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## Soft Tissue Considerations Around Dental Implants - A Review

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### Abstract

Branemark and co-workers introduced the replacement of missing teeth by implants and its osseointegration. As soft tissue can shelter the underlying osseous structures the osseointegration surrounding the implant body. Three types of epithelium are composed in which fibers run parallel on the surface around implants and perpendicular around natural teeth. Thus, bone dimension reduces and blood supply also imbalanced. However, to control biofilm formation self-management of patient is more important. Two methods explained, such as mechanical method and chemical method. Various surgical techniques used for soft tissue around implants such as pedicle flap, free gingival grafts, connective tissue grafts. Therefore, future aspects more importance should be given to the soft tissue health around implants.

**Keywords:** Soft tissue interference; Soft tissue health and maintenance; Surgical managements around implants

### Introduction

In 1969, the concept was introduced by Branemark and co-workers on the replacement of missing teeth by implants and osseointegration. The implant restoration is successful when healthy soft tissue developed. Biologic connection between tooth and tissues is essential for a successful implant. Thus soft tissue shelter the underlying osseous structures and Osseointegration around implant [1]. Considering all these factors as stable the prosthesis can be placed. Therefore literature includes soft-tissue interference, soft-tissue health, the papilla around implants and surgical planning.

#### The soft-tissue interface

**The epithelial structure around the dental implant:** Junctional epithelium forms the seal around implants in the oral mucosa. Three types of epithelium are composed such as peri-implant epithelium, peri-implant sulcular epithelium, and oral epithelium [2].

**Structure of interface between the implant and oral epithelium:** According, Gould *et al.*, in 1984, reported that peri-implant epithelium cells similarly connect to titanium to that of junctional epithelium cells which connects to the natural teeth via hemidesmosome [3].

**Structures of an interface between the implant and connective tissue:** The connective tissue attachment is apical to the junctional epithelium in case of natural teeth to invade bacteria by providing adhesion between fibers such as type III collagen fibers, PDL and cementum. While in case of an implant, type V collagen fibers. In additional fibers attachment pattern of the in connective tissue on the surface around implants and perpendicular around natural teeth (Figure 1) [4] epithelium to the implant and tooth different due absence of PDL, cementum around implants [5] Connective tissue play important role in protection from oral bacteria but supply nutrients from blood vessels. While fiber run parallel.

**Microbiota and inflammatory response:** According to researchers, periodontal pathogens are responsible for peri-implantitis. They found that micro-organism such as staphylococcus aureus is closely present in the peri-implant pocket which leads to bleeding on probing [6]. Another inflammatory response of soft tissue in natural teeth and implant site is different in cellular response such as B cells and plasma cells which is high rated and similar to chronic periodontitis and aggressive periodontitis but differences in host response such as rapid diseases progression [7].

**Blood supply of peri-implant mucosa:** Gingiva is derived from supraperiosteal blood vessels and anastomosis with the vessels from the periodontal ligaments and alveolar. Due to lack of

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periodontal ligaments its peri-implant mucosa only supplied by the suprapariosteal blood vessels [1]. Thus, bone dimension reduces and blood supply also imbalanced. Due to lack of anastomosis, it also reduces the blood supply to the peri-implant connective tissue (Figure 2) [4]. It may affect the wound healing in surgical therapy.

**Significance of keratinized attached mucosa:** According to Wennstrom *et al.*, (1994), conducted a study to evaluate peri-implant conditions around 171 Branemark implants within 5 years of follow-up. The results showed that 24% sites were lacking Keratinized tissue and 13% implants had a keratinized tissue width 2mm [8]. Therefore advantage of keratinized attachment mucosa surrounding the implants are less controversial. So insufficient keratinized attachment in implant site does not make any side effect on oral hygiene maintenance.

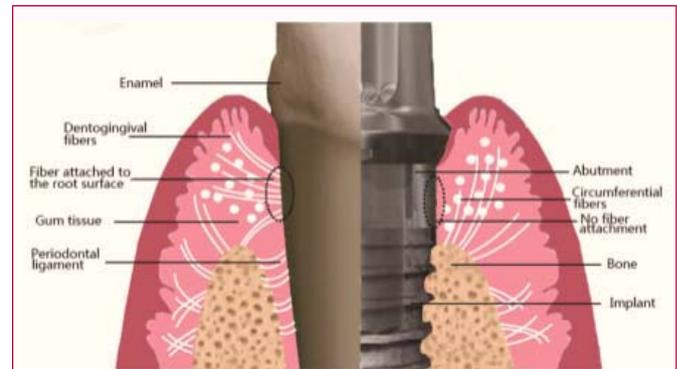
**The biologic width:** The interface between implants surface and supracrestal soft tissue consists of junctional epithelium and connective tissue. Reports of cadaver specimens, the average width of epithelial attachment was 1.07mm, connective tissue attachment 0.97mm and average biologic width 2.04mm around natural tooth [9]. The dentogingival junction and seal around the tooth represents the zone for biologic width. Biologic width has been established around implants through non-submerged implants and 2-piece submerged implants. After implant placement biologic width established around submerged implant within 1 month follow up [4,5] while in 2-piece implant after abutment placement zone of attachment is formed. The ratio of epithelial attachment and connective attachment 2:1 approximately. Biologic width around implant accounting more bone resorption due to thin soft tissue and contaminated bacterial gap between the implant and supra-structure [10]. However, more bone loss and inflammation is present around implant where the micro gap is placed below the crest [11].

**Soft tissue health around implants:** Patients oral hygiene is maintained due to the prevention of peri-implantitis soft tissue. However, to control biofilm formation self-management are important. Two methods, such as mechanical method and chemical method. In mechanical method manual as well as powered brushes both are effective in maintaining gingival health in peri-implant soft tissue. In chemical method Triclosan/Copolymer Toothpaste, Fluoride-Containing Mouth Rinses, Essential Oils Mouth Rinse, Chlorhexidine, may provide additional benefits to mechanical plaque control [12]. Alternate method for improving peri-implant soft tissue is an application of phosphoric etching gel in the peri-implant sulcus. According to strooker *et al.*, 1998, they demonstrated that phosphoric gel with P<sup>H</sup> 1% showed a reduction in bacterial colonies so rapidly [13] similarly, mechanical debridement, ultrasonic devices, adjunctive antibiotics, lasers maintained the management in peri-implant soft tissue.

**The papilla around dental implants:** Inesthetic zone interdental papilla is most important aspects to preserve. Lack of interdental papilla formed a black triangle in between two adjacent teeth. In case of implants the distance between two implants surfaces are not more than 3mm which show greater bone loss. Therefore to avoid greater bone loss small diameter implants are chosen with minimum 3mm distances which give proper support to implants and also maintained soft tissue around them [14].

## Surgical Procedures

Various surgical technique used for soft tissue around implants.



**Figure 1:** Arrangement of gingival fibers at natural teeth and dental implants [4].

### Pedicle grafts

According, Goldstein *et al.*, (2000), suggested the technique of full-thickness rotational advanced palatal flap raised in a coronal direction, thus facilitating complete coverage of the extraction site on 38 patients for primary coverage of post-extraction placed implants. 32 patients required single tooth replacement in which 2 implants placed in 3 patients, and three implants placed in three patients each. In 27 cases out of 38 cases, performed conjunction with barrier membranes, 25 patients required the use of DFDBA to fill the defect after extraction. The mean average of defect width was  $4.70 \pm 0.2$ mm. Therefore all cases received complete primary coverage without any disturbances in the size, anatomy of the buccal vestibule and maintained the healing period of 6-8months with no exposed of cover screw of the implant during healing even in cases of GTR. After a period of 1-5 years none of the implants was lost. Thus the author concluded that the palatal advanced flap procedure is useful to perform in case of immediate implant placement [15].

### Free gingival grafts

To increase the amount of keratinized mucosa adjacent to implant abutment, used of free gingival graft is effective to prevent peri-implantitis. Avoiding biofilm migration into the implant interface. Keratinized tissue is a firmer and stable seal on titanium abutment which protects the implant from inflammation and discomfort [16]. Therefore, free gingival graft used for immediate implants placement. According to Barone *et al.*, (1998) described a study for soft tissue reconstruction around implants. When keratinized tissue  $\leq 2$ mm, a free gingival graft was placed before fixture installation. While the implant is placed the distance between the bone crest and the mucogingival junction was the measured and second type of surgery was planned. When this distance was  $\leq 3$ mm, an apically positioned flap was used for exposed implants. While a circular gingivectomy was planned when this distance was  $\geq 3$ mm. This procedure is followed till 1 year in 53 implants where all sites showed an area of  $KT \geq 2$  mm [17].

### Free connective tissue grafts

Connective tissue graft act as a soft tissue barrier membrane in immediate postextraction implants. According, Bianchi & Sanfilippo *et al.*, (2004), described a study on immediate implant placement and CTG for single-tooth replacement in a retrospective study. They evaluated 116 patients with a total of 116 solid screw ITI implants: 96 patients underwent the combined treatment (immediate implant+CTG), while 20 received only single immediate implants with 1-9years follow up. Both the test and the control group show a 100% survival rate. Compared to control group statistical analysis

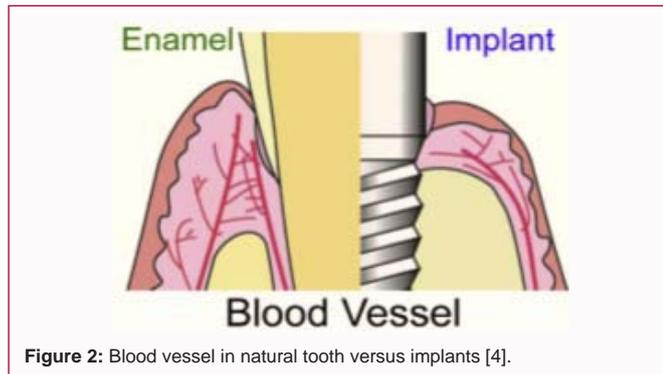


Figure 2: Blood vessel in natural tooth versus implants [4].

showed better results for the test group for bone levels, and adequate keratinized width and patient satisfaction [18]. Similar study conducted by Covani *et al.*, (2007), who described an immediate implants placement with connective tissue placed over implants to treat severe gingival recessions in hopeless cases with lack of keratinized. Thus results showed a mean width of KT >3mm at the 1-year follow-up [19].

#### 4. Conclusion

Dental Implant osseointegration is a process which leads to proper bone healing which plays a role in protecting alveolar bone from bacterial invasion in the oral cavity. Thus structural differences between natural teeth and implants are peri-implant soft tissue healing, inflammatory response, host tissue response, deeper probing depth, weaker connective tissue attachment, and inadequate blood supply; make the implant more weak and unstable. Therefore, oral hygiene maintenance, brushing technique using chemical methods to remove plaque and calculus is more important so that implant surfaces may facilitate properly in maintaining soft tissue health. Though many companies established different types of abutments connection such as platform switching and mini-implant to reduced marginal bone loss. Still complication such as peri-implantitis is upcoming disadvantage of dental implants every year. Therefore, future aspects more importance should be given to maintain the health of soft tissues around implants.

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