Modified Vascularized Interpositional Periosteal Connective Tissue Graft Versus Xenogeneic Collagen Matrix For soft tissue Augmentation Around Implant in Esthetic Zone
(A Comparative Study)

Proposal

Presented By

Heba Ahmed Abd El-Maged Elsweefy

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Introduction and Review

Immediate implant placement defined as the positioning of a dental implant immediately into fresh extraction socket after tooth extraction, it's a predictable and acceptable procedure for redressing missing teeth **(Mazzotti, Stefanini et al. 2018).**

The immediate implant placement in anterior maxilla represent one of the most challenging areas and require orchestrated steps and protocols to help achieving predictable and long term esthetic outcomes **(Dixon and Yassin 2020).**

Contrary to popular belief, it is now evident that labial bone contour cannot be maintained by placing implants in fresh extraction sockets. Dimensional changes, including the loss of labial soft tissues and mid buccal mucosal recessions, seem to be inevitable following immediate placement. Even when guided bone regeneration is simultaneously performed to correct peri-implant bone defects or to fill horizontal gaps between implants and socket walls, changes in soft tissue levels may still occur, particularly in the presence of thin gingival biotypes or inadequate width of keratinized tissues**(Atieh and Alsabeeha 2020).**

Peri-implant soft tissue has attracted great attention recently as it is hypothesized that a sufficient amount of keratinized mucosa may establish a stable epithelial seal around dental implants, which is beneficial for avoiding bacterial penetration **(Huang, Liu et al. 2021).**

Hence, thickening the soft tissue and increasing the amount of keratinized mucosa with autogenous soft tissue grafts **(Chung, Rungcharassaeng et al. 2011)** or tissue substitutes **(Sanz, Lorenzo et al. 2009)** were thought to reduce the risk of mucosal recession, maintain the stability of peri-implant mucosal level and compensate for peri-implant mucosal changes following immediate implant placement and restoration(IIPR) **(Atieh and Alsabeeha 2020).**

Most techniques of soft tissue augmentation procedure have the drawback of less gain in volume because of limited size of the graft that can be used. Large onlay grafts have chances of necrosis due to lack of sufficient blood supply **(Cheng 2016)** .

In 2003, Sclar in his book, "Soft Tissue and Esthetic Consideration in Implant Therapy" described a pedicle CT grafting technique namely VIP-CT flap. It was introduced as anteriorly based pediculated tissue of palatal submucosa that composed of periosteum and connective tissue. It is preferred for large volume soft tissue augmentation and for simultaneous hard and soft tissue grafting **(Sclar 2003).**

The procedure involves raising a subepithelial palatal connective tissue periosteal flap and rotating it into the prepared anterior recipient site. It is then positioned beneath the curvilinear recipient flap and rigidly immobilized with sutures**(Landi and Sabatucci 2001).** The main advantages of this technique are the amount of tissue gain is more and the pedicled blood supply is derived from the connective tissue periosteal plexus within the flap that provides the biological basis for predictable coverage **(Rahpeyma, khajeh Ahmadi et al. 2012).**

Kim proposed a modified VIP-CT (mVIP-CT) graft in the implant site including papilla preservation flap in the implant site in order to minimizes tissue insult thus reduces postoperative shrinkage, maintains the intact vascularity of donor site even better and achieving optimum results with negligible tissue trauma **(Kim, Jang et al. 2012).**

This modification of VIP-CT flap differs from the conventional technique by lacking the releasing incisions at donor site for advancing the pedicle over the recipient site. Instead in this proposed technique, the advancing was done through tunneling procedure. An anteroposterior subperiosteal tunneling was done on the palate near implant site to create a passageway for pedicle graft connecting donor and recipient sites **(Kumar, Gayatri et al. 2015).**

A new soft tissue substitute xenogenic collagen matrix (XCM) is a xenogenic-derived absorbable bio-membrane, commonly used as three-dimensional matrix is composed of two layers: a compact layer, which is beneficial to suturing and wound protection, and a porous layer that favours blood clot stabilization, rapid vascularization, and tissue integration**(Huang, Liu et al. 2021).**

This novel tridimensional xenogenic derived acellular dermal matrix, derived from the porcine dermis composed of natural types I and III collagen without any artificial cross-linking, has been developed for multiple clinical situations **(Papi and Pompa 2018)**.

Previous studies have investigated the clinical efficacy of XCM for augmenting keratinized mucosa and reported promising results **(Schmitt, Moest et al. 2016).**

So, our research aiming to compare between modified VIP-CT graft and xenogenic collagen matrix membrane for soft tissue augmentation around dental implant in esthetic zone.

Aim of the study

-The primary aim of this study is to evaluate the efficacy of mVIP-CT graft technique for soft tissue augmentation around dental implant in esthetic zone.

-The secondary aim is to compare between mVIP-CT graft and xenogenic collagen matrix membrane for soft tissue augmentation around dental implant in esthetic zone.

Patients and methods

Patient selection

This study will be conducted on 20 patients with missing maxillary teeth in esthetic zone seeking its replacement. After approval from the ethical committee, patients will select from the outpatient clinic, Department of Oral medicine, Diagnosis and Periodontology, Faculty of Dentistry, Minia University.

Inclusion criteria

1. Selected patients of both sexes are 20-40 years old.
2. Patients are systemically healthy based on questionnaire dental modification of Cornell index.
3. Good oral health
4. The recipient site of the implant is free from any pathological conditions.
5. Necessity for soft tissue volume augmentation at the buccal implant site (thin gingival biotype with a narrower zone of keratinized tissue & decrease in papilla height)
6. Adequate interocclusal space to accommodate the available restorative components.
7. Adequate native/apical bone to achieve primary implant stability.

Exclusion criteria:

1. Pregnant female
2. Parafunctional habits such as bruxism and clenching Patients suffering from periodontitis.
3. Untreated periodontitis and poor oral hygiene
4. Patients underwent any prior periodontal surgery in the relevant region for at least 6 months prior to this study
5. Smokers.

Ethical regulation

All patients will undergo an immediate implant placement and the complete treatment plan will be explained to all patients including detailed steps, risks, and expected results. Verbal and written informed consent will obtained from all patients before the commencement of the study. All experiments will be examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and the research ethics committee of the Faculty of Dentistry, Minia University.

Pre surgical phase

1. All selected patients will be screened by comprehensive periodontal examination and full periodontal charts will be obtained. A preoperative cone beam computed tomography (CBCT) will be performed for each patient who met the inclusion criteria prior to the surgery to determine bone height and width and decide the implant length and diameter to be placed and to evaluate the underlying bone condition.
2. Trans-gingival probing will be done at the mesial line angle 2, 4 and 6 mm apical to the gingival margin. At the same apico-coronal direction three points will be recorded at the mid-buccal and at the distal line angle **(Rotenberg and Tatakis 2014)**
3. The width of keratinized gingiva will be measured using UNC-15 probe and recorded as the distance from the mucogingival junction to the gingival margin.

Randomization

The study will use simple randomization to allocate patients into 2 groups, each group will be included 10 patients.

Then, random allocation will be performed using computer-generated random numbers to determine which group they will be assigned.

- **Group 1**: Immediate dental implant +Xenogenic bone graft +mVIP-CT graft technique

- **Group 2**: Immediate dental implant + Xenogenic bone graft+ Xenogenic collagen matrix membrane

Surgical Phase

In group 1" the mVIP-CT group "

1. After obtaining adequate local anesthesia (2% lidocaine HCL 1:100000 epinephrine), atraumatic extraction using periotome will done followed by immediate implant placement.
2. After ensuring the correct three-dimensional placement of the implant, the jumping distance between the implant and socket will grafted with xenogeic bone graft.
3. Soft tissue augmentation will be planned over the implant site. Modified VIP-CT graft will be harvested with modified single incision technique from the palate and the advancement will done through palatal tunneling procedure.
4. An anteroposterior subperiosteal tunneling will done on the palate near implant site to create a passageway for pedicle graft connecting donor and recipient sites.
5. The posterior end of the tunnel prepared mesial to the single incision on the palate. The passageway of the tunnel prepared will further checked using an instrument.
6. Then the flap advanced over the jumping distance through the tunnel into the implant site. The pedicle graft will stabilized using external mattress sutures and the donor site by cross-mattress sutures with 6‑0 vicryl suture.

In group 2 " XCM group "

1. After obtaining adequate local anesthesia (2%lidocaine HCL 1:100000 epinephrine), atraumatic extraction using periotome will done followed by immediate implant placement.
2. After ensuring the correct three-dimensional placement of the implant, the jumping distance between the implant and socket will grafted with xenogeic bone graft.

3. The matrix will be rehydrated with sterile saline solution and then trimmed with scissors to fit into the buccal pouch. The matrix, used in one layer with a thickness ranging from 1.2 to 1.7 mm (prior rehydrating).
4. The crestal aspect of the split-thickness flap and the underlying CM will be sutured to the palatal flap with interrupted sutures (resorbable, Vicryl 6.0 suture) at the mesial and distal aspects.

Postoperative instructions

1. Routine verbal and written postoperative instructions for periodontal surgery will be given to all patients including ice compression on the surgical site during the first 4 h, a liquid and/or soft food diet for 3 days.
2. As with all surgical procedures, patients will be informed to contact the therapist if any problems will be developed during postoperative period.
3. The postoperative medications prescribed will be (Amoxicillin+ clavulenic acid*625mg for 8 days) * every 8 h or clindamycin 300 g every 8 h for 7 days for patients allergic to penicillin, and (Ibuprofen**600 mg every 12 h for 5 days).
4. The patients will be advised to refrain from retracting the lips and cheeks and to avoid brushing or flossing in the grafted area for 6 weeks.
5. The sutures remained in situ for 2 weeks.

Clinical assessment:

All patients included in the present study will followed carefully and monitored to motivate the patient for oral hygiene instructions and for maintenance of good oral hygiene.

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*(Amoxicillin +clavulenic acid) , GlaxoSmithKline, Egypt.
** Brufen ®, Abbott, Egyp

All patients will be examined at baseline (immediately after the implant insertion), 3 and 6 months for the following criteria to evaluate esthetic results around dental implants, include:

1. **Gingival thickness (GT)**
2. **keratinized tissue width (KTW)**
3. **Pink esthetic score (PES)** to evaluate the soft tissue surrounding the crown.
4. **Buccal bone thickness**

Statistical analysis:

-All data will be tabulated and analyzed by statistical method.