Scientific Highlights of the Month

SHORT OVERVIEWS ON RECENTLY PUBLISHED SCIENTIFIC EVIDENCE.

February 2018
FEATURED VIDEO
WHAT’S NEW IN STARGET
EDITOR’S CHOICE
Osteointegration of Tissue-Level Implants With Very Low Insertion Torque in Soft Bone: A Clinical Study on SLA Surface Treatment.

IMPLANT SOLUTIONS
Osteoblastic differentiating potential of dental pulp stem cells in vitro cultured on a chemically modified microrough titanium surface.

Effects of Osteotomy Lengths on the Temperature Rise of the Crestal Bone During Implant Site Preparation.

An up to 17-year follow-up retrospective analysis of a minimally invasive, flapless approach: 18,945 implants in 7,783 patients.

Comparison of peri-implant and periodontal marginal soft tissues in health and disease.

Immediate provisionalization in the esthetic zone: 1-year interim results from a prospective single-cohort multicenter study evaluating 3.0-mm-diameter tapered implants.

Clinical and aesthetic outcomes of immediately placed single-tooth implants with immediate vs. delayed restoration in the anterior maxilla: A retrospective cohort study.

PROSTHETIC SOLUTIONS
Custom Morse taper zirconia abutments: Influence on marginal fit and torque loss before and after thermomechanical cycling.

Horizontal bone-augmentation procedures in implant dentistry: prosthetically guided regeneration.

BIOMATERIALS
Combining enamel matrix proteins with mechanical stimuli potentiates human periodontal ligament fibroblasts proliferation and periodontium remodeling.

Novel Biomaterials Used in Medical 3D Printing Techniques.

Alveolar ridge preservation in the esthetic zone.


Soft-Tissue Grafting Techniques Associated With Immediate Implant Placement.

A prospective controlled trial comparing xenograft/autogenous bone and collagen-stabilized xenograft for maxillary sinus augmentation—Complications, patient-reported outcomes and volumetric analysis.

REFERENCES
Featured video

Immediate restoration in the esthetic zone using bone level tapered implants.
Dr Arndt Happe

What’s new in STARGET

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Restoration of a 3D bony defect in region 46 with pre-fabricated...
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A clinical case report by Bernhard Gesenius, Germany

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CEO Marco Gadola on Straumann Group 2017 full year results

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- 08 Feb 2018
- Enablement and education
Dr. Sepohi Tarabi, Iran
OSTEINTTEGRATION OF TISSUE-LEVEL IMPLANTS WITH VERY LOW INSERTION TORQUE IN SOFT BONE: A CLINICAL STUDY ON SLA SURFACE TREATMENT.
Verardi S, Swoboda J, Reaudi F, Reaudi A

Study objectives
The present work tested the hypothesis that implants unstable at insertion could achieve osteointegration with proper implant surface treatment. Eleven Straumann tissue-level implants with sandblasted, large-grit, acid-etched (SLA) surface treatment were placed in soft bone unfavorable to primary stability, as indicated by insertion torque lower than 10 N/cm and slight mobility on the application of a lateral load of 250 g. After 4 to 6 months of healing, a reverse torque of 35 Ncm was applied to assess osteointegration.

Results and conclusions
- All implants appeared to be clinically osseointegrated and were successfully restored and loaded with fixed partial dentures or single crowns. After 28.5 months, all implants remained functional.
- Within the limitations of the low number of implants analyzed, it can be concluded that tissue-level implants with sandblasted and acid-etched surface treatment can achieve osteointegration, even in the absence of primary stability.

Adapted from Verardi S. et al Implant Dent. 2018 Feb;27(1):5-9. for more info about this publication click HERE
Implant solutions


Osteoblastic differentiating potential of dental pulp stem cells in vitro cultured on a chemically modified microrough titanium surface.


Study objectives
The aim of this study was to determine surfaces influence on dental pulp stem cells (DPSCs) viability and differentiation. Implants were divided into sandblasted/acid-etched (control) and sandblasted/acid-etched coated with calcium and magnesium ions (CaMg), supplied as composite, (test). Proliferation was evaluated by MTT, differentiation checking osteoblastic gene expression, PGE2 secretion and matrix formation, inflammation by Interleukin 6 (IL-6) detection.

Results and conclusions
- MTT and IL-6 do not modify on test.
- A PGE2 increase on test is recorded.
- BMP2 is higher on test at early experimental points, Osterix and RUNX2 augment later.
- Alizarin-red S reveals higher matrix production on test.
- These results suggest that test surface is more osteoinductive, representing a start point for in vivo studies aiming at the construction of more biocompatible dental implants, whose integration and clinical performance are improved and some undesired effects, such as implant stability loss and further surgical procedures, are reduced.

Adapted from De Colli M. et al, Dent Mater J. 2018 Feb 8, for more info about this publication click HERE


Effects of Osteotomy Lengths on the Temperature Rise of the Crestal Bone During Implant Site Preparation.

Katic Z, Jukic T, Stubijar D

Study objectives
The aim of this study was to compare temperatures of the crestal bone during implant site preparation for different osteotomy lengths and implant systems. Bovine ribs were used to simulate the cortical bone of the human mandible. Three different implant systems were tested: Astra Tech, Ankylos, and XiVE. Drilling force, drilling speed, drilling length, and temperature were recorded.

Results and conclusions
- Differences in the maximum temperature of the crestal bone during the first drilling for various osteotomy lengths (P = 0.021) and all implant systems (P = 0.013) were observed. A similar result was showed during the second drilling, osteotomy lengths (P = 0.014) and drilling systems (P = 0.003). Second drillings showed lower temperatures of the crestal bone with statistical differences on all measurements (P < 0.001).
- Astra Tech and Ankylos implant systems showed similar performance; XiVE had lower temperature and higher temperature differences between osteotomy lengths. The XiVE system showed the best performance.
- Temperature above 47°C that could cause bone necrosis was not recorded at any time.
- Different drilling lengths contributed to the variation in temperature regardless of the implant system. Longer drills and osteotomies induced higher temperatures on the crestal bone. The maximum temperature difference between the shortest and the longest osteotomy was under 1°C.

Adapted from Katic Z. et al, Implant Dent. 2018 Feb 13, for more info about this publication click HERE
Implant solutions

An up to 17-year follow-up retrospective analysis of a minimally invasive, flapless approach: 18 945 implants in 7783 patients.

Jesch P, Jesch W, Bruckmoser E, Kiebs M, Kladek T, Seemann R

Study objectives
The aim of this study was to evaluate the survival rates of implants in patients using a mucoperiosteal punch for flapless implantation in the majority of cases in order to evaluate its medical efficacy and safety. Between 1994 and 2015 all patients with complete data treated at the Wienerberg Dental Clinic, Vienna, Austria, were included and statistically analyzed in Cox proportional hazard (PH) models. As patients with multiple implants were included, a clustering term was added to the Cox PH model to respect pooled failures in patients. Of the initial 24 282 ANKYLOS/Dentsply implants placed in 8137 patients a total of 7783 patients with 18 495 implants were finally included. The mean follow-up was 2.8 ± 3.2 up to 17.9 years.

Results and conclusions
- Cumulative survival rates (CSRs) after 1, 3, 5, and 10 years were 98.5%, 97.7%, 96.7%, and 93.0%, respectively. Of these, 17 517 (92.5%) implants were placed minimally invasive via a flapless approach by use of the ATP-Punch with comparable survival rates as observed for flap surgery.
- The Cox PH models proved smoking (hazard ratio [HR] = 2.2) and implant position as significant factors of implant survival. In the maxilla, canines and third molars were identified as low risk sites in comparison to the most frequently implanted first premolar site. In the mandible, the central incisor and second premolar were identified as high-risk sites, the canine as low risk site in comparison to the most frequently placed first molar site.
- The analyzed data concludes the safety and medical efficacy of the ATP-Punch. The CSRs using this flapless technique are comparable to the classic surgical flap approach.

Adapted from Jesch P et al., Clin Implant Dent Relat Res. 2018 Feb 15, for more info about this publication click HERE

Comparison of peri-implant and periodontal marginal soft tissues in health and disease.

Ivanovski S, Lee R

Study objectives
The integrity of the peri-implant soft-tissue seal is crucial for maintaining peri-implant tissue health. Whilst the transmucosal component of the restored implant shares some common features with teeth, namely the presence of a junctional epithelium and a connective tissue component, there are some important differences. A key difference is the nature of the relationship of the connective tissue with the implant surface, whereby there is ‘adaptation’ of collagen fibers in a parallel orientation in relation to the implant, but insertion of fiber attachment perpendicularly into cementum in the case of teeth. This, combined with reduced cellularity and vascularity in the peri-implant connective tissue, may make implants more susceptible to disease initiation and progression.

Adapted from Ivanovski S et al, Periodontol 2000. 2018 Feb;76(1):116-130, for more info about this publication click HERE
Implant solutions


Immediate provisionalization in the esthetic zone: 1-year interim results from a prospective single-cohort multicenter study evaluating 3.0-mm-diameter tapered implants.


Study objectives
The aim of this interim analysis of a 5-year prospective multicenter study is to evaluate clinical and radiological performance of immediately provisionalized 3.0-mm-diameter tapered implants. Patients needing implant rehabilitation of maxillary lateral incisors or mandibular lateral and central incisors were treated with 3.0-mm-diameter implants placed in extraction or healed sites and immediately provisionalized. Marginal bone levels and changes, complications, the papilla, plaque, and bleeding indices, and the pink esthetic score (PES) were evaluated at each follow-up visit.

Results and conclusions
- Seventy-one patients with 82 implants completed the 1-year follow-up. Three implants failed yielding a CSR of 96.7%. All failures occurred within the first 3 months after implant insertion.
- Marginal bone level changes from insertion to 6 months was -0.57±1.30 mm (n = 75) and from insertion to 12 months - 0.25±1.38 mm (n = 72).
- Fifteen non-serious complications were recorded. Papilla index score and PES improved at the 1-year follow-up.
- Plaque formation and bleeding-on-probing showed no statistically significant differences between the 6-month and the 1-year visit.
- This 1-year analysis demonstrated high survival, stable bone levels, and healthy soft tissue with 3.0-mm-diameter implants.
- Narrow diameter implants are a safe and predictable treatment option in patients with limited bone volume and/or limited interdental space and eligible for immediate loading protocols.

Adapted from Kolinski M. et al, Clin Oral Investig. 2018 Feb 3 for more info about this publication click HERE
Implant solutions


Clinical and aesthetic outcomes of immediately placed single-tooth implants with immediate vs. delayed restoration in the anterior maxilla: A retrospective cohort study.

Arora H, Ivanovski S

Study objectives
The aim of this study was to evaluate the impact of the timing of restoration on clinical and aesthetic outcomes following immediate implant placement in the maxillary aesthetic zone. Forty patients (16 males, 24 females) with a mean age of 50.55 ± 12.79 years (range 19-74) who had a single maxillary anterior tooth replaced by an immediate implant were included in this study. Twenty patients had their implant restored immediately with a provisional restoration (Group A), while the other 20 patients had a delayed restoration placed after 3-4 months of non-submerged healing (Group B).

Results and conclusions
- No significant differences were observed in the bone level changes between the two groups: 0.05 ± 0.65 mm mesially and 0.06 ± 0.52 mm distally for the immediate group and 0.30 ± 0.54 mm mesially and 0.21 ± 0.60 mm distally for the delayed group, respectively.
- The median PES scores were 11.5 for Group A and 10 for Group B.
- Mean PES and WES scores did not differ significantly between Groups A and B: PES (11.1 vs. 10.3; p = .16) and WES (8.4 vs. 7.8; p = .16).
- In terms of individual PES variables, the distal papillae were significantly better in Group A as compared to Group B (p = .006).
- Within the limits of this study, timing of restoration seemed to positively affect the aesthetic outcomes of immediately placed implants as evidenced by higher median PES values for the immediate restoration group when compared to the delayed restoration group.
- Restoration timing had no impact on the individual PES variables, except for the distal papillary height which was superior in the immediate restoration group.

Adapted from Arora H. et al., Clin Oral Implants Res. 2018 Feb 16 for more info about this publication click HERE.
Prosthetic solutions


Custom Morse taper zirconia abutments: Influence on marginal fit and torque loss before and after thermomechanical cycling.
Moris ICM, Faria ACL, Ribeiro RF, Fok AS, Rodrigues RCS

Study objectives
The aim of this in vitro study was to evaluate the marginal fit and torque loss of customized and non-customized aesthetic zirconia abutments associated with Morse taper implants before and after thermomechanical cycling. Twenty-four implant/abutment/crown sets were divided into three groups (N = 8): Zr - non-customized zirconia abutments, Zrc - customized zirconia abutments, and Ti- titanium abutments. The ceramic crowns of the upper canines were made. All of the abutments were tightened with 15-N.cm torque, and the crowns were cemented on the abutments. The misfits and torque loss were measured before and after thermomechanical cycling.

Results and conclusions
- Thermomechanical cycling significantly decreased the marginal misfit only with the Zrc (p = 0.002), and the Ti was significantly different from the Zr and Zrc before and after thermomechanical cycling.
- Thermomechanical cycling did not affect the torque losses of the groups, but a significant difference between the Zr and Zrc (p = 0.0345) before cycling was noted.
- Customization of zirconia abutments does not significantly affect torque loss and marginal misfit after thermomechanical cycling suggesting that they can be safe for clinical utilization.

Adapted from Moris ICM et al, J Mech Behav Biomed Mater. 2018 Feb;78:241-245., for more info about this publication click HERE


Horizontal bone-augmentation procedures in implant dentistry: prosthetically guided regeneration.
Chiapasco M, Casentini P.

Study objectives
This article presents an evidence-based, prosthetically driven approach for the treatment of edentulous ridges with horizontal defects. The classification of bony defects, the main augmentation techniques, the selection criteria among different surgical procedures for different types of bony defects, and the advantages, disadvantages and limitations of each technique, are described in detail.

Adapted from Chiapasco M et al, Periodontol 2000. 2018 Feb 25, for more info about this publication click HERE
**Biomaterials**

Histol Histopathol. 2018 Feb 27;11978

**Combining enamel matrix proteins with mechanical stimuli potentiates human periodontal ligament fibroblasts proliferation and periodontium remodeling.**

**Zou R, Wan W, Li J, Du C, Wang Y, Qian , Niu L**

**Study objectives**

The aim of this study was to test the combined effects of EMPs and mechanical stimuli on the proliferation of human periodontal ligament fibroblasts (HPDLFs) and Col-I and MMP-1 mRNA expression. Primary HPDLFs were isolated using an enzyme digestion method. The impact of EMPs combined with mechanical stimuli on Col-I and MMP-1 mRNA expression were measured by reverse transcription polymerase chain reaction.

**Results and conclusions**

- 100 µg/mL of EMPs and a 50 kPa mechanical stimulus were chosen as the optimum parameters due to the higher proliferation rates than other doses.
- The combination of 100 µg/mL of EMPs and a 50 kPa mechanical stimulus significantly stimulated HPDLFs proliferation and increased Col-I and MMP-1 expression levels compared with incubation with two factors alone.
- The combination of EMPs and mechanical stimulus have synergistic effects on cell growth, cell number, collagen turnover, and periodontium remodeling.

**Adapted from Zou R et al., Histol Histopathol. 2018 Feb 27;11978, for more info about this publication click HERE**

J Funct Biomater. 2018 Feb 7;9(1)

**Novel Biomaterials Used in Medical 3D Printing Techniques.**

**Tappa K, Jammalamadaka U**

**Study objectives**

In the esthetic zone, in the case of tooth extraction, the clinician is often confronted with a challenge regarding the optimal decision-making process for providing a solution using dental implants. This is because, after tooth extraction, alveolar bone loss and structural and compositional changes of the covering soft tissues, as well as morphological alterations, can be expected. Ideally, the therapeutic plan starts before tooth extraction and it offers three options: spontaneous healing of the extraction socket; immediate implant placement; and techniques for preserving the alveolar ridge at the site of tooth removal. The decision-making process mainly depends on: (i) the chosen time-point for implant placement and the ability to place a dental implant; (ii) the quality and quantity of soft tissue in the region of the extraction socket; (iii) the remaining height of the buccal bone plate; and (iv) the expected rates of implant survival and success.

Based on scientific evidence, three time-periods for alveolar ridge preservation are described in the literature:

(i) soft-tissue preservation with 6-8 weeks of healing after tooth extraction (for optimization of the soft tissues);
(ii) hard- and soft-tissue preservation with 4-6 months of healing after tooth extraction (for optimization of the hard and soft tissues); and (iii) hard-tissue preservation with > 6 months of healing after tooth extraction (for optimization of the hard tissues).

**Adapted from Tappa K et al., J Funct Biomater. 2018 Feb 7;9(1), for more info about this publication click HERE**
Biomaterials

Periodontol 2000. 2018 Feb 27

Alveolar ridge preservation in the esthetic zone.
Jung RE, Ioannidis A, Hämmerle CHF, Thoma DS.

Study objectives
The aim of this study was to test the combined effects of EMPs and mechanical stimuli on the proliferation of human periodontal ligament fibroblasts (HPDLFs) and Col-I and MMP-1 mRNA expression. Primary HPDLFs were isolated using an enzyme digestion method. The impact of EMPs combined with mechanical stimuli on CoH and MMP-1 mRNA expression were measured by reverse transcription polymerase chain reaction.

Results and conclusions
• 100 µg/mL of EMPs and a 50 kPa mechanical stimulus were chosen as the optimum parameters due to the higher proliferation rates than other doses.
• The combination of 100 µg/mL of EMPs and a 50 kPa mechanical stimulus significantly stimulated HPDLFs proliferation and increased Col-I and MMP-1 expression levels compared with incubation with two factors alone.
• The combination of EMPs and mechanical stimulus have synergistic effects on cell growth, cell number, collagen turnover, and periodontium remodeling.

Adapted from Jung RE et al, Periodontol 2000. 2018 Feb 27, for more info about this publication click HERE

Int J Oral Maxillofac Implants. 2018 Feb 8

Zhang Q, Jing D, Zhang Y, Miron RJ.

Study objectives
The aim of this study was to compare new bone formation in bone defects created in both normal and osteoporotic animals loaded with three types of bone grafts from different origins. Forty-eight female Wistar rats were equally divided into control normal and ovariectomized animals. Bilateral 2.5-mm femur defects were created and filled with an equal weight of (1) natural bone mineral (NBM, BioOss) of bovine origin, (2) demineralized freeze-dried bone allograft (DFDBA, LifeNet), or (3) biphasic calcium phosphate (BCP, Vivoss).

Results and conclusions
• All bone substitutes demonstrated osteoconductive potential at 3 and 6 weeks with higher osteoclast numbers observed in all ovariectomized animals.
• NBM displayed continual new bone formation with little to no sign of particle degradation, even in osteoporotic animals.
• DFDBA particles showed similar levels of new bone formation but rapid particle degradation rates with lower levels of mineralized tissue.
• BCP bone grafts demonstrated significantly higher new bone formation when compared with both NBM and DFDBA particles; however, the material was associated with higher osteoclast activity and particle degradation. Interestingly, in osteoporotic animals, BCP displayed synergistically and markedly more rapid rates of particle degradation.
• The results from this study point to the clinical relevance of minimizing fast-resorbing bone grafting materials in osteoporotic phenotypes due to the higher osteoclastic activity and greater material resorption.

Adapted from Zhang Q et al., Int J Oral Maxillofac Implants. 2018 Feb 8, for more info about this publication click HERE
Biomaterials

Compent Contin Educ Dent. 2018 Feb;39(2):e1-e4

Soft-Tissue Grafting Techniques Associated With Immediate Implant Placement.
Bishara M, Kurtzman GM, Khan W, Choukroun J, Miron RJ.

Study objectives
Immediate implant placement often presents challenges in terms of predictably obtaining soft-tissue coverage over the implant site. While delayed implant placement offers the ability for soft tissues to grow and invade the extraction socket making their attachment around implants more predictable, immediate implant placement poses a significant risk of bacterial invasion towards the implant surface as a result of insignificant soft-tissue volume. This article discusses soft-tissue grafting techniques associated with immediate implant placement, presents several cases demonstrating the use of PRF in routine immediate implant placement, and further discusses the biological and economic advantages of PRF for the management of soft-tissue grafting during immediate implant placement.

Adapted from Bishara Met al, Compend Contin Educ Dent. 2018 Feb;39(2):e1-e4, for more info about this publication click HERE


A prospective controlled trial comparing xenograft/autogenous bone and collagen-stabilized xenograft for maxillary sinus augmentation: Complications, patient-reported outcomes and volumetric analysis.
Alayan J, Ivanovski S

Study objectives
The aim of this study was to compare maxillary sinus augmentation (MSA) using two different materials-anorganic bovine bone mineral (ABBM) + autogenous bone (AB) (control group) vs. collagen-stabilized ABBM (test group) in terms of complications, patient-reported outcome measures (PROMs) and volumetric analysis. Sixty patients underwent sinus augmentation (30 control + 30 test group). Intra- and postoperative complications were recorded. PROMs measured the impact of grafting on daily activities, pain and morbidity.

Results and conclusions
• All complications were minor and did not prevent completion of the augmentation or subsequent implant placement. Schneiderian membrane perforation was the most frequently encountered complication.
• Both treatment groups reported moderate limitation in the 1st 48 hr post-surgery but little or none by day 3 or 4. Jaw opening, chewing and bruising were significantly higher in the control group.
• The impact on work and social life was moderate initially but reduced to little or none by the 2nd day. Mild to moderate pain and interference to daily activities were reported for the first 3 days requiring the use of NSAIDs only.
• A mean graft volume of 1.46 cm3 (±0.77) was calculated in the control group and 1.27 cm3 (±0.65) in the test group.
• Extent of contact between graft and surrounding sinus walls had a significant impact on bone volume. Shorter (8 mm) implants were utilized more frequently in the test group, which was also more likely to require additional vertical augmentation, but this was not statistically significant.
• MSA using a lateral wall approach is safe and associated with mild to moderate pain and restrictions to daily activities for 48-72 hr. Patients’ reports of morbidity were greater with autogenous bone harvesting. Collagen-stabilized ABBM provides comparable bone volume to AB + ABBM that is sufficient for placement of implants of adequate size with no need for further vertical augmentation. Engaging the surrounding sinus walls had a significant positive impact on graft volume.

Adapted from Alayan J. et al, Clin Oral Implants Res. 2018 Feb;29(2):248-262, for more info about this publication click HERE
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