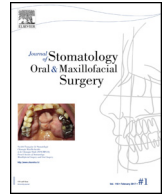




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Review

Augmentation of keratinized gingiva around dental implants



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ABSTRACT

To date, there is no general consensus with respect to the amount of soft-tissue volume needed for esthetic and functional purposes on the buccal aspect of dental implants. Numerous studies have investigated the relationship between the width of keratinized mucosa and the health of peri-implant tissues. Our purpose was to discuss about the necessity of keratinized tissue to maintain the peri-implant health and to report clinical efficacy of different techniques used to increase the keratinized tissue around dental implants.

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1. Introduction

The increased esthetic demands require the peri-implant soft tissue color and contour to be in harmony with the adjacent teeth for the patient satisfaction. Thus, surgical reduction of the peri-implant soft tissue defect may be indicated [1]. While surgical reconstructive procedures have been used for the improvement of soft tissue defects prior to implant placement, the preservation of appropriate soft tissue architecture around osseointegrated implants remains challenging; especially, when the implants are not inserted in a proper position [2] (Fig. 1). Numerous studies have dealt with the relationship between the width of keratinized mucosa and the health of peri-implant tissues [3–8]. The necessity of keratinized mucosa around dental implants is controversial. Our aim is to discuss the necessity of keratinized tissue to maintain the peri-implant health and to report clinical efficacy of different surgical approaches used to increase the keratinized tissue around dental implants.

2. Necessity of keratinized tissue for dental implants

To understand the role of keratinized tissue around implants, it is important to understand its role around teeth. Lang and Loe [9] were the first who assessed the impact of keratinized gingiva on periodontal health in natural teeth. The authors found in their longitudinal clinical study that the majority of areas with less than

2 mm of keratinized gingiva remained inflamed despite being plaque-free. They concluded that 2 mm of keratinized gingiva is adequate to maintain gingival health. Successive studies [10–13] were then performed to investigate the role of keratinized gingiva to maintain the periodontal health. However, the results are divergent and without consensus. Controversy exists with respect to the question of whether or not there is a need to augment the keratinized tissue around implants in patients with a lack of width or thickness. Chung et al. [4] reported that the absence of adequate amount of keratinized mucosa in dental implants, especially in posterior implants, was associated with higher plaque accumulation and gingival inflammation. This study confirms the findings of Warrer et al. [3] who suggested that the absence of keratinized mucosa around dental implants increases the susceptibility of the peri-implant region to plaque-induced tissue destruction. The results of these studies are consistent with a cross sectional study conducted by Bouri et al. [5] who reported that increased width of keratinized mucosa (≥ 2 mm) around implants is associated with lower mean alveolar bone loss and improved indices of soft tissue health. Wider zones of keratinized mucosa may lead to more resistance to the forces of mastication and frictional contact that occur during oral hygiene procedures. Levin et al. [14] concluded in a systematic review that for some patients a lack of keratinized mucosa may be a risk factor for one or more issues: plaque accumulation, tissue soreness while brushing, gingival inflammation, recession, bone loss, and esthetics. Regarding esthetics in the anterior maxilla, Zigdon and Machtei [6] reported that the keratinized mucosa thickness and width around dental implants affects both the clinical and the immunological parameters at

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Fig. 1. A submerged implant replacing the maxillary left central incisor too facially positioned. The buccal soft tissue was so thin that the underlying implant surface is visible through the tissue.

these sites. A negative correlation was found between mucosal thickness and marginal recession. Likewise, keratinized mucosa width showed a negative correlation with marginal recession, periodontal attachment level and prostaglandin E2 (PGE2) levels. Kim et al. [7] reported that insufficiency of keratinized mucosa does not necessarily mediate adverse effects on the hygiene management and soft tissue health condition. However, the risk of the increase of mucosal recession and the crestal bone loss is present. The authors suggested that the presence of an appropriate amount of keratinized mucosa is required. A cohort study conducted by Souza et al. [8] highlighted that implant sites with a band of <2 mm of keratinized mucosa were shown to be more prone to brushing discomfort, plaque accumulation, and peri-implant soft tissue inflammation when compared to implant sites with ≥ 2 mm of keratinized mucosa. Based on a systematic review Gobbato et al. [15] showed that reduced keratinized mucosa width around implants appears to be associated with clinical parameters indicative of inflammation and poor oral hygiene. In addition, the data from a meta-analysis performed by Lin et al. [16] suggested also that a lack of adequate keratinized mucosa around dental



Fig. 2. Soft tissue augmentation with an apically positioned flap. (a) Initial intra-oral condition. Thin buccal keratinized mucosa showing by transparency the underlying implant surface replacing the maxillary right central incisor. (b) Radiographic initial condition showing two osseointegrated implants replacing the two central upper incisors. (c and d) A trapezoidal flap (full thickness coronal to the submerged implant and splith thickness apical to it) was raised with vertical releasing incisions, repositioned apically and stabilized by periosteal sutures. (e and f) Intraoral condition 3 months after the surgical procedure. Occlusal view showing the increase in buccal soft tissue thickness at the implant site. (g) An orthodontic treatment was performed to correct the malocclusion. (h) Intraoral condition 1 year after the soft tissue augmentation and completion of treatment. The soft tissue margin was stable and the esthetic appearance was well maintained and no signs of gingival inflammation were present. (i) Views at 1 year post-surgery.

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