

Perikymata: A Non-existent Term. A Scientific Literature Invention? Terminology Analysis and Proposal

Periquematíe: Un Término Inexistente. ¿Una Invención de la Literatura?
Análisis de la Terminología y Propuesta

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SUMMARY: The constant and gradual apposition of the enamel during odontogenesis forms different histological structures on the tooth, including the perikymata, which appear on the crown surface as ridges between two imbrication lines. Although they are enamel-dependent structures described in various scientific texts and publications, they are not included in the enamel-dependent histological terms published in the *Terminologia Histologica*. The aim of this study was to analyze the term perikymata from a linguistic point of view and propose it as a new histological term. The word perikymata is derived from the Greek words *perí* 'around'+ *kyma*, 'wave', introduced by Preiswerk in 1895. Although the term is descriptive in itself, concentrating only information about the structure in a single word, as the terminology establishes, this does not indicate its location. We propose the term *perikymata enamelis* (perikymata of the enamel) be added. Although proposing new terms that are more in line with the International Federation of Associations of Anatomists (IFAA) and its terminology poses great challenges, a term is not just a word that makes reference to a morphological structure, it is also a unit of language, a means of communication, which in this case unites the morphological community in a single language.

KEY WORDS: Enamel; Perikymata; *Terminologia Histologica*.

INTRODUCTION

Terminology is a unique communication tool inside and outside any specific scientific field, enabling clear communication with no confusion. Given that anatomy may be considered the first exact medical field, its terminology serves as the central pillar for other medical disciplines (theoretical and clinical) (Kachilik *et al.*, 2015), where the development of anatomical terminologies is the foundation of medical terminology so that doctors and scientists worldwide can use the same name for each structure (FICAT, 2008).

The *Terminologia Histologica* (TH) groups the cytological, general histological and special terms (i.e., microscopic anatomy), and given the complexity of the disciplines that it encompasses, it is common to find eponyms (Roa *et al.*, 2016), Latin neologisms (e.g., *Vesicula transferrens enzymata lysosomatica*) as well as commonly used abbreviations (e.g., MALT) (FICAT). As we can see, TH are not perfect, and several researchers have observed inconsistencies, such as excessively long terms, multiplication

of terms (Kachilik *et al.*), and mismatches in the naming of structures in the different terminologies, to mention just a few (Vásquez & del Sol, 2015). On the other hand, there are many omissions of terms, and the area of dental histology is a good example, where some frequently used terms have been omitted in the scientific literature and textbooks, such as the term perikymata.

TERMINOLOGY ANALYSIS AND DISCUSSION

The appositional secretion process of the enamel during its histogenesis creates a series of striations on the surface of the dental crown in the form of grooves known as Perikymata (Simmer & Hu, 20) *perí* [περί] 'around' + *kýma* [κύμα] derived from the Greek words 'wave' (Cortés & Ureña, 2011). In 1895 the first *Nomina Anatomica* was published in Basel, Switzerland, known as

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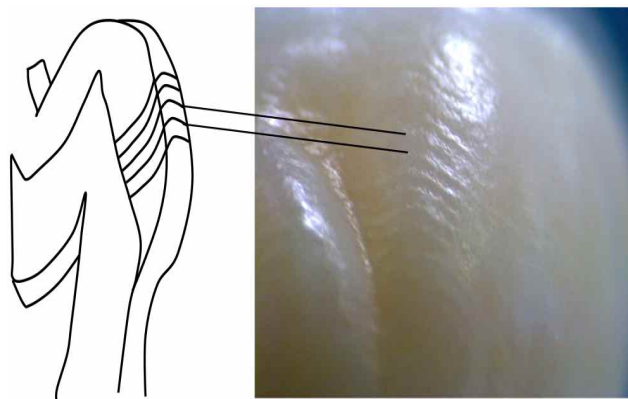
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the Basel Nomina Anatomica (BNA), coincidentally the same year the term by Preiswerk was introduced (Preiswerk, 1895) in German as 'Perikymatien', although previously in 1678, Dutch researcher Leeuwenhoek was the first to describe them as, "fine circular grooves, oriented cross-sectionally on the surface of the enamel" (Nasmyth, 1839). The perikymata are the externalizations of enamel incremental lines (striae of Retzius) (Simmer & Hu), which are nothing more than lines that show the constant apposition of the enamel during its secretion process (Fig. 1). Retzius (1837) was one of the first to observe incremental growth lines on the enamel of vertebrates, which have been widely defined and described, particularly in studies on primates (Dean, 1989; Boyde, 1990).

The term perikymata is undoubtedly accepted and used in various histology texts in various languages, such as Portuguese (periquimácias) (Katchburian & Arana, 2012), Spanish (periquematias) (Gómez de Ferraris & Campos Muñoz, 2009; Chiego, 2014) and English (perikymata) (Bath-Balogh & Fehrenbach, 2011; Hand & Frank, 2014; Nanci, 2013) and in the scientific literature in general (Hoffman *et al.*, 1969; Huang *et al.*, 1998; Monge *et al.*, 2006; Bocaege *et al.*, 2010; Saeves *et al.*, 2016). In addition, it is a term recognized in the Oxford Dictionary of Dentistry (Ireland, 2010), which describes them as: "Incremental growth lines approximately 30–40 μm apart that appear on the surface of enamel as a series of curved grooves. They indicate the termination of the enamel striae of Retzius on the labial surface of the tooth. They may disappear over time due to surface abrasion". However, it is not a word recognized by Spain's Royal National Academy of Medicine (RANM, 2012) nor has it been incorporated into the *Terminologia Histologica* by the Federative International Programme for Anatomical Terminology (FIPAT), sponsored by the International Federation of Associations of Anatomists (IFAA) (FCAT, 2001).

There is no doubt perikymata exist on the surface of the dental crown: multiple studies attest to this. The number and spacing of the perikymata are considered important



indicators of dental growth patterns, providing information on crown formation times and underlying development processes (Bocaege *et al.*, 2010). In addition to being used in anthropological research for the purposes of estimating the age at which growth alterations caused by developmental defects were produced (Hillson & Bond, 1997; Fitzgerald, 1998), as well as determining the age of crown formation and the age of death in young hominid fossils to infer the life history of the fossil (Ramirez Rozzi & Bermudez de Castro, 2004; Guatelli-Steinberg & Reid, 2008; Le Cacec *et al.*, 2015; Modesto-Mata *et al.*, 2015), in this area the perikymata count is a widely used technique mainly due to its advantages: it is non-invasive and can be done under a stereomicroscope or by means of scanning electron microscopy (SEM) (McFarlane *et al.*, 2014).

The *Terminologia Histologica*, despite being a great work requiring the efforts of many specialists in different areas, still has some gaps in it. The perikymata, although structures dependent on the apposition of the enamel described in many scientific texts and publications, are not found among the enamel-dependent histological terms published in the *Terminologia Histologica* or the terms dependent on the tooth in the *Terminologia Anatomica* (FCAT), and is also used indistinctly and erroneously as a synonym for the imbrication lines (Chiego; Risnes, 1984); the latter is another omitted term. Although the term perikymata is descriptive in itself, concentrating the information of the structure in a single word, as the terminology suggests, it does not indicate its location. Therefore, and according to the evidence and research used in the present work, we propose its incorporation in the *Terminologia Histologica* as *Perikymata enameli*: perí 'around' + kyma, 'wave' [amel germ. 'enamel'] (perikymata of the enamel).

CONCLUSIONS

Finally, everyone knows that proposing new terms that are more in line with the International Federation of Associations of Anatomists (IFAA) and its terminology poses great challenges. We must remember that a term is not just a word that makes reference to a morphological structure, it is also a unit of language, a means of communication, which in this case unites the morphological community so that health care professionals and researchers worldwide will use the same name for each structure, both in textbooks and in scientific publications.

Fig. 1. Schematic vision of surface zone of enamel in a longitudinally sectioned tooth, and buccal aspect of upper molar. Perikymata are clearly visible across the entire crown.

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RESUMEN: La aposición constante y paulatina del esmalte, durante la odontogénesis, forman en el diente distintas estructuras histológicas, uno de ellas son los perikymatas; los cuales se presentan en la superficie coronaria, como rodetes o crestas bajas, entre dos líneas de imbricación. Si bien son estructuras dependientes del esmalte, descritas en múltiples textos y publicaciones científicas, estas no se encuentran dentro de los términos histológicos dependientes del esmalte, publicados en *Terminologia Histologica*. El objetivo del estudio fue realizar un análisis del término perikymata desde un punto de vista lingüístico y proponerlo como nuevo término histológico. El término perikymata deriva de las palabras griegas *peri* 'alrededor de' + *kyma*, 'onda', introducido por Preiswerk en 1895, si bien el término es descriptivo por si solo concentrando la información de la estructura en una sola palabra, tal como lo establece la terminología, este no indica su ubicación. Debido a lo anterior proponemos agregar el término *perikymata enamelis* (periquematíe del esmalte). Aunque proponer nuevos términos que estén más acorde con la señalado por la International Federation of Associations of Anatomists (IFAA) y la propia terminología, presenta grandes desafíos; un término no sólo es una palabra que hace referencia a una estructura morfológica, sino que también es una unidad del lenguaje, un vehículo de comunicación, que en este caso une a la comunidad morfológica en un solo lenguaje.

PALABRAS CLAVE: Esmalte; Periquematíe; *Terminologia Histologica*.

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