

E. Schiegnitz  
R. Noelken  
M. Moergel  
M. Berres  
W. Wagner

## Survival and tissue maintenance of an implant with a sloped configured shoulder in the posterior mandible—a prospective multicenter study

### Authors' affiliations:

E. Schiegnitz, R. Noelken, M. Moergel, W. Wagner, Department of Oral and Maxillofacial Surgery, Plastic Surgery, University Medical Center of the Johannes Gutenberg-University Mainz, Mainz, Germany  
R. Noelken, Private Practice, Lindau/Lake Constance, Lindau, Germany  
M. Berres, Department of Mathematics and Technology, University of Applied Sciences Koblenz, RheinAhrCampus Remagen, Remagen, Germany  
M. Berres, Institute of Medical Biometry, Epidemiology and Informatics, Johannes Gutenberg-University, Remagen, Germany

### Corresponding author:

Dr. Eik Schiegnitz  
Department of Oral and Maxillofacial Surgery, Plastic Surgery, University Medical Center of the Johannes Gutenberg-University, Augustusplatz 2, 55131 Mainz, Germany  
Tel.: 0049-176-20197848  
Fax: 0049-6131-17-6602  
e-mail: eik.schiegnitz@unimedizin-mainz.de

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### Abstract

**Aim:** Clinical studies evaluating the influence of the implant design on the preservation of peri-implant keratinized mucosa are rare. The aim of this prospective multicenter study was to investigate the survival, and soft and hard tissue maintenance of an implant with a sloped shoulder configuration, when placed in the posterior mandible.

**Material and Methods:** In this study, 24 centers participated and 184 patients receiving 238 implants (OsseoSpeed™ Profile TX implants) were included. Clinical assessments of soft tissue parameters were performed before implant placement, immediately after implant placement, at prosthetic delivery and at 6, 12 and 24 months after implant placement and marginal bone adaptation was examined.

**Results:** After an average time *in situ* of  $28.7 \pm 4.7$  months ( $2.4 \pm 0.4$  years), the survival rate was 99.2%. Analysis of the peri-implant soft tissues during follow-up showed a slight but significant increase in peri-implant keratinized mucosa width after 2 years ( $P < 0.001$ ). All patients with reduced peri-implant keratinized mucosa width of  $\leq 2$  mm at postoperative examination ( $n = 95$ ) showed a pronounced and statistically significant increase in the peri-implant keratinized mucosa width over time ( $P < 0.001$ ). After a mean follow-up of  $20.7 \pm 8$  months ( $1.7 \pm 0.7$  years), mean inter-proximal marginal bone loss was  $0.30 \pm 0.6$  mm, indicating high bone stability around the sloped implant neck.

**Conclusion:** These results indicate that sloped configured implants have a high survival rate after 2 years in function. The sloped implant shoulder configuration helps to support the hard and soft tissue around the implant neck and supports the regain of a physiological peri-implant keratinized mucosa in patients with compromised peri-implant soft tissue conditions (Clinicaltrials.gov: NCT01400321).

### List of additional study centers (all in Germany):

Tilo Barth (Mannheim), Pascal Black (Germering), Rainer Buch (Ingelheim), Robert-Marie Frey (Heidelberg), Stefan Gau (Euskirchen), Stefan Kanehl (Hamburg), Martin Kestel (Rückersdorf), Wolfram Knöfler (Leipzig), Gerd Körner (Bielefeld), Michael Korsch (Karlsruhe), Christopher Köttgen (Mainz), Christian Küttner (Ingelheim), Michael Loeck (Berlin), Volker Michalczik (Essen), Fabienne Oberhansl (Lindau), Robert Noelken (Lindau), Petra Rauch (Melsungen), Udo Schwarzott (Berlin), Marcus Riedl (Stein), Helmut Steveling (Gernsbach), Enrico Trilck (Berlin), Heiko Visser (Oldenburg) and Jörg-Ulf Wiegner (Saalfeld).

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Adequate alveolar bone volume and favorable morphology of the alveolar ridge are both fundamental to achieve optimal, functional and esthetic rehabilitation after dental implant placement. Prior to tooth extraction, alveolar bone loss may develop as a result of trauma, periapical pathology or periodontal disease. After tooth extraction, atrophy of the periodontium with the complete remodeling of the attachment apparatus including cementum, periodontal ligament fibers and bundle bone occur (Schropp et al. 2003; Araujo & Lindhe 2009; Tan et al. 2012). Noticeable regressions of hard and soft tissues have been shown in several studies (Pietrokovski & Massler 1967; Johnson 1969; Camargo et al. 2000; Araujo & Lindhe 2005). These horizontal and vertical tissue alterations

following tooth extraction were more pronounced on the buccal than on the lingual side (Pietrokovski & Massler 1967; Schropp et al. 2003; Araujo & Lindhe 2005). This remodeling process resulted in a discrepancy in bone height of around 2 mm in the pre-molar area between the buccal and lingual aspects of the ridge (Araujo & Lindhe 2005). When inserting a flat-top implant in such a sloped healed ridge, the implant shoulder can be placed either in level with the lingual marginal bone or in level with the buccal marginal bone. The use of the buccal bone as reference for implant placement will result in a subcrestal position of the implant at the lingual aspect with subsequent bone resorption (Carmagnola et al. 1999; Welander et al. 2009). Alternatively, using the lingual bone