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# **SCIENTIFIC HIGHLIGHTS**

SHORT OVERVIEWS ON RECENTLY  
PUBLISHED SCIENTIFIC EVIDENCE.

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*Edited by Dr. Marcin Maj*

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### EDITOR'S CHOICE

Long-Term Clinical, Radiographic and Esthetic Outcomes of Zirconia Dental Implants: A 10-Year Prospective Multicenter Study

(S Roehling et al. 2026)

AND

One-Year Analysis of Clinical and Radiological Outcomes of Two-Piece Zirconia Compared to Titanium Implants: A Multicenter Prospective Randomized Clinical Trial

(Marc Balmeret al., 2026)

Clinical evaluation and bone loss prediction of titanium-zirconium implants: A retrospective study of 1-5-year follow-up

(Zhaoting Ling et al., 2026)

## EDITOR'S CHOICE

*Clin Oral Implants Res. 2026 Jan 22*

### Long-Term Clinical, Radiographic and Esthetic Outcomes of Zirconia Dental Implants: A 10-Year Prospective Multicenter Study

S Roehling, K H Bormann, M M Bornstein, S Laval, F Thieringer, M Gahlert



#### STUDY OBJECTIVES AND METHODS

This study aimed to prospectively investigate the long-term clinical performance of a commercially available one-piece zirconia dental implant system over 10 years. A multicenter, open-label study was conducted at three clinical centers in Germany. Forty-four patients with single-tooth gaps meeting specific inclusion criteria received 44 yttria-stabilized zirconia (Y-TZP) implants featuring a sandblasted and acid-etched (ZLA) surface. Clinical and radiographic follow-ups were performed at 1, 3, 5, and 10 years to assess implant survival, success, peri-implant bone levels, and esthetic outcomes using Pink Esthetic Score (PES) and White Esthetic Score (WES).

#### RESULTS

- At the 10-year follow-up, 35 patients with 35 implants were available for evaluation.
- The estimated 10-year survival rate was 97.7% (95% CI: 97.27-98.13). Three implants (8.6%) showed biological complications, including peri-implant mucositis in 2 implants (5.7%) and peri-implantitis in 1 implant (2.9%), leading to a success rate of 91.4% (95% CI: 76.9-97.8).
- Peri-implant bone loss was moderate, averaging 1.20 ( $\pm$ 0.61) mm over 10 years, with stable bone levels observed after the initial remodeling phase.
- Esthetic outcomes revealed a slight increase in PES (7.4 to 7.8) and a minor decrease in WES (7.0 to 6.7) between years 5 and 10.

#### CONCLUSIONS

Zirconia implants demonstrated high long-term survival and success rates, moderate bone loss, and favorable esthetic outcomes. These findings support their use as a clinically reliable and esthetically acceptable long-term alternative to titanium implants. However, the limited sample size highlights the need for further confirmation in larger cohorts.

Adapted from S Roehling et al., J Prosthet Dent. 2025 May 3:S0022-3913(25)00358-0, for more info about this publication, click [HERE](#)

*Clin Oral Implants Res. 2026 Jan 22*

## One-Year Analysis of Clinical and Radiological Outcomes of Two-Piece Zirconia Compared to Titanium Implants: A Multicenter Prospective Randomized Clinical Trial

Marc Balmer, Michael Payer, Anke Steinwender, Valentin Herber, Ronald E. Jung, Sebastian Kühl



### STUDY OBJECTIVES AND METHODS

The purpose of this study was to evaluate the clinical performance of two-piece zirconia implants with screw-retained abutments compared to titanium implants after 1 year of loading. In this multicenter, prospective, randomized clinical trial, 61 two-piece zirconia and 61 titanium implants were placed and restored with single crowns. Evaluations were performed at implant placement, crown delivery, and 1-year post-loading. Peri-implant Marginal Bone Loss (MBL), survival rate, early wound healing index, and soft tissue parameters were assessed. Intergroup comparisons of continuous outcomes were performed using Linear Mixed-Effects Models accounting for center and potential confounders. Categorical variables were analyzed using the chi-square or Fisher's exact test. Survival was analyzed using Kaplan-Meier estimates. Significance was set at  $p < 0.05$ .

### RESULTS

- No significant differences were found between the two implant types.
- Mean MBL from implantation to crown insertion was  $1.10 \pm 0.78$  mm for titanium and  $0.94 \pm 0.67$  mm for zirconia implants.
- No significant additional bone loss occurred over the subsequent year, with changes of  $0.07 \pm 0.55$  mm and  $0.08 \pm 0.51$  mm for titanium and zirconia, respectively.
- After 1 year, zirconia implants showed a 100% survival rate, while titanium implants showed 96.5% with two failures.
- At 1 year, differences in probing depths, plaque accumulation, and Papilla Bleeding Index were not statistically significant.

### CONCLUSIONS

After 1 year of loading, no statistically significant differences in MBL, implant survival, or peri-implant health were found between zirconia and titanium implants, indicating no clinical superiority. Zirconia implants may therefore be considered a viable alternative in single-tooth implant restorations.

Adapted from M Balmer et al., Clin Oral Implants Res. 2026 Jan 22, for more info about this publication, click [HERE](#)

*Niger J Clin Pract. 2026 Jan 1;29(1):30-42*

## Osteogenic Differentiation on Nonthermal Atmospheric Plasma-Treated versus SLActive® Titanium and Titanium-Zirconium Implants: An In Vitro Comparative Study

*S G Kocaayan, G Pulat, Zby Cevik, S Enhos*

### STUDY OBJECTIVES AND METHODS

The aim of this study was to compare osteogenic differentiation in vitro on NTAP-treated Ti and TiZr SLA® and Ti and TiZr SLActive®. Ti and TiZr SLA® were treated with a plasma source to convert hydrophobic Ti and TiZr SLA® surfaces into hydrophilic state and compared the osteogenic differentiation in vitro with Ti and TiZr SLA and SLActive® surfaces. Contact angle measurements, scanning electron microscopy (SEM), and surface roughness were performed to physical characterization of implants. Then, osteogenic differentiation of hBMSCs on the implants was evaluated for 21 days by calcium assay, alkaline phosphatase assay, DNA content quantification kit, and mRNA expression with Quantitative real-time PCR analysis.

### RESULTS

- NTAP treatment increased the wettability of all SLA implants.
- Ti and TiZr NTAP-treated implants had higher osteoblastic proliferation and differentiation compared with untreated ones.
- SLActive implants showed maximum osteogenic differentiation.
- In terms of material difference, TiZr SLActive discs had higher differentiation compared to SLActive discs.

### CONCLUSIONS

NTAP treatment was found to be effective in increasing wettability. The accelerated osteoblastic difference was seen in NTAP-treated samples compared to SLA samples. Although nonthermal atmospheric plasma (NTAP) treatment effectively improved the hydrophilicity of SLA surfaces and accelerated osteogenic differentiation, the SLActive® surface-particularly TiZr SLActive®-demonstrated the most pronounced effect in promoting osteogenesis in this in vitro study.

Adapted from S G Kocaayan et al., Niger J Clin Pract. 2026 Jan 1;29(1):30-42, for more info about this publication, click [HERE](#)

*Dent J (Basel). 2026 Jan 19;14(1):63*

# The Effect of Age and Use of Enamel Matrix Derivative on Implant Loss

*Stephen K Harrel, Thomas G Wilson Jr, Martha E Nunn, Charles M Cobb*



## STUDY OBJECTIVES AND METHODS

The current study further evaluated the existing database to determine the effect of age and EMD use on long term survival of implants. An existing database from a private periodontal specialty practice was evaluated for the effect of age at the time of implant placement on implant survival. In addition, all available clinical factors were evaluated, including the use of EMD at any point during site preparation or implant placement to determine any effect on implant survival.

## RESULTS

- Patient age at the time of implant placement had a negligible effect on implant survival for younger individuals. However, starting at 58 years of age, an increase in relative risk for implant loss was noted.
- When the patient age was divided into groups, it was determined that patients  $\geq 58$  and  $\leq 68$  years had a statistically significantly increased relative risk of implant loss (2.75), which was sharply reduced if EMD had been used (1.24).
- This trend was also noted to a lesser extent in patients older than 68 years.

## CONCLUSIONS

The risk of implant loss was elevated when implants were placed in older patients. This risk was reduced if EMD had been used at any point during implant site preparation or placement.

Adapted from SK Harrel et al., *Dent J (Basel)*. 2026 Jan 19;14(1):63, for more info about this publication, click [HERE](#)

*Dent J (Basel). 2026 Jan 4;14(1):30*

## Impact of Zirconia and Titanium Implant Surfaces of Different Roughness on Oral Epithelial Cells

*Marco Aaqi Rausch, Zhiwei Tian, Vera Maierhofer, Christian Behm, Christian Ulm, Erwin Jonke, Raphael S Wagner, Benjamin E Pippenger, Bin Shi, Xiaohui Rausch-Fan, Oleh Andrukhov*



### STUDY OBJECTIVES AND METHODS

The current study investigated how titanium and zirconia surfaces with different roughness influence various parameters of oral epithelial cells in vitro. We used the human oral squamous carcinoma Ca9-22 cell line and cultured them on the following surfaces: machined smooth titanium (TiM) and zirconia (ZrM) surfaces, as well as sandblasted and acid-etched titanium moderately rough (SLA) and zirconia (ZLA) surfaces. Cell proliferation/viability was measured by CCK-8 assay, and cell morphology was analyzed by fluorescent microscopy. The gene expression of interleukin (IL)-8, intercellular adhesion molecule (ICAM)-1, E-cadherin, integrin (ITG)- $\alpha$ 6, and ITG- $\beta$ 4 was measured by qPCR, and the content of IL-8 in conditioned media by ELISA.

### RESULTS

- At the initial culture phase, cell proliferation was promoted by rougher surfaces.
- Differences in cell attachment were observed between machined and moderately rough surfaces.
- Machined surfaces were associated with slightly higher IL-8 levels ( $p < 0.05$ ).
- Furthermore, both ZLA and SLA surfaces promoted the expression of (ITG)- $\alpha$ , ITG- $\beta$ 4, and ICAM-1 in Ca9-22 cells ( $p < 0.05$ ).
- Surface material had no impact on the investigated parameters.

### CONCLUSIONS

Under the limitations of this in vitro study, some properties of oral epithelial cells, particularly the immunological and barrier function, are moderately modified by roughness but not by material. Hence, the roughness of the implant surface might play a role in the quality of the peri-implant epithelium.

Adapted from M Aaqi Rausch et al., *Dent J (Basel)*. 2026 Jan 4;14(1):30, for more info about this publication, click [HERE](#)

*Int J Periodontics Restorative Dent. 2026 Jan 15;46(1):88-101*

## Impact of Two Implant-Abutment Connection Types on Crestal Bone Stability: A 3-Year Comparative Split-Mouth Clinical Trial

*Behnam Shakibaie, Paolo Nava, Javier Calatrava, Markus B Blatz, Katalin Nagy, Hamoun Sabri*

### STUDY OBJECTIVES AND METHODS

The current study investigated the comparative effectiveness of platform-switching (PS) vs traditional butt-joint or platform-matching (PM) implant-abutment connections on peri-implant crestal bone stability. Utilizing a split-mouth design, 10 systemically healthy patients (n = 20 implants) had adjacent nonrestorable maxillary anterior teeth replaced with two different implants (butt-joint connections and PS interfaces). Patients underwent alveolar ridge preservation, followed by implant placement: PM implants were inserted at the crestal bone level, and PS implants were placed 1 mm subcrestally. Customized zirconia crowns were then fabricated for both systems. Outcome measures included bleeding on probing (BOP), probing pocket depth (PPD), and marginal bone loss (MBL), which were evaluated through standardized periapical radiographs over a 3-year timeframe.

### RESULTS

- Results showed significantly higher ( $P < .01$ ) initial MBL in the PM group ( $0.86 \pm 0.13$  mm) compared to the PS group ( $0.34 \pm 0.29$  mm).
- Moreover, at the 3-year follow-up, the crestal bone levels remained above the implant shoulder until the third year of the study for the PS subcrestal group ( $-0.15 \pm 0.39$  mm) and slightly below the implant platform in the PM crestal group ( $0.55 \pm 0.19$ ).
- After 3 years, the PS group also exhibited lower mean BOP percentages (12%) than the butt-joint group (17%).

### CONCLUSIONS

This study suggests that subcrestal placement with PS and internal connections can provide better long-term peri-implant bone preservation, thereby potentially improving implant success and esthetic outcomes in the anterior maxilla.

Adapted from B Shakibaie et al., *Int J Periodontics Restorative Dent. 2026 Jan 15;46(1):88-101*, for more info about this publication, click [HERE](#)

*Case Rep Dent. 2025 Dec 12:2025:9947626.*

# Full-Arch Implant Rehabilitation Integrating Mandibular Movement Records Using Complete Digital Workflows: A Case Report

*Khanh Long Nguyen, Quang Khanh Chu, Duc Tien Doan, Thanh Tung Nguyen*



## STUDY OBJECTIVES AND METHODS

This report presents the rehabilitation of a 69-year-old male with terminal dentition using a complete digital approach. Six maxillary and five mandibular implants were placed with a stackable surgical guide. CBCT, intraoral and facial scans, Exocad planning, and the PIC system were combined to ensure precise implant positioning. Mandibular kinematic records from the Zebris JMA Optic system guided occlusal adjustment in both provisional and definitive prostheses.

## RESULTS

- The zirconia-based restoration provided stable function, good esthetics, and high patient satisfaction, with no complications during follow-up.

## CONCLUSIONS

This case illustrates how incorporating mandibular movement records into a digital workflow can enhance the predictability and clinical outcomes of full-arch rehabilitation.

Adapted from KL Nguyen et al., *Case Rep Dent. 2025 Dec 12:2025:9947626.*, for more info about this publication, click [HERE](#)

*J Dent. 2026 Mar;166:106516.*

## Clinical evaluation and bone loss prediction of titanium-zirconium implants: A retrospective study of 1-5-year follow-up

*Zhaoting Ling, Cong Chen, Siyuan Wang, Yun Zhu, Xiaoting Shen, Kefang Sun, Hongye Lu, Fuming He*

### STUDY OBJECTIVES AND METHODS

The aim of this study was to evaluate the clinical and radiographic outcomes of titanium-zirconium implants, identify risk factors and develop predictive models for bone loss progression. Patients with titanium-zirconium implants were screened for inclusion and underwent follow-ups. Cumulative survival rates at the implant and patient levels were calculated using life tables. Clinical and radiographic data were retrospectively analyzed for implant/restoration success rates and peri-implant marginal bone loss. Factors influencing marginal bone loss were examined using generalized estimating equations (GEE). Support vector machine (SVM), artificial neural network (ANN), logistic regression (LR), and random forest (RF) were used to develop the prediction models of bone loss.

### RESULTS

- 573 titanium-zirconium implants from 399 patients were included, with an average observation time of  $27.6 \pm 11.5$  months (12-63 months).
- The cumulative 5-year survival rate was 99.1% at the implant level, and 98.8% at the patient level.
- The mean probing depth was  $3.1 \pm 1.2$  mm, with 23.6% incidence of bleeding on probing.
- The mean marginal bone loss was 0.37-0.52 mm. GEE analysis showed that marginal bone loss was significantly influenced by follow-up time, advanced age, narrow-diameter implant, location, and fixed partial denture. LR and ANN models demonstrated optimal predictive performance, both with 93.5% accuracy.
- Baseline marginal bone level emerged as the most significant predictor, with an importance score of 41.3.

### CONCLUSIONS

The 1-5-year outcomes revealed that titanium-zirconium implants achieved high survival and success rates, with limited marginal bone loss. The prediction model demonstrated 93.5% accuracy, identifying baseline marginal bone level as the primary determinant of bone loss progression.

Adapted from Z Ling et al., *J Dent. 2026 Mar;166:106516.*, for more info about this publication, click [HERE](#)

*Med Oral Patol Oral Cir Bucal. 2026 Jan 24:27841*

## Scientific evaluation of design and surface advances in Straumann implants

*P Cea-Arestín*



### STUDY OBJECTIVES AND METHODS

The aim of this study was to evaluate the performance of recent Straumann® implants-specifically comparing Bone Level Tapered (BLT) and Bone Level Conical (BLC) designs-in relation to peri-implant bone resorption and immediate loading protocols. A total of 84 BLT implants and 84 BLC implants were placed in 78 patients between 2023 and 2025 across several clinics in Spain. Radiographic and periodontal probe measurements were performed to assess crestal bone level changes at one year post-placement. This retrospective cohort study focused on primary outcomes including 1-year survival rates and the evaluation of marginal bone loss (MBL).

### RESULTS

- The most significant result was the 98.8% success rate observed for BLC implants

### CONCLUSIONS

While both Straumann® tapered implants represent excellent treatment options, BLC implants demonstrated superior improvements across all evaluated parameters. Future research should focus on identifying areas for further enhancement and comparing their performance with other leading implant systems.

Adapted from P Cea-Arestín et al., *Med Oral Patol Oral Cir Bucal. 2026 Jan 24:27841*, for more info about this publication, click [HERE](#)

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