To Compare Free Gingival Grafts and Connective Tissue Grafts Around Implants With Lack of Keratinized Mucosa

Study Protocol & Statistical Analysis Plan

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A Prospective, Randomized Clinical Trial to Compare Free Gingival Graft and Connective Tissue Graft around Implants with a Lack of Keratinized Mucosa

Study Protocol

1. Objectives/Specific Aims:

The purpose of this study is to compare two commonly used soft tissue grafting techniques (FGG and CTG + gingivoplasty) to create/augment the soft tissue around dental implants with a lack of keratinized mucosa and to quantify the WKM gains at 6 and 12 months following incorporation at the recipient sites.

Secondary outcomes include evaluating the efficacy of gingivoplasty to induce keratinization, capturing changes in tissue thickness (tissue biotype), assessing esthetic outcomes using a newly developed peri-implant esthetic scale (PIES), and measuring patient-centered outcomes (pain, bleeding, swelling, patient satisfaction and change in daily activities) between the 2 groups.

Null hypothesis: there will be a statistically significant difference between FGG and CTG + gingivoplasty when used to increase WKM around dental implants at 6 and 12 months post-op.

2. Materials and Method:

Study population

A total of 30 patients seeking treatment at the UAB SOD Graduate Periodontology clinics will be recruited to participate in this study according to the criteria in Table 1.

If deemed eligible, study visits, objectives, risks and benefits will be explained to all participants and IRB-approved written informed consent will be obtained. Conventional oral impressions will be made to fabricate a customized acrylic stent for reproducibility of clinical measurements. One trained calibrated examiner will be available for all study visits when clinical measurements are required. Photographs will be taken during all visits using a SLR digital camera in a 1:1 ratio.

Randomization

Randomization will take place on the day of surgery via sealed envelopes indicating the surgical approach the patient will receive, as follows:

Treatment Group 1: Free Gingival Graft (FGG)

Treatment Group 2: Connective Tissue Graft (CTG) + Laser Gingivolplasty (LG)

Table 1. Study Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
Patients: • English speaking • At least 18 years old • Able to read and understand informed consent document	Systemic conditions contraindicating oral surgical procedures or adversely affecting wound healing
	Crestal bone loss extending apical to first implant thread
	Presence of peri-implantitis, acute infection and/or suppuration at the implant placement site(s)
One or more adjacent dental implants having WKM <2mm around the buccal aspect. [if there are multiple affected adjacent implants, they will all be treated but only 1 implant with the least WKM will be included in the analysis]	Presence of soft tissue recession exposing threads at implant site
Timing of intervention: Implants with healing abutments awaiting restoration or after delivery of temporary/permanent restoration	Absence of buccal plate of bone
Periodontally healthy neighboring teeth, healthy implants or edentulous ridge on either side of the involved site (s)	Previous soft tissue grafting at the implant site(s)

Plaque Score <15% following prophylaxis	Smoking >10 cigarettes per day

Surgical Visit

Group 1: Under local anesthesia, the implant site (s) will be prepared with a trapezoidal split-thickness flap on buccal aspect leaving a thin periosteum as recipient bed. Mesio-distal and apico-coronal dimensions will be measured at recipient site and a FGG with equal dimensions and uniform thickness will be harvested from the patient's palate. Exact FGG dimensions will be measured with a UNC-15 periodontal probe and its thickness will be measured using a caliper prior to placement at recipient site. FGG will be secured in position with multiple suture techniques. KM will then be measured immediately after FGG is secured. Donor site will be treated with wet gauze compression or placement of hemostatic agent if needed, and a prepared acrylic palatal stent will be delivered.

Group 2: A similar procedure will be performed with the following differences. The flap at the recipient site will be full-thickness in design. CTG harvesting from the patient's palate will be completed using a single incision or trap door technique leaving a minimal wound. After CTG is secured with sutures, the full-thickness flap will be repositioned to achieve complete CTG coverage.

Figure 1 illustrates the treatment of two implants with lack of KM using FGG.

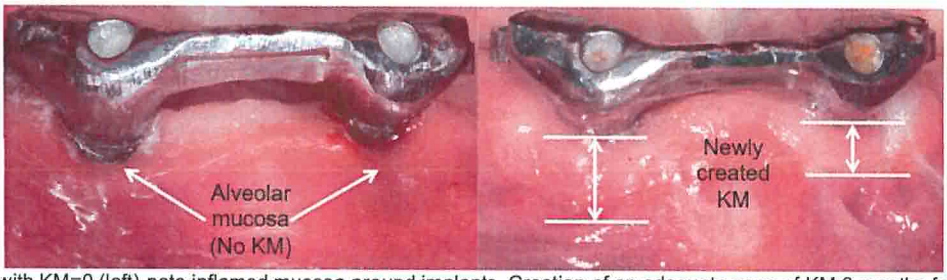

Fig. 1. Implants with KM=0 (left)-note inflamed mucosa around implants. Creation of an adequate zone of KM 3 months following treatment with FGG (right)-note increase in tissue thickness and absence of inflammation signs

Follow-up Visits and Clinical Outcomes

The surgical sites will be examined at 1 and 2 weeks after surgical visits and loose sutures will be removed. Exams will then be scheduled at 1, 3, 6, and 12 months post-op. For participants in Group 2 (CTG), a CO2 Laser gingivoplasty will be performed at 1-month follow-up taking in account the CTG dimensions and flap thickness at time of grafting in order to expose underlying CTG to induce formation of keratinized epithelium.

The clinical parameters and the respective timing of the measurements will be evaluated for all patients as indicated in Table 2.

Table 2. Clinical parameters and their respective timing of measurement

Clinical parameters	Timing of measurements
Probing Depth (PD) using UNC periodontal probe (in mm) using a custom acrylic stent	Screening, Surgery (Pre-surgical), at 3, 6 and 12 months post-op
Width of Keratinized Mucosa (KM) using UNC periodontal probe (in mm) using a custom acrylic stent	Screening, Surgery (Pre-surgical), at 3, 6 and 12 months post-op
Width of attached mucosa (AM) will be calculated by subtracting PD from KM	Screening, Surgery (Pre-surgical), at 3, 6 and 12 months post-op
Tissue Thickness (TT1 and TT2) of peri-implant buccal mucosa will be measured during the surgical visit by horizontal transmucosal probing using an endodontic reamer after local infiltration of anesthetic prior to surgical site preparation. TT1 and TT2 will be measured at 2 mm and 5 mm from the mucosal margin, respectively, using a custom acrylic stent	Screening, Surgery (Pre-surgical), at 3, 6 and 12 months post-op
Plaque Index (PI) according to Silness & Löe (1964)[17]	Screening, Surgery (Pre-surgical), at 1, 3, 6 and 12 months post-op

Gingival Index (GI) according to Löe & Silness (1963)[18]	Screening, Surgery (Pre-surgical), at 1, 3, 6 and 12 months post-op

Esthetic Outcomes

A newly developed peri-implant esthetic scale (PIES) will be used by a second trained calibrated examiner to objectively evaluate standardized clinical photographs taken at 6-months and 1-year after soft tissue grafting. Transparency, blending, recession/level of soft-tissue margin, gingival color, and muco-gingival junction alignment will be recorded and compared.

Patient-centered outcomes

A customized visual analog scale (VAS) will be completed by patients at 1 week (both groups) and 5 weeks post-op (CTG+LG group only) using a scale of 1 through 10: 1-having the least pain/bleeding/swelling/satisfaction/impact on daily activity and 10-having the most pain/bleeding/swelling/satisfaction/ impact on daily activity.

Statistical Analysis

The non-inferiority design of the current study operates on an assumed standard deviation (SD) of .9 and a minimally clinically significant value (d) of 1 (1mm), based on previous studies of a similar nature.[19] Based on these values, if there is truly no difference between the standard and experimental treatment, then N=26 patients are required to be 80% sure that the lower limit of a one-sided 97.5% confidence interval will be above the non-inferiority limit of –d.

Since the results will not follow a normal distribution, a Mann-Whitney U test will be used to compare the gains in KM around dental implants between the control (FGG) and test group (CTG+LP) at 6 months and 12 months post-operatively.