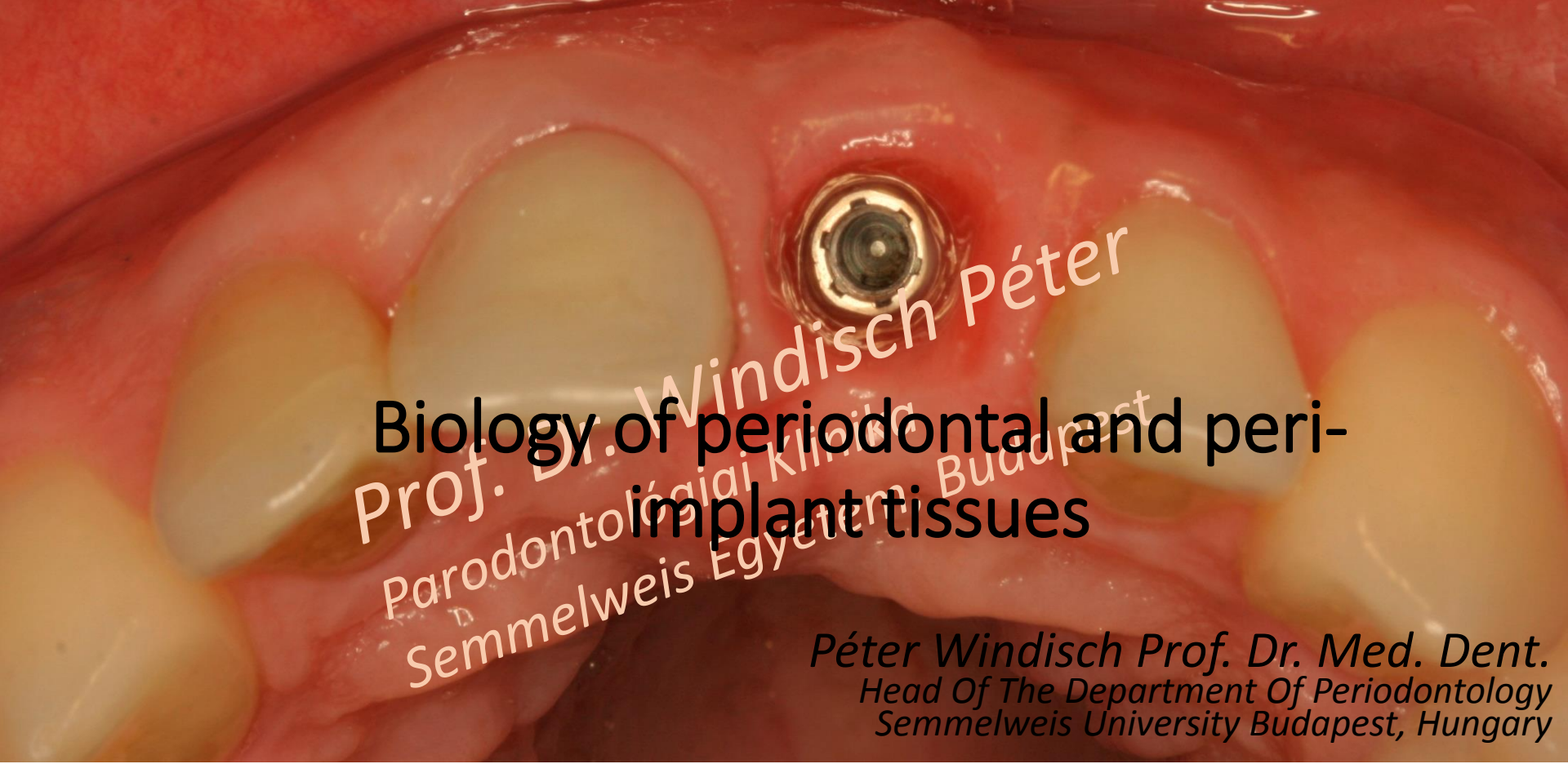

Biology of periodontal and peri-implant tissues

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Factors effecting long term functional and esthetic stability around teeth and implants

1) Biotype, thickness of facial bone
2) Existence and shape of interdental papilla, level of proximal bone
3) Thickness and width of keratinized gingiva, maintained bone surrounding
4) Depth of the vestibulum
5) Contour and proximal height of the periodontium of neighbouring teeth
6) Shape and positioning of the teeth - „emergence profile”

There is an obvious need to achieve tooth-like harmonious pink and white esthetics via implant borne restorations. In order to achieve successful treatment:

1. proper planning
2. 3D positioning
3. required amount of bone and non-mobile soft tissue are the key factors.

Efficacy of periodontal plastic surgery procedures in the treatment of localized facial gingival recessions. A systematic review. J Clin Periodontol. 2014 Apr;41 Suppl 15:S44-62.
Esthetic implant site development. Oral Maxillofac Surg Clin North Am. 2015 May; 27(2):283-311.

Classification and treatment options of gingival recessions around teeth

- Lack of keratinized gingiva
  - Autogenous free gingival graft (FGG), xenograft
- Shallow vestibule
  - Autogenous free gingival graft (FGG), xenograft
- Gingival recession /apical displacement of marginal gingiva: distance from the CEJ/
  - Autogenous subepithelial connective thisse graft (SCTG), xenograft, allograft
- Healthy conditions can be kept even with gingival recession and minimal amount keratinized tissue around teeth!

Prato GP. Advances in mucogingival surgery. J Int Acad Periodontol. 2000 Jan;2(1):24-7.

Classification and treatment options of gingival recessions around implants

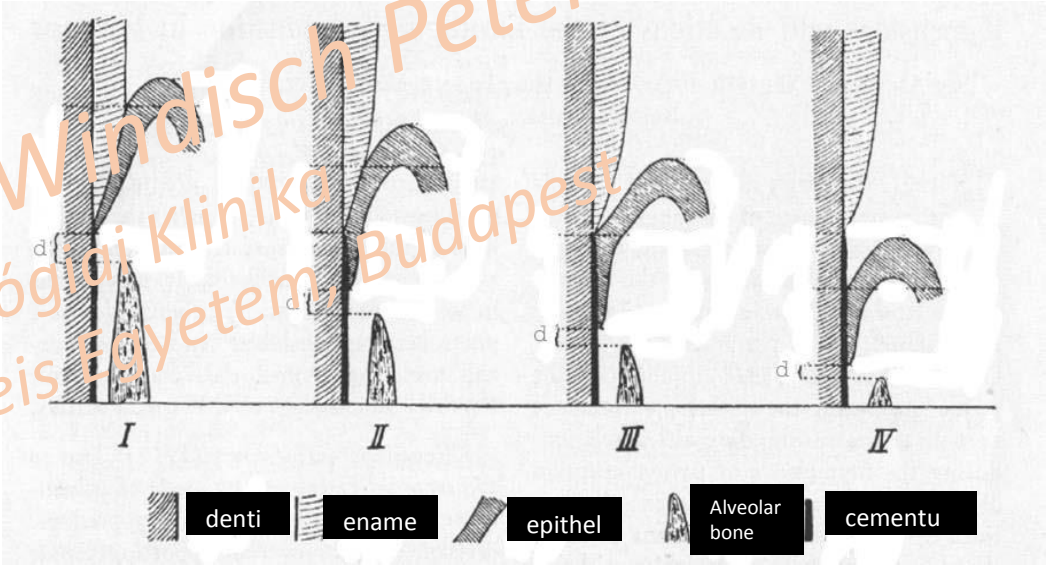
- Non-sufficient amount of periimplant mucosa
  - Autogenous subepithelial connective tissue graft (SCTG), xenograft, allograft
- Lack of keratinized periimplant mucosa
  - Autogenous free gingival graft (FGG), xenograft, allograft
- Periimplant recession
  - Autogenous free gingival graft (FGG)
- The role and importance of periimplant keratinized tissue – Still under discussion

Wennström JL, Derks J. Is there a need for keratinized mucosa around implants to maintain health and tissue stability? Clin Oral Implants Res. 2012 Oct;23Chung DM, Oh TJ, Shotwell JL, Misch CE, Wang HL. Significance of keratinized mucosa in maintenance of dental implants with different surfaces. J Periodontol. 2006 Aug;77(8):1410-20. P

Role of biologic width around teeth

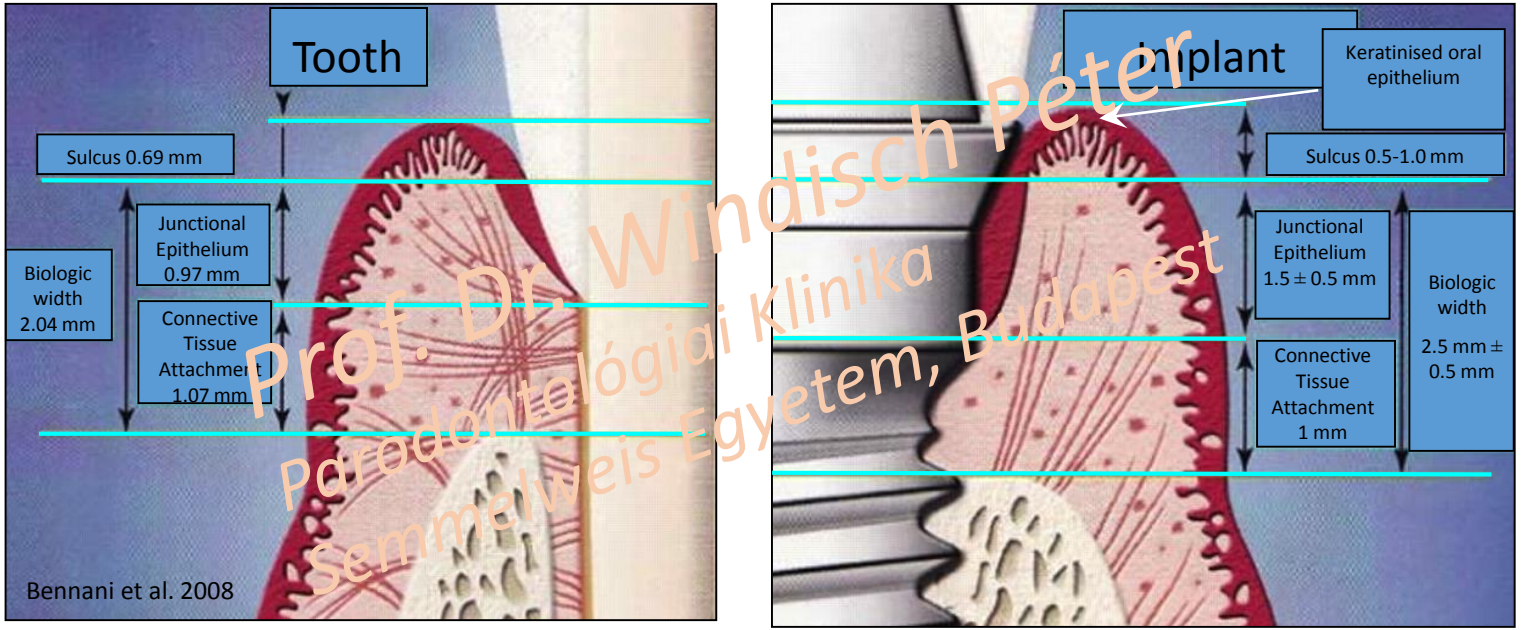
Combined connective tissue- and epithelial attachment from the crest of the alveolar bone to the base of the gingival sulcus.

The biologic width is patient and site specific, may vary between ***0,75 - 4,3 mm*** including a required amount of soft tissue barrier to maintain underlying tissue(s) healthy.



Gargiulo, A.W.,Wentz,F.M.& Orban, B. (1961) Dimensions and relations of the dentogingival junction in humans, Journal of Periodontology 32,262-267

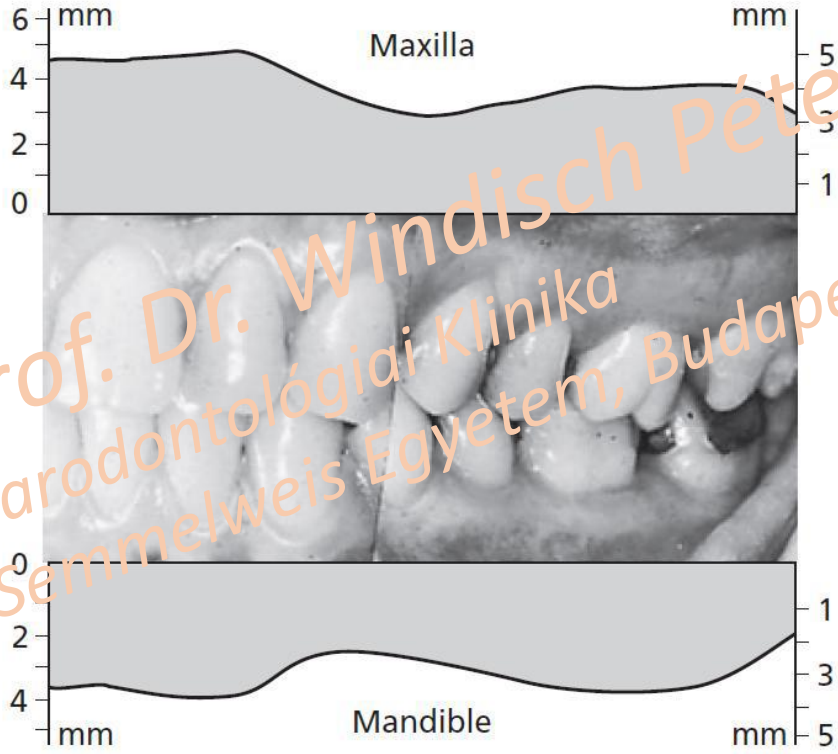
The biologic width – supracrestal soft tissue attachment



The biologic width is patient and site specific but always higher around implants than natural teeth

Bennani V, Schwass D, Chandler N.: Gingival retraction techniques for implants versus teeth: current status. J Am Dent Assoc. 2008 Oct;139(10):1354-63.

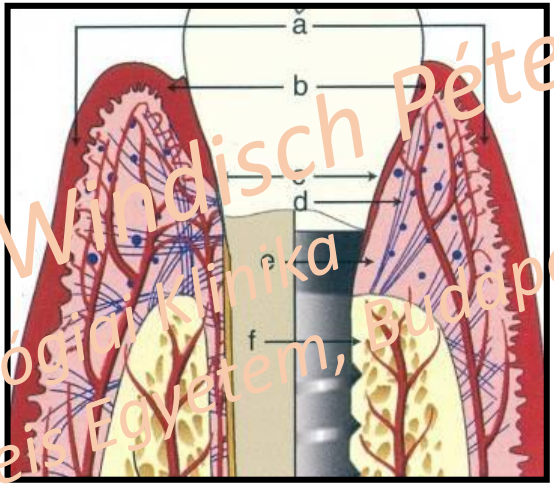
Alterations of gingival biotype around different anatomic regions of both jaws



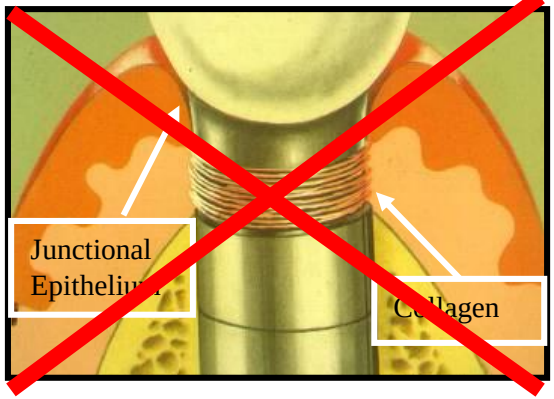
(*Lindhe 1976*)

Characteristics of periimplant soft tissues

- Lack of cementum layer
- Hemidesmosomal attachment
- Parallely oriented collagen fibers



WRONG!
Periimplant mucositis



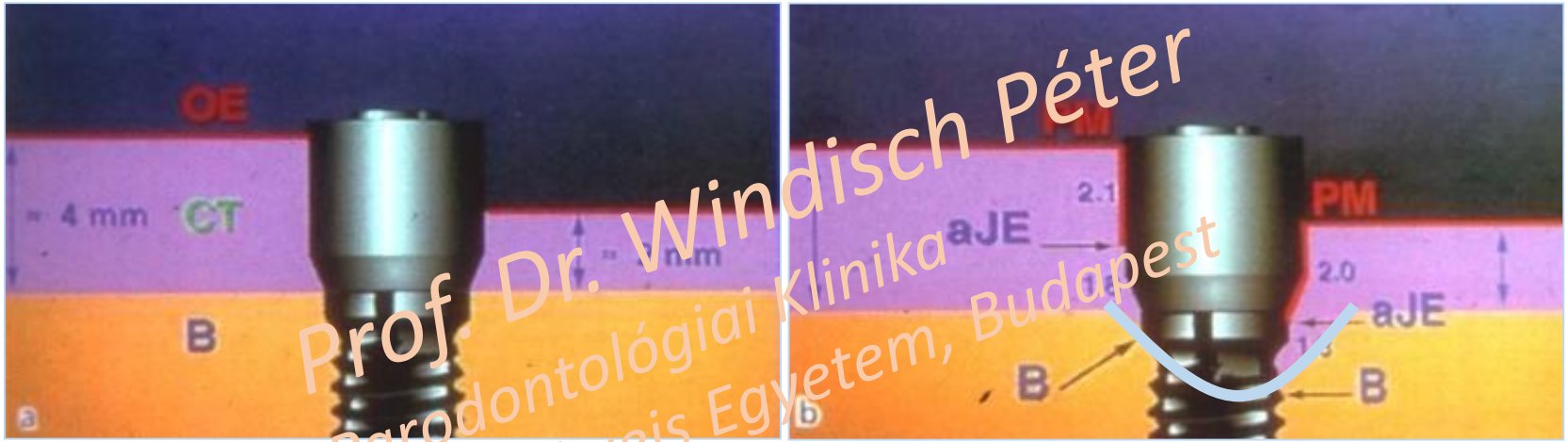
Berglundh T, Lindhe J, Ericsson I, Marinello CP, Lijenberg B, Thomsen P.
The soft tissue barrier at implants and teeth.
Clin Oral Implants Res 1991;2:81-90

Characteristics of periimplant soft tissues

Human proof-of-principle study: Achieving a physical connective tissue attachment to the Laser-Lok microchannel collar of a dental implant. Its 2-mm collar has been micromachined to encourage bone and connective tissue attachment while preventing apical migration of the epithelium.

Nevins M, Nevins ML, Camelo M, Boyesen JL, Kim DM. Human histologic evidence of a connective tissue attachment to a dental implant. Int J Periodontics Restorative Dent. 2008 Apr;28(2):111-21.

Biologic width development around implants



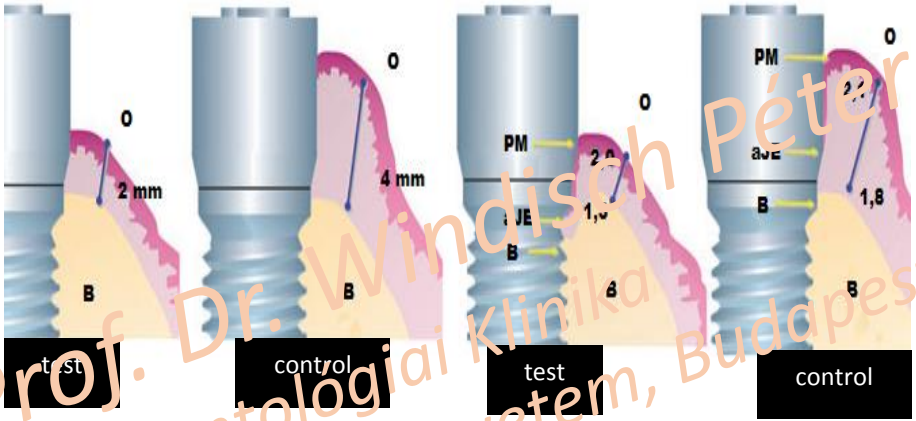
Basic research

The reduced amount of soft tissues resulted in crestal bone loss at an external hex abutment implant interface

Saucerisation of crestal bone: typical phenomenon for two-stage implants after abutment connection

Berglundh T, Lindhe J. Dimension of the periimplant mucosa. Biological width revisited. J Clin Periodontol. 1996 Oct;23(10):971-3.

Biologic width



Biologic width around implants with different amount of soft tissue.

O: Oral epithelium; B: Bone; aJE: Junctional epithelium; PM: periimplant mucosa

Berglundh, T., Lindhe, J. (1996). Dimension of the peri-implant mucosa. Biological width revisited. *J. Clin. Periodontol.* 23: 971-973. (16)

Predictive factors determining functional stability and esthetics

Kois (2004) :

1. Relative position of the tooth	2. Shape of the periodontium
3. Type of the periodontium	4. Shape of the tooth
5. Positions of the alveolar bone	

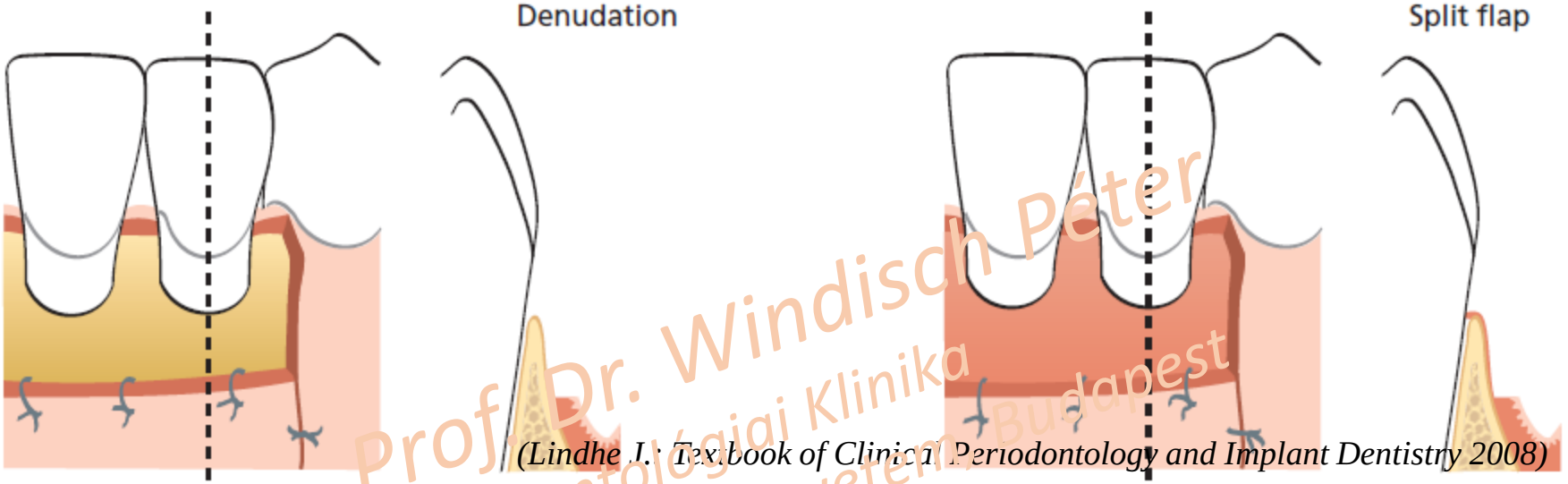
El Askary (2001)

Bone quality and quantity	Soft tissue quality and quantity	Soft tissue biotype	Emergence profile
Lip line and smile line	Treatment options	Surgical alternatives(immediate, delayed, late implant placement)	Periodontal and orthodontic aspects
Orthodontic options	Number of missing teeth	Optimal implant size	Temporary solutions
Implant positioning (apico-incisal, mesio-distal, labio-palatal)	Mucogingival surgery options	Esthetic bone augmentation	Prosthetic options

Kois JC, Kan JY. (2001). Predictable peri-implant gingival aesthetics: surgical and prosthodontic rationales. *Pract Proced Aesthet Dent.* Nov-Dec (83)

El Askary, AS (2001). Multifaceted Aspects of Implant Ethetics: The Anterior Maxilla. *Implant Dentistry*. 10(3): 182-190.

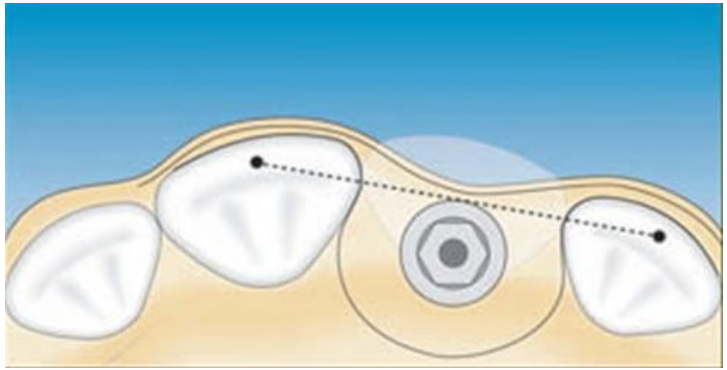
Vestibuloplasty technique



(Lindhe J.: Textbook of Clinical Periodontology and Implant Dentistry 2008)

- If the buccal deflection is too shallow vestibular deepening is needed additionally the enlargement of keratinized tissue is also required
- Aim is: to achieve conditions which are more conducive for plaque control
- Classical mucogingival or preprosthetic surgical approach: mostly applied in implant dentistry

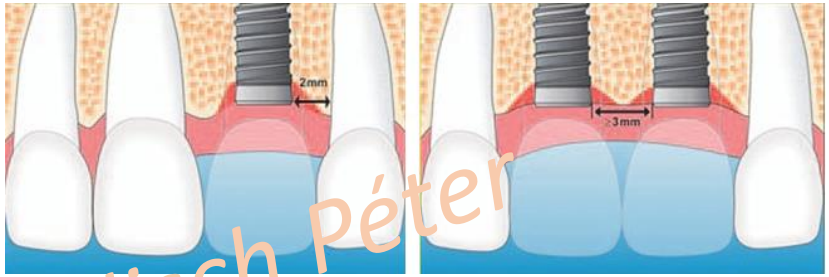
Aesthetically driven implant positioning



Orovestibular positioning

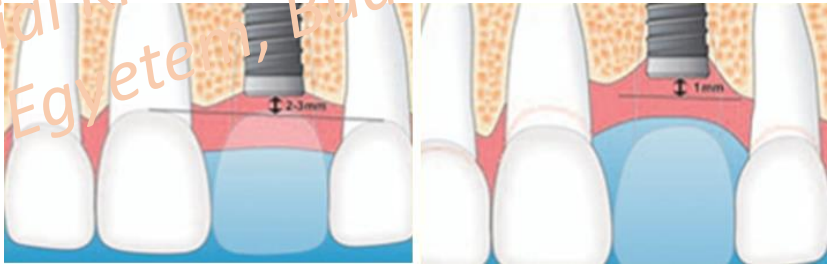
Spray JR, Black CG, Morris HF, Ochi S.The influence of bone thickness on facial marginal bone response: stage-1 placement through stage-2 uncovering. Ann Periodontol 2000;5:119-128.

„As shallow as possible, as deep as necessary”



Mesio-distal positioning

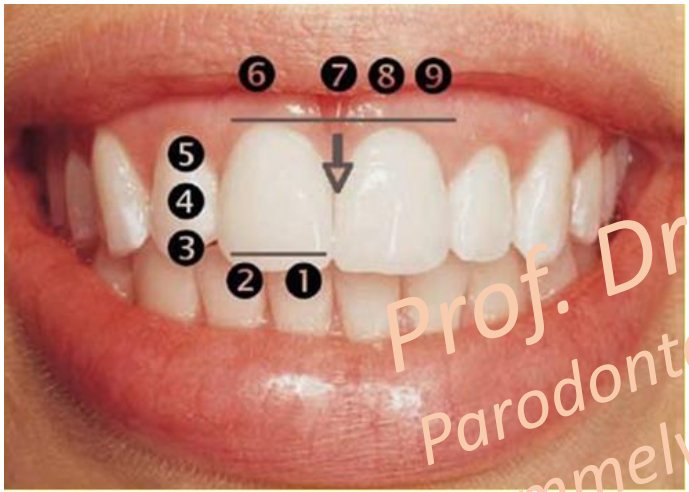
Gastaldo JF, Cury PR, Sendyk WR. Effect of the vertical and horizontal distances between adjacent implants and between a tooth and an implant on the incidence of interproximal papilla. J Periodontol 2004;75:1242-1246)



Apicocoronal or vertical positioning

Tarnow D, Elian N, Fletcher P, Froum S, Magner A, Cho SC, Salama M, Salama H, Garber DA. Vertical distance from the crest of bone to the height of the interproximal papilla between adjacent implants. J Periodontol 2003;74(12):1785-1788.)

Evaluation of aesthetics



Implant Crown Aesthetic index

1. Mesio-distal crown width
2. Position of incisal edge
3. Labial convexity of the crown
4. Colour and translucency
5. Structure of the crown
6. Vestibular level of the periimplant mucosa
7. Approximal level of the mucosa
8. Vestibular contour of the mucosa
9. Colour and surface of keratinised gingiva

(Meijer HJA, Stellingsma K, Meijndert L, Raghoebar GM. A new index for rating aesthetics of implantsupported single crowns and adjacent soft tissues – The Implant Crown Aesthetic Index. Clin Oral Implants Res 2005;16:645-649.)

Evaluation of esthetics

Pink Esthetic Score PES

1. mesial papilla
2. distal papilla
3. Height of gingival contour
4. Shape of gingival contour
5. Shape of a healthy jugum alveolare
6. Texture of gingiva
7. Colour of gingiva

(Fürhauser R, Florescu D, Benesch T, Haas R, Mailath G, Watzek G. Evaluation of soft tissue around single-tooth implant crowns: the pink esthetic score. Clin Oral Implants Res. 2005 Dec;16(6):639-44.)

Single gingival recession coverage techniques - natural teeth

Coronally advanced flap -CAF

Double papilla technique

Laterally rotated flap technique

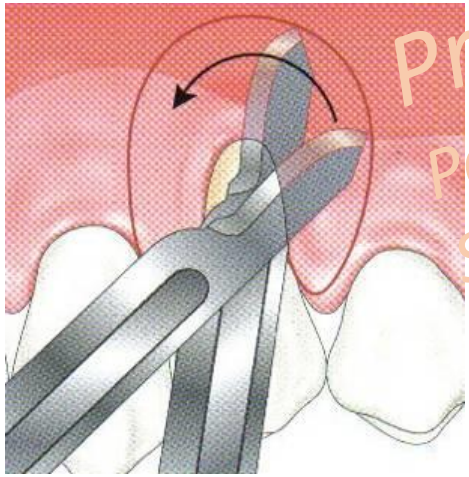
Envelope technique

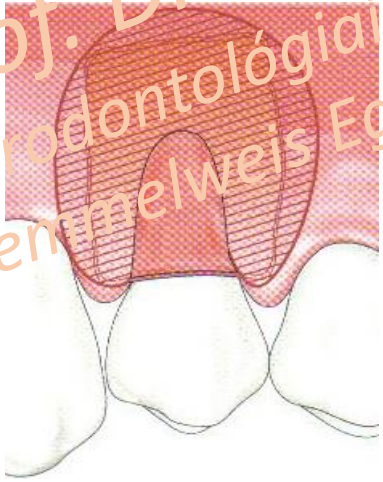
SCTG in the subepithelially prepared "envelope"

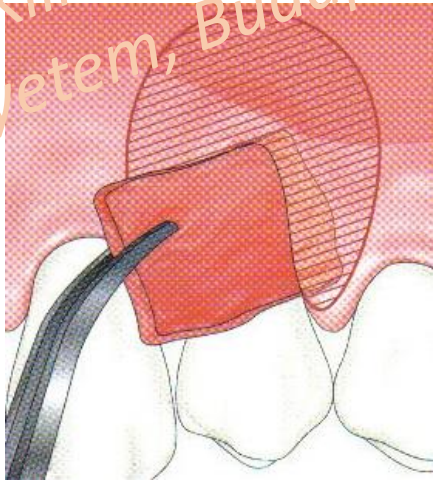
→ No vertical incision, less damage

→ Increased revascularization

→ Faster Healing







Raetzke PB. Covering localized areas of root exposure employing the "envelope" technique. J Periodontol. 1985 Jul;56(7):397-402.

Single gingival recession coverage techniques - implants

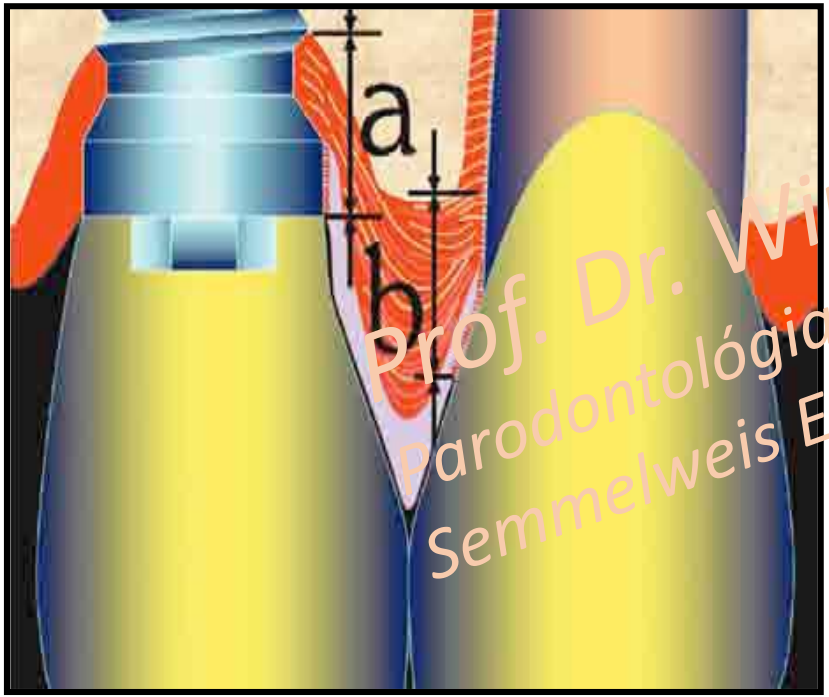
Coronally advanced flap -CAF

Bernimoulin JP, Lüscher B, Mühlemann HR. Coronally repositioned periodontal flap. Clinical evaluation after one year. J Clin Periodontol. 1975 Feb;2(1):1-13.

Envelope technique and partially epithelialized connective tissue graft

Frisch E, Ratka-Krüger P, Ziebolz D. A new technique for increasing keratinized tissue around dental implants: The partially epithelialized free connective tissue graft (PECTG). Case Series. J Oral Implantol. 2013 Jul 8.

Limits of papilla regenerative techniques around teeth and implants



a.: ideal apico-coronal positioning of an implant;
b: distance of the maintained interproximal bone level and contact point

Tarnow DP, Magner AW, Fletcher P. (1992). The effect of the distance
from the contact point to the crest of bone on the presence or absence of the
interproximal dental papilla. J Periodontol. 63(12):995-6. (168)

Conclusions

- Ideal hard- and soft tissue surroundings are needed of an optimally positioned implant
- Soft tissue correction around a previously loaded implant has it’s limits: mucogingival surgical technique can be only partially applied
- The treatment predictability is always more favorable for natural teeth then for implants – soft tissue improvements prior to implant abutment connection are more preferable
- Anatomical restoration can help to achieve ideal emergence profile and thus esthetics if proper width and thickness of keratinized periimplant tissue exists

Thank you for your kind attention!

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