



# PROSTHETIC PLANNING AND RESTORATIVE PRINCIPLES IN POSTERIOR SITES

**Controversial issues,  
practical guidelines, tips & tricks**

Urs | Belser

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## CONTROVERSIAL ISSUES

- Adequate **number**, distribution, size (**length / diameter**), configuration (**design**) of implants
- **Single units versus splinted** adjacent implants
- **Cantilevers** (mesial *versus* distal; **size**)
- Combination of **teeth and implants** in the same restoration
- **Cemented versus screw-retained**
- Optimal implant shoulder **sink depth**
- Healing times prior to loading (**immediate, early, late**)

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## CONTROVERSIAL ISSUES

- Implant-specific **occlusal concepts**, including occluding restorative materials, non-axial loading (angled abutments), and type of guidance limiting mandibular excursions
- Minimal ratio between **implant length** and suprastructure height
- Significance of « **progressive loading** »
- **Design** of the optimal abutment-to-implant connexion

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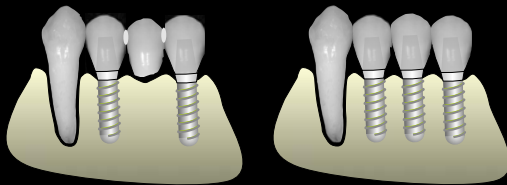
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## CONTROVERSIAL ISSUES

- Adequate number, distribution, size (**length diameter**), and configuration (**design**) of implants



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## PREMOLAR UNITS ?!



*Tissue Level Implants (TLI):*

- > 20 years of clinical documentation
- reach the 1st molar region with a minimum number of implants
- simplicity of clinical procedures and suprastructure design

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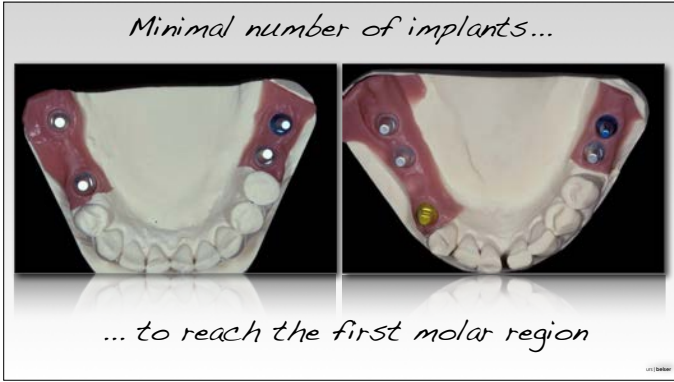
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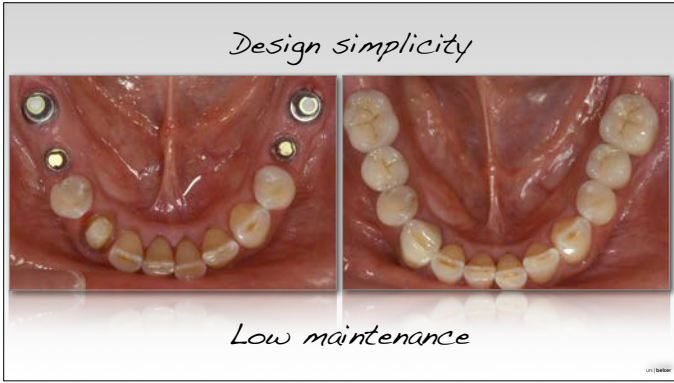
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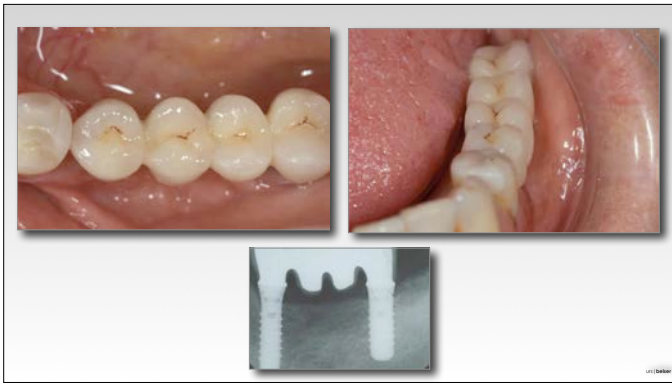
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## CONTROVERSIAL ISSUES

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• **Single units versus splinted** adjacent implants

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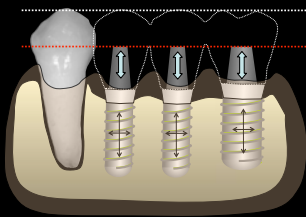
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### Splinting of adjacent implants ?



- Reduced inter-occlusal space?
- Short abutments?
- Reduced- diameter implants?
- Short implants?
- Low density bone?
- Grafted bone?
- Parafunctions, bruxism?
- Protection of implant components?

*Difficulty with adjustment of interproximal contacts?!*

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Grossmann Y, Finger IM & Block MS

### INDICATION FOR SPLINTING IMPLANT RESTORATIONS

*J Oral Maxillofac Surg 63:1642-52, 2005*

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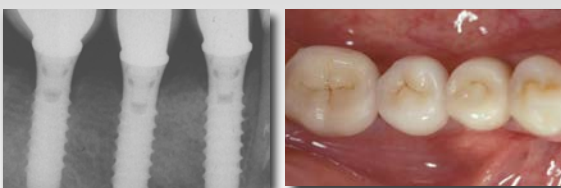
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### Scientific evidence?



*Prosthetic common sense!*

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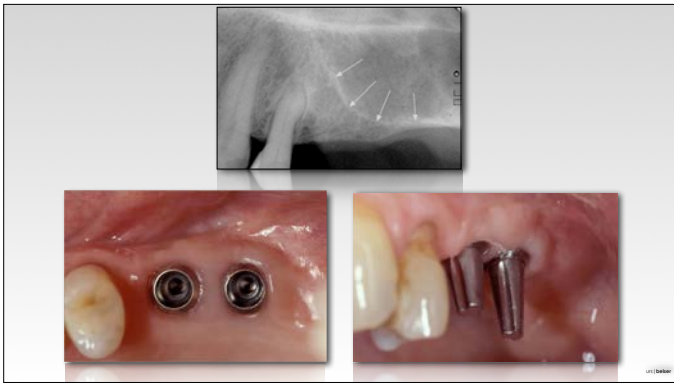
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### CONTROVERSIAL ISSUES

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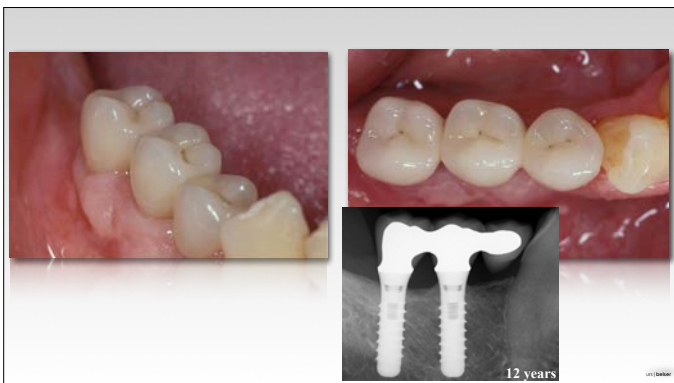
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Romeo E, Lops D, Margutti E, Ghisolfi M Chiapasco M & Vogel G

### IMPLANT-SUPPORTED FIXED CANTILEVER PROSTHESES IN PARTIALLY EDENTULOUS ADULTS

*A seven-year prospective study*

*Clin Oral Impl Res 14: 303-311, 2003*

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#### References

- Hälg GA et al. Bone level changes at implants supporting crowns or fixed partial dentures with or without cantilevers. *Clin Oral Implants Res.* 2008 Oct;19(10):983-90.
- Aglietta M et al. A systematic review of the survival and complication rates of implant supported fixed dental prostheses with cantilever extensions after an observation period of at least 5 years. *Clinical Oral Implants Research* 2009; 20(5):441-51.
- Zurdo J et al. Survival and complication rates of implant-supported fixed partial dentures with cantilevers: a systematic review. *Clin. Oral Impl. Res.* 20 (Suppl. 4), 2009; 59-66.
- Romeo E et al. Implant-supported fixed cantilever prosthesis in partially edentulous jaws: a cohort prospective study. *Clin Oral Implants Res.* 2009; 20(11):1278-85.
- Palmer R et al. A prospective clinical trial of single Astra Tech 4.0 or 5.0 diameter implants used to support two-unit cantilever bridges: results after 3 years *Clin Oral Impl Res.* 2012; 23(1): 35-40.

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#### Cantilevers supported by posterior SINGLE implants



# CAN WE?

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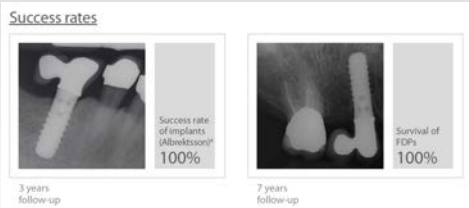
Posterior fixed dental prostheses (FDPs) with cantilever extensions supported by a single implant – a retrospective study following 36 patients (39 FDPs) for up to 14 years.



| Study population   |  |
|--|--|
| Mean age of subjects   | 66.9 years (range: 40 – 89 years)  |
| Gender of subjects   | 26 females, 10 males   |
| Site of cantilever restoration                                   | 30 maxillary & 9 mandibular  |
| Position of cantilever extension(s) relative to implant abutment | 34 distal & 3 mesial extensions. Also, 2 cases of 1 implant supporting 2 cantilevers |
| Mean observation period for restoration                          | 80.5 months (range 7 - 172 months)   |

Schmid B, Gruetter L, Vazquez L, Tabor R, Buser D & Belser UC (in manuscript)

Posterior fixed dental prostheses (FDPs) with cantilever extensions supported by a single implant – a retrospective study following 36 patients (39 FDPs) for up to 14 years.



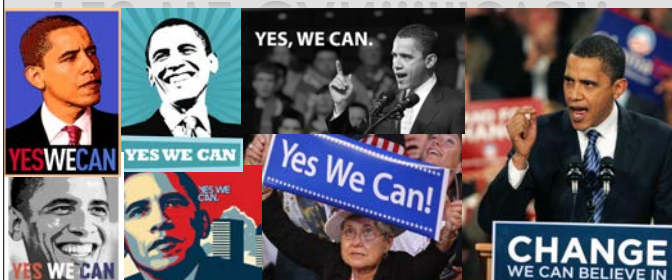
Schmid B, Gruetter L, Vazquez L, Tabor R, Buser D & Belser UC (in manuscript)

## Conclusions

- ✓ Implant-supported cantilever bridges have good long-term survival rates.
- ✓ Short-span cantilever extensions can be predictably used to restore single implants in the posterior region.
- ✓ This treatment option may be used in posterior regions in cases where the placement of further implant units would involve complex procedures, thereby **simplifying treatment** and **reducing patient charges**.

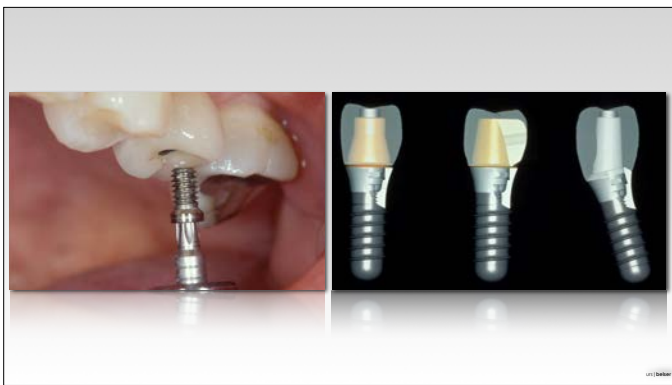
Schmid B, Gruetter L, Vazquez L, Tabor R, Buser D & Belser UC (in manuscript)

## YES WE CAN...tilever!



## CONTROVERSIAL ISSUES

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*The use of polytetrafluoroethylene tape for the management of screw access channels in implant-supported prostheses*

Moráquez OD & Belser UC  
**J Prosthet Dent. 2010;103:189-91**

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PREPARING A PTFE TAPE FOR CLINICAL USE

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## IS THERE EVIDENCE FOR AN IMPLANT-SPECIFIC OCCLUSAL CONCEPT ?

- « light infra-occlusion » in CO
- only « axial » loading
- no or only minimal implant contacts during mandibular excursions:
  - => no canine guidance on implants
  - => event. « minimal » group function

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## IS THERE EVIDENCE FOR AN IMPLANT-SPECIFIC OCCLUSAL CONCEPT ?

### *Types of intraoral forces:*

- high magnitude / short duration
  - => chewing
- low magnitude / long duration
  - => orthodontic appliances
- **high magnitude / long duration**
  - => **bruxism / non-passive fit**

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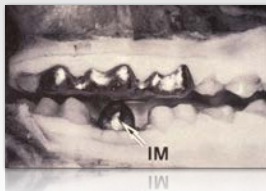
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Ogiso M, Tabata T, Kuo PT & Borgese D

## A histological comparison of the functional loading capacity of an occluded dense apatite implant and the natural dentition



J Prosthet Dent 71: 581-588, 1994

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- vertical occlusal overload
- 6 monkeys / 12 implants (1-3 months)

*... no loss of osseointegration, but gradual intrusion of the opposing natural dentition ...*

J Prosthet Dent 71: 581-588, 1994

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Richter E

## In vivo vertical forces on implants

*« ... equivalent load levels of implants and natural teeth lead to the conclusion that shock-absorbing elements in implants may not be necessary ... »*

Int J Oral Maxillofac Impl 10: 99-108, 1995

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Celletti R, Pameijer CH, Bracchetti C, Donath K,  
Persichetti G & Visani I

Histologic evaluation of  
osseointegrated implants  
restored in nonaxial functional  
occlusion with preangled  
abutments

*Int J Periodontics Restor Dent* 15: 563-573, 1995

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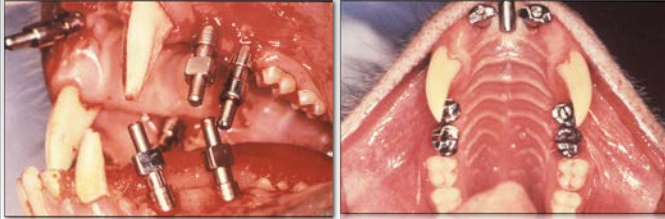
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*Int J Periodontics Restor Dent* 15: 563-573, 1995

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*Int J Periodontics Restor Dent* 15: 563-573, 1995

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- nonaxial functional occlusal loading
- 2 monkeys / 19 implants (1 year)

*... no loss of osseointegration,  
but mechanical failures of components,  
such as gold screws ...*

*Int J Periodontics Restor Dent* 15: 563-573, 1995

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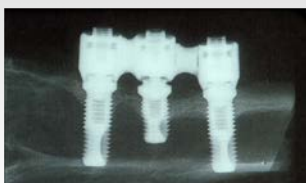
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Jemt T & Lekholm U

Measurements of bone and framework  
deformations induced by misfit of  
implant superstructures



*Clin Oral Impl Res* 9: 272-280, 1998

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- 3-D photogrammetric technique
- component/bone flexure measurem.



*... deformation may be important for the initial bone remodelling seen during the first year ...*

Clin Oral Impl Res 9: 272-280, 1998

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Currently, there is **no** evidence for the need of an implant-specific occlusal concept

As a general rule, occlusal considerations for dental implants should **not differ** from those advocated for natural teeth

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### CONTROVERSIAL ISSUES

- Implant-specific **occlusal concepts**, including occluding restorative materials, non-axial loading (angled abutments), and type of guidance during mandibular excursions ?
- Minimal ratio between implant length and suprastructure height ?

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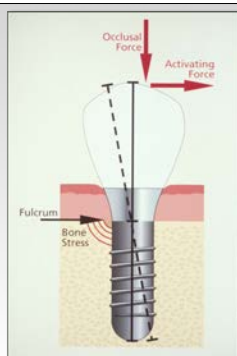
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Effect of crown-to-implant ratio on crestal bone loss ?




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*Blanes R, Bernard JP, Blanes Z & Belser UC*

**A 10-YEAR PROSPECTIVE STUDY OF ITI DENTAL IMPLANTS PLACED IN THE POSTERIOR REGION**

I: CLINICAL AND RADIOGRAPHIC RESULTS

II: INFLUENCE OF THE CROWN-TO-IMPLANT RATIO AND DIFFERENT PROSTHETIC TREATMENT MODALITIES ON CRESTAL BONE LOSS

*Clin Oral Impl Res 18: 699-706, 2007*  
*Clin Oral Impl Res 18: 707-714, 2007*

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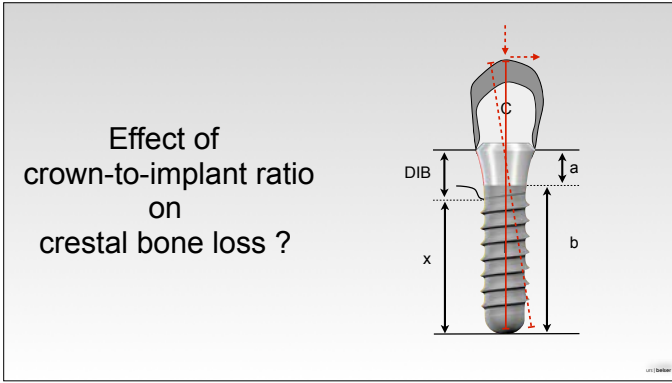
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- 90 patients / 219 posterior implants
  - > 5 years in function
  - 3 groups (C<I; C=I; C>I)
  - Bone level measurements (Rx)
  - Albrektsson's criteria for success
- Blanes R, Bernard JP, Blanes Z & Belser UC*  
*Clin Oral Impl Res 2007*

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« ... the analysis of the data shows that the mean difference of marginal bone loss between the first year and the following 5 years was **not statistically significant** among the three groups ... »

Blanes R, Bernard JP, Blanes Z & Belser UC  
Clin Oral Impl Res 2007

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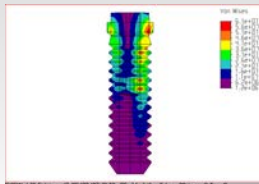
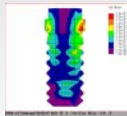
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Renouard F & Nisand D  
Impact of implant length and diameter on survival rates



Clin Oral Impl Res 17 (Suppl 2): 35-51, 2006

© 2006 Blackwell

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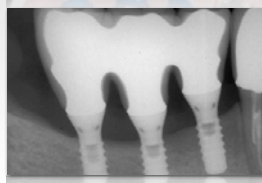
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20 years



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Does the type of implant supported restoration affect outcomes in the partially edentulous patient ?

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

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Implant survival/success & prosthesis survival/success

- Abutment type
- Retention type (cemented vs. screw-retained)
- Support type (implant-tooth combined support vs. implant support; single vs. multiple implant support)
- Restorative material

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

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Implant survival/success & prosthesis survival/success

*Overall, the restoration type seems to have little impact on implant survival or success in the partially edentulous indication*

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

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Implant survival/success & prosthesis survival/success

*Screw-retained and cemented restorations performed equally well in regards to implant success and survival*

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

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Implant survival/success & prosthesis survival/success

*Prosthetic success was better for cemented restorations (93%) in comparison to screw-retained restorations (83%).*

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

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Implant survival/success & prosthesis survival/success

*There appeared to be a trend towards lower prosthesis success rates with single implant restorations.*

AO Consensus Conference, Chicago August 2006  
Int J Oral Maxillofac Impl 2007

© 2006

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Complications in traditional fixed prosthodontics

Covering the dental literature of the past 50 years

...5-yr porcelain veneering fractures: **2.5%**

Goodacre CJ et al.  
Clinical complications in fixed prosthodontics  
J Prosthet Dent. 2003; 90(5): 31-41. Review

© 2006

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5 year data

Metal-ceramic **implant-supported** fixed dental prosthesis fracture rate **8.8%**

Metal-ceramic **implant-supported** single crown fracture rate **3.5%**

Mean **6.2%**

Pjetursson BE, et al.  
Comparison of survival and complication rates of tooth-supported fixed dental prostheses (FDPs) and implant-supported FDPs and single crowns (SCs).  
Clin Oral Impl Res 2007; 18 (Suppl. 3), 97-113

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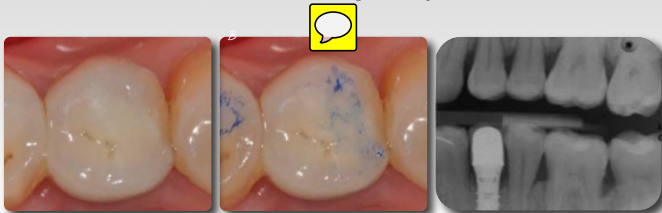
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Occlusal contacts on *marginal ridges* and *shearing cusps*?



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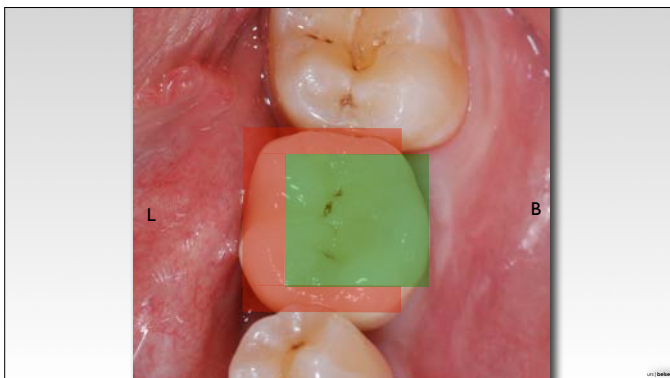
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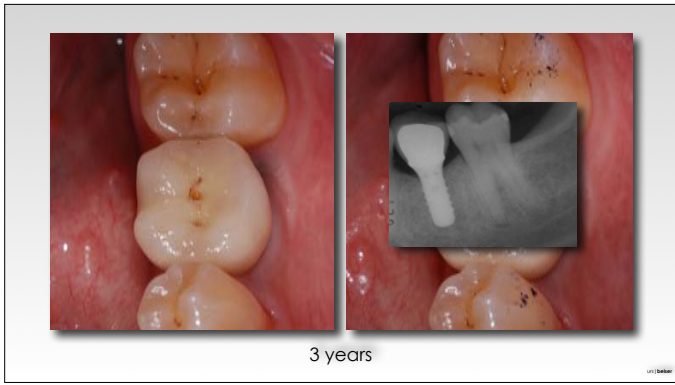
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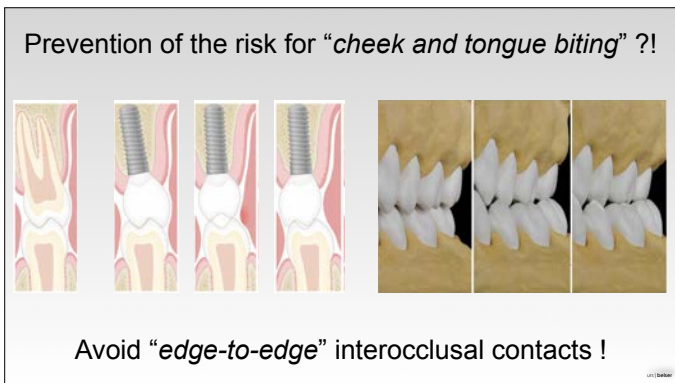
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