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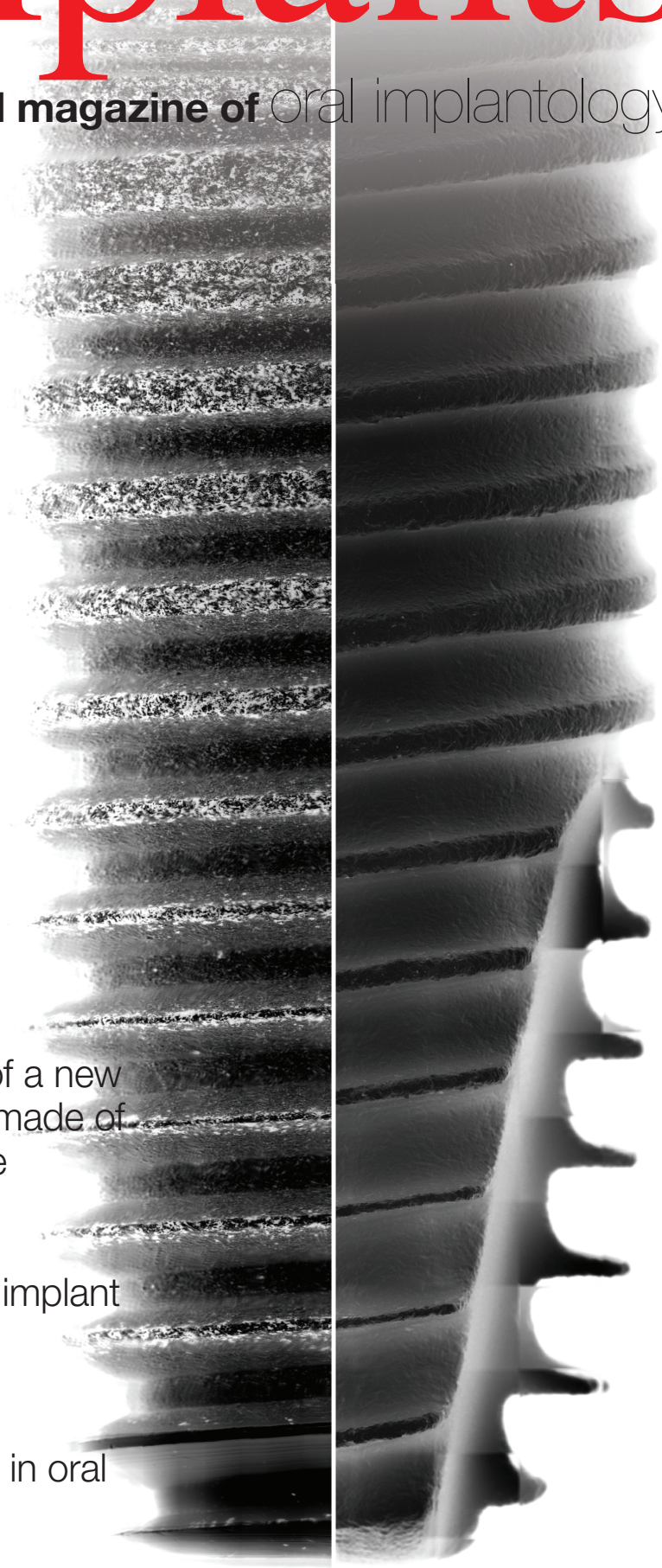
implants

international magazine of oral implantology



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Dr Georg Bach

President of the DGZI

Minimally invasive implant therapy can be implemented in many ways

We can look back with gratitude and pride on the successful international annual congress of the German Association of Dental Implantology, which took place this year in Berlin in Germany. A common theme ran throughout many of the contributions to the scientific programme: the demand for a minimally invasive procedure that is as gentle on the tissue as possible.

The reality has already become apparent in the past few years: the digital workflow is increasingly being integrated into oral implantology. The digital impression—whether from an intra-oral scan or derived from the dental model—the individual CAD of the required prosthetic elements and their CAM, as well as the 3D diagnostics and planning of the surgical procedure, can all be seamlessly combined digitally. The possibilities offered by reliable planning, achieved through backward planning, and consistent teamwork between the surgeon, prosthodontist and dental technician enable aesthetic, functional and durable dental restorations.

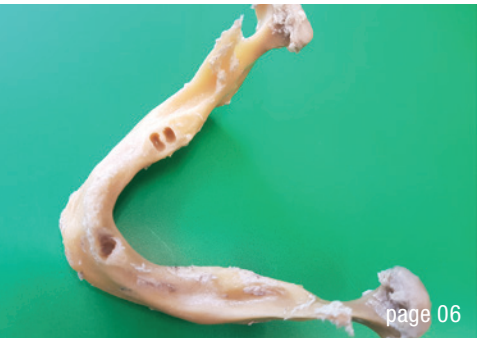
From the patient's point of view, in addition to these possibilities, the invasiveness of the planned intervention plays a decisive role. For the practitioner, the aim is to treat the patient as painlessly and quickly as possible in order to minimise additional stress for the patient, and there are very different minimally invasive approaches to employ for the individual case. Besides the use of reduced-diameter one-piece screw implants with self-tapping threads, there are very different minimally invasive approaches to employ for the individual case. Both the patient's state of health and the desired implant restoration are central starting points for a sound therapy. In the end, which path to take is the joint decision of the practitioner and patient.

I would like to wish you an engaging read of this year's last issue of implants—**international magazine of** oral implantology, as well as a time of introspection leading up to the festive season!

Warm and friendly greetings,

Dr Georg Bach

President of the German Association of Dental Implantology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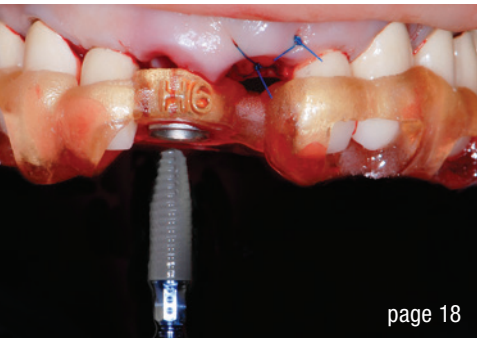
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[1] Semper-Hogg, W, Kraft, S, Stiller, S et al. Analytical and experimental position stability of the abutment in different dental implant systems with a conical implant–abutment connection Clin Oral Invest (2013) 17: 1017
[2] Semper Hogg W, Zulauf K, Mehrhof J, Nelson K. The influence of torque tightening on the position stability of the abutment in conical implant-abutment connections. Int J Prosthodont 2015;28:538-41

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Development of a new guided sleeve made of zirconia dioxide

Application for surgical guides in dental implantology

Literature

Leonard Vollmer, Dr Rainer Valentin, Dr Rolf Vollmer, Prof. Werner Götz, Germany

The field of dental implantology has developed enormously over the last 50 years. Not only the actual dental implants but also the placement techniques and the possibilities of predictable planning have changed and improved greatly. In order to make implant placement in the jaw safer and as accurate as possible, methods have been developed to use 3D data obtained in advance. This technique became possible after the development of CT by Hounsfield in 1972 and the introduction of reduced-radiation CBCT.[1–3]

With the help of the data obtained, surgical guides can be produced with appropriately incorporated guided sleeves. This enables the most precise implantation possible.[5] In this regard, Schnutenhaus et al. found that implants placed with surgical guides were positioned more precisely than those placed freehand.[6]

Generally, metal drills paired with metal guided sleeves are used in dental implantology.[7] However, this can cause abrasion during guided drilling and contamination of the surgical site.[8] Experience in hip arthroplasty shows that metal–metal pairings are unfavourable in their abrasion behaviour. The metal particles can cause inflammation of the surrounding tissue, abrasion disease or particle disease.[9] In dentistry, the abrasion in the surgical area also poses risks in terms of wound healing and eventual peri-implantitis.[10,11] Titanium ions from the titanium particles indirectly evoke an inflammatory reaction, and it is assumed that the osteoblasts are damaged.[12,13] In orthopaedics, a ceramic–ceramic pairing offers an alternative with lower biological activity and a 27-fold reduction in abrasion. The following article presents the development of a new guided sleeve of zirconia for surgical guides for accurate drilling while avoiding chipping or particle abrasion that can cause peri-implantitis or particle disease.

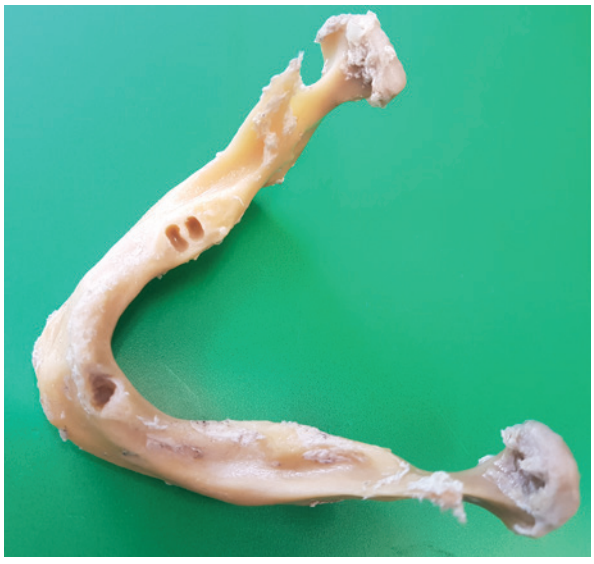

Fig. 1: Lower jaw preparation before drilling. (© Leonard Vollmer)

Objective

The objective of the research was to test the chip abrasion of a combination of a zirconia sleeve with a zirconia drill and compare it with that of a titanium guided sleeve used in combination with a steel drill in order to prevent or minimise the risks associated with chip abrasion. For this purpose, test drillings were carried out on an anatomical specimen and subsequently compared histologically and by means of energy-dispersive X-ray spectroscopy (EDS).

Materials and methods

Ten drillings with the combination of a zirconia guided sleeve and zirconia drill and one drilling with a titanium guided sleeve and steel drill were carried out and subsequently examined (Table 1).

Bone material

An anatomical edentulous macerated mandibular specimen fixed in paraformaldehyde was used for the experiment (Fig. 1). This preparation was chosen to simulate an *in vivo* situation. The portions of the cortical bone were broad and the cancellous structures dense. The

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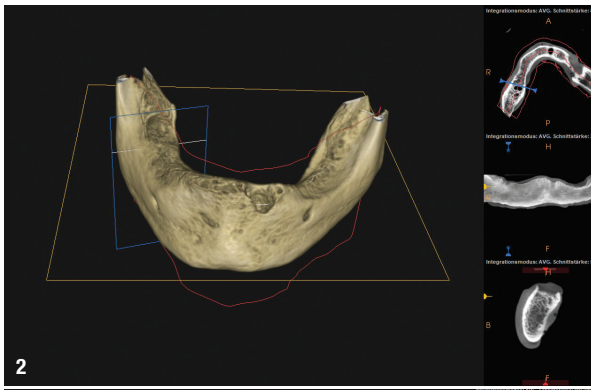
bone quality corresponded to the D2 classification according to Lekholm and Zarb.[14] The ramus of the mandible was separated from the body of the mandible to keep the drilling of the steel drill in conjunction with the titanium guided sleeve and the zirconia drills in conjunction with zirconia guided sleeves separate and to exclude contamination.

CBCT scanning of mandibular bone for planning and positioning of the drills

The fixed jaw sections were scanned in a CBCT unit (CS 9300, Carestream Dental; Fig. 2). This was followed by digital planning (CS 3D, Version 3.8.6, Carestream Dental). Eleven implants were planned and positioned in the bone, ten in the body of the mandible (Fig. 3) and one in the ramus. The data was then imported into the coDiagnostiX technical program (Dental Wings) to produce both the jaw model and the bone-supported surgical guides.

Fabrication of the jaw model and the guides

The model and guides were fabricated using the NextDent 5100 printer (3D Systems). NextDent Model 2.0 in grey was used for printing the jaws, and NextDent SG was used for the surgical guide. Since surgical guides are made of plastic and direct drilling through plastic leads to extremely strong abrasion of this by sharp implant drills, the guided sleeves must be made of a correspondingly harder material. The guide was therefore provided with titanium or zirconia guided sleeves.



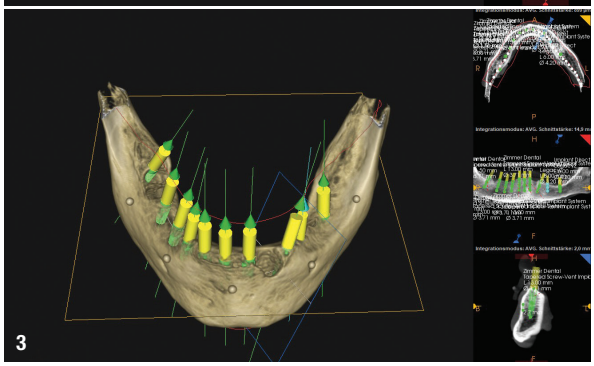


Fig. 2: CBCT scan of the body of the mandible in the planning program, showing broad portions of cortical bone and dense cancellous structures.

Fig. 3: CBCT scan of the body of the mandible in the planning program showing ten implants positioned. (© Leonard Vollmer)

Implant planning	
CBCT device	CS 9300 (Carestream Dental)
Planning program	CS 3D, Version 3.8.6 (Carestream Dental)
Design program	coDiagnostiX (Dental Wings)
3D-printing	
Printer	Nextdent 5100 (3D Systems)
Model material	Nextdent Model 2.0/grey (3D Systems)
Guide material	Nextdent SG (3D Systems)
Guided sleeves and drills	
Titanium guided sleeve	M.27.31.D200L5 (Steco)
Zirconia guided sleeve	Utility model no. 202020103184.8
Adhesive for sleeves	BLUE FIX (FLUSSFISCH)
Steel pilot drill	210L16.204.020 (Komet Dental)
Zirconia pilot drill	K210L19.204.020 (Komet Dental)
Histological examination	
Separation unit (large diamond disc)	333C450 (HORICO)
Plastic infiltrate	2-hydroxyethylmethacrylate
Plastic infiltrate	Technovit 7200 VLC (Kulzer)
Light polymerisation unit	EXAKT
3-component resin	Technovit 4000 (Kulzer)
Vacuum precision adhesive press	EXAKT
Grinding machine	EXAKT 400 CS
Diamond bandsaw	EXAKT 300 CP
Light microscope	ZEISS Axioscope 2
Video camera	ZEISS AxioCam MRc
Dye	Toluidine blue

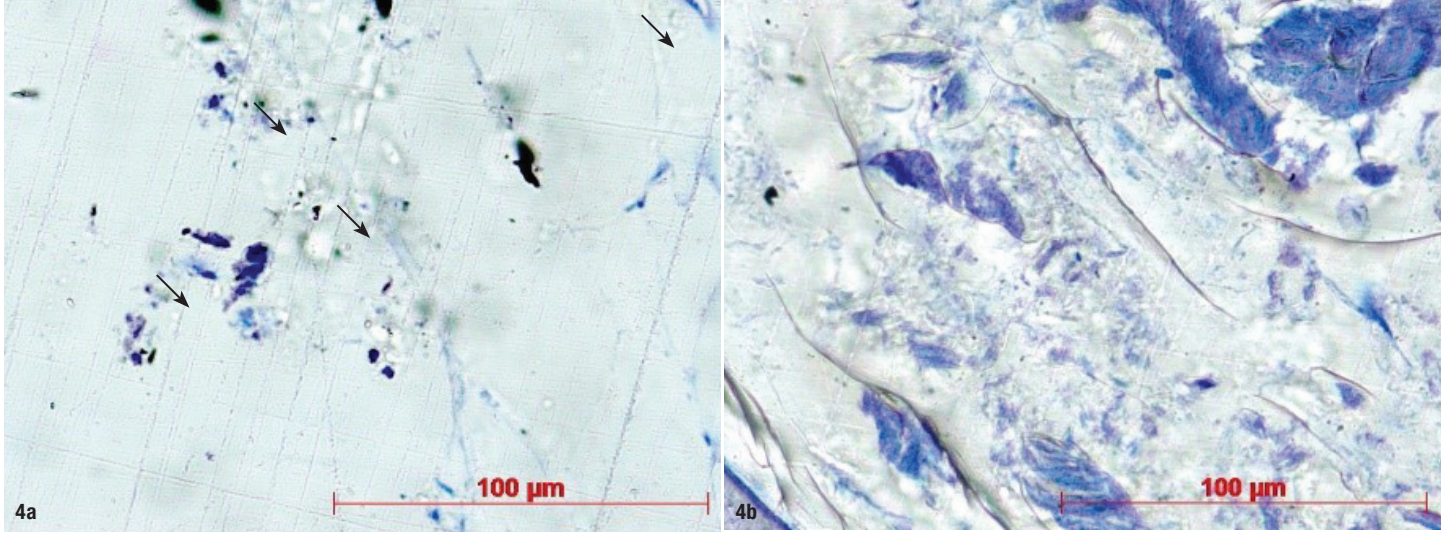
Table 1: Overview of the materials used.

Guided sleeves

A M.27.31.D200L5 titanium guided sleeve (Steco) with an inner diameter of 2 mm was glued (BLUE FIX, FLUSSFISCH) into the surgical guide for the ramus. No guided sleeve of zirconia is commercially available, so new guided sleeves were made from yttrium tetragonal zirconia polycrystals according to our specifications:

– collar according to our own design;
– inner diameter of 2 + 0.02 mm or + 0.04 mm;
– length of 8 mm;
– chamfer of 0.5 × 45° on the opposite side of the collar.

To ensure quality control, the outer dimensions of the sleeves were measured with a micrometre screw and the inner diameter was checked with test pins. A 2.02 mm diameter test pin, but not a 2.04 mm diameter test pin, had to be able to pass through the inner drill hole. Furthermore, the manufacturer declared that the



Figs. 4a & b: Histological preparation of the tissue of the drill hole made with the titanium sleeve and steel drill combination. The arrows indicate the metal particles. (© Werner Götz, University of Bonn)

sleeves were compliant with the requirements of Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment. The zirconia guided sleeves were glued into the surgical guide.

Drilling

Eleven holes were drilled using the surgical guides. Drilling was carried out without cooling at a low speed of a maximum of 400 rpm. A steel pilot drill (210L16.204.020, Komet Dental) was used for drilling in the ramus of the mandible up to the stop, and a zirconia pilot drill (K210L20.204.020, Komet Dental) was used for drilling ten holes (drilling depth of 8–12 mm) in the body.

Histological preparation for the examination

For the histological examination, the fixated mandible was cut into narrow bone slices (approximately 5 mm thick) with a large diamond separating disc (333C450, HORICO), and numbered. These were further processed using a sawing-grinding technique. The sections were first dehydrated in an ascending alcohol series (70%, 90%, 96% and 100%), followed by infiltration in two steps.[15] The specimens were infiltrated with a one-to-one mixture of 2-hydroxyethylmethacrylate and Technovit 7200 VLC (Kulzer) for seven days and then infiltrated with Technovit 7200 VLC for another seven days. Both steps were carried out under vacuum (500 kPA) and light exclusion. For polymerisation, the infiltrated preparations were left in a light polymerisation unit (EXAKT) under yellow light for 4 hours and under blue light for 4 hours.

Subsequently, the resulting discs were trimmed and attached to a plastic carrier with a three-component resin (Technovit 4000). Grinding using a micro-grinder (EXAKT 400 CS) was carried out until the holes were reached. Another plastic carrier was fixed to the ground surface, which was the surface to be examined. With a diamond bandsaw (EXAKT 300 CP), a 100–150 µm thick section of the block was removed and ground down to a thickness of 10–15 µm with the micro-grinder. In this way, between one and three preparations could be obtained per bone block. A total of ten segments were prepared. The ground sections were then stained with toluidine blue.

Histological evaluation

The sections were examined under a light microscope (ZEISS Axioscope 2) at different objective magnification (50×, 100×, 200×, 400× and 500×). The images were digitised via a connected digital video camera (ZEISS AxioCam MRc). All histological preparations were examined for artifacts, possible heat damage and other foreign bodies (e.g. caused by abrasion).

Energy-dispersive X-ray spectroscopy

Owing to unclear structures in the histological preparations of Segment 3, they were additionally subjected to

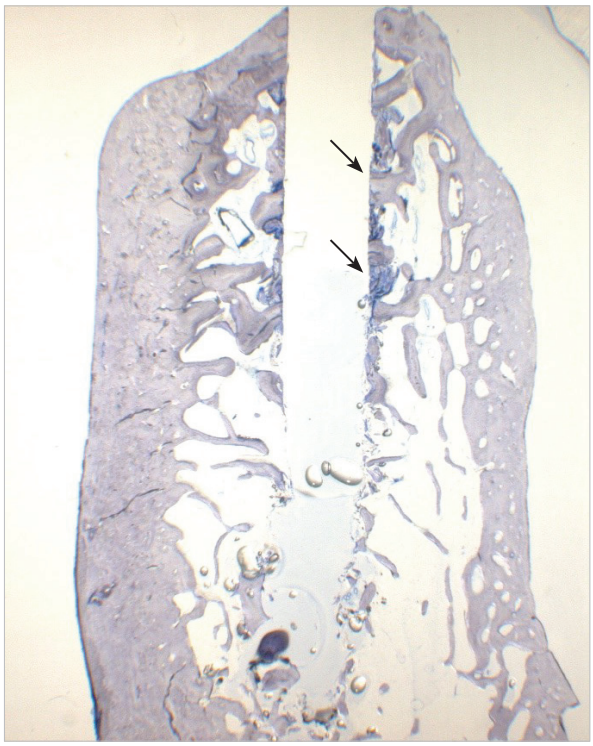


Fig. 5: Histological preparation of segment 3. Compacted debris (marked with arrows). Small granular fragments at the bottom; 500× magnification. (© Werner Götz, University of Bonn)

"The aim of this research was to investigate to what extent abrasion can be found in zirconia or titanium guided sleeves after drilling."

EDS to detect any zirconia. EDS is used to determine element concentrations in solids.[16, 17] It uses "the characteristic X-rays emitted by a solid as a result of electron bombardment to qualitatively and quantitatively determine the elements contained therein".[18]

Results

Observations during drilling

The rather jerky guidance of the steel drill was conspicuous. In contrast to the titanium–steel pairing, the very good gliding ability of the zirconia drill in the zirconia sleeve was noticeable. The drill could be guided very well in the pre-planned sleeves in depth and axis. Macroscopically, no abrasion was detected during drilling. The surfaces of the preparations cut with the steel drill were clean and smooth, as were the surfaces of the preparations cut with the zirconia drills.

Histological results

In the histological preparations of Segments 1–3, 5, 6, 7 and 9, as well as of the tissue of the drill hole made with the titanium sleeve and steel drill combination, frequently occurring artifacts due to the infiltration (e.g. bubble formation, Figs. 4 and 5) were visible. Histologically, no foreign bodies were detected in any of the sections. Granular fragments, smaller bone debris and granular debris were found in all the sections.

Titanium–steel pairing

At the higher magnifications, the titanium–steel segment showed abrasion typical of metal cutting in the form of irregularly shaped blackish particles of up to 20 µm (Fig. 4). Heat damage could not be detected.

Zirconia–zirconia pairing

In the zirconia–zirconia segments, no evidence of zirconia particle abrasion could be found in seven segments when magnified up to 20×. Heat damage could also not be detected in these seven specimens. Only three (3, 5 and 8) of the examined segments showed minor heat damage, and zones of abrasion in these were also suspected. They were thus re-examined at 500× magnification (Fig. 5). There was some indication of a small amount of zirconia abrasion in these preparations; therefore, in order to reliably detect zirconia abrasion, EDS of the affected areas of Segment 3 was carried out. The following elements were detected: carbon, nitrogen, oxygen, sodium, magnesium, aluminium, silicon, phosphorus, sulphur, chlorine, potassium and calcium (Fig. 6). No zirconia was found in the examined areas of the preparations.

The specimens with heat damage were subsequently evaluated for special features. The results are shown in Table 2. The evaluation of the preparations revealed greater angulations in the drill axis (Segment 3) and close contact with hard cortical bone structures (Segments 5 and 8).

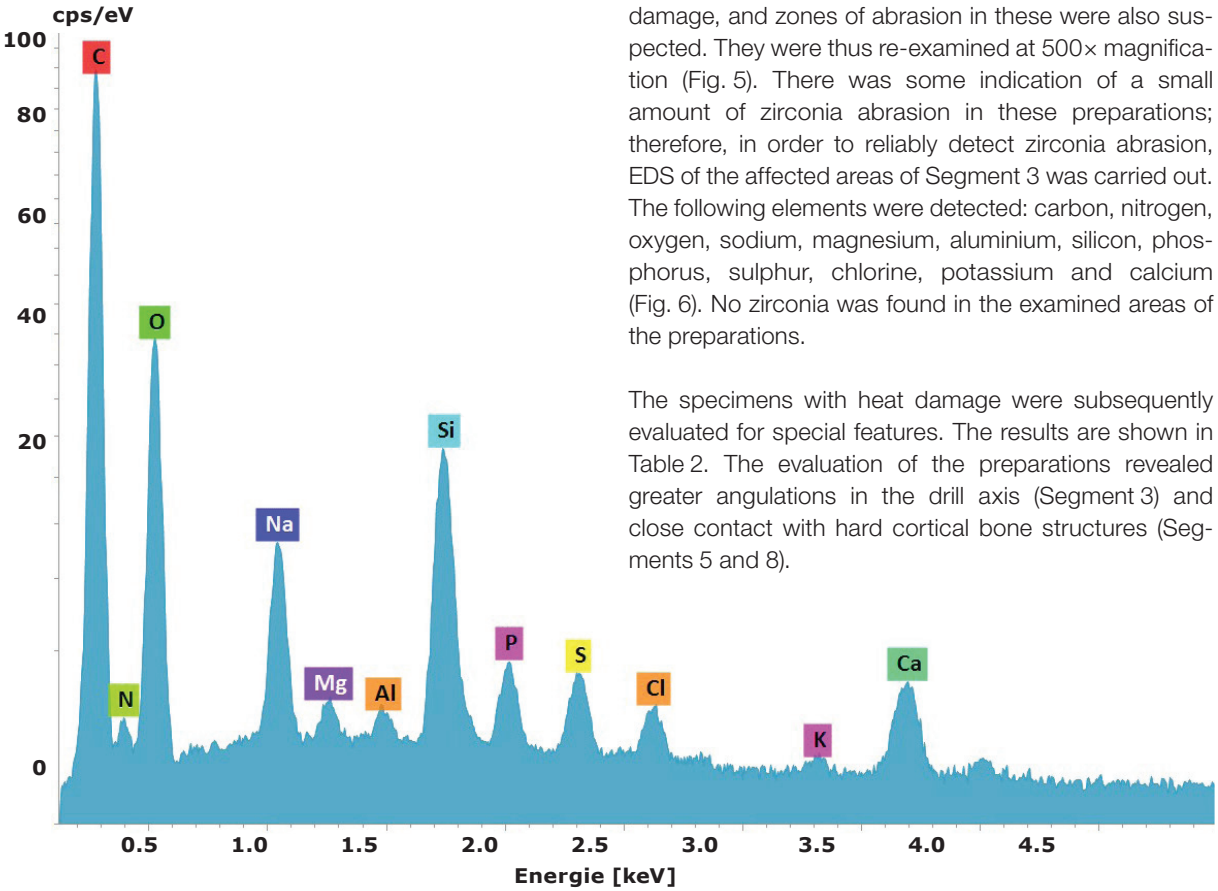


Fig. 6: Spectra of the energy-dispersive X-ray spectroscopy. C = carbon; N = nitrogen; O = oxygen; Na = sodium; Mg = magnesium; Al = aluminium; Si = silicon; P = phosphorus, S = sulphur; Cl = chlorine; K = potassium; Ca = calcium. (© nanoAnalytics GmbH)

Segment	Drill hole depth	Diameter	Angulation	Close contact with cortical structures	Heat damage
1	6.0 mm	2 mm	2°	Yes	No
2	8.0 mm	2 mm	0°	Yes	No
3	13.0 mm	2 mm	21°	No	Yes
4	13.0 mm	2 mm	0°	No	No
5	13.0 mm	2 mm	0°	Yes	Yes
6	13.0 mm	2 mm	0°	No	No
7	11.5 mm	2 mm	10°	No	No
8	11.5 mm	2 mm	11°	Yes	Yes
9	13.0 mm	2 mm	15°	Yes	No
10	13.0 mm	2 mm	25°	Yes	No
Titanium	15.0 mm	2 mm	0°	No	No

Table 2: Overview of the deviations of the drill holes from each other in terms of drill hole depth, angulation, contact with cortical structures and heat damage. (© Leonard Vollmer)

Discussion

The aim of this research was to investigate to what extent abrasion can be found in zirconia or titanium guided sleeves after drilling. Abrasion could be found in titanium guided sleeves but not in zirconia sleeves, neither by histological analysis nor by EDS. In the present test set-up, drilling was always carried out at the same low speed of a maximum of 400 rpm. Whether abrasion occurs in a zirconia–zirconia pairing at higher speeds remains to be investigated.

Titanium particles can lead to intolerance and to inflammatory reactions.[19] Furthermore, the prevalence of titanium particles in the vicinity of diseased peri-implant tissue is higher than that in the vicinity of healthy peri-implant tissue.[20, 21] These particles can originate from metal instruments during implant bed preparation, from the implant surface itself and from the insertion of the abutment.[22] However, "while titanium is subject to tribocorrosion in the biological system and subsequently triggers immunological reactions, [...] zirconia is characterised by excellent corrosion resistance and has a high biological compatibility due to this."[23] The zirconia sleeves examined in the present study could thus possibly represent a further advancement on titanium guided sleeves.

Regarding the deviations from the other drillings found for specimens with heat damage, this may be cited as a point of criticism but are the result of the anatomical mandibular preparation. This made a very realistic examination possible on the one hand, but on the other meant that the drill holes were not all equally reproducible.

This work has laid the foundation for the use of zirconia guided sleeves. In order to make a definitive statement relevant to the practice of dental implantology and to clarify the question of whether zirconia sleeves are clinically preferable to titanium sleeves, a larger number of drill holes should first be tested in another *ex vivo* bone model and then with an *in vivo* approach.

Conclusion

Based on the known problems with titanium particles from hip arthroplasty, the titanium incompatibilities described by Jacobi-Gresser and the effects of titanium particles on peri-implantitis, it can probably be assumed that the use of zirconia guided sleeves in combination with zirconia drills offers advantages over titanium guided sleeves with steel drills.[19, 21]

Acknowledgements: The authors would like to thank Dr Ute Nimtschke (TU Dresden, Germany) for providing the mandible and Beate Schiermeyer-Dunkhase (University Bonn, Germany) for performing the thin-sectioning.

contact

Leonard Vollmer
info.vollmer@t-online.de

Dr Rolf Vollmer
info.vollmer@t-online.de

Prof. Werner Götz
wgoetz@uni-bonn.de

Dr Rainer Valentin
info@zahnarztpraxis-valentin.de

Leonard Vollmer | Dr Rolf Vollmer | Prof. Werner Götz | Dr Rainer Valentin

Snake technique in the treatment of posterior peri-implant soft-tissue defects

Drs Cosmin Dima & Iulia Florea, Romania

Soft-tissue peri-implant defects (papillary loss, decrease of mucosal volume, gingival recession, dehiscence, alteration of the ridge colour) are common complications of implant treatment and affect the final aesthetic result and implant stability in the long term.[1, 2] Many factors can influence the onset of peri-implant soft-tissue defects. Facial bone loss and thin biotype promote peri-implant recession,[3] and a soft-tissue thickness of less than 2 mm promotes peri-implant marginal bone loss.[4, 5] The consequences are exposure of the implant and modification of the abutment–crown ratio. A combination of gingival recession and minimal keratinised mucosa leads to difficulties in plaque removal, inflammation and aesthetic complaints by patients.[6]

Soft-tissue grafting procedures in second-stage surgery are performed at immediate implantation sites for aesthetic reasons, papillary reconstruction, gain in width of keratinised mucosa, increase of mucosal volume and preservation of alveolar ridge contour.[7] The need for management of peri-implant soft-tissue defects is increasing, as immediate implantation is associated with peri-implant gingival recession as the result of the soft-tissue remodelling processes. Also, when implants are placed with no soft-tissue augmentation, peri-implant mucosa may become thin and greyish or may have altered texture due to scars if the flap was not properly managed.[8, 9] Thin peri-implant mucosa (< 2 mm) may be transparent, and thus the implant or abutment may show through it.[10]

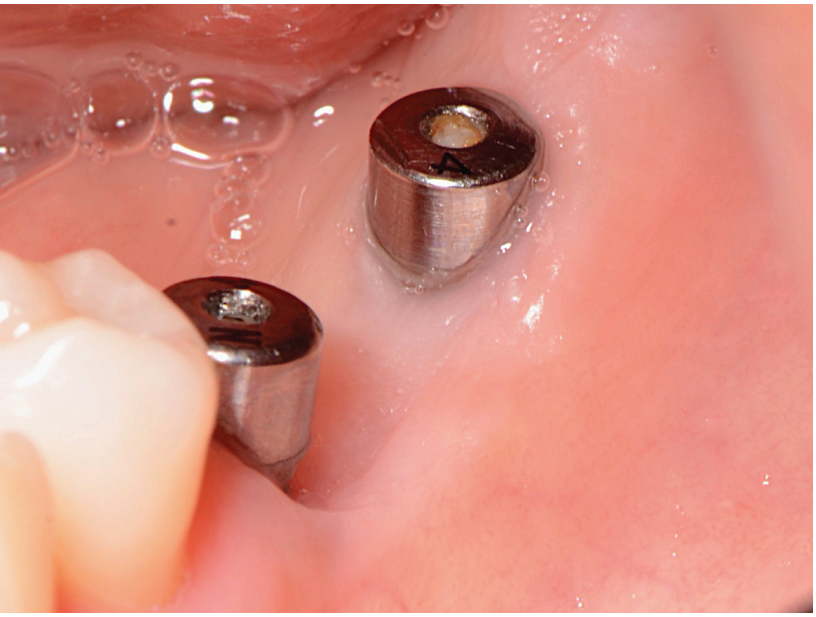
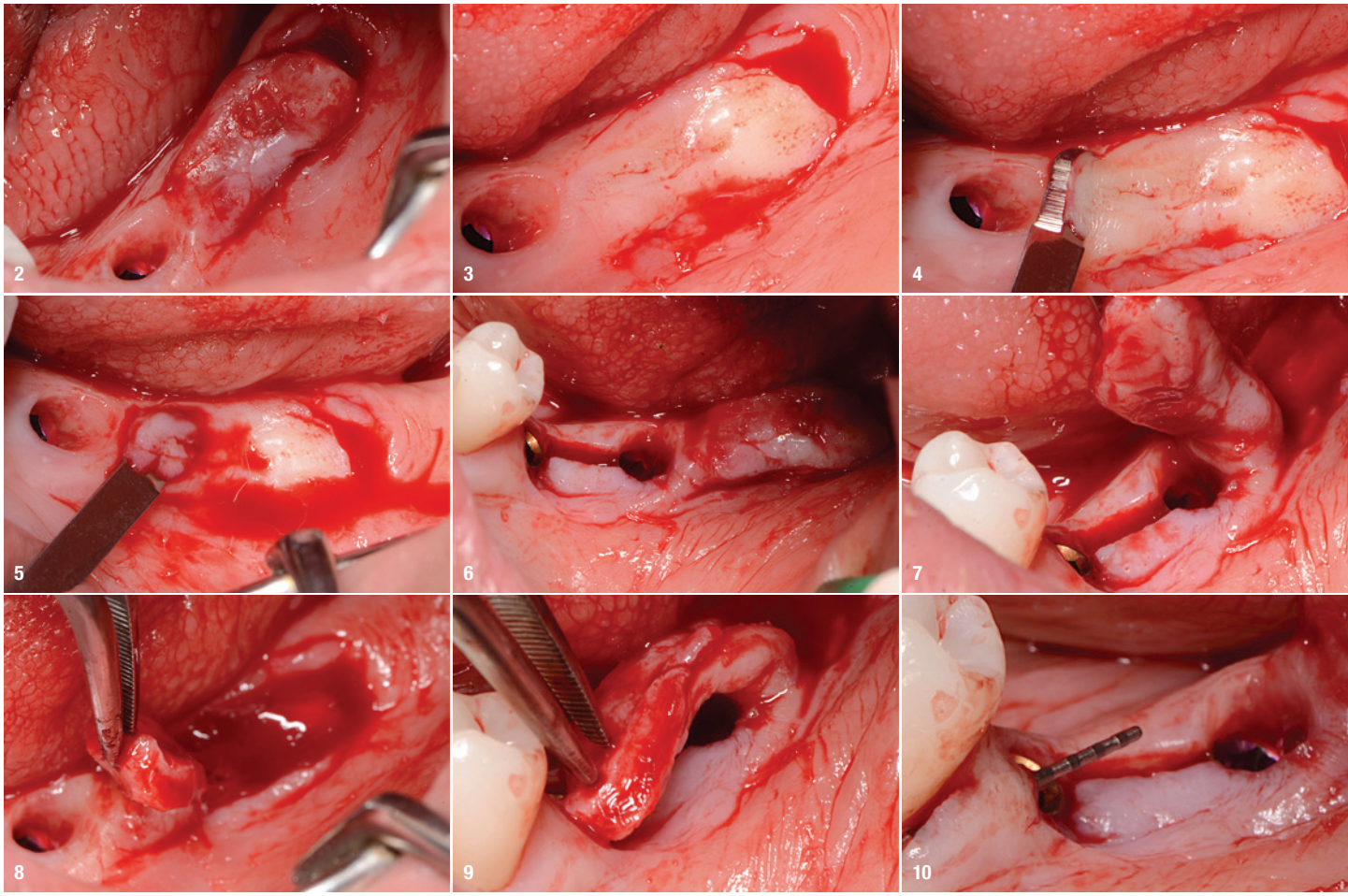


Fig. 1: Pre-op situation, showing the concave area between the implants favouring food retention and peri-implantitis.

Various surgical techniques and a combination of surgical and prosthetic techniques have been described in the therapeutic management of the peri-implant soft-tissue defects. Arguments in favour of second-stage surgical interventions at the level of the peri-implant soft tissue are made in the literature. A review of the literature concluded that, when aesthetic demands are high or proper plaque control is not feasible, regeneration of keratinised mucosa is required in order to maintain the stability of the peri-implant soft tissue.[11] The design of the flap depends on the extent of the peri-implant gingival recession, vestibular depth, width of the attached gingiva and volume of the interproximal tissue.[1] A classic surgical approach uses apically or laterally positioned flaps at the time of implant exposure. These techniques are combined with a free gingival graft when the width of the keratinised mucosa over the alveolar ridge is minimal. An apically positioned flap or vestibuloplasty combined with a free gingival graft or subepithelial connective tissue graft is the best researched technique in soft peri-implant tissue grafting and has been reported to achieve gains in the width of keratinised mucosa of between 1.15 ± 0.81 mm and 2.57 ± 0.50 mm and partial coverage of the implant surface after peri-implant gingival recession.[12] The combination of an apically positioned flap with a collagen matrix, when used to increase the width of keratinised mucosa, has been found to result in less morbidity and surgery time, but to be as effective as the same technique combined with a free gingival graft.[13] Peri-implant soft-tissue conditioning using a free autologous epithelial graft has also been proposed in the



Figs. 2–5: Incising the flap edges and de-epithelisation. **Figs. 6–9:** Partial thickness flap. **Fig. 10:** Pedicle gingival graft try-in.

management of supra-crestal and/or dehiscence-type defect morphology.[14] Techniques using autogenous grafts are significantly more effective in the increase of the peri-implant soft-tissue aesthetics and thickness compared with non-grafting techniques.[15, 16] A systematic review of the literature concluded that the use of autogenous grafts to increase mucosal thickness results in significantly less marginal bone loss in the long term and that the use of an apically positioned flap combined with an autogenous graft to increase the width of keratinised tissue improves bleeding on probing indices and marginal bone levels significantly.[17]

Despite the favourable outcome of the previously described techniques for conditioning of the peri-implant soft tissue, morbidity (because of the wound created at the palatal donor site), dynamic soft-tissue changes and the longer healing period must be considered. Also, although these techniques can resolve volume loss and shallow peri-implant recessions, they are less predictable in the management of deep or large peri-implant recessions and papillary loss.[1] These disadvantages can be overcome by epithelial or connective tissue pedicle flap techniques used with or without collagen matrices.[18, 19]

Pedicle flap techniques are a new minimally invasive surgical approach that can be performed at either a one-stage or two-stage surgery, in both anterior and posterior areas as well as at single and multiple adjacent implants.[18] Pedicle flap techniques are recommended especially in patients demanding retreatment of failed implants and edentulous patients receiving numerous implants that require soft-tissue conditioning with multiple connective grafts.[18] Pandolfi describes a modified flap design (omega roll envelope flap) that combines a roll flap with a modified pouch technique to correct localised horizontal alveolar ridge defects and to increase the peri-implant soft-tissue thickness.[20] This technique avoids harvesting autologous connective tissue from another donor site by using the supra-crestal connective tissue of the implant surgical site. Tabanella describes a buccal pedicle flap technique used in both anterior and posterior areas with a minimum of two adjacent implants.[18] The technique starts with a long lingual horizontal incision running slightly to the buccal side, followed by parasulcular incisions mesially and distally. The mucogingival junction is cut with a #15C blade to avoid flap perforation. The flap is positioned buccally and slight overlapping of tissue on the buccal side creates wrinkles of

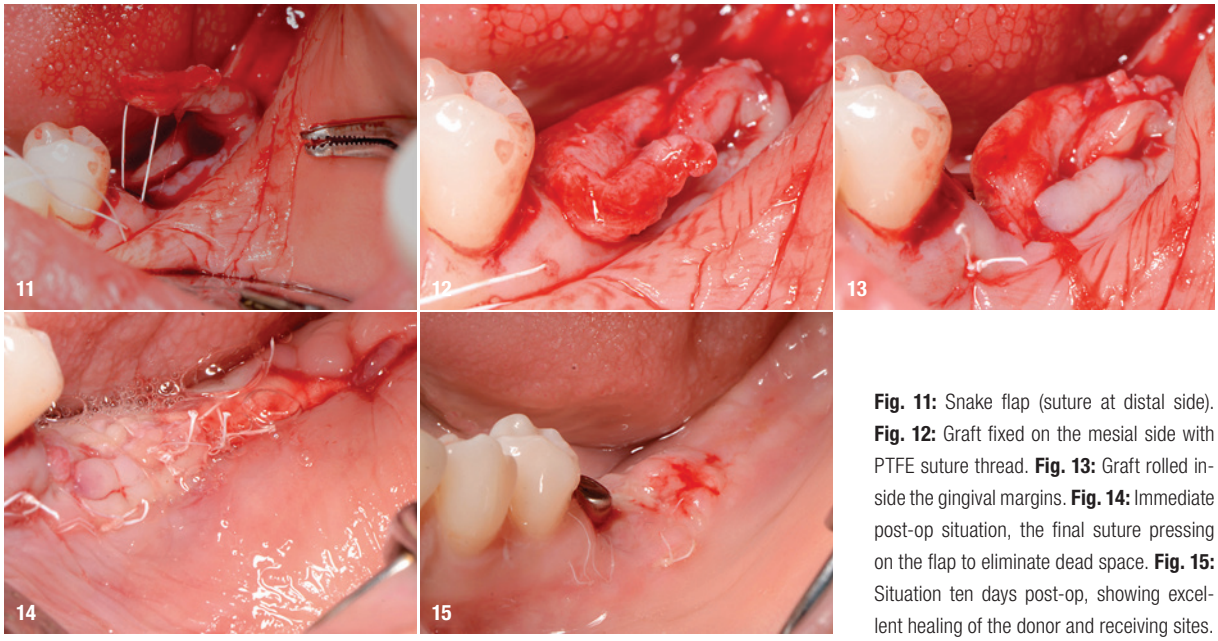


Fig. 11: Snake flap (suture at distal side). **Fig. 12:** Graft fixed on the mesial side with PTFE suture thread. **Fig. 13:** Graft rolled inside the gingival margins. **Fig. 14:** Immediate post-op situation, the final suture pressing on the flap to eliminate dead space. **Fig. 15:** Situation ten days post-op, showing excellent healing of the donor and receiving sites.

tissue that enable the increase of the mucosal volume. Moreno Rodriguez and Caffesse proposed a pedicle flap technique (laterally rotated flap) for the treatment of peri-implant defects.[21] The technique involves the creation of a buccal mesial and apical recipient area around each implant and rotating of a pedicle keratinised tissue flap by 90° from the distopalatal and its positioning and suturing on the peri-implant buccal side.[21, 22]

The objective of this paper is to present a novel surgical approach, the Snake modified pedicle flap technique, to peri-implant soft-tissue conditioning around loaded osseointegrated dental implants in the mandibular posterior area.

Case description

A 47-year-old patient presented with a severely resorbed mandibular posterior alveolar ridge due to molar extractions (Fig. 1). The patient was diagnosed with two posterior sites with peri-implant gingival recession and minimal keratinised tissue (< 1 mm). Peri-implant soft-tissue conditioning was performed four months after the initial implant surgery.

Surgical technique

Anaesthesia was performed in the surgical area with articaine and 1:100,000 adrenaline. The recipient site was prepared by sharp dissection in order to create a periosteal bed free of any muscle attachment. Two crestal parallel incisions were made on the distal area of the implants with a #15C blade and connected by a horizontal incision (Figs. 2–5). The extension of the incisions towards the crestal area and the distance between them depend on the amount of keratinised tissue grafting required for each case. The de-epithelisation of the flap was performed with a #15C blade (Fig. 6). A partial thickness flap was raised (Fig. 7). The flap was released apically by inner superficial incision to allow passive displacement and suturing without tension. It was mesially displaced with a 180° rotation (Figs. 8 & 9). The mesial papilla was prepared for grafting with the tunnelling technique (Fig. 10). The resulting flap was sutured to the recipient bed at the base of the newly created vestibule with #5/0 non-resorbable PTFE suture thread (Coreflon, IMPLACORE). The graft was rolled inside the gingival margins and was fixed to the mesial side with PTFE sutures (Figs. 11–14).

The patient was instructed to rinse twice daily with a 0.12% chlorhexidine mouthrinse for two weeks. Anti-inflammatory therapy (400 mg of ibuprofen every 8 hours) was prescribed for three days. The patient reported no discomfort or postoperative pain. The patient was further recommended to rinse with a 0.2% chlorhexidine mouthrinse twice a day for four weeks and to avoid mechanical hygiene on the operated area. The sutures were removed one week later. Excellent healing of the donor and receiving sites was noted at ten days postoperatively (Figs. 15 & 16). Control visits were scheduled at two and four weeks thereafter, followed by visits at three, six and 12 months, and every six months afterwards for five years (Figs. 17–20). After each control visit, professional maintenance procedures were performed at the surgical area.

Clinical measurements

Peri-implant probing depth was measured at the midpoint of the interproximal side, taking the highest value from the soft-tissue margin to the bottom of the peri-implant sulcus. The buccal thickness of the peri-implant

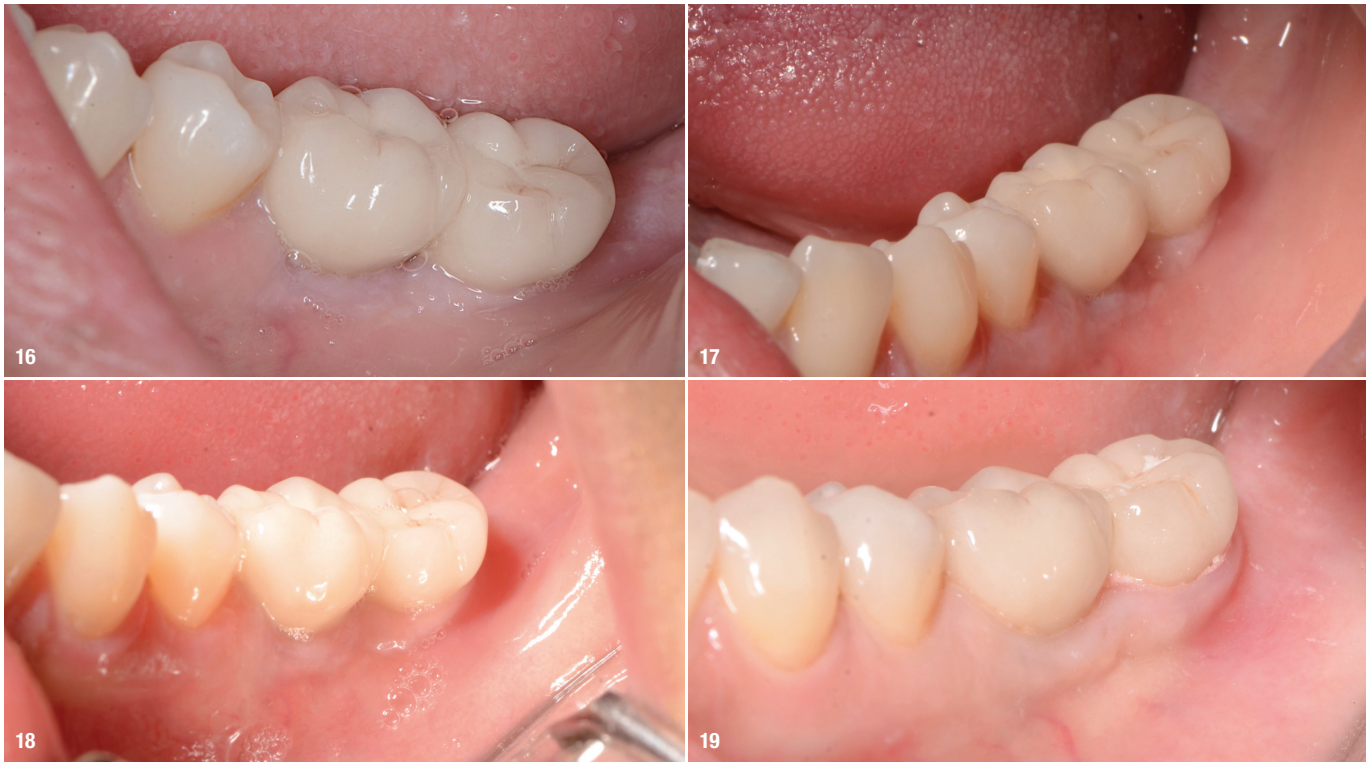


Fig. 16: Clinical aspect of the peri-implant soft-tissue area after loading of the definitive restorations. **Fig. 17:** Clinical aspect of the peri-implant soft-tissue area at one-year follow-up. **Fig. 18:** Clinical aspect of the peri-implant soft-tissue area at two-year follow-up. **Fig. 19:** Clinical aspect of the peri-implant soft-tissue area at five-year follow-up.

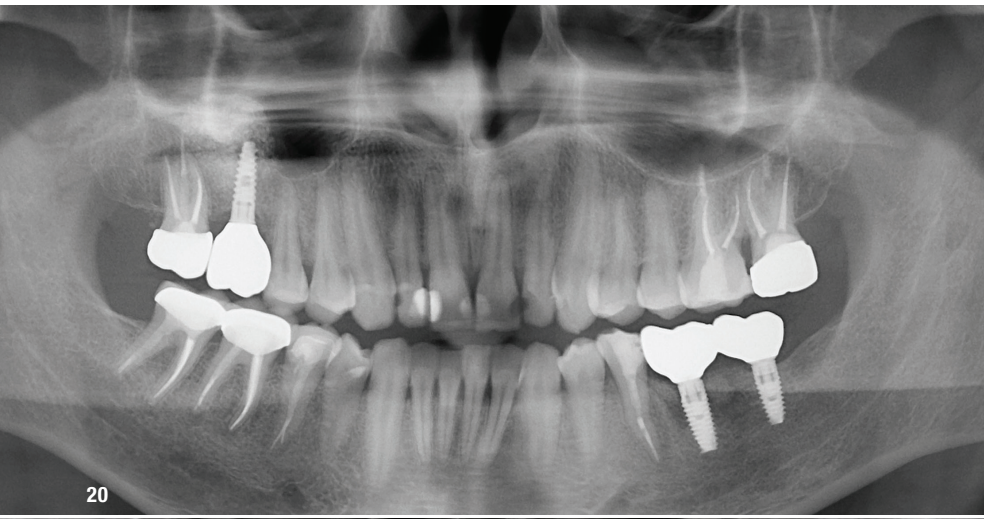
mucosa was measured with an ISO #15 endodontic file at 2 mm from the soft-tissue margins mesial, distal and medial to the implant platform (reference point). The keratinised mucosa was measured with a periodontal probe between baseline and follow-up. The measurements were taken vertically from the implant platform to the free gingival margin at the mid-buccal point. The records were performed preoperatively, immediately postoperatively and at four weeks and one and two years postoperatively. The clinical parameters (width of keratinised mucosa, mucosal volume and recession coverage) were recorded at baseline and at follow-up intervals. At baseline, the width of keratinised mucosa was minimal (1 mm). The gain in width of keratinised mucosa was 2 mm at four weeks, 3 mm at one year and 4 mm at five years postoperatively. The gain in mucosal volume was 3 mm at four weeks, 4 mm at one year and 5 mm at five years postoperatively. The recession coverage was 100% at four weeks, 100% at one year and 100% at five years postoperatively.

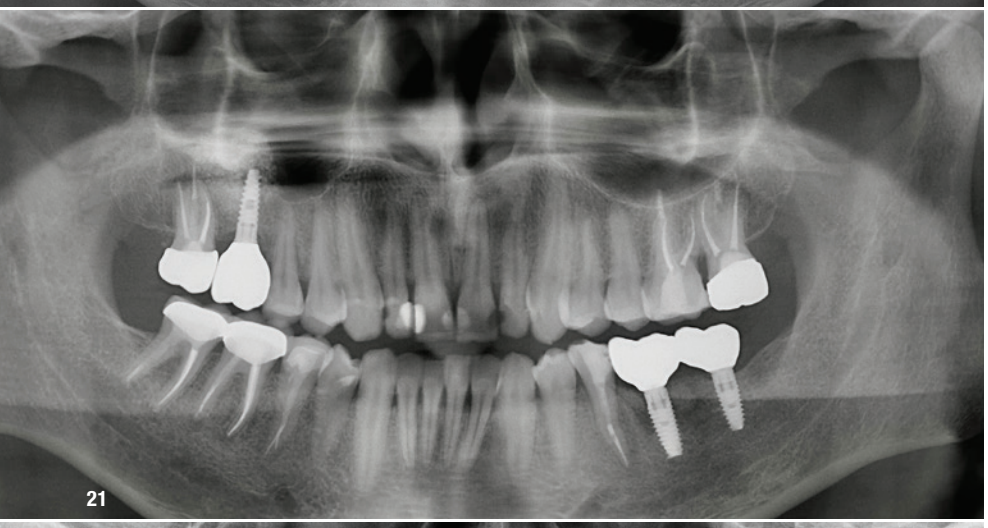
Discussion

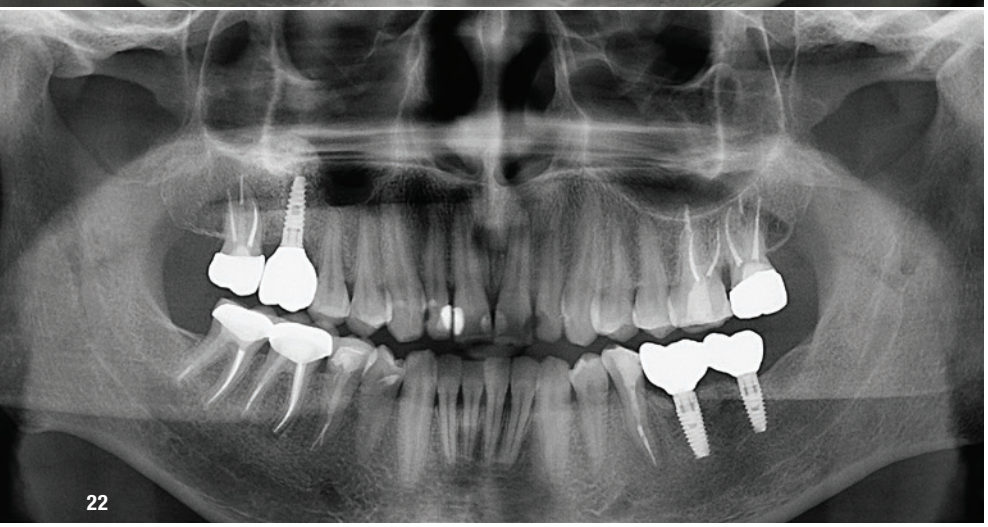
Research has focused on the health of the peri-implant soft tissue because of the importance of adequate width of keratinised mucosa and adequate mucosal thickness in the prevention of biological complications and crestal bone loss.[4, 5] Also, non-mobile attached tissue is necessary to preserve transmucosal components of peri-implant tissue, thus avoiding peri-implant inflammation and biological complications, as well as preserving the peri-implant marginal bone.[24, 25] Peri-implant soft-tissue conditioning techniques are recommended in clinical cases with factors that may alter good prognosis of the soft-tissue stability and implant coverage (convex prosthesis–abutment contour, thin mucosa, distance from the implant platform to the bone crest of > 3 mm, interproximal tissue loss, implant positioned outside the bony envelope).[1]

There is limited scientific evidence regarding the treatment of peri-implant soft-tissue defects.[1] Gains in width of keratinised mucosa were reported by a systematic review that analysed the results of an apically positioned partial thickness flap combined with a free gingival graft, a subepithelial connective tissue graft or xenogeneic grafting material.[12] The same systematic review reported mean rates of between 28.0% and 96.3% for coverage of the soft-tissue recession when a coronally advanced flap was combined with a subepithelial connective tissue graft or allogenic grafting materials or a partial thickness flap was combined with a subepithelial connective tissue graft.[12] Despite the predictability of the classic apically or laterally positioned flap technique (combined with epithelialised soft tissue), recession due to graft contraction, wound stability failure or graft necrosis was reported.[17]

Also, techniques that also use a connective tissue graft or collagen matrix can result in the creation of a mobile peri-implant mucosa that will hinder the stability of the peri-implant soft tissue and will promote biological complications.[26]







Figs. 20–22: Pictures from 2017, 2019 and 2022.

Considering the invasive character and the morbidity of the classic soft-tissue conditioning techniques, variants of the pedicle flap technique have been proposed for different clinical situations, mostly supported by schematic illustrations and clinical case reports.[18, 20–22] Moreno Rodríguez et al. combined their clinical case report with a pilot study.[22] The test group included subjects with partial or complete maxillary implant rehabilitation, buccal soft-tissue defects (absence of keratinised tissue or a soft-tissue width or thickness of < 2 mm) around an osseointegrated implant, hard-tissue dehiscence at buccal level, transparency of the underlying implant surface on the buccal side, and plaque and bleeding indices of less than 30%. The researchers reported a mean 1.37 mm gain in clinical peri-implant buccal attachment, a 3.06 mm gain in soft-tissue thickness and a 4.69 mm gain in width of keratinised mucosa. They also reported the maintenance of the stability of the peri-implant soft tissue for a mean period of 13.50 ± 1.87 months (range of 12.00–18.00 months). Also, other researchers have used pedicle flap techniques in patients with a keratinised soft-tissue thickness and width of less than 2 mm on the buccal side and reported increases of the attached soft tissue and gains of over 2 mm in buccal mucosal thickness and keratinised tissue width.[18, 20] Considering the outcome in the short and medium term, one study reported the improvement in width of keratinised mucosa and mucosal volume in the first three months but a 42.4% shrinkage at 12 months.[14]

Systematic reviews of the literature have found insufficient data to provide recommendations regarding the ideal technique, flap design or graft to be used in the conditioning of the peri-implant soft tissue in relation to the type of peri-implant defect and targeted therapeutic goals (gain in width of keratinised or attached mucosa and in mucosal thickness).[15–17, 27]

The Snake technique was born from the desire to offer patients the least invasive technique in the treatment of vulnerable, thin peri-implant soft tissue. I have

always thought of both the treatment plan and the treatment as if I were the patient, and if I were the patient, I would like to benefit from a complex treatment in a single surgical session without pain and with very fast postoperative healing. The Snake technique has exactly these advantages, and it has the further advantage of creating only one wound, rather than two. Seeing the amount of quality keratinised tissue in the vicinity of the area to be augmented, I wondered why I would graft from the palate when I could use tissue from the immediate area requiring augmentation. Moreover, whereas a gingival graft harvested from the palate completely interrupts vascularisation, the Snake graft is permanently vascularised, which significantly reduces the risk of necrosis.

The distal donor area from where the flap is elevated ensures the availability of keratinised tissue and provides the quality of the connective tissue graft according to the need of the receiving area.[28] The 180° rotation of the flap supports the mobility of the flap without reducing muscle freedom and vestibular depth and while maintaining the blood supply in the mesial peri-implant area.[22] A partial thickness flap ensures the flexibility that supports the gain in mucosal volume. Also, it avoids the formation of peri-implant pseudopockets that could favour the growth of pathogenic bacteria.[18]

The patient had mobile peri-implant soft tissue, a width of keratinised tissue of less than 1 mm and mucosal thickness of less than 2 mm. The soft-tissue margin was at the level of the implant platform. The use of this technique resulted in significant improvements in peri-implant soft-tissue quality, and the attached keratinised tissue gain was 4 mm. The rotated flap employed in the Snake technique has the benefits of a free keratinised mucosa graft, increasing the width of the peri-implant buccal mucosa. It also ensures high blood supply and stability of the pedicle flap, resulting in less shrinkage over time compared with a free soft-tissue graft.[29]

Conclusion

Complete rehabilitation of the peri-implant soft-tissue defects can be successfully achieved using grafting procedures at second-stage surgery. The proposed Snake modified pedicle flap technique improved status of the soft tissue around dental implants considering the gains of width and thickness at one, two and five years postoperatively. The benefits are as follows: no need for a second wound, graft stability, better vascularisation, absence of necrosis risk, faster healing of both donor and receiving sites, and no additonal pain or discomfort. Randomised controlled studies with long-term follow-ups are necessary to validate the long-term predictability of this surgical technique.

about the authors

Dr Cosmin Dima graduated in dentistry from the Carol Davila University of Medicine and Pharmacy in Bucharest in Romania in 2001, was certified in implantology in 2004 and completed his PhD in surgery on the topic of bone regeneration around implants in 2019. He is the managing director of the Dental Progress Clinic in Bucharest. Besides the Snake technique, he has invented the periosteal membrane surgical technique for bone augmentation. Dr Dima is co-founder and educational director of the Digital Dentistry Society in Romania and a member of the Society of Esthetic Dentistry in Romania, European Society of Cosmetic Dentistry and International Congress of Oral Implantologists. In 2020, he received the World's Top 100 Doctor in Dentistry lifetime achievement award from the Global Summits Institute.

Dr Cosmin Dima

Dr Iulia Florea is a passionate and dynamic medical professional with a commitment to serving others through best practices and superior care within ten years of experience in general practice after graduating in dentistry from Carol Davila University of Medicine and Pharmacy in Bucharest in Romania in 2012, regular attendee at dental conferences, dental lectures and scientific events. Adept in planning and implementing appropriate and powerful patient care plans, leading to optimal results. Much of her passion includes dental photography, for which she dedicated part of her ten years of experience in this profession.

Dr Iulia Florea

contact

Dr Cosmin Dima
Dental Progress Clinic
+40 751 336825
www.dentalprogress.ro

Literature

Guided one-stage and two-stage implant placement in the anterior zone

A three-year follow-up

Dr Paula Corvello, Brazil

Certain situations do not allow for immediate placement of implants in the anterior region, mainly when the buccal plate is absent and/or the periodontal phenotype is very thin. In these cases, choosing the surgical technique and biomaterials based on the clinical situation is critical. Furthermore, it is crucial to respect tissue healing times before proceeding to the next phase of treatment.

The following case report describes one-stage and two-stage guided implant placement in a patient with high aesthetic expectations who had to have his maxillary central incisors extracted owing to vertical fractures. The Straumann Bone Level Tapered (BLT) implant, which has an apically tapered and self-tapping design, was used in this clinical case. Its features make it particularly suitable for situations involving poor bone quality or, fresh extraction sockets, where primary stability is critical.

Initial situation

A healthy 72-year-old non-smoking male patient who took no medication came to our clinic having noticed gingival inflammation and bleeding in the area of his two central incisors a few months before. He had previously visited another dentist, who concluded after the clinical and radiographic assessments that the teeth presented vertical fractures and, therefore, needed to be extracted. The patient stated that he would like to have them restored in the shortest possible time and for pleasing aesthetics to be maintained until the end of treatment. The extra-oral examination revealed a low smile (Fig. 1). The intra-oral and CBCT examination showed the vertical root fractures of teeth #11 and 21. Moreover, tooth #21 presented with an active fistula and loss of the buccal bone plate (Figs. 2 & 3).

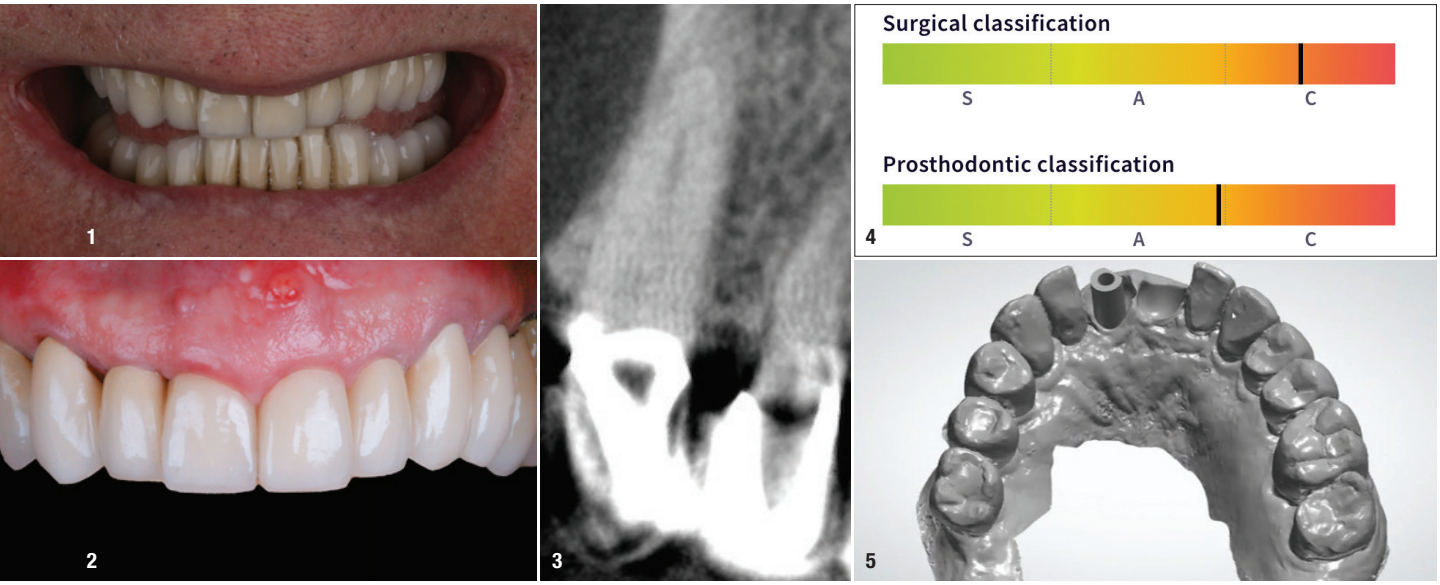


Fig. 1: Initial image of the patient's smile. **Fig. 2:** Clinical image of the maxillary dental arch. **Fig. 3:** CBCT image of tooth #21. **Fig. 4:** Final SAC classification. **Fig. 5:** Intra-oral scan image, occlusal view.

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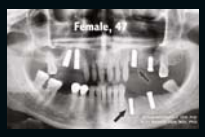

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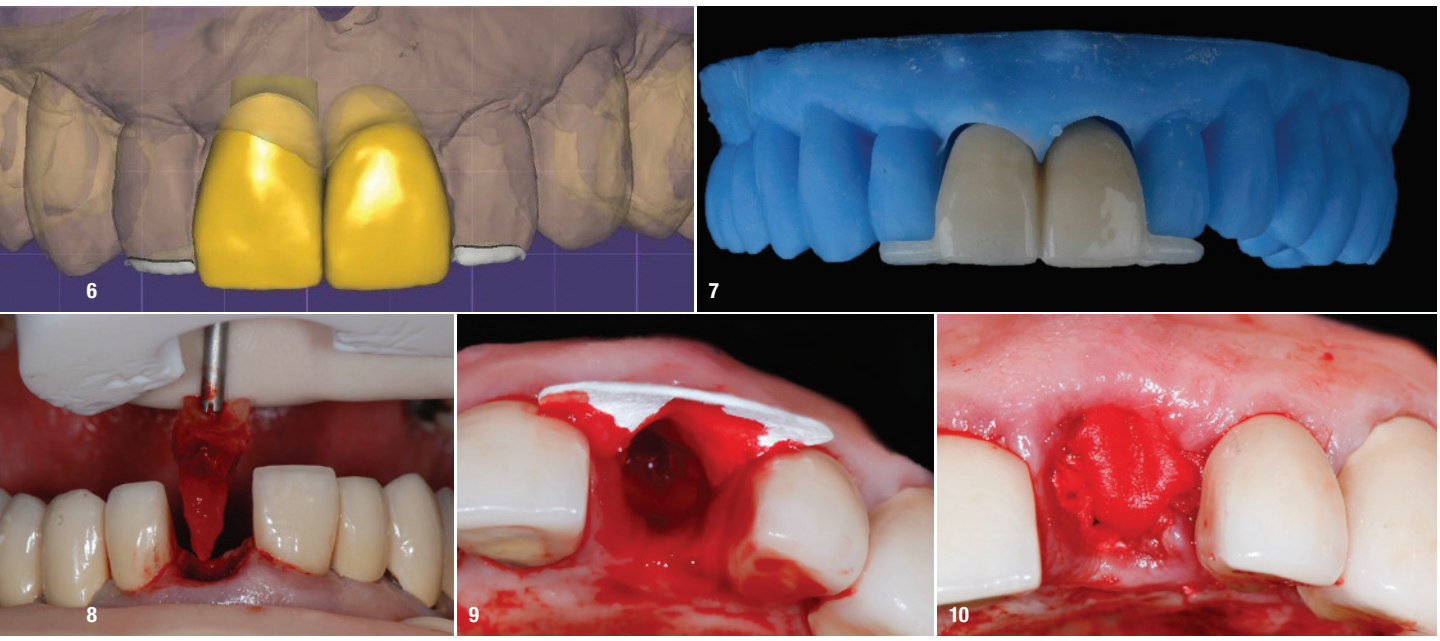


Fig. 6: Digital treatment planning. **Fig. 7:** Immediate screw-retained splinted provisional restoration. **Fig. 8:** Atraumatic extraction of tooth #21. **Fig. 9:** Jason membrane in the mouth. **Fig. 10:** Jason membrane covering the cerabone used together to preserve the extraction socket.

The case was assessed using the SAC classification, which provides an objective, evidence-based framework for assessing the potential difficulty, complexity and risk of an implant-related treatment involved in individual implant dentistry cases in an easy-to-use process. It also helps clinicians with patient selection and treatment planning. The patient was classified as a complex surgical case and advanced prosthodontic case (Fig. 4).

Treatment planning

After a thorough discussion of the various treatment options with the patient, it was decided to perform digital planning, which included guided immediate implant placement in one site and guided delayed implant placement in the other (Figs. 5 & 6). The workflow included the following steps:

- minimally invasive extraction of tooth #21 with alveolar curettage, followed by socket preservation with the bone substitute cerabone and Jason membrane (both botiss biomaterials);
- minimally invasive extraction of tooth #11, followed by immediate placement of a Straumann BLT implant (diameter: 4.1 mm; length: 12.0 mm; SLActive; Roxolid) into the site and filling of the gap between the implant and buccal bone with cerabone, and delivery of provisional screw-retained splinted crowns on implant #11 in the same visit (Fig. 7);
- placement of a Straumann BLT implant (diameter: 3.3 mm; length: 12.0 mm; SLActive; Roxolid) in site #21 after tissue healing;
- delivery of the final screw-retained crowns on implants #11 and 21; and
- yearly follow-up visits for clinical and radiographic assessment and reinforcement of oral hygiene instructions.

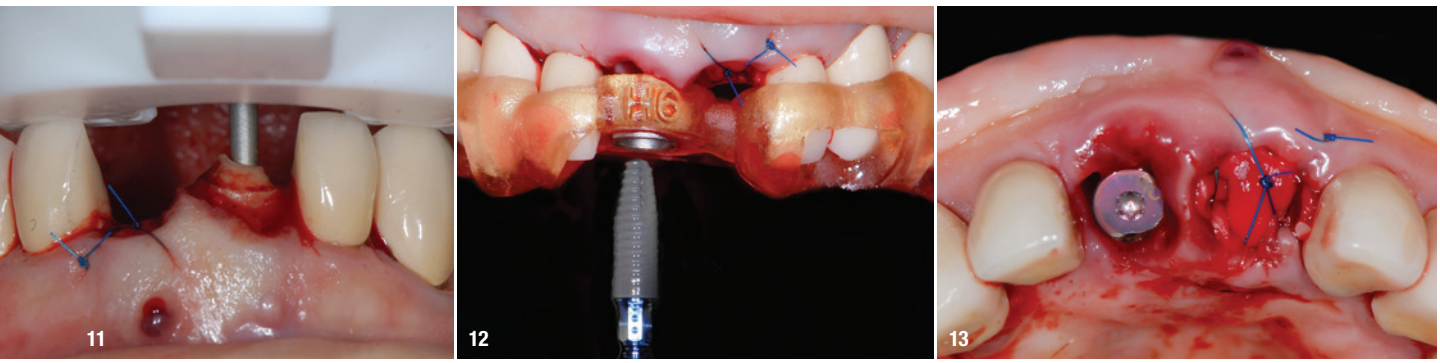


Fig. 11: Atraumatic extraction of tooth #11. **Fig. 12:** Placement of the implant during the guided procedure. **Fig. 13:** Clinical occlusal view after immediate implant placement in tooth #11 and socket preservation of tooth #21.

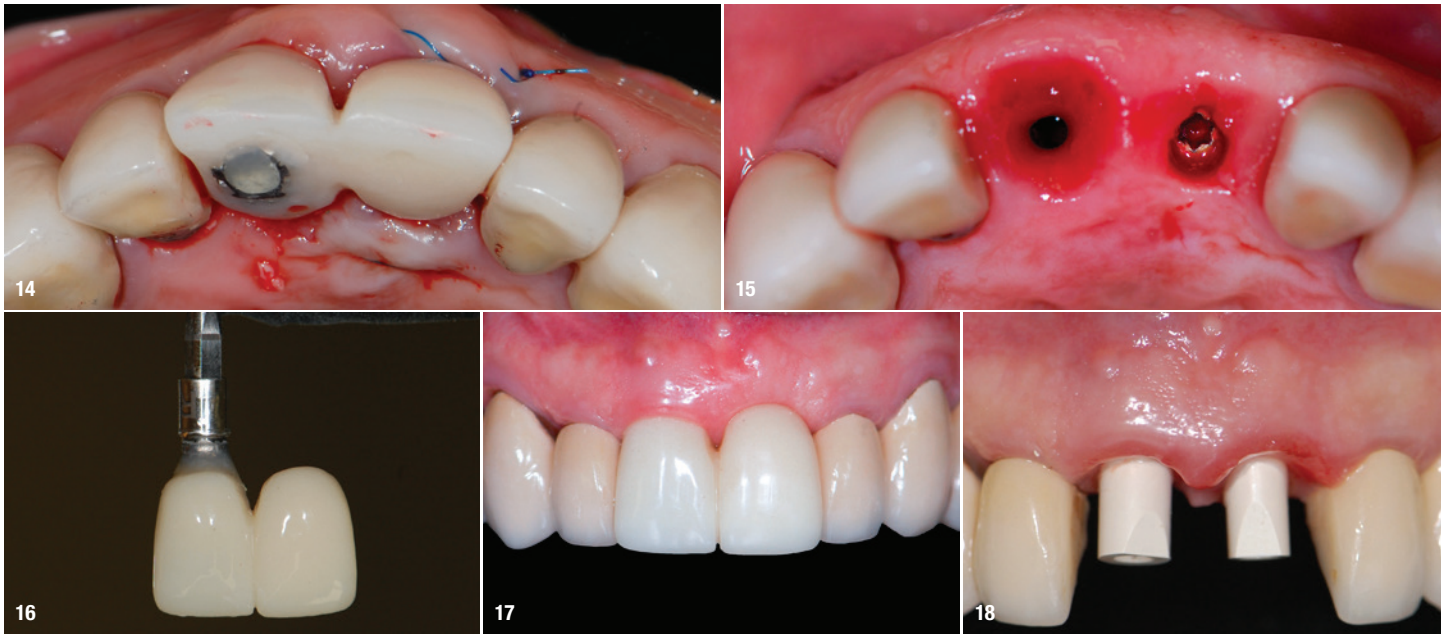


Fig. 14: Immediate screw-retained splinted provisional restoration placed. **Fig. 15:** Clinical occlusal view four weeks post-op. **Fig. 16:** Customised new provisional restoration. **Fig. 17:** Frontal view of provisional restoration. **Fig. 18:** Placement of scan bodies on the implants.

Surgical procedure

The surgical guide was checked for proper fit before administering local anaesthesia with 2% lidocaine with 1:100,000 adrenaline. Tooth #21 was extracted gently in order to preserve the remaining bone, and careful alveolar curettage was done to remove all infected tissue (Fig. 8). The socket preservation was performed with cerabone and a Jason membrane (15 × 20 mm), which was stabilised with sutures (Figs. 9 & 10). Afterwards, tooth #11 was also extracted with minimal trauma (Fig. 11). The surgical guide was then seated. The implant axis and depth were defined, and the drilling protocol was performed following the manufacturer's instructions. The implant was placed considering the high gingival margin of the lateral incisors. Finally, the gap between the implant and buccal bone was filled with cerabone (Figs. 12 & 13). After implantation into site #11 and confirming optimal primary stability, an immediate screw-retained splinted provisional restoration was placed (Fig. 14). The appropriate occlusal load was checked.

The patient came back four weeks after surgery for a follow-up visit. The soft-tissue healing was uneventful. Following our treatment plan, an implant was inserted into site #21, taking into consideration a minimal distance of 1.5 mm from the implant shoulder to the adjacent tooth at the bone level and a minimal distance of 3.0 mm between the implants (mesiodistally; Fig. 15).

After the soft-tissue healing, a new provisional restoration was individualised and polished on an analogue of implant #11 before being placed to a torque of between 15 Ncm and 35 Ncm. The aesthetic result was very satisfying for the patient (Figs. 16–18).

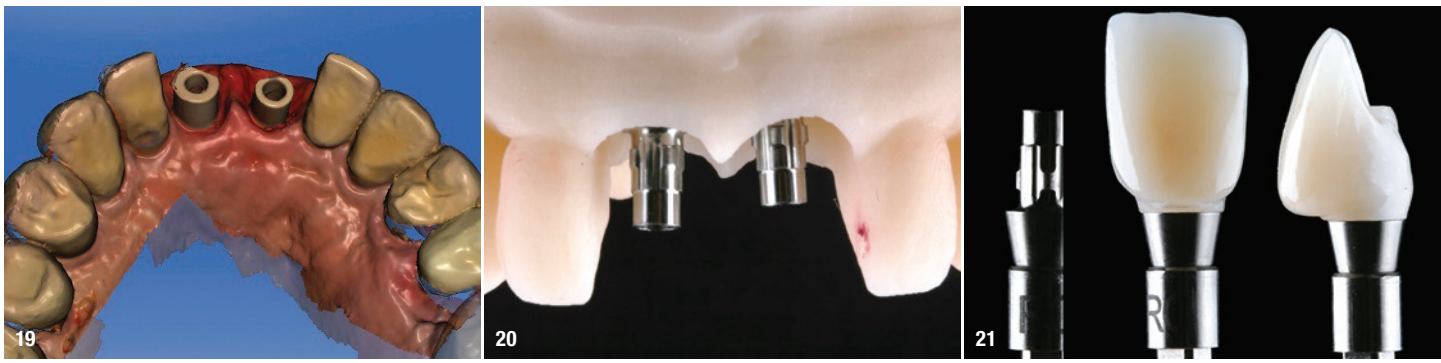
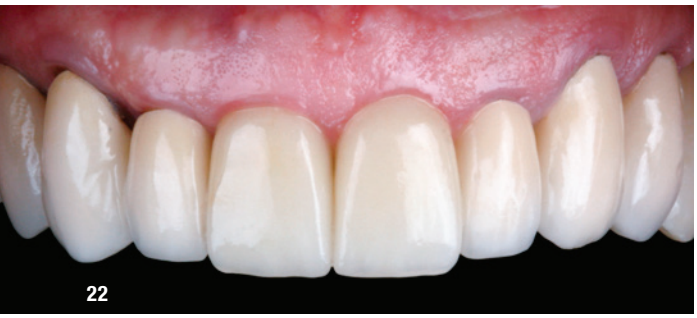


Fig. 19: Occlusal view of digital impression. **Fig. 20:** Final abutments. **Fig. 21:** Final crowns.



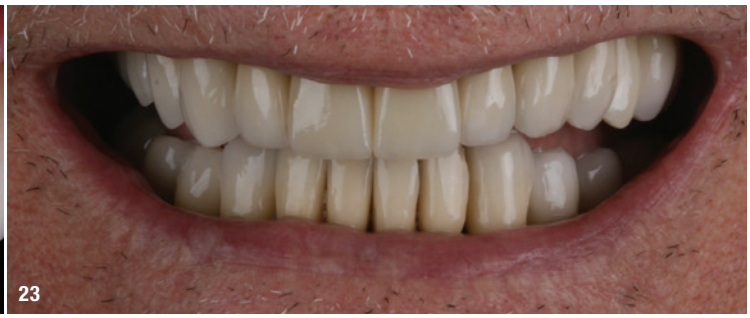


Fig. 22: Clinical frontal view of the final crowns. **Fig. 23:** Final image of the patient's smile.

Prosthetic procedure

Three months later, scan bodies were placed directly on the implants, and a digital impression was taken (Figs. 19 & 20). The colour for the final crowns was chosen with the patient. The STL files, colour assessment and laboratory prescription were sent to the dental technician. The master model was 3D-printed, and the crowns were fabricated. The substructure and emergence profile of the crowns were optimal and met the patient's expectations; thus, the final crowns were screwed in, and a radiographic control was performed. The periapical radiograph demonstrated an optimal fit (Figs. 21–25). Instructions on oral hygiene were given, and the occlusion was checked.

Treatment outcomes

For cosmetic reasons, the patient was very concerned about losing both anterior teeth. He thought that the treatment was going to be long owing to the reconstruction required. For him, it was a relief to have a provisional restoration at all times. It has been three years since we treated him with dental implants, and he is very satisfied with the treatment outcome. Oral hygiene is not an issue for him, and this restoration allowed him to smile and talk with confidence again.

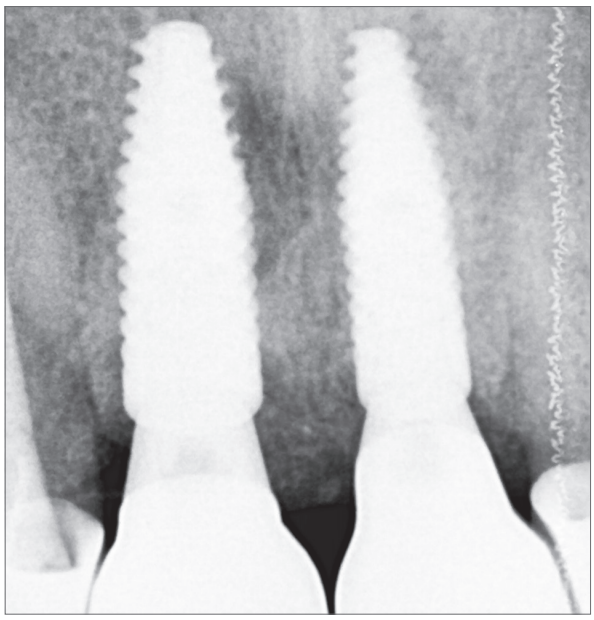


Fig. 24: Periapical radiograph four months post-op.

Author's testimonial

In my daily practice, the Straumann BLT implants enable me to achieve optimal primary stability in fresh extraction sockets and immediate aesthetics owing to the possibility of placing a provisional restoration with confidence. As a result, high patient satisfaction is obtained. Furthermore, in cases of patients with limited anatomy, it is the ideal implant to provide a less invasive and time-saving treatment.

about the author

A specialist in temporomandibular dysfunction and orofacial pain, **Dr Paula Chiattone Corvello Vidal** graduated from the Federal University of Pelotas in Brazil in 2005 and in 2007 became a specialist in oral and maxillofacial surgery and traumatology at the Lutheran University of Brazil. In 2009, she defended her master's degree in oral rehabilitation with an emphasis in implantology at the same university. Since graduating, she has worked in her own private clinic. She has taught in the specialisation course in implantology at the Associação Brasileira de Odontologia, seção Rio Grande do Sul (Rio Grande do Sul section of the Brazilian association of dentistry) since 2009 and is a member of the postgraduate faculty of IMED Porto Alegre. She is an International Team for Implantology fellow and speaker and director of the International Team for Implantology Porto Alegre II study club.

contact

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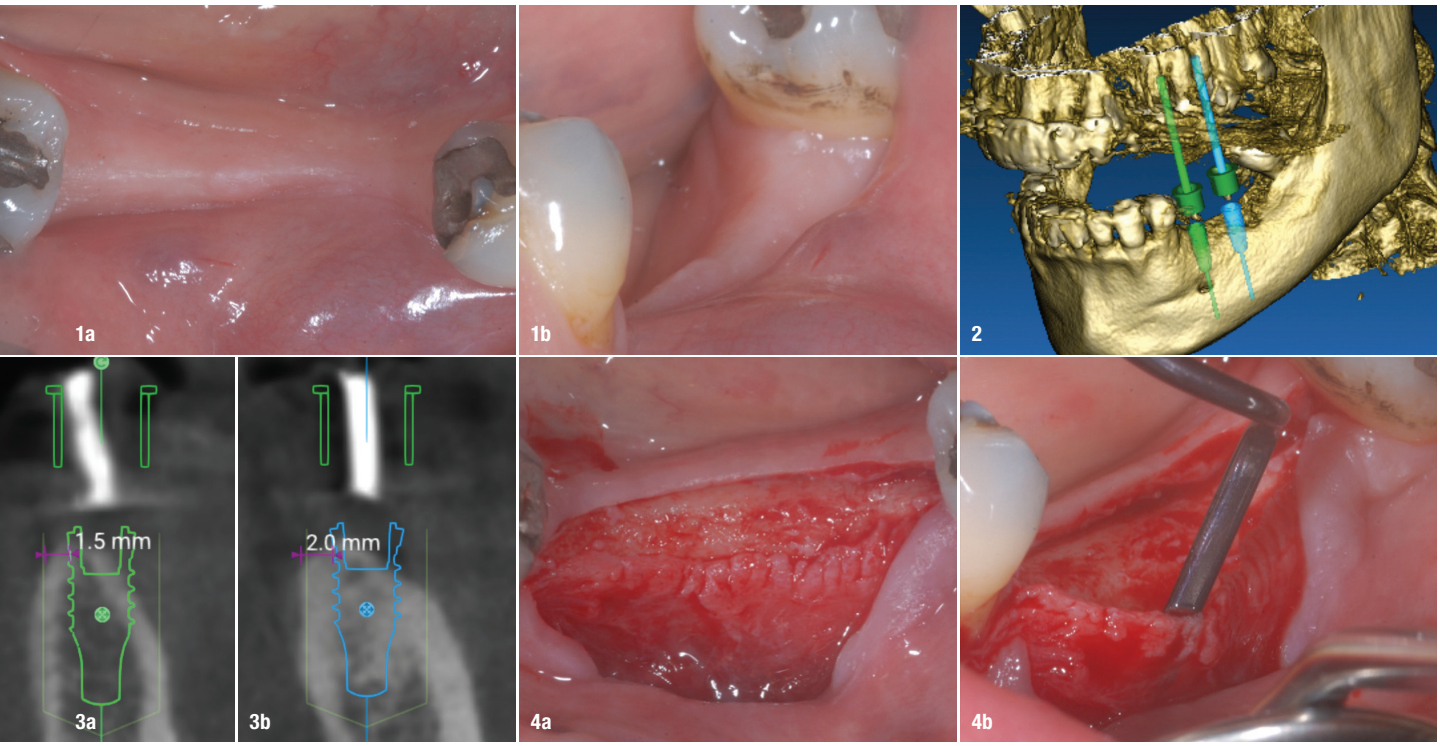
Peri-implant bone augmentation using the subperiosteal peri-implant augmented layer technique and a bovine-derived bone block

Prof. Leonardo Trombelli, Italy

A 50-year-old, non-smoking, systemically healthy female patient presented for implant-supported rehabilitation of an edentulous area in the left posterior mandible (Fig. 1). After treatment for Stage II periodontitis, the patient had a bleeding on probing score of < 10% and no sites with a probing depth of ≥ 5 mm and was enrolled in a supportive periodontal care programme.

The implant position was planned digitally on a CBCT scan, and a surgical guide was fabricated. Digital planning previewed the formation of a buccal dehiscence at placement of both implants, suggesting the need for a horizontal bone augmentation procedure (Figs. 2 & 3). At the buccal aspect, a split-thickness flap (creating the mucosal layer) was raised, leaving the periosteal layer on the edentulous ridge intact. The periosteal layer was then elevated from the bone crest by means of a microsurgical periosteal elevator (PTROM, Hu-Friedy) and tunnelling knives (KPAX, TKN1X and TKN2X, Hu-Friedy) with varying angulated sharp edges (Fig. 4). At the lingual aspect, a full-thickness flap was elevated. The elevation was extended in an apical direction to detach the superficial fi-



Figs. 1a & b: Clinical view of the initial situation. **Fig. 2:** Digital planning of the implant positions. **Figs. 3a & b:** Digital planning of the individual implant positions, previewing the formation of a buccal dehiscence at placement of both implants. **Figs. 4a & b:** Split-thickness flap at the buccal aspect **(a)**. Elevation of the periosteal layer from the bone crest **(b)**.

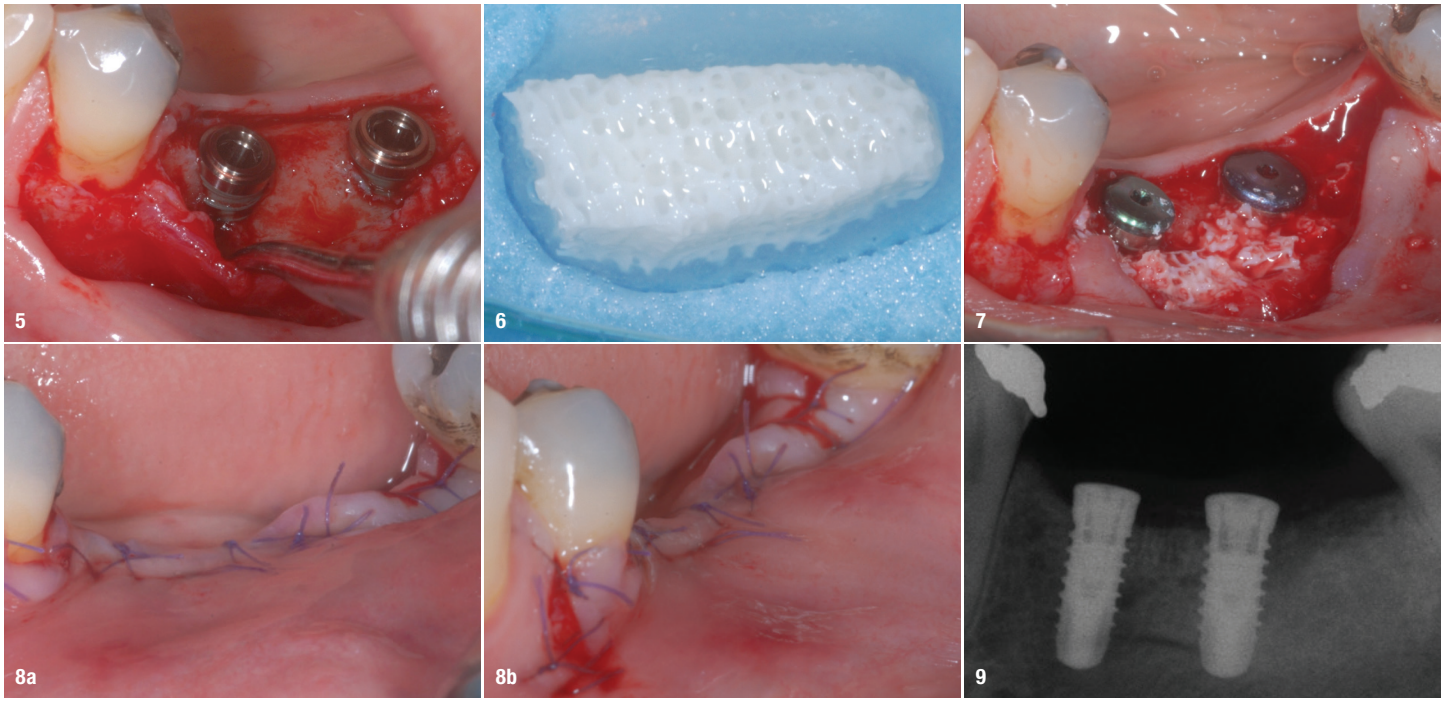
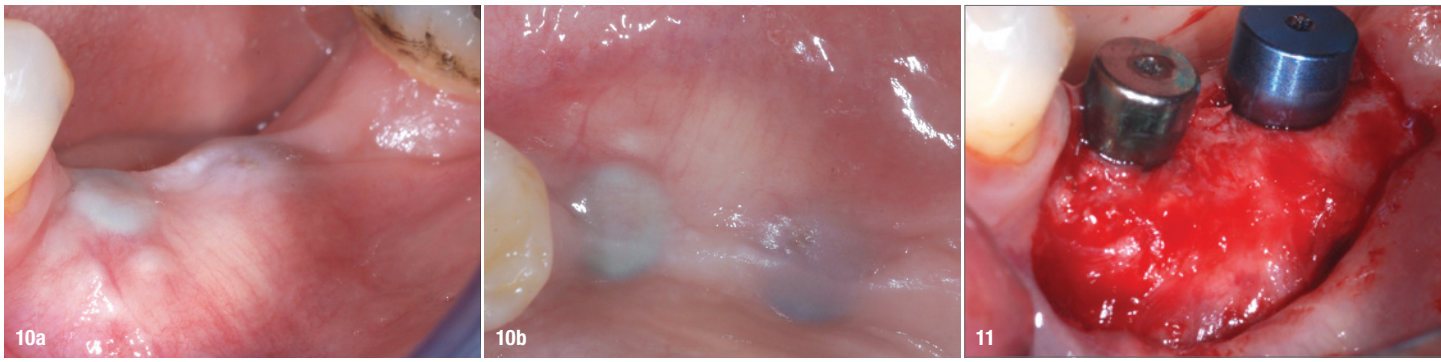


Fig. 5: Positioning of the two tissue-level implants. **Fig. 6:** Graft composed of deproteinised bovine bone mineral. **Fig. 7:** Adaptation of trimmed deproteinised bovine bone mineral beneath the periosteal layer to cover the exposed implant surface. **Figs. 8a & b:** Stabilisation of the periosteal layer to the lingual flap by internal mattress sutures. **Fig. 9:** Radiographic image immediately after implant placement and bone augmentation.



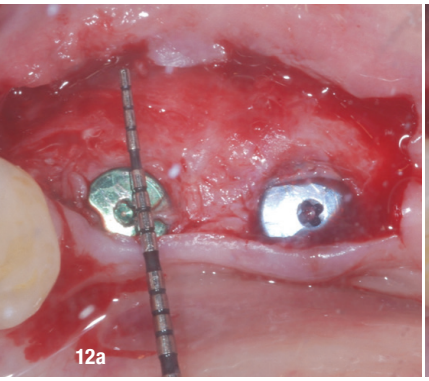
Figs. 10a & b: Before the re-entry procedure. **Fig. 11:** Previously exposed implant surfaces covered by new hard tissue.

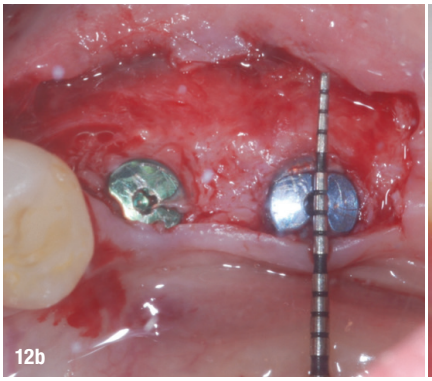
bres of the mylohyoid muscle and obtain a tension-free lingual flap. The implant sites were prepared using the CAD surgical guide, and two tissue-level implants (ELEMENT, Thommen Medical) were positioned. The implants presented with a buccal dehiscence of 3 mm at implant #36 and 2 mm at implant #35. Cortical perforations were performed using a carbide bur (Fig. 5).

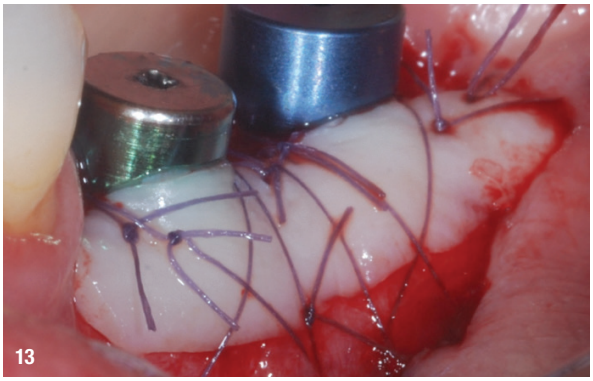
A graft composed of deproteinised bovine bone mineral, delivered as a block (Geistlich; Fig. 6), was trimmed using a high-speed diamond bur in order to obtain a homogeneous thickness of 3–4 mm and was adapted beneath the periosteal layer to completely cover the exposed implant surface (Fig. 7). Using a resorbable #6/0 suture, the periosteal layer was stabilised to the lingual flap by means of internal mattress sutures. The mucosal layer was coronally advanced to achieve primary closure of the wound (Figs. 8 & 9).

Six months after the implant placement, a re-entry procedure for implant exposure was performed using a buccal split-thickness flap (Fig. 10). It could be seen that the previously exposed implant surfaces were completely covered by new hard tissue, and a peri-implant buccal tissue thickness of ≥ 3 mm was present at the most coronal portion of both implants (Figs. 11 & 12). A free epithelial and connective tissue graft was placed to augment the peri-implant soft-tissue phenotype (Fig. 13).

A digital impression was taken four weeks after the implant exposure to digitally plan the shape and emergency profile for the definitive restoration (Fig. 14). Two splinted







Figs. 12a & b: Peri-implant buccal tissue thickness of ≥ 3 mm at the most coronal portion of both implants. **Fig. 13:** Augmentation of the peri-implant soft tissue with a free epithelial and connective tissue graft.

crowns were milled from a zirconia monobloc and cemented on to the titanium inserts according to the manufacturer's instructions. The definitive restoration was screwed on four weeks after impression taking (Fig. 15). The peri-implant tissue conditions appeared adequate on both clinical and radiographic examination (Fig. 16).

Conclusion

The present case report indicates that the combination of a subperiosteal peri-implant augmented layer and deproteinised bovine bone mineral may be successfully used to achieve an increase in buccal tissue thickness at the most coronal portion of an exposed implant.

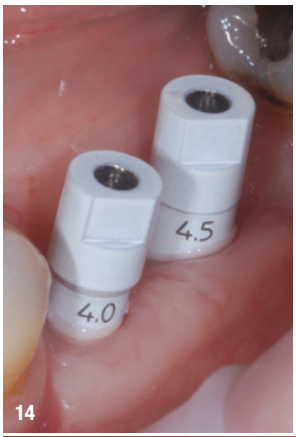
about the author

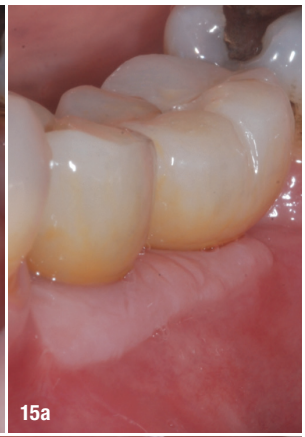
Prof. Leonardo Trombelli is professor and chair of the department of periodontics of the dental school at the University of Ferrara in Italy and has been dean of the school since 2013. He is director of the Research Center for the Study of Periodontal and Peri-implant Diseases at the University of Ferrara and director of the dental clinic at the Ferrara university hospital. He practises periodontics and implantology in private practice. From 2007 to 2009, he served as President of the Italian Academy of Osseointegration, of which he is still an active member. He is also an active member of the Italian Society of Periodontology and Implantology and the International Association for Dental Research. Prof. Trombelli serves as a member of the editorial boards of several peer-reviewed journals.

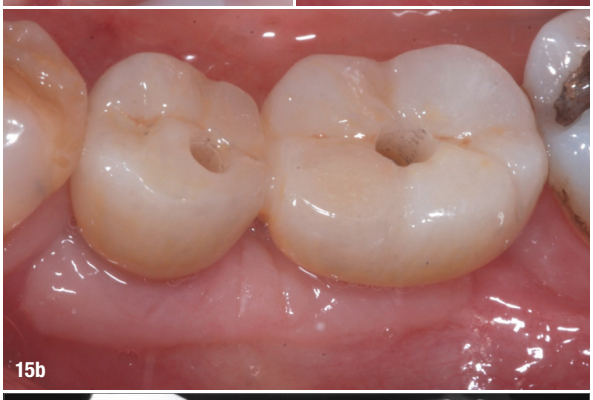
contact

Prof. Leonardo Trombelli
leonardo.trombelli@unife.it

Prof. Leonardo Trombelli







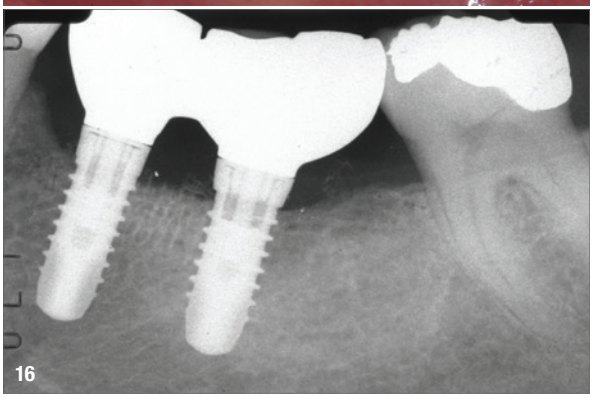


Fig. 14: Digital impression taking four weeks after implant exposure. **Figs. 15a & b:** Definitive restoration four weeks after impression taking. **Fig. 16:** Radiographic examination after definitive restoration.

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Simultaneous implantation and augmentation of a buccal bone defect with biologised bone substitute material

Dr Haki Tekyatan, Germany

In implant dentistry, we need sufficient bone and soft tissue for long-term and prognostically safe stability. This is a good prerequisite for long-term success in order to achieve secure stability of the implant and the surrounding peri-implant soft tissue. Buccal defects are often found in our practice and are frequently caused by physiological remodelling processes after tooth extraction. These remodelling processes after tooth loss are scientifically very well studied and proved. Especially the loss and degradation of the bundle bone results in a wide variety of defect morphologies.[1–3]

In addition to an adequate bone situation, sufficient attached and keratinised mucosa is important for long-term success in order to avoid peri-implantitis developing and to prevent aesthetic losses or limitations of the prosthetic restoration.[4–6] If the bone volume is insufficient, bone augmentation or regenerative measures are often necessary. A wide variety of methods, measures and techniques are used for this purpose, for both horizontal and vertical defects,[7] such as augmentation of buccal or horizontal defects with granules of various types. In combination with a membrane, an increase in volume of up to approximately 3 mm can be achieved if indicated.[8] In our practice, various materials are used for this purpose. When using these materials, it is important to ask oneself whether one wants to perform a volume-stable build-up with very little to no resorption or whether one wants to achieve complete remodelling and reshaping into vital

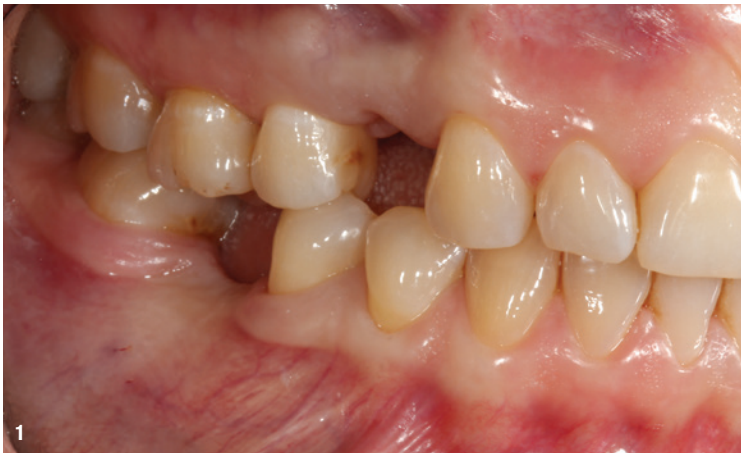
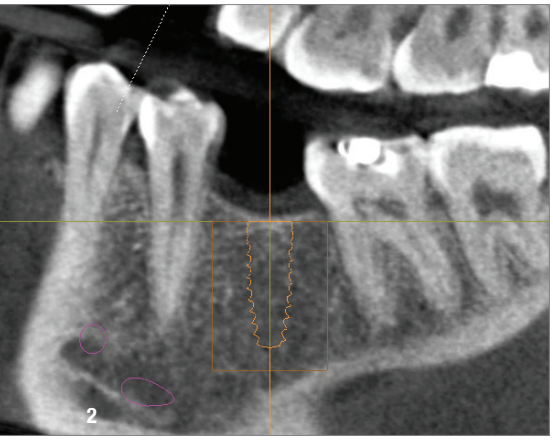
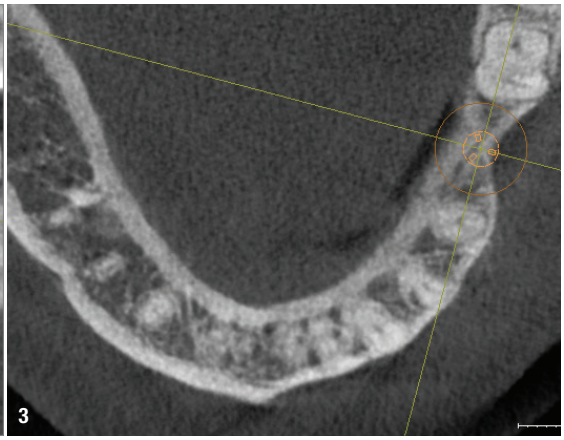
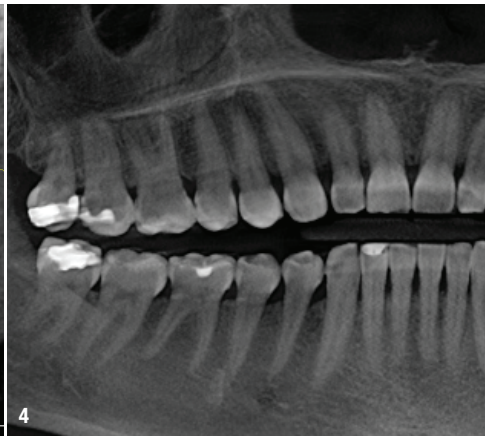
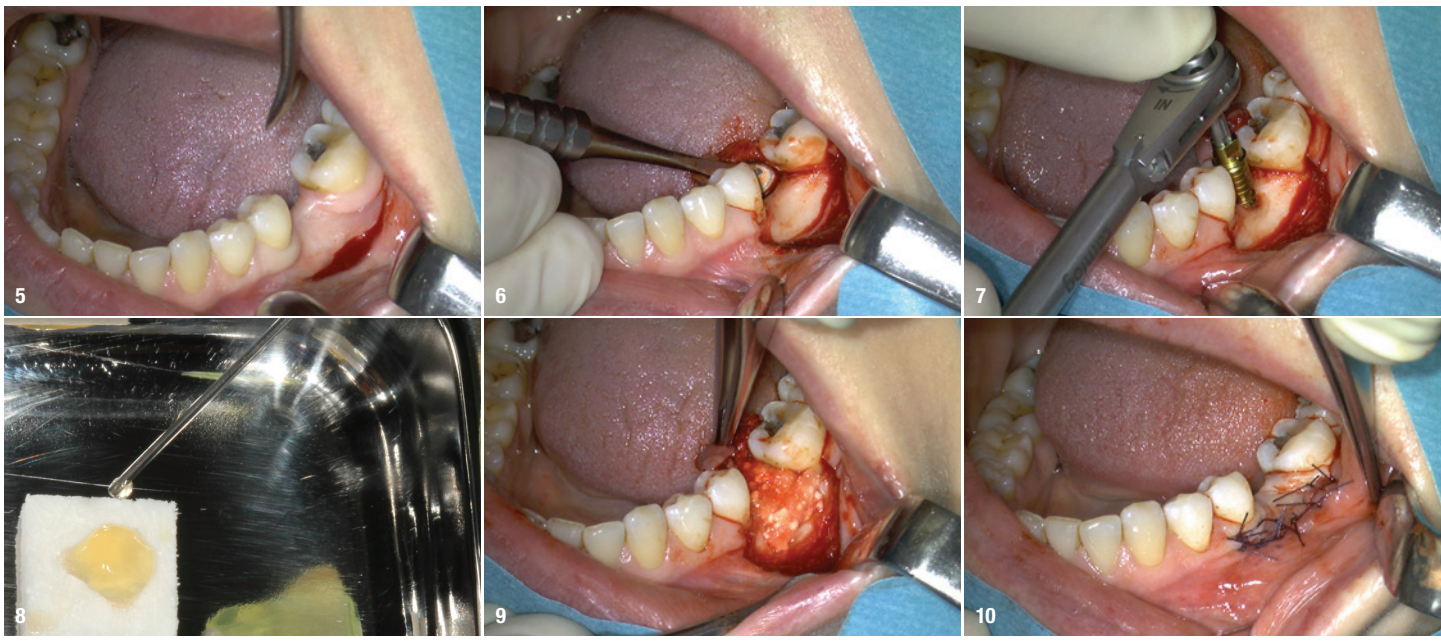


Fig. 1: Initial clinical situation in region #36 with a clear buccal contour incision and complete absence of buccal keratinised mucosa. **Figs. 2–4:** CBCT: the transversal and vertical views clearly showed the buccal defect in region #36.





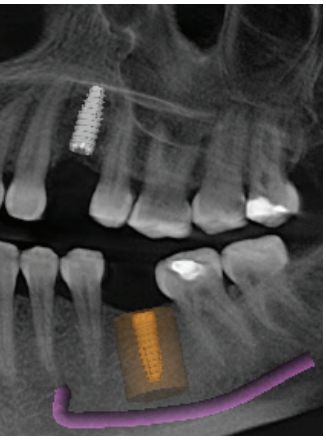




Figs. 5 & 6: Vestibuloplasty modified according to Edlan–Mejchar, lingual mobilisation of the flap and visualisation of the surgical site. **Fig. 7:** Manual final implant positioning to a torque of 25 Ncm². **Fig. 8:** Biologisation and wetting of the CERASORB Foam with injectable platelet-rich fibrin according to the low-speed centrifugation concept protocol. **Fig. 9:** Gentle adaptation of the easily mouldable CERASORB Foam to the defect situation in two layers with medium gentle compression. **Fig. 10:** Layering of two fibrin membranes, plastic coverage of the surgical area.

bone using biomimetic materials. In combination with the unavoidable side effect of a controlled but nevertheless present volume loss, the use of biologised materials according to Ghanaati's low-speed centrifugation concept (LSCC) seems to be a promising approach in this regard, and has been increasingly used and observed in practice.[9, 10]

In the case presented here, a buccal defect was augmented after implantation using a bone regeneration material (a 3D β-tricalcium phosphate collagen matrix; CERASORB Foam, curasan) biologised with platelet-rich fibrin and further covered with fibrin membranes. The intention of this method is to achieve complete remodelling of the inserted material into vital bone and to support the regeneration of a buccal defect under controlled volume loss.



Case presentation

A healthy 49-year-old female patient presented to our practice with missing teeth #24 and 36 and a request for single-tooth implant restorations. In region #24, the bone and soft-tissue situation was clinically and radiographically adequate. Since this case report deals with the restoration of the implant in region #36, region #24 will not be discussed further. In region #36, there was a considerable bone and soft-tissue defect buccally (Fig. 1). Pre-implant planning using CBCT (Orthophos XG 3D, Dentsply Sirona) was performed to evaluate the situation (Figs. 2–4). After evaluation of the CBCT scan and planning, an implant with a diameter of 3.8 mm and a length of 11.0 mm was selected for region #36.

A few weeks later, the implant was placed under local anaesthesia with simultaneous lateral augmentation. In order to provide sufficient plastic coverage of the augmentation area and the surgical area later, a vestibuloplasty modified according to Edlan–Mejchar was performed. An arch-shaped incision was made buccally. A split-thickness flap was formed crestally and then a horizontal periosteal incision was made. The split-thickness flap formed in this way (combined mucosa and mucoperiosteal flap) was mobilised lingually, and the surgical site was visualised. This revealed a homogeneously structured bone of Class D1 quality (Figs. 5 & 6). After marking and defining of the implant position, the implant site was prepared according to the defined drilling protocol, and the implant was placed to a torque of 25 Ncm² (Fig. 7).

After implant placement, the buccal bone defect or the buccal contour defect was augmented with the collagen matrix. In the hydrated and biologised state in which it was used, the matrix can be excellently shaped and adapted to the defect situation with light to medium compression (Fig. 8). The 3D matrix was adapted and attached to the defect situation in two parts, one layer in the vertical direction and one layer in the horizontal direc-

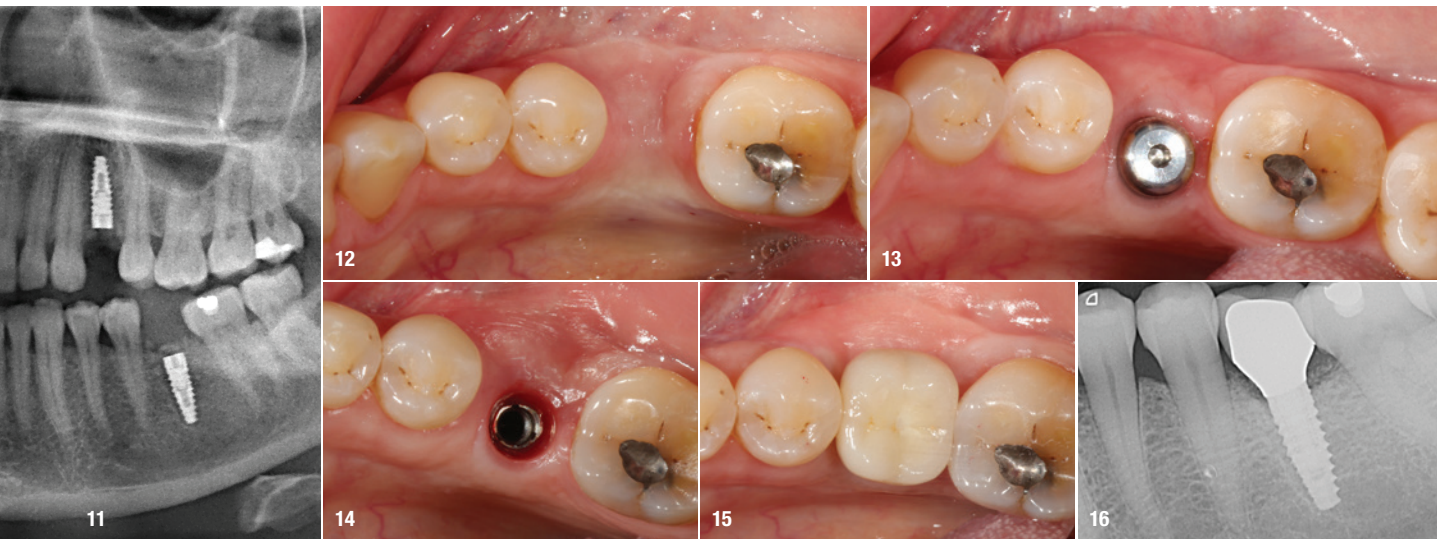


Fig. 11: Postoperative dental panoramic tomogram. **Fig. 12:** Observation of the course of healing found completely irritation-free, stable and pain-free conditions. **Fig. 13:** Exposure of the implant after about four months and inserted healing abutment. **Fig. 14:** Individually shaped mucosa immediately before definitive restoration. **Fig. 15:** After seating of the ceramic crown. **Fig. 16:** Final radiograph.

tion. The reason for this two-layer approach was the calculated and deliberately controlled resorption of the material described at the beginning, in order to ensure sufficient material for the remodelling process of the bone and the soft tissue. At the end of the procedure, two fibrin membranes were placed on the augmentation area, and the surgical area was sutured plastically tight (Figs. 9 & 10). At the end of the operation, a radiographic postoperative control was performed with a dental panoramic tomogram (Fig. 11).

Healing was pain-free and observation of the course of healing showed completely irritation-free, stable tissue (Fig. 12). After about four months, the implant was uncovered under local anaesthesia. Clinically, the peri-implant bone was sufficiently dimensioned, firm and stable; there was an estimated volume gain of 2 mm, especially in the buccal region; and there was a significant volume gain in the soft tissue (Fig. 13). After a further four weeks, the final prosthetic restoration of a ceramic crown on a customised zirconia abutment was made, the fit, aesthetics and occlusion were checked and the final radiograph was taken (Figs. 14–16). After six months, a final clinical check and evaluation of the clinical situation were carried out. Stable, irritation-free soft-tissue conditions and, above all, sufficiently dimensioned, stable, attached and keratinised mucosa were still evident buccally.

Conclusion

With the treatment protocol presented, simultaneous augmentation in implantology can be performed predictably. Using individual concepts specifically adapted to the situation, buccal ridge defects can be treated successfully and regeneratively using biologised bone substitute materials. The special 3D matrix structure of CERASORB Foam enables simple and safe handling and very good adaptation to the bony defect. Even though histological evidence of bone regeneration and augmentation was not provided in this clinical case report, the soft-tissue situation showed a clear contour improvement clinically. The combination of the bone substitute with its special collagen matrix and its biomimetic properties, biologised according to the LSCC protocol, as well as the surgical soft-tissue techniques used contributed to this clinically stable and adequately dimensioned situation. In combination with the unavoidable side effect of controlled volume loss, the use of biologised materials seems to be a promising approach in this regard and is increasingly being applied and gaining growing attention in practice.

about the author

Dr Haki Tekyatan is a Germany-based dentist who specialises in implant dentistry and oral surgery. He is currently in private practice in the German city of Simmern.

contact

Dr Haki Tekyatan
info@dr-tekyatan.de
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Literature

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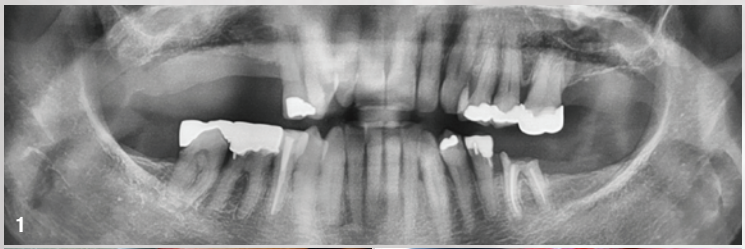
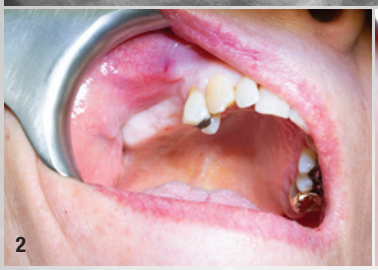
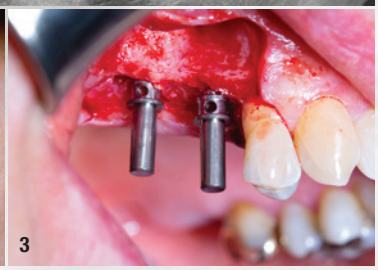
Screw-retained restoration of maxillary right first molar and second premolar

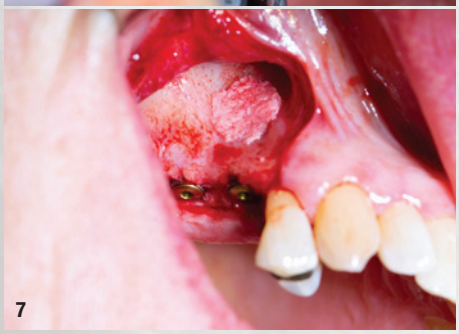
Dr Anthony Bendkowski, UK







The following case report, presented in a step-by-step manner and elucidated in detailed images (Figs. 1–18), describes the treatment of a 64-year-old female patient who presented to our practice complaining about the free-end gap starting at the second premolar in the maxillary right quadrant resulting from the extraction of her failing maxillary right second premolar and first molar by her general dental practitioner. The patient wanted a fixed restoration. After a detailed examination, a treatment plan was drawn up. We decided to place two OmniTaper EV implants (Dentsply Sirona). Two individual screw-retained zirconia crowns were planned as the superstructure. The prosthodontic and technical digital workflow was performed using an intra-oral scanner (Primescan, Dentsply Sirona) and impression components (Atlantis, Dentsply Sirona).



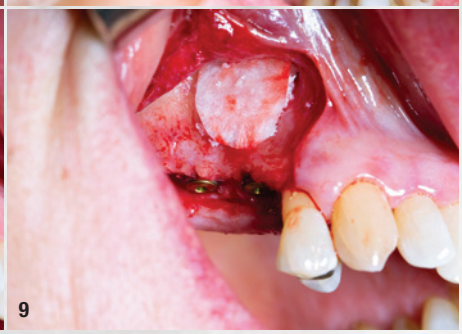
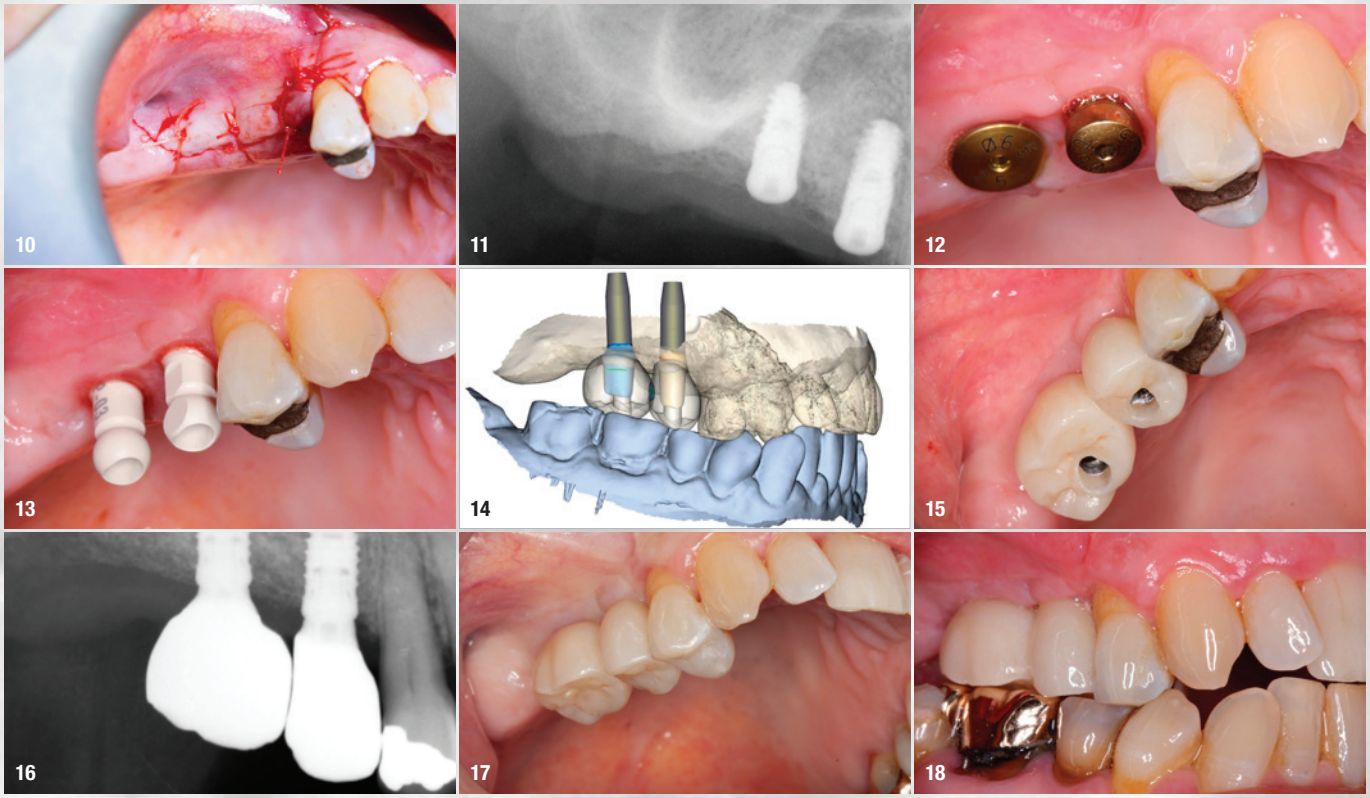


Fig. 1: The pre-op initial radiographic assessment indicated that there was sufficient bone depth in the posterior maxilla to enable a satisfactory implantation. **Fig. 2:** The failing maxillary right second premolar and first molar had been extracted by the patient's general dental practitioner, leaving an edentulous area which we were to restore with implants and crowns. **Fig. 3:** A flap was raised to expose the alveolar bone in the surgical area. After the initial preparation with the 2 mm diameter OmniTaper drill, two direction indicators were used in order to guide the drilling process and to ensure that the right depth and angulation were achieved for the implant placement. This helps to prevent errors which could lead to the loss of primary stability in the bone. **Fig. 4:** An OmniTaper



EV implant (3.8 × 11.0 mm) was inserted into area #15 using the TempBase driver. The OmniTaper EV implant has an apically tapered thread design that ensures good primary stability. **Fig. 5:** Both OmniTaper EV implants were placed in areas #15 and 16 in a well-adjusted manner using the pre-mounted TempBase abutments. The yellow band on the abutment indicates the size of the implant–abutment connection: medium. **Fig. 6:** A disposable BoneTrap (Dentsply Sirona) was used to harvest bone particles during surgery for the augmentation of the small bone fenestration. **Fig. 7:** A large amount of autologous bone chips collected with the BoneTrap was placed into the cavity. **Fig. 8:** To support new bone formation, Symbios xenograft granules (Dentsply Sirona) were placed on the autologous bone material. **Fig. 9:** A Symbios Collagen Membrane SR (slow resorbable; 15 × 20 mm; Dentsply Sirona) was trimmed to shape and placed to complete the guided bone regeneration procedure. The membrane acts like a barrier and enhances wound healing. **Fig. 10:** The wound was sutured closed with PGA suture. **Fig. 11:** The implants were evaluated radiographically post-op. **Fig. 12:** Three months after the initial surgery, the soft-tissue condition was assessed. The peri-implant gingiva was well healed, and the emergence profile was sufficient. **Fig. 13:** Atlantis IO FLO components were placed for the Primescan digital impression. It is important that the flat side and the ball of the FLO head are fully visible. **Fig. 14:** A virtual working model was designed based on the intra-oral scans, including a scan of the antagonist dentition for digital bite registration. The Atlantis abutments and the superstructures (zirconia crowns) were also designed. **Fig. 15:** The screw-retained Atlantis Custom-Base abutments and zirconia crowns were tried in. They fitted perfectly, and no adjustment was needed. **Fig. 16:** Immediately after final prosthetic replacement of teeth #15 and 16 with implant-supported, screw-retained crowns, the situation was evaluated radiographically. **Fig. 17:** The screw access holes were sealed, and the amalgam filling in tooth #14 was replaced with composite. **Fig. 18:** The clinical evaluation of the final fixed zirconia crowns found appropriate emergence profiles.

about the author

Dr Anthony Bendkowski is an oral surgery specialist in practice limited to implant reconstructive surgery with two clinics in London and the South East of England. He has over 30 years of experience in both the surgical and restorative management of implant cases. He is a Past President of the Association of Dental Implantology (UK) and an examiner for the Royal College of Surgeons, Edinburgh Diploma in Implant Dentistry as well as lecturing both nationally and internationally. He is also a contributor to the postgraduate dental implant programme at Brighton & Sussex Medical School. He is co-chair of Bromley, Bexley and Greenwich LDC and is an honorary consultant at Kings College Hospital Foundation Trust in London.

contact

Dr Anthony Bendkowski
enquiries@theimplantexperts.com
+44 1622 751553

Dr Anthony Bendkowski

The X factor in implant dentistry

An interview with Dr Dirk U. Duddeck and Dr Ken S. Serota, Germany & USA

Research to determine the consequences and clinical relevance of avoidable contamination and quality deficiencies in dental implants, are promoted and commissioned in collaboration with renowned universities by the CleanImplant Foundation. The project was initiated in 2016 by Dr Dirk Duddeck, dentist, and biologist, who is working in this field of research for more than 15 years. In September 2022, they opened their new office in New York City with Dr Ken S. Serota, as a dedicated ambassador of the initiative. He will bring awareness of the problem of preventable, manufacture-created contamination of medical devices to the North American dental community. implants—**international magazine of** oral implantology spoke with the two scientists about their achievements, motivation and goals.

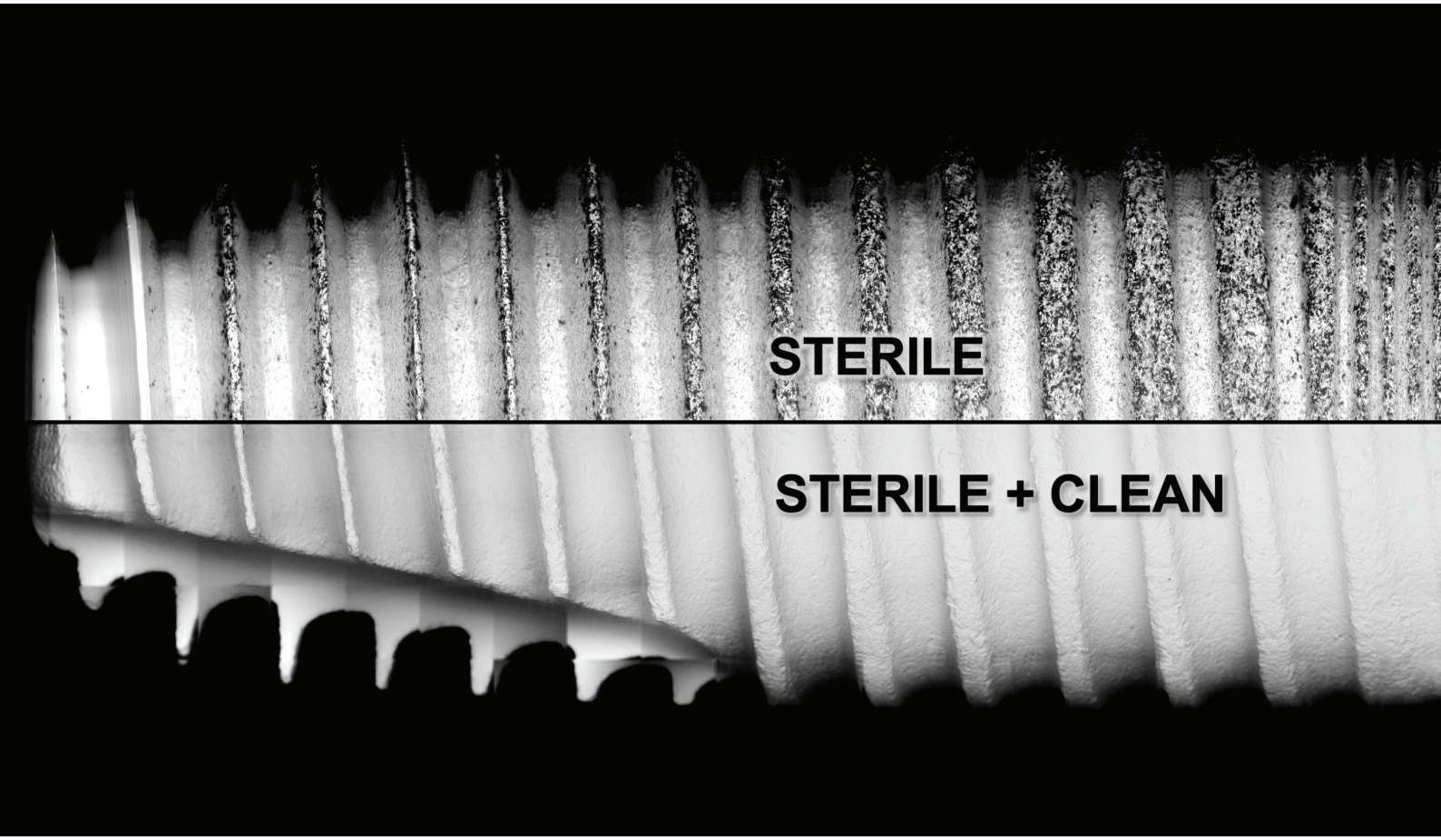
Dr Ken S. Serota (left) and Dr Dirk U. Duddeck.

Dr Duddeck, you founded the CleanImplant Foundation in 2016 as a non-profit organisation with the goal of raising awareness about factory-related contaminants on sterile packaged dental implants. Looking back over the years, what have you achieved?
Initially, at the start of the project on implant quality assessment, there was daunting resistance to our mission by manufacturers. Over time they have recognised that we are not adversaries. Rather, we are allies in ensuring the delivery of the highest levels of quality medical devices for patient care. It is an expected standard and our collective duty of care.

Irrefutably, it is within the capability of all companies worldwide to meet that standard. We welcome the opportunity to work with them for the good of our profession and the good of our patients. We are incredibly proud and thankful that, as of this date, more than 125,000 dentists acknowledge our advocacy for a cleanliness standard in implant dentistry.

You recently opened an office for CleanImplant North America in New York City. What is your intention?
We recognised that implant dentistry and patient care have no geographic boundaries, and we were not represented in North America. As such, we realised that it was time to redress the situation and include North American manufacturers in our growing family of quality-committed companies. With Dr Ken Serota as our representative, we found a comrade-in-arms to further amplify our mission and values.

Dr Serota, what is your motivation for joining the project?
Having been a practicing dentist for almost 50 years, I recognised that achieving 100 per cent is always difficult because there is invariably an X factor. The X factor is a combination of any number of things: The dentist is far too often accused of deficiencies in technical protocols, diagnosis, and treatment planning. As shown repeatedly in publications of the CleanImplant's Scientific Advisory Board, carbonaceous compounds abound as a consequence of inadequacies in manufacturing processes and packaging. If you seek 100 per cent success yet, the implant in question has deficits; you already have a condition where it's impossible to achieve that level of success before initiating the treatment.



The images show SEM mapping of two brand-new dental implants immediately after unboxing. Above: sterile implant (manufactured in the US and marketed with FDA clearance) covered with significant carbonaceous contaminants, most likely leading to uncontrolled foreign body reactions. Below: sterile and clean implant (Kontact S, Biotech Dental) awarded with the Trusted Quality Seal of the CleanImplant Foundation. SEM mapping images are compiled of up to 400 single SEM frames in 500x magnification.

Dentists have to trust in the quality standard of the products delivered by the manufacturer. Is this trust justified, in your opinion?
You can provide the patient with the means to improve their physical health prior to a surgical procedure. There are conditions you cannot control; however, you can control the use of the best-quality medical devices.

What we provide our patients with our knowledge, skills, and clinical expertise is within our control. The X factor that challenges 100 per cent success is determined by that provided by our corporate partners. If those devices exhibit flaws as a result of their manufacture, then we are delivering risk to our patients.

What is your perspective regarding the value of the Foundation for the dental community at large?
Our Foundation is dedicated to ensuring on behalf of our colleagues that medical devices from implant manufacturers worldwide are incontestably clean. We presume that they are sterile, but that does not imply that the manufacturing processes render them clean. Residual contaminants are an unacceptable by-product and wholly resolvable. THAT IS OUR MANDATE. We can evaluate, ascertain, and advise our corporate colleagues about what they leave behind and what they need to remove. It is well within their ethical mandate to eliminate any and all contaminants. That's the bottom line for the purpose and the vision of the CleanImplant Foundation. There is a responsibility to be ideal in all our clinical endeavours. It is the pursuit of excellence that defines professionalism.

Thank you Dr Duddeck and Dr Serota for the interview.

contact

Dr Dirk U. Duddeck
CleanImplant Foundation CIF GmbH
Berlin, Germany
+49 30 200030190
duddeck@cleanimplant.org
www.cleanimplant.org

Dr Dirk U. Duddeck

Straumann

Iconic tissue level meets immediacy

The Straumann® TLX Implant System is built on a strong basis of scientific studies. It considers key biological principles of hard and soft-tissue healing. It is designed to significantly reduce the risk of inflammation and bone resorption as the implant–abutment interface is moved away from the bone. Straumann® TLX has been perfected for immediacy and is an excellent solution for all other indications to suit the dentist's preferred treatment protocol—ranging from immediate to conventional placement and loading. The Straumann® TLX Implant System perfectly complements our bone-level BLX Implant System. Both systems use one common drill set and TorcFit™ connection for maximum compatibility with minimum investment.

Simplicity and efficiency

- A one-stage process with restoration at soft-tissue level allows you to use chair time more efficiently,
- Ease of restoration even in the posterior region,
- Highly efficient treatment protocol thanks to straightforward conventional and digitally integrated workflows.

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Dentsply Sirona

A new premium solution for an intuitive, reliable and simplified experience

Dentsply Sirona is announcing the launch of the DS OmniTaper Implant System, a new and innovative solution that combines proven technologies with new features. The design is based on the trusted apically tapered Xive Implant design, which has over 20 years of success, modernised with the conical EV connection and OsseoSpeed surface. The DS OmniTaper Implant System will be available in many countries in early 2023.*

The OmniTaper EV Implant features ActiveBone Control design and has an apically tapered shape. The ActiveBone Control design uses a combination of bone specific preparation protocols and the dual core bone condensing thread design to achieve high primary stability. In combination, this ensures safe and atraumatic implant placement, even in soft bone. The conical EV connection ensures a tight, stable fit and minimises micromovement and microleakage. In addition, it provides access to the harmonised and comprehensive EV prosthetic range for restorative flexibility. Furthermore, it offers clinicians simplicity and efficiency for immediate chairside solutions.

"We are driven to deliver first-class products and excited to present this new implant system which will further expand clinicians' ability to meet their patients' needs," says Tony Susino, Group Vice President Global Implant Solutions at Dentsply Sirona. "The addition of the OmniTaper EV into the EV family of implants combines the proven implant technologies from Dentsply Sirona into a solution that offers clinicians simplified protocols, efficiency in handling and a portfolio optimised for digital dentistry."

Dentsply Sirona, Sweden
+46 31 3763000
www.dentsplysirona.com/ds-omnitaper

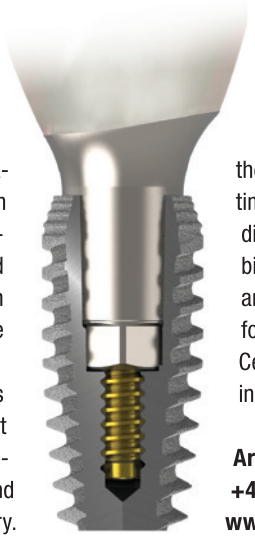
** Due to the different approval and registration times, DS OmniTaper Implant System is not immediately available in all countries.*

Argon Dental

K3Pro—sustainable tissue retention and impressive prosthetic range

Experienced implantologists have known for a long time: when it comes to the sustainability of hard and soft-tissue stability in two-piece implant systems, the first consideration is the connection between implant and abutment. The so-called Morse taper is particularly solid, a steep and long connection that is equivalent to a cold weld and successfully eliminates any micromovements or gap formations. And thus, reliably ensures tissue preservation. Argon Dental has also relied on this superior concept since the first of its own implants 25 years ago.

But with regard to the goal of offering our customers the most modern implant system, the development got a new push in 2010: the self-locking Morse taper became reversible with the help of a threaded channel and an unscrewing instrument that is unique in the industry.



It is not only the prosthetic handling in the practice and laboratory that has benefited enormously—it is above all the options for abutment selection that have resulted from this new development and enable the perfect solution for every indication. In the meantime, you can also perfect your prosthetics completely digitally with K3Pro—for the best that the clever combination of proven principles from the art of engineering and innovative dental prosthetics can make possible for your patients.

Celebrate 25 years of K3Pro success with us and be inspired by its unique product features.

Argon Medical, Germany
+49 6721 3096-0
www.argon-medical.com

BioHorizons Camlog

Complete solution for bone fixation and membrane stabilisation

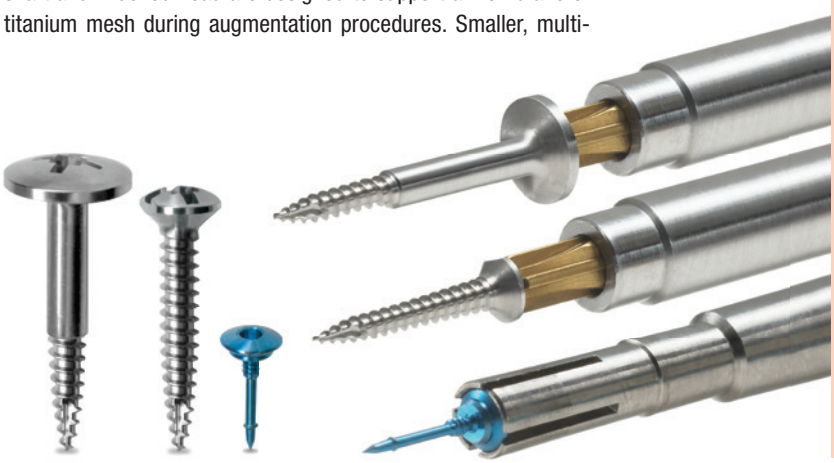
Since July 2022, the truFIX system, designed for primary fixation of bone grafting materials, has been distributed by Camlog. The fixation system contains all the necessary components for picking up and screwing in truSCREW (osteosynthesis screw), truTENT (tenting screw) and truTACK (pin) for the fixation of membranes and titanium meshes for reconstruction of bone defects. This comprehensive and user-friendly system makes the use of additional systems and components for defect regeneration unnecessary.

TruSCREW with its aggressive self-tapping thread is the ideal bone screw for fixing small bone blocks used in the field of oral and maxillofacial surgery. Thanks to the thread, no pre-drilling is required in most cases. The patented screw design allows effortless insertion into all bone types.

The truTENT screw is a complement to truSCREW. The extended shaft and widened head are designed to support a membrane or titanium mesh during augmentation procedures. Smaller, multi-wall defects can also be successfully regenerated with the help of the tent screws, as they further expand the space and reduce soft-tissue pressure by holding the gingiva over a larger area.

Using truTACK, membranes can be stabilised quickly and easily. It has a hexagonal head and threads on the shaft for easy removal. It is inserted like a nail and removed like a screw—a helpful feature.

Camlog Biotechnologies GmbH, Switzerland
+41 61 5654141
www.biohorizonscamlog.com



Titanium meshes

If the augmentation covers more than two tooth widths and has an increasing vertical component, titanium meshes are increasingly being used in addition to the shell technique. They serve as a cage to preserve the space created for the augmentation for regeneration. The titanium meshes are adapted to the defect intra-operatively, filled with augmentation material and fixed in a stable position with screws. They have no barrier function. The titanium meshes are available in different sizes and structures as flat meshes. Depending on the indication, the implantation can be carried out in one or two stages.

2022 international annual congress of the DGZI

New directions in oral implantology: Where is the journey taking us?

Dr Georg Bach, Germany

In the 52nd year of its existence, the oldest European professional society for implantology, the German Association of Dental Implantology (DGZI), is continuing to break new ground with a view to the future, organisational modernity, attractiveness of content and a new form of presentation. Presented by 50 speakers and attended by a good 250 participants—the move to a new hotel necessitated by the cancellation of the original hotel did not allow for more—75 table clinics and livestreaming of two surgical tutorials were the focus on Friday, the first day of the congress, whereas Saturday was all about science.

Future podium: "Young Generation DGZI"

The first highlight of the congress was three lectures with completely different orientations that together drew a clear picture of the future options of our field and indeed of the whole spectrum of dentistry. Their target group was also clearly defined: the younger generation of implantologists. The series of lectures started with Dr Jochen Tunkel speaking on a peripheral area of our discipline: whether social media is important for the implantology practice. The practice's goal in using social media should be patient acquisition and quick communication of information to patients. In addition, it can be used to create a modern image for the practice. In conclusion, he emphasised that the use of social media is essential for implantology practices and an indispensable tool for staff recruitment.

Dr Eik Schiegnitz then reported on the latest on augmentation and soft-tissue management to great enthusiasm from the auditorium. Starting with inlay techniques, Dr Schiegnitz moved on to block onlay techniques. His clinic has almost completely abandoned the use of the classic block in favour of the particulate onlay technique. His lectures are an explosion of information, so one has to really pay attention to catch all the details. One of these was the statement—based on a soon to be published guideline—that there is no evidence whatsoever for the use of platelet-rich fibrin in augmentation surgery.

In the third lecture, Dr Sigmar Schnutenhaus discussed the role and importance of aligner therapy in implantology. A high number of excellently documented case studies proved that the relatively new aligner therapy is of great importance in solving complex patient cases. In his very practice-oriented lecture, Dr Schnutenhaus described aligner therapy carried out as part of treatment prior to implant placement as indispensable for numerous implantological issues, whether for the straightening of a tilted distal molar to optimise a gap situation, resolution of crowding or tooth rotations.

In the subsequent podium discussion, the congress participants had the opportunity to engage with the speakers. The depth of the discussion and the number of questions confirmed that the three speakers had been well chosen for the future podium. It was also pleasing to see the large number of younger colleagues in the auditorium, who fuelled the discussion with numerous questions and had their pictures taken with the speakers afterwards to make the first social media posts of the congress.

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Admission of the DGZI to the DGZMK

DGZI President Dr Georg Bach promised the auditorium a special moment after the first session had ended, and indeed the congress participants witnessed a historic occasion: the DGZI's admission as an associate affiliate to the Deutsche Gesellschaft für Zahn-, Mund- und Kieferheilkunde (DGZMK; German society for dental, oral and maxillofacial medicine), the umbrella society for all German dental societies. President-Elect Prof. Jörg Wiltfang presented the acceptance certificate, saying that he was pleased that the significant strengthening of the DGZMK with the admission of the DGZI, including more than 4,000 new DGZI members, who are now also members of the DGZMK, has brought the DGZMK a considerable step closer to its goal of German dentistry speaking with a unified and strong voice. Dr Bach emphasised how important and significant it was for the DGZI to be part of the DGZMK family of values.

Surgical tutorials

It was then time to put what had been learned into practice. Livestreaming of surgical tutorials enabled congress participants to experience a unique insight into the work of renowned colleagues. The first of these was given by Dr Puria Parvini, who addressed immediate implant placement and immediate restoration in the aesthetic zone. After a journey of three cancelled flights, 12 hours of waiting time and ultimately arrival by train, Dr Parvini launched immediately into an intense lecture, in which he pointed out the high number of anterior tooth traumas. His method of backing up his statements with short films was fascinating. By the third video, it was obvious how much progress has been made in the field of immediate restoration and immediate implantation.

Dr Mauro Marincola presented the implantological options for a less stressful procedure for the patient, speaking on minimally invasive implantology in cases of greatly reduced bone volume. He too was a victim of the travel chaos during the congress weekend, arriving just in time. Dr Marincola explained that the treatment concept he advocates, which he has been applying for 35 years, is highly evidenced. His preferred system is the Bicon system, which enables a short treatment time in combination with a non-invasive procedure. Between the plateau-shaped press-fit implants placed subcrestally are spaces which he defines as healing chambers. The abutments are not screwed in, but cold welded by tapping, which is intended to ensure a bacteria-tight closure.

The second day of the congress: Science day

Leading on from the strong practical orientation of first day, the second day focused on scientific aspects. Starting with a review of current trends, the question of what the future of implant dentistry will look like was also addressed. The DGZI congress organisers again pursued the goal of presenting development directions and visions. The sessions were presented in three main themes.

Bone regeneration concepts

Three papers covered this theme in a very insightful morning session that concluded with a speaker and podium discussion. When it comes to questions about bone and implants, there can really only be one speaker: Prof. Peer Kämmerer spoke about the latest in this re-

Fig. 1: From left to right: Dr Rolf Vollmer (First Vice President of the DGZI), Dr Elhassan Mohammad Nour, Dr Hisham Abueljebain, Dr Ahmed Fadl and DGZI President Dr Georg Bach. **Fig. 2:** The Table Clinics.


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gard. His opening statement was surprising: the current S2k guideline on implantological indications for the use of bone substitute materials of the Association of the Scientific Medical Societies of Germany requires revision. Regarding this claim—supported by numerous case studies—Prof. Kämmerer first addressed the diseases and external factors that have a direct influence on bone metabolism. His remarks focused on the biological potential of the area to be augmented. His take-home message was that much is possible, but biology cannot be outsmarted!

On the topic of minimally invasive versus augmentative treatment, Dr Keyvan Sagheb presented the "Mainz concept" for avoiding augmentation. It considers preoperative risk stratification and the situation before a defect arises and after it has arisen. With immediate implantation, a later defect can be avoided, and it is therefore the method of choice if all the conditions are met. However, in the case of a defect, short and narrow implants can be an alternative to avoid augmentation. For patients, these offer an attractive choice, as the treatment time is shortened and treatment is much less invasive, but for the practitioner, these options are as complex as conventional ones in terms of handling owing to their sensitivity to technology.

Prof. Florian Stelzle next presented his box technique as the basis for successful bone augmentation. He too highlighted the practitioner's and patient's points of view in decision-making, as well as added that of the team, regarding the need to minimise treatment time and intensity. "In short, we need concepts for decision-making in support of the simplification and time reduction of treatment," he said. These considerations, among others, led to the development of his decision path, or box: the assessment of the defect configuration, the defect relation and the time relation. Case studies using the box decision model demonstrated the advantages of decision-making in this way.

Prosthetic concepts

The midday session was dedicated to an area of debate on restoration in implantology: high-tech or simple prostheses? The lectures with very different focuses nevertheless complemented each other.

Dentist Dr Kay Vietor and dental technician Björn Roland described high-end implant prostheses and asked the question of whether digital emergence profiling is the new gold standard. The conventional use of an individualised impression coping that reflects the emergence profile achieved with the provisional restoration is costly and poses the risk of information loss according to Roland—Dr Vietor surprised the audience with the statement that considerable tissue collapse can be expected after only 5 minutes. Dr Vietor therefore also prefers to carry out the presentation and design of the emergence profile digi-


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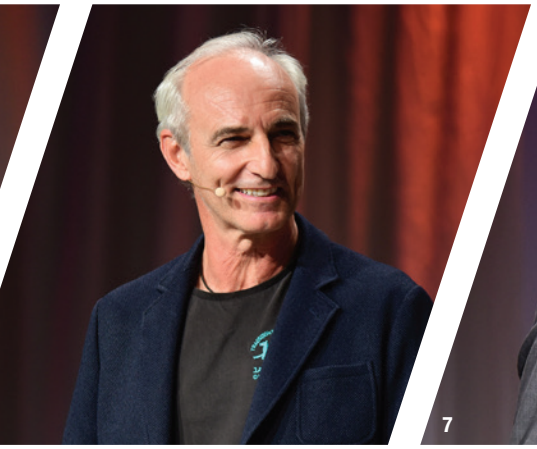

Figs. 3-7: Prof. Peer Kämmerer, Dr Keyvan Sagheb, Prof. Florian Stelzle, Prof. Mauro Marincola and Dr Jochen Tunkel (from left) were speakers at the 51st International Congress of the DGZI. **Fig. 8:** Dr Eik Schiegnitz (right) in discussion with DGZI President Dr Georg Bach after his lecture. **Fig. 9:** Dr Amely Hartmann's table clinics focused on the topic of implantation in the aesthetic zone in complex situations.

tally. However, Roland explained the need for the information provided by a physical impression in highly complex cases. The duo thus presented the solution and demonstrated it via case studies: an extra-oral emergence profile impression using the provisional restoration, followed directly by an intra-oral emergence profile scan, a scan with scan bodies and a scan of the emergence profile of the provisional restoration.

When dentists and dental technicians start sweating, something has usually not gone well—Dr Bach and dental technician Christian Müller reported on implant prosthetic troubleshooting. Whereas in the past collaboration between dental technician and dentist was mostly required towards the end of the prosthetic phase, today this is required in the case of classic late complications, when there are no more spare parts for an abandoned implant system, when the friction of an otherwise still usable superstructure wears off or when a patient presents with implants needing restoration, but the system cannot be identified. Numerous case studies underpinned the credo of these presenters: keep everything, throw nothing away, document everything and discuss every step with each other! The fact that some congress participants approached Müller with questions and requests immediately after the lecture demonstrates the relevance of the topic.

All about ceramic implants

This final session was a real highlight to round off the congress! Four well-known speakers illuminated the topic of ceramic implants with all its facets and demonstrated the extraordinary level of achievement in this field. Dr Stefan Röhling and his working group have contributed substantially to the currently available evidence on ceramic implants. Dr Röhling presented the most important findings from this wealth of knowledge and provided long-term evidence of the effectiveness of this new class of materials.

The author duo Prof. Jürgen Becker and Dr Nicole Rauch added further scientific facts and long-term experience. They agreed with Dr Röhling that ceramic implants are on a par with titanium implants in terms of their reliability and safety and have considerable advantages with regard to the peri-implant soft tissue.

In the concluding speaker discussion, the immunological effects of implants made of titanium and zirconia played an important role. Dr Röhling in particular proved on the basis of numerous scientific studies that zirconia implants are clearly superior to those made of titanium in a certain proportion of our patients.

Conclusion

At the DGZI congress, participants were indeed able to experience an outstanding and innovative continuing education event—but not only that: an encouraging level of interaction was achieved from different perspectives of science, practice, politics and industry. With the attempt to pursue the urgent questions of what implantology will look like in five or perhaps ten years and what the political and economic framework conditions will be then, the DGZI broke new ground and prominent speakers from German-speaking dental implantology took to the stage. As a conclusion of this year's annual congress, it can be stated that the implant practice of the future, in addition to scientific and technological aspects, should focus on strategic questions and answers. The DGZI will continue to work actively on this topic and on this claim, thus demonstrating the importance and appeal of this professional society in the years to come.

Next year's congress will take place on 6 and 7 October in Hamburg.

Picture gallery

DGZI details

contact

Dr Georg Bach
doc.bach@t-online.de

Nations united by innovation

2022 EAO congress celebrates comeback in new hybrid format

A review report by Janine Conzato, Germany

For the last two years, the annual scientific meeting of the European Association for Osseointegration (EAO) could only take place virtually owing to the SARS-CoV-2 pandemic. From 29 September to 1 October, the 29th EAO congress took place this year as a hybrid format for the first time in its history, consisting of a face-to-face event held at Palexpo exhibition and congress centre in Geneva and a virtual evening programme—much like the EAO Digital Days in the last two years. A rich programme with numerous educational and networking opportunities awaited participants.

"This digital part is mostly for those who do not want to or cannot travel to Geneva. It features congress teasers and summaries of the respective day, such as short summaries of the plenary sessions or live recorded parts of the discussions. Although it isn't a replacement of the congress, the evening programme is informative and entertaining," explained Prof. Irena Sailer, chair of the 2022 EAO congress, ahead of the event. Highlights of the digital congress programme are still available on the EAO online platform until the end of November. In addition, Prof. Sailer explained that access is free of charge to dentists from Ukraine this year, giving them the opportunity to learn about the latest innovations in the dental world even from the war zone.

This year's programme featured renowned speakers who shared their knowledge on the use of digital technologies in all areas of implantology and dentistry. In the sessions, current digital techniques were compared with conventional techniques, and clinically relevant recommendations for practice were given. In addition to interesting lectures, there was broad participation by the industry in the exhibition and the supporting programme, offering practical education via forums and hands-on sessions.

Focus on digital technologies

Under the theme "Uniting nations through innovations", the 2022 EAO congress focused on the role and potential of digital technologies for communication, work, and

learning and training opportunities. A goal of this year's congress was to critically examine investments in new technologies and their actual benefits for clinicians and patients. Prof. Sailer commented: "It is, indeed, our aim to critically evaluate all the new developments that are offered to clinicians today. All these new tools that promise to improve quality of care while reducing treatment costs for patients do sound tempting, but we will ask whether all of this can be achieved just by investing in technology and changing the practice structure from a conventional one to a digital one. Many dental professionals are asking what evidence there is behind these rapidly appearing developments and whether the evidence is sufficient to abandon well-established paths."

After the ceremonial opening and the presentation of the silver medals for dedicated services to the EAO by President-elect Dr Luca Cordaro to the scientific committee, consisting of Prof. Sailer, Dr Sven Mühlemann (co-chair of the 2022 EAO congress and President of the Swiss Society for Implantology), Dr Christoph Ramseier, Prof. Sebastian Kühl and Dr Fidel Ruggia, the dense programme, which was grouped around three plenary sessions, began. The first session focused on the virtual patient, including the growth of this field as well as the potential role of digital human technology. Might it eventually be possible to create a 3D patient without ever seeing the patient in the office?

No less than senior staff research scientist at Google Thabo Beeler and chief scientist at DisneyResearch | Studios Prof. Markus Gross took the audience on a journey into digital human technology and explained how dentistry can learn from Hollywood. Also, Prof. Florian Beuer, Prof. Dennis Rottke, Dr Andrea Ricci and Prof. Rubens Spin-Neto discussed the virtual patient and went into greater detail on innovations such as computer-designed smiles and 3D radiography.

One highlight followed the next

The congress was held in collaboration with the Swiss societies of implantology, of oral surgery and stomatology, of periodontics and of reconstructive dentistry, and

one highlight of the congress was the Swiss Day, an interactive congress programme presented by these societies on the first day. The EAO Junior Committee also presented a hands-on workshop titled My first implant that day.

The daily online sessions were a wonderful feature. These repeated a selection of sessions each evening for participants at home on their screens and offered innovative formats such as the Prime Time Debate, Battle and #isittrue?

Does the digital approach improve treatment efficiency?

The sessions on Friday were dedicated to this question. The icing on the cake for the already knowledge-packed programme presented by award-winning dentists was an ambitious surgical double session on Friday afternoon: the procedures of Dr Istvan Urban from Hungary and Dr Mario Roccuzzo from Italy were livestreamed at the congress. The strengths and challenges of digital and conventional approaches to 3D bone regeneration were explored. Ten participants competed in the clinical video competition, presenting their 7-minute videos on different topics in digital dentistry. The winner, Dr Ramon Gómez Meda, received the European Prize for Clinical Video on Implant Dentistry and €1,000 at the ceremony on Saturday.

Saturday also addressed perhaps the most important question of all for the digital future of dentistry: does investing in new technologies improve the lives of patients and clinicians? This session focused on how to improve communication between clinicians and patients and how to better manage expectations to avoid disappointment.

Successful family reunion!

According to Prof. Sailer, the EAO congresses have always felt like a family reunion. She therefore expressed in advance: "We hope to rekindle this feeling again this year, as we have missed it in the past years." An entertaining social programme, such as the get-together and the subsequent congress dinner, as well as the party on Thursday evening and happy hour at rooftop°42 on Friday evening offered participants the opportunity to meet like-minded people and exchange experiences of their clinical work—so it seems that this wish was fulfilled.

At the EAO and Swiss associations members and faculty dinner on Thursday evening, Prof. Georg Watzek was awarded honorary EAO membership in recognition of his outstanding achievements in the field of osseointegration and his commitment to the EAO since joining the association in 1990. Prof. Watzek was EAO President in 2003–2004 and was involved in the development of several educational projects, including the EAO certification examination for implant-based therapy. So far, only seven people have received this award, among them Profs. Niklaus P. Lang and Christoph Hämmerle. In addition, Prof. Ronald Jung from Switzerland formally assumed the role of EAO President during the congress, taking over from Dr Cordaro.

International exchange is a must!

Geneva is a truly international city and is the headquarters of numerous international organisations, including the United Nations, the World Health Organization, the World Trade Organisation and the International Committee of the Red Cross. The EAO, founded in 1992, reflected this international character at the congress, where more than 80 countries were represented and which 25,000 clinicians from all over the world attended. Every participant left the congress with valuable knowledge and insights and had the opportunity to meet old friends and make new ones.

Save the date for next year's EAO congress in the German capital of Berlin from 28 to 30 September. You will not be disappointed!

contact

EAO Office, France
+33 142 366220
info@eao.org

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EFP calls for applications for second edition of digital innovation award into the future of digital dentistry

European Federation of Periodontology, Spain

Since October applications can be made for the second edition of the EFP Innovation Award for Digital Solutions for Gum Health, which recognises digital-technology projects for patients, dentists, and researchers that will contribute to improving gum health. The annual competition, financially supported by Haleon (one of the EFP's partners), seeks to promote research in Europe and around the world and is open to all EFP national societies. Three prizes (of €10,000, €6,000, and €4,000) will be awarded for digital innovations that contribute to gum health in one of three ways:

1. Innovation for the public: applications or devices that everybody can use that can help people improve their gum health and prevent gum inflammation, thereby supporting primary or secondary prevention.
2. Innovation for the dentist: digital technology that can help dentists diagnose gum disease or improve gum health.
3. Innovation of periodontal researchers: novel digital methods that will help researchers by enhancing the quality of studies regarding gum health.

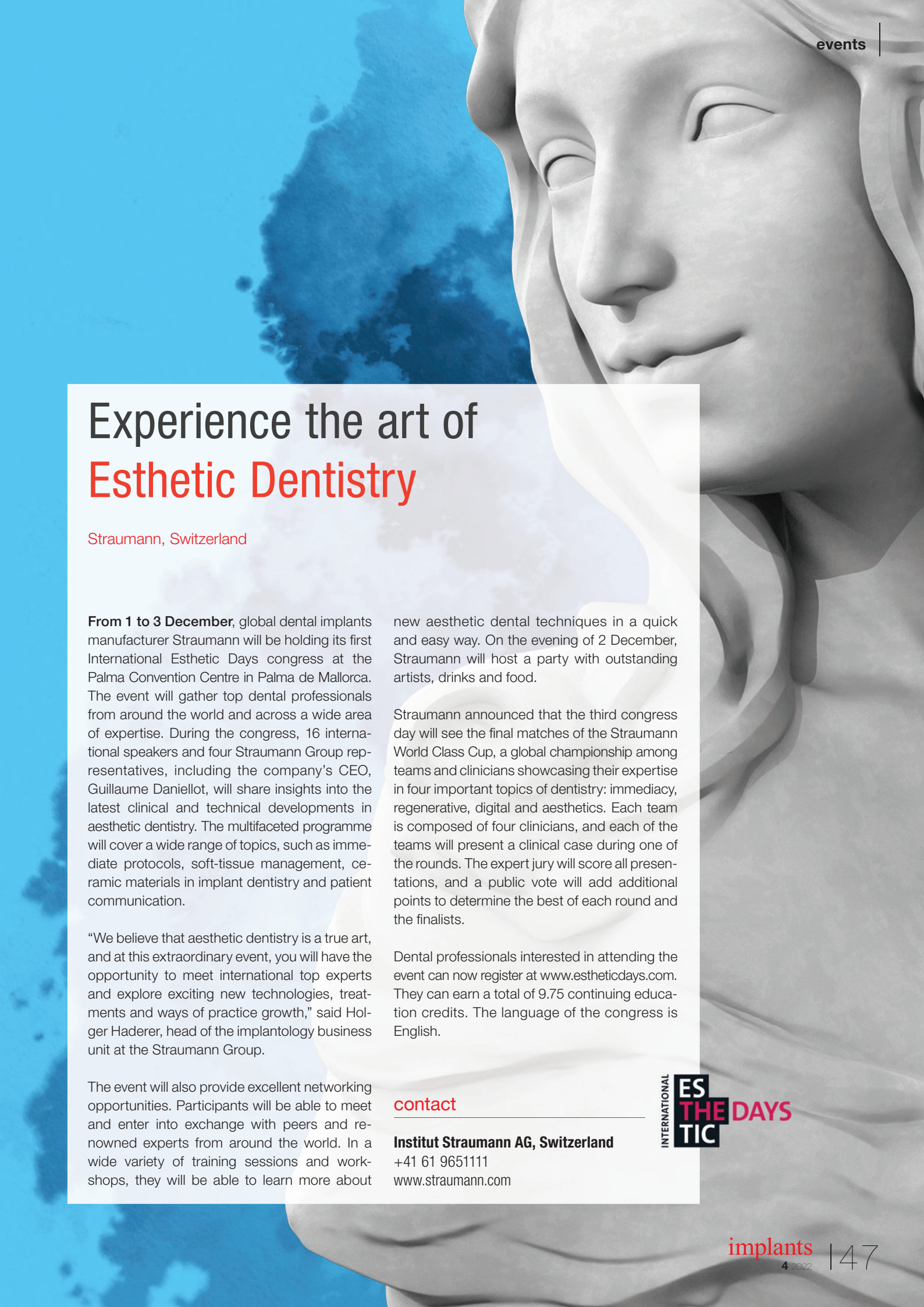
Applications will be assessed according to four criteria: the need, the market, the presentation of the idea, and the business plan. They will be evaluated by a panel of five adjudicators from the EFP: chair and deputy chair of the scientific affairs committee, chair of the postgraduate education committee, chair of the workshop committee, and a member of the executive committee. Full details of the EFP Innovation Award for Digital Solutions for Gum Health and the application process can be found on the EFP website. Candidates should send their applications and supporting materials in PDF format to Monica Guinea, EFP European coordinator (monica@efp.org) by 5 January 2023.

The awards will be announced at the EFP 2023 general assembly, to be held in Helsingor, Denmark, on 1 April.

contact

European Federation of Periodontology, Spain
www.efp.org

From left to right: Monique Danser, EFP treasurer; Paula Gómez, representative from GSK Consumer Healthcare; Lodewijk Gründemann and Melle Vroom (Netherlands); Andreas Stavropoulos, EFP President; Nicola West, EFP secretary general and EuroPerio10 treasurer, and Phoebus Madianos, EuroPerio10 chair. (© EFP)



Experience the art of Esthetic Dentistry

Straumann, Switzerland

From 1 to 3 December, global dental implants manufacturer Straumann will be holding its first International Esthetic Days congress at the Palma Convention Centre in Palma de Mallorca. The event will gather top dental professionals from around the world and across a wide area of expertise. During the congress, 16 international speakers and four Straumann Group representatives, including the company's CEO, Guillaume Daniellot, will share insights into the latest clinical and technical developments in aesthetic dentistry. The multifaceted programme will cover a wide range of topics, such as immediate protocols, soft-tissue management, ceramic materials in implant dentistry and patient communication.

"We believe that aesthetic dentistry is a true art, and at this extraordinary event, you will have the opportunity to meet international top experts and explore exciting new technologies, treatments and ways of practice growth," said Holger Haderer, head of the implantology business unit at the Straumann Group.

The event will also provide excellent networking opportunities. Participants will be able to meet and enter into exchange with peers and renowned experts from around the world. In a wide variety of training sessions and workshops, they will be able to learn more about new aesthetic dental techniques in a quick and easy way. On the evening of 2 December, Straumann will host a party with outstanding artists, drinks and food.

Straumann announced that the third congress day will see the final matches of the Straumann World Class Cup, a global championship among teams and clinicians showcasing their expertise in four important topics of dentistry: immediacy, regenerative, digital and aesthetics. Each team is composed of four clinicians, and each of the teams will present a clinical case during one of the rounds. The expert jury will score all presentations, and a public vote will add additional points to determine the best of each round and the finalists.

Dental professionals interested in attending the event can now register at www.estheticdays.com. They can earn a total of 9.75 continuing education credits. The language of the congress is English.

contact

Institut Straumann AG, Switzerland
+41 61 9651111
www.straumann.com

INTERNATIONAL ESTHETIC DAYS

CleanImplant Foundation

Dr Ken Serota will be the representative of the non-profit CleanImplant Initiative in North America

The CleanImplant Foundation, based in Berlin, Germany, has a North American office in New York City since 1 September 2022. Dr Ken Serota is acting as the Foundation's representative. He is responsible for bringing the Foundation's information campaign to the profession and the industry to ensure the highest standard and duty of care.

"We are very pleased that Dr Serota, as a dedicated ambassador of our initiative, will bring awareness of the problem of preventable, manufacture-created contamination of medical devices to the North American dental community. Together with Ken, the Foundation will be able to reach more of our colleagues, as well as implant manufacturers and distributors to foster understanding of the importance of a residue-free implant surface as an indispensable quality criterion," explains Dr Dirk Duddeck, Managing Director and Head of Research at CleanImplant.

Dr Serota will represent the CleanImplant Foundation at trade shows, conferences, and congresses. As a speaker, he will educate not only colleagues about the CleanImplant Foundation's study results, their clinical relevance, and the legal implications of using substandard implants. He will be the point of contact for North American implant manufacturers who are involved in the CleanImplant quality assessment studies. Dr Serota is "… deeply convinced of the CleanImplant Foundation's mission and the unimpeachable scientific standards of its studies. Throughout my career, I have been fascinated by how the synergy of clinical skills, research studies, and ethical standards can ensure that patient centric care is guided by the highest scientific canons of quality control. It is my great pleasure to bring the CleanImplant Foundation as a 'Partner in Science' to the profession and the industry in the United States and Canada."

Source: CleanImplant Foundation

Rapid test for periodontal disease

Researchers are developing a device to rapidly determine the presence and progression of periodontal disease

The link between periodontal disease and a range of systemic health conditions such as cardiovascular disease, Type 2 diabetes and rheumatoid arthritis is well established at this point. Researchers from the University of Birmingham are in the process of developing a rapid test for identifying the presence of periodontal disease in the hope of benefiting the overall health of patients with these comorbidities. The device is being developed by Prof. Tim Albrecht from the university's School of Chemistry, together with Dr Melissa Grant from the university's School of Dentistry. It consists of a specialised probe and detector that provides a measurement of certain protein-based biomarkers that indicate both the presence and progression of periodontal disease. This biomarker panel was discovered and validated in a study published in the *Journal of Clinical Periodontology* by a team of researchers led by Dr Grant earlier this year.

"We believe the device we are prototyping will be the first dental probe that can identify periodontal disease in this way," Prof. Albrecht said in a press release. "It will detect periodontitis quickly and easily in a variety of healthcare settings, opening up opportunities for monitoring and early intervention in the patients with comorbid disease, who would benefit most from rapid treatment for periodontitis."

"The ability to detect and profile disease biomarkers in real time will allow monitoring for disease severity, and in particular the transition between milder and more severe forms of gum disease," added Dr Grant. "This will benefit not only dental health, but also reduce costs and capture patients for whom periodontal treatment may, in the long run, be life-saving." The researchers recently received funding from UK Research and Innovation's Engineering and Physical Sciences Research Council impact acceleration account, and they plan to develop a prototype of this device within a year. In the long term, they hope to develop a probe small enough to be inserted into interdental spaces that will allow dental and other healthcare professionals to collect saliva and gingival crevicular fluid and measure the periodontal disease's progression.

Source: Dental Tribune International

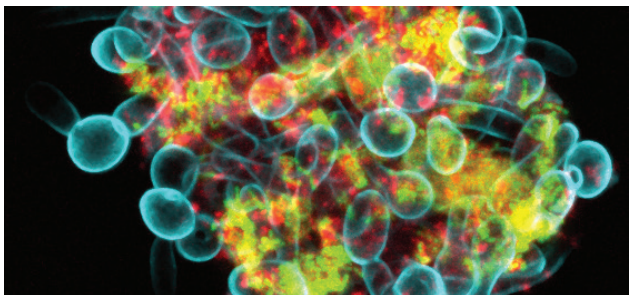
Research led by School of Dental Medicine scientists

Microbes that cause cavities can form superorganisms able to “crawl” and spread on teeth

A research team from the University of Pennsylvania has found that, within hours of growth, groupings of bacteria were able to “leap” more than 200 times their own body length across dental surfaces, offering an insightful explanation into the mechanism behind rapid bacterial colonisation and dental caries.

In a university press release, co-author Prof. Hyun (Michel) Koo, founding director of the Centre for Innovation and Precision Dentistry at the university, stated that, although the organisms comprising the biofilm in the laboratory were non-motile, the combination of bacteria and fungi created a “superorganism”: an assemblage that was far more difficult to remove from teeth than either of its two constituents alone. The research team was originally studying severe childhood caries in toddlers when they were shocked to find that the blend of bacteria and fungi actually developed the ability to “walk” and “leap”, when neither could do so before. The organisms in question, *Streptococcus mutans* and the fungus *Candida albicans*, were identified as the main components of the biofilm causing the severe caries in toddlers. The bacteria and fungi were able to develop unexpected levels of adhesion and microbial tolerance. The fungi sprouted hyphae, which enabled the bacteria to better attach themselves and prevent removal. Despite the secure attachment, the new assemblage was still able to move itself forward, “like bacteria hitch-hiking on the fungi,” said Prof. Koo. This ability meant that, once the assemblages were tested on human teeth in a laboratory model, the biofilm spread much faster than anticipated, because the organisms were able to move as they grew. The findings could not only help dentists better understand the levels of prevention necessary to stave off severe caries but could also help clinicians understand bacterial proliferation in other areas of medicine. The study, titled “Interkingdom assemblages in human saliva display group-level surface mobility and disease-promoting emergent functions”, was published in the 11 October 2022 issue of the Proceedings of the National Academy of Sciences.

Source: University of Pennsylvania



Real-time microscopy enabled researchers to track the movement and behaviour of a grouping of fungi and bacteria in the saliva of children with severe tooth decay. The interspecies cluster took on new functions and caused more severe decay than either species alone. (Image: Penn Dental Medicine)

Congresses, courses and symposia

IDS – International Dental Show 2023

14–18 March 2023
Cologne, Germany
www.ids-cologne.de

EFP International Perio Master Clinic

5–6 May 2023
Léon, Mexico
www.efp.org

WID 2023

12–13 May 2023
Vienna, Austria
www.wid.dental

52nd International Annual Congress of DGZI

6–7 October 2023
Hamburg, Germany
www.dgzi-jahreskongress.de

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Publisher
Torsten R. Oemus
oemus@oemus-media.de

CEO
Ingolf Döbbecke
doebbecke@oemus-media.de

Member of the Board
Lutz V. Hiller
hiller@oemus-media.de

Chairman Science & BD
Jürgen Isbaner
isbaner@oemus-media.de

Chief Editorial Manager
Dr Torsten Hartmann
(V. i. S. d. P.)
hartmann@dentalnet.de

Editorial Council
Dr Rolf Vollmer
info.vollmer@t-online.de

Dr Georg Bach
doc.bach@t-online.de

Dr Suheil Boutros
SMBoutros@aol.com

Editorial Management
Janine Conzato
j.conzato@oemus-media.de

Executive Producer
Gernot Meyer
meyer@oemus-media.de

Product Manager
Timo Krause
t.krause@oemus-media.de

Art Director
Alexander Jahn
a.jahn@oemus-media.de

Designer
Aniko Holzer
a.holzer@oemus-media.de

Customer Service
Marius Mezger
m.mezger@oemus-media.de

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DGZI
DGZI Central Office
Paulusstraße 1
40237 Düsseldorf, Germany
Tel.: +49 211 16970-77
Fax: +49 211 16970-66
office@dgzi-info.de

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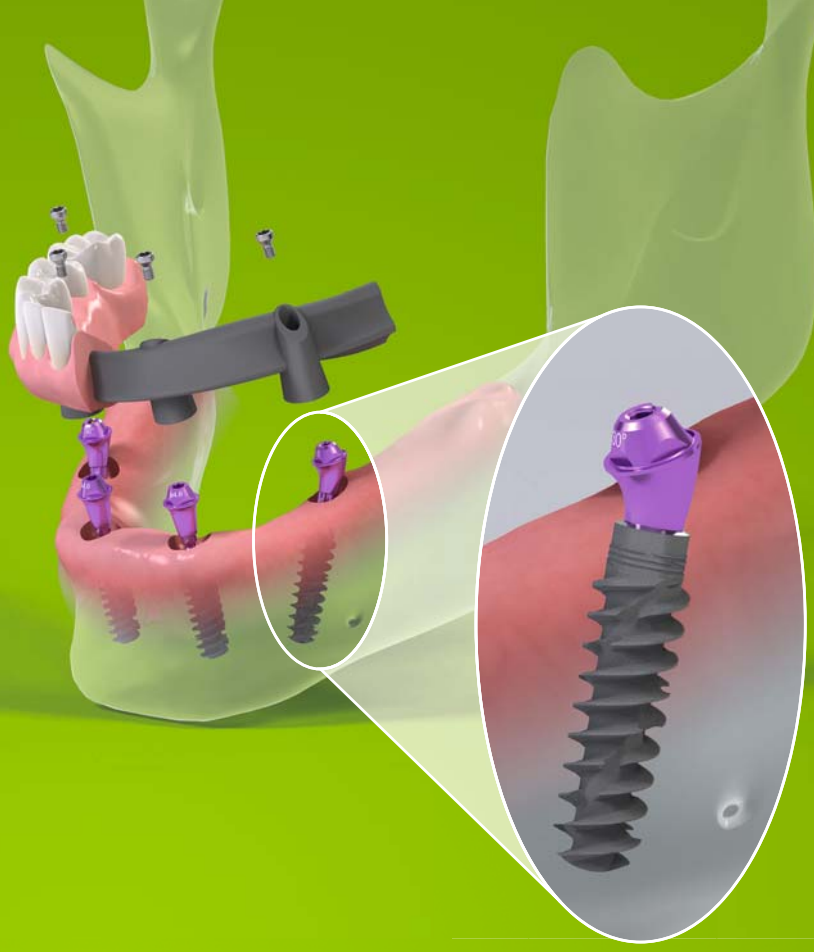

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