

THE PERIODONTAL ASPECT OF IMPLANT THERAPY

Prof. Dr. Windisch Péter

☐ **Periodontal aspects of implant therapy**

- 1) Comprehensive perioprosthodontic treatment by utilizing implants on perio-patients.
- 2) Anatomical consideration on soft tissue seal between tooth and implant – the role of the biological width
- 3) Development of biological width
- 4) Pink and white esthetics around implants – immediate implant placement – one and two stage-approach
- 5) Hard tissue augmentation (GTR-GBR similarities and alterations)
- 6) Soft tissue augmentation
- 7) Peri-mucositis, peri-implantitis
- 8) Maintenance of periimplant tissues - regular periodontal maintenance care

☐ **Epidemiology of Periodontal Diseases**

- ☐ **Untreated periodontal cases** (descriptive epidemiological survey between 14-46 years old workers, a 15 years follow up study, 11% beyond gingivitis, 8% rapid progression, 81% moderate progression) *Löe 1986*

- ☐ **Periodontal disease and tooth loss** „Periodontitis is thought to account for 30-35% of all tooth extraction while caries and its sequelae for up to 50%.”

- ☐ Conclusion : more than 35 % of removed teeth has a perio-origin, not well- motivated adult patients up to 90% suffer in periodontitis
J.Lindhe: Clinical Periodontology and Implant Dentistry, Blackwell 2008

- ☐ **Treatment Planning** for Implant Therapy in the Periodontally Compromised Patient

- ☐ Prognosis of implant therapy in the **periodontally compromised patients**

- ☐ **Strategies** in treatment planning and prosthetic rehabilitation

- ☐ **Treatment decisions**

Posterior segments

Tooth versus implant

Aggressive periodontitis

Furcation involvements

Single-tooth advanced attachment-loss in the esthetic zone

- ☐ **Elimination of inflammation**

- ☐ **Splinting** (temporary; even long-term!)

- ☐ **Restoring the missing teeth:** lack of enough well anchored „natural abutments” (teeth they could be selected for bridgework, but do not perform the required primary stability), fixed prostheses is not allowed. Even any kind of combined prosthetic solution (bridge + partial removable) would damage the last abutments more rapidly

☐ Utilisation of implants

Early eighties: Periodontitis – No! or completely edentulous cases

Later on : For restoring „critical” abutments

Today : Even for single tooth replacement

☐ **The role of the implants in the comprehensive rehabilitation**

☐ Strategies in treatment planning and prosthetic rehabilitation

☐ The updating **guidelines** on implant therapy during planing

1. What is the primary goal: function or esthetics?
2. In case of periodontally compromised teeth whereas the effectiveness of therapy is questionable rather tooth extraction.
3. Implant placement only after comprehensive periodontal therapy (inflammation-free environment)
4. Implant prosthetics:
 1. Only implant with implant born bridge
 2. More separated, and less-extensive bridge solutions

☐ **Aim of the lecture**

To give an overview of biological factors which can effect periimplant tissue health around implants

☐ Definition of the **biological width - tooth vs. Implant**

☐ Development of the biological width - tooth vs. Implant

☐ **Evolution of implant concepts** – development of the biological width influenced by the implant itself

☐ Biological considerations of hard- and soft tissue healing – determinants of **functional longevity and esthetic stability** around implants – host tissue response to (or against?) implant therapy

☐ The role of biological widths around teeth

☐ Biological width development around implants

☐ The **peri-implant mucosal condition** at different implants: two stage – one stage

☐ Healed mucosal conditions around the implant

☐ The Mucosa at Teeth and Implants

☐ **Peri-implant Mucositis and Peri-implantitis**

☐ Biological width around teeth

Definition

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

☐ **Basic studies**

▪ Basic morphology – *Sicher, Orban*

▪ Vertical dimension - „biological width” *Gargiulo*

▪ Mean measurements – *Vacek*:

1.32 ± 0.80mm for sulcus depth

1.14 ± 0.49 mm for epithelial attachment

0.77 ± 0.29 mm for connective tissue attachment

Based on human histological samples

- ☐ Biological width around implants
 - Definition
 - A mucoseal (cuff-like) barrier which adheres to the surface of the titanium abutment
 - The role of this periimplant mucoseal seal (scar like tissue?) is to protect underlying bone
 - Based on animal studies
- ☐ Biological width around implants - Basic studies
- ☐ **Soft tissue barrier:** composed by sulcus with a non keratinized epithelium junctional epithelium supracrestal connective tissue with dense circular fibres
 - Circular fibres run from the periosteum and the alveolar crest towards the oral epithelium.
 - Basic morphology – *Berglundh*
 - The role of junctional epithelium – *Abrahamson*
 - Soft tissue dimensions around different titanium surfaces – *Buser et al.*
- ☐ Biological width around implants
 - Recent Studies 1.
 - ☐ Epithelial attachment:
 - ☐ basal lamina and hemidesmosomes? – *Ikeda*
 - ☐ The junctional epithelium is longer adjacent to machined implant surfaces (a mean of 2.9 mm) than it is to acid etch–conditioned implant surfaces (a mean of 1.4 mm) or oxidized surfaces (a mean of 1.6 mm) – *Glauser*
 - ☐ No differences at submerged or non submerged implants – *Abrahamsson*
 - ☐ Biological width around implants
 - Recent Studies 2.
 - ☐ The presence of a fibroblast rich layer next to the implant surface – *Moon et al.*
 - ☐ Fibroblasts oriented with their long axis parallel to the implant surface
 - ☐ Real connective tissue attachment depending on implant surface characteristic? – *Schwarz et al.; Nevins et al.*
 - ☐ Biological width around teeth and implants
 - ☐ Similarities
 - Epithelial and connective tissue supracrestal
 - ☐ Location
 - ☐ Proportions
 - ☐ Adherence
 - ☐ Differences
 - Lack of cementum and periodontal fibers
 - Connective attachment to abutment surface?
 - Less vasculatisation in connective tissue
 - More pronounced tendency for developing periimplant infections
 - ☐ Biological width development around teeth
 - ☐ Biological width development around implants – at a conventional two-stage implant
 - ☐ Clinical impact of biological width development around implants
 - ☐ Implant **success- and survival rate** in periodontitis
 - Determined by microbiological- and/or tissue environment?

- ☐ Bone loss around titanium implants (submerged healing), machined surface is not related to periodontal destruction around teeth.
- ☐ Mean bone loss significantly ($P \leq 0.0001$) higher around teeth ($0.48 \pm 0.95 \text{ mm}$) than around implants ($0.09 \pm 0.28 \text{ mm}$).

Quirynen M, Peeters W, Naert I, Coucke W, van Steenberghe D: Peri-implant health around screw-shaped c.p. titanium machined implants in partially edentulous patients with or without ongoing periodontitis. Clin Oral Implants Res. 2001 Dec;12(6):589-94.

- ☐ Moderately rough surface (SLA). Implant survival 96,5% in healthy, vs. 90,5% in periodontitis patients. Implant success 79.1% vs. 52.4%.
- ☐ Success criteria at 10 years were set at: pocket probing depth (PPD) $\leq 5 \text{ mm}$, bleeding on probing negative, bone loss $< 0.2 \text{ mm}$ annually.

Karoussis IK, Salvi GE, Heitz-Mayfield LJ, Bragger U, Hammerle CH, Lang NP: Long-term implant prognosis in patients with and without a history of chronic periodontitis: a 10-year prospective cohort study of the ITI Dental Implant System. Clin Oral Implants Res. 2003 Jun;14(3):329-39.

- ☐ Location of the implant abutment interface
(two-stage implant)
- ☐ A 0.75 mm thick inflammatory cell infiltrate and inflammatory connective tissue was found at the implant-abutment interface
- ☐ A study in dogs - *Ericsson et al.*
- ☐ Thickness of inflammatory tissue 0.35 mm apically and coronally to the implant-abutment interface Controversary data from a human biopsy of one implant - *Luongo et al.*
- ☐ Reduced amount of inflammatory tissues may also be explained by a favourable prosthetic design: Horizontal offset at the implant- abutment interface - *Luongo et al.*

- ☐ Individualized, horizontally reduced diameter abutment
- ☐ Concept of **platform switching**
- ☐ Evolution of implant concepts to improve periimplant tissue healing
- ☐ Aim of the lecture
To give an overview of biological factors which can effect periimplant tissue health around implants
- Definition of the biological width - tooth vs. Implant
- Development of the biological width - tooth vs. Implant
- *Evolution of implant concepts – development of the biological width influenced by the implant itself*
- Determinants of functional longevity and esthetic stability around implants – host tissue response to (or against?) implant therapy
Periimplant tissue stability and dimensional differences in three clinical settings

- ☐ Periimplant tissue stability and dimensional differences in three clinical settings

1. **Flap vs. “flapless” surgical approach** in a healed edentulous alveolar ridge
 2. Implant placement in compromised defect configurations
 3. Immediate implant placement into fresh extraction sites
- ☐ Implant placement in a healed edentulous alveolar ridge
Flap vs. “flapless” surgical approach

- ☐ No differences concerning osseointegration when implants placed flapless or with flap mobilization.

Becker W, Wikesjö UM, Sennerby L, Qahash M, Hujoel P, Goldstein M, Turkyilmaz I. Histologic evaluation of implants following flapless and flapped surgery: a study in canines. *J Periodontol*. 2006 Oct;77(10):1717-22.

- ☐ Flapless implant insertion results in less inflammation and early reepithelialization, establishing an esthetically preferable peri-implant soft tissue collar.

Mueller CK, Thorwarth M, Schultze-Mosgau S. Histomorphometric and Whole-Genome Expression Analysis of Peri-implant Soft Tissue Healing: A Comparison of Flapless and Open Surgery. *Int J Oral Maxillofac Implants*. 2011 Jul-Aug;26(4):760-7.

- ☐ Crestal bone resorption is limited when implant placed flapless.

Campelo LD, Camara JR. Flapless implant surgery: a 10-year clinical retrospective analysis. *Int J Oral Maxillofac Implants*. 2002 Mar-Apr;17(2):271-6.

- ☐ Technical difficulties during implant positioning → **navigation** during flapless surgery, computer guided technique.

Danza M, Carinci F: Flapless surgery and immediately loaded implants: A retrospective comparison between implantation with and without computer-assisted planned surgical stent *Stomatologija, Baltic Dental and Maxillofacial Journal*, 12:35-41, 2010

- ☐ Technical difficulties during implant positioning
- ☐ 162 implants inserted via computer assisted surgery (Nobel Guide™; Nobel Biocare AB) with immediate loading after 1 year 0.80 mm bone loss in the maxilla, and 0.85 mm in the mandible.

Komiyama A, Hultin M, Näsström K, Benchimol D, Klinge B Soft Tissue Conditions and Marginal Bone Changes around Immediately Loaded Implants Inserted in Edentate Jaws Following Computer Guided Treatment Planning and Flapless Surgery: A 31-Year Clinical Follow-Up Study *Clinical Implant Dentistry and Related Research* 2009

Clinical experience?!

- ☐ A statistically better outcome when using smaller ($\varnothing \leq 3$ mm) soft tissue punch sizes, but is this of any clinical significance?

Lee DH, Choi BH, Jeong SM, Xuan F, Kim HR, Mo DY. Effects of soft tissue punch size on the healing of peri-implant tissue in flapless implant surgery. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010 Apr;109(4):525-30.

Clinical explanation: Preserved keratinized alveolar mucosa may transform into periimplant keratinized mucosa

- ☐ Controversial clinical experience: 3D positioning with guided surgery I
- ☐ Controversial clinical experience: 3D positioning with guided surgery II
- ☐ Controversial clinical experience: 3D positioning with guided surgery III
- ☐ Controversial clinical experience: 3D positioning with guided surgery IV
- ☐ The **role of the keratinized gingiva (KG)** in the maintenance of periodontal tissue health
- ☐ An intact band of attached keratinized gingiva is critical to protect the function of the mucogingival complex, although minimum width requirements remain controversial.
- ☐ Lack of a proper amount, even less than 1mm of keratinized tissue can be compensated by individual oral hygiene.

- ☐ Increased tendency for developing local plaque accumulation or recession.
- ☐ Beneficial effects of enhancement the width of keratinized tissue.
- ☐ The role of the keratinized periimplant mucosa in the maintenance of periimplant tissue health
- ☐ An experimental study in the monkey: sites with minimal or no keratinized periimplant mucosa more prone to recession and bone loss during plaque accumulation
- ☐ Similar results from human studies. Randomised controlled studies on the importance of keratinized periimplant mucosa are needed. Literature data suggest an evidently greater risk for periimplant tissue pathology.
- ☐ Conclusion of a literature review: The role of keratinized periimplant mucosa seems to be implant and surface dependent