



SCIENTIFIC **HIGHLIGHTS**

Short overviews on recently
published scientific evidence.

Issue **3**/2024

Edited by Dr. Marcin Maj

CONTENT

1. Increased Peri-implant Bone Formation Around Simultaneously Grafted Hydrophilic Microrough Titanium Implants: An Exploratory Human Histometric Analysis in Four Patients 4
2. Histological evaluation of osseointegration between conventional and novel bone-level tapered implants in healed bone-A preclinical study 5
3. Primary stability and osseointegration comparing a novel tapered design tissue-level implant with a parallel design tissue-level implant. An experimental in vivo study 6
4. Immediate loading of a fully tapered implant with deep apical threads placed in healed alveolar ridges vs. immediate extraction sockets. 7
5. Clinical outcomes of 3-5 years follow-up of immediate implant placement in posterior teeth: a prospective study 8
6. Clinical analysis of the tooth-implant papilla for two narrow-diameter titanium-zirconium implants in the anterior area: prospective controlled clinical study 9
7. Immediate versus early loading of immediately placed bone-level tapered dental implants with hydrophilic surface in full arch maxillary rehabilitation: A pilot randomized clinical trial with 2-year follow-up. 10
8. Bone-level Tapered Implants for Single Tooth Replacement. Immediate vs Delayed Placement: A Randomized, Controlled, Multi-center One-year No-inferiority Clinical Study 11
9. A randomized clinical trial on zirconia versus titanium implants in maxillary single tooth replacement 12
10. Immediate versus delayed implant placement of novel fully tapered tissue-level implants - A retrospective multicenter clinical study 13
11. Influence of scanning protocol on the accuracy of complete-arch digital implant scans: An in vitro study 14

IN THIS ISSUE

EDITOR'S CHOICE

Increased Peri-implant Bone Formation Around Simultaneously Grafted Hydrophilic Microrough Titanium Implants: An Exploratory Human Histometric Analysis in Four Patients

(Alexandre Perez et al. 2024)

and

Primary stability and osseointegration comparing a novel tapered design tissue-level implant with a parallel design tissue-level implant. An experimental in vivo study

(Thomas Gill et al., 2024)

Immediate loading of a fully tapered implant with deep apical threads placed in healed alveolar ridges vs. immediate extraction sockets.

(Danny Hadaya et al., 2024)

EDITOR'S CHOICE

Int J Periodontics Restorative Dent. 2024 May 24;44(3):1-11

Increased Peri-implant Bone Formation Around Simultaneously Grafted Hydrophilic Microrough Titanium Implants: An Exploratory Human Histometric Analysis in Four Patients

Alexandre Perez, Carla Patricia Martinelli-Klay, Tommaso Lombardi

STUDY OBJECTIVES AND METHODS

This pilot case series histologically and histometrically investigated the influence of implant surface hydrophilicity on early osseointegration and peri-implant bone formation around simultaneously grafted immediate implants. Hydrophilic test (SLAactive) or hydrophobic control (SLA) implants were immediately placed in maxillary molar extraction sites and simultaneously grafted with mineralized cancellous bone allograft (MCBA). Core biopsy samples were obtained at 3 weeks postplacement and histometrically compared for bone-to-implant contact, quantity of graft material, new bone formation, tissue reaction, and inflammatory scores.

RESULTS

- Test implants showed a more pronounced implant-bone apposition, peri-implant bone formation, and bone aggregate than control implants.
- Trabecular bone formation and maturation were also qualitatively advanced around test implants.

CONCLUSIONS

These results indicate that the combination of implant surface and bone graft may affect periimplant bone formation.

Adapted from A Perez et al., Int J Periodontics Restorative Dent. 2024 May 24;44(3):1-11, for more info about this publication, click [HERE](#)

J Periodontal Res. 2024 May 19

Histological evaluation of osseointegration between conventional and novel bone-level tapered implants in healed bone-A preclinical study

Jean-Claude Imber, Andrea Rocuzzo, Delia R Irani, Benjamin Bellón, Dieter D Bosshardt, Anton Sculean, Benjamin E Pippenger



STUDY OBJECTIVES AND METHODS

The purpose of this study was to histologically compare osseointegration and crestal bone healing between newly introduced tapered, self-cutting bone-level test implants and tapered bone-level control implants in sites with fully healed sites. Sixty-six implants (33 test, 33 control) were placed 1 mm subcrestally in a minipig model and underwent qualitative histologic and quantitative histometric analyses after 3, 6 and 12 weeks of submerged healing. The primary and secondary outcomes were the bone-to-implant contact (BIC) and first bone-to-implant contact (fBIC). Outcomes between the test and control implants were statistically compared.

RESULTS

- The BIC values of the test implants were comparable and non-inferior over the time points studied, except for the 12 weeks time point which showed statistically significantly higher BIC values of the test ($88.07 \pm 5.35\%$) compared to the control implants ($80.88 \pm 7.51\%$) ($p = .010$).
- Similarly comparable and non-inferior were the fBIC values, except for the 6-week outcome, which showed statistically higher values for the test ($-546.5 \pm 450.80 \mu\text{m}$) compared to the control implants ($-75.7 \pm 100.59 \mu\text{m}$).
- fBIC results for the test implants were qualitatively more stable and consistent between test time points.

CONCLUSIONS

Novel self-cutting bone-level test implants demonstrated superior osseointegration and similar bone levels compared to conventional bone-level implants after a healing period of 12 weeks in healed ridges.

Adapted from JC Imber et al., J Periodontal Res. 2024 May 19, for more info about this publication, click [HERE](#)

Clin Oral Implants Res. 2024 May 31

Primary stability and osseointegration comparing a novel tapered design tissue-level implant with a parallel design tissue-level implant. An experimental in vivo study

Thomas Gill, Sebastian Kühn, Simon Rawlinson, Benjamin Pippenger, Benjamin Bellon, Shakeel Shahdad



STUDY OBJECTIVES AND METHODS

The purpose of this study was to compare a novel tapered, double-threaded self-tapping tissue-level design implant (TLC) to a well-established parallel walled tissue-level (TL) implant in terms of primary and secondary stability over time. Test TLC (n = 10/per timepoint) and control TL (n = 10/per timepoint) implants were placed in the mandible of minipigs and left for submerged healing for 3, 6, and 12 weeks. Maximum insertion torque and implant stability quotient (ISQ) were measured for each implant at placement. Osseointegration and cortical bone maintenance were histologically evaluated by measuring total bone-to-implant contact (BIC) and first bone-to-implant contact (fBIC).

RESULTS

- A significantly higher maximum insertion torque was measured for the test implant TLC compared to the control TL implant (57.83 ± 24.73 Ncm and 22.62 ± 23.16 Ncm, respectively; $p < .001$).
- The mean ISQ values were comparable between the two implant types (75.00 ± 6.70 for TL compared to 75.40 ± 3.20 for TLC, $p = .988$).
- BIC was comparable between both implant types at each of the evaluated time points.
- The fBIC was found to be significantly more coronal at 12 weeks for the TLC implant compared to the TL implant (0.31 ± 0.83 mm for TLC compared to -0.22 ± 0.85 for TL, $p = .027$).

CONCLUSIONS

The novel tapered tissue level design implant showed improved primary stability and an overall improved crestal bone height maintenance compared to the parallel walled design at 12 weeks.

Adapted from T Gill et al., Clin Oral Implants Res. 2024 May 31, for more info about this publication click [HERE](#)

Clin Oral Implants Res. 2022 May;33(5):501-510

Immediate loading of a fully tapered implant with deep apical threads placed in healed alveolar ridges vs. immediate extraction sockets.

Danny Hadaya, Joan Pi-Anfruns, Benjamin Bellon, Benjamin E Pippenger, Tara L Aghaloo



STUDY OBJECTIVES AND METHODS

Novel implant designs that facilitate increased primary stability, while not compromising osseointegration and long-term survival are important to offer immediate solutions for missing teeth. Here, we hypothesize that fully tapered implants can obtain successful osseointegration with high survival rates after immediate loading in fresh extraction sockets and healed sites. A total of 13 swine with 73 implants were evaluated. Fully tapered or apically tapered implants were placed in extraction sockets and healed sites. Insertion torque and resonance frequency analysis were determined at placement and euthanasia. Animals were evaluated at: placement, and 1-week and 12-weeks after placement. Bone to Implant Contact (BIC), Bone Area/Total Area (BA/TA), and first BIC (fBIC) analyses were conducted.

RESULTS

- The fully tapered implant achieved similar primary stability with lower insertion torque at placement.
- Apically and fully tapered implants had comparable BIC (50.1% vs 59.4%) and ISQ (82.5 vs 80.3) values by 12 weeks in healed sites.
- In extraction sockets, BIC and ISQ for the apically tapered implant was 35.8% and 73.2 and 37.8% and 79.2 for the fully tapered implants, respectively.

CONCLUSIONS

In this short-term study, immediately loaded fully tapered implants obtained high survival with similar osseointegration ability as apically tapered implants when placed in healed sites and fresh extraction sockets. Fully tapered implants show promise for use in immediate loading and immediate placement.

Adapted from D Hadaya et al., Clin Oral Implants Res. 2022 May;33(5):501-510, for more info about this publication click [HERE](#)

BMC Oral Health. 2024 Mar 8;24(1):312

Clinical outcomes of 3-5 years follow-up of immediate implant placement in posterior teeth: a prospective study

Rusama Wipawin, Parinya Amornsettachai, Woraphong Panyayong, Dinesh Rokaya, Sasipa Thiradilok, Patr Pujarern, Suphachai Suphangul



STUDY OBJECTIVES AND METHODS

The aim of this study was to analyze the clinical outcomes of immediate implant placement in the posterior region with conventional loading with 3-5 years follow-up following the International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference. The study was done in 25 bone-level implants (Straumann® SLActive® bone level tapered implant, Straumann®, Basel, Switzerland) in 19 patients who underwent immediate implant placement in a posterior tooth with conventional loading with 3-5 years follow-up.

RESULTS

- It was found that 24 out of the 25 (96%) dental implants survived for an average of 57 ± 8.07 months.
- All of the 24 surviving dental implants were considered an operational success.
- The average mPES was 9.75 ± 0.44 . The major prosthetic complications seen were: (1) proximal contact loss (41.67%), (2) loosening of the screw (8.33%), and (3) cement debonding (4.17%).

CONCLUSIONS

Immediate implant placement in a posterior tooth with conventional loading yields a predictable result with some complications. The most prominent complications were proximal contact loss, followed by loosening of the screw and cement debonding. The implant survival rate was 96% at a mean time follow-up of 4 years and 9 months.

Adapted from R Wipawin et al., BMC Oral Health. 2024 Mar 8;24(1):312, for more info about this publication, click [HERE](#)

BMC Oral Health. 2024 Mar 5;24(1):310

Clinical analysis of the tooth-implant papilla for two narrow-diameter titanium-zirconium implants in the anterior area: prospective controlled clinical study

Paola Herrera-Pérez, Ana María García-De-La-Fuente, Eztizen Andía-Larrea, Xabier Marichalar-Mendía, José Manuel Aguirre-Urizar, Luis Antonio Aguirre-Zorzano



STUDY OBJECTIVES AND METHODS

The aim of this study was to analyze the formation of the tooth-implant papilla between the implant and the adjacent natural tooth in the maxillary lateral incisors and mandibular incisors. A total of 40 patients treated with NDI, of titanium-zirconium (Ti-Zr) alloy i.e., 2.9 mm Test Group (TG) and 3.3 mm Control Group (CG), were included. The mesiodistal distance between the adjacent natural teeth was used for implant selection, maintaining 1.5 mm between the fixation and the adjacent tooth. Clinical assessment was performed by a clinical examiner at 6 and 12 months after the final prosthesis. The primary variable was the Jemt Papillary Index. Also, implant survival rate (SR), complications, Implant Stability Quotient (ISQ), and patient-reported outcomes measures (PROMs) such as aesthetics, chewing, phonation, comfort, and self-esteem were analyzed.

RESULTS

- A significant amount of papilla filling was observed concerning the baseline, with a trend towards more formation of the papilla in the TG, with a JPI score of 3.
- No significant differences were observed between the two groups regarding implant SR, clinical parameters, and complications.
- In terms of PROMs, a higher satisfaction in the TG was observed, with significant intergroup differences for aesthetics, comfort, self-esteem, and primary stability ISQ (TG: 59.05 (SD: 5.4) vs. CG: 51.55 (SD: 5.7)).

CONCLUSIONS

The 2.9 mm diameter Ti-Zr implants achieved a formation of papilla similar to 3.3 mm implants in the anterior region at 12 months of follow-up after the final prosthetic restoration. The use of Ti-Zr implants with a diameter of 2.9 mm to rehabilitate single teeth in areas of the anterior region, where the mesiodistal distance is limited, showed favorable clinical results and a high degree of satisfaction during 1 year of observation similar to 3.3 mm dental implants.

Adapted from P Herrera-Pérez et al., BMC Oral Health. 2024 Mar 5;24(1):310, for more info about this publication, click [HERE](#)

Clin Implant Dent Relat Res. 2024 May 1

Immediate versus early loading of immediately placed bone-level tapered dental implants with hydrophilic surface in full arch maxillary rehabilitation: A pilot randomized clinical trial with 2-year follow-up.

Aleksa Marković, Ana Todorović, Mirko Glišić, Jovana Marković, Branislav Ilić, Bojan Janjić, Tijana Mišić, Branka Trifković, Uroš Vučić, Miodrag Šćepanović, Michel M Dard

STUDY OBJECTIVES AND METHODS

The aim of this study was to compare implant stabilities between the immediate and early loaded, immediately placed bone-level tapered dental implants in the maxilla and to evaluate marginal bone loss (MBL), oral health-related quality of life (OHRQoL), and patient satisfaction at a 2-year follow-up. A pilot, prospective, randomized, controlled clinical trial was conducted on 24 maxillary failing dentition patients. The bone-level tapered implants of 12 patients were immediately loaded with temporary restorations, while the other 12 patients did not receive any kind of temporization. Implant-supported screw-retained complete porcelain-fused-to-metal prostheses were delivered to all patients in the seventh postoperative week.

RESULTS

- The insertion torque values of implants assigned to the immediate and early loading groups were 33.0 ± 4.87 and 29.26 ± 8.31 Ncm, respectively.
- The dynamics of implant stability changes from implant placement up to a 2-year follow-up were similar for both groups (Penguin®, $p = 0.268$; Ostell®, $p = 0.552$), while the MBL was at submillimeter level.
- The cumulative implant survival rate was 91.80% for immediately loaded implants and 97.22% for early loaded implants, without significant difference ($p = 0.162$).
- The total score on the Oral Health Impact Profile questionnaire significantly decreased over time in both groups, indicating improvement in OHRQoL ($p < 0.001$), and the high level of patient satisfaction remained after 2 years of function regardless of a loading protocol.

CONCLUSIONS

Both loading protocols, immediate and early, of six immediately placed bone-level tapered dental implants are an adequate treatment choice for fixed rehabilitation of the maxillary failing dentition.

Adapted from A Marković et al., Clin Implant Dent Relat Res. 2024 May 1, for more info about this publication, click [HERE](#)

Int J Oral Maxillofac Implants. 2024 Apr 5;0(0):1-46.

Bone-level Tapered Implants for Single Tooth Replacement. Immediate vs Delayed Placement: A Randomized, Controlled, Multi-center One-year No-inferiority Clinical Study

Saba Sameeh Ghazal, Rawan Marey Alshahry, Michael P Mills, William Martin, Tara L Aghaloo, David L Cochran

STUDY OBJECTIVES AND METHODS

Post-market, prospective, randomized, controlled, multi-center study with a primary endpoint of one year. 53 subjects were randomized to receive either immediate implant placement (test group) or delayed implant placement (control group). The mean crestal bone-level changes from implant loading to 12 months post-implant loading were measured using standardized, digital periapical radiographs. Changes in facial plate thickness measured on cone-beam computed tomography (CBCT) images, implant success and survival, implant stability, soft tissue changes, patient-centered outcomes, and adverse effects were measured to assess outcomes between the test and control treatments at 12 months post-loading.

RESULTS

- 46 subjects completed the study (23 in each group). Mean bone changes from loading to the 12 month follow-up were recorded with no statistically significant difference ($p=0.950$) between both groups.
- The hypothesis was confirmed that immediate implant placement (Test) in extraction sockets is similar to delayed placement (Control).
- The test group was found to be similar to the control group ($P=0.022$) in terms of mean changes in facial plate thickness.
- Implant survival and success were 95.8% in the test group and 92% in the control group.
- Stability in the control group was superior at the time of surgery, but there was no difference between both groups at implant loading, producing a non-significant p-value of (0.563).

CONCLUSIONS

This randomized, controlled, multi-center one-year study showed comparable outcomes 1-year after prosthetic loading in the immediate and delayed placement groups.

Adapted from SS Ghazal et al., Int J Oral Maxillofac Implants. 2024 Apr 5;0(0):1-46., for more info about this publication, click [HERE](#)

Clin Oral Implants Res. 2024 Apr 3

A randomized clinical trial on zirconia versus titanium implants in maxillary single tooth replacement

J H W de Beus, M S Cune, J W A Slot, C Jensen-Louwerse, S la Bastide-van Gemert, H J A Meijer, G M Raghoobar, U Schepke



STUDY OBJECTIVES AND METHODS

The aim of this study was to compare zirconia and titanium dental implants in the maxillary premolar region. The comparison was based on marginal bone level (MBL) changes, clinical parameters, aesthetic outcomes, and patient related outcome measures (PROMs) 1 year after prosthetic loading. Fifty patients were randomly assigned to receive either a zirconia (ZrO₂, n = 25) implant or a titanium (Ti, n = 25) bone-level implant. Implants were provided with a lithium disilicate crown 3 months after placement. Follow-up was at 1 month and after 1 year. The primary outcome pertained to changes in MBL. Reported secondary outcomes consisted of implant survival, peri-implant tissue health, aesthetics, and PROMs.

RESULTS

- Mean MBL change after 1 year was 0.01 mm (SD = 0.45; min = 0.72, max = 0.86) for ZrO₂ and -0.09 mm (SD = 0.34; min = 0.53, max = -1.06) for Ti (p = .439).
- Scores for the other clinical outcome parameters and PROMs were generally favorable, with no significant differences.
- Significant differences were found for the aesthetic outcomes regarding two criteria: (a) level of facial mucosa (p = 0.022), in favor of Ti, and (b) root convexity/soft tissue color and texture (p = .005) in favor of ZrO₂.

CONCLUSIONS

The ZrO₂ and Ti implant types used in this study, replacing a single missing maxillary premolar, show a comparable outcome in terms of MBL change after 1 year. Clinical and aesthetic parameters, as well as PROMs, are favorable and similar between both implant types after 1 year of prosthetic loading. These short-term study results suggest that both are suitable for clinical use.

Adapted from JHW de Beus et al., Clin Oral Implants Res. 2024 Apr 3, for more info about this publication, click [HERE](#)

Clin Oral Implants Res. 2024 Apr 4.

Immediate versus delayed implant placement of novel fully tapered tissue-level implants - A retrospective multicenter clinical study

Eik Schiegnitz, Keyvan Sagheb, Leila Raahimi, Jochem König, Adriano Azaripour, Bilal Al-Nawas



STUDY OBJECTIVES AND METHODS

The aim of this study was to compare the clinical and radiological outcomes of novel fully tapered tissue-level implants in immediate implant placement (type 1) versus late implant placement (type 4) for the first time. 318 fully tapered tissue-level implants in 65 patients were inserted immediately (n = 68 implants) or late (n = 250 implants) in two different centers. Implant survival and success rates and marginal bone levels were analyzed.

RESULTS

- After a mean follow-up of 12.0 ± 5 months, implant survival rates were 97.8% for all implants.
- No statistically significant difference in implant survival rates between type 1 and type 4 could be detected (98.5% vs 97.6%, HR 0.70, 95%-CI 0.084-5.81).
- Neither for implant length (HR 0.53, 95%-CI 0.055-5.08) nor for implant width (HR 0.27, CI 0.028-2.55), a significant influence on implant survival could be detected.
- Type of used biomaterial for filling the gap and immediate loading showed no effect on implant survival.
- Mean marginal bone loss was 0.02 ± 0.05 mm for type 1 and 0.04 ± 0.1 for type 4

CONCLUSIONS

Within the limitations of this retrospective study and the short follow-up, the results demonstrated comparable high survival and success rates and stable marginal bone levels for type 1 and type 4 placement of this novel tissue-level implant (no clinical trial registration as retrospective study design).

Adapted from E Schiegnitz et al., Clin Oral Implants Res. 2024 Apr 4., for more info about this publication, click [HERE](#)

Clin Oral Implants Res. 2024 Apr 3

Influence of scanning protocol on the accuracy of complete-arch digital implant scans: An in vitro study

Adam Hamilton, William Matthew Negreiros, Shruti Jain, Matthew Finkelman, German O Gallucci



STUDY OBJECTIVES AND METHODS

The aim of this study was to assess the influence of two intraoral scanning (IOS) protocols on the accuracy (trueness and precision) of digital scans performed in edentulous arches. Twenty-two abutment-level master casts of edentulous arches with at least four implants were scanned repeatedly five times, each with two different scanning protocols. Protocol A (IOS-A) consisted of scanning the edentulous arch before inserting the implant scan bodies, followed by their insertion and its subsequent digital acquisition. Protocol B (IOS-B) consisted of scanning the edentulous arch with the scan bodies inserted from the outset. A reference scan from each edentulous cast was obtained using a laboratory scanner. Trueness and precision were calculated using the spatial fit analysis, cross-arch distance, and virtual Sheffield test. Statistical analysis was performed using generalized estimating equations (GEEs). Statistical significance was set at $\alpha = 0.05$.

RESULTS

- In the spatial fit test, the precision of average 3D distances was 45 μm ($\pm 23 \mu\text{m}$) with protocol IOS-A and 25 μm ($\pm 10 \mu\text{m}$) for IOS-B ($p < .001$), and the trueness of average 3D distances was 44 μm ($\pm 24 \mu\text{m}$) with protocol IOS-A and 24 μm ($\pm 7 \mu\text{m}$) for IOS-B ($p < .001$).
- Cross-arch distance precision was 59 μm ($\pm 53 \mu\text{m}$) for IOS-A and 41 μm ($\pm 43 \mu\text{m}$) for IOS-B ($p = .0035$), and trueness was 64 μm ($\pm 47 \mu\text{m}$) for IOS-A and 50 μm ($\pm 40 \mu\text{m}$) for IOS-B ($p = .0021$).
- Virtual Sheffield precision was 286 μm ($\pm 198 \mu\text{m}$) for IOS-A and 146 μm ($\pm 92 \mu\text{m}$) for IOS-B ($p < .001$), and trueness was 228 μm ($\pm 171 \mu\text{m}$) for IOS-A and 139 μm ($\pm 92 \mu\text{m}$) for IOS-B ($p < .001$).

CONCLUSIONS

The IOS-B protocol demonstrated significantly superior accuracy. Placement of scan bodies before scanning the edentulous arch is recommended to improve the accuracy of complete-arch intraoral scanning.

Adapted from A Hamilton et al., Clin Oral Implants Res. 2024 Apr 3, for more info about this publication, click [HERE](#)

REFERENCES

A Perez et al., Int J Periodontics Restorative Dent. 2024 May 24;44(3):1-11 | JC Imber et al., J Periodontol Res. 2024 May 19 | T Gill et al., Clin Oral Implants Res. 2024 May 31 | D Hadaya et al., Clin Oral Implants Res. 2022 May;33(5):501-510 | R Wipawin et al., BMC Oral Health. 2024 Mar 8;24(1):312 | P Herrera-Pérez et al., BMC Oral Health. 2024 Mar 5;24(1):310 | A Marković et al., Clin Implant Dent Relat Res. 2024 May 1 | SS Ghazal et al., Int J Oral Maxillofac Implants. 2024 Apr 5;0(0):1-46 | JHW de Beus et al., Clin Oral Implants Res. 2024 Apr 3 | E Schiegnitz et al., Clin Oral Implants Res. 2024 Apr 4 | A Hamilton et al., Clin Oral Implants Res. 2024 Apr 3 | source: www.pubmed.gov | Dr. Marcin Maj holds the position of Head of Global Scientific Affairs at Institute Straumann in Basel, Switzerland