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study

Dimensional changes of newly established keratinised tissue following free gingival grafts

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Background

The role of the attached gingiva in maintaining both periodontal and peri-implant health has been extensively investigated but until now the evidence has been equivocal. There is a general consensus that gingival augmentation around teeth should be performed only in cases where a patient cannot perform proper plaque control because of sensitivity of the non-keratinized gingiva, when there is progressive soft-tissue recession, and for pre-prosthetic purposes. Sometimes bone dehiscence developed because of orthodontic movement may also warrant gingival augmentation.

Despite similarities in the clinical appearance of the gingiva around teeth and implants, the connective tissue differs significantly. Around implants, there is a reduced blood supply because of the lack of periodontal ligament and the collagen fibres do not attach to the implant's surface but run parallel to and in a circular fashion around it. It is because of these characteristics that existing literature advocates ≥ 2 mm of keratinised tissue width (KTW) around implants as its presence is associated with a reduction in mucosal inflammation, brushing discomfort, and plaque levels.

Gingival augmentation by means of a free gingival graft (FGG) is the established "gold standard" procedure for increasing the amount of keratinised tissue. Graft shrinkage occurs during the healing phase, but it is unknown whether FGGs behave differently around teeth and implants.

Aims

The aim of the study was to compare dimensional changes in keratinised tissue around teeth and implants, following a FGG procedure with one year of follow-up. Graft shrinkage and the gingival margin position were also evaluated.

Materials & methods

- This prospective observational study was conducted on patients attending the Department of Periodontology at the Universitat Internacional de Catalunya (UIC), Barcelona, Spain.
- Adult patients with a mucogingival defect at the buccal site of a tooth or implant were identified. Inclusion criteria included < 2 mm of keratinized tissue width (KTW) present and discomfort while brushing.
- The primary outcome variable was change in KTW around teeth and implants, following an FGG procedure, with one year of follow-up. The secondary variables were changes in keratinised tissue length (KTL), gingival shrinkage (GS) and gingival margin position (GMP).
- Initial therapy involved oral-hygiene instructions (OHI) and scaling and root planing (SRP) to achieve low plaque and bleeding scores. In the implant group, resolution of peri-implant mucositis was required.
- The same surgical technique was used for both the teeth and implant group. A partial-thickness flap was dissected at the recipient site. An FGG of 1.5mm thickness was taken from the anterior palate and sutured over the recipient site. Post-operative care instructions included OHI, pain relief (1g of paracetamol QDS, prednisone 10-40mg/day), and soft-diet advice.
- Recall appointments (including supportive periodontal therapy) occurred initially at one, two, and six weeks, and then at three, six, and 12 months.
- All clinical examinations were performed by the same experienced clinician. A customised acrylic stent was made on study models to standardise the clinical measurements.
- The clinical measurements recorded in both groups were:
 - Keratinised tissue width of the graft – apico-coronal dimension (mm).
 - Keratinised tissue length of the graft – mesial-distal dimension (mm).
 - Graft shrinkage (%).
 - Gingival margin position (mm).



Figure: Images depicting free gingival graft at teeth and implant sites: immediately post-op, and at three, six, and 12 months of follow-up.

Results

- Twenty-nine patients contributed 35 sites. The teeth group had two males and 14 females, two of whom were current smokers and 14 non-smokers/former smokers. The implant group had three males and 10 females, three of whom were current smokers and 10 non-smokers/former smokers. The overall mean age was 56 ± 11.86 years.
- Nineteen FGGs were placed in the teeth group and 16 in the implant group.
- The mean KTW and KTL of grafts at baseline were 6.4 ± 1.4 mm and 16.8 ± 6.8 mm in the teeth group, while in the implant group they were 5.7 ± 1.4 mm and 18.6 ± 4.9 mm, respectively (no significant difference in KTW/KTL between groups).
- Mean decrease in KTW of the grafts between baseline and 12-months were:
 - Teeth group: 2.0 ± 2.1 mm.
 - Implant group: 2.9 ± 2.0 mm.
- Differences between groups were not statistically significant ($p=0.22$). However, a multilevel analysis showed a 1.31 mm ($SE=0.66$) higher KTW reduction in the implant group ($p=0.02$).
- Mean decrease in KTL of the grafts between baseline and 12-months were:
 - Teeth group: 3.1 ± 5.5 mm.
 - Implant group: 6.9 ± 5.4 mm.
- Differences between groups were statistically significant ($p=0.046$).
- Mean graft shrinkage at 12 months was $36.7 \pm 38.2\%$ in the teeth group and $61.8 \pm 36.3\%$ in the implant group ($p=0.056$).
- The greatest reduction in KTW and GS was observed following six weeks of healing.

Limitations

- While 94% of the augmentation procedures around teeth were performed in the anterior regions of the mouth, 90% of the augmentation procedures around implants were performed in the posterior region. This discrepancy may have affected the outcome.
- Similarly, anatomic difference between teeth and implant groups relate to the lack of adjacent teeth at implant sites. The lack of adjacent teeth, and thus vascular supply from a periodontal ligament, may have affected the outcome.
- The sample size of the study was determined by a power calculation (80% power with an $\alpha = 5\%$). However, given the marginal p values at 12 months, a larger study might have provided more certainty in findings.
- The method of calculating the graft area is an estimate because of the irregular shape of grafts. Standardised digital scanning might have been helpful.

Conclusions & impact

- Where and when it is indicated, a FGG is a valuable and predictable treatment for increasing KTW around both teeth and implants.
- Within the limitations of this study, there may be more KTW and KTL reduction and GS following FGG augmentation procedures performed around implants than in those around teeth.
- Further research comparing augmentation procedures in teeth and implants is needed with standardised parameters such as recipient anatomic site location.

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