



Straumann Scientific Highlights

SHORT OVERVIEWS ON RECENTLY PUBLISHED SCIENTIFIC EVIDENCE.

October – December 2018

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In this issue

1. 10 year results from a multicenter randomized controlled trial on the Straumann[®] tissue level implants with SLActive[®] surface. Implant survival of 98.2% and 97.1% in the immediate and early loading groups, respectively, and stable marginal bone levels. (Nicolau P. et al. 2018).
2. 100% implant survival and improved esthetic outcome after 5 year of function of the Straumann[®] bone level implants with SLActive[®] surface following immediate provisionalisation in esthetic zone. (Donos N. et al 2018)
3. Hydrophilicity to possibly improve the soft tissue integration of dental implants. (Wang Y et al 2018).
4. Promising radiographic and clinical outcomes of CAD/CAM-processed implant crowns after 5 years in function (Joda T. et al. 2018)



Quintessence Int. 2018 Dec 18:2-12

10-year outcomes with immediate and early loaded implants with a chemically modified SLA surface.

Nicolau P, Guerra F, Reis R, Krafft T, Benz K, Jackowski J.

Study objectives

The purpose of this study was to evaluate long-term outcomes in a 10-year follow-up study of patients who previously completed a 3-year multicenter randomized controlled trial of immediate and early loading of dental implants with a hydrophilic and chemically active surface (SLActive) in the posterior maxilla or mandible. The patients received implants to replace at least one missing tooth, with provisional restoration on the day of surgery (immediate loading) or 28 to 34 days later (early loading). Implant survival, change in crestal bone level, and patient satisfaction were evaluated.

Results and conclusions

- The mean crestal bone level change from implant surgery to 10 years was -2.00 ± 1.19 mm and -1.37 ± 1.06 mm in the immediate and early groups, respectively. The corresponding change between 5 to 6 months' post-surgery (permanent fixed restoration placement) and 10 years was -1.25 ± 0.99 mm and -0.89 ± 1.11 mm in the immediate and early groups.
- After the initial remodeling phase (5 to 6 months) where the depth of implant placement had an influence on the initial bone remodeling, no significant differences between the two treatment groups were detected.
- Mean implant survival was 97.6% (98.2% and 97.1% in the immediate and early loading groups, respectively).
- Implants with the SLActive surface show successful long-term outcomes following immediate or early loading in posterior maxillae and mandibles.

Adapted from Nicolau P et al., Quintessence Int. 2018 Dec 18:2-12, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Dec 25

Immediate provisionalization of bone level implants with a hydrophilic surface. A 5-year follow-up of a randomised controlled clinical trial.

Donos N, Horvath A, Calciolari E, Mardas N

Study objectives

The aim of this study was to follow-up the radiographic bone level changes and the clinical outcomes of immediately provisionalized and conventionally restored implants with a hydrophilic surface following 5 years of function. This was a 5-year follow-up of a prospective, randomized, single blind controlled study involving 16 out of the 24 originally recruited patients in need of a single tooth replacement in the esthetic area. Implants were either immediately provisionalized with a non-occluding temporary crown (test group, n=7), or left without a crown (control group, n=9). In both groups, the definitive restoration was placed 16 weeks after implant placement. Radiographic and clinical parameters were evaluated at 36, 48 and 60 months post-implant placement, together with implant survival and success rates. The esthetic outcomes were measured with the Papilla Fill Index (PFI) and the Pink Esthetic Score (PES).

Results and conclusions

- At 60 months, similar peri-implant bone loss was observed in the test ($-0.42 \text{ mm} \pm 0.17 \text{ mm}$) and in the control ($-0.37 \text{ mm} \pm 0.35 \text{ mm}$) groups.
- A tendency for an improved esthetic outcome from implant loading to the subsequent follow-ups was noticed in both groups.
- Both groups presented with high levels of long-term implant survival and success.
- This study supports non-functional immediate provisionalization as a viable long-term option for the management of single-tooth implants in the esthetic area.

Adapted from Donos N et al., Clin Oral Implants Res. 2018 Dec 25, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct 3

Immediate and early implant placement in single-tooth gaps in the anterior maxilla: A prospective study on ridge dimensional, clinical, and aesthetic changes.

Arora H, Ivanovski S

Study objectives

The aim of this study was to evaluate the impact of timing of placement (immediate and early) on the horizontal ridge dimensional changes, clinical, and aesthetic outcomes of implants placed in single-tooth gaps in the anterior maxilla. were placed in single-tooth gaps in the anterior maxilla of 30 patients, either immediately after extraction (Group A, n = 15) or after a healing period of 4-8 weeks (Group B, n = 15). In both groups, implant placement was followed by a 3- to 4-month period of non-submerged healing, after which definitive crowns were placed. Study models were obtained before extraction (T0), at implant placement (T1), at the insertion of a definitive crown (T2), and 1-year thereafter (T3). Horizontal ridge dimensional changes were measured by superimposing the optical scans of the study models from different time-points. Radiographs and photographs were used to evaluate changes in marginal bone levels and soft tissue recession. Aesthetic evaluation was carried out using the Pink and White Esthetic Score (PES and WES) indices. Patient-reported outcomes were measured using a subjective questionnaire.

Results and conclusions

- A 100% implant survival rate was observed in both groups after a 1-year follow-up.
- Analysis showed a labial horizontal tissue dimensional change of 0.61 mm and 0.72 mm from T0 to T3 in Groups A and B, respectively.
- Acceptable PES values were observed in both groups (Group A: 9.40; Group B: 9.27) after the 1-year follow-up period.
- No incidence of advanced mucosal recession was observed between definitive crown insertion and 1-year follow-up in both groups. No significant changes were observed for all other measured variables at different time-points.
- Immediate and early placed implants in single-tooth gaps in the anterior maxilla showed similar ridge dimensional changes as well as acceptable clinical, aesthetic, and patient-centred outcomes in the short-term (1-year follow-up).

Adapted from Arora H et al., Clin Oral Implants Res. 2018 Oct 3, for more info about this publication click [HERE](#)

Int J Mol Sci. 2018 Dec 13;19(12)

Influence of Implant Material and Surface on Differentiation and Proliferation of Human Adipose-Derived Stromal Cells.

Jung S, Bohner L, Hanisch M, Kleinheinz J, Sielker S



Study objectives

For the guided regeneration of periimplant hard and soft tissues, human adipose-derived stromal cells (hADSC) seem to be a promising source for mesenchymal stromal cells. For this, the proliferation and differentiation of hADSC were evaluated on titanium and zirconia dental implants with different surface treatments. Results were compared to edaphic cells as human osteoblasts (hOB) and human gingival fibroblasts (HGF). Primary cells were cultured on (1) titanium implants with a polished surface (Ti-PT), (2) sandblasted and acid-etched titanium (Ti-SLA), (3) sandblasted and alkaline etched zirconia (ZrO₂-ZLA) and (4) machined zirconia (ZrO₂-M). The cell proliferation and differentiation on osteogenic lineage were assessed after 1, 7 and 14 days.

Results and conclusions

- Zirconia dental implants with rough surface (ZrO₂-ZLA) showed the highest proliferation rates ($p = 0.048$).
- The osteogenic differentiation occurred early for zirconia and later for titanium implants, and it was enhanced for rough surfaces in comparison to polished/machined surfaces.

Adapted from Jung S et al., *Int J Mol Sci.* 2018 Dec 13;19(12), for more info about this publication click [HERE](#)

Eur J Oral Sci. 2018 Oct;126 Suppl 1:81-87

Dental implants - are they better than natural teeth?

Pjetursson BE, Heimisdottir K

Study objectives

Nowadays, patients find much information on dental treatment from the Internet. There is a vast amount of information on dental implants, in contrast to the limited information available on natural teeth. This review addresses research on survival of natural teeth and dental implants, and discusses factors affecting the survival rate of implants, as well as certain dogmas in implant dentistry. To simplify treatment planning, the article presents a classification system in which teeth are classified as secure, doubtful, or irrational to treat. Secure teeth should last for a long period of time without need for complex treatment. Doubtful teeth are teeth that might need complicated treatment and additional maintenance in order to be maintained. Teeth irrational to treat are teeth that cannot be saved and for which extraction is the only treatment option. Multiple risk factors might decrease the survival probability of teeth. The survival and success rates of dental implants will never succeed the survival rates of healthy, clean teeth. Dental implants and implant-supported restorations are an excellent treatment modality, but it must always be kept in mind that it is associated with a risk of biological and technical complications. Implants are supposed to replace missing teeth - they are not supposed to replace teeth.

Adapted from Pjetursson BE et al., *Eur J Oral Sci.* 2018 Oct;126 Suppl 1:81-87, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Dec;29(12):1212-1219

Long-term follow-up of single crowns supported by short, moderately rough implants-A prospective 10-year cohort study.

Rossi F, Lang N, Ricci E, Ferraioli L, Baldi N, Botticelli D

Study objectives

The aim of this study was to evaluate prospectively the clinical and radiographic outcomes after ten years of short (6 mm) implants with a moderately rough surface supporting single crowns in the posterior region. Forty 6 mm modified sandblasted large-grit acid-etched (mod-SLA), soft tissue level implants were installed in the distal segments of 35 consecutive patients. After 6 weeks of healing, abutments were tightened, and single porcelain-fused-to-metal crowns were cemented. Implant survival, marginal bone loss, and clinical crown/implant ratio were evaluated at various time intervals up to 10 years after loading.

Results and conclusions

- Two out of the 40 implants were lost before loading, one implant was lost after 7 years because of peri-implantitis. One patient with two implants died and was excluded from analysis. Two patients did not come at the 10-year follow-up and were considered as drop out (2 implants). The survival rate was 91.7% (n = 36).
- Thirty-three implants were available for marginal bone loss evaluation. A mean marginal bone loss after 10 years of function was 0.8 ± 0.7 mm. Between 5 and 10 years, the loss was 0.2 ± 0.4 mm.
- No technical complications were registered during the 10-year period. The clinical crown/implant ratio increased with time from 1.6 at the delivery of the prosthesis to 2.0 after 10 years of loading with no increase between 5 and 10 years.
- Short (6 mm) implants with a moderately rough surface supporting single crowns in the posterior region and loaded after 6-7 weeks maintained full function for at least 10 years with low marginal bone resorption

Adapted from Rossi F et al., Clin Oral Implants Res. 2018 Dec;29(12):1212-1219, for more info about this publication click [HERE](#)

Dent Mater. 2019 Jan;35(1):74-86

Assessing the osteogenic potential of zirconia and titanium surfaces with an advanced in vitro model.

Rottmar M, Müller E, Guimond-Lischer S, Stephan M, Berner S, Maniura-Weber K

Study objectives

The aim of this study was to investigate how the interaction of a microstructured zirconia surface with blood influences its osseointegration potential compared to microstructured titanium with or without additional nanostructures. Microstructured zirconia and micro- (and nano)structured titanium surfaces were fabricated via sandblasting followed by acid etching and their topographical as well as physico-chemical features were thoroughly characterized. Following, an advanced in vitro approach mimicking the initial blood interaction of material surfaces upon implantation was applied. Fibrinogen adsorption, human blood coagulation as well as their influence on cell fate decisions of primary human bone and progenitor cells (HBC) were studied.

Results and conclusions

- Obtained surface micro- and nanostructures on titanium surfaces were sharp with rugged peaks whereas zirconia surfaces were less rough with structures being shallower, more round and granular.
- Compared to titanium surfaces, the zirconia surface showed increased fibrinogen adsorption, higher levels of total accessible fibrinogen γ -chain moieties yielding in increased platelet adhesion and activation and consequently thrombogenicity. Mineralization of HBC on microstructured surfaces was significantly higher on zirconia than on titanium, but was significantly lower compared to titanium surfaces with nanostructures.
- This study provides insights into blood-material interaction and subsequent cellular events that are important for implant surface development.

Adapted from Rottmar M et al., Dent Mater. 2019 Jan;35(1):74-86, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Dec 6

Full-arch implant-supported rehabilitations: A prospective study comparing porcelain-veneered zirconia frameworks to monolithic zirconia.

Caramês J, Marques D, Malta Barbosa J, Moreira A, Crispim P, Chen A

Study objectives

The aim of this study was to evaluate the performance of two types of zirconia frameworks. From 2014 to 2016, in a prospective clinical trial, 150 patients were rehabilitated with 83 and 110 implant-supported, screw-retained, full-arch ceramic-veneered zirconia (PVZ) rehabilitations and monolithic zirconia with porcelain veneering limited to buccal (MZ) rehabilitations, respectively. Patients were consecutively enlisted according to pre-defined inclusion criteria and evaluated on 4 months intervals.

Results and conclusions

- The average follow-up time (\pm SD) and implant success rate was 608.80 ± 172.52 days with 99.53% implant success for the PVZ group and 552.63 ± 197.57 days with 99.83% success for the MZ group.
- According to the Kaplan-Meier estimator, the mean cumulative survival rate at the 2-year follow-up for framework fracture, major chipping, minor chipping, or any of the former combined to occur was 0.99, 0.95, 0.93 and 0.85 for the PVZ group ($n = 18$) and 0.99, 0.95, 0.95 and 0.89 for the MZ group ($n = 15$).
- No significant differences were found between the two groups.
- Results suggest zirconia as a suitable material for frameworks in full-arch implant-supported rehabilitations. Both groups presented a low incidence of technical complications. When comparing the two different designs, the MZ group presented a lower technical complication rate, thus presenting itself as a viable alternative for full-arch implant-supported rehabilitations.

Adapted from Caramês J et al., Clin Oral Implants Res. 2018 Dec 6, for more info about this publication click [HERE](#)

Clin Oral Investig. 2018 Nov 10

Macrophage behavior and interplay with gingival fibroblasts cultured on six commercially available titanium, zirconium, and titanium-zirconium dental implants.

Wang Y, Zhang Y, Sculean A, Bosshardt DD, Miron RJ

Study objectives

The aim of this study was to first investigate how macrophages behaved on various dental implant surfaces and thereafter to investigate their effect on soft tissue cells. Macrophage adhesion, proliferation, and polarization towards either an M1 or M2 phenotype were investigated on six implant surfaces fabricated from pure titanium (Ti), pure zirconium (ZLA), and a titanium-zirconium (Ti-Zi) alloy of various surface topographies/chemistries. Thereafter, conditioned media (CM) collected from macrophages seeded on these various implant surfaces was cultured with murine gingival fibroblasts and investigated for their ability to promote collagen synthesis.

Results and conclusions

- Macrophages attached and proliferated in similar levels on all implant surfaces; however, the modSLA hydrophilic surfaces tended to decrease the pro-inflammatory response by lowering the gene expression of TNF-alpha, IL-1, and IL-6 and promoting tissue resolution through the expression of an M2-macrophage cytokine IL-10.
- Thereafter, CM from macrophages were seeded with gingival fibroblasts on each implant surface. In general, CM from macrophages significantly promoted gingival fibroblast cell attachment on all implant surfaces at either 4 or 8 h and, most notably, significantly promoted fibronectin and TGF-beta gene expression on both Ti and Ti-Zi hydrophilic surfaces.
- The present study found that implant surface topography and chemistry substantially impacted macrophage behavior. Most notably, modifications via hydrophilicity to both the pure Ti and Ti-Zi were shown to favor the secretion of macrophage pro-resolution markers and favored subsequent gingival fibroblast cell behavior when cultured with CM, whereas surface composition (Ti vs ZLA vs Ti-Zi) had little effect on macrophage polarization or gingival fibroblast behavior.
- This finding suggests that surface hydrophilicity would improve the soft tissue integration of dental implants, irrespective of material composition.

Adapted from Wang Y et al., Clin Oral Investig. 2018 Nov 10, for more info about this publication click [HERE](#)

BMC Oral Health. 2018 Nov 1;18(1):181

A prospective clinical study to evaluate the performance of zirconium dioxide dental implants in single-tooth edentulous area: 3-year follow-up.

Bormann KH, Gellrich NC, Kniha H, Schild S, Weingart D, Gahlert M



Study objectives

The aim of this study was to investigate the mid-term (36 months) clinical performance of a ceramic monotype implant in single-tooth edentulous area. Ceramic implants (PURE Ceramic Implant, Institut Straumann AG, Basel, Switzerland) with a diameter of 4.1 mm were placed following standard procedure and loaded with provisional and final prostheses after 3 and 6 months, respectively. Implant survival rate and implant success rate were evaluated and crestal bone levels were measured by analysing standardized radiographs during implant surgery and at 6, 12, 24 and 36 months.

Results and conclusions

- With one implant lost during the first 6 months after surgery, the implant survival rate was 97.7% at 6 months. No further implants were lost over the following 30 months, and 3 patients were lost to follow-up during this time frame. This led to a survival rate of 97.5% at 36 months.
- Six months after implant surgery 93.0% of the implants were considered "successful", increasing to 97.6% at 12 months and remaining at this level at 24 months (95.1%) and 36 months (97.5%).
- Bone loss was most pronounced in the first half-year after implant surgery (0.88 ± 0.86 mm). By contrast, between 12 and 36 months the mean bone level remained stable (minimal gain of $0.06 [\pm 0.60]$ mm). Hence, the overall bone loss from implant surgery to 36 months was $0.97 (\pm 0.88)$ mm.
- In the follow-up period ceramic implants can achieve favourable clinical outcomes on a par with titanium implants. For instance, these implants can be recommended for patients who object to metal dental implants.

Adapted from Bormann KH et al., BMC Oral Health. 2018 Nov 1;18(1):181, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29 Suppl 16:135-153

Performance and outcome of zirconia dental implants in clinical studies: A meta-analysis.

Roehling S, Schlegel KA, Woelfler H, Gahlert M

Study objectives

The aim of this study was to evaluate implant survival, peri-implant marginal bone loss, technical, and biological complications as well as aesthetic outcomes of zirconia implants in clinical studies. Electronic (Medline, Embase) and hand searches were performed to identify clinical studies published between January 2004 and March 2017 investigating zirconia dental implants with a mean follow-up of at least 12 months. Primary outcomes were implant survival and peri-implant marginal bone loss. Secondary outcomes included technical and biological complications as well as aesthetic outcomes. Meta-analyses were performed to estimate implant survival and marginal bone loss.

Results and conclusions

- From 943 titles, 264 abstracts were selected. Subsequently, 80 full-text articles were screened, and 18 studies were included for data extraction. One- (14 studies) and 2-piece zirconia implants (4 studies) were investigated.
- Commercially available (CA) (510 implants, 398 patients) and not commercially available (NCA) zirconia implants (618 implants, 343 patients) were identified.
- For CA implants (follow-up: 12-61.20 months), technical complications (1.6%), implant fractures (0.2%) and biological complications (4.2%) were reported.
- Meta-analyses estimated 1- and 2-year survival rates of 98.3% (95% CI: 97.0%-99.6%) and 97.2% (95% CI: 94.7%-99.7%), respectively, and a mean 1-year marginal bone loss of 0.7 mm (95% CI: 0.4-1.0 mm).
- Since 2004, the survival rates of CA implants significantly improved compared with NCA implants. CA 1-piece zirconia implants showed similar 1- and 2-year mean survival rates and marginal bone loss after 1 year compared with published data for titanium implants.

Adapted from Roehling S et al., Clin Oral Implants Res. 2018 Oct;29 Suppl 16:135-153, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29 Suppl 18:196-223

The clinical performance of all-ceramic implant-supported single crowns: A systematic review and meta-analysis.

Rabel K, Spies BC, Pieralli S, Vach K, Kohal RJ

Study objectives

The aim of this study was to evaluate the survival and technical complication rates of all-ceramic implant-supported single crowns (SC). Three electronic databases were searched for clinical studies conducted at ≥ 15 patients examining implant-supported all-ceramic SCs over ≥ 12 months. Survival rates of implants and restorations plus technical complication rates of SCs were calculated and tested for statistical correlation with confounding variables. Statistical analysis was performed using a negative binomial distribution model to calculate 5- and 10-year survival and complication estimates.

Results and conclusions

- Forty-one included studies reported on implant-supported SCs made of veneered and monolithic high-strength oxide ceramics, monolithic, and veneered glass-based ceramics and of a monolithic resin-nano-ceramic (RNC).
- Survival estimates for SCs of 93% (95% CI: 86.6%-96.4%) after 5 years and 94.4% (95% CI: 91.1%-96.5%) after 10 years were calculated, corresponding values for implant survival were 95.3% (95% CI: 90.6%-97.7%) and 96.2% (95% CI: 95.1%-97.1%).
- Technical complication rates after 5/10 years were as follows: chipping 9.0% (95% CI: 5.4%-14.8%)/2.7% (95% CI: 2.1%-3.5%), framework fractures 1.9% (95% CI: 0.7%-4.9%)/1.2% (95% CI: 1%-1.5%), screw loosening 3.6% (95% CI: 1.6%-8.4%)/5.2% (95% CI: 3.6%-7.5%), and decementations with 1.1% (95% CI: 0.4%-2.8%) after 5 years. Some confounding variables influenced the above-mentioned estimates significantly.
- All-ceramic implant-supported SCs showed-with the exception of a RNC material-high survival rates. However, failures and technical complications occurred which have to be considered when informing patients on the treatment with implant-supported all-ceramic SCs.

Adapted from Rabel K et al. Clin Oral Implants Res. 2018 Oct;29 Suppl 18:196-223, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29 Suppl 18:160-183

A systematic review of the influence of the implant-abutment connection on the clinical outcomes of ceramic and metal implant abutments supporting fixed implant reconstructions.

Pjetursson BE, Zarauz C, Strasding M, Sailer I, Zwahlen M, Zembic A

Study objectives

The aim of this study was to assess the influence of implant-abutment connection and abutment material on the outcome of implant-supported single crowns (SCs) and fixed dental prostheses (FDPs). An electronic Medline search complemented by manual searching was conducted to identify randomized controlled clinical trials, prospective and retrospective studies with a mean follow-up time of at least 3 years. Patients had to have been examined clinically at the follow-up visit. Failure and complication rates were analyzed using robust Poisson regression, and comparisons were made with multivariable Poisson regression models.

Results and conclusions

- The search provided 1511 titles and 177 abstracts. Full-text analysis was performed for 147 articles resulting in 60 studies meeting the inclusion criteria.
- Meta-analysis of these studies indicated an estimated 5-year survival rate of 97.6% for SCs and 97.0% for FDPs supported by implants with internal implant-abutment connection and 95.7% for SCs and 95.8% for FDPs supported by implants with external connection.
- The 5-year abutment failure rate ranged from 0.7% to 2.8% for different connections with no differences between the types of connections. The total number of complications was similar between the two connections, yet, at external connections, abutment or occlusal screw loosening was more predominant. Ceramic abutments, both internally and externally connected, demonstrated a significantly higher incidence of abutment fractures compared with metal abutments.
- For implant-supported SCs, both metal and ceramic abutments with internal and external connections exhibited high survival rates. Moreover, implant-supported FDPs with metal abutments with internal and external connections for also showed high survival rates.

Adapted from Pjetursson BE et al., Clin Oral Implants Res. 2018 Oct;29 Suppl 18:160-183, for more info about this publication click [HERE](#)

Edentulous jaw impression techniques: An in vivo comparison of trueness.

Chebib N, Kalberer N, Srinivasan M, Maniewicz S, Perneger T, Müller F

Study objectives

The aim of this study was to compare the trueness of maxillary edentulous jaw impressions made with irreversible hydrocolloid (ALG), polyvinyl siloxane (PVS), PVS modified with zinc oxide eugenol (ZOE) (PVSM), and an intraoral scanner (TRI) with a conventionally border-molded ZOE impression (control). Twelve edentulous maxillary impressions were made with the impression techniques. The analog impressions were scanned using a laboratory scanner, imported into 3-dimensional comparison software, and superimposed against the corresponding control. Trueness was evaluated by calculating the effective deviation known as root mean square (RMS) for the entire surface (ES) and for specific regions of interest such as peripheral border, inner seal, midpalatal suture, ridge, and posterior palatal seal. The secondary outcomes for this study were the patients' perception of the impression techniques. Statistical analyses with the Wilcoxon tests were carried out ($\alpha=.05$).

Results and conclusions

- For ES, significant differences were found when comparing ALG (1.21 ± 0.35 mm) with PVS (0.75 ± 0.17 mm; $P=.008$), PVSM (0.75 ± 0.19 mm; $P=.012$), and TRI (0.70 ± 0.18 mm; $P=.006$) but not among the other groups. Significant differences were found for peripheral border when comparing ALG (2.03 ± 0.55 mm) with PVS (1.12 ± 0.32 mm; $P=.006$), PVSM (1.05 ± 0.29 mm; $P=.003$), and TRI (1.38 ± 0.25 mm; $P=.008$), as well as TRI and PVSM ($P=.028$).
- Significant differences were also found for inner seal when comparing ALG (0.74 ± 0.36 mm) with PVSM (0.52 ± 0.13 mm; $P=.041$), as well as TRI (0.8 ± 0.25 mm) versus PVS (0.56 ± 0.14 mm; $P=.005$) and PVSM ($P=.005$). The difference at the ridge was significant when comparing PVS (0.18 ± 0.07 mm) with PVSM (0.28 ± 0.19 mm; $P=.015$) but not among the other groups.
- A significant difference was also found for posterior palatal seal when comparing PVS (0.55 ± 0.41 mm) with PVSM (0.60 ± 0.43 mm; $P=.034$). Patient perceptions showed significantly better satisfaction scores for ALG (1.83 ± 2.03) and PVS (3.17 ± 2.40) than for TRI (4.08 ± 2.71), PVSM (4.58 ± 2.35), and ZOE (6.83 ± 1.75).
- Edentulous impressions made with PVS, PVSM, and TRI had similar deviations and may yield clinically acceptable results. Irreversible hydrocolloids are contraindicated for definitive impression making in completely edentulous jaws.

Adapted from Chebib N et al., J Prosthet Dent. 2018 Dec 20. pii: S0022-3913(18)30732-7, for more info about this publication click [HERE](#)

J Clin Periodontol. 2018 Dec;45(12):1498-1509

The severity of human peri-implantitis lesions correlates with the level of submucosal microbial dysbiosis.

Kröger A, Hülsmann C, Fickl S, Spinell T, Hüttig F, Kaufmann F, Heimbach A, Hoffmann P, Enkling N, Renvert S, Schwarz F, Demmer RT, Papapanou PN, Jepsen S, Kebschull M

Study objectives

The aim of this study was to cross-sectionally analyse the submucosal microbiome of peri-implantitis (PI) lesions at different severity levels. Microbial signatures of 45 submucosal plaque samples from untreated PI lesions obtained from 30 non-smoking, systemically healthy subjects were assessed by 16s sequencing. Linear mixed models were used to identify taxa with differential abundance by probing depth, after correction for age, gender, and multiple samples per subject. Network analyses were performed to identify groups of taxa with mutual occurrence or exclusion. Subsequently, the effects of peri-implant probing depth on submucosal microbial dysbiosis were calculated using the microbial dysbiosis index.

Results and conclusions

- In total, we identified 337 different taxa in the submucosal microbiome of PI.
- Total abundance of 12 taxa correlated significantly with increasing probing depth; a significant relationship with lower probing depth was found for 16 taxa.
- Network analysis identified two mutually exclusive complexes associated with shallow pockets and deeper pockets, respectively. Deeper peri-implant pockets were associated with significantly increased dysbiosis.
- Increases in peri-implant pocket depth are associated with substantial changes in the submucosal microbiome and increasing levels of dysbiosis.

Adapted from Kröger A et al., J Clin Periodontol. 2018 Dec;45(12):1498-1509, for more info about this publication click [HERE](#)

J Prosthet Dent. 2018 Nov 23

Influence of different implant-abutment connection designs on the mechanical and biological behavior of single-tooth implants in the maxillary esthetic zone: A systematic review.

Vetromilla BM, Brondani LP, Pereira-Cenci T, Bergoli CD.

Study objectives

The purpose of this systematic review was to determine the best implant-abutment connection type for anterior single-tooth implants considering esthetics, success, and survival rates. An electronic search was conducted in MEDLINE, Scopus, Embase, and the Cochrane Library databases to identify clinical studies on single-tooth implants with external and internal hexagon, and/or Morse taper connections. These studies needed to describe at least one of the following outcomes: esthetic score, survival/success rate, or marginal bone loss. The included studies and reports were assessed for bias using the Cochrane risk of bias tool.

Results and conclusions

- Of the 891 articles identified, 29 were selected and analyzed.
- The most common technical complications were abutment screw loosening and crown-cement loosening, while dehiscence and recession were the most common biological complications.
- The most frequent complications were dehiscence for external hexagon, crown-cement loosening for the internal hexagon, and ceramic fracture for the Morse taper.
Esthetics were favorable for all connections, but the internal hexagon performed better. However, better results for marginal bone loss, success, and survival were found for the Morse taper. The global annual failure rate was 0.90% and 0.2% for Morse taper, 0.3% for external hexagon, and 2.2% for internal hexagon.
- This review suggests that Morse taper performs better for survival, success, and marginal bone loss. Internal hexagon performed better for esthetic parameters.

Adapted from Vetromilla BM et al., J Prosthet Dent. 2018 Nov 23, for more info about this publication click [HERE](#)

Clin Implant Dent Relat Res. 2018 Oct 29

Patient satisfaction versus retention of implant overdentures with two attachment systems: A randomized trial.

de Albuquerque RF Jr, Fromentin O, Lassauzay C, Conceição Pereira Saraiva MD

Study objectives

The aim of this study was to compare the levels of retention and patient-based outcomes on implant overdentures retained/supported by cylindrical (LA) and ball (RA) attachment systems overtime and investigate their relationship. Attachment retention (Newtons), and patient satisfaction with the treatment, prosthesis stability, and ability to chew (VAS, 100 mm) were assessed in a crossover trial for both attachment systems at baseline, 1 week, 3, 6, and 12 months and compared to preintervention values. Patients' preference was also recorded.

Results and conclusions

- Mean retention of worn attachments and patient satisfaction with denture retention assessed in the preintervention phase were 3.2 N (SD 4.9) and 23.5 mm (IQR 6.5-65.5), respectively.
- Overall mean retention along the study was higher for RA than LA (difference of 5.0 N, 95%CI: 2.5-7.6; $P = 0.0005$), declining significantly overtime ($P < 0.0001$), more steeply for the cylindrical attachment. Differences in VAS ratings between attachments were nonsignificant in the crossover phase ($P > 0.05$), but general satisfaction, satisfaction with retention, and comfort were significantly higher when compared with preintervention scores ($P < 0.05$).
- Ratings of retention decreased significantly overtime for both systems and earlier for LA than RA. Satisfaction was lower when retention was either too low or too high, although there was large variation in this association.
- At the end of the study, all participants chose to remain with the attachment system that they had received last.
- Attachment selection should be based on patients' individual characteristics and expectations as satisfaction with the attachment retention and denture stability vary largely among patients.

Adapted from de Albuquerque RF Jr et al., Clin Implant Dent Relat Res. 2018 Oct 29, for more info about this publication click [HERE](#)

Clin Implant Dent Relat Res. 2018 Oct 26

CAD/CAM implant crowns in a digital workflow: Five-year follow-up of a prospective clinical trial.

Joda T, Bragger U, Zitzmann NU

Study objectives

The aim of this study was to investigate computer-aided-design (CAD)/computer-aided-manufacturing (CAM)-processed implant crowns after 5 years of loading. Twenty patients were included for cement-retained crowns in posterior sites. Radiographic analysis of bone levels was performed after delivery and follow-up. The Functional Implant Prosthodontic Score (FIPS) was assessed at the final follow-up. Wilcoxon signed-rank tests were used with a level of significance set at $\alpha = 0.05$.

Results and conclusions

- One implant was lost, resulting in a success rate of 95% at 5 years.
- For 19 crowns, neither technical complications nor biological complications were observed. The mean marginal bone level was 0.6 ± 0.26 mm (range: 0.18-1.12) mesially, and 0.79 ± 0.36 mm (range: 0.23-1.36) distally at 5 years.
- During the observation period, mean radiographic bone levels increased significantly by 0.23 mm at mesial and by 0.17 mm at distal sites ($P < .0001$) indicating minor additional bone loss.
- The mean total FIPS score was 8.2 ± 1.0 (range: 7-10) with the high score of 2.0 ± 0.0 for the variable "bone."
- CAD/CAM-processed implant crowns demonstrated promising radiographic and clinical outcomes after 5 years in function. Future large-scale trials are crucial to confirm these initial results in the field of digital implant processing.

Adapted from Joda T et al., Clin Implant Dent Relat Res. 2018 Oct 26, for more info about this publication click [HERE](#)

Clin Implant Dent Relat Res. 2018 Dec;20(6):988-996

Randomized controlled clinical study of veneered zirconia abutments for single implant crowns: Clinical, histological, and microbiological outcomes.

Thoma DS, Sailer I, Mühlemann S, Gil A, Jung RE, Hämmerle CHF

Study objectives

The aim of this study was to analyze the effect of veneering of the submucosal part of zirconia abutments and the type of retention (cemented vs screw-retained) on clinical, microbiological, and histological outcomes of single-tooth implant crowns. A total of 44 patients with a single missing tooth to be replaced by an implant in the anterior region participated in the study. Implants were randomly assigned to receive zirconia-based CAD/CAM reconstructions using either one of four treatment modalities: cement-retained with submucosal veneering (CR-P), cement-retained without submucosal veneering (CR-W), screw-retained with submucosal veneering (SR-P), and screw-retained without submucosal veneering (SR-W). Clinical parameters were assessed at baseline (after crown insertion), at 6 and 12 months. Histological and microbiological analyses were performed at 6 months.

Results and conclusions

- The clinical evaluation revealed, in general, stable peri-implant soft tissues with minimal differences for all measured parameters between the four groups, except for bleeding on probing with the two cemented groups exhibiting higher values at 12 months ($35.0\% \pm 26.5\%$ for CR-W and $25.0\% \pm 38.8\%$ for CR-P versus 13.1 ± 14.8 for SR-W and 13.0 ± 18.2 for SR-P).
- The descriptive and semi-quantitative histology showed a trend for a higher inflammatory reaction in the two cemented (a medium to high number of inflammatory cells) compared to the screw-retained groups (low number of inflammatory cells) at 6 months.
- The microbiological test demonstrated low bacterial counts and a similar distribution in between the groups except for two species (*Tannerella forsythia* and *Peptostreptococcus micros*) that were found in higher counts in the cemented groups at 6 months.
- Submucosal veneering of zirconia abutments did not negatively affect the health of the peri-implant tissues. The cemented groups, though, did show a clinical and histological trend to higher levels of inflammation.

Adapted from Thoma DS et al., *Clin Implant Dent Relat Res.* 2018 Dec;20(6):988-996, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2018 Oct;29(10):1007-1015

Histological and micro-CT analysis of peri-implant soft and hard tissue healing on implants with different healing abutments configurations.

Souza AB, Alshihri A, Kämmerer PW, Araújo MG, Gallucci GO

Study objectives

The aim of this study was to assess the effect of different abutment configurations on peri-implant soft and hard tissue healing. Two-piece dental implants, 3.5 mm in diameter and 8 mm in length, were placed in four beagle dogs. Two different transmucosal healing abutment configurations were randomly selected: one with a wide emergence profile (WE) (45° angulation with implant long axis) and the other with a narrow emergence profile (NE) (15° angulation with implant long axis). After four months of healing, the animals were sacrificed. Micro-CT scans were taken for mesio-distal analysis; subsequently, the biopsies were prepared for bucco-lingual histometric analyses. Several measurements were taken using the following reference points: marginal mucosal level (MML), apical barrier epithelium (aBE), implant shoulder (IS), marginal bone crest (BC), and first bone-to-implant contact (fBIC).

Results and conclusions

- In the micro-CT analysis, the distance from IS-fBIC was 1.11 ± 0.66 mm for WE and 0.12 ± 0.21 mm for NE ($p = 0.004$). The IS-BC of WE was -0.54 ± 0.80 mm, whereas NE presented 0.76 ± 0.48 mm ($p = 0.002$).
- The histometric analysis showed that both groups presented comparable dimensions of peri-implant biologic width ($p > 0.05$). However, in the distance from IS to BC, the WE showed a mean distance of -0.66 ± 0.78 mm while NE was 0.06 ± 0.42 mm ($p = 0.039$); the IS to fBIC was 0.89 ± 0.68 mm for WE while NE was 0.30 ± 0.30 mm ($p = 0.041$).
- The design of the transmucosal component can influence the establishment of the peri-implant biologic width. The flat and wide emergence profile induced an apical displacement of the peri-implant biologic width and more bone loss.

Adapted from Souza AB et al., Clin Oral Implants Res. 2018 Oct;29(10):1007-1015, for more info about this publication click [HERE](#)

J Periodontol. 2018 Oct 27

A comparative, randomized, prospective, two-center clinical study to evaluate the clinical and esthetic outcomes of two different bone grafting techniques in early implant placement.

Mau JL, Gordin E, Lin JJ, Chen MC, Ho CH, Cochran D

Study objectives

The aim of this study was to evaluate the clinical esthetic outcome, when two different bone grafting materials were used. Forty-eight patients were randomly assigned into two groups. In the control group, autogenous bone was used to cover the exposed implant surface then a layer of deproteinized bovine bone mineral (DBBM) was added. This graft combination was then combined with a collagen membrane. In the test group, the exposed implant surface was covered with a layer of freeze-dried bone allograft (FDBA) in combination with the collagen membrane. Modified plaque index (mPI), modified sulcular bleeding index (mSBI), probing depth (PD), keratinized mucosa (KM), implant crown length (IC), distance from the implant shoulder radiographic bone-to-implant contact (DIB), pink esthetic score (PES), and white esthetic score (WES) were measured at 12-months post implant loading.

Results and conclusions

- All 48 implants were clinically successful, and no significant differences were observed in mPI, mSBI, PD, KM, IC, DIB, PES, and WES at 1-year implant loading.
- The mean mucosal recessions of test and control group were unchanged, 0 and -0.02 mm, respectively.
- The mean DIB were -0.32 and -0.21 mm in test and control implants, respectively.
- The mean totals of PES/WES were 15.29 and 15.33 for the test and control groups, respectively, with no significant difference between groups.
- This study demonstrated that autogenous bone plus DBBM and FDBA each combined with a collagen membrane both resulted in stable clinical and esthetic outcomes in early implant placement with contour augmentation after 1 year.

Adapted from Mau JL et al., J Periodontol. 2018 Oct 27, for more info about this publication click [HERE](#)

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