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EVALUATION OF CHANGES IN THE WIDTH OF GINGIVA IN CHILDREN AND YOUTH. REVIEW OF LITERATURE

OCENA ZMIANY SZEROKOŚCI DZIAŚŁA U DZIECI I MŁODZIEŻY. PRZEGLĄD LITERATURY

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Abstract

Comprehensive health care in children and youth includes periodic oral examinations. The mucogingival complex undergoes significant changes during development. The factors that impact the width of attached and keratinized gingiva during this period of life are: tooth eruption phase, the position in the arch, the type of frena attachment and oral hygiene. Along with the child's development the width of attached and keratinized gingiva increases, except for the period of tooth replacement, when a temporary narrowing of attached gingiva of erupting permanent teeth is observed. The understanding of physiological processes of the mucogingival complex is prerequisite for diagnostics and treatment of gingival abnormalities in children and youth. Therefore close cooperation between paediatrician and dental specialists: paedodontist, orthodontist and periodontologist is essential.

Key words: gingival recession, mucogingival surgery, tooth position, width of attached gingiva

Streszczenie

Kompleksowa opieka medyczna nad dziećmi i młodzieżą obejmuje również opiekę nad prawidłowym stanem jamy ustnej. Kompleks śluzówkowo-dziąsłowy ulega u pacjentów w wieku rozwojowym istotnej przebudowie. Do czynników, które w okresie rozwojowym wpływają na zmiany szerokości dziąsła przyczepionego i skeratynizowanego należą: etap wyrzynania zęba, pozycja w łuku, rodzaj przyczepów wędzidełek i poziom higieny jamy ustnej. Szerokość dziąsła przyczepionego i skeratynizowanego rośnie wraz z wiekiem dziecka, z wyjątkiem okresu wymiany uzębienia, kiedy obserwowane jest zwężenie dziąsła przyczepionego przy wyrzynających się zębach stałych. Znajomość fizjologicznych procesów zachodzących w kompleksie śluzówkowo-dziąsłowym jest podstawą diagnostyki i leczenia nieprawidłowości dziąsłowych u pacjentów w okresie wzrastania wymaga ścisłej współpracy lekarza pediatry ze specjalistami z dziedzin stomatologii: pedodonty, ortodonty i periodontologa.

Słowa kluczowe: chirurgia śluzówkowo-dziąsłowa, dziąsło przyczepione, dziąsło skeratynizowane, recesje dziąsłowe

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INTRODUCTION

Holistic treatment of children and youth provided by a multidisciplinary team allows more effective patient care [1]. There is a proven association between periodontal status and occurrence of systemic diseases [2, 3]. Healthy oral cavity of a child is an important element of general health prophylaxis. Significant changes occur in morphological structure of periodontal tissues in primary, mixed and

permanent dentition [4]. The awareness of those differences allows initiation of prophylaxis and optimal treatment selection if any pathology occurs [5].

Mucogingival defects may occur even in early childhood. They are caused by alterations of teeth development and eruption, malformations of mandible or maxilla, poor oral hygiene or bacterial and viral infections. Changes in the width of attached and keratinized gingiva at various stages of dentition development are still under investigation. A

close relationship between the process of tooth eruption and the width of keratinized and attached gingiva has been proven [6, 7, 8, 9].

The width of keratinized gingiva is measured as the distance from the free gingival margin to the mucogingival junction. The width of attached gingiva is calculated by subtracting the depth of gingival sulcus from the measurement of keratinized gingiva [10]. (Figure 1). The attached gingiva is wider in the maxilla than in the mandible, both in deciduous and permanent dentition [11, 12]. Previously it was believed that a wide zone of attached and keratinized gingiva (at least 1 mm and 2 mm respectively) constitutes a protective barrier against inflammation and forces operating during mastication, tooth brushing and orthodontic treatment [9, 13, 14]. Subsequent studies have shown, however, that with the attached gingiva lesser than 1 mm, healthy periodontal tissues can be preserved if proper oral hygiene is maintained [15, 16, 17].

During the development of the jaws and dentition, the morphology of the mucogingival complex undergoes certain changes. These changes are associated also with the position of teeth in alveolus. Rose and App [8] as well as Bowers [9] observed that the position of the tooth in the arch impacts the width of attached gingiva. The movement of both deciduous and permanent teeth during growth

in the lingual or vestibular direction causes changes in the width of attached gingiva [6]. A tooth which is positioned lingually after eruption has a wider gingiva on the vestibular side, whereas a tooth in a vestibular position has a narrower gingiva than normally positioned teeth [6, 7, 8, 9, 17, 18].

Malformations of the mucogingival complex at anterior teeth in children are most commonly associated with a narrow zone of attached gingiva, abnormal frena attachments, occurrence of pull syndrome and, less frequently, gingival recessions. The width of attached gingiva can be reduced and the oral vestibule can be shallower congenitally, as a result of teeth malposition or abnormal attachment of labial and lingual frena. Gingival problems in children are most commonly detected while planning of orthodontic treatment. It is important that paediatrician pay close attention to gingiva and frena condition during patient's examination, and refer patient to a specialist in case of malformations.

If lack of attached gingiva and/or presence of recession occur, following aspects should be considered before planning the surgery stage of dentition development, type of defect and position of teeth in the arch, intended direction of teeth movements during orthodontic treatment [10, 17].

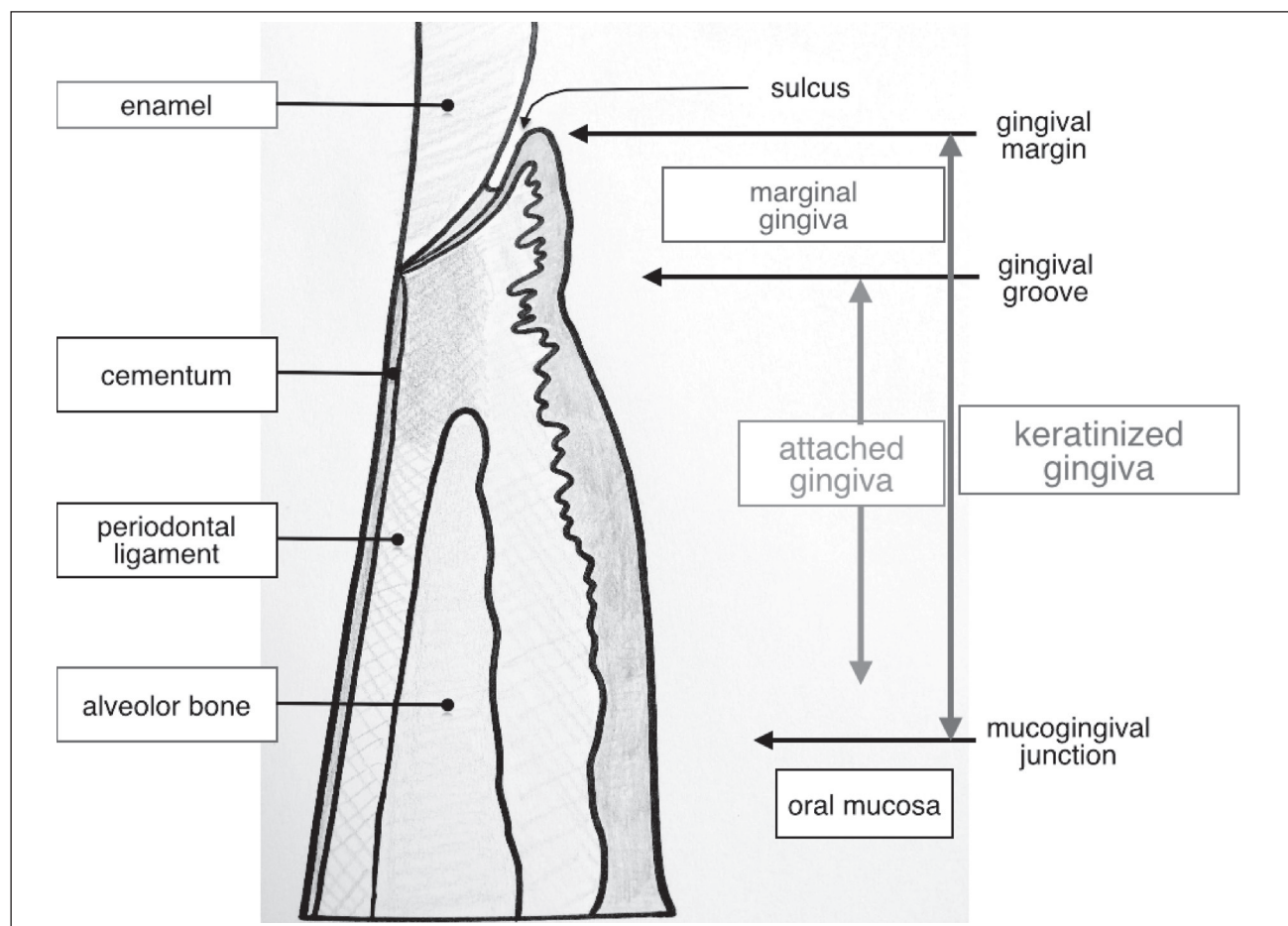


Fig. 1. Schematic drawing of hard and soft periodontal tissues (Author: Maryla Siwiec).

Ryc. 1. Schemat obrazujący elementy tkanek zębowych wraz z przyzęciem (Autor: Maryla Siwiec).

Changes in the width of gingiva in children and youth

Additionally to age, the degree of tooth eruption, the position in the arch and the presence of inflammation are factors which impact dimensions of gingiva [8, 9, 10, 17]. Recent study compared the width of gingiva during and after active tooth eruption phase. Some authors referred only to teeth properly aligned in the arch, while others studied children with diagnosed malocclusions. Due to the different criteria of patient selection, different results were obtained [8, 9, 11, 17, 19].

Rose and App [8] as well as Bowers [9] found that the attached gingiva is wider in permanent than in deciduous teeth. Other authors however, did not observe this association [11]. It is proven that the width of gingiva increases with age, both in deciduous and permanent dentition [11, 19]. In permanent dentition, the increase of the width of attached gingiva is associated with gradual reduction of the sulcus depth, while the width of keratinized gingiva remains the same. In deciduous dentition, however, it is not correlated with a reduction in the depth of the sulcus, for it remains constant [11]. Thus initially the sulcus of erupting permanent teeth is deeper than that of corresponding deciduous teeth, but later it becomes shallower [8, 19, 20]. These differences may result from initially weaker periodontal attachment, which is less resistant to probing [13] as well as from the occurrence of false pockets and temporary inflammation during gingival phase of teeth eruption. These two factors cause higher probing depth recordings [19, 21]. The width of the attached gingiva of newly erupted permanent teeth is therefore smaller than in the case of deciduous teeth. However, the width of attached gingiva increases while permanent teeth erupt [19]. Similar findings were described by Sayrafi et al [12] and Srivastawa et al [22], who conducted their study at deciduous, mixed and permanent dentition. Sarrío et al [23, 24] used radiographs to measure the width of gingiva in deciduous and permanent teeth. In both groups, the width of the attached gingiva increased during eruption of teeth. This can be explained by the fact that the mucogingival junction remains stable and the erupting teeth "pull" the surrounding tissues [24].

To evaluate the sulcus depth and the width of attached and keratinized gingiva of anterior teeth, Andlin-Sobocki [17] took into account only the teeth properly aligned in the arch, without orthodontic treatment before or during the study. The results indicated that the width of attached and keratinized gingiva increased with age both in deciduous and permanent teeth. The increase in the erupted permanent teeth was reversely proportional to the initial value [17]. Ochsenbein and Maynard [13] and Hall [25] however, noted that there is no increase in the width of attached gingiva with age, i.e. when eruption is complete the width does not change any more.

Influence of position of the tooth in the arch on width of attached gingiva and risk of recession in children and youth

Gingival recessions in adults are caused by many factors. In children, however, the most important factor in the etiology of recessions is abnormal position of teeth

[6, 18, 26, 27]. The presence of gingival recession during development concerns mostly permanent lower central incisors and is observed in 8.3% of cases [11]. It was observed that absence or limited attached gingiva (less than 1 mm) on the vestibular side does not always cause recession [15]. The width of the attached gingiva is less critical for the development of recession than the position of the tooth, if proper oral hygiene is maintained [15, 16]. Proper alignment of teeth is necessary to maintain healthy periodontal tissues [28]. Crowded, rotated, protruded and tilted anterior teeth are recognised aetiological factors of recessions. Buccal bone and gingiva on the vestibular side are thin and less resistant to mechanical injuries in teeth in vestibular position [29]. Bone dehiscence and fenestrations may also occur in such cases. It was noted, however, that gingival recessions in children may decrease or disappear without surgical treatment, as a result of normal position of teeth after eruption or orthodontic treatment [6, 27, 29, 30] (Figure 2a and Figure 2b).

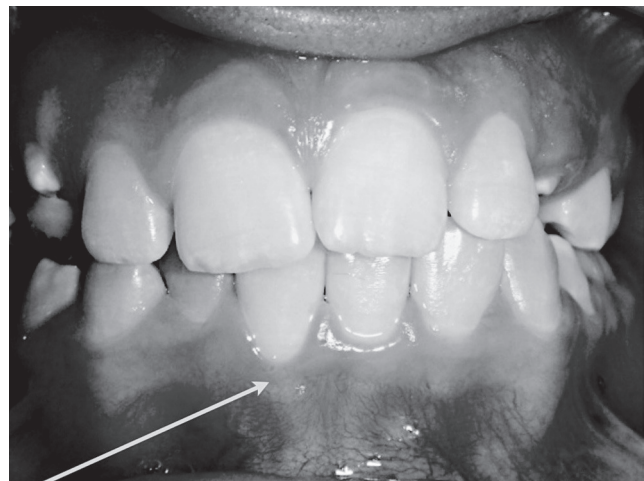


Fig. 2a. 11-year-old-patient presenting lack of keratinized gingiva at tooth 41.

Ryc. 2a. Pacjent lat 11 – brak skeratynizowanego dziąsła przy zębie 41.



Fig. 2b. The same patient at age of 19 presenting normal width of keratinized gingiva at tooth 41.

Ryc. 2b. Ten sam pacjent w wieku 19 lat w trakcie leczenia ortodontycznego – prawidłowa szerokość dziąsła skeratynizowanego przy zębie 41.

During orthodontic treatment the mucogingival complex undergoes various changes. They depend on the initial width and thickness of attached gingiva and on the direction of tooth movement [31]. Lingual tooth movement increases the thickness of gingiva on the vestibular side. As a consequence, it causes coronary migration of the gingival margin, reduction of the length of clinical crowns and an increase of the width of attached gingiva [26, 31]. This results in decrease of existing recessions. Vestibular tooth movement decreases thickness of the gingiva and the width of attached gingiva [7, 31]. If this movement does not exceed the alveolar bone, then the orthodontic treatment will not cause or increase existing recession [31]. The above-mentioned changes in mucogingival parameters occur both as a result of orthodontic movements and spontaneously due to eruption of teeth.

Mucogingival surgical procedures in children and youth

Maynard and Ochsenbein [7] claimed that greater risk of gingival recession exists in newly erupted permanent teeth with a narrow gingival zone. According to the authors it was the indication for gingival grafting, especially before orthodontic treatment. Formerly some mucogingival surgical procedures were performed routinely because it was believed that the lack of correction of a narrow gingival zone in childhood may cause mucogingival defects in adults [13]. Considering a surgical procedure one should take into account the fact that during the mixed dentition the width of attached gingiva decreases only temporarily [11, 20, 32]. When permanent teeth erupted completely, a gradual increase in the width of gingiva occurs [33]. A decrease in the width of gingiva in mixed dentition may be caused by greater sulcus depth and by vestibular movement of newly erupted teeth [20, 34]. In this period an increased accumulation of bacterial plaque resulting in gingivitis may also occur [11]. If oral hygiene is maintained the risk of recession is significantly limited [35]. Absence of gingival margin inflammation is the most important, in reducing, or eliminating gingival recessions.

The recessions in children decreased with age despite the fact that at the baseline a narrow zone of attached gingiva or no attached gingiva was observed [29]. The thickness of gingiva is more important than its width. Therefore the thickness of gingiva should be examined prior to orthodontic treatment, especially when vestibular movement is planned [36]. Gingival graft should be considered only in cases of limited gingival thickness.

Non-surgical treatment should be considered first [37]. Observation is recommended in malpositioned teeth as well as in normally positioned teeth with a narrow attached gingiva. Normal teeth eruption or orthodontic alignment may result in changes of dimensions of keratinized and attached gingiva [6, 17]. These changes should be considered before planning a surgical procedure in the mandibular incisors region. The area may be affected with high attachments of frena and muscles, often coexisting with a shallow vestibule of the oral cavity. This may cause pull syndrome of the gingival margin, which favours accumulation of plaque

and development gingivitis. In such situations frenectomy alone or deepening oral vestibule procedures may be performed in order to remove abnormal frena. These are alternative methods to gingival grafting performed to cover recessions. Kazanijan vestibuloplasty, may be performed in children since it does not prevent gingiva grafting in the future.

SUMMARY

Comprehensive care ensures proper development of child since the earliest years. During the child's development essential changes occur in morphology of mucogingival complex such as: bone growth, changes in the width of attached and keratinized gingiva. Additionally, changes in the alignment and position of teeth are observed. Physiological changes that occur during development should be identified before carrying out the mucogingival surgery in children [31]. Surgical treatment of recessions including gingival grafting should be preceded by observation and postponed until final teeth alignment which may enable increase of gingiva and spontaneous reduction of recessions. Close cooperation between medical and dental specialists is crucial for proper diagnostics and treatment of mucogingival defects in children and youth.

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