117

Bone resorption around self-tapping implants in bone-class I and II

R. Mericske-Stern, N. Enkling, W. Schilli, S. Jepsen, S. Bayer, P. Jöhren

Department of Prosthodontics, University of Bern, Switzerland

Topic: Implant therapy outcomes, surgical aspects

Study protocol was reviewed and approved by the Clinical Trials Committee of the University of Witten/Herdecke, Witten, Germany.

Abstract

Background: Cortical stress is assumed to enhance peri-implant bone resorption. SICace is a cylindrical, bone level, titanium implant with a medium rough surface up to the shoulder and an internal hex abutment connection with platform switching. The implant has a self-tapping thread design leading to controlled bone compression adapted to cortical bone quality (depending on the insertion protocol).
Aim: The aim was to measure crestal bone level changes and to evaluate the clinical performance of SICace implants inserted in bone class I-II supporting single crowns.
Material and Methods:
26 patients received a total of 96 SICace implants (length 9.5mm, diameter 4mm and 5mm) that were placed in healed bone in the posterior mandible with flap procedure. After a submerged 3-months healing period, the reentry surgery was performed and the prosthetic treatment started. 4 months after implant placement, the crowns were delivered, and the patients had to follow a strict monitoring protocol with 7 follow-up visits. Biological and technical complications were registered and radiographs taken at five time-points. 3 calibrated investigators measured radiographically crestal bone level changes with the baseline time 0 = implant surgery. The hypothesis was that due to the implant design the mean crestal bone loss would be significantly reduced after 25 months, i.e. less than 1.5mm, which is considered an accepted success criterion (Albrektsson & Isidor 1994).
Results:
After the healing period, all implants were clinically stable and during the follow-up period no implant failure or drop out were registered. Minimal bone loss of -0.56mm (CI 95% -0.69 ; -0.42) was observed from the time point of surgery to the delivery of the crown. During the following 21 months after loading, the additional bone loss was in average -0.08mm (CI 95% -0.20; 0.04). Good oral hygiene was observed with a full-mouth plaque index of 0.52 (CI 95% 0.46; 0.58) and a full-mouth bleeding index of 0.37 (CI 95% 0.32; 0.42). No significant changes in probing depth measurements around the implants were observed: mean probing depth 2.39 mm (CI 95% 2.34; 2.44). Technical complications did not occur, but 2 crowns exhibited minimal chipping of the ceramic veneering.
Conclusion: The treatment outcome with SICace implants was excellent with regard to biological and technical parameters. Two years after implant placement, the mean crestal bone loss was significantly smaller than claimed by the common implant success criteria.

Background and Aim

Self tapping implants and implants inserted in bone of high density show a high primary stability. However, a high insertion torque of implants in high density bone may cause cortical stress leading to a local necrosis in the bone and increased marginal bone resorption.

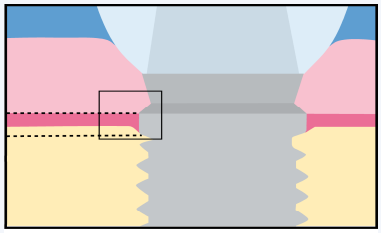
A bone-quality adapted drilling protocol for self-tapping implants was evaluated and crestal bone changes assessed. Additionally biological and technical problems were recorded.

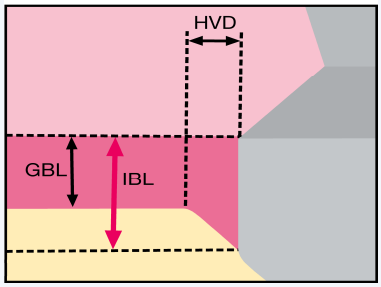
Fig. right:
Standardized radiographs at 5 time-points: implant regio 46

Methods and Materials

Fig.Top: Patient with the customized X-ray bite-splint

Fig. Left: SICace Implant, SIC invent AG, Basel,CH





Study design: single-blinded, controlled clinical trial. **26 patients:** 2 up 7 SICace implants of 9.5mm length and 4 or 5 mm diameter placed in the posterior mandible. **Total:** 96 implants.
Specific drilling protocol: according to the bone quality as prescribed by the manufacturer.
Standardized digital radiographs: at time-point 0, 3, 4, 12, and 25 months after implant insertion
Measurements: crestal bone level changes was assessed (Dimaxis Software 4.3.1, Planmeca, Helsinki,Finland) at measial and distal sites

Hypothesis:
IBL changes after 25 months is less than 1.1mm, i.e. clinically significantly less (0.4mm, Astrand et al. 1999) than success criterion (1.5mm, Albrektsson & Isidor 1994).

Measurements:
IBL: Vertical implant bone level
GBL: General horizontal bone level
HVD: Horizontal distance of angular defect
VVD = IBL-GBL: Vertical distance of angular defect

Fig. left: Mean bone level alterations after two years
The red area demonstrates the bone level alteration since baseline (implant insertion operation).

Results

	Mean	SD	95% CI
IBL	-0.64	±0.65	-0.77; -0.51
GBL	-0.26	±0.73	-0.41; -0.10
HVD	-0.30	±0.42	-0.22; -0.39

Sucess rate: 100%.
Minimal bone loss: during healing period.
Study-hypothesis accepted (p<0.001, post-hoc power 99,4%). Good oral hygiene.
No biological and no technical complications.

Table left:
Mean bone level changes (mm) at 25 months after surgery

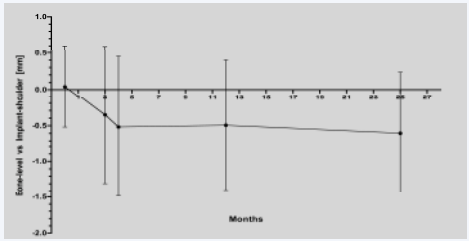


Fig. left:
Means ± SD of the vertical implant bone level (IBL).
A negative value at the Y-axis indicates that the most coronal bone-to-implant contact was more apical than the implant shoulder, and vice versa.
After the healing period during functional loading (month 4 until month 25) there was only a mean bone level alteration of -0.04mm per year.

References

1. Albrektsson T & Isidor F, Consensus report of session IV. In: Lang, N. P. & Karring, T., eds. *Proceedings of 1st european workshop on periodontology. Quintessence Publishing Co. (1994)*
2. Hitchon PW et al., Faktors affecting pullout stength of self drilling and self tapping anterior cervical screws, *Spine (2003)*
3. Manz MC, Factors associated with radiographic vertical bone loss around implants placed in a clinical study. *Annals of Periodontology (2000)*
4. Widmark G et al., MK III: a third generation of the self-tapping Branemark System implant. A 1-year prospective four-center study. *Clin Oral Implants Res (2003)*
5. Batulla S et al., The effect of pilot hole size in the insertion torque and pullout strength of self-tapping cortical bone screws in osteoporotic bone. *J Trauma (2008)*
6. Goodacre CJ et al., Clinical complications with implants and implant prostheses. *J Prosthet Dent (2003)*
7. Astrand P et al., Astra tech and branemark system implants: A prospective 5-year comparative study. Results after one year. *Clinical Implant Dentistry and Related Research (1999)*

Conclusions

An insertion of self-tapping implants (SICace, SIC invent AG, Basel, CH) in bone-class I and II is possible, resulting in a 100% success rate with minimal crestal bone level changes 2 years after implant surgery using a bone quality adapted drilling protocol.

Presented at the 19th Annual Scientific Meeting of the European Association of Osseointegration – 6-9 October 2010, Glasgow