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FORMS AND AETIOLOGY OF THE ENAMEL FORMATIONS IN THE CERVICAL ZONE OF TEETH (Literary summary) *

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RESUME

Les Auteurs présentent l'étude synthétique des formations d'émail dentaire, d'après la littérature et leurs travaux.

Ils décrivent quatre types de formations d'émail : **la langue d'émail, la perle d'émail, la goutte d'émail et la raie d'émail.**

Certains auteurs supposent une connexion entre les langues d'émail très développées et les parodontoses, mais la langue d'émail ne peut être rendue responsable que du maintien ou de l'aggravation de l'inflammation. Comme elle ne cause aucun désordre esthétique ou fonctionnel, elle ne peut être considérée comme une anomalie évolutive mais seulement comme une variation anatomique de la marge de l'émail.

Il faut séparer les perles d'émail, du point de vue étiologique, en deux groupes. Les perles d'émail de petite taille, d'origine extradentale ou intradentale, peuvent être considérées comme des variations anatomiques Les perles d'émail, plus importantes, sont composées de dentine ou de dentine avec une pulpe, elles peuvent être assimilées à des dents surnuméraires.

Les Auteurs rejettent l'étiologie tumorale des formations d'émail surnuméraire.

1 – INTRODUCTION

In an earlier work (Kocsis-Marcsik, Fogorvosi Szemle, in press), we have observed the frequency of irregular enamel formations in the cervical zone of teeth in a material originating from the Avar Age. In the 2099 molars belonging to 239 crania (73,2 per cent) we have found such formations in 258 cases. We have arranged the enamel formations in four groups : the enamel tongue and enamel drop extend as process of the coronal enamel towards the bifurcation of the root. The enamel stripe and enamel pearl, however, take place in a smaller or larger distance from the coronal enamel.

In our present paper, we have performed the comparative investigation into the enamel formations and are making known the aetiological relations to be found in the literature.

2 – TYPES OF ENAMEL FORMATIONS.

The enamel tongue was first described by Linderer in 1842 (cited by Gorlin-Goldman, 1970). On the basis of its dimension, there were distinguished three grades by Masters and Hoskins (1964). It is of first grade if from the limit of enamel-cement only one definite enamel formation can be found towards the bifurcation (Fig. 1). It is of second grade if the enamel process reaches to the level of the root bifurcation. And it is of third grade if it extends between the roots. Swan and Hurt (1976) distinguish an incipient form, as well.

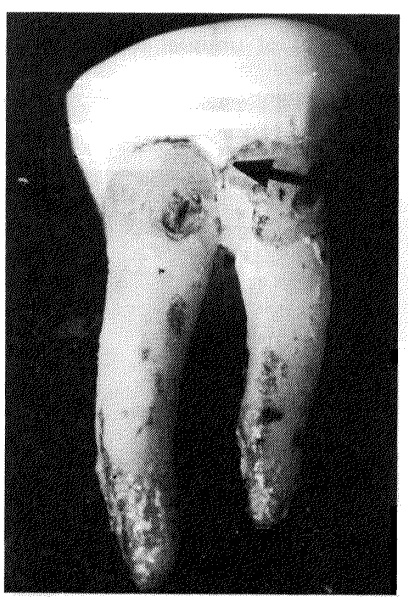

FIGURE 1 – An enamel tongue on the side of a lower second buccal molar

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The enamel tongue is localized at the line of the bifurcation, mainly on the buccal side. In respect of its frequency, in contradiction to its 15-50 per cent occurrence, found in the literature (Grewe et al. 1965, Koichi Kawasaki et al., 1976, Leib et al., 1967, Swan-Hurt, 1976), we have only found 11 per cent. The cause may have been we have not taken into consideration the incipient enamel process (till about 0,5 mm). On the other hand, the material of our investigation originates from a 1200-1300 years older time, while the literary data generally refer to the present-day population. This latter conception is supported by the results of Bissada-Abdelmalek's investigations (1973), as well, according to which in the teeth of the Egyptian crania enamel projections were found in 8,6 per cent.

On the basis of our investigations and the literary data (Grewe et al., 1965, Moeschler, 1968, Koichi Kawasaki et al., 1976, Leib et al., 1967, Pedersen, 1949, Tsatsas et al., 1973), the enamel tongue most frequently occurs in the lower second molar, in about 35 per cent.

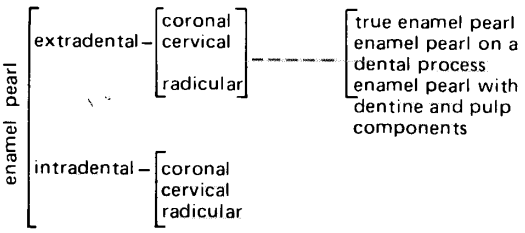
The second enamel formation occurring most frequently is the enamel pearl. According to Göllner (1928), it was first describe by Linderer in 1842. According to Schumacher-Schmidt (1976), however, its first description took place by Wedl in 1879, then by Baume in 1890.

The enamel pearls were distributed by Fuler and Meyer (1927), on the basis of their tissue construction in to three groups :

1. enamel of unusual location at a normal dentine surface,
2. below the enamel of unusual location there is a dentine process,
3. in the dentine process there is also a pulp cavity.

Göllner has investigated (1928) into the last two groups as sub-groups and sharply separated these from the enamel to be found at the smooth dentine surface, which mostly lies on the dentine, covered with cement.

After the investigations of Cavanha (1965) the enamel pearls were newly grouped by Pindborg (1970) :



The results of investigations concerning the frequency and localization of the enamel pearls are different. The enamel pearls covered with cement and those of order of a few microns, as well as the intradental forms cannot be, of course, investigated by inspectio The type of it, to be investigated by inspection (Fig. 2) mostly occurs in the upper first and lower second molar, in the mesial or distal furcation in 1.1 - 1.5 per cent (Kocsis-Marcsik, Fogorvosi Szemle, in press - Turner, 1945). At the same time, with microscopical investigations, the percentage of occurrence of the enamel pearl is 14.8 ; in molars 53.6 in incisors 13.7, in premolars 1.0 (Göllner, 1928). No data were found concerning enamel pearls in a canine tooth.

The form of enamel drop is taken - apart from a few authors (Cavanha, 1965, Lasker, 1950, Moscow, 1971, Pedersen-Thyssen, 1942) - for identical with the enamel drop in a single case in the material of our investigation (2099 teeth) (Fig. 3).

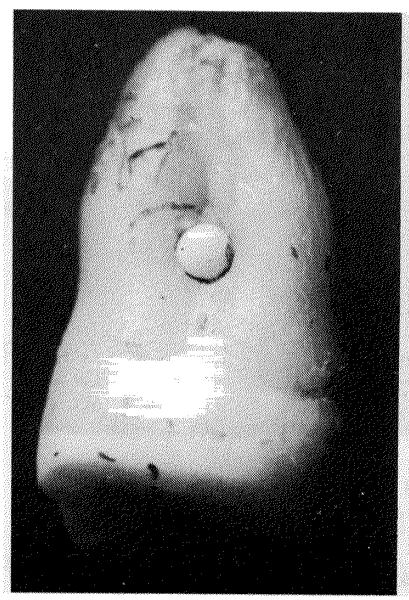


FIGURE 2 – An enamel pearl in an upper third molar mesially

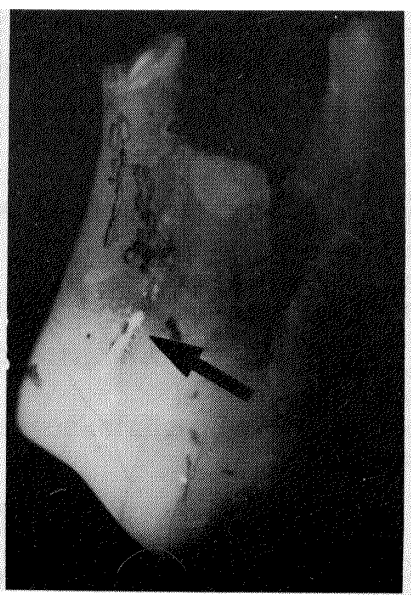


FIGURE 3 -- An enamel drop in an upper second molar buccally

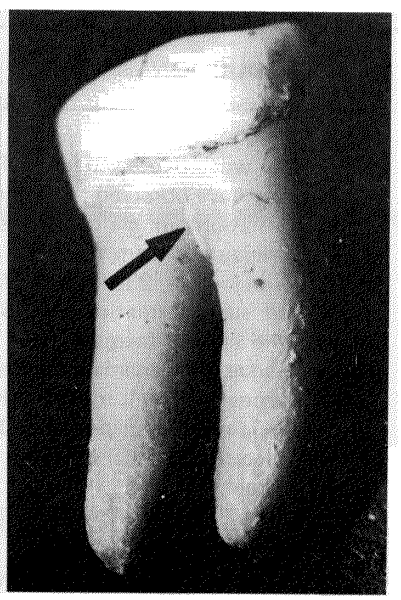


FIGURE 4 -- An enamel stripe on the buccal side of a lower second molar

We have not found any form of enamel stripe, described in the literature. Independently from the coronal enamel, it may be found, protruding into the radicular bifurcation (Fig. 4). It is an about 1 - 1,5 mm long, 0,2 - 1,5 mm wide enamel formation, rising from the dentine basis (Fig. 5). According to our investigations, it occurs both in fossil (0,5 per cent) and in recent teeth. The localization of the enamel stripe is corresponding to that of the enamel tongue. It occurs most frequently in the lower second molar, buccally

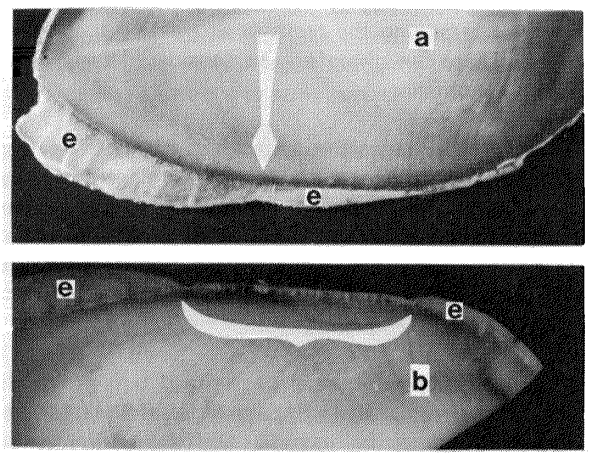


FIGURE 5

a) A picture of the polished sample of an enamel tongue. The white arrow designates the end of the coronal enamel.

b) A picture of the polished sample of an enamel stripe. The zone designated, covered with cement, is the enamel-free dentine (e = enamel).

3 – AETIOLOGICAL RELATIONS.

There may be found but a few data on the aetiology of enamel formations. From among the four forms, we have only to deal with the formation of the enamel pearl because the other two forms can be deduced from these .

1. The form of enamel drop was described like anamel pearl, adhering to the end of an enamel tongue (Cavanha, 1965, Moskow, 1971, Pedersen-Thyssen, 1942). In Figure 6, the formation of the enamel pearl and enamel tongue into the form of a drop can be seen. The frequency of the enamel drop is, therefore, equal to the frequency of the concrescence of ena mel tongue and enamel pearl.

2. The enamel stripe is a thin zone of the enamel tongue, stretching into the radical bifurcation, which came off during the growing of the tooth. The mechanism of coming off is that the enamel epithelium, forming the enamel tongue, has broken in the course of the growth of roots and then, in this form, it hardened (Orban, 1949). This is referred to by that, above the enamel stripe, the edge of the coronal enamel tongue, exactly in the direction of the enamel stripe lying below it. Between them, it is sometimes to be found a thin connection, as well, which is hardly visible to the naked eyes (Fig. 7). On the other hand, as already mentioned, its localization agrees with that of the enamel tongue.

4 – AETIOLOGY OF THE ENAMEL TONGUE.

At discussing the enamel formations, the question arises, whether these take place as anomalies or they are to be considered as dentition variations.

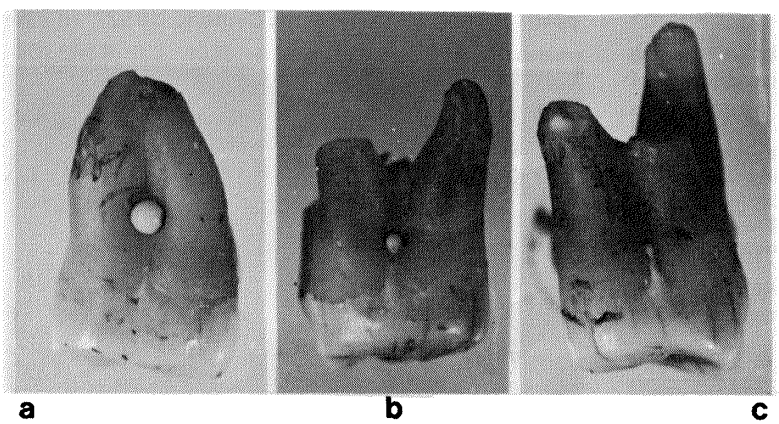


FIGURE 6

a) An enamel pearl, far from the enamel tongue
b) An enamel pearl in the proximity of the enamel tongue
c) The enamel tongue and enamel pearl united themselves into an enamel drop

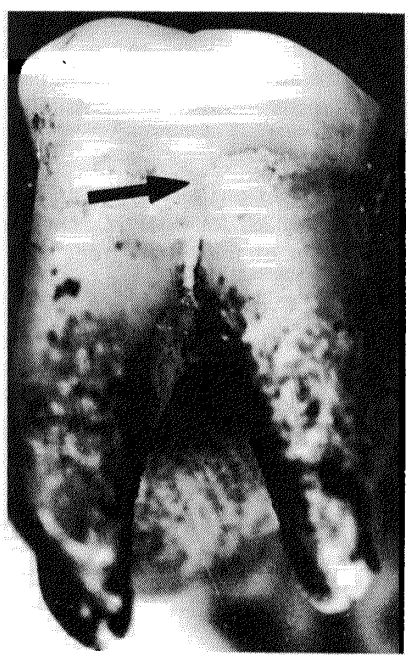


FIGURE 7 – A thin connection between the enamel stripe and the coronal enamel

A number of authors (Bissada-Abdelmalek, 1973, Grewe et al., 1965, Swan-Hurt, 1976) suppose some connection between the major enamel tongues and the paradental processes. The formation of enamel can, however, not take any part in the formation of these, as primary factor, because the epithelial layer of the gingiva organically adheres to the surface of the enamel (Schroeder-Listgarten, 1971). The gingiva is only separated from the enamel as a result of an inflammation and if then an enamel formation is present, a deep sac issues. The enamel tongue may, therefore, only be held responsible for the continuation or the seriousness of the inflammation. As the neamel tongue does not cause either an aesthetical or a functional disturbance (Dobszay, 1969), it cannot be regard as a developmental anomaly but only as an antomical variation of the edge of enamel.

Concerning genetics of the enamel tongue, there have been found only few data. According to Moeschler (1968), on the basis of gene frequency calculations, the enamel tongue seems to be genetically determined. The inheritance of this enamel formations can only be proved very difficulty. According to our present-day knowledge, it can only be studied in a removed tooth. In a routine radiography it cannot be observed. As immediately in the mouth the evaluation is limited, the appearance in more than one generation could only be cleared up by a 20 - 30 years long longitudinal investigation. Inheritance is indirectly referred to by that this must have had a part in the large percentage of the anatomical variants and anomalies appearing in teeth (Gorlin-Goldman, 1970, Pindborg, 1970, Csiba, 1978). On the other hand, a difference manifests itself between the single populations (Pedersen, 1949, Bissada-Abdelmalek, 1973), where there is a difference in the frequency both root-bifurcation and of enamel processes. This calls the attention to the connection between the two phonomena and to the possibility of inheritance, as well.

On the basis of literary data (Gorlin-Goldman 1970, Göllner 1928, Miles 1967), the accepted theory of the origin of the enamel tongue is the following. In the course of the development of polyradicular teeth, at the strangulation of roots, the enamel organ forms tongue-shaped horizontal processes, which are showing towards each other. These tongues are built up of the same epithelial cells, like the enamel organ. In the course of calcification, these processes are transformed to a greater or less degree into an enamel tissue.

5 – AETIOLOGIE OF ENAMEL PEARLS.

At the morphological description, we have mentioned that several types of enamel pearls are known. From aetiological point of view, two groups should be separated. According to Pindborg's classification (1970) into one of the groups, the so-called "true enamel pearl" of extradental or intradental appearance falls, while the second group is formed by those having dentine or dentine and pulp components, as well.

The small enamel pearls, falling in the first group, resp. the smaller forms of a few mm-s from the second group, may similarly be considered as anatomical variants. The major enamel pearls, particularly those containing pulp, as well, can cause some problem at removing the teeth or at treating the dental radix. These can, therefore, be considered as developmental anomalies.

To their inheritance the same establishments refer as to the enamel tongue (by X-ray examinations, only the major, supernumerary enamel pearls of peak or tooth character can be observed). Between the appearances of enamel pearls in different populations there is some difference (Pedersen, 1849, Gorlin-Goldman, 1970).

The separation of enamel pearls into two groups is aetiologically justified. On the basis of the present-day literary data, their genesis is different.

1. The true enamel pearl - i.e. which is lying at a dentine surface of smooth, normal tissue structure - is formed presumably in the following way.

Some parts of Hertwig's dentinal sheath survive after the formation of roots, as well. These are the epithelial islands described by Malassez (1885). Their cells - or already in the time of the root formation, the cells of Hertwig's dentinal sheath - can be transformed into ameloblasts and form - in case of an extradental enamel pearl - at the surface on the normal root dentine an enamel of microscopical order of magnitude, possibly covered with cement (Gorlin-Goldman, 1970, Miles, 1967, Moskow, 1971, Orban, 1949, Pindborg, 1970, Scott-Symons, 1952). In case

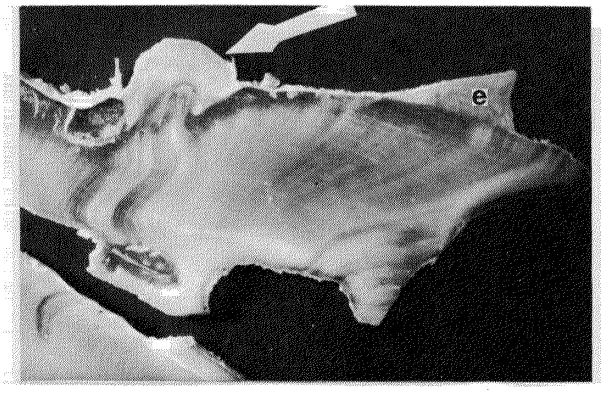


FIGURE 8 – An enamel pearl with a dentine nucleus (a picture of the polished sample).
The enamel formation partly rises from the dentine. Below it, the dentine canals are of irregular course (e = enamel).

of an intradental form, the ameloblasts are invaginated by the developing dentine and the formed enamel is surrounded by dentine (Cavanha 1965, Pindborg 1970).

The second theory of the formation of the true enamel pearl - which is not duly supported - comes from Göllner (1928). According to this, at the ends of the epithelial processes, turning towards one another and developing the poly-root character the epithelial cells, piled up owing to the active growth, can be transformed into enamel. This increase in epithelial cells can take place owing to some unknown cause even independently of the poly-root character, at a smooth dentine surface.

2. The enamel pearls, having dentine resp. dentine and pulp components, too, can be considered as the micro-shapes of the supernumerary teeth resp. twin-teeth (Gorlin-Goldman, 1970, Göllner, 1928, Pindborg, 1970, Wannenmacher, 1952).

A number of authors (Schlenker, 1891, Loos, 1902, Turner, 1945, Thoma, 1950, Malassez-Galipe, 1910) regard the enamel pearls, covering dentine processes, as enameloma, small enamel tumours. The present-day literature does not accept the tumour-formation as the aetiology of such enamel pearl forms. On the basis of histological investigations (Cavanha, 1965, Moskow, 1971, Tadashi Funaki, 1975) the ends of the enamel prisms of the enamel pearl are irregular, the canals in the dentine below them are of irregular course, the calcination is deficient (Fig. 8). This tissue structure does not refer to the character of a tumour and in the environment of the enamel pearl (cement, peridontium) there were also not described any cells with degenerations, changes, characteristic of a tumour.

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