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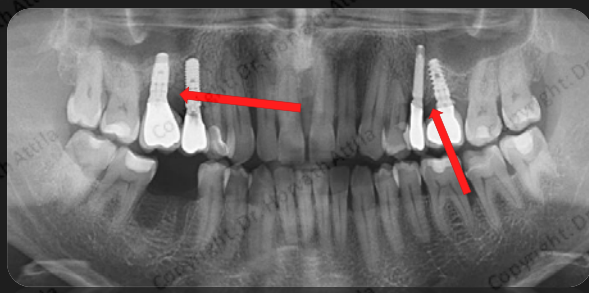
## Is periodontitis a risk factor in implant dentistry?

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## 1ST QUESTION

Is implant success independent of periodontitis?



## Tooth vs. Implant

### Anatomical differences



*Courtesy of Peter Schüpbach, France Lambert & Peter Rakics*

## ANATOMY: DIFFERENCES

Tooth	Implant
<ul style="list-style-type: none"> <li>Neck: 0.60 mm</li> <li>Coronal Epithelium: 0.27 mm</li> <li>Biological width: 2.28 mm</li> <li>Connective tissue: 0.27 mm</li> <li>Microleakage: 0.27 mm</li> </ul>	<ul style="list-style-type: none"> <li>Neck: 0.5-1.0 mm</li> <li>Coronal and subcoronal</li> <li>Biological width: 1.5-2.0 mm</li> <li>Connective tissue: 0.5 mm</li> <li>Microleakage: 1 mm</li> </ul>

**Anchored in the alveolar bone through periodontal ligaments inserting to the cementum.**

**Anchored in the alveolar bone through ankylosis**

**multidirectional connective tissue bundles of the gingiva perpendicular to the root**

**unidirectional connective tissue bundles of the gingiva parallel to the root**

**Vascular supply of the encompassing soft tissue is originated from periodontal ligaments, and the suprapariosteal bunches.**

**Limited vascular supply of the encompassing soft tissue is originated from the suprapariosteal bunches only.**

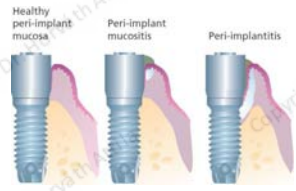
## PERI-IMPLANT PATHOLOGY

Cause:

- Periopathogen bacterial infection
- Comparable to the periodontal pocket (Gram -, anaerobic)
- Therefore the inflammatory diseases are similar to Gingivitis/Periodontitis model

**Periimplant mucositis**  
Reversible inflammation of the soft tissue that surrounds the implant. No bone loss.



**Peri-implantitis**  
Irreversible inflammation of the periimplant mucosa alongside bone resorption



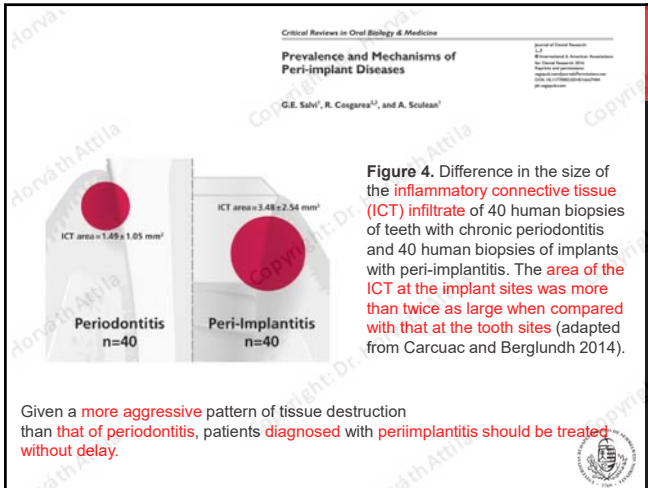
Zitzmann, N. U. & Berglundh, T., 2008. Definition and prevalence of peri-implant diseases. Journal of Clinical Periodontology, 35(s8), p. 286-291.

## DIAGNOSTICS

PERI-IMPLANT MUCOSITIS	PERI-IMPLANTITIS
<ul style="list-style-type: none"> <li>gingival erythema</li> <li>gingival eodema</li> <li>Bleeding on Probing +</li> </ul>	<ul style="list-style-type: none"> <li>gingival erythema</li> <li>gingival eodema</li> <li>Bleeding on Probing +</li> <li>PPD ≥ 5mm</li> <li>Bone loss compared to the baseline/loading (Radiograph)</li> </ul>

Lang NP, Berglundh T. Working Group 4 of Seventh European Workshop on Periodontology Periimplant diseases: how to diagnose? Consensus of the Seventh European Workshop on Periodontology. J Clin Periodontol. 2011 Mar;38 Suppl 11:11-16.



### Is implant success independent of periodontitis?

The **microbiota** between teeth and implants in partially edentulous patients is **similar** (Quirynen & Listgarten 1990, Mombelli et al. 1995, Papaioannou et al. 1996, Gouvoussis et al. 1997)

Initial **colonization of peri-implant pockets** with bacteria associated with periodontitis occurs within **2 weeks** (Quirynen et al. 2005)

Crevices of **periodontally involved teeth** might act as **reservoirs** of bacteria (suspected periodontal pathogens) which can **colonize the implant site** (Koka et al. 1993; Gouvoussis et al. 1997)

**Periodontal pockets** seem to be responsible for the **periimplant infection** as a reservoir of the periopathogen bacteria (Mombelli et al. 1995)

The **periimplant tissues** present with a **compromised defense mechanism** against infections due to their **imperfect blood supply** compared to the natural teeth. (Mombelli et al. 1995)

**Thus the success rate of these implants assumed to be lower compared to the periodontally healthy individuals**



### 2<sup>ND</sup> QUESTION

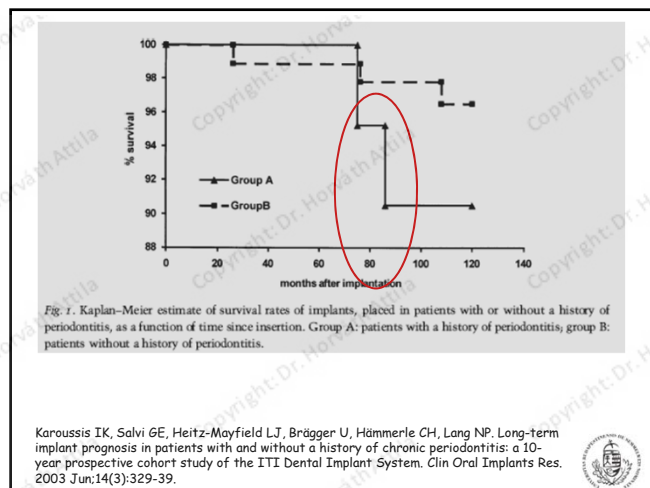
Are the success and survival rates of implants similar between patients with or without periodontal disease in the background?

- ### CRITERIA FOR SUCCESS/SURVIVAL
- survival rate** – implant is still in the mouth
  - failure rate** – implant is explanted
  - success rate** – implant is in function meeting the criteria (Van Steenberghe et al. 1999)
- Ong et al. 2008.
- ❑ Absence of persistent subjective complaints, such as pain, foreign body sensation and/or dysaesthesia (Buser et al. 1990, Albrektsson et al. 1986)
  - ❑ Absence of a recurrent peri-implant infection with suppuration (Buser et al. 1990)
  - ❑ Absence of mobility (Buser et al. 1990, Albrektsson et al. 1986)
  - ❑ Absence of a continuous radiolucency around the implant (Buser et al. 1990, Albrektsson et al. 1986)
  - ❑ Bone loss during the first year of function should not exceed 1.5 mm and after the first year should not exceed 0.2 mm per year\* (Albrektsson et al. 1986)
  - ❑ No PPD > 5mm at implant sites (Mombelli & Lang 1994; Bragger et al. 2001) or presence of BOP at implant sites (Mombelli & Lang 1994)
- Ong CT, Ivanovski S, Needleman IG, Retzepi M, Moles DR, Tonetti MS, Donos N. Systematic review of implant outcomes in treated periodontitis subjects. J Clin Periodontol. 2008 May;35(5):438-62.



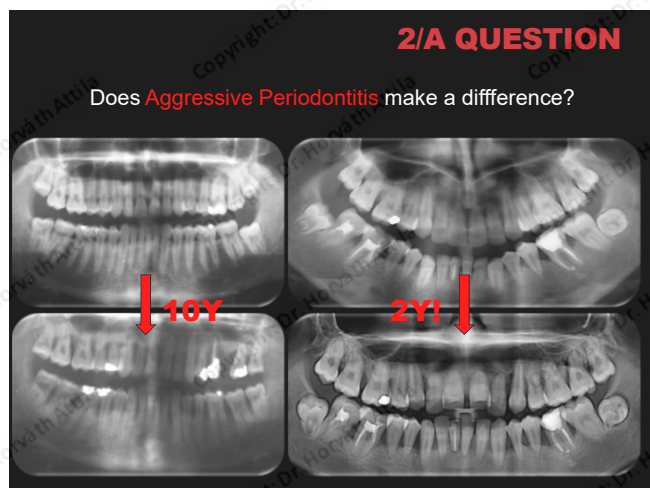
Karoussis et al. 2003 <b>(10Y)</b>	PHP (Periodontally Healthy Patients)	PCP (Periodontally Compromised Patients)
Patients/implants(n)	45/91	8/21
Survival rate(%)	96,5	90,5
Success rate(%) <b>p &lt; 0,025</b>	<b>79,1</b>	<b>52,4</b>

Karoussis IK, Salvi GE, Heitz-Mayfield LJ, Bragger U, Hammerle 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.



Rocuzzo et al. 2010 <b>(10 Y)</b>	PHP (Periodontally Healthy Patients)	mPCP (moderate Periodontally Compromised Patients)	sPCP (severe Periodontally Compromised Patients)
Patients/implants(n)	28/61	37/95	36/90
Survival rate(%)	96,6	92,8	90
Periimplant bone loss >3mm (%)	4,7	11,2	<b>15,1</b>

Rocuzzo M, De Angelis N, Bonino L, Aglietta M. Ten-year results of a three-arm prospective cohort study on implants in periodontally compromised patients. Part 1: implant loss and radiographic bone loss. Clin Oral Implants Res. 2010 May;21(5):490-6.



Mengel et al. 2005 <b>(3 Y)</b>	PHP (Periodontally Healthy Patients)	GCP (Generalized Chronic Periodontitis)	GAgP (Generalized Aggressive Periodontitis)
Patients/implants(n)	12/30	12/43	15/77
Survival rate(%)	100	100	<b>97,5</b>
Success rate(%)			
Maxilla:	100	100	<b>95,7</b>
Mandible:	100	100	<b>100</b>

Mengel R, Flores-de-Jacoby L. Implants in regenerated bone in patients treated for generalized aggressive periodontitis: a prospective longitudinal study. Int J Periodontics Restorative Dent. 2005 Aug;25(4):331-41.

Mengel et al. 2007 <b>(10 Y)</b>	PHP (Periodontally Healthy Patients)	GagP (Generalized Aggressive Periodontitis)
Patients/implants(n)	5/7	5/36
Survival rate(%)	100	<b>88,88</b>
Success rate(%)	100	<b>83,3</b>

**„...Significant more bone loss at the GagP group..”**

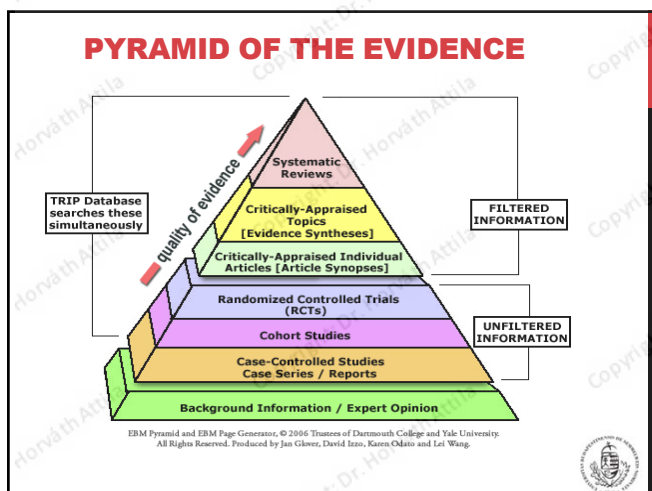
Mengel R, Behle M, Flores-de-Jacoby L. Osseointegrated implants in subjects treated for generalized aggressive periodontitis: 10-year results of a prospective, long-term cohort study. J Periodontol. 2007 Dec;78(12):2229-37.



Swierkot et al. 2012 (3-16 Y)	PHP (Periodontally Healthy Patients)	GagP (Generalized Periodontitis)	Aggressive
Patients(n)	18	35	
Survival rate(%)	100	96	
Success rate(%)	50	33	
Peri-implant mucositis (%)	40	56	
Peri-implantitis(%)	10	26	

**GAgP patients had:**  
 5x greater risk of implant failure  
 3x greater risk of mucositis  
 14x greater risk of peri-implantitis.

Swierkot K, Lottholz P, Flores-de-Jacoby L, Mengel R. Mucositis, peri-implantitis, implant success, and survival of implants in patients with treated generalized aggressive periodontitis: 3- to 16-year results of a prospective long-term cohort study. J Periodontol. 2012 Oct;83(10):1213-25.



**SYSTEMATIC REVIEW**

**A SYSTEMATIC REVIEW OF IMPLANT OUTCOMES IN TREATED PERIODONTITIS PATIENTS**  
 SOUSA V, MARDAS N, FARIAS B, PETRIE A, NEEDLEMAN I, SPRATT D, DONOS N. (CLIN ORAL IMPLANTS RES. 2015 SEP)

Examined parameters in 27 publications:

- implant survival
- success
- peri-implantitis
- bone-level change

**RESULTS:**  
 There is some evidence that patients treated for periodontitis may experience more implant loss and complications around implants than non-periodontitis patients. Evidence is stronger for implant survival than implant success; methodological issues limit the potential to draw robust conclusions.

**SYSTEMATIC REVIEW**

**History of periodontitis as a risk factor for long-term survival of dental implants: a meta-analysis.**  
 WEN X, LIU R, LI G, DENG M, LIU L, ZENG XT, NIE X. (INT J ORAL MAXILLOFAC IMPLANTS. 2014 NOV)

**M&M:**  
 - 6,802 dental implants

**RESULTS:**  
 No significant difference revealed between the periodontally healthy and compromised groups regarding implant survival in a 100-months-period. Within a period of 101-200 months the difference was significant.

**CONCLUSION:**  
 Within the limitations of this meta-analysis, a history of periodontitis is estimated to be a statistical risk factor for the long-term survival of dental implants. This negative effect would be most evident in patients with aggressive periodontitis, severe periodontitis, or after a longer follow-up.

**SYSTEMATIC REVIEW**

**PERIODONTALLY COMPROMISED VS. PERIODONTALLY HEALTHY PATIENTS AND DENTAL IMPLANTS: A SYSTEMATIC REVIEW AND META-ANALYSIS.**  
 CHRCANOVIC BR, ALBREKTSSON T, WENNERBERG A. (J DENT. 2014 DEC)

**M&M:**  
 periodontally compromised patients: 10,927 dental implants (PCP)  
 periodontally healthy patients: 5881 dental implants (PHP)

**PCP vs. PHP:**  
 → implant failure rate (OR): **1.78**  
 → in case of controlled clinical trials (OR): **1.97**  
 → occurrence of postoperative infections (OR): **3.24**

**RESULTS:**  
 There is some evidence that patients treated for periodontitis may experience more implant loss and complications around implants including higher bone loss and peri-implantitis than non-periodontitis patients

**2017 WORLD WORKSHOP  
CONSENSUS REPORT**  
Journal of Clinical Periodontology Volume 45, Issue S20

**PERI-IMPLANTITIS** Frank Schwarz Jan Derks Alberto Monje Hom-Lay Wang

**Conclusions**


- 1) Peri-implantitis is a pathological condition occurring in tissues around dental implants, characterized by inflammation in the peri-implant connective tissue and progressive loss of supporting bone.
- 2) The histopathologic and clinical conditions leading to the conversion from peri-implant mucositis to peri-implantitis are not completely understood.
- 3) The onset of peri-implantitis may occur early during follow-up and the disease progresses in a non-linear and accelerating pattern.
- 4a) Peri-implantitis sites exhibit clinical signs of inflammation and increased probing depths compared to baseline measurements.
- 4b) **At the histologic level, compared to periodontitis sites, peri-implantitis sites often have larger inflammatory lesions.**
- 4c) Surgical entry at peri-implantitis sites often reveals a circumferential pattern of bone loss.
- 5a) **There is strong evidence that there is an increased risk of developing peri-implantitis in patients who have a history of chronic periodontitis, poor plaque control skills, and no regular maintenance care after implant therapy.** Data identifying "smoking" and "diabetes" as potential risk factors/indicators for peri-implantitis are inconclusive.
- 5b) There is some limited evidence linking peri-implantitis to other factors such as: post-restorative presence of submucosal cement, **lack of peri-implant keratinized mucosa** and positioning of implants that make it difficult to perform oral hygiene and maintenance.
- 6) Evidence suggests that progressive crestal bone loss around implants in the absence of clinical signs of soft tissue inflammation is a rare event.



**2<sup>ND</sup> QUESTION**

**Are the success rates for implants similar between patients with or without periodontitis in the background?**

**NOT similar!!**



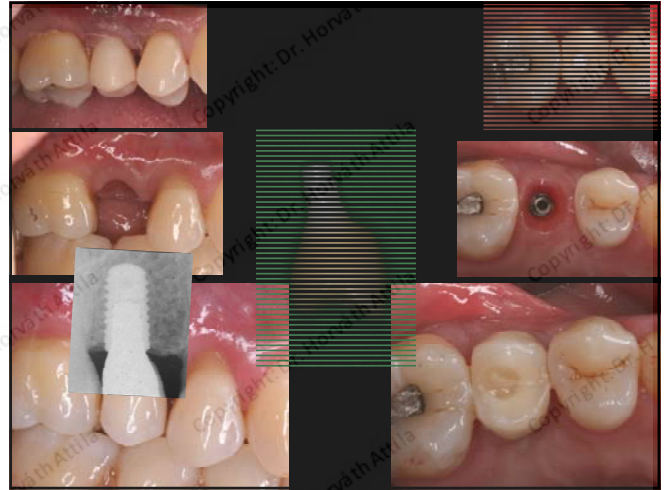
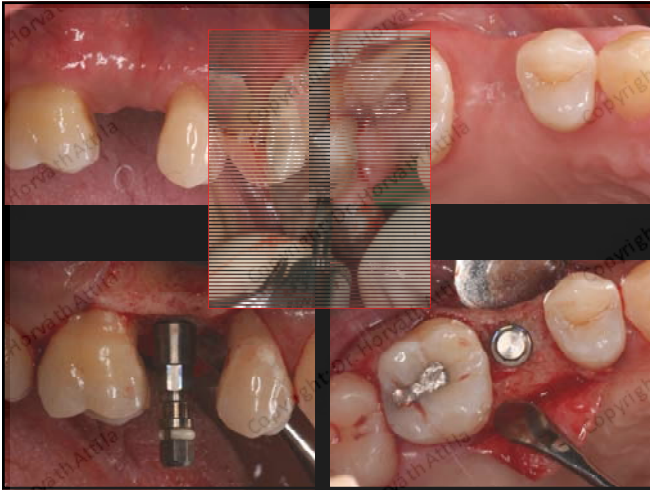

**TOOTH or Implant?**

**DONOS N, LAURELL L and MARDAS N. 2012**  
Hierarchical decisions on teeth vs. implants in the periodontitis-susceptible patient: the modern dilemma.

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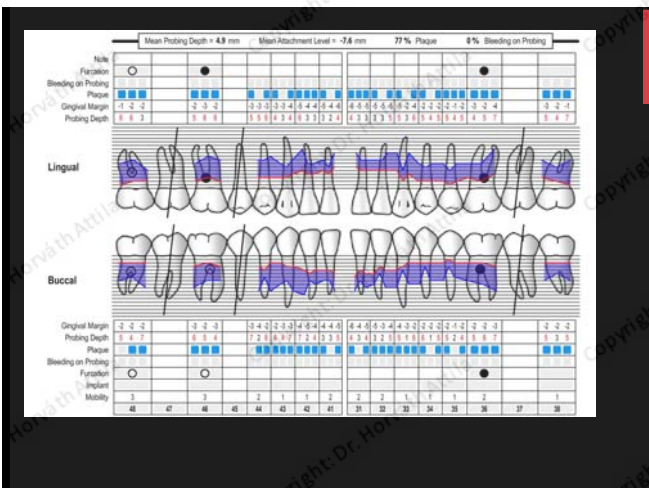
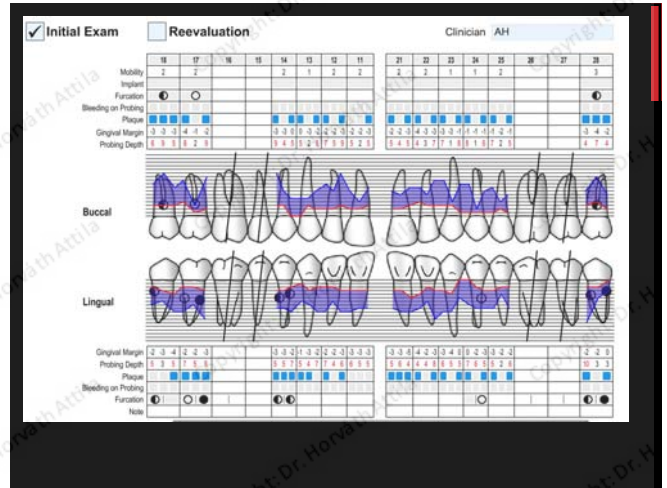
Systemic factors	Local factors
<ul style="list-style-type: none"> <li>• Medically healthy</li> <li>• Patient responded very favorably to periodontal therapy with optimal OH</li> <li>• Low functional and esthetic demands</li> <li>• No cost-related concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Adequate bone quantity and quality</li> <li>• Neighboring teeth periodontally and endodontically stable</li> </ul>
<b>Implant placement is possible</b>	



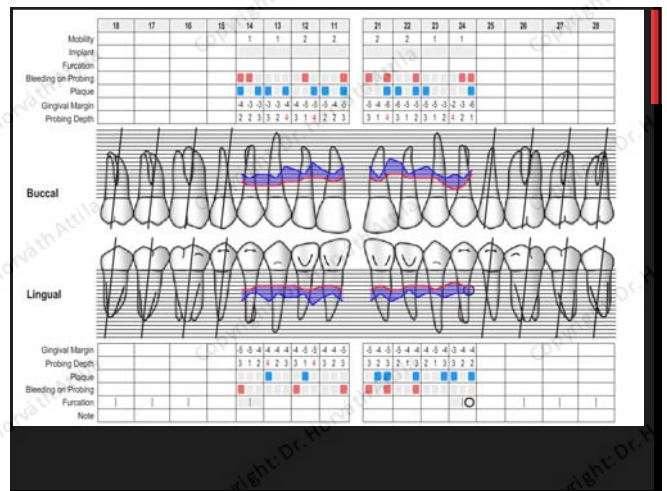
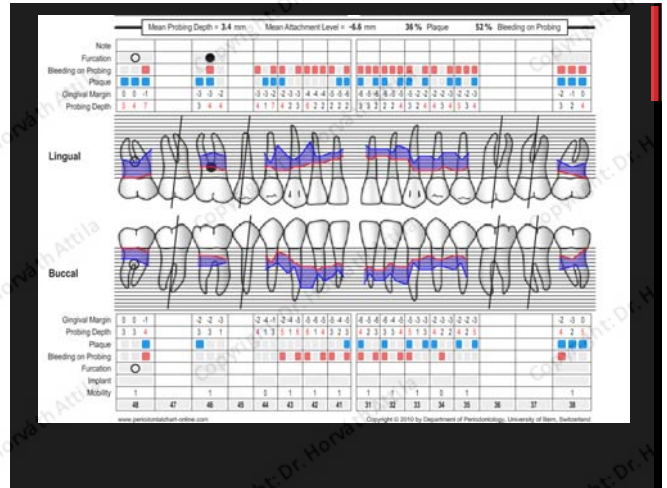
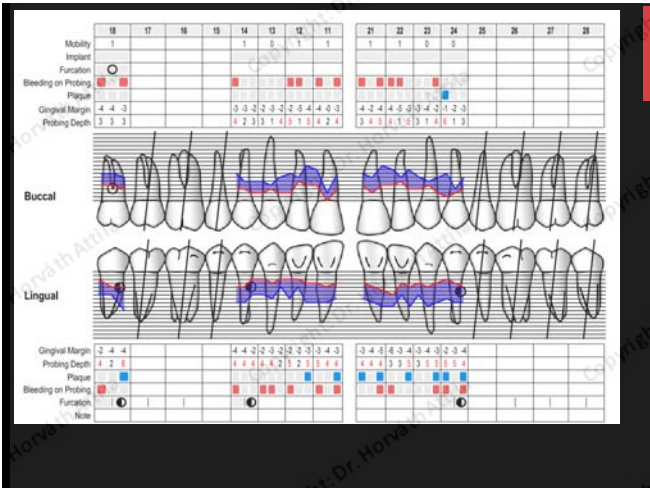


**DONOS N, LAURELL L and MARDAS N. 2012**  
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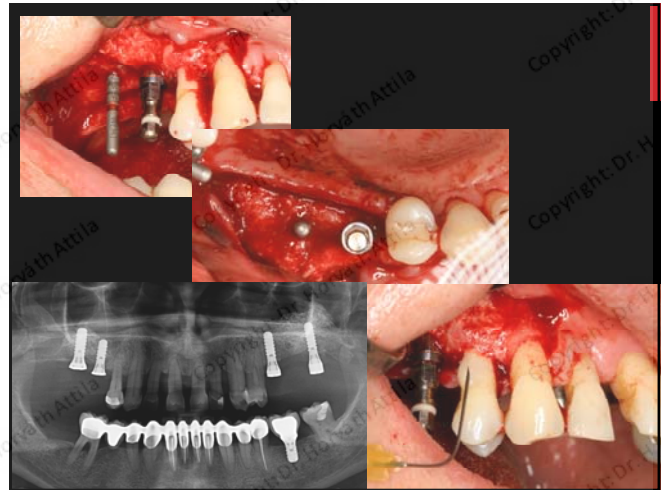
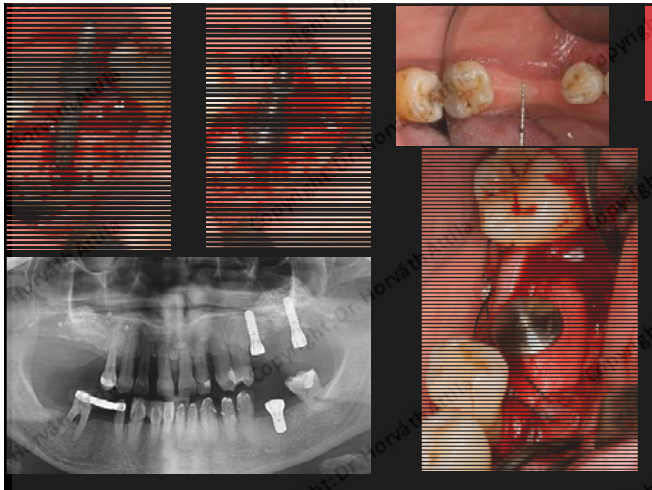
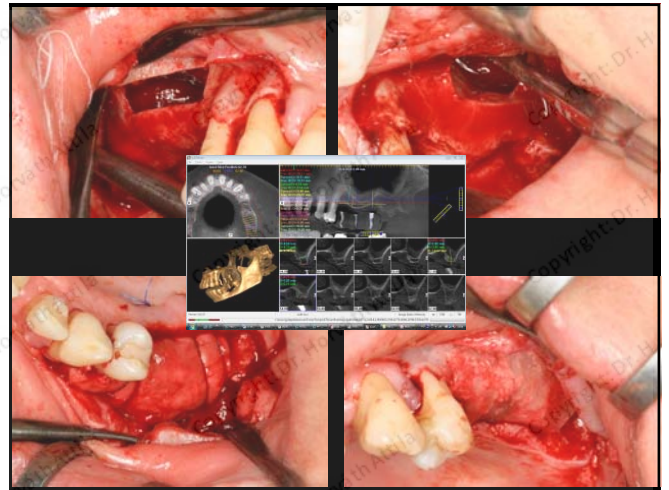
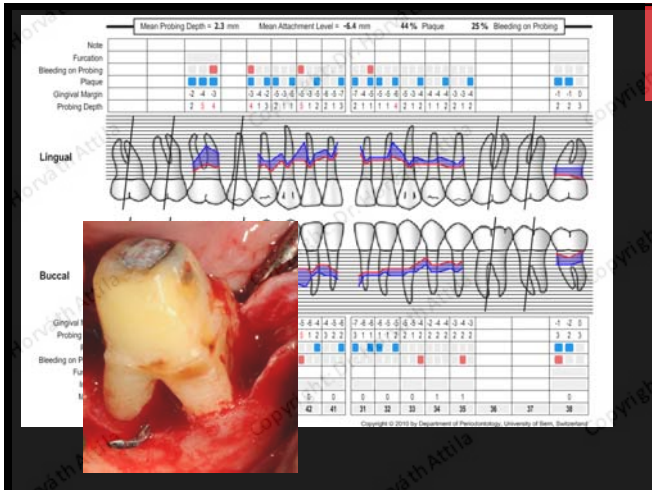
Systemic factors	Local factors
<ul style="list-style-type: none"> <li>• Good response on periodontal treatment, but the patient still presents with a limited number of residual pockets</li> <li>• OH not always optimal</li> <li>• Patient prepared to accept compromised esthetic result</li> <li>• Able to afford a moderate-high cost restorative solution</li> </ul>	<ul style="list-style-type: none"> <li>• Suboptimal local alveolar bone availability not requiring extensive augmentation procedures</li> <li>• Neighboring teeth might require periodontal or endodontal retreatment</li> </ul>
Implant placement should be delayed until periodontal conditions are stable	













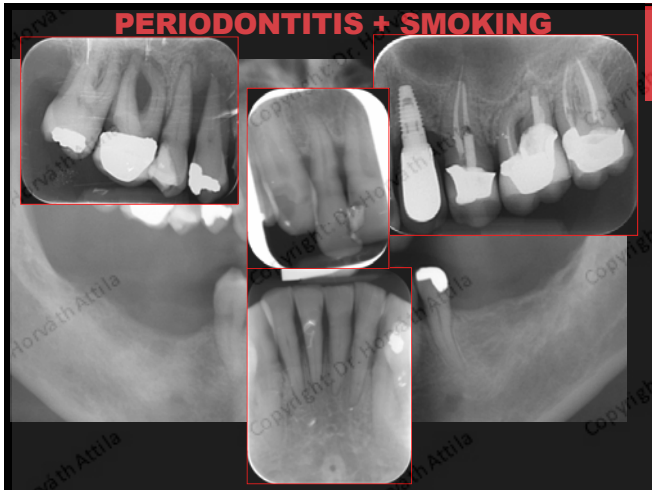
**DONOS N, LAURELL L and MARDAS N. 2012**  
**Hierarchical decisions on teeth vs. implants in the periodontitis-susceptible patient: the modern dilemma.**

Systemic factors	Local factors
<ul style="list-style-type: none"> <li>• Aggressive or refractory periodontitis</li> <li>• High plaque and BOP scores</li> <li>• Heavy smoker</li> <li>• High esthetic demands</li> <li>• High treatment costs</li> </ul>	<ul style="list-style-type: none"> <li>• Extensive hard and soft tissue augmentation needed</li> <li>• Neighboring teeth presenting with residual PPD<math>\geq</math>5 mm and BOP+</li> </ul>

Treatment option other than implant should be sought








**SUMMARY 1**

Donos N, Laurell L, Mardas N (2012)

- ❑ Advanced periodontitis typically affects about **10% of most adult populations**
- ❑ **Poor plaque control and smoking** are well established risk factors for periodontitis, as well as for peri-implant disease.
- ❑ **Treatment of periodontal disease**, even if advanced, can be **successful in arresting disease progression and preventing** (or at least significantly delaying) **tooth loss**.
- ❑ With the increasing development of implant dentistry, traditional **well documented and evidence-based therapies to treat periodontal diseases** may sometimes **not be used to their full potential**.
- ❑ Instead, there appears to be an **increasing tendency to extract** periodontally compromised teeth and **replace them with implants**, as if implants could solve the problem.
- ❑ Unlike for teeth, our **knowledge on implant survival beyond 10 years is limited**.

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## SUMMARY 2

Donos N, Laurell L, Mandas N (2012)

- ❑ However, **peri-implant diseases** are prevalent, affecting between **28% and 56% of people with implants**, and (at the implant level) **12-43% of implants**.
- ❑ A history of **periodontal disease**, **smoking** and **poor oral hygiene** are all risk factors for developing **peri-implantitis**.
- ❑ Unlike periodontitis, there are currently **no predictable means for treating peri-implantitis**, although **resective surgery** seems to be the most effective technique.
- ❑ Consequently, if implant treatment is considered in patients who are susceptible to periodontitis, it should be **preceded by appropriate and adequate periodontal treatment** or re-treatment to control the condition, and should be followed by a stringent **supportive maintenance program to prevent** the development of peri-implant disease.
- ❑ The decision whether or not implant treatment should be performed should be based on an **assessment of the patient's risk profile at the subject level, as well as at the site level**.

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