10}(PO_4)_6(OH)_2$. Small amounts of carbonate, magnesium, potassium, sodium, strontium, lead and fluoride are also present and therefore enamel crystals are considered imperfect hydroxyapatite. Most ion substitutes other than fluoride result in a small increase in the solubility of the crystal at an acidic pH. Although, the main bulk of enamel is formed of densely packed hydroxyapatite crystals, a fine network of organic material and water exist between the crystals **Eanes, (1979)** and **Eisenmann, (1998)**.

Enamel is composed of enamel prisms, prism sheaths and in some regions a cementing interprismatic substance **Sharawy et al., (1991)**.

Enamel prisms in human enamel are morphological features produced by ameloblasts. They are considered to be petrified images of the pathway of ameloblasts. The prisms own their existence to a highly organized pattern of crystal orientation **Radlanski et al., (2001)**.

When prisms are examined in cross sections, a keyhole shape can be observed. Enamel prisms are seen with specific orientation where the head of the key hole is oriented towards the cuspal or incisal direction, and the tail is oriented towards the cervix of the tooth, So that the tail of one enamel prisms lies between heads of two other prisms **Sharawy et al., (1991)**.

Not all prismatic enamel in human tooth shows the keyhole pattern, three shapes are commonly seen:

Pattern 1: Prisms appear completely circular. This is commonly seen near the enamel dentine junction and cusp tips.

Pattern 2: Prisms are arranged in longitudinal rows.

Pattern 3: Prisms are so called arcade which is the most common variety found in human.

The appearance of enamel prisms is dependent on the plane of section. **Helmcke, (1967)**

Radlanski et al., (1995) reported that there is no difference between enamel prisms of permanent and deciduous enamel, except that prisms are smaller in deciduous enamel.

Scott et al., (1973) using electron microscope was able to distinguish: enamel prisms, prism sheath; a concentration of organic material at the periphery of the prism, and interprismatic substance.

Prism sheath was long considered to be a wholly organic membrane but, it is now well established that it contains more organic material than the prism **Gustafson et al., (1967)**. **Eisenmann, (1998)** reported that it is the boundary where the crystals of the prisms meet those of the interprismatic region at sharp angles.

Prisms are held together by interprismatic cementing substance, which sometimes separates prisms and their sheaths or may be absent in areas leaving prism sheaths in contact with each other **Frank et al., (1967)** and **Gustafson et al., (1967)**.

Surface enamel differs physically and chemically from subsurface enamel. Surface enamel is harder, less porous, less soluble, and more radio opaque than subsurface enamel. It is richer in trace elements especially: fluoride, zinc, lead, and chlorides, it is lower in carbonated content, water content and higher in degree of mineralization. These properties may contribute to the ability to resist acid dissolution and caries initiation, as well as to the character of the early enamel lesion **Anderson et al., (1992)**.

Aprismatic or structureless enamel signifies the outer most layer of enamel a 30 µm thick layer described in 70% of permanent teeth and all deciduous teeth **Sharawy et al., (1991)**.

Surface enamel structure

-*Perikymata*: The enamel surface may be smooth or may have fine ridges, such ridges result from the *striae of Retzius* terminating on the surface enamel, forming transverse wave like grooves parallel to each other and to the cement-enamel junction. However, perikymata spacings vary and