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Morphological Patterns of Gingival Recession in Adult Chilean Population

Patrones Morfológicos de Recesiones Gingivales en Población Chilena Adulta

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SUMMARY: The aim of this study was to determine the prevalence of morphological patterns of gingival recession, attachment loss, and type of interdental papilla in adult subjects of different age in a Chilean population. A total of 105 patients with ages ranging from 18 to 64 years of both sexes participated in our study. The prevalence of gingival recession was 92.38%, affecting 530 teeth. The morphological pattern of gingival recession most common was class II (34.94%), followed by types III, I and IV. According to ANOVA test, differences were significant in relation to the mean number of affected teeth. Of those who had recessions, females had a slightly higher prevalence. The range 18-34 years showed a prevalence of 82.22% and from 35 years increased to 100%. The vertical extent between 0-3mm and horizontal between 4-7mm were the most prevalent affected 88.68% and 59.05% of teeth, respectively. Attachment loss was 3-4mm in 316 teeth (59.62%), and the most prevalent interdental papillae on the different patterns was type I (40.18%) followed by type III (21.88%). Differences were statistically significant (p=0.001) in relation to age of individuals who presented diferent morphological patterns of gingival recession. For the others parameters (depth and width of the recession, attachment loss) we found no statistically significant differences with a confidence interval of 95%. These findings represent a contribution for the evaluation of gingival recession in our population, particularly in the anterior aesthetic zone.

KEY WORDS: Morphological patterns; Gingival recession; Miller's classification; Attachment loss; Interdental papilla.

INTRODUCTION

Gingival recession is defined as the displacement of the gingival margin apical to the cementoenamel junction, localized or generalized in one or more tooth surfaces, which occasionally involves the mucogingival junction (MGJ) and the alveolar mucosa. Installation is slow, progressive, and destructive (American Academy of Periodontology, 2001).

Its prevalence varies in different countries in America and Europe (Susin *et al*., 2004; Maetahara 2006), and its association with gender is under discussion (Segovia, 2002). Its incidence ranges from 8% in children up to 100% after 50 years, which is a physiological process associated with aging (Kassab & Cohen, 2003). However, there are several anatomical factors, such as bone alteration (genetic, physiological, or pathological), amount of attached gingiva, tooth malposition, root anatomy, bone dehiscence, high set of lingual frenulum (Bracho de Peña *et al*., 2003; Kassab & Cohen) or factors associated with occlusal trauma intensity, as well as duration and quality of the bone that supports it (Sanz-Sánchez *et al*., 2008; Ardila Medina, 2009), which are considered as predisposing factors of gingival recession, while inflammation, traumatic tooth brushing (Ardila Medina; Kassab & Cohen), iatrogenic and gingival trauma (Kassab & Cohen), subgingival restorations margins, improper design of removable prosthesis, and orthodontic uncontrolled movements (Ardila Medina; Kassab & Cohen; Slutzkey & Levin, 2008) are considered as triggers.

The most accepted theory to explain the origin of gingival recession is based on inflammation of the connective

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tissue of free gingiva and its consequent destruction, where the gingival epithelium migrates into the connective tissue and gets destroyed, while the gingival epithelial basement membrane and sulcus epithelium reduce the thickness of the connective tissue between them, thus reducing the blood flow by impairing the repair of the initial injury. As the lesion progresses, the connective tissue disappears and fusion occurs between the gingival epithelium and the sulcular and union epithelia, which will subsequently withdraw due to lack of blood flow (Susin *et al*.).

Various classifications have been proposed to determine the pattern of gingival recession. Miller's classification is considered more valid and is based on morphological assessment of the periodontal tissues, which determines the status of the apical margin of the recession on mucogingival line and the amount of lost tissue (gum and bone) in interproximal areas adjacent to the recession (Miller, 1985; Kassab & Cohen; Mahajan 2010; Pini-Prato, 2011).

Several aspects of the morphological patterns of gingival recession are clinically relevant, because in their vertical or horizontal extension, an exposition of the tooth root surface can be generated, making it susceptible to hypersensitivity and caries lesions, creating difficulty in mechanical removal of plaque, and favoring calculus formation, while the surrounding anatomical elements' commitment allows the creation of interproximal spaces where food and bacteria can accumulate (Bracho de Peña; Vicario *et al*., 2006). In addition, establishing the pattern of recession is very useful in predicting the final amount of root coverage following a dental procedure of gingiva free graft. In Chilean population, information related to morphological patterns of gingival recession is not available.

The aim of this study was to determine the prevalence of morphological patterns of gingival recession, attachment loss, and type of interdental papilla in adult subjects of different age in a Chilean population.

MATERIAL AND METHOD

We performed an observational, cross-sectional study in Temuco, Chile. Were selected two health centers (Cesfam Labranza and Cesfam Amanecer), which serves a population of 61,137 subjects. To determine the size of the sample, a simple random sample of subjects with 95% confidence interval was used; this size was calculated in a similar population as in previous studies (Maetahara, 2006). The sample consisted in patients of both the sexes between 18 and 64 years, all with good health system, with or without periodontal disease. No ethnic discrimination was made. Prior to data collection, the two examiners, who conducted oral examination, were trained and evaluated (kappa> 0.8760).

A clinical record form was developed for age, sex, periodontal disease, and gingival recession measurement of vertical (depth) and horizontal (width) extension, based on the classification of recessions of Miller, as defined in Class I, II, III, and IV (Fig. 1). Gingival recession was defined as the total or partial loss of the gum covering the root, resulting in a margin apical to the cementoenamel junction. All patients agreed to participate in the study by signing an informed consent.

The morphological pattern of gingival recession was recorded using a North Carolina periodontal probe calibrated to 15 mm in length (Hu-Friedy, USA). The periodontal probe was also used to measure the periodontal attachment level. Three buccal and palatal/lingual measurements in each tooth were performed. Finally, the height of the papillae adjacent to gingival recession, according to Nordland & Tarnow (Fig. 2), was recorded. The sample was categorized into age groups ranging from 18 to 34, 35 to 50, and 51 to 64 years. The data were quantified and analyzed using descriptive statistics and ANOVA with SAS statistical software system.

RESULTS

The sample corresponded to 105 subjects, divided according to gender in 74 women and 31 men. The prevalence of gingival recession was 92.38% (97 subjects, with a total of 530 teeth affected), comprising 93.24% of women and 90.32% of men. The most frequent morphological patterns of gingival recession according to Miller's classification corresponded to Class II, where gingival recession reaches or extends beyond the mucogingival line of hard or soft tissues. It was followed by the Class III, where the gingival recession reaches or extends beyond the MGJ with loss of apical interproximal support to the midline, apical to cementoenamel line, but coronal to apical extension of the recession or malpositioned teeth. The next frequent pattern was Class I, where gingival recession fails to reach mucogingival line without loss of interproximal hard or soft tissue. Class IV gingival recession, which showed a low prevalence, such as teeth without recession, extends beyond the mucogingival line or exhibits interproximal

attachment loss that extends to the apical level of the recession (Fig. 3).

With regard to age, the age group 35–50 and 51–64 years exhibited the highest prevalence, followed by the group aged 18–34 years (Fig. 4A). The vertical extent (depth) of recession was most often presented in the range of 0–3 mm in 470 of the teeth studied, followed by deep recessions in the range of 4–6 mm in 55 cases. Furthermore, a range of 7–9 mm was in 5 cases (Fig. 4B). The horizontal extension (width) of recession was most frequently observed in the range of 4–7 mm, in 313 of the teeth examined, followed by a width of 0–-3 mm in 175 cases. The range of 8–10 mm was only present in 42 of the affected teeth (Fig. 4C). The differences were statistically significant (p=0.001) in relation to the age of the individuals who presented gingival recession. For the rest of the parameters studied (depth and width of the recession, attachment loss), we found no statistically significant differences with a confidence interval of 95%.

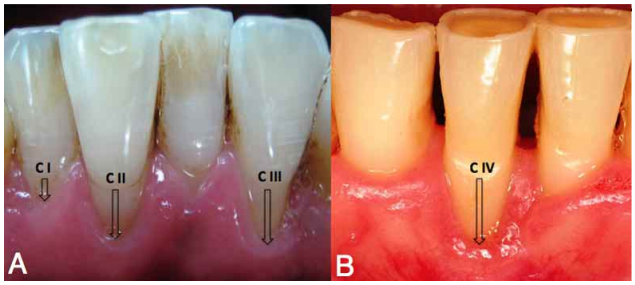

Fig. 1. Morphological patterns of gingival recession according to Miller's classification. A: Class I, gingival recession fails to reach MGJ without loss of interproximal hard or soft tissue; Class II where gingival recession reaches or extends beyond the MGJ of hard or soft tissues; Class III gingival recession reaches or extends beyond the MGJ with loss of apical interproximal support to the midline, apical to cementoenamel line, but coronal to apical extension of the recession or malpositioned teeth. B. Class IV gingival recession that extends beyond the MGJ or exhibits interproximal attachment loss that extends to the apical level of the recession.

The most affected tooth was the lower left second premolar (39.9%), followed by the lower right second premolar (38.85%) and lower left first premolar (37.8%). The least affected teeth were 1.7, 2.1, 1.1, and 2.1, respectively. Among the 530 teeth that showed different morphological patterns of gingival recession, attachment loss was more prevalent in the range of 3–4 mm in 316 teeth, followed by that in the range of ≥5 mm in 179 teeth and ≤3 mm in only 35 teeth (Fig. 4D). One-way ANOVA test showed statistically significant differences (p=0.000) relative to the means of the affected teeth among individuals who had recession (Types I, II, III, and IV, as classified by Miller) and those who did not have recession.

The most common gingival interdental papilla in teeth with recession was Type I, with the apex of the papilla located between the contact point and the cement enamel joint (the latter was not visible in 40.18% of the cases), followed by Type III (21.88% of the cases). Gingival papilla was normal in 108 cases (20.37%).

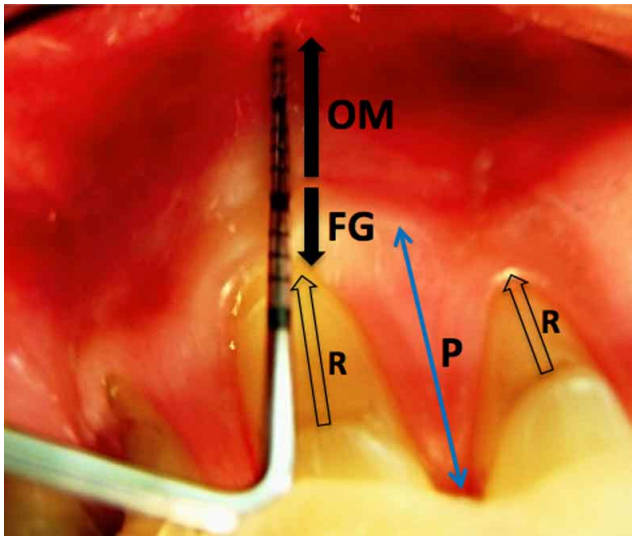

Fig. 2. Determining the height of the interdental papillae adjacent to gingival recession. A North Carolina Probe, 15mm in length (Hu-Friedy, USA) was used for the measurements. P: papilla, R: gingival resection, FG: free gingiva, OM: oral mucosa.

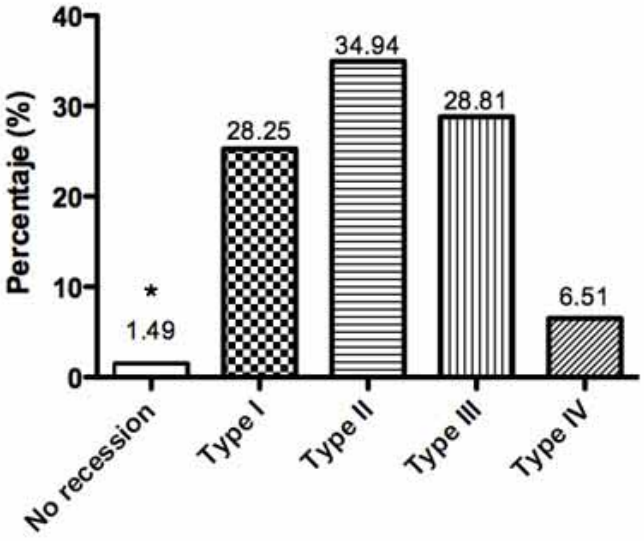

Fig. 3. Distribution of gingival recession according to the classification of Miller in 105 patients aged between 18 and 64. *Statistically significant differences were observed (p=0.000) among individuals who had gingival recession in relation to those not presented).

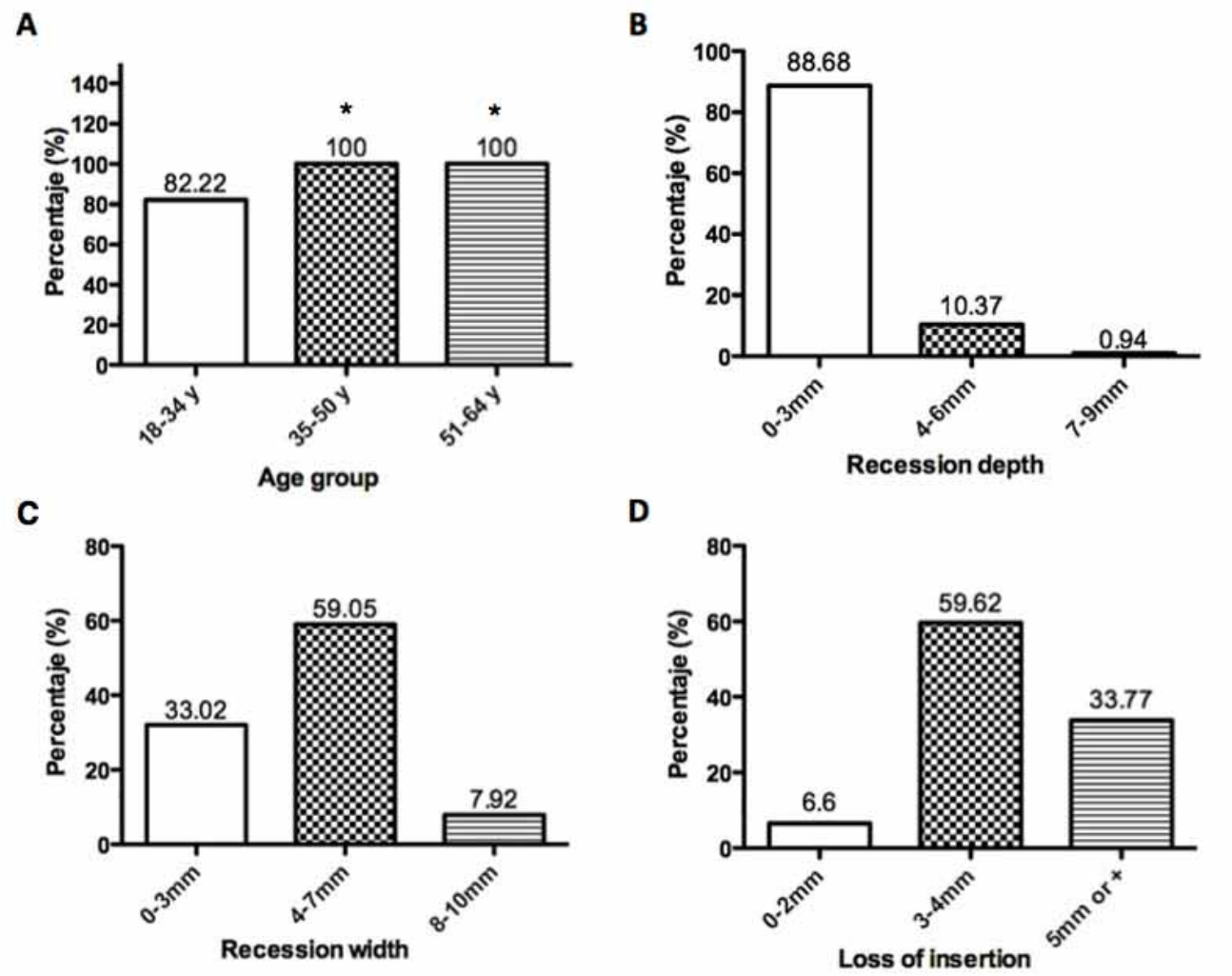

Fig. 4. Prevalence of gingival recession according to: A. age group, B: depth - vertical, C: width - horizontal. D: degree of clinical attachment loss in affected teeth. *There is a statistically significant (p=.001) compared with gingival recession by age group.

DISCUSSION

Assessment of the morphological patterns of gum covering the tooth is of great importance both in its vertical dimension in terms of depth and horizontal dimension in terms of width. The depth is important in presenting the biological dimensions for connective, epithelial, and gingival sulcus components, while the width is closely related to the vertical parameter, because it relates to the periodontal biotype and is a key determinant of the type of wound healing after bone remodeling. Thus, ignoring the morphological pattern can lead to failure of gingival stability (Delgado Pichel *et al*., 2001). Several classifications have been proposed to determine the pattern of gingival recession (Mahajan; Pini-Prato), where the most useful is based on the morphological assessment of damaged periodontal tissues (Pini-Prato).

In Chile, there are no studies on the prevalence of different morphological patterns of gingival recession. The results obtained in our study show an overall prevalence higher than that obtained in the neighboring countries, such as Brazil (83–89%), Peru (73%), Venezuela (83.3%), and Spain (85%) (Matas *et al*., 2011). In the population aged 18–34 years, a prevalence of 82.2% was observed, similar to that reported by Matas *et al*., in a longitudinal study on 40 subjects with a baseline prevalence of gingival recession of 85% (average 23.48 years), which did not change after 10 years (average 33.95 years). In the older age groups, we observed 100% gingival recession. The age group over 34 years showed a prevalence of 100%, which is significantly higher than that observed by Segovia *et al*. with only 65%

of individuals between 45 and 65 years. Therefore, it is evident that gingival recession in individuals of Temuco is prevalent in a larger percentage and in the younger population. These observations differ from the data provided by Segovia *et al*., who, using the Smith index, established a gingival recession prevalence of 44, 36, and 20% among the age groups of 18–27, 28–47, and 48–67 years, respectively, with a clear difference by age; this observation is in contrast to our results based on morphological classification.

According to our results, the various morphological patterns of gingival recession were found to be similar in both the sexes. However, Segovia *et al*., described a higher prevalence in men. Furthermore, gingival recessions were morphologically characterized as wider than deep, but the literature does not describe this aspect in detail, and therefore, it was not possible to carry out a comparison with other studies.

We reaffirm the conclusion of Ardila Medina, who noted that "gingival recession seems to be more common in single-rooted teeth than in molar" (sic), where the morphological patterns maintained the characteristics of the corresponding tooth surface. Matas *et al*., showed the highest frequency of recessions in molars, followed by premolars and canines, with the incisive group exhibiting lower frequency. Although our results are in agreement with most of their observations, the molars were found to be less frequent than premolars. This could be explained by the study population of Matas *et al*., who were subjects (dentists) with a high level of oral hygiene, probably more affected by trauma of brushing, a common factor in the progression of non-inflammatory gingival recession. However, data to support or refute the association between tooth brushing and gingival recession are inconclusive (Rajapakse *et al*., 2007).

The different morphological patterns had 99.39% of attachment loss of ≤3 mm and 33.77% of attachment loss ≥5 mm. In this regard, Gamonal *et al*., (2010) examined the clinical attachment loss in adult Chilean population referred to the first Chilean National Dental Examination, and found 93.45% of young adults (35–44 years) with at least one site of attachment loss of ≥3 mm, when compared with 97.58% of older adults (65–74 years).

Gingival recession with a more advanced morphological pattern, which exceeded the MGJ with loss of apical inteproximal support to the mid and cementoenamel lines, but coronal to apical extension of the recession, had a high frequency. Recently, Esteibar *et al*. (2011) studied the pre-surgical, surgical, and postoperative morphological pattern of 121 teeth with Class III recessions, and reported that only 47% of the cases could recover forming a normal gingival morphological pattern, able to completely cover the root, suggesting that this is due to interproximal tissue integrity, use of grafts, and a width recession of < 3 mm.

The morphological patterns classification proved useful to distinguish recessions related to the trauma of brushing (Classes I and II), the periodontal disease caused by interproximal insertion, and loss of bone (Classes III and IV). However, this morphological classification is not exhaustive and does not consider all cases of recession, such as a marginal tissue recession with interproximal bone loss that does not extend to the MGJ. In fact, this recession can neither be included in Class I, due to the interproximal bone loss, nor in Class III because the gingival margin does not extend to the MGJ. In addition, palate recessions are not mentioned in the classification system; due to the lack of MGJ on the palate, it is impossible to classify these lesions. On the other hand, although palate recessions do not present any esthetic problems, these may be associated with dental hypersensitivity that may require surgical treatment (Pini-Prato). Moreover, both the determination of the morphological patterns through Miller's classification and other commonly used methods contain inherent disadvantages. In many cases, buccal MGJ is not easily detectable, and there exist observer-dependent factors, such as location, angle of insertion, and the type of probe that can affect the results.

To overcome this disadvantage, an in vitro evaluation method by optical scanning and subsequent 3D overlay suggested by Lehmann *et al*., (2012) can reproduce the volume of gingival recession, which is highly consistent with low SD and correlation coefficients between 0.997 and 0.999. This new method allows reproducible volumetric assessment of gingival recession, facilitating the operator to control the volumetric progression of periodontal soft tissue – e.g., after root coverage procedures – and to detect early relapse.

These findings represent a contribution for the evaluation of gingival recession in our population, particularly in the anterior aesthetic zone, and it can be applied to comparative studies using different surgical techniques or materials, such as membrane types or bone replacement grafts.

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RESUMEN: El objetivo fue determinar los patrones morfológicos de recesión gingival más prevalentes junto al grado

de pérdida de inserción clínica y tipo de papila interdentaria en una muestra de población chilena. Se evaluaron 105 pacientes de ambos sexos, con edades entre 18 y 64 años. La prevalencia de recesión gingival fue del 92,38%, afectando 530 dientes. El patrón morfológico de recesión más frecuente fue el clase II (34,94%), seguido por los tipos III, I y IV. Según la Prueba de ANOVA, fueron encontradas diferencias significativas en relación a las medias de dientes afectados entre los individuos que presentaban recesión. El sexo femenino presentó una prevalencia ligeramente mayor. En el rango de 18-34 años se observó una prevalencia de 82,22% y desde los 35 años aumentó al 100%. La extensión vertical entre 0-3mm y horizontal entre 4-7mm fueron las más prevalentes y afectaron al 88,68% y 59,05% de los dientes, respectivamente. La perdida de inserción más habitual fue del rango 3-4mm en 316 dientes (59,62%). El tipo de papila interdentaria en las recesiones gingivales fue del tipo I (40.18%) seguido por el tipo III (21.88%). Se encontraron diferencias estadísticamente significativas (p=0.001) en relación a la edad de los individuos que presentaron estos patrones morfológicos de recesión gingival y quiénes no. Estos resultados representan una contribución para la evaluación de la recesión gingival en nuestra población, particularmente en la zona estética anterior.

PALABRAS CLAVE: Patrones morfológicos; Recesión gingival; Clasificación de Miller; Pérdida de inserción; Papila interdental.

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