Interventions for replacing missing teeth: management of soft tissues for dental implants.

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Abstract

BACKGROUND: Dental implants are usually placed by elevating a soft tissue flap, but in some instances, they can also be placed flapless reducing patient discomfort. Several flap and suturing techniques have been proposed. Soft tissues are often manipulated and augmented for aesthetic reasons. It is often recommended that implants are surrounded by a sufficient width of attached/keratinized mucosa to improve their long-term prognosis.

OBJECTIVES: To evaluate whether (1a) flapless procedures are beneficial for patients, and (1b) which is the ideal flap design; whether (2a) soft tissue correction/augmentation techniques are beneficial for patients, and (2b) which are the best techniques; whether (3a) techniques to increase the perimplant keratinized mucosa are beneficial for patients, and (3b) which are the best techniques; and (4) which are the best suturing techniques/materials.

SEARCH STRATEGY: The Cochrane Oral Health Group's Trials Register, The Cochrane Central Register of Controlled Trials, MEDLINE and EMBASE were searched. Handsearching included several dental journals. Authors of all identified trials, an internet discussion group and 55 dental implant manufacturers were contacted to find unpublished randomised controlled trials (RCTs). The last electronic search was conducted on 15 January 2007.

SELECTION CRITERIA: All RCTs of root-form osseointegrated dental implants comparing various techniques to handle soft tissues in relation to dental implants. Outcome measures were: prosthetic and implant failures, aesthetics evaluated by patients and dentists, biological complications, postoperative pain, patient preference, ease of maintenance by patient, and width of the attached/keratinized mucosa.

DATA COLLECTION AND ANALYSIS: Screening of eligible studies, assessment of the methodological quality of the trials and data extraction were conducted in duplicate and independently by two review authors. Authors were contacted for missing information. Results were expressed as random-effects models using mean differences for continuous
outcomes and risk ratios for dichotomous outcomes with 95% confidence intervals (CI). Heterogeneity was to be investigated including both clinical and methodological factors.

**MAIN RESULTS:** Eight potentially eligible RCTs were identified and five trials including 140 patients in total were included. Two trials (100 patients) compared flapless placement of dental implants with conventional flap elevation, two trials (20 patients) crestal versus vestibular incisions, and one trial (20 patients) Erbium:YAG laser versus flap elevation at the second-stage surgery for implant exposure. On a patient, rather than per implant basis, implants placed with a flapless technique and implant exposures performed with laser induced statistically significant less postoperative pain than flap elevation. There were no other statistically significant differences for any of the remaining analyses.

**AUTHORS’ CONCLUSIONS:** Flapless implant placement is feasible and has been shown to reduce patient postoperative discomfort in adequately selected patients. There is insufficient reliable evidence to provide recommendations on which are the best incision/suture techniques/materials, or whether techniques to correct/augment perimplant soft tissues or to increase the width of keratinized/attached mucosa are beneficial to patients or not. Properly designed and conducted RCTs are needed to provide reliable answers to these questions.

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**Soft tissue management at implant sites.**

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**Abstract**

**BACKGROUND:** Dental implants are widely used to replace lost teeth. It was suggested that surgical manipulation/augmentation of peri-implant soft tissue may be beneficial to increase the width/thickness of keratinized tissue (KT) and to enhance aesthetic outcomes of implant therapy. The aim of this paper was to provide a narrative review of the literature concerning soft tissue management at implant sites.

**MATERIAL AND METHODS:** Clinical studies were identified with both medline and hand searches. Three topics were considered in this review: (i) the significance of KT at implant sites, (ii) the surgical techniques to increase KT and (iii) soft tissue stability around implants.

**RESULTS:** Several papers concerning soft tissue management at implant sites were identified, mainly expert opinions, case reports and case series. In addition, a systematic review was selected. Generally, the level of evidence was weak. So far, literature analysis showed that (i) the width of KT did not influence the survival rate of dental implants; (ii) there is no evidence to recommend a specific technique to preserve/augment KT; and (iii) factors including bone level, KT and implant features have not been shown to be associated with future mucosal recession around dental implants.

**CONCLUSION:** Although scientific evidence in most part is lacking, soft tissue augmentation at implant sites may need to be considered in some clinical situations.
Connective tissue graft used as a biologic barrier to cover an immediate implant.


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Abstract

BACKGROUND: The purpose of the present study was to evaluate the clinical efficacy of placing implants in fresh extraction sites with simultaneous connective tissue grafting. The teeth selected for this treatment showed gingival recession and/or absence of attached gingiva.

METHODS: Ten patients (five men and five women), 42 to 55 years of age, were included in the study. After initial examination and treatment planning, all of the patients selected for the study underwent periodontal treatment that was deemed necessary to favor wound healing. Subsequently, the teeth were extracted, and implants were placed without reflection of a mucoperiosteal flap. Immediately after implantation, a connective tissue graft was placed over the implants to treat the gingival recession. The second stage of surgery was performed 6 months after the initial procedure. The following clinical parameters were evaluated for each patient at 6 and 12 months after implant placement and connective tissue grafting: probing depth, probing attachment level, and mobility. Radiographs were taken using a standardized method to evaluate the marginal bone loss. Esthetic outcomes were evaluated using the measurements before implant placement and 12 months after surgery: width of the keratinized mucosa, emergence profile of the crown, and patient satisfaction.

RESULTS: The healing period was uneventful for all patients. All of the implants had osseointegrated. At the end of the 12-month follow-up, the patients were asymptomatic, and the implant sites showed no signs of infection or bleeding when probed. The parameters used to estimate the esthetic outcomes showed an improvement.

CONCLUSIONS: Implant placement immediately after tooth extraction with simultaneous connective tissue graft was considered a successful procedure. Moreover, the surgical approach used in this study can be considered a treatment option in cases with non-salvageable teeth showing gingival recession and the absence of attached gingiva.
**Mucosal considerations for osseointegrated implants.**

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**Abstract**

Tissue resistance is determined by the nature of cells and intercellular contacts irrespective of the presence or absence of keratinization, masticatory mucosa, or skin. However, these tissues are more easily maintained and less vulnerable to inflammation when in contact with dental implants. Lack of masticatory mucosa and the presence of alveolar mucosa embracing the implant are often associated with plaque, which can induce inflammation resulting in subsequent peri-implant destruction. To facilitate proper mechanical oral hygiene maintenance, transplantation of autogenous masticatory mucosal grafts at the implant sites was performed in patients without attached gingiva, unfavorable vestibulum with submucosal muscular activity, and uncontrolled peri-implant mucositis. The rationale for having attached mucosa around osseointegrated implants and illustration of possible methods of mucosal management in the different phases of implant rehabilitation are presented.

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**Five-year evaluation of the influence of keratinized mucosa on peri-implant soft-tissue health and stability around implants supporting full-arch mandibular fixed prostheses.**

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**Abstract**

BACKGROUND: The question of the importance of keratinized mucosa around dental implants for the prevention of peri-implant disease could not be answered in the relevant literature so far.

OBJECTIVE: To investigate the influence of peri-implant keratinized mucosa on long-term peri-implant soft-tissue health and stability over a period of 5 years.

MATERIAL AND METHODS: A total of 386 mandibular dental implants were placed in 73 completely edentulous patients, and subsequently restored with fixed full-arch prostheses. At prosthesis delivery (baseline) and after 3, 6, 12, 18, 24, 36, 48 and 60 months, modified plaque index (mPlI), modified sulcus bleeding index (mBI), distance between implant shoulder and mucosal margin (DIM) and width of peri-implant keratinized mucosa (KM) were
recorded. Statistical analysis included multivariate logistic regression, multivariate ordinal logistic regression, generalized estimating equations and Bonferroni’s correction.

RESULTS: Fifty-eight patients with 307 implants completed the 5-year study. Statistically significantly higher plaque accumulation on lingual sites (mean mPll 0.67, SD 0.85), bleeding tendencies on lingual sites (mean mBI 0.22, SD 0.53) and larger soft-tissue recession on buccal sites (mean DIM -0.69 mm, SD 1.11 mm) were found when the width of KM was <2 mm, compared to sites with >or=2 mm of KM (mean mPll 0.40, SD 0.68, P=0.001; mean mBI 0.13, SD 0.41, P<0.01; mean DIM -0.08 mm, SD 0.86 mm, P<0.001). The width of keratinized mucosa had no effect on bleeding tendency or plaque accumulation on buccal sites (P>0.05).

CONCLUSION: In patients exercising good oral hygiene and receiving regular implant maintenance therapy, implants with a reduced width of <2 mm of peri-implant keratinized mucosa were more prone to lingual plaque accumulation and bleeding as well as buccal soft-tissue recession over a period of 5 years.

The influence of the masticatory mucosa on the peri-implant soft tissue condition.

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Abstract

The aim of this study was to evaluate the soft tissue conditions at osseo-integrated oral implants in relation to the width of masticatory mucosa. Thirty-nine patients who had received a full-arch fixed bridge reconstruction > or = 10 years ago or a partial reconstruction > or = 5 years ago on a total of 171 implants ad modum Bränemark were included in the study. The examinations involved assessments of plaque, gingivitis, bleeding on probing, probing depth, width of masticatory mucosa and marginal tissue mobility. Simple correlation analysis as well as multiple regression analysis were performed to evaluate relationships between recorded parameters. The results showed that 24% of the sites were lacking masticatory mucosa, and an additional 13% of the implants had a width of less than 2 mm. Mobility of the facial marginal soft tissue, i.e., lack of an attached portion of masticatory mucosa, was observed at 61% of all implants. No major differences in the clinical parameters examined were found between sites with and without an "adequate" width of masticatory mucosa. Multiple regression analyses revealed that neither the width of masticatory mucosa nor the mobility of the border tissue had a significant influence on (i) the standard of plaque control or (ii) the health condition of the peri-implant mucosa, as determined by bleeding on probing. Hence, the study failed to support the concept that the lack of an attached portion of masticatory mucosa may jeopardize the maintenance of soft tissue health around dental implants.
Local risk factors for implant therapy.

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Abstract

PURPOSE: The aim of this review was to determine the effect of several potential local risk factors on implant survival and success (primary outcomes) as well as on mucosal recession, bleeding on probing, and proximal marginal bone loss (secondary outcomes).

MATERIALS AND METHODS: A comprehensive review of the literature was conducted. The selection of publications reporting on human clinical studies was based on predetermined inclusion criteria and was agreed upon by three reviewers. After title and abstract screening of 2,681 publications obtained from the search, 19 articles were deemed to be relevant to the topic and the search criteria.

RESULTS: Limited data show that when an implant is placed within 3 mm of the neighboring tooth, proximal bone is at risk. The data regarding the placement of implants into infected sites are still insufficient, but studies have shown that this may be possible. Soft tissue thickness has not been shown to be a risk factor in implant survival. There is also no evidence to support a relationship between the width of keratinized tissue and implant survival. No studies were found that directly related bone density to implant survival. Implant stability was also difficult to examine due to the lack of validated stability measures.

DISCUSSION AND CONCLUSION: One critical factor that faced the group during the review of the literature and interpretation of the data was the multifactorial nature of implant therapy. This makes isolation of specific risk factors difficult. Conclusions are limited by the current lack of quality clinical trials in this area.

Evaluation of peri-implant tissue response according to the presence of keratinized mucosa.

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Abstract
OBJECTIVES: The purpose of this study was to evaluate the responses of peri-implant tissue in the presence of keratinized mucosa.

STUDY DESIGN: A total of 276 implants were placed in 100 patients. From the time of implant placement, the average follow-up observation period was 13 months. The width of keratinized mucosa was compared and evaluated through the gingival inflammation index (GI), plaque index (PI), the pocket depth, mucosal recession, and marginal bone resorption.

RESULTS: The GI, PI, and pocket depth in the presence or absence of the keratinized gingiva did not show statistically significant differences. However, mucosal recession and marginal bone resorption experienced statistically significant increases in the group of deficient keratinized mucosa. Based on implant surface treatments, the width of keratinized gingiva and crestal bone loss did not show a significant difference.

CONCLUSION: In cases with insufficient keratinized gingiva in the vicinity of implants, the insufficiency does not necessarily mediate adverse effects on the hygiene management and soft tissue health condition. Nonetheless, the risk of the increase of gingival recession and the crestal bone loss is present. Therefore, it is thought that from the aspect of long-term maintenance and management, as well as for the area requiring esthetics, the presence of an appropriate amount of keratinized gingiva is required.

Mandibular two-implant telescopic overdentures.

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Abstract

To stabilize mandibular overdentures in edentulous patients, various connector types which can be attached to between two and four implants placed in the anterior mandible are possible. Treatment using non-rigid telescopic connectors on two interforaminal implants for overdenture stabilization began in 1989. The objective of this study is to investigate soft- and hard-tissue conditions as well as prosthesis function after a period of 10 years. This also involved an evaluation of correlations between radiographic and clinical parameters. Twenty-three subjects with 46 interforaminal implants (ITI solid screw implants, 12 mm in length, 4.1 mm in diameter; 10.4 years in situ, range, 8-12.8 years) were investigated. Modified plaque index (mPI), sulcus fluid flow rate (SFFR), modified sulcus bleeding index (mBI), probing depth (PD), distance from implant crown margin to the coronal border of the peri-implant mucosa (DIM), attachment level (AL), width of keratinized mucosa (KM), Periotest values (PTVs) and prosthesis function were evaluated. In the radiographic evaluation, the distance between implant shoulder and first crestal bone-implant contact (DIB) in mm and the horizontal bone loss (HBL) in mm were measured. The relatively high mPI scores (mean, 0.82; score, 0 in 44.4%; SD, 0.83) did not result in increased SFFR scores (mean, 12; min, 3, max, 38; SD, 7.43) or higher mBI scores (mean, 0.35; score, 0 in 70.8%; SD, 0.59), which was commensurate with healthy peri-implant mucosa. A mean PD value of 2.15 mm (min, 1 mm; max, 5 mm; SD, 0.96) and a mean DIM value of 0.28 mm (min, 0 mm; max, 2 mm; SD,
0.52) were measured. The implants were stable, showing a mean Periotest value of -1.91 (max, 0.2, min, -6; SD, 1.76). A mean DIB of 3.19+/−0.95 mm (range, 1.3-5.16 mm) and a mean HBL of 1.6+/−1.52 mm (range, 0.28-8.33 mm) were calculated. A correlation was found between DIB and the parameters SFFR (P=0.060), DIM (P=0.042), AL (P=0.050) and especially PTV (P<0.01), leading to the assumption that these clinical parameters may be useful indicators of peri-implant bone loss. The results of the 10-year follow-up examination show that non-rigid telescopic connectors with two interferaminal implants for overdenture stabilization appear to be an efficient and effective long-term treatment modality in severely resorbed edentulous mandibles. Particularly in geriatric patient treatment this concept may provide advantages in terms of handling, cleaning and long-term satisfaction.

**Single-tooth replacement by immediate implant and connective tissue graft: a 1-9-year clinical evaluation.**

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**Abstract**

OBJECTIVES: The aim of the present study was to evaluate the long-lasting efficacy of a combined surgical protocol, using immediate implant and subepithelial connective tissue graft for single-tooth replacement. The advantages of this single-center, longitudinal, randomized, blind examiner research were the following: preservation of both keratinized mucosa amount and bone tissue, optimal peri-implant marginal sealing, satisfactory aesthetic results, reduction in treatment time.

MATERIALS AND METHODS: In the time period from 1990 to 1998, 116 patients were consecutively admitted for treatment with a total of 116 solid screw ITI-implants supporting single crowns. Ninety-six patients underwent the proposed combined treatment (test group), while 20 received only single immediate implants (control group). The observation time extended from 1 up to 9 years.

RESULTS: The 9-year cumulative survival rate was 100% for both test and control groups. Comparative statistical analysis of soft and hard tissue peri-implant parameters demonstrated better results in the test group than in the control during every single 3-year analysis and especially in the last observation interval. The test group also showed very good results in terms of aesthetic parameters, which estimated the keratinized mucosa width, the alignment of crown emergence profile and the patient's satisfaction.

CONCLUSION: Single-tooth replacement by immediate solid screw ITI implants in association with connective tissue autograft was demonstrated to be a predictable procedure. Moreover, this treatment can be considered as a sure system to reach an excellent functional and harmonious aesthetic restoration.