Management of Complications in Implant Dentistry
THANK YOU
Problems with Complication Studies

1. Study designs not ethnical or realistic to conduct
2. Mostly observational studies over time
3. Require long-term studies vs. short-term studies
4. Literature reviews are subject to bias
5. Published systematic reviews are oversimplified and underestimated
The reported Complications and Failures are speculated to be UNDER estimated.

Most studies are done in a well controlled, supervised institute or hospital environment with procedures performed by experienced specialists that MAY NOT be reflective of private practice settings.
Case # 2
How to Classify Complications?

1. Biological or Mechanical
2. Objective (measurable) or Subjective (patient inputs)
3. Early or late or maintenance
4. Treatment plan or Surgical or Prosthetic
5. Level of complexity (minor, moderate, severe, reversible, or irreversible)
Complications in Implant Dentistry

- Host/Patient Related
- Dentist/Surgeon Related
- Clinical Protocol Related
- Systemic Conditions
- Psychological Status
- Smoking
- Periodontitis

- Treatment Planning
  - Surgical
  - Prosthetic
  - Restorative

- Local Factors
  - Grafting
  - Maintenance
Complication

Aetiology

Management
Let’s Get Started
Complications in Implant Dentistry

Host/Patient Related

Systemic Conditions

Treatment Planning
- Surgical
- Prosthetic
- Restorative

Grafting

Maintenance

Psychological Status

Smoking

Periodontitis
Host/ Patient Related

Medical Status

Absolute Contraindications to Surgery
Relative Contraindications / Risk Factors to Surgery

Susceptibility to Infections and impaired healing response and medications for treatment of systemic conditions can potentially affect implant and tissues
Host/ Patient Related

Medical Status

Absolute Contraindications
For Surgery (Dental alveolar, implant, hard or soft tissue grafting)

• Debilitating Diseases:
  • Active cancer
  • Chemotherapy
  • Radiation therapy
  • Transmittable infections
    • Hepatitis, HIV

• Impaired Healing Capacity Diseases:
  • Uncontrolled diabetes
  • Uncontrolled hypertension
  • Immune Compromised Disease
  • History of Osteomyelitis in operative site
Host/ Patient Related

Medical Status

**Absolute Contraindications**

- Recent myocardial infarction (M.I.), cerebrovascular accident, uncontrolled clotting / bleeding disorders
- Pregnancy
- Chronic or severe alcoholism
- Drug abuse
- Psychiatric disorders
- I.V. bisphosphonates use or long term oral bisphosphonates
- Uncontrolled periodontal disease
- ASA IV or V patients
Host/ Patient Related

Medical Status

Relative Contraindications/ Risk Factors
For Surgery (Dental alveolar, implant, grafting)

• Debilitating Diseases:
  • Inactive cancer
• Impaired Diseases:
  • Controlled diabetes
  • Controlled hypertension
• Myocardial infarction (M.I.) history of >1 year
• Oral bisphosphonates
• Smoking habits
• Periodontal disease
American Society of Anesthesiologists (ASA) Classifications

ASA I: A normal, healthy patient, without systemic disease

ASA II: A patient with mild to moderate systemic disease

ASA III: A patient with severe systemic disease, which limits or alters activity but is not incapacitating

ASA IV: A patient with severe systemic disease, which is incapacitating and is a constant threat to life

ASA V: A morbid patient not expected to live more than 24 hours without an operation
Elective Implant surgeries are NOT indicated for ASA IV or V patients
For a patient at risk, strict adherence to the standard protocol does not always yield the expected results.
a. Confirm medical status of ASA classification with last full medical checkup

b. Record baseline vital signs (blood pressure, pulse)

c. Consult with medical practitioner as required to confirm stability of medical status prior to elective implant surgery
When in doubt, consult M.D.
## Diagnostic Evaluation For Risk Factors In Implant Dentistry

<table>
<thead>
<tr>
<th>Tx Planning</th>
<th>Low Risk</th>
<th>Medium Risk</th>
<th>High Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) Medical Status</td>
<td>ASA 1</td>
<td>ASA 2</td>
<td>&gt; ASA 3</td>
</tr>
<tr>
<td>2) Smoking Status</td>
<td>None</td>
<td>Yes / Minimal duration and quantity</td>
<td>Yes / Long duration and large quantity</td>
</tr>
<tr>
<td>3) Reasons For Tooth Loss</td>
<td>Caries and other reasons</td>
<td>Periodontal Disease</td>
<td>Parafuncional Habits</td>
</tr>
<tr>
<td>4) Duration of Tooth Loss</td>
<td>&lt; 1 year</td>
<td>&gt; 1-3 years</td>
<td>&gt; 3 years</td>
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<tr>
<td>5) Residual Bone Pattern</td>
<td>Tooth Only defect</td>
<td>Mild-Moderate Composite RRR</td>
<td>Advance Composite RRR</td>
</tr>
<tr>
<td>6) Muscular Dynamics</td>
<td>Normal Tonicity</td>
<td>Moderate Tonicity</td>
<td>Hard Tonicity</td>
</tr>
<tr>
<td>7) Facial Form</td>
<td>Dolichocephalic</td>
<td>Mesocephalic</td>
<td>Brachycephalic</td>
</tr>
<tr>
<td>8) TMJ Evaluation</td>
<td>Asymptomatic</td>
<td>Clicking / Popping but without discomfort</td>
<td>Unstable / Discomfort / Unable to Load</td>
</tr>
<tr>
<td>9) Jaw Relations Record</td>
<td>Consistently Repeatable</td>
<td>Needs Manipulation</td>
<td>Unstable and Inconsistent Position</td>
</tr>
<tr>
<td>10) Parafuncional Habits</td>
<td>None</td>
<td>Moderate Wear / Attrition</td>
<td>Heavy Wear / Attrition</td>
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<tr>
<td>11) Oral Hygiene</td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
</tr>
<tr>
<td>12) Anatomical Confirmation</td>
<td>Clinical Examination / Panoramic</td>
<td>Clinical Examination/ Panoramic / CBCT</td>
<td>Clinical Examination / Panoramic / CBCT / Software Planning</td>
</tr>
</tbody>
</table>

**Patient Name:** ____________________________  **Date:** __________
Complications in Implant Dentistry

Host/ Patient Related

Systemic Conditions

Psychological Status

Surgical

Prosthetic

Restorative

Grafting

Maintenance
Have you ever treated a patient within your practice and regretted accepting this patient later?
Host/ Patient Related

Psychological Status

1. Psychological and mental stability for patient to accept and tolerate required procedures

2. Normal healing response and sequelae of bone and soft tissue grafting procedures

3. The 3 “C’s” prior to treatment
   a. Communication
   b. Compliance
   c. Consent
An Upset Patient
Married to an Upset Patient
Married to a Upset and Crazy Patient!
Perception that dentists are looking to “sell” more dentistry due to lack of busyness to generate high incomes
The Suspicious Patient
The Uncooperative Patient
The “Know-it-All” Patient
The patient looking for fuel to be litigious or burn other colleagues
The patient with unrealistic desired results and goals
The patient with unrealistic desired results and goals
Hemorrhage/ Bleeding Management

1. Management of intra operative bleeding source (soft tissue/ bone) prior to suturing

2. Proper soft tissue suturing techniques to ensure primary closure without tension of soft tissues

3. Proper use of sterile gauze pads with moistened sterile saline solution with firm pressure over the wound for 20 minutes

4. Oral and written instructions for care to prevent vasoactive substance (caffeine or alcohol), minimize exercise, post operative care to minimize disturbance to wound clotting, oral hygiene instruction care
1. Inform patient that it will be a normal sequelae of any surgical procedure

2. Inform patient that degree of bruising is *not* an indicator of success/failure, traumatic/atraumatic nature of procedure of operator

3. Application of ice bag or cold packs immediately after surgery for 2 days
Need to communicate these sequelae *prior* to procedures otherwise it will become a “complication”
b) Compliance

- Disposed to agree with others or obey rules, especially to an excessive degree. Meeting or in accordance with rules or standards.

- A quality of yielding to pressure or force without disruption, or an expression of the measure of the ability to do so
  - Dorland’s Illustrated Medical Dictionary, 27th Edition
Cooperative Partners in Treatment
Money
c) Consent Process

1. Communication and patient education

2. Process of informed consents and financial arrangements confirmed

3. Relationship and rapport development with patients

4. Continuous monitoring support, empathy and sincere compassionate care

5. Review of all risks, benefits and alternatives (R.B.A.)
Complications in Implant Dentistry

Host/ Patient Related

Systemic Conditions
Psychological Status
Smoking Periodontitis
Smoking Status

1. Consequences of smoking on wound healing
2. Management protocol for smokers
3. Warning and consent for smokers
Arteriolar vasoconstriction reduces vascularization and microcirculations of tissues.

May lead to increase incidence of flap necrosis and dehiscence to early graft exposures.

Tobacco’s toxic byproducts have been implicated as risk factors for impaired healing.
Table 1. Characteristics of studies selected in meta-analysis aimed to examine the influence of smoking on osseointegrated implant failure

<table>
<thead>
<tr>
<th>Author, the year of publish</th>
<th>No. cases/ no. controls</th>
<th>OR</th>
<th>95% CI (confidence interval)</th>
<th>Rate of implant failure (%)</th>
<th>Study design</th>
<th>Cigarette smoking</th>
<th>Diagnosis of implant failure</th>
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<tbody>
<tr>
<td>Bain &amp; Moy (1993)</td>
<td>390/1804</td>
<td>2.54</td>
<td>1.74–3.72</td>
<td>5.93</td>
<td>Case–control</td>
<td>nr</td>
<td>r, b**</td>
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<td>De Bruyn &amp; Collaert (1994)</td>
<td>114/338</td>
<td>5.46</td>
<td>1.57–19.02</td>
<td>2.43</td>
<td>Case–control</td>
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<td>Gorman et al. (1994)</td>
<td>646/1420</td>
<td>2.03</td>
<td>1.33–3.11</td>
<td>4.31</td>
<td>Cohort</td>
<td>nr</td>
<td>r</td>
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<tr>
<td>Minsk et al. (1996)</td>
<td>157/570</td>
<td>1.21</td>
<td>0.68–2.16</td>
<td>9.49</td>
<td>Case–control</td>
<td>nr</td>
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<td>Wang et al. (1996)</td>
<td>13/70</td>
<td>0.98</td>
<td>0.19–5.02</td>
<td>15.66</td>
<td>Case–control</td>
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<td>Yamada et al. (1997)</td>
<td>389/347</td>
<td>2.08</td>
<td>1.04–4.18</td>
<td>5.3</td>
<td>Casecontrol</td>
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<td>Keller et al. (1999)</td>
<td>32/216</td>
<td>2.05</td>
<td>0.80–5.2</td>
<td>13.31</td>
<td>Case–control</td>
<td>Current vs. never or former</td>
<td>r</td>
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<tr>
<td>De Bruyn et al. (1999)</td>
<td>30/32</td>
<td>0.64</td>
<td>0.2–2.08</td>
<td>24.19</td>
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<td>Jones et al. (1999)</td>
<td>126/217</td>
<td>4.06</td>
<td>1.38–11.96</td>
<td>4.66</td>
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<td>Wallace (2000)</td>
<td>72/115</td>
<td>2.68</td>
<td>1.04–6.91</td>
<td>10.70</td>
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<td>Lambert et al. (2000)</td>
<td>959/1928</td>
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<td>Current vs. never or former</td>
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<td>Kuroyama et al. (2001)</td>
<td>1522/2994</td>
<td>1.22</td>
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<td>Geurs et al. (2001)</td>
<td>62/279</td>
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<td>Widmark et al. (2001)</td>
<td>67/131</td>
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<td>2.53–11.12</td>
<td>20.2</td>
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<td>Schwartz-Arad et al. (2002)</td>
<td>380/579</td>
<td>1.86</td>
<td>0.79–4.34</td>
<td>2.29</td>
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<td>Kan et al. (2002)</td>
<td>70/158</td>
<td>2.76</td>
<td>1.16–6.62</td>
<td>10.09</td>
<td>Case–control</td>
<td>Current vs. never or former</td>
<td>r</td>
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<td>Karoussis et al. (2003)</td>
<td>28/84</td>
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<td>Cohort</td>
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<td>Leonhardt et al. (2003)</td>
<td>31/13</td>
<td>3.5</td>
<td>0.39–31.8</td>
<td>18.18</td>
<td>Cohort</td>
<td>nr</td>
<td>r</td>
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<tr>
<td>Shiratori &amp; Isokawa (2003)</td>
<td>303/592</td>
<td>23.1</td>
<td>5.39–98.9</td>
<td>2.68</td>
<td>Case–control</td>
<td>nr</td>
<td>r</td>
</tr>
</tbody>
</table>

vs., versus; nr, not reported; current, current smoker; quit, subject who quit smoking; never, subjects who had never smoked; r, removal; b, progressive bone loss assessed by the radiograph; b*, bone loss in excess of 50% of the fixture length; b**, progressive bone loss with mobility or pain.
Effects of Smoking

Hinode D, Tanabe S, Yokoyama M, Fujisawa K, Yamauchi E, Miyamato Y.

Studies on Smoking and Implants

Study #1
- 5% lost on non-smokers vs. 11% on smokers. Smokers with higher implant failure rates in all regions except for the posterior mandible.

Study #2
- 3% lost on non-smokers vs. 7% on smokers by number of implants. 9% lost on non-smokers vs. 22% on smokers by number of patients. Regardless of method of analysis, a significant difference was noted between smokers and non-smokers.
Study #3

- Smoking cessation protocol of 1 week before surgery and 8 weeks after surgery
- 6% implant lost on non-smokers
- 38% implant lost on smokers without smoking cessation program
- 12% implant lost on smokers with smoking cessation program

Cessation protocol demonstrated improving implant success on treatment of smokers
**Effects of Smoking**  
(Evaluated in 9 Studies)

- Significantly increases implant loss
- Consumption increases failures (2 studies)
- Consumption does not increase failure (1 study)
- Comparison (smokers/ non-smokers)
  - 178/1668 implants lost in smokers (11%)
  - 239/4862 implants lost in non-smokers (5%)
1. Don’t treat!

2. Smoking cessation programs

3. Treat with consent form
Tobacco and Nicotine Warning Consent Forms

Nicotine and Tobacco Warning

The nicotine in tobacco constricts the blood vessels of your body. This effect is immediate and lasts up to one month. Furthermore, nicotine will reduce the amount of oxygen delivered to the body. This constriction of blood vessels and reduced oxygen delivered will affect the circulation of the tissues handled. Implant surgery and bone grafting may require extensive manipulation of soft tissues. The use of nicotine can compromise the healing and cosmetic outcome of these surgeries.

YOU MUST STOP SMOKING one month prior to surgery. You must not smoke for at least three weeks following surgery. A nicotine patch may be used to help stop smoking. However, no nicotine patch or nicotine gum may be used one month prior to surgery and for three weeks after surgery.

Parent Signature ___________________________ Date ___________________________

Witness Signature __________________________ Date ___________________________
Implant survival in patients with a history of treated Periodontitis ranged from 59%-100%.

17/18 studies reported high implant survival rates of >=90% with turned or moderately rough implant surfaces.

Need for continued regular supportive periodontal therapy.

Statistically significantly greater risk of peri-implantitis, odds ratio of 3.1 to 4.7.

Possible risk of increase incidence of future Peri-implantitis.
Iatrogenic

Any adverse condition in a patient occurring as the result of treatment by a physician/ dentist or surgeon, especially to infections acquire by the patient during the course of treatment.

- Dorland’s Illustrated Medical Dictionary, 27th Edition
Complications in Implant Dentistry

Dentist/Surgeon Related

Treatment Planning

Host/Patient Related

Dentist/Surgeon Related

Clinical Protocol Related

Systemic Conditions

Psychological Status

Smoking

Periodontitis

Treatment Planning

Surgical

Prosthetic

Restorative

Local Factors

Grafting

Maintenance
Complications in Implant Treatment Planning

1. Improper surgical implant placements without desired prosthetic goals treatment planned

2. Improper use of number and location of dental implants for final prosthesis. Application of Biomechanical rationale to implant treatment planning

3. Implant occlusion and management of parafunctional habits
Fail to Plan

Plan to Fail
Single implant placed into interproximal position between 24 and 25. Results in prosthetic compromise.
The Success criteria compromise the following determinants:

1. The resultant implant support does not preclude the placement of a planned functional and aesthetic prosthesis that is satisfactory to both patient and dentist.
Consensus Report: Towards Optimized Outcomes for Dental Implants

The Success criteria compromise the following determinants:

2. There is no pain, discomfort, altered sensation, or infection attributable to the implants
3. Individual unattached implants are immobile when tested clinically
4. The mean vertical bone loss is less than 0.2mm annually following the first year of function
Implant Treatment Planning

Implantology is a “Prosthetically / Restorative” driven discipline with a “Surgical” component.

Not a “Surgical” discipline with a “Prosthetic” component!!!!!!
Success with Implants

- The “Restorative” Dentist must be the “leader” in any type of implant treatment and work closely with all the other members of the team.
Treatment Sequence

- Soft tissue augmentation
- Hard tissue augmentation
- Implant placement
- Abutment connection
- Soft tissue management
- Prosthetic restoration
  - Emergence profile
  - Biomechanics
  - Function
  - Esthetics
  - Phonetics
Overview of Treatment Planning Protocol

1) Determine Patient’s desired treatment goal.
2) Diagnostic work up to evaluate patient’s existing condition.
3) Implant recipient site (Bone) considerations.
4) Soft tissue (Gingival) considerations.
5) Aesthetic considerations
6) Surgical Implant Placement Position guided by prosthetic requirements.
7) Prosthetic Restorations (fixed / removable).
8) Maintenance of Restored Implant Restoration
1. Improper surgical implant placements without prosthetic goals
Improper Surgical Implant Placements without Prosthetic Goals
Incorrect Implant Position
(Too Buccal)
Aesthetic Failure
Non restorable useless implant
Aesthetic nonrestorable implant placement
Post surgical CBCT reveals anatomical violation of implant placements

Post Surgical Implant Evaluation:

Fig 1  Fig 2  Fig 3A
Undesirable implant placement position
Implant Angulation Problem
Single implant placed into interproximal position between 24 and 25. Results in prosthetic compromise.
Palatal placement of dental implants leading to possible cross-bite in prosthesis
Inadequate inter occlusal clearance for implant supported fixed prosthesis
Improper surgical implant placements without prosthetic goals
Improper surgical implant placements without prosthetic goals
Improper surgical implant placements without prosthetic goals
Various Surgical Guide Options

1. No guides, free hand based on surrounding anatomy
2. Traditional lab fabricated guides
3. Computer generated “Guided” surgeries
4. Dynamic Guides
Design and Use of Surgical Guides
THE MOST IMPORTANT GUIDE

YOU
Complications in Implant Treatment Planning

1. Improper surgical implant placements without desired prosthetic goals treatment planned

2. Improper use of number and location of dental implants for final prosthesis. Application of Biomechanical rationale to implant treatment planning

3. Implant occlusion and management of parafunctional habits
Improper use of number and location of dental implants for final prosthesis
How Many Implants Required?
1 for Maxillary Arch
How Many Implants Required?
3 for Maxillary Arch
How Many Implants Required?
4 for Maxillary Arch
How Many Implants Required?
5 for Maxillary Arch
How Many Implants Required?
6 for Maxillary Arch
How Many Implants Required?
6 with 2 Angled for Maxillary Arch
How Many Implants Required?
6 for Maxillary Arch
6 Maxillary with 4 Angled Mandibular
How Many Implants Required?
7 for Maxillary Arch
How Many Implants Required?
8 for Maxillary Arch
How Many Implants Required?
9 for Maxillary Arch
How Many Implants Required?
10 for Maxillary Arch
How Many Implants Required?
12 for Maxillary Arch
How Many Implants Required?
13 for Maxillary Arch
How Many Implants Required?
22 for Maxillary and 18 for Mandibular Arch
Biomechanical Rationale
Bone Remodeling
- Turnover or internal restructuring of previously existing bone
- It is a coupled tissue level phenomenon
- Activation - of osseous precursor cells
- Active resorption
- Reversal or Quiescence
- Formation
- Remodeling cycle called “Sigma”
  - In humans, it is 17 weeks
Strain

- The change in length divided by the original length and the units of strain are given in percent.

- Too much bone strain at the implant interface causes bone loss.

- The strain to bone may be caused by the stress applied to the prosthesis.
Figure 6-12  Microstrain conditions may be responsible for the bone loss. The pathologic overload zone next to an implant may result in bone loss.
What is the equation for STRESS?
Stress = ___________
Excess stresses to an implant/bone interface will cause overload and implant failure

Complications from Stress

- Implant integration failure with fibrous tissue formation around implant, mobility instead of rigid fixation
- Early crestal bone loss
- Occlusal overload bone loss
- Screw loosening (prosthesis or abutment)
- Implant fracture (body or component)
- Prosthesis fracture (occlusal material or framework)
Clinical Force Factors
Clinical Force Factors

1. Bite forces (light vs. normal vs. heavy)
2. Parafunction
3. Crown implant height ratio
4. Masticatory Dynamics
5. Opposing Arch
6. Direction of load
7. Nature of opposing arch
8. Position of abutment in the arch
9. Occlusal scheme
Nature of Opposing Arch

- Implant supported Fixed Prosthetics
- Implant supported Removable Prosthetics
- Natural dentition with Porcelain Prosthetics
- Natural dentition
- Partial Removable Prosthetics
- Full Removable Prosthetics
2) Parafuction

Repeated or sustained non-functional wear that is harmful to the stomatognathic system

1. Bruxism: vertical or horizontal nonfunctional grinding of teeth. A maximum bite force recorded at 990 psi (4-10x normal)

2. Clenching: a habit that generates a constant force exerted form 1 occlusal surface to the other without any lateral movement. Bruxing and clenching can exist in combination

3. Tongue: thrust and size; unnatural force of the tongue against the teeth during swallowing
Character of Forces

- Force Magnitude (heavy, medium, light)
- Force Duration
- Force Type (compressive, tensile, shear)
- Force Direction
- Force Magnifiers (horizontal and vertical cantilevers)
Surface Area for Maximal Bone/Implant Interface Contacts
Options to Increase Surface Area

1. Increase Implant Numbers
2. Increase Implant Size and Length
3. Implant Design
4. Implant Surface Conditioning
5. Bone Density
Maxillary Anterior
Bone Density, Position, Esthetics
Maxillary Posterior
Bone Density, Implant/ Bone Interface Position, Biomechanics, Non-violation of Anatomical Structures (Sinus Membrane)
Surface Area for Maximal Bone/Implant Interface Contacts

1. Maximize implant number
2. Maximize implant diameter
3. Maximize implant length
   (without violation of the limits of bone volume or anatomical structures)
4. Bone density classification
   D1- Dense cortical (>1250 Hounsfield units)
   D2- Porous cortical and coarse Trabecular (850-1250 H. units)
   D3- Porous cortical (thin) and fine Trabecular (350-850 H. units)
   D4- Fine Trabecular (<150 H. units)
The speed of osseointegration dictates the severity and duration of the stability dip.
Goals of Diameter of Implant

1. Increase surface area
2. Compensate for unfavorable patient bite force factors
3. Minimize cantilevers for angled implants
4. Compensate for poor bone density
5. Enhance surface for shorter implants
6. Improve emergence profile
7. Decrease screw loosening
8. Minimize component fracture
9. Facilitate oral hygiene
<table>
<thead>
<tr>
<th></th>
<th>Mesial-Distal Crown</th>
<th>Mesial-Distal CEJ</th>
<th>Mesial-Distal CEJ - 2mm</th>
<th>Recommended Implant*</th>
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<tbody>
<tr>
<td>Central</td>
<td>8.6</td>
<td>6.4</td>
<td>5.5</td>
<td>3.75, 4.0, <strong>4.3</strong>, 5.0</td>
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<td>Cuspid</td>
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<td>1st Bicuspid</td>
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<td>4.7</td>
<td>4.1</td>
<td>3.75, 4.0, <strong>4.3</strong></td>
</tr>
<tr>
<td>1st Molar</td>
<td>10.4</td>
<td>7.9</td>
<td>7.0</td>
<td>3.75, 4.0, 4.3, <strong>5.0</strong></td>
</tr>
<tr>
<td>2nd Molar</td>
<td>9.8</td>
<td>7.6</td>
<td>7.0</td>
<td>3.75, 4.0, 4.3, <strong>5.0</strong></td>
</tr>
</tbody>
</table>
### Table 2 - Mandibular Arch
Mesial-Distal Crown and Root Diameter of Mandibular Teeth and Implant Recommendations

<table>
<thead>
<tr>
<th></th>
<th>Mesial-Distal Crown</th>
<th>Mesial-Distal CEJ</th>
<th>Mesial-Distal CEJ - 2mm</th>
<th>Recommended Implant*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>5.3</td>
<td>3.5</td>
<td>3.5</td>
<td>3.0, 3.3, <strong>3.5</strong></td>
</tr>
<tr>
<td>Lateral</td>
<td>5.7</td>
<td>3.8</td>
<td>3.5</td>
<td>3.0, 3.3, <strong>3.5</strong></td>
</tr>
<tr>
<td>Cuspid</td>
<td>6.8</td>
<td>5.2</td>
<td>4.1</td>
<td>3.75, 4.0, <strong>4.3</strong></td>
</tr>
<tr>
<td>1st Bicuspid</td>
<td>7.0</td>
<td>4.8</td>
<td>4.5</td>
<td>3.75, 4.0, <strong>4.3</strong></td>
</tr>
<tr>
<td>2nd Bicuspid</td>
<td>7.1</td>
<td>5.0</td>
<td>4.7</td>
<td>3.75, 4.0, <strong>4.3</strong></td>
</tr>
<tr>
<td>1st Molar</td>
<td>11.4</td>
<td>9.2</td>
<td>9.0</td>
<td>3.75, 4.0, 4.3, <strong>5.0</strong></td>
</tr>
<tr>
<td>2nd Molar</td>
<td>10.8</td>
<td>9.1</td>
<td>8.5</td>
<td>3.75, 4.0, 4.3, <strong>5.0</strong></td>
</tr>
</tbody>
</table>
### Approximate Surface Area of Anterior Natural Dentition (mm$^2$)*

<table>
<thead>
<tr>
<th>Position</th>
<th>Central</th>
<th>Lateral</th>
<th>Cuspid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>204</td>
<td>179</td>
<td>273</td>
</tr>
<tr>
<td>Mandible</td>
<td>154</td>
<td>168</td>
<td>268</td>
</tr>
</tbody>
</table>

### Approximate Surface Area of Posterior Natural Dentition (mm²)*

<table>
<thead>
<tr>
<th>Position</th>
<th>First Premolar</th>
<th>Second Premolar</th>
<th>First Molar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maxilla</td>
<td>234</td>
<td>220</td>
<td>443</td>
</tr>
<tr>
<td>Mandible</td>
<td>180</td>
<td>120768</td>
<td>431</td>
</tr>
</tbody>
</table>

Goals of Length of Implant

1. Increase surface area
2. Compensate for unfavorable patient bite force factors
3. Gain initial ridged fixation of dental implant
4. Compensate for poor bone density
5. Not violate any vital anatomical anatomy (IAN, mental nerve, sinus, lingual concavities, nasal foramen, adjacent roots, etc.)
Biomechanical Differential
Complications in Implant Dentistry

- Dentist/ Surgeon Related
- Treatment Planning
- Surgical
Types of Surgical Complications

- Surgical complications
- Hemorrhage-related complications
- Neurosensory complications
- Mandibular fracture
- Adjacent tooth devitalization
- Life-threatening hemorrhage
- Air emboli
- Violation of mandibular canal
- Aspiration of screwdriver, parts, components
<table>
<thead>
<tr>
<th>Failure</th>
<th>Success</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor bone site selection</td>
<td>Bone site selection</td>
</tr>
<tr>
<td>Short, Narrow, Porous</td>
<td>High, Wide, Dense</td>
</tr>
<tr>
<td>Implant design oversized implant</td>
<td>Implant choice / Design</td>
</tr>
<tr>
<td></td>
<td>Bone around implant</td>
</tr>
<tr>
<td>Poor surgical technique</td>
<td>Surgical technique</td>
</tr>
<tr>
<td></td>
<td>Proper implant placement</td>
</tr>
<tr>
<td></td>
<td>Adequate healing time</td>
</tr>
<tr>
<td></td>
<td>Sterile technique</td>
</tr>
<tr>
<td>Poor prosthetic technique</td>
<td>Prosthetic Reconstruction</td>
</tr>
<tr>
<td></td>
<td>Biomechanical design</td>
</tr>
<tr>
<td></td>
<td>Occlusal relationships</td>
</tr>
<tr>
<td>Poor patient cooperation</td>
<td>Patient hygiene / Recall</td>
</tr>
</tbody>
</table>
Classification of Oral Implant Failures

1. Biological

- Early or Primary (before loading):
  - Failure to establish osseointegration

- Late or Secondary (after loading):
  - Failure to maintain the achieved osseointegration
Early or Primary (before loading): Failure to establish osseointegration

1. Inadequate quantity and quality of bone for initial fixation of dental implant
2. Experience of surgical operator
3. Over-heating of bone during osteotomy preparations
4. Pressure necrosis, especially in D1 bone
5. Infection operatively after initial surgery
6. Incision line opening leading to complications or infections
# Effect of Timing of Implant Loss

<table>
<thead>
<tr>
<th>Number if Implants Lost</th>
<th>Early Implant Loss (%)</th>
<th>Late Implant Loss (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>248</td>
<td>135 (54%)</td>
<td>113 (46%)</td>
</tr>
<tr>
<td>293</td>
<td>176 (60%)</td>
<td>117 (40%)</td>
</tr>
<tr>
<td>170</td>
<td>104 (61%)</td>
<td>66 (39%)</td>
</tr>
<tr>
<td>15</td>
<td>7 (47%)</td>
<td>8 (53%)</td>
</tr>
<tr>
<td>726</td>
<td>422 (58%)</td>
<td>304 (42%)</td>
</tr>
</tbody>
</table>

Surgical Complications

- Hemorrhage-related
- Neurosensory disturbance
- Adjacent tooth devitalization
- Implant failure associated with adjacent asymptomatic root canal treated tooth
- Mandibular fracture (0.3%)
- Life-threatening hemorrhage
- Air emboli
Complications in Implant Dentistry

Dentist/ Surgeon Related

Treatment Planning

Surgical

Prosthetic
  Restorative
Complications in Implant Prosthetic Dentistry
REVIEW OF 3 COMMON IMPLANT PROSTHETIC COMPLICATIONS

- Porcelain Fracture / Repair options
- Acrylic Fracture
- Implant Screw Complications
Complications

1. OD loss of retention or adjustments - 30%
2. Resin acrylic veneer fracture of FPD - 22%
3. OD relines required - 19%
4. OD clip/attachment fractures - 17%
5. Prosthesis screw loosening - 7%
6. Abutment screw loosening - 6%
## Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD loss of retention or adjustments (30%)</td>
<td>Lack of simultaneous contact engagements of attachments with differential wearing of component parts</td>
<td>Pick up attachments to be parallel Use customized abutments to correct for unparallel implant placements</td>
</tr>
</tbody>
</table>
Complications

1. OD loss of retention or adjustments - 30%
2. Resin acrylic veneer fracture of FPD - 22%
3. OD relines required - 19%
4. OD clip / attachment fractures 17%
5. Prosthesis screw loosening - 7%
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## Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrylic Fractures</td>
<td>Inadequate interocclusal distance from implant platform level to opposing</td>
<td>Osteoplasty prior to implant placement to increase interocclusal distance</td>
</tr>
<tr>
<td></td>
<td>cusp</td>
<td>Consider different attachment options that require less interocclusal distance (locator attachments)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Need &gt;0.2 mm acrylic resin thickness over attachments for strength</td>
</tr>
</tbody>
</table>
Figure 14-2  The mandibular overdenture requires at least 12 mm between the soft tissue and the occlusal plane to provide sufficient space (15 mm from bone level to occlusal plane) for the bar, attachments, and teeth.
Fractured Acrylic at Attachment
Space Requirements for Bar-Overdenture

- Thickness of soft tissue- 2.0 mm
- Hygiene space under bar- 1.5 mm
- Thickness of bar- 4.0 mm
- Clip and housing- 1.5 mm
- Acrylic denture base- 2.0 mm
- Denture tooth- 3.0 mm
- Total Height Requirement = 14.0 mm
- Compromised Height is 10.5 mm - 14.0 mm (bar touching soft tissue, reduce thickness of bar, attachment type altered, reduce thickness of acrylic base and denture tooth size)
# Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Porcelain chips and fracture</td>
<td>Unsupported substructure</td>
<td>Substructure extension to support porcelain of less than 2.0 mm thickness</td>
</tr>
<tr>
<td>Resin acrylic veneer fracture of FPD</td>
<td>Heavy occlusion for implant restoration</td>
<td>Confirm implant protected occlusion</td>
</tr>
<tr>
<td></td>
<td>Steep cusp angles with lateral excursion forces</td>
<td>Shallow cusp angles with narrow occlusal table to avoid lateral forces</td>
</tr>
<tr>
<td>Complication</td>
<td>Etiology</td>
<td>Solution</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>---------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Porcelain chips and fracture</td>
<td>Inadequate interocclusal clearance for abutment, substructure and porcelain</td>
<td>Treatment plan options to manage interocclusal distance</td>
</tr>
<tr>
<td></td>
<td>Zirconia with higher incidence of porcelain shear fractures</td>
<td>Screw retain option metal occlusal</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Osteoplasty prior to surgery to submerge implant platform level</td>
</tr>
</tbody>
</table>
Porcelain Fractures
Porcelain Fractures
Porcelain Fractures
Inter-Occlusal Space Recommendations

1. <3.0 mm abutment height- Use screw retention
2. 3.0 mm - 4.0 mm abutment height- Use screw retention or very cement type to make it non-retrievable
3. >4.0 mm abutment height- Use retrievable cement
Complications

1. OD loss of retention or adjustments - 30%
2. Resin acrylic veneer fracture of FPD - 22%
3. OD relines required - 19%
4. OD clip/attachment fractures 17%
5. Prosthesis screw loosening - 7%
6. Abutment screw loosening - 6%
## Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>OD relines required (19%)</td>
<td>Increased forces compared to conventional CD</td>
<td>Need relins in bilateral residual ridge resorption areas to provide load bearing areas of OD</td>
</tr>
<tr>
<td></td>
<td>Increased use and forces applied to residual ridge areas with increased resorption</td>
<td></td>
</tr>
</tbody>
</table>
Complications

1. OD loss of retention or adjustments - 30%
2. Resin acrylic veneer fracture of FPD - 22%
3. OD relines required - 19%
4. OD clip/attachment fractures 17%
5. Prosthesis screw loosening - 7%
6. Abutment screw loosening - 6%
# Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment breakage or fractures (17%)</td>
<td>Improper loading, angulated and/or imbalance of engagements of attachments</td>
<td>Pick up attachments after correction and imbalance and obtain parallel alignment of attachments and achieve simultaneous contacts of components</td>
</tr>
<tr>
<td></td>
<td>Differential wear of attachment parts</td>
<td>Treatment plan properly</td>
</tr>
<tr>
<td></td>
<td>Soft tissue support adequate for loading breaching areas of OD</td>
<td>Change attachment types that require less interocclusal distance</td>
</tr>
<tr>
<td></td>
<td>Inadequate interocclusal distance</td>
<td></td>
</tr>
</tbody>
</table>
Broken Attachments

Plastic Bar Clip

- Damaged of broken
  - Cut along long axis with sharp knife and remove
- Missing
  - Replace by inserting a new clip into denture base receptacle
- If unavailable, contact Command Implant Coordinator
Broken Attachments

**Metal Bar Clip**

- Damaged or Broken (replacement clip available)
  - Remove the clip and perforate the denture base carefully for intraoral pick up replacement
  - Block out under the bar with wax, seat the denture and position a new clip through access in denture base
- Use autopolymerizing acrylic resin with “bread brush” technique to fill in access and connect clip to denture base. Polish, disinfect, and deliver
- Always confirm seating of denture after repair and evaluate occlusion
Broken Attachments

**Metal Bar Clip**
- Damaged or Broken (replacement clip available)
  - Remove all remnants of the clip from the denture base
  - Block out under the bar with wax
  - Reline the clip area of the denture with a resilient chair side reline material (viscogel)
- Intact Clip with No Retention
  - Carefully bend the leaves of the clip toward the bar with a thin instrument
  - Reseat the denture to confirm increased retention
  - Re-check occlusion
Stud Attachments

- Treatment is similar to clips
  - Tease out “O” ring with an explorer and replace as needed
  - Fractured housing can be treated like a clip replacement
Complications

1. OD loss of retention or adjustments - 30%
2. Resin acrylic veneer fracture of FPD - 22%
3. OD relines required - 19%
4. OD clip/attachment fractures 17%
5. Prosthesis screw loosening - 7%
6. Abutment screw loosening - 6%
## Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abutment Screw Loosening (7%)</td>
<td>Inadequate preload forces applied to abutment screw with inadequate torque force</td>
<td>Confirm proper use of torque driver, new abutment screw insert for each case, repeat torque tightening 2x with torque driver to 35N cm. If cemented crown, consider drilling access screw hole and convert to screw retained instead of fabrication of new crown.</td>
</tr>
</tbody>
</table>
Problems with Screw Loosening

1. Improper use of torque driver leading to inadequate “preload” force application
2. Stripped screw driver or screw head
3. Use of lab screws vs. definitive screws
4. Material and surface used for fabrication of screws
5. Design of screws
6. Occlusal overload
7. Combination of any or all of the above
# Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjacent natural tooth drifting and opens contacts</td>
<td>Viscoelastic nature of PDL with adjacent rigid fixation of dental implant</td>
<td>Confirm implant protected occlusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Modification of adjacent occlusion to natural dentitions to prevent distal or mesial shifting of forces when partial edentulous space is present</td>
</tr>
</tbody>
</table>
## Implant Prosthetic Complications

<table>
<thead>
<tr>
<th>Complication</th>
<th>Etiology</th>
<th>Solution</th>
</tr>
</thead>
</table>
| Improper implant placement of implants to support desired prosthetic goals | Improper treatment planning  
     Surgery conducted without prosthetic goals  
     Improper or lack of use of surgical guides | Customized or angulated abutments  
     Screw retained prosthesis with access holes to accommodate off angles  
     Removal of implants and start again |
Complications in Implant Dentistry

- Host/Patient-Related
- Dentist/Surgeon-Related
- Clinical Protocol Related

- Systemic Conditions
- Psychological Status
- Smoking
- Periodontitis

- Treatment Planning
  - Surgical
  - Prosthetic
  - Restorative

- Local Factors
- Grafting
- Maintenance
Local Factor Complications

1. Mesial Distal Implant Spacing
2. Lack of Interocclusal Spacing
3. Peri-Implantitis / Peri-implant Mucositis
4. Immediate Loading Concepts
5. Flapless Surgery
How to Avoid Non-Optimal Implant Placement

- Requires thorough diagnosis and treatment planning
- Mounted working casts and diagnostic tooth arrangement
- Radiographic template & 3D scan
- Surgical template and its use

*If we fail to plan, we plan to fail*
Lack of Interocclusal Spacing
Inadequate interocclusal clearance for implant supported fixed prosthesis
### Treatment Options when Presented with Minimal Interocclusal Distance

1. Increase vertical dimension of occlusion for restorative convenience
2. Extract teeth involved that violated the interocclusal distance and replace accordingly
3. Orthodontic intrusion of opposing teeth involved
4. Coronoplasty, crown preparations, prophylactic endodontic therapy, periodontal crown lengthening options to restore teeth involved
5. Prior to surgical placement of implants, perform alveoloplasty of residual ridge to increase interocclusal distance
6. Prosthetic design: screw retain as opposed to cement retain to implant level
7. Restorative material: metal occlusal as opposed to porcelain fused to metal
• Lack of Inter Occlusal clearance, treatment options prior to implant placement?
Inadequate inter occlusal clearance
Correction with Alveloplasty prior to deep implant placement
Lack of Inter Occlusal Clearance: Treatment Options

• 1) Coronal adjustment of opposing arch or prophylactic endodontic therapy, crown lengthening and crowns to opposing arch.

• 2) Alveloplasty prior to implant placement with deeper surgical implant placement.

• 3) Prosthetically compensate with screw retained and metal occlusal to decrease required restorative clearance.
Peri-Implantitis
Peri-Implant Mucositis
Peri-Implantitis-Definitions

• Defined as an inflammatory process affecting the tissues around an osseointegrated implant in function, resulting in loss of supporting bone.  
  (Albrektsson & Isidor 1994)

• Plaque-induced progressive marginal bone loss observed on radiographs with clinical signs of infection of the peri-implant soft tissues.  
  (Cochrane Database of Systematic Reviews 2006)
Soft Tissue Reactions

- Often seen with split thickness skin grafts or lack of peri-abutment keratinized tissue
- Soft tissue inflammation most commonly due to loose screw joints
  - Remove the offending screw, tighten the abutments and reinsert the prosthesis
- Poor oral hygiene: soft tissue inflammation often referred to “peri-implantitis”. Etiology similar to natural teeth (plaque, lack of attached tissue, etc.) May result in progressive bone loss
- Failing or failed implants
Consequences of Peri-Implantitis

1. May lead to eventual implant loss
2. Soft tissue exudates, abscess, or infection localized to peri-implant locations
3. Guarded prognosis and continuous soft tissue maintenance requirement for peri-implant soft tissues
4. Possible source of irritation and discomfort to patient
Prevalence Rates

- Peri-Implant Mucositis: 8% - 44%
- Peri-Implantitis: 1% - 19%
Table IV. Peri-implant soft tissue complications

<table>
<thead>
<tr>
<th>Condition</th>
<th>Number of implants placed/affected</th>
<th>Mean incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fenestration/dehiscence</td>
<td>3156/223</td>
<td>7%</td>
</tr>
<tr>
<td>Gingival inflammation/proliferation</td>
<td>17,565/1,060</td>
<td>6%</td>
</tr>
<tr>
<td>Fistulas</td>
<td>11,764/117</td>
<td>1%</td>
</tr>
</tbody>
</table>
Early Implant Bone Loss

Early Implant Bone Loss

Possible Aetiologies of Peri-Implantitis

1. Location of Micro-gap
2. Implant thread design
3. Surgical trauma
4. Quality of bone
5. Occlusal forces
6. Bacterial contamination
7. Biologic width consideration
8. Cement trap contamination
9. Combination of any or all of the above
Cement Retained

1. Ideal aesthetics
2. Questionable retrievability
3. Retention require conventional fixed prosthodontic principles of CHS of >7.0 mm
4. Ideal Implant placement to support prosthesis with use of straight or angulated abutments
5. Ideal Occlusion or support over axially loaded ceramics
6. Less requirements for passivity or lab costs
7. Removal of cement subgingival may be compromised
8. Depth of implant level placement should allow ease of cement clean up
Cement Trap with inflammation
Cement Problems

- Subgingival cement left after cementation acting as a foreign body reaction causing pathologic bony and soft tissue reactions.
Removal of cement subgingival may be compromised leading to bone lost.
Screw retained

• 1) Compromised aesthetics.
• 2) Reliable retrievability. (Multiple or full mouth reconstructions.)
• 3) Retention achieved with minimal CHS of < 7.0 mm using screw retention preload principles.
• 4) Accommodate compromised Implant placement to support prosthesis with use of custom or angulated abutments.
• 5) Compromised Occlusion or support over axially loaded compromised integrity ceramics.
• 6) More requirements for passivity or lab costs.
• 7) No cement clean up considerations.
• 8) Deep implant level placements.
• 9) Transitional provisionals with multiple units.
Problems with Screw Loosening

1) Improper use of torque driver leading to inadequate “preload” force application
2) Stripped screw driver or screw head
3) Use of lab screws versus definitive screws
4) Material and surface used for fabrication of screws
5) Design of screws
6) Occlusal overload
7) Combination of any or all of the above
Treatment of peri-implantitis

- Non-surgical therapy
  - mechanical submucosal debridement using hand instruments
  - Sonic/ultrasonic instruments
  - Air polishing
  - locally applied antiseptics
  - Local delivery or systemic administration of antibiotics
  - Lasers
  - host modulation therapy
Non-surgical therapy for the management of peri-implantitis: a systematic review

- Locally delivered antibiotics (minocycline microspheres or doxycycline hyclate) as an adjunct to submucosal debridement may result in greater reduction in BOP scores and PPDs compared with submucosal debridement with adjunctive submucosal irrigation with chlorhexidine digluconate.

- Er:YAG laser treatment may result in greater reduction in BOP scores compared with submucosal debridement with adjunctive submucosal irrigation with chlorhexidine digluconate.

- Submucosal glycine powder air polishing may reduce BOP scores to a greater extent than submucosal irrigation with chlorhexidine digluconate as an adjunct to submucosal debridement with hand instruments and showed no different clinical outcomes compared with Er:YAG laser treatment.

- The available information is insufficient to suggest whether or not any of the assessed non-surgical treatments arrest bone loss in implants with periimplantitis.

Treatment of peri-implantitis

- Surgical therapy
  - open flap debridement
  - open flap debridement with implant surface decontamination
  - bone grafting
  - guided tissue regeneration
  - resective osseous surgery
  - combination regenerative therapy
Surgical therapy for the control of peri-implantitis

- Access flap surgery, removal of granulation tissue and implant surface decontamination has been demonstrated to decrease plaque index, BOP, suppuration, probing depths and to arrest bone loss for 58% of implant sites over 5 years.

- Laser treatment of the exposed implant surface during surgery was not shown to be beneficial.

- Available data indicate that it is possible to obtain defect fill of peri-implantitis defects following surgical-treatment modalities with concomitant placement of bone or bone substitutes in such defects. However, there is lack of evidence that placement of membranes in addition to grafting procedures provides any additional defect fill.

- Surgical therapy for treating peri-implantitis is a predictable method for treating peri-implant disease and patients receiving this therapy have benefited from it in the short term.

Managing Peri-implant bone loss: current understanding

Complications in Implant Dentistry

- Host/Patient Related
- Dentist/Surgeon Related
- Clinical Protocol Related
- Systemic Conditions
- Psychological Status
- Smoking
- Periodontitis

Treatment Planning
- Surgical
- Prosthetic
- Restorative

Local Factors
- Grafting
- Maintenance
Calculus build up can cause areas of soft tissue inflammation
May result in progressive bone loss if left untreated
Remove prosthesis, check implants for mobility, retorque abutments
Perform maintenance cleaning on posthesis and abutments
Reinsert prosthesis with new screws, give oral hygiene instructions
Maintenance and Recall

- Annually
  - Periapical radiographs should be taken to monitor the crestal bone levels. (Crestal bone can be at the level of the first thread in one year with 0.1 mm continued loss to approximately 1.5 mm total bone loss)
  - Remove and reinsert screw retained implant prostheses every 2 years unless indicated otherwise
    - Replace prosthesis with new retaining screws if removed
  - Cemented restorations are usually permanent (nonretrievable)
- Recall focus
  - Occlusion - verify there are no excursive contacts. Should not hold shimstock. Better to be out of occlusion
  - Oral Hygiene - same requirements as for natural teeth
  - Soft Tissue Health - periodontal probing for evidence of disease
  - Screw Joint Torque - check for loosened screws (most common problem)
  - Integrity of attachments - applies to overdenture/overpartials
  - Stability of Implants - must be stable (non-mobile) to be successful
Screw Retained Prosthesis

- Remove prosthetic retention screws
  - Screw access holes are usually sealed with a layer of cotton pellet, silicone plug or gutta percha the acrylic or composite resin
  - Expose the screw by drilling carefully through the resin
  - Remove the screw (slt or hex) with the appropriate screw driver
  - Throat drapes are highly recommended

- Check for implant mobility and retorque abutments to 20 Ncm. (hand tighten as much as possible with finger abutment driver if no torque control device is available)

- Clean and polish abutments (Do not remove)

- Reseat restoration using new gold retaining screws
  - Tighten screws as if doing nuts on the lugs of an automobile - place all screws back with minimal torque. Then work back and forth across the arch until all are tightened to 10 Ncm. (Hand torque with appropriate hand screw driver if no torque controller is available)
Maintenance and Recall

- Screw Retained Prosthesis (cont.)
  - Temporary reinsertion
    - Fill access holes with small cotton pellet and polyvinylsiloxane impression material or putty
  - Long-term reinsertion
    - Fill access hole with small cotton pellet over the head of the screw, followed by warm gutta percha and only 1 mm - 2 mm of acrylic or composite resin
- Cemented Restorations
  - Single unit
    - usually nonretrievable and not removed for maintenance
  - Multiple units (usually not indicated)
    - Carefully tap off with crown remover, check for mobile implants and retorque abutment screws
    - Replace restoration with provisional luting media, and recheck occlusion
Hygiene Aids

- Super-floss
- End tufted brushes
- Proxy brushes
- Tarter control dentrifices
- Mechanical instruments
- Peridex
Super - Floss
- Excellent for all types of implant restorations

Butler Post Care Floss Aid
- Excellent for implant bars and fixed hybrid prostheses.
Fixed Hybrid Prosthesis
- Hygiene care with a proxy brush
Soft Tissue Relationship

- Similar to teeth
- No Sharpeys fibers
- Hemidesmosomal attachments
- Circumferential and perpendicular connective tissue
Patient presents with a maxillary RPD with an implant bar/clip component to the anterior edentulous area.
Butler Floss Aid is used to clean the bar including the area contacting the tissue.
The bar may be removed with the appropriate screw driver, polished and the torque of all the abutments checked prior to replacement.
Prophy paste and a rubber cup on a prophy head / handpiece can be used to polish implant bars when removal is not indicated.
Plastic scalers are appropriate for cleaning around standard abutments supporting implant bar substructures, hybrid prostheses and implant supported splinted restorations.

Plastic scaler tips are also available for metal handle scalers.
Implant supported fixed partial denture

Scaler tips are designed to fit the curvature of the standard abutment.
Complications in Implant Dentistry

Host / Patient Related

Systemic Conditions
Psychological Status
Smoking Periodontitis

Dentist / Surgeon Related

Treatment Planning
Surgical
Prosthetic Restorative

Clinical Protocol Related

Local Factors
Grafting
Maintenance
Complication Management
The Rule of 3 “P’s”
1. Plan
Diagnostic records and careful planning is required on every case. Because not everything is always as it seems. Don’t be fooled and make any assumptions!
Complication Management

1. Plan
2. Prepare
“Prepare. The Time to Win Your Battle is Before it Starts”

Frederick W. Lewis
Forewarned is Forearmed!
1. Do not initiate the surgical phase of implant dentistry until there is a definitive Prosthetic/Restorative treatment plan.

2. Biomechanical treatment planning for adequate number and locations of implants to support final prosthesis. Stress = Force/Area.

3. Management of occlusion specific to implant dentistry and proper diagnosis of parafunctional patients.

Take Home Message
Complication Management

4. Pray
Complication Management

4) Pray
Final Closing Thoughts
Know what day this is?
Cannot afford to wait for ever!
Don’t be a Victim of Peer Pressure, Patient Pressure or old habits!
“A mind once stretched by a new idea, never regains its original dimension”
It’s the most important source of power we’re developing.
EPIC FAIL

you may not see it coming, but you’ll know it the second it happens.
NEVER GIVE UP!
Be Confident
Success.
KNOWLEDGE IS NOT POWER

KNOWLEDGE PUT INTO ACTION IS POWER
“Tell me and I’ll forget. Show me and I may not remember. Involve me and I’ll understand”

Native American Proverb
Dr. Mark Lin

You

Your Team

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