TOPICS – Day 1

• Factors influencing the long-term stability of dental implants
• Surgical procedures in estheticics: Implant treatment associated with or without flap elevation
• Surgical procedures in posterior sites: Implant placement with or without flap elevation
• Implant placement and sinus floor elevation: Surgical types of Osteotome technique
• Prosthetic planning and restoration in posterior maxilla
• Esthetic principles in the context of esthetic implant treatment

Implant Placement in Esthetic Sites

• This is a frequent clinical situation today
  - Today, we see predominantly implant placement post extraction
• Implant sites in the esthetic zone are demanding
  - Cat. A or Cat. C
• The timing of the treatment is crucial:
  - When to place and when to restore the implant(s)

Factors influencing Treatment Outcomes

Surgical Recipe for successful Outcomes in Implant Esthetics

• Good understanding of tissue biology
  - Concept of biologic width
  - Hard and soft tissue alterations following extraction
  - Biology of bone defects

• Detailed esthetic risk assessment is mandatory
  - Martin et al. 2006

• Correct 3-D implant position must be achieved
  - Buser et al. 2004

• Facial contour augmentation with GBR is most often needed
  - Buser et al. 2008

• Primary wound closure to protect applied biomaterials

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Patient

Surgical Surgeon

Implant

Bio-materials

Surgical Approach
The concept of the **biologic width** around dental implants


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The bone plays a key role for esthetics

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Surgical Recipe for successful Outcomes in Implant Esthetics

- Good understanding of tissue biology
- Hard and soft tissue alterations following extraction
- Natural-looking esthetic soft tissue appearance is crucial
- Control 3-5 implant positions with the bone
- Facial contours augmentation with soft tissue often needed
- Primary wound closure to protect applied biomaterials

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Araujo MG, Lindhe J: Dimensional ridge alterations following tooth extraction. J Clin Periodontol 32: 212-18, 2005

Buccal sites: Mean vertical bone loss of ≥ 2.3 mm

Prospective case series study in 39 patients with a single tooth extraction in the max
2 CBCT’s at day 0 and after 8 weeks of soft tissue healing


Regression Analysis in Central Sites for Vertical Bone Loss

Thick wall phenotype: Median vertical bone loss = 1.1 mm
Thin wall phenotype: Median vertical bone loss = 7.5 mm
Examination of 125 Cone Beam Computed Tomographies (CBCT) in the anterior maxilla

498 teeth were measured at two points:
- At the crest area (4 mm apical to the CEJ)
- In the middle of the root


The anterior maxilla is dominated by thin wall phenotypes!

The mean facial bone wall thickness in the anterior maxilla is between 0.6 and 0.8 mm

A thick facial bone wall is rarely present (<10%) except for premolars (>20%)

Significant vertical bone loss must be expected due to the bundle bone resorption

Conclusions of all these studies (1 clinical, 3 CBCT studies)
- The mean facial bone wall thickness in the anterior maxilla is between 0.6 and 0.8 mm
- A thick facial bone wall is rarely present (<10%) except for premolars (>20%)
- Significant vertical bone loss must be expected due to the bundle bone resorption

Surgical Recipe for successful Outcomes in Implant Esthetics

- Good understanding of tissue biology
- Biological of bone defects
- General esthetic risk assessment
- Correct implant position
- Focal contour augmentation with GBR and other biomaterials
- Primary wound closure to protect applied biomaterials

Biology of Bone Defects

- The corono-apical dimension of the defect is not relevant
- The mesio-distal width is important
- Most important is the crest width
- Should be at least implant diameter plus 2 mm
- V-shape, vs. U-shape, vs. UU-shape (Kan et al. 2007)

Ridge Alterations following Extraction


Conclusions of all these studies (1 clinical, 3 CBCT studies)
- The mean facial bone wall thickness in the anterior maxilla is between 0.6 and 0.8 mm
- A thick facial bone wall is rarely present (<10%) except for premolars (>20%)
- Significant vertical bone loss must be expected due to the bundle bone resorption
2-wall Defect:
Defect Regeneration very predictable and fast

Swiss Alps Valley Defect
Grand Canyon Defect

Ridge Alterations following Extraction: Timing is crucial!!

Surgical Recipe for successful Outcomes in Implant Esthetics

• Good understanding of those biology
  • Gingival biotype
  • Ridge alterations following extraction

• Detailed esthetic risk assessment is mandatory
  • Aromatic C-I: Implant position must be assessed
  • Forced contour augmentation with direct bone grafts
  • Primary wound closure to protect applied biomaterial

Esthetic Risk Assessment in Implant Patients
### Medical Risk Factors in Implant Dentistry

- **High risk factors for implant therapy**
  - Severe bone diseases
  - Immunocompromised patients
  - Intra-venous medication with bisphosphonates

- **Risk factors for implant therapy**
  - Local radiotherapy
  - Uncontrolled or juvenile diabetes
  - Bleeding disorders such as hemostatic diathesis
  - Drug abuse & psychological/mental disorders

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### Smoking as a Risk Factor in Implant Dentistry

- **Smoking has been identified already 15 years ago to be high risk factors**
  - Frequent smoking
  - Light smokers (< 10 cigarettes/day)
  - Heavy smokers (≥ 10 cigarettes/day)

- **Negative synergy with genetic factor (Interleukin/PST)**
  - Heavy smoking and PST positive are really at risk

- **Controversial discussion**
  - Medical status
  - Smoking habit

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### Soft tissue anatomy

- **Gingival biotype**
  - Adjacent teeth
  - Tooth crown
  - Soft tissue deficiency

- **Bone defect at implant site**
  - Adjacent teeth
  - Soft tissue deficiency

- **Shape of tooth crown**
  - Adjacent teeth
  - Soft tissue deficiency

- **Width of edentulous space**
  - Adjacent teeth
  - Soft tissue deficiency

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<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
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</thead>
<tbody>
<tr>
<td>Medical Status</td>
<td>healthy patient</td>
<td>intact immune system</td>
<td>reduced immune system</td>
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<tr>
<td>Smoking Habit</td>
<td>non-smoker</td>
<td>light smoker</td>
<td>heavy smoker</td>
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<tr>
<td>&lt; 10 cig/d</td>
<td></td>
<td>≥ 10 cig/d</td>
<td></td>
</tr>
<tr>
<td>Patient’s esthetic demand</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Lip Line</td>
<td>low</td>
<td>medium</td>
<td>high</td>
</tr>
<tr>
<td>Gingival biotype</td>
<td>thick, low-scalloped</td>
<td>medium thick, medium scalloped</td>
<td>thin, high scalloped</td>
</tr>
<tr>
<td>Shape of tooth crown</td>
<td>rectangular</td>
<td>triangular</td>
<td></td>
</tr>
<tr>
<td>Bone level at adjacent teeth</td>
<td>≤ 5 mm to contact point</td>
<td>5.5 to 6.5 mm to contact point</td>
<td>≥ 7 mm to contact point</td>
</tr>
<tr>
<td>Restorative status of neighb. teeth</td>
<td>virgin</td>
<td>restored</td>
<td></td>
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<tr>
<td>Width of edentulous space</td>
<td>1 tooth ≥ 7 mm*</td>
<td>1 tooth ≥ 5.5 mm+</td>
<td>1 tooth &lt; 7 mm*</td>
</tr>
<tr>
<td>Bone defect at implant site</td>
<td>no bone deficiency</td>
<td>horizontal bone deficiency</td>
<td>vertical bone deficiency</td>
</tr>
<tr>
<td>Soft tissue anatomy</td>
<td>intact soft tissues</td>
<td>Soft tissue defect</td>
<td></td>
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<tr>
<td>Clinical trial</td>
<td>2002.11</td>
<td>2008: 5 yrs</td>
<td>2013.07: 10 1/2 yrs</td>
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### Risk Factors in Implant Dentistry

**Local Infection**

- A generalized periodontal infection needs to be addressed prior to implant therapy
- Local infection as well
- Endodontic problems
- Root resorption or fracture
- Infected root remnants
- We don’t recommend to place implants into infected extraction sockets

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<tr>
<th>Risk Factor</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local infection of implant site</td>
<td>none</td>
<td>present</td>
<td>acute</td>
</tr>
<tr>
<td>Bone level at adjacent teeth</td>
<td>≤ 5 mm to contact point</td>
<td>5.5 to 6.5 mm to contact point</td>
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Development of Straumann Implants for Esthetic Sites

Development of Straumann Implants for Esthetic Sites

Mesio-distal Positioning: Bone Level Implants

Mesio-distal Position:
• Respect a minimal distance to the root surfaces of adjacent teeth
• A distance of 1.5 mm is recommended for bone level implants


Development of Straumann Implants for Esthetic Sites

Development of Straumann Implants for Esthetic Sites

Mesio-distal Positioning: Bone Level Implants

Mesio-distal Position:
• Respect a minimal distance to the root surfaces of adjacent teeth
• A distance of 1.5 mm is recommended for bone level implants
Corono-apical Direction

Problems with corono-apical malpositions
• Too superficial location: Coronal malposition
  ✓ Metal margin becomes visible
  ✓ Emergence profile becomes problematic
• Too deep location: Apical malposition
  ✓ Too much countersinking
  ✓ Malposition often results in facial recession of mucosa
  ✓ Difficult prosthetic handling

Corono-apical Positioning

Soft Tissue Level Implants

Bone Level Implants

Rule: 2 mm apical to the future mid-facial mucosal margin

Rule: 3 mm apical to the future mid-facial mucosal margin

Tissue Level vs. Bone Level Implants?


- Radiographic analysis of 42 TL implants (5-9 yrs follow-up) and 20 BL implants (4 yrs)
- Patient pool of two studies (Buser et al. Perio 2013; Buser et al. JDR 2013)
- Measurement of various radiographic distances

Tissue Level vs. Bone Level Implant?

How to avoid Mucosal Problems corono-apically

Recommendations

- Use surgical stents if needed
  - There is no need in single tooth gaps, if you have good landmarks at adjacent roots
  - In sites with multiple missing teeth, it is imperative to use a stent
- Avoid too much countersinking
  - Develop a gut feeling for a correct vertical positioning
  - Just as much as necessary

Implant Platform in Oro-facial Direction

Problems with oro-facial malpositions

- Common oro-facial malpositions
  - Increased risk for mucosal recession
  - Associated with immediate implant placement
  - Facial impingement can be clipped by oversized implants (wide-platform)
- Rare oro-palatal malpositions
  - Requires restorations with a ridge-lap design

Oro-facial Positioning

Recommendations

- Don’t use wide-platform implants in the anterior maxilla
- Make sure to position the implant into the alveolar process
- Implant platform should be ≈1.0 to 1.5 mm palatal to the point of emergence of the future implant crown
- Use periodontal probe for orientation
Protocol for Healing Period (since 1998)

- Implant Surgery
- Provisional Restoration
- Initial Bone Healing Period
- Reopening
- Restorative Phase
- Soft Tissue Conditioning

1997: 1 year
Conclusions: Implant Surgery in Esthetic Sites

- The primary goal is an esthetic treatment outcome
- These situations are demanding for involved clinicians
  - Advanced to complex level
- A correct 3-dimensional implant position is essential
- Restoration-driven implant placement within the comfort zones
- Don't use wide-neck or wide-platform implants in the esthetic zone
- Contour augmentation is a key factor for esthetic outcomes
  - The surgeon must master the GBR technique
- A submerged healing is preferred