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Vestibular deepening and widening of gingival zone – indications and complications

Pogłębienie przedsionka i poszerzenie strefy dziąsła – wskazania i komplikacje

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ABSTRACT

Periodontal practice focuses not only on biological and functional problems affecting the periodontium, but also on improving the aesthetics of the periodontium. The depth of the vestibule is one of the factors that may influence the periodontal condition. A shallow vestibule may lead to exposure of the root surface due to apical migration of the connecting epithelium, deterioration of aesthetics, root hypersensitivity and root caries. Deepening the vestibule can facilitate daily hygiene activities, improve patient comfort and positively change conditions in this area.

Keywords: gingiva, oral vestibule, vestibular depth.

STRESZCZENIE

Praktyka periodontologiczna koncentruje się nie tylko na problemach biologicznych i funkcjonalnych wpływających na przyzębie, ale także na poprawie estetyki przyzębia. Głębokość przedsionka jest jednym z czynników, które mogą mieć wpływ na stan przyzębia. Płytki przedsionek może prowadzić do odsłonięcia powierzchni korzenia na skutek migracji wierzchołkowej nabłonka łączącego, pogorszenia estetyki, nadwrażliwości korzenia i próchnicy korzenia. Pogłębienie przedsionka może ułatwić codzienne czynności higieniczne, poprawić komfort pacjenta i pozytywnie zmienić warunki w tym obszarze.

Słowa kluczowe: dziąsło, przedsionek jamy ustnej, głębokość przedsionka jamy ustnej.

Introduction

Periodontal practice, thanks to the latest achievement in therapy, focuses not only on biological and functional problems that affect the periodontium, but also on improving the aesthetics of the periodontium. The depth of the vestibule is one of the main factors that may affect the condition of the periodontium, its aesthetics and the effect of prosthetic treatment.

Measurement of the vestibular depth is not standardly included in the dental examination. Vestibular depth is defined as the distance between the crest of the lip and the greatest concavity of the mucobuccal fold (referred to as VL) or the distance between the coronal margin of the attached gingiva and the mucobuccal fold (referred to

as Vg) [1], which allows the vestibule to be classified as shallow (**Figure 1**) or deep (**Figure 2**). A shallow vestibule often coexists with a narrow zone of keratinized gingiva and high frenulum attachments, especially in the anterior part of the mandible. This leads to exposure of the root surface due to apical migration of the connecting epithelium and, as a result, deterioration of aesthetics, root hypersensitivity and root caries. Additionally, due to the large attachments of muscles and mucous membranes, a pulling syndrome is observed.

Vestibular deepening procedures have always been a matter of concern for the periodontist. Deepening the vestibule can facilitate daily hygiene activities, improve patient comfort and positively change the conditions in this area.



Figure 1. Shallow vestibule, visible plaque accumulation and gingival recession
Rycina 1. Płytki przedsiónek, widoczne złoże płytki nazębnej i recesja dziąseł



Figure 2. Deep vestibule
Rycina 2. Głęboki przedsiónek

Characteristic of oral vestibule

Attached gingiva (AG) is the tissue between the mucogingival junction (MGJ) and the point where the external gingival surface of the most apical portion of the gingival sulcus or the periodontal pocket projects [2]. This structure is tough, inflexible and resist abrasion because of its histological characteristics. Being part of the keratinized gingiva, it helps the periodontium increase its resistance to external trauma and stabilizes the gingival margin against frictional forces [3]. Different areas of the mouth has various width of attached gingiva. The greatest width is in incisor region between 3.5 to 4.5mm in maxilla and 3.3–3.9 in mandible, however in the posterior teeth it is much narrower around 1.9 mm in maxillary and 1.8 mm in mandibular first premolars [4]. To measure width of attached gingiva we subtract the depth of the sulcus or pocket from the distance between the crest of the gingival edge and the MGJ [5]. Revealing MGJ

could be done by three methods: visual method, functional method and histochemical staining method. The last one is associated with the fact that the attached gingiva has no glycogen in the most superficial layer and gives an iodo-negative reaction while staining the alveolar mucosa with Lugol's iodine solution [2] Gingival biotype, also called phenotype, was classified into thin and thick one. This first one is much more common in women compared to men and when it is associated with anterior teeth it is more susceptible to recession. Gingival phenotype could be measured invasive or noninvasive way by visual evaluation, needles injection, probe transparency, histological sections, transgingival probing, cephalometric radiographs, ultrasonic devices and CBCT [6].

In 2018, mucogingival deformities were categorized as: gingival recession, low vestibular depth, lack of keratinized gingiva, aberrant frenum position, abnormal gingival color and gingival excess [7].

Indication

Multiple research studies have shown that having an adequate depth of vestibule and width attached gingiva are crucial for oral hygiene maintenance [2, 8, 9]. Based on prior studies there should be at least 1 mm of width of AG for maintaining good oral hygiene [10]. Also the food accumulation may occur during mastication. The food impact against the gingival margin and into the interproximal spaces causes difficulties for the patient to clean the area [11]. In a shallow vestibule, proper tooth brushing may be difficult due to the lack of space for the toothbrush. The movable gingival margin facilitates the introduction of microorganisms into the gingival crevice, which may be difficult to eliminate during regular tooth brushing [12].

Pull syndrome is identified when marginal gingiva movement is observed during pulling the lower lip [5]. The width of attached gingiva around natural teeth was contemplated significant because it was needed to dissipate the forces of the muscle pull of unattached mucosa. The shallow vestibule as a restricted zone of keratinized gingiva where high frenulum attachments commonly occur increase plaque accumulation in the gingival sulcus. [13] This may cause, mostly in patients with inadequate oral hygiene, gingival inflammation and further to gingival recession [7]. High frenulum and muscle attachments may also cause periodontal recession to return after treatment [14].

The zone of attached gingiva is considered functionally adequate when it is sufficient to prevent retraction of the marginal gingiva and interdental papilla [15]. This along with the inadequate width of attached gingiva and inadequate vestibular depth clinically often occur in the front region of the lower jaw.

The gingival recessions and shallow vestibule may happen without any symptoms, but may be a concern for patients due to their un-aesthetics appearance. Periodontal esthetic surgery is associated not only with biological and functional issues that impact the periodontium, but also with improving esthetic appearance [16].

The success of implants, if required in the future, can be enhanced by the increase in vestibular depth and attached gingiva. From a periodontal point of view, the concern with using implants as abutments is that the periodontal pockets surrounding them may lead to pathological pockets and insufficient vestibular depth, which can negatively impact their function [15]. Increasing vestibular depth and attached gingiva may ensure better adaptation of the soft tissue onto the implant

[13]. Especially, expanding the width of keratinized tissue reduce plaque accumulation and mucosal inflammation, enlarge resistance of the periodontium, stabilizes the gingival margin position, and dissipates some physiological forces exerted by the muscular fibers of the alveolar mucosa onto the gingival tissues. Maintaining a minimum thickness of peri-implant mucosa may be necessary to prevent bone loss in the future [17, 18].

In edentulous jaws, it is common to observe a loss of alveolar bone and an inadequate amount of attached gingiva. Although the bone structure may be sufficient, the attachments of the surrounding muscles may not provide enough support for dental prostheses, causing them to slip loose during speech or feeding. A limited zone of keratinized gingiva and high frenulum attachments frequently occur in the shallow vestibule. Due to requirement of the adequate vestibular depth for the retention of prosthetic equipment vestibuloplasty is performed. This treatment is one pre-prosthetic surgery to improve the denture bearing area and surrounding tissue [19, 20].

Orthodontic treatment and gingival recession often occur together. It is associated with specific risk factors such as the position of the teeth in the buccolingual dimension and the movement of teeth in the frontal plane. The position of the teeth in the buccolingual dimension affects the thickness and width of the keratinized gingiva, with more keratinized gingiva present when the teeth are positioned lingually rather than buccally. Rapid palatal expansion (RPE) is an orthodontic appliance that expands the maxillary arch and applies forces to the maxillary molars and premolars in the frontal plane, which can cause teeth to shift buccally and result in reduced gingival width on the labial aspects of the teeth [21]. Insufficient width of attached gingiva during orthodontic treatment, can cause problems with the bands and brackets which might get engrossed in the buccal mucosa. In orthodontics when the end position is predicted to result in recession periodontal grafts can be performed before, during or after orthodontics [5, 22].

To sum up, vestibuloplasty and increasing width of attached gingiva is indicated when there is a problem with maintaining proper oral hygiene associated with food and plaque accumulation which can lead to gingivitis and further gingival recession. It's also recommended when pull-syndrome occurs, to improve esthetic appearance, to ensure good peri-implant tissue health, to provide retention of prosthetic equipment and in some specific cases during orthodontic treatment.

Complication

Due to numerous indications, vestibuloplasty and widening of the gingival zone are performed more and more often, but complications are quite common.

Autogenous gingival grafting is a well-known method of increasing the width of keratinized gingiva and vestibule deepening. Despite its effectiveness, some disadvantages like two treatment sites (associated with an additional wound mainly in the palate area), a longer healing process in the palate, the quality and quantity of tissue in the donor site, the possibility of hemorrhage in the donor site, aesthetic changes resulting from discrepancies in the color of the palatal gingiva and the transplanted area (in the case of a free tissue graft) and morbidity should be taken into account [5, 9, 17]. The cost of the procedure and the patient's postoperative discomfort should also be considered before deciding to perform the surgery. Griffin et al. compared the frequency of post-operative complications among different soft tissue grafting procedures, and noted that for each minute of the procedure, there was a 4% increase in the probability of developing moderate to severe pain and a 3% increase in moderate to severe swelling [23].

Surgical gingival widening using the Clark technique [24, 25] consisted in exposing the alveolar bone from the mucosa to a width of about 10 mm from the muco-gingival border. This involves creating a pedunculated flap of the mucosa by carefully cutting it in a way that only exposes the part facing the lip. The flap is then sutured into the bottom recess of the vestibule (**Figure 3**). In the Clark

method, a section of bone is created that is covered with the periosteum, unlike the Corn method [26], in which an area of the bone is created without the periosteum – fenestration. Observations have shown the effectiveness of both procedures, although in the Corn method there was less postoperative complications, which is the result of the use of fenestration. However, leaving a fragment of exposed bone increased the risk of alveolar bone resorption. In both methods, there was also a large contraction of tissues, as a result of which secondary frenulum is formed at the site of the postoperative scar [27, 28].

Vestibuloplasty techniques can be generally categorized as mucosal advancement, secondary epithelization and grafting vestibuloplasty [25, 29]. Vestibuloplasty with secondary epithelization is the conventional procedure for increasing the vestibular depth and the width of attached gingiva. However, in such a procedure there is often recurrence of the shallow vestibule and inadequate width of attached gingiva.

Edlan Mejchar procedure is a vestibular deepening procedure which is a predictable technique with long-term results. This procedure also appeared to increase the width of the attached gingiva where other procedure impracticable due to lack of vestibular depth. Complications associated with this technique are patients complain of stiffness during movement of the lower lip and shortening of the lip [13].

Kazanjian technique [20, 30] is secondary epithelization technique in mandible to overcome poor quality of mucosa which means hyperplastic



Figure 3. Clark technique, intraoperative photo

Rycina 3. Metoda Clarka, zdjęcie śródoperacyjne

mucosa or scar tissue. Labial incision is performed and large flap is reflected so that mucosal flap was transposed on to the bone and sutured to desired vestibular depth. Raw surface of lip is healed by granulation, secondary epithelization and contracture. Disadvantages associated with this technique are scar contracture and loss of sulcus depth [31].

Conclusion

The importance of maintaining adequate attached gingiva is often overlooked when planning treatment. Often, management of a shallow vestibule is largely considered important only when planning removable dentures to improve retention.

Prolonged muscular traction, especially with reduced attached gingiva, causes gingival recession and leads to the development of marginal fissure, hypersensitivity, and caries.

Failure to recognize the impact of a shallow vestibule may affect orthodontic, prosthetic and implant treatment regardless of the patient's age. Late treatment is associated with a greater risk of complications, also due to weaker regenerative abilities in older patients.

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Conflict of interest statement

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