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Analysis of the amelocemental junction in premolars of an ecuadorian population

Análisis de la unión amelocementaria en premolares de una población ecuatoriana

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Abstract

The aim was to microscopically analyse the prevalence of amelocemental junction types in premolars according to Choquet's classification. The study was observational, descriptive and cross-sectional. The sample included extracted maxillary and mandibular premolars (60 premolars). Random sampling was used to select the teeth. As a result, it was determined that the most prevalent Choquet case was the bis-to-bis case, which represented 35 teeth (58.33%). In 19 teeth we can observe the cement on enamel case and it gives us a percentage of 31.66% of the sections, on the other hand, in 6 teeth we observe the dentine between cement and enamel with a percentage of 10%. And finally, we can observe that no tooth presents

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the first case of choquet which belongs to enamel over cementum. Concluding that the most predominant relationship between enamel and cement was the case of Choquet Bis a Bis.
Keywords: cemento-enamel junction, tooth neck, light microscopy.

Resumen

El objetivo fue analizar microscópicamente la prevalencia de los tipos de unión amelo cementaría en premolares según la clasificación de Choquet. El estudio fue observacional, descriptivo y transversal. La muestra incluyó premolares maxilares y mandibulares extraídos (60 premolares). Para la selección de los dientes se utilizó la técnica de muestreo aleatorio, como resultado se determinó que el caso de choquet con más prevalencia es el de bis a bis pues represento 35 dientes (58.33%). En 19 dientes podemos observar el cemento sobre esmalte caso y nos da un porcentaje de 31.66% de las secciones, por otro lado, en 6 dientes observamos la dentina entre cemento y esmalte con un porcentaje de 10%. Y finalmente podemos observar que ningún diente presenta el primer caso de choquet que pertenece a esmalte sobre cemento. Concluyendo que la relación entre esmalte y cemento de más predominio fue el caso de Choquet Bis a Bis.
Palabras clave: Unión cemento-esmalte, cuello del diente, microscopía óptica.

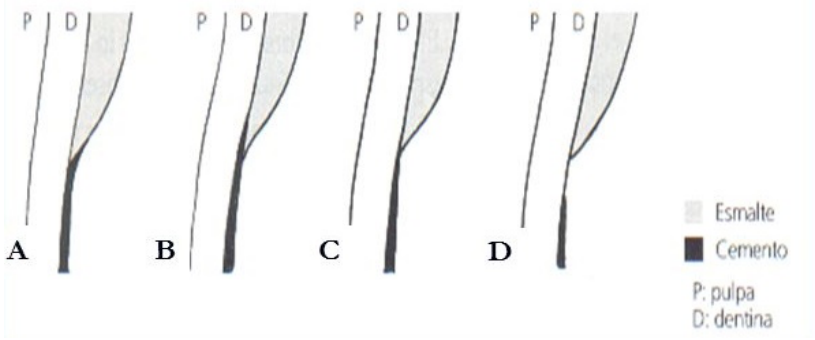
Introduction

The cemento-amelocemental junction (CAJ) is the complex anatomical area or junction where the tooth enamel meets the cementum, where the enamel covers the crown of the tooth and the cementum covers the root of the tooth (Ansari et al., 2019; Arambawatta et al., 2009; Fleites et al., 2019; Roa et al., 2013; Rosa, 2003). The UAC acts as a reference point in the practice of clinical dentistry, this site is where the gingival fibres attach to the healthy

tooth, and there is a limitation between the hard tissues of the tooth (Ceppi et al., 2006; Reyes-Gasga, 2021).

According to Choquet in 1899, who was the first person to describe and classify the relationship between cementum and enamel in the (UAC), he catalogued 4 types of relationships between these tissues (Figure 1): A) Cement superimposed on enamel; B) Enamel superimposed on cementum C) Cementum and enamel; edge to edge; D) Dentin between cementum and enamel (Delgado and Beatriz, 2021; Neuvald and Consolaro, 2000).

Figure 1. Relationships of enamel to cementum: Choquet's cases. A) Cementum covers enamel (60%). B) Enamel contacts cementum. C) Enamel and cementum do not contact and D) Dentine between cementum and enamel.



Source: Gomez de Ferraris (2013).

In young individuals, the UAC is protected by periodontal tissues, however, as individuals age, eruption and passive destruction progresses, creating wear of the occlusal and incisal surfaces of the teeth, along with gingival recession, resulting in migration of the UAC into the gingival sulcus (Botero and Bedoya, 2010; Srebrzyńska-Witek et al., 2020).

The Amelocemental Attachment (AAU) establishes an essential and important reference point within the dental field, serving to diagnose the severity of various pathologies and to determine the correct procedure for different specialties such as periodontics, endodontics and oral rehabilitation (Simmer et al., 2012; Solis, 2014).

With regard to the importance of the CAU in oral rehabilitation, it is mentioned that, as long as the periodontal status is not in good condition and the CAU is not protected, no procedure should be performed, which would prevent the aesthetic success of the restorations, this implies the management of gingival tissues.

Furthermore, it is the area that limits between the dental enamel and the root cementum in cervical teeth; this is where the gingival fibres join the tooth slightly apically, because of this, it represents an important landmark in periodontal health and constitutes the most constant and repeatable guide to locate the pulp chamber in endodontic treatments (Rivera et al., 2013; Alberti et al., 2007; Arunachalam et al., 2019; Gasic et al., 2012; Lehm, 2005; Vandana and Haneet, 2014).

On the other hand, the gingival margin is fundamental for periodontal diagnosis and is located between 1 and 2 mm coronal to the amelocemental junction (Fonseca and Fonseca, 2017; Grossman and Hargreaves, 1991). This area is important because bone loss is assessed by measuring the distance from the UAC to the bone crest (Carvalho et al., 2004; Lehmann and Schmeisser, 1991).

Therefore, the aim of this work is to microscopically analyse the prevalence of amelocemental junction types in premolars according to Choquet's classification.

Methodology

The present study was a type of observational research, quantitative approach, descriptive design and cross-sectional. It was reviewed, analysed and approved by the Head of Research and the Formative Research area on 08 November 2021 with resolution: UCACUE-IF-2021-020-OF.

The sample included extracted maxillary and mandibular premolars. The sample included extracted maxillary and mandibular premolars, the final size for the study was 72 premolars obtained from the tooth bank of the dental career of the UCACUE.

For the selection of the teeth, the following inclusion criteria were used: teeth with intact cervical area; on the other hand, the exclusion

criteria were teeth with caries, wear, abrasion, erosion and restorations; therefore, the final sample consisted of 60 premolars.

The teeth were rinsed with sodium hypochlorite for 1 minute and immersed in saline until sectioned. The teeth were then dried and sectioned coronally in two halves and the central groove of the premolars was used as a reference point. This section was carried out with the aid of a 0.15 mm thick, superfine-grained diamond disc, Dentaurum brand, and under constant irrigation to avoid overheating. Each sectioned tooth was placed in boxes for identification and enumerated for the corresponding microscopic study.

Finally, for microscopic analysis, a 40x stereomicroscope (dino-lite edge 3.0) was used; the different choquet cases were classified into: 1) enamel on cementum; 2) bis to bis; 3) dentine between cementum and enamel; 4) cementum on enamel.

Results

Sections of 60 teeth in total were examined, these being 10 upper first premolars, 20 lower first premolars, 18 upper second premolars, and 12 lower second premolars. In all teeth we could observe that the UAC is morphologically similar.

The UAC of the 60 teeth was classified into four, according to the enamel-cement interrelationships observed. From the analysis of the teeth, we determined that the most prevalent case of choquet is the bis-to-bis choquet, as it represents 35 teeth, 58.33% of the total sample. In 19 teeth we can observe the cement on enamel case and it gives us a percentage of 31.66% of the sections, on the other hand, in 6 teeth we observe the dentine between cement and enamel with a percentage of 10%. And finally we can observe that no tooth presents the first case of choquet which belongs to enamel on cement (Table 1).

Table 1. Absolute table description

CASO DE CHOQUET	N	%
1 (esmalte sobre cemento)	0	0
2 (bis a bis)	35	58,33%
3 (dentina entre cemento y esmalte)	6	10%
4 (cemento sobre esmalte)	19	31,66%
TOTAL	60	99,99%

Table 2 shows the relationship between choquet cases and premolars. Finally, no significant correlation was observed between arch, tooth and UAC.

Table 2 *shows the relationship between choquet cases and premolars. Finally, no significant correlation was observed between arch, tooth and UAC.*

Diente	Caso Choquet 1	%	Caso Choquet 2	%	Caso Choquet 3	%	Caso Choquet 4	%	Total	Valor p
Primer Premolar Superior	0	0	7	11.66%	0	0	3	5%	10	
Primer Premolar Inferior	0	0	14	23.33%	1	1.66%	5	8.33%	20	
Segundo Premolar Superior	0	0	10	16.66%	1	1.66%	6	11.66%	18	0,111
Segundo Premolar Inferior	0	0	4	6.66%	4	6.66%	5	20%	12	
Total	0		35	58.31%	6	9.98%	19	44.99%	60	

Figure 2. Second Choquet case: bis a bis (40x)

Figure 3. Third Choquet case: Dentine between cementum and enamel.

Figure 4. Fourth Choquet's case: Cement on enamel (40x)

The UAC is an area of great importance in clinical dentistry, as it is an anatomical reference point for the classification of dental hard tissues, which is why the research of certain authors discusses the relationship between the different cases of Choquet, demonstrating the prevalence. Thus, in the study of Arambawatta et al. showed under observation the highest frequency of the case of choquet bis a bis with a prevalence of 55.1%, while the lowest prevalence was 1.6% cementum superimposed on the enamel (Arambawatta et al., 2009).

According to the studies conducted by the authors Fonseca et al. stated the highest prevalence of Choquet case is dentin between enamel and cementum with 39.25%, while the least frequent case was enamel on cementum with 2.14% (Fonseca and Fonseca, 2017).

On the other hand, Carvalho et al. (2004) state that the most dominant choquet case is cement on enamel with 42%, and the least dominant is enamel on cement with 12%. In recent studies by Arambawatta et al. (2021) reports that the most prevalent Choquet cases are enamel over cementum-cement and non-contact enamel. Finally, in the present study the most prevalent Choquet case is bis-to-bis with 58.33% of the total sample, and the least prevalent is enamel on cementum with 0%.

Conclusions

It can be concluded that the examination of the amelocemental junction in the premolars of an Ecuadorian population, based on the Choquet classification, has yielded valuable information on tooth structure. The results indicate that the predominant type of bonding observed was the Choquet "Bis to Bis" case, which was evident in 58.33% of the teeth examined. This finding suggests a predominant tendency towards an amelocemental junction characterised by a close association of both tissues.

In addition, a significant presence of cementum was observed in the enamel, which accounted for 31.66% of the sections analysed. This phenomenon has implications for dental health and allows a better understanding of the processes of mineralisation and formation of dental tissues.

It is worth noting that 10% of the sections studied showed the presence of dentine between cementum and enamel. This underlines the morphological diversity inherent in the amelocemental bond and emphasises the importance of considering these variations in both clinical and research contexts.

The absence of cases with enamel-on-cement in the sample analysed is a noteworthy finding, suggesting a low prevalence of this type of bond in the Ecuadorian population under study. These data have diagnostic and therapeutic implications, as well as contributing to the understanding of the processes of mineralisation and dental development in this particular population.

Reference

Alberti, L., Sarabia, M., Martínez, S., and Méndez, M. (2007). Histógenesis del esmalte dentario. Consideraciones generales. Archivo Médico de Camagüey, 11(3), 1–9.

Ansari, A. S., Sheikh, A. T., Ahmed, I., and Abbas Zaidi, S. J. (2019). Morphological Analysis Of Cementoenamel Junction Types In Premolars And Molars Of A Sample Of Pakistani Population. J Ayub Med Coll Abbottabad, 31(2), 221–225.

Arambawatta, K., Abeysundara, A., Ihalagedera, D., Nawarathna, G., Nandasena, T., Peiris, R., Banneheka, S., and Nanayakkara, D. (2021). Morphological analysis of cementoenamel junction in premolars of Sri Lankans. Anatomical Science International, 96(4), 509–516. https://doi.org/10.1007/s12565-021-00615-w

Arambawatta, K., Peiris, R., and Nanayakkara, D. (2009). Morphology of the cemento-enamel junction in premolar teeth. Journal of

Oral Science, 51(4), 623–627. https://doi.org/10.2334/josnusd.51.623

Arunachalam, P., Ramya, R., Swarnalakshmi, R., James, A., Ramya, M., and Rajkumar, K. (2019). Analysis of optical mineralogy of cemento – enamel junction in deciduous dentition. Journal of Oral and Maxillofacial Pathology, 23(3), 475. https://doi.org/10.4103/jomfp.JOMFP_216_19

Botero, J., and Bedoya, E. (2010). Determinantes del diagnóstico periodontal. Revista Clínica de Periodoncia, Implantología y Rehabilitación Oral, 3(2), 94–99. https://doi.org/10.4067/S0719-01072010000200007

Carvalho, R. B., Rocha, M. J., and Vieira, R. S. (2004). Structural analysis of cementoenamel junction of primary teeth by scanning electron microscopy analysis. J Bras Clín Estet Odontol, 4, 46–51.

Ceppi, E., Dall'Oca, S., Rimondini, L., Pilloni, A., and Polimeni, A. (2006). Cementoenamel junction of deciduous teeth: SEM-morphology. European Journal of Paediatric Dentistry, 7(3), 131–134.

Delgado, T., and Beatriz, J. (2021). Relación entre el límite amelocementario y la cresta ósea en el sector anterosuperior: Revisión Sistemática. Universidad Católica de Santiago de Guayaquil.

Fleites, R. Y., González, D. K., and Rico, P. A. M. (2019). Prevalencia de los defectos del desarrollo del esmalte en la dentición permanente. Medicentro, 23(3), 177–191.

Fonseca, M., and Fonseca, G. (2017). Relación esmalte-cemento y presencia de caries. Revista de La Facultad de Odontología, 19(20), 69–77.

Gasic, J., Kesic, L., Popovic, J., Mitic, A., Nikolic, M., Stankovic, S., and Barac, R. (2012). Ultrastructural changes in the cemento-enamel junction after vital tooth bleaching with fluoride and fluoride-free agents – a pilot study. Medical Science Monitor, 18(3), PR5–PR12. https://doi.org/10.12659/MSM.882502

Gómez de Ferraris, M. E. (2013). Histología, Embriología e Ingeniería Tisular Bucodental (3ra ed.). Editorial Médica Panamericana S.A.

Grossman, E. S., and Hargreaves, J. A. (1991). Variable cementoenamel junction in one person. The Journal of Prosthetic Dentistry, 65(1), 93–97. https://doi.org/10.1016/0022-3913(91)90057-4

Lehm, A. (2005). Histología dentaria y periodontal: fundamentos para el tratamiento en odontología. Quintessenz, 56(12), 129–135.

Lehmann, U., and Schmeisser, S. (1991). Variations of cemento-enamel junction of human teeth. Literature review. Deutsche Stomatologie (Berlin, Germany : 1990), 41(12), 516–519.

Neuvald, L., and Consolaro, A. (2000). Cementoenamel Junction: Microscopic Analysis and External Cervical Resorption. Journal of Endodontics, 26(9), 503–508. https://doi.org/10.1097/00004770-200009000-00004

Reyes-Gasga, J. (2021). Estudio del Esmalte Dental Humano por Microscopía Electrónica. Pädi Boletín Científico de Ciencias Básicas e Ingenierías Del ICBI, 9(Especial2), 1–6. https://doi.org/10.29057/icbi.v9iEspecial2.7655

Rivera Priego, A., Carmona Rodríguez, B., & Arzate, H. (2013). Producción y caracterización de una proteína recombinante del cemento (CEMP 1) en células de Drosophila melanogaster (DML-2-23). *Revista Odontológica Mexicana*, 17(2), 76–80. https://doi.org/10.1016/S1870-199X(13)72020-2

Roa, I., Sol, M., and Cuevas, J. (2013). Morphology of the Cement-Enamel Junction (CEJ), Clinical Correlations. Int J Morphol, 31(3), 894–8.

Rosa, N. (2003). Estudio histopatológico de las reabsorciones cemento-dentinarias de la región apical de los dientes humanos extraídos con lesión crónica en el periapice. Avances En Odontoestomatología, 19(2), 63–73.

Simmer, J. P., Richardson, A. S., Hu, Y.-Y., Smith, C. E., and Ching-Chun Hu, J. (2012). A post-classical theory of enamel

biomineralization… and why we need one. International Journal of Oral Science, 4(3), 129–134. https://doi.org/10.1038/ijos.2012.59

Solis, E. (2014). Variaciones histológicas y morfológicas del esmalte , dentina y cemento en dientes permanentes con atrición. RAAo, 3(2), 12–15.

Srebrzyńska-Witek, A., Koszowski, R., Różyło-Kalinowska, I., and Piskórz, M. (2020). CBCT for estimation of the cemento-enamel junction and crestal bone of anterior teeth. Open Medicine, 15(1), 774–781. https://doi.org/10.1515/med-2020-0211

Vandana, K., and Haneet, R. (2014). Cementoenamel junction: An insight. Journal of Indian Society of Periodontology, 18(5), 549. https://doi.org/10.4103/0972-124X.142437