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SOFT TISSUE ESTHETICS AROUND IMPLANTS - A REVIEW

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ABSTRACT: Implant therapy has evolved significantly during the last two decades, from being one of the treatments of choice for edentulous arches to becoming a routine procedure to replace lost dental elements, regardless of the type of edentulism. Only when a close resemblance with what once existed in nature is achieved does the end result of implant therapy become a success for its ability to provide the proper masticatory function while disappearing in between the remaining natural teeth. For an implant restoration to closely mimic the lost dental element, it is undoubtedly important to select the proper shape and color of the prosthetic tooth. Nonetheless, it is imperative to surround the crown with healthy, gingival-like tissue.

KEYWORDS: Dental Implant, Masticatory function,

INTRODUCTION

Soft tissue integration is a biologic process that occurs during the formation and maturation of the structural relationship between the soft tissues and the transmucosal portion of the implant.

The various factors affecting the peri-implant soft tissues includes internal factors such as age, general health, periodontal status of remaining dentition, host resistance, periodontal phenotype, systemic disease, preexisting bony dehiscence, vestibular depth, aberrant frenum, thickness of attached tissue, apico-coronal dimension of attached tissue if present and external factors such as tobacco, medications, oral hygiene, implant design, surface characteristics, submerged Vs no submerged technique, surgical approach, implant location, depth of implant placement, prominence of implant position, restorative surface and materials, restorative margin and biologic width.¹

Clinical rationale for attached peri-implant soft tissues:

- Provide "prosthetic -friendly" environment
- Facilitate oral hygiene maintenance
- Resist recession
- Maintain predictable levels over time
- Enhance esthetic blending

Biologic width

Biologic width is nature's mechanism for protecting the alveolar bone from the bacterial and mechanical

challenges of the oral cavity. It is otherwise known as physiologic dentogingival junction.

Biologic width =	Connective tissue attachment	+	Epithelial attachment
(2.04mm)	(1.07mm)		(0.97mm)

Epithelial attachment is greater in tooth surface adjacent to subgingival restorations. Both attachments are greater in posterior sextants. This concept is clinically significant only in intra crevicular restorative margins². Clinically, 0.5 to 1.0mm is the safe distance in-between restorative margin and base of the crevice. Violations of biologic width lead to pocket formation, soft tissue recession and loss of alveolar bone. Biologic width exists around non submerged one-piece titanium implants and that this is physiologically formed and stable structure which is similar to that found on human natural dentition.

Maynard and Wilson divided dentogingival unit as superficial physiologic dimension, Crevicular physiologic dimension³.

Submerged or nonsubmerged approach – which provides esthetic predictability?

- It provides sufficient time for mature soft tissue integration
- allows for stabilization of junctional epithelium and sulcus depth dimensions during integration periods

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- eliminates the need to disrupt mature peri-implant soft tissues
- improves the long -term predictability
- requires fewer surgical approaches, thus. circulation preserved in that area
- less treatment time and patient discomfort, improved patient acceptance
- closes to the ingress of bacterial contaminants
- maintains or develops positive soft tissue architecture at the site
- prevents soft tissue shrinkage
- provides opportunity to monitor soft tissue volume and architecture and to perform soft tissue refinements as needed
- Provides stable environment for the restorative dentist and finally facilitates abutment selection.

Systematic evaluation of esthetic implant patient

Smile design and smile esthetics, facial and dental symmetry, upper lip line, lower lip line, incisal plane, occlusal plane, tooth proportions and relationships, gingival plane and outline and finally periodontal biotype should be evaluated before implant placement in order to provide them the good esthetics.

Periodontal Biotype:

According to Olsson and Lindhe it is classified as Thin scalloped and Thick flat periodontium (Table-1)

Classification of alveolar ridge defects in esthetic implant dentistry :

Based on the volume and nature of the defect⁷

LARGE-VOLUME HARD TISSUE DEFECT: It prevents ideal three-dimensional implant placement. It uses autogenous corticocancellous block grafts in combination with particulate grafts. If the defect is entirely horizontal, ,complete restoration can be achieved and if it is both horizontal and vertical, complete restoration is limited. Staged reconstruction is indicated in such defects.

SMALL-VOLUME HARD TISSUE DEFECT: It does not affect three-dimensional implant placement or primary implant stability.It allows simultaneous reconstruction at the time of implant placement. GBR procedure can be performed and staged approach is indicated. Additionally, esthetic implant therapy may require soft tissue grafting.

LARGE-VOLUME SOFT TISSUE DEFECT: It prevents the development of stable peri-implant environment and the emergence of implant restoration that is in harmony with adjacent dentition. It provides inadequate soft tissue coverage for successful hard tissue augmentation. Epithelialized palatal mucosal grafts, Subepithelial connective tissue grafts and Vascularized interpositional periosteal- connective tissue are preferred in these defects.

SMALL-VOLUME SOFT TISSUE DEFECT: In these

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defects volume of attached tissue surrounding an implant restoration is less than ideal for predictable long term stability or esthetic emergence. Subepithelial connective tissue grafts secured in closed pouch recipient sites or in conjunction with coronally repositioned flap are preferred here.

COMBINATION HARD AND SOFT TISSUE DEFECTS: These are very common type of defects.

LARGE VOLUME COMBINATION DEFECTS: These defects prevent ideal implant positioning and Compromises stable environment. Staged approach is indicated in such defects. Corticocancellous block grafts are used in hard tissue grafting. Subepithelial connective tissue graft or epithelialized palatal mucosal graft provides adequate soft tissue quality and volume in these defects where as VIP-CT provides large volume of soft tissue and significant amount of circulation. Epithelialized palatal mucosal graft are preferred for defects resulting from traumatic avulsion injuries.

VOLUME -COMBINATION DEFECTS: SMALL These defects does not compromise ideal implant positioning or opportunity to establish stable peri-implant soft tissues but it results in subtle ridge contour defects that compromise esthetics. VIP-CT flap performed or alloplast graft material can be used in such type of defects.

Optimal flap design in implant therapy

- Preserve blood supply
- Preserve the topography of alveolar ridge and mucobuccal fold
- Facilitate identification important of anatomic structures
- Provide ample access for implant instrumentation and use of surgical guides
- Provide access for harvesting of local bone
- Facilitates closure away from implant placement or tissue augmentation site
- Minimize bacterial contamination
- Facilitate circumferential closure around perimucosal implant structures⁷

Application of plastic surgery principles in implant therapy:

CURVILINEAR BEVELED INCISIONS AND _ EXAGERRATED CURVILINEAR FLAP

PERICRESTAL INCISION: Incision initiated over lingual or palatal aspect of ridge crest. Reflection of buccal flap exposes the entire ridge crest and provides ample access for Used to obtain circumferential adaptation around the emerging implant.

Thin scalloped periodontium	Thick, Flat Periodontium
Pronounced positive periodontal architecture	Flat periodontal architecture
Delicate, friable soft tissue curtain	Dense and fibrotic soft tissue curtain
Attached tissue – minimal	Attached tissue – abundant
Underlying osseous form – Bony dehiscence and fenestration defects possibly	Underlying osseous form – Thick and dense bone
Triangular anatomic crowns with small interdental contacts at incisal third	Square anatomic crowns with large interdental contacts that extend into the cervical 1/3 rd
Clinical crowns – flat in cervical area or emerge with subtle convexities	Clinical crowns – Bulbous convexities in cervical third
Reacts with surgical or prosthetic interventions with soft tissue recession, apical migration of attachment and bone loss	Resists to soft tissue recession and reacts with surgical or prosthetic interventions with pocket formation
Thin maxillary plate underlying the soft tissue is predisposed to defect formation secondary to remodelling and resorption of bone following the surgery	Thick, fibrotic soft tissue is predisposed to form unsightly notches and scars following the surgery
Ridge preservation techniques should be performed	Soft tissue plastic surgery should be performed
Immediate implant placement recommended, Primary stability should be obtained, Graft between the implant body and buccal wall of socket recommended, Anatomically correct provisional restorations or prosthetic components are mandatory	Immediate implant placement recommended through flapless approach, combined with prosthetic support for the surrounding soft tissues recommended
Flapless or U-shaped Peninsula flap or Tissue punch approach recommended	U-shaped Peninsula flap or exaggerated curvilinear flap with beveled incision recommended , U-shaped Peninsula flap or exaggerated curvilinear flap with beveled incision recommended
Soft tissue grafting- Pouch dissection flap design that preserves circulation and avoids elevation of papilla or col recommended, Hard tissue grafting- Curvilinear – beveled flap is preferred	Soft tissue grafting- closed pouch approach or laser soft tissue resurfacing and sculpting procedures preffered
Soft tissue grafting always indicated, but excellent esthetic blending and incision lines are often inconspicuous	Soft tisue grafting used when needed, scar formation common and incision lines are conspicuous
PILLA REGENERATION: Used to obtain soft tissue arage and primary closure in the inter implant area and nerates interdental papilla successfully ERAL FLAP ADVANCEMENT:Used to obtain the ary closure and circumferential adaptation of attached	BIO-COL TECHNIQUE: Bio-col alveolar ridge preserva technique have a synergistic effect of combining sur and prosthetic site-preservation protocols. Clinical Go To preserve both the hard and soft tissue volume architecture, especially interdental papillae, in orde optimize function and esthetics
mal risk of recession on the adjacent dentition	ESSIX APPLIANCE
APED PENINSULA FLAP: Used when hard and soft	Soft tissue grafting

Table.1. Periodontal Biotype

tissue augmentation is not necessary and in case of site development procedures

TISSUE PUNCH: In areas of esthetic concern, punch is oriented with palatal or lingual inclination

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Periodontal plastic surgery for the implant patient includes

natural teeth and implant restorations

Root and implant abutment coverage

Augmentation of attached tissues surrounding

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Correction of mucogingival defects around implants

- Edentulous ridge preservation following tooth removal in preparation for prosthetic rehabilitation with conventional or implant prosthesis
- Management of aberrant frenula
- Preservation of reconstruction of interdental or inter-implant papillae
- Surgical soft tissue sculpting procedures

Goals of soft tissue grafting^{7,8}

- To create a stable peri-implant soft tissue environment by providing an adequate zone of attached keratinized tissues with intimate adaptation to emerging implant structures
- Inconspicuous reconstruction of natural soft tissue architecture to enable the emergence of harmonious implant restorations

Principles of soft tissue grafting^{7,8}

PREPARATION OF RECIPIENT SITE: Ensure adequate vascularity to support the graft and Provide a means for rigid immobilization of the graft. Then prepare uniform surface for intimate graft adaptation and obtain hemostasis.

MANAGEMENT OF DONOR TISSUE: Harvest graft of adequate size to take advantage of peripheral circulation. Ensure a uniform graft surface for adaptation of recipient site. Ensure adequate thickness to obtain desired volume augmentation and for survival over avascular surfaces

Various techniques of soft tissue grafting:

MODIFIED PALATAL ROLL TECHNIQUE

EPITHELIALIZED PALATAL GRAFT TECHNIQUE FOR DENTAL IMPLANTS: To increase the zone of attached tissue, thick split-thickness (0.75 - 1.25) graft preferred and for root or abutment coverage, split thickness flap approaching full-thickess flap (1.25 - 1.75 mm) preferred⁹.

ALLODERM (Acellular dermal matrix) can also be used.

SUBEPITHELIAL CONNECTIVE TISSUE GRAFT TECHNIQUE: Versatile approach to anterior esthetic enhancement¹⁰

VASCULARIZED INTERPOSITIONAL PERIOSTEAL-CONNECTIVE TISSUE (VIP-CT) FLAP: It allows large – volume soft tissue augmentation at esthetic sites with a single procedure

CONCLUSION

One of the most significant advances in implant therapy is the adoption of the "Plastic and Reconstructive

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surgery mindset" which embraces the need for sequence of surgical procedures performed to achieve the desired result. The insight guides us in the formulation of treatment planning options and surgical approaches that have anatomic and biological bases for success. Thus, the application of plastic surgery principles and the anatomic and biologic bases for the flap designs and soft tissue surgical maneuvers results in the enhanced esthetic contours and stable peri-implant soft tissue environment that can withstand the bacterial and mechanical challenges present in the oral cavity with impressive

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predictability.

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