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implants

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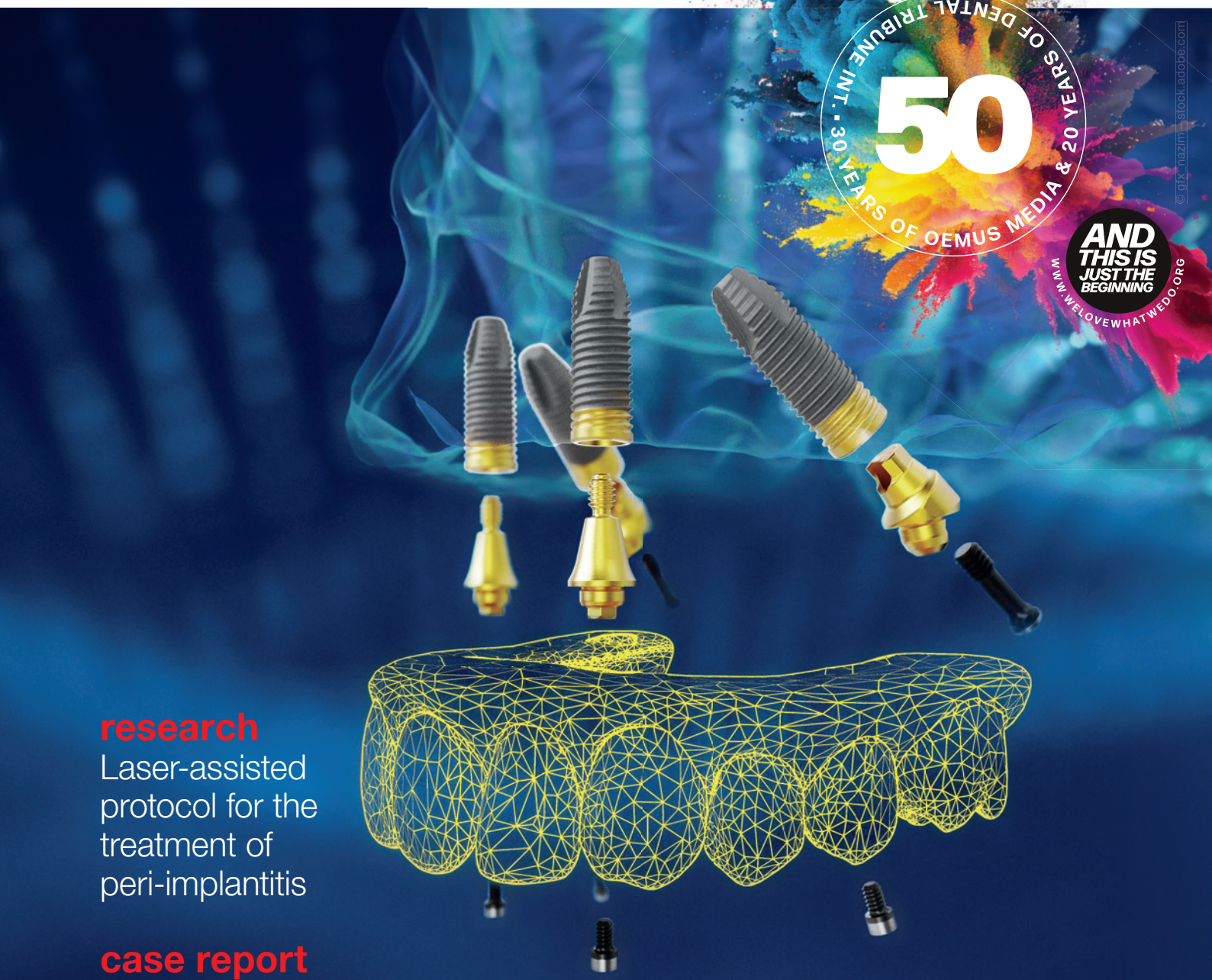

research
Laser-assisted protocol for the treatment of peri-implantitis

case report
BLT implants in a periodontal patient with hopeless dentition

interview
Big data in implant dentistry

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Dr Georg Bach

President of the DGZI

Before the court and on the high seas...

Dear colleagues!

"Before the court and on the high seas, you are in God's hands," goes the oft-quoted adage. A recent verdict by the Berlin Regional Court underscores the profound resonance of this proverb. Despite the assertions of the court-appointed expert to the contrary, the ruling discounted the medical necessity of two-part ceramic implants due to purported lack of evidence. The remarkable aspect lies not merely in the court's dismissal of expert testimony but in the consequential denial of reimbursement by various insurance companies for procedures involving two-part ceramic implants, citing this ruling.

The ensuing discourse has illuminated a persistent reality: ceramic implants remain a contentious topic in contemporary implantology, even years after their introduction. It falls upon each of us, esteemed colleagues, to discern our stance on ceramic implants, be they one-piece or two-piece, and draw informed conclusions. However, one incontrovertible truth emerges: such a verdict demands a response.

As the representative of the Implantology Consensus Conference, the DGZI (German Association of Dental Implantology) brought this issue to the forefront during the latest meeting, known internally as the "KK". The KK issued a succinct yet cogent statement in response. Yet, under the auspices of DGZI's leadership, a cadre of experts convened to craft a comprehensive analysis and further statement. I urge you to turn to pages 40 and 41 of this edition of *implants* for a detailed exposition. Rest assured, DGZI remains vigilant in monitoring developments on this front and will keep you apprised accordingly.

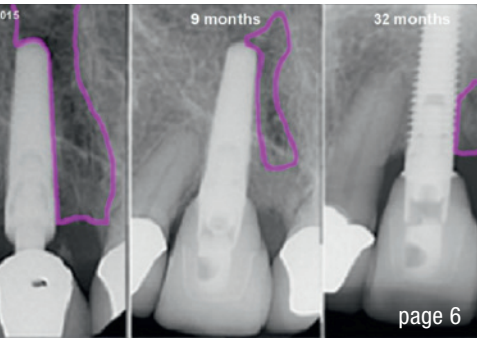
In this vein, I extend my warm regards and encourage you to delve into this issue of *implants* with zeal.

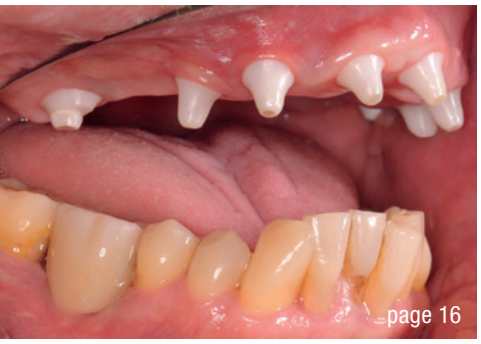
Yours sincerely

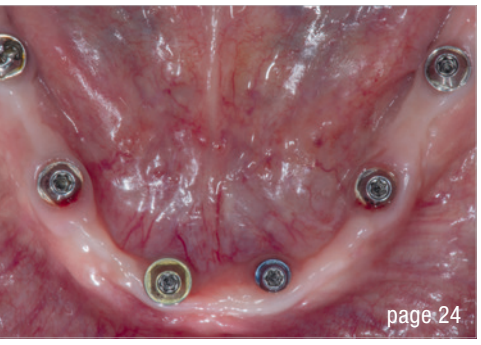
Dr Georg Bach

President of the German Association of Dental Implantology

Dr Georg Bach







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Laser-assisted protocol for the treatment of peri-implantitis: A long-term retrospective case series

Drs Gary M. Schwarz, David M. Harris & Gregori M. Kurtzman, USA

Pulsed Nd:YAG dental lasers are surgical tools used to obtain specific surgical objectives as defined in the LANAP (laser-assisted new attachment procedure) for periodontitis and the LAPIP (laser-assisted peri-implantitis procedure) for peri-implantitis. The LANAP using the PerioLase Nd:YAG laser (Millennium Dental Technologies) was introduced in 1998 as Laser ENAP,[1] and in 2004, the LANAP gained US Food and Drug Administration 510(k) clearance (No. K030290) for the claim "laser-assisted new attachment procedure (cementum-mediated periodontal ligament new attachment to the root surface in the absence of long junctional epithelium)". Subsequently, human histology studies[2, 3] established that the LANAP resulted in "periodontal regeneration—true regeneration of the attachment apparatus (new cementum, new periodontal ligament, and new alveolar bone) on a previously diseased root surface" (2016 510[k] clearance No. K151763).

The LAPIP emerged from the LANAP as a stand-alone procedure.[4–7] The indication for the LANAP is moderate to advanced periodontitis, whereas the LAPIP is indicated for peri-implantitis treatment. The basic steps in the two protocols are the same and have adjustments for the whole mouth versus a single site, the responses to irradiation of root cementum versus implant titanium, and differences in surgical objectives.

A recent review of published studies of peri-implantitis laser treatment concluded that laser treatment enhances bone growth, but a quantitative analysis of bone-level changes is limited.[9] The authors called for greater relevance and translation of the research findings to the clinician. This report addresses those concerns with a detailed analysis of the clinical outcomes and a quantitative description of changes in radiographic density two to five years after undergoing a LAPIP in a private practice setting.

Dr Schwarz completed training in the LAPIP in September 2013. A retrospective analysis of the 222 sequential patients with 437 failing dental implants that were treated during the following three years was performed.[7] That study was focused on the short-term efficacy of the LAPIP. A statistically significant reduction of clinical signs of erythema, bleeding and suppuration and reduced probing depth (PD) at the first follow-up visit (median period: 7.6 months; $P < 0.001$) was noted. The survival rate, the percentage of intact implants, was 94% over the longest follow-up period (median: 13.1 months) among those in the analysis.

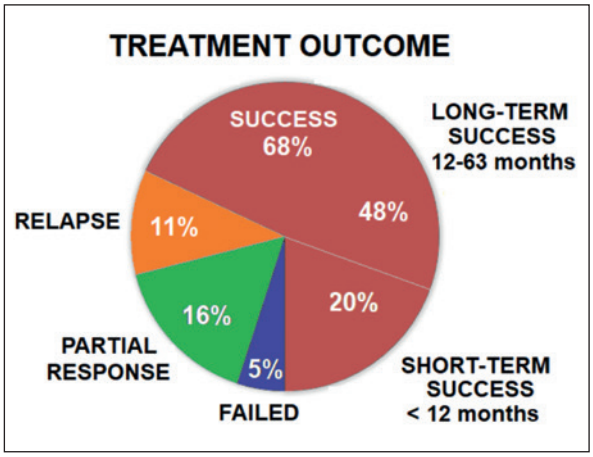

Fig. 1: Proportion of dental implants in each clinical treatment outcome category.

i Periodontitis: "Inflammation of the periodontal tissues resulting in clinical attachment loss, alveolar bone loss, and periodontal pocketing."[8]

ii Peri-implantitis: "An inflammatory process around an implant which includes both soft-tissue inflammation and loss of supporting bone."[8] Clinical signs include inflammation, bleeding on probing and suppuration. It progresses from peri-implant mucositis, which is confined to the soft tissue, to include PD > 4 mm and evidence of bone loss. Peri-implantitis often leads to progressive loss of osseointegration and eventual loss of the implant.

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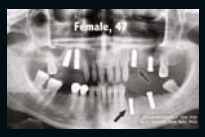

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Long-term clinical and radiographic data are presented from the same group of 222 patients. There was a continuum of responses, including long-term successes, partial responses with intact implants and implants lost after two years of maintenance with multiple treatments, as well as cases of successful treatments that relapsed after one to two years. Analysis of radiographic data from a sample of successfully treated implants provided a time course for bone regeneration.

Methods

Collection and analysis were performed of retrospective data, wherein patient records were sorted to find all patients in the practice who had undergone LAPIP treatment within the 37-month interval from the first treatment (October 2013) until the date of institutional review board approval (October 2016). A private institutional review board (Quorum Review) granted a waiver of informed consent and approved the retrospective data collection and analysis protocol. Later, the institutional review board approved the retrospective analysis of the long-term follow-up data that is included in this report. The original study was conducted according to standards established by the Declaration of Helsinki and Good Clinical Laboratory Practice Guidelines. Research standards established in the original study were maintained in the current study.

The purpose of the original study was a precise statistical analysis of the initial clinical outcome of a single treatment, seeking to determine whether there was improvement or a lack of improvement at the first follow-up visit. A review was conducted of patients who received the treatment in the three years after the LAPIP training. All patients were included to eliminate selection bias. A staff member went through the medical records of each LAPIP patient and copied data into case report forms. Any identifying information was excluded, and the case report forms were sent electronically to the statistician for data entry and analysis. Data captured included laser settings, demographics, medical history, implant information, adverse events, PD (mm; for six pockets) and the presence of clinical signs (bleeding, erythema and/or suppuration). Panoramic and/or periapical radiographs were available for analysis. The statistician excluded patients with missing data from the various analyses. The original group included 222 patients with 437 implants. That study enrolment closed in October 2016. Exclusion of patients with incomplete data resulted in 116 patients with 224 implants available for analysis, including 47% men and 53% women with a mean age of 65.8 years (range: 23–98 years).

Two years later (September 2018), a second look at the original group of patients was performed. Several patients had follow-up visits beyond the closing date of the original analysis. Case report forms of additional follow-up visits were collected, uploaded and added to the original data set. This resulted in 155 patients with 299 implants who had sufficient baseline and follow-up data to determine implant survival and clinical outcomes.

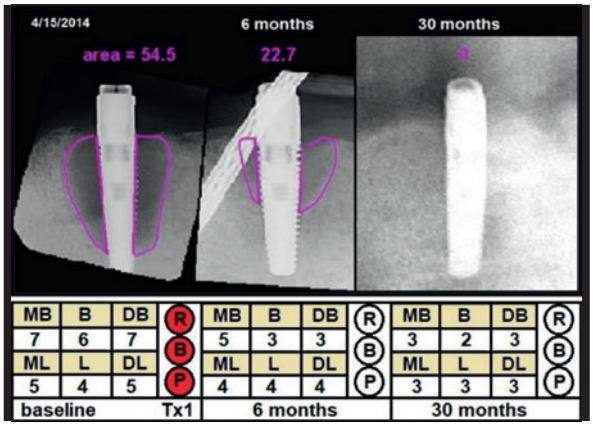

Fig. 2: Example of a successful treatment (Case 1), showing changes in radiographic defect (mm^2), probing depth (PD; mm) and clinical signs from baseline to 30 months later. Violet = cross-sectional area; MB = mesiobuccal PD; B = buccal PD; DB = distobuccal PD; ML = mesiolingual PD; L = lingual PD; DL = distolingual PD; R = redness; B = bleeding; P = suppuration; Tx1 = first treatment.

Laser dosimetry

The dental laser was a 6 W pulsed Nd:YAG laser (PerioLase MVP-7, Millennium Dental Technology) utilising an optical fibre that delivered high-energy pulses of light to the tissue. For the LAPIP, the fibre tip is inserted into the periodontal pocket. Parameters that are set on the control panel are energy per pulse up to 300 mJ; pulse duration, variable from 100 to 650 µs; and pulse repetition rate from 10 to 100 Hz. The duration of exposure is controlled with a foot switch.

The LAPIP details have been published elsewhere[4–7] and are only summarised as follows for the protocol specifying surgical end points. Achieving those end points is what determines the dosimetry. In Step 2 of the protocol, the distal fibre tip is inserted into the periodontal pocket and passed around the implant several times to initially open the sulcus and then to remove the diseased pocket epithelium and disinfect the tissue, constituting Pass 1 with the laser.[10] In Step 4 of the protocol, the fibre tip is inserted into the pooled blood within the sulcus and again passed around the implant, heating and congealing the blood and forming a fibrin clot, constituting Pass 2 with the laser.[11]

Hence, real-time dosimetry is based on these clinical conditions. With a constant laser power (output), the time spent lasing within the sulcus determines the total energy delivered. In other words, a prescribed laser dose does

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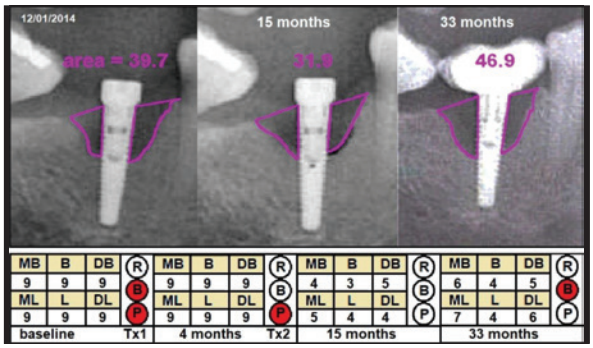

Fig. 3: Example of a partial response to treatment (Case 2), showing changes in radiographic defect (mm²), probing depth (PD; mm) and clinical signs from baseline to 33 months later. Violet = cross-sectional area; MB = mesiobuccal PD; B = buccal PD; DB = distobuccal PD; ML = mesiolingual PD; L = lingual PD; DL = distolingual PD; R = redness; B = bleeding; P = suppuration; Tx1 = first treatment; Tx2 = second treatment.

not determine the treatment end point; rather, achieving the surgical end point determines the total joules. The surgeon understands that clinical conditions determine the precise laser parameters and the total energy delivered. However, exceeding the recommended dosimetry increases the risk of possible adverse effects.

The hard copy printout of the laser dose for Pass 1 and Pass 2 was available for 138 implants, and the mean total energy per implant was 285.8 J. This was divided between the two laser steps. Pass 1 mean total energy was 181.8 J, and Pass 2 mean total energy was 104.0 J. Energy was delivered according to the following formulas, and sizable case-to-case variance was required to achieve the surgical end points:

- Pass 1 total joules delivered = 130 + (10 × aPD)
- Pass 2 total joules delivered = 85 + (4 × aPD)

These two formulas are not a prescription; they merely define the dosimetry used in this study. On average, Pass 1 required an initial 130 J for all implants, and Pass 2 required an initial 85 J. The formula specifies that the total joules per pass is related to the average probing depth (aPD; the average of six PD measurements). Consequently, to estimate the total energy, add ten times the aPD in joules to the initial values for Pass 1 and four times the aPD for Pass 2.

Radiographic analysis

Film radiographs were scanned and digitised and then the digital radiographs were rotated, cropped and resized. Brightness and contrast were not adjusted. Images were arranged in chronological order to illustrate the sequential changes in radiographic density for each case. A technician skilled at reading dental radiographs outlined the radiographic defect and areas of change in subsequent images. The cross-sectional area of the defect within the outlines was measured using public domain software (ImageJ, National Institutes of Health freeware). As the dimensions of the implant were known, the areas were calibrated in square millimetres so that comparisons could be made over time and across cases. The sum of the defect areas on both sides of the implant is referred to as the cross-sectional area. Cross-sectional areas at follow-up visits of successful cases were converted to baseline percentage to estimate the time course of bone regeneration.

Results

The clinical outcome categories were defined as follows (Fig. 1):

- *Long-term success:* return to healthy PD and an absence of clinical signs
- *Short-term success:* patients with successful outcomes but without follow-up data beyond 12 months
- *Partial response:* failure to meet success criteria but the implant was still intact and stable
- *Relapse:* initial success and then return of clinical signs
- *Failed:* implant lost or removed.

The long-term responses to treatment can thus be divided into four general outcomes: successful response (Group 1), partial response (Group 2), spontaneous relapse (Group 3) and lost implant (Group 4). Summary statistics for each of the four groups are presented in this section, followed by one case from each group.

Group 1: Successful response

This was the most common response, 204 implants (68%) meeting the success criteria of post-treatment PD ≤ 4 mm and no clinical signs at follow-up visits. Most implants in

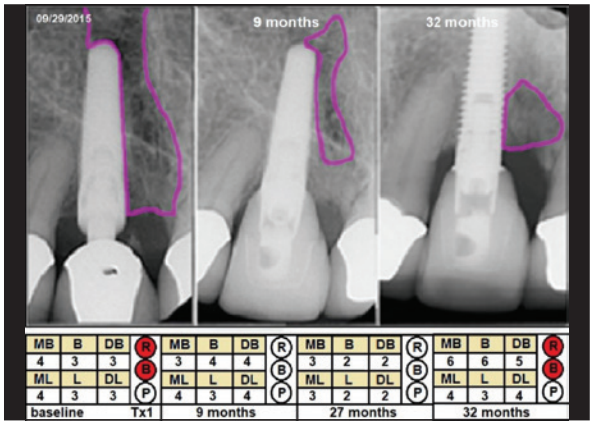

Fig. 4: Example of a successful single treatment that was without clinical signs for over two years, and then the implant presented with signs of re-infection (Case 3), showing changes in radiographic defect (mm²), probing depth (PD; mm) and clinical signs from baseline to 32 months later. Violet = cross-sectional area; MB = mesiobuccal PD; B = buccal PD; DB = distobuccal PD; ML = mesiolingual PD; L = lingual PD; DL = distolingual PD; R = redness; B = bleeding; P = suppuration; Tx1 = first treatment.

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1 Norton MR, Astrom M. The influence of implant surface on maintenance of marginal bone levels for three premium implant brands: A systematic review and meta-analysis. Int J Oral Maxillofac Implants 2020;35(6):1099-111

this group (91%) achieved success after a single treatment. Others (7%) demonstrated a partial response and then success after a second treatment, and 2% achieved success after three treatments. The median follow-up period in this group was 18.8 months, and one implant was still successful at 63 months. At the time of the latest analysis, 48% of all implants still showed long-term success (12–63 months). The remaining 20% of successfully treated implants had follow-up periods of less than 12 months, so their long-term outcomes could not be determined. Most of these patients did not return for their scheduled hygiene visits.

Case 1 is an example from the group of successful treatments (Fig. 2). The patient was an 87-year-old man with a cardiovascular condition and had implants in positions #32 and 42 that supported a mandibular overdenture. He presented with deep pockets (PD = 5.7 mm) accompanied by a large defect around implant #42. This had led to acute symptoms, including pain, erythema, bleeding, suppuration and swelling of the vestibule. At the pretreatment visit, the labial plate was mostly absent along the buccal aspect of the implant becoming exposed. At six months post-treatment, the clinical signs had resolved, the PD had reduced to 3.8 mm and the area of radiolucency had reduced too. At 30 months, the PD was 2.8 mm, and there was a complete absence of clinical signs.

Group 2: Partial response

Partial responders are implants that improved but still showed some clinical signs, had a PD > 4 mm and never achieved the success criteria. There were 47 implants (16%) in this category. Most were treated a second time at six or 12 months after the first treatment, and several received a third treatment. They continued to exhibit clinical signs and had a PD > 4 mm. The median follow-up period in this group was 22 months.

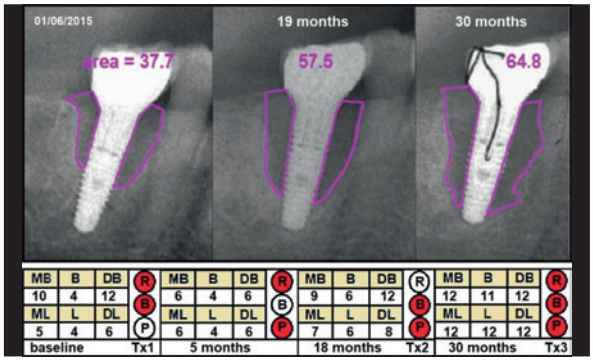

Fig. 5: Example of a lost implant (Case 4), showing changes in radiographic defect (mm²), probing depth (PD; mm) and clinical signs from baseline to 30 months later. Violet = cross-sectional area; MB = mesiobuccal PD; B = buccal PD; DB = distobuccal PD; ML = mesiolingual PD; L = lingual PD; DL = distolingual PD; R = redness; B = bleeding; P = suppuration; Tx1 = first treatment; Tx2 = second treatment; Tx3 = third treatment.

Case 2 is an example of a partial response to treatment (Fig. 3). The patient was a 58-year-old man with Type 2 diabetes, hypertension and hyperlipidaemia and had had an implant (Nobel Biocare Tapered) placed in position #46 in July 2014. The patient presented in December 2014 with a PD of 9 mm around the implant, bleeding and suppuration and was treated with the LAPIP. At four months, there was no bleeding, but the PD was still 9 mm, and a second treatment was performed. At 15 months, the clinical signs had improved, and PD was reduced to an aPD of 4.2 mm. At 33 months, the implant was still intact; however, the PD had increased to 5.3 mm, and there was some bleeding on probing. The PD and clinical signs at follow-up visits did not allow this implant to reach the success criteria. Even though bone regeneration is unlikely with a defect this wide, the PD and clinical signs improved and remained improved for almost three years after the first LAPIP treatment, and the implant remained in function at the time of last follow-up.

Group 3: Spontaneous relapse

There were 32 implants (11%) with initially successful outcomes that demonstrated relapse with the return of inflammatory markers along with deeper PD. The medium time to relapse was 24 months (range: 11–43 months).

Case 3 is an example of a successful single treatment that was without clinical signs for over two years and then presented with signs of reinfection (Fig. 4). The 59-year-old female patient had had an implant (Nobel Biocare Tapered; 3.5 × 16.0 mm) immediately placed in position #11. She had no risk factors for peri-implantitis, but four months later, at her first follow-up visit, the implant showed signs of redness and bleeding from 4 mm pockets. Subgingival cement was noted on the periapical radiographs and was removed. The first LAPIP treatment was performed in September 2015. At follow-up visits at nine, 15 and 27 months after the first treatment, all inflammatory markers were absent, and the PD showed progressive improvement, good bone fill being noted in the periapical radiographs. The apical radiolucency was absent, but a new defect had appeared coronally at 27 months. At 32 months, she showed significant relapse with redness and bleeding from pockets that had deepened beyond the pretreatment levels. Radiography revealed that the new defect had enlarged. The implant was subsequently retreated.

Group 4: Lost or removed implants

There were 16 implants (5%) that failed during the follow-up period. The median time to failure after the initial LAPIP treatment was five months (range: one week to 31 months). Four implants were lost within the first month, six more by the first follow-up visit (five months), two at nine months, one at 18 months and three after two years of maintenance. One of the last was healthy but ordered extracted by the patient's physician.

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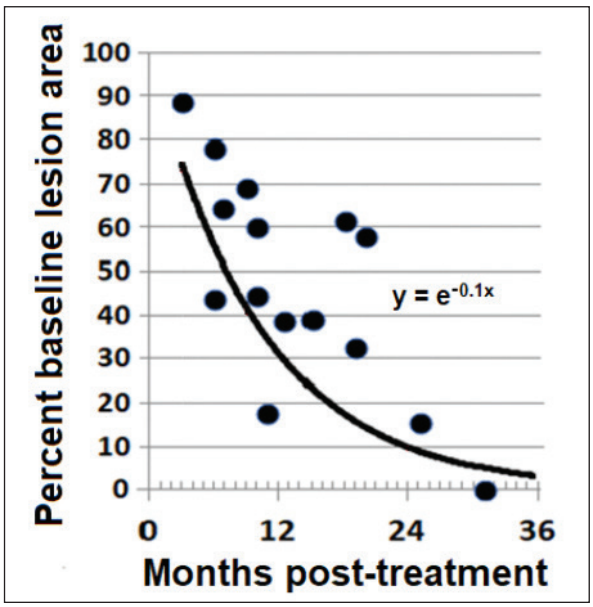

Fig. 6: Change in cross-sectional area of the defect as a percentage of the baseline area for seven implants from Group 1. Black circles = success.

Case 4 is among the lost implant cases (Fig. 5). The patient was an 81-year-old immunocompromised man with several medical conditions, including cardiovascular disease and a drug-resistant systemic infection. An implant (Nobel Biocare Tapered; 5 × 13 mm) had been placed in position #46, and he was seen six months later with an aPD of 6.8 mm, bleeding at four sites, erythema and radiographic evidence of bone loss. At the five-month follow-up visit, bleeding had resolved, and the aPD was reduced to 5.5 mm, but there was still redness and suppuration. By the 18-month visit, the condition had deteriorated. The aPD had increased to 8 mm, and there was bleeding and suppuration. At that time, the patient received a second LAPIP treatment. At 30 months, one PD was 11 mm and the rest were 12 mm, and there was an increase in the radiographic size of the defect. A third treatment was performed, and the laser dose was increased to 305 J at Pass 1 and 180 J at Pass 2 for that treatment. However, the implant was finally removed 31 months after the first treatment.

Change in radiographic density

Radiographs from all 299 implants were reviewed to identify interproximal vertical defects at baseline indicating bone loss. Many patients had panoramic radiographs of low resolution, and most bone loss was restricted to the buccal plate, which is not visible in transmission (periapical and panoramic) radiography. Only 21 cases were identified, and of these, ten provided measurable baseline and follow-up radiographs. Radiographic data reflected a similar proportion of outcomes to the PD and clinical sign data. Out of the ten cases, one was from Group 3 (lost implant), two were from Group 2 (partial response) and seven were from Group 1 (successful cases). The cross-sectional areas of the seven successful cases were converted to a percentage of the baseline areas, and those values were plotted at their respective follow-up times (Fig. 6). The data fitted well to a decaying exponential function, $y=e^{-0.1x}$, which suggested that regeneration approached 98% by 36 months.

Discussion

The LAPIP utilises the advantages of laser sulcular debridement (e.g. selective tissue removal, bacterial reduction, haemostasis, minimally invasive method) and embeds the laser components into a medically sound protocol that also includes implant debridement, occlusal adjustment, and detailed pretreatment and post-treatment procedures. Because of these additional therapeutic measures, the outcomes reported here may not be directly comparable with those of many controlled laser studies.

PD and clinical signs were analysed. Analysis of the short-term data from 116 patients with complete baseline and follow-up data determined that there was a statistically significant reduction in PD and clinical signs at the first follow-up visit (median: 7.6 months) after a single treatment. The aPD was reduced by 2.0 mm (5.4 mm reduced to 3.4 mm, $P < 0.001$), and clinical signs of erythema, bleeding and suppuration were reduced by 78–85% ($P < 0.001$). A recent prospective controlled trial of ten patients who were treated with the LAPIP found similar results: a 1.9 mm PD reduction and decreased bleeding and suppuration.[12]

Several patients had follow-up visits after the short-term study had concluded. By the time of this long-term analysis, there were 155 patients with 299 implants available to determine long-term survival and response to therapy. The initial survival rate was 94% at 13.1 months (15 were lost out of the 264 implants). The long-term survival rate matched and surpassed the previous results, being 95% at 28.8 months (16 of the 299 implants were lost). In the long term, PD remained ≤ 4 mm, and clinical signs remained absent for 68% of the 299 implants. An additional 11% were initially successful, but then presented with a relapse at about two years post-treatment. Sixteen per cent of the 299 implants never achieved success but remained intact at 22 months.

The clinical healing curve indicated by the average rate of increase in radiographic density for successful cases demonstrated that, on average, bone fill is expected to be 25% complete by three months, 70% complete at one year, 90% complete by two years and 98% complete after three years. It is important to note that this study only sampled interproximal defects, and the analysis may thus not accurately reflect changes to labial bone.

Conclusion

One of the greatest challenges has been fighting a losing battle against peri-implantitis. The impact of the LAPIP on treatment of peri-implantitis has been significant. Using other methods over 30 years of practice in the case of Dr Schwarz, achieving bone fill and eliminating all signs of inflammation have been challenging. These results describe the final stage of translation of an experimental protocol into clinical practice. An attempt to present an unbiased analysis of the real-world clinical outcomes, successful or not, has been accomplished. The results demonstrated would be typical for any clinician who has been properly trained and follows the protocol. Even a partial responder is a clinical success if the implant remains improved. Periodic retreatment of the partial responders and the relapses is a way to extend the time of functionality for the patient. The results of this study indicate that the LAPIP offers a minimally invasive, repeatable way to regenerate bone and eliminate clinical signs of disease in most patients and to effectively manage the more difficult cases.

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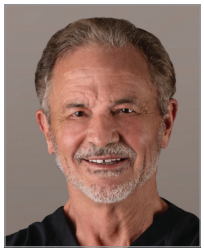

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Literature

Dr Gregori M. Kurtzman

Full-arch: Full rehabilitation of the upper jaw—Part 2

Literature

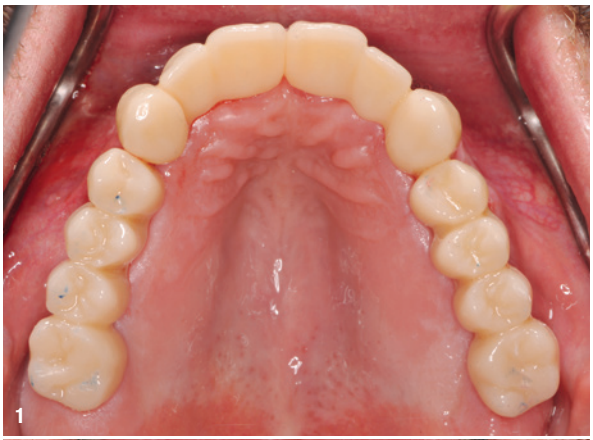
Dr Dr Michael Rak, Norbert Wichnalek, Arbnor Saraci & Lukas Wichnalek, Germany

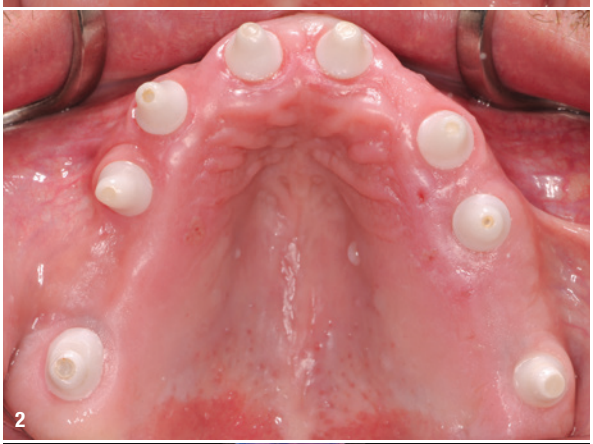
The complete rehabilitation of a compromised residual dentition represents a major challenge in terms of implant treatment as well as function and aesthetics. In particular, there is great demand for fixed restorations that both achieve aesthetics and restore function. In addition, patients are increasingly interested in biocompatible restorations and surgical concepts that take biological criteria into account. Biological dentistry employing metal-free implants and zirconia dentures can meet this demand effectively. In the first part of this case report, we dealt with the diagnosis of the patient and the case's special features, the preparation of the patient for surgery and the surgical procedures of tooth extraction and immediate implant placement.[1] In this second part, the prosthetic restoration will be described.

From Part 1, recall that the 41-year-old patient wanted a biologically neutral and metal-free comprehensive rehabilitation of his compromised residual maxillary dentition and caries treatment of his mandibular teeth. In the maxilla, the patient retained tooth #17 and part of tooth #25, as well as the roots of teeth #13 and 15, and had a bridge replacing teeth #12 to 22. The remaining maxillary dentition had already undergone endodontic treatment and was not worth preserving. In the mandible, teeth #47, 45, 36 and 37 had carious lesions, and tooth #46 was devitalised and decayed and showed extensive apical whitening radiographically. The remaining mandibular teeth were vital. Moderate chronic periodontitis was diagnosed in both the maxilla and mandible.

Prosthetic restoration

The success of restoration is highly dependent on careful planning, requiring the exchange of information between the dentist, patient and dental technician. Planning revolves around the following questions: What are the patient's expectations? What is realistic and technically feasible? It is extremely important to involve the patient in the entire decision-making process; after all, it is the patient who will have to live with the finished work. Once all the important matters have been clarified, we first fabricate the planned prothesis as a prototype (temporary restoration) and then have everything checked in the mouth.





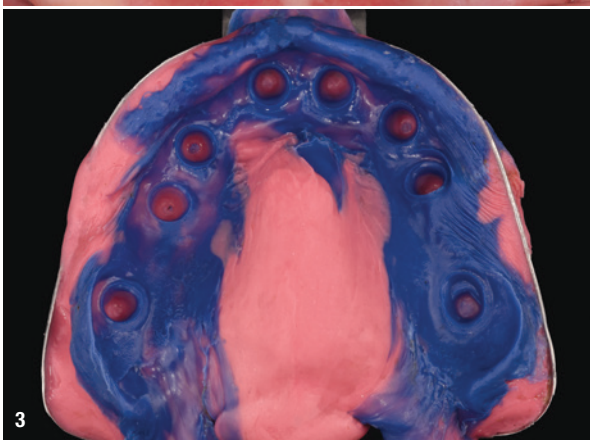


Fig. 1: Prototype *in situ* after about three months of healing. **Fig. 2:** Completely irritation-free gingiva with beautifully healed implants after about three months of healing. **Fig. 3:** Silicone impression of the situation with the temporary restoration removed.

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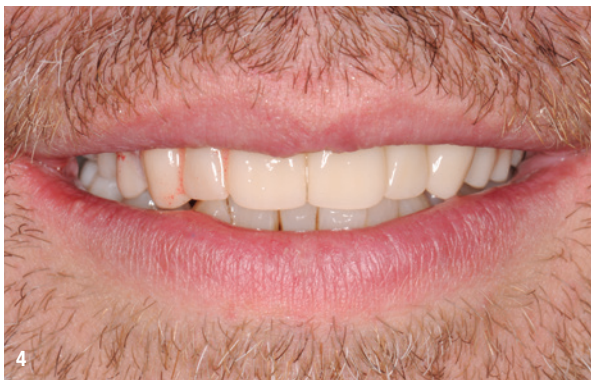


Fig. 4: After replacement of the temporary restoration on the implants.

Our focus is always on the whole person. Therefore, the patient's posture and, most importantly, his or her comfortable occlusion are central role to our approach. Particularly with such a compromised residual maxillary dentition, it is important to consider that the patient may have adapted to an incorrect occlusion over the years. We therefore check posture to determine whether we need to intervene therapeutically in advance with the help of splint therapy. We then discuss the patient's wishes and select the desired tooth shape together.

Based on all this information, we create a prototype in our laboratory that corresponds to the final restoration in terms of shape and design. The prototype in this case was made of acrylic based on the intra-oral scan of the patient with and without his existing bridge and a conventional fully adjustable articulator. From this data, we first generated a virtual wax-up, from which we also prepared the various surgical aids—the surgical guide and various transparent verification templates—as shown in the first part of this article. Practice has shown us time and again that, despite immense technical, instrumental and computer-assisted effort, there is always a discrepancy between the appliance and the biomechanical system of hard and soft tissue. The true measure is in the patient's mouth, not in the precise, mathematically calculated condylar paths and eccentric excursions of a virtual articulator.

An occlusal restoration is always a compromise. Occlusion is not something that can be measured. Occlusion is something individual. Even at the beginning of articulation research, dental technology greats such as Dr Alfred Gysi, Rudolph L. Hanau and Dr Rudolf Thielemann recognised that a biological system cannot be implemented on a mechanically and mathematically precise mastication simulator. Carl Hildebrand, the founder of VITA Zahnfabrik, said in the 1930s: "Occlusion cannot be understood from observation of the morphology of individual teeth but rather from the living structure (cybernetics) of the entire organism."[2] Following this guiding principle, we use our patient as the best articulator a dental technician could wish for. During the osseointegration of the implants, the prototype serves to record the eccentric movements manifesting in patient-specific wear facets, which we can then transfer directly to the final restoration. The dental practice scans the prototype *in situ* when the patient visits the practice for a check-up and follow-up care and sends the data obtained in this way to the laboratory for transfer of the wear facets directly to the final restoration.

Follow-up appointment in the practice

The patient came back to the practice after a healing period of around three months. After scanning the prototype,

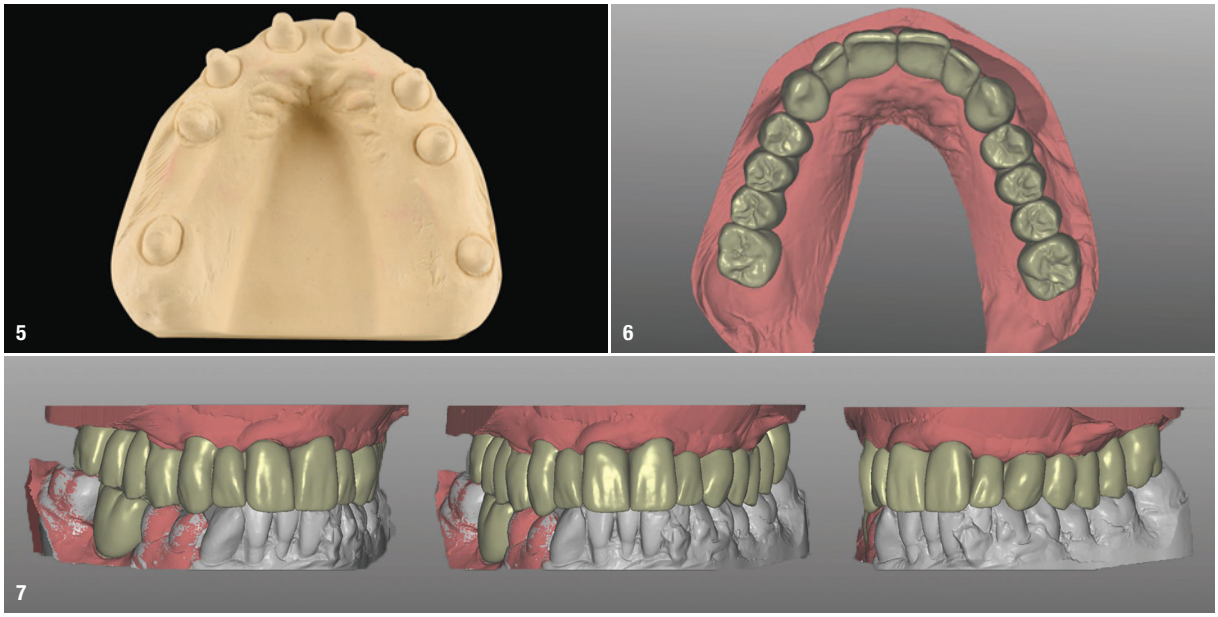


Fig. 5: Plaster model created based on the silicone impression. **Fig. 6:** Digitised model. **Fig. 7:** Design of the three bridges.

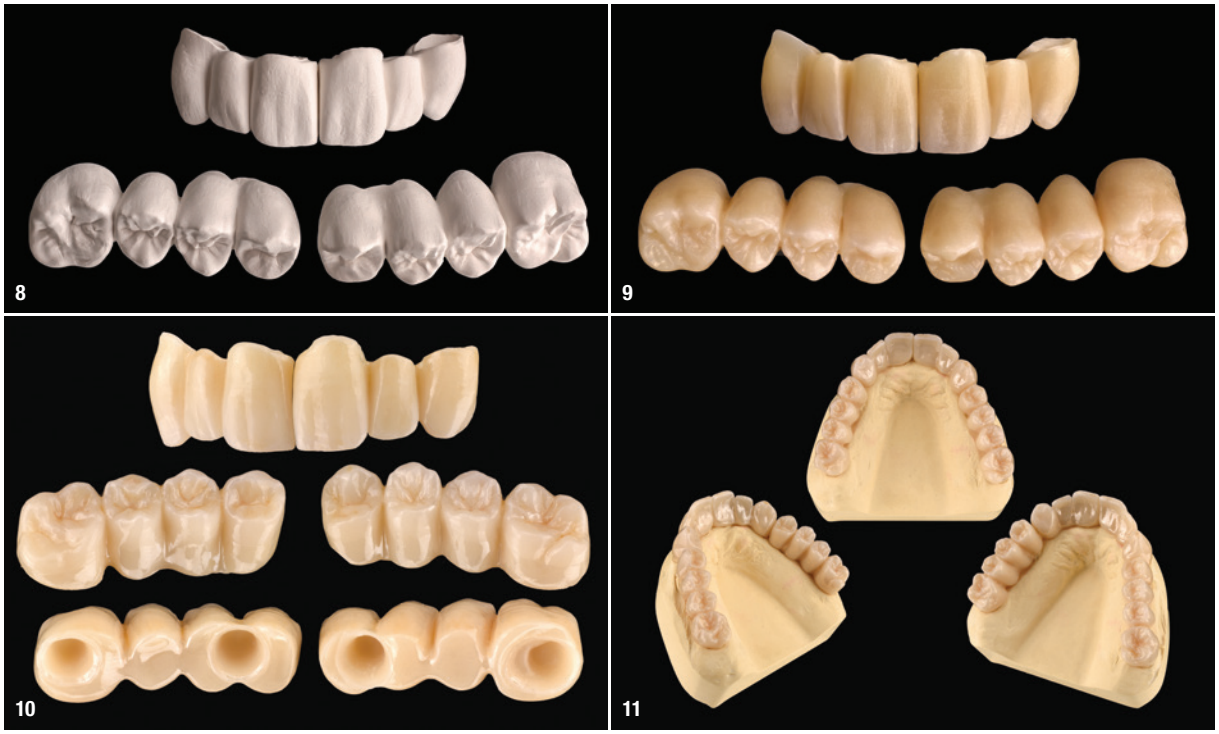
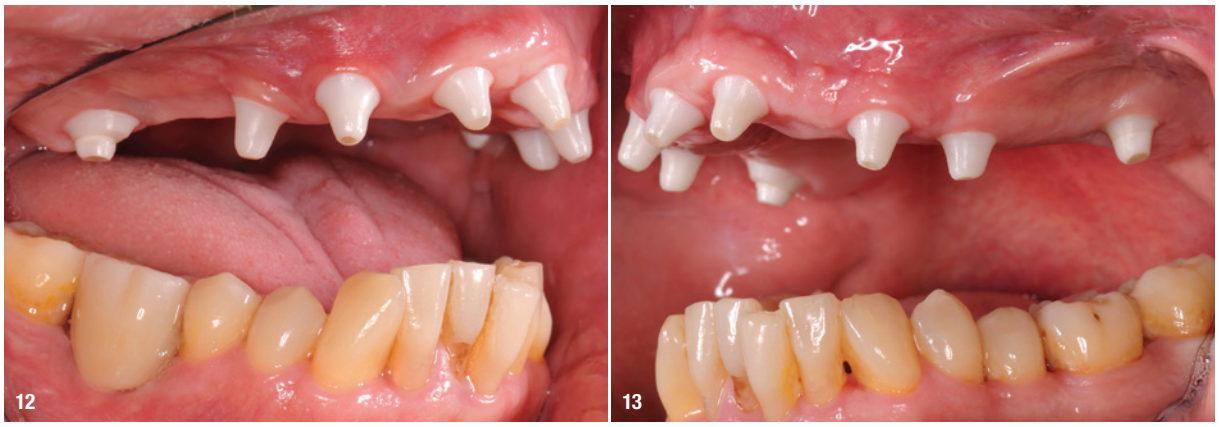


Fig. 8: Three milled bridges prior to processing. **Fig. 9:** Impressive aesthetics of the zirconia after the first firing. **Fig. 10:** Bridges after the final glaze firing and polishing. **Fig. 11:** Bridges on the model after the final glaze firing and polishing.

we removed it and found a completely irritation-free gingiva underneath with beautifully healed implants (Figs. 1 & 2). We then took an impression of this situation using silicone and then replaced the temporary restoration on the implants (Figs. 3 & 4). We thereafter submitted the scan and silicone impression to the laboratory for completion of the final restoration.

Principle of cranial respiration

It used to be assumed that the skull was a kind of bony steel helmet that only served to protect the underlying brain. Today, we know that the bony structures of the skull are a vibratory element within the organism. The skull is made up of a very complex structure of cranial bones which form a 3D interlocking mechanism. Each cranial bone can move along all three planes, allowing movement in six directions (anterior to posterior, superior to inferior, medial to lateral). The cranial bones as a whole oscillate in a kind of breathing motion referred to as “cranial respiration”. They move rhythmically, alternating between shortening, expanding, lengthening and narrowing over a period, without the volume of the skull changing quantitatively. Not only can this rhythm of movement be pathologically altered, that is, increased or decreased, but individual cranial bones can also become stuck or displaced in such a way that their mobility and thus that of the entire system is restricted.[3]



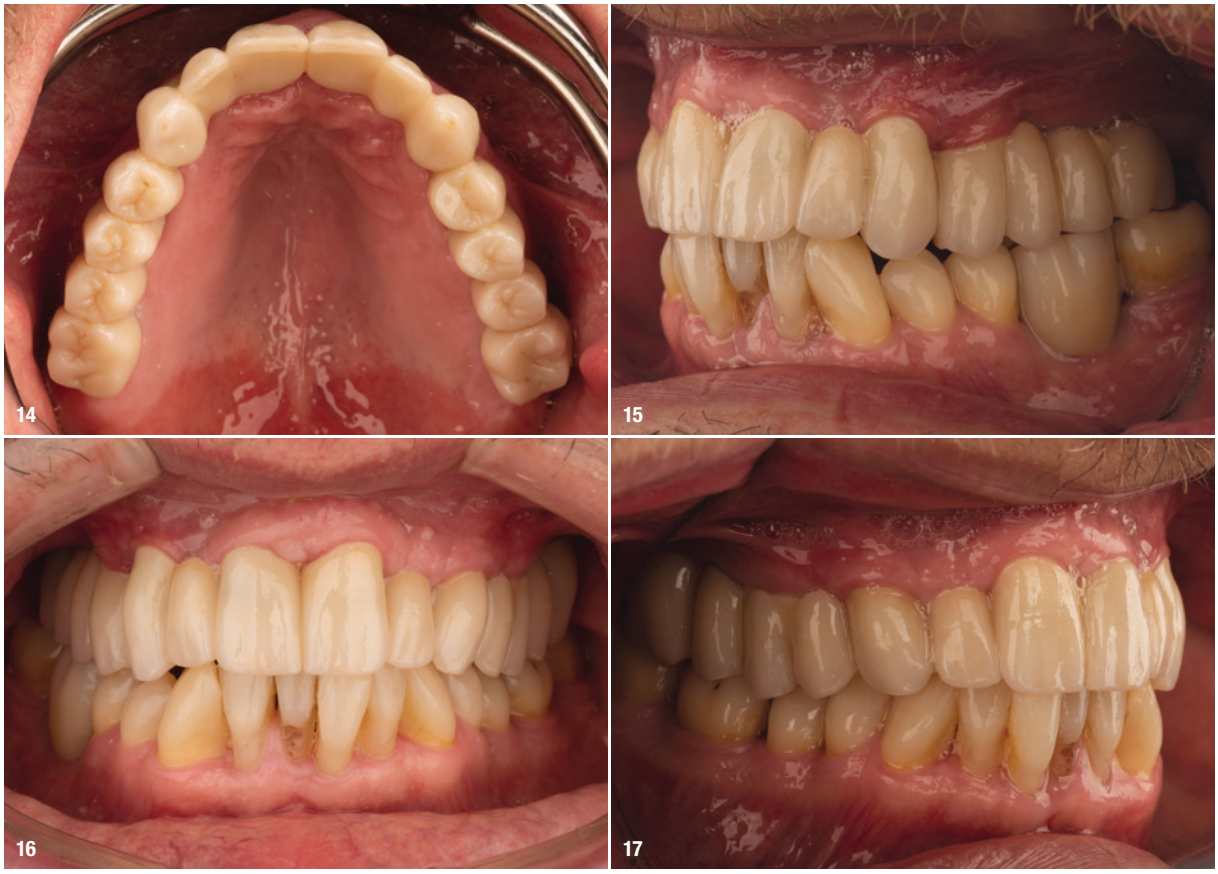
Figs. 12 & 13: Situation before placement of the final restorations.

Fabrication of the final maxillary restoration

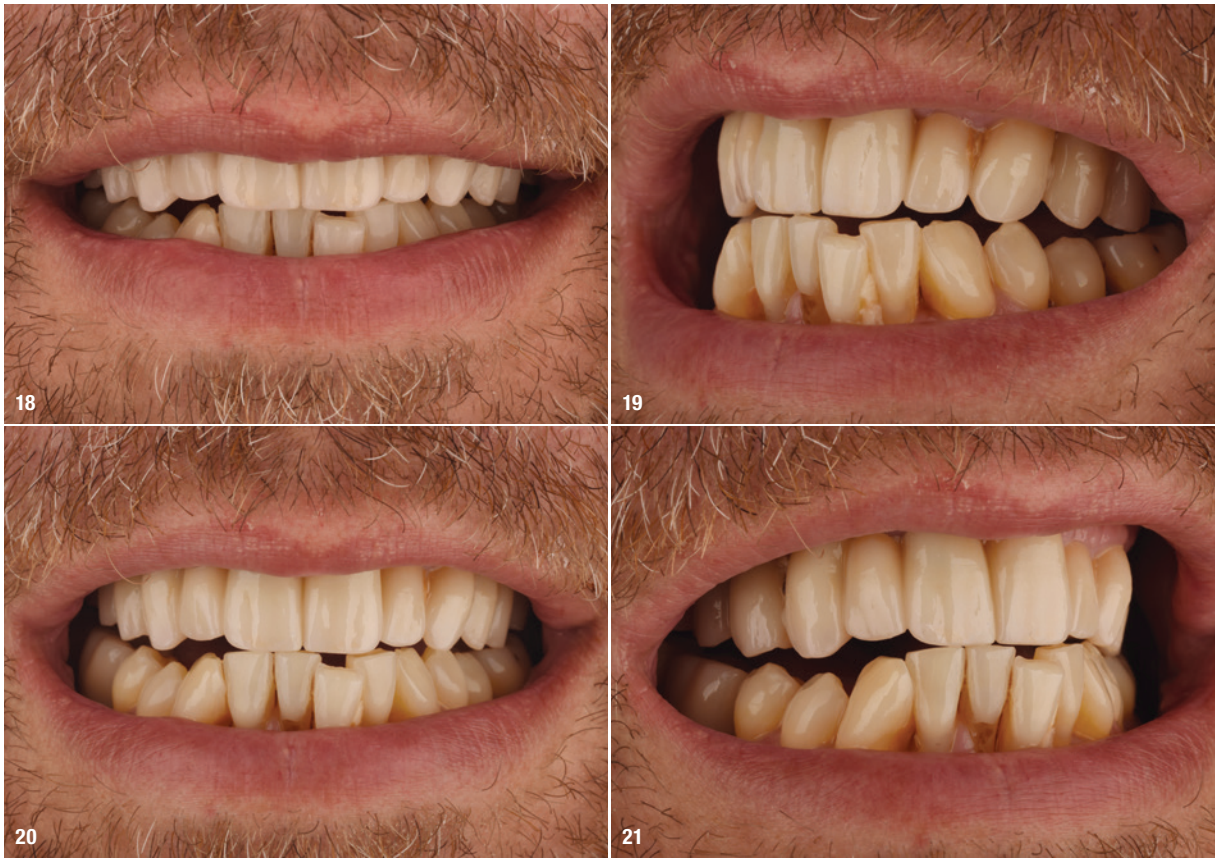
We regard zirconia as a material with the greatest possible benefit for the patient. Compared with conventional titanium implants, zirconia offers several advantages. One of the main advantages of implants made of zirconia is their excellent biocompatibility. Zirconia is considered hypoallergenic, making it an ideal choice for patients with metal sensitivity or allergies. Unlike titanium, zirconia does not trigger any adverse reactions in the body, ensuring a comfortable and stress-free dental implant experience. In addition, zirconia implants have remarkable resistance to corrosion and plaque build-up, reducing the risk of peri-implantitis. The non-porous surface of zirconia prevents the adhesion of bacteria, resulting in healthier gingivae and greater longevity of the implant.[4] In order to avoid compromising the advantages of the zirconia implants placed, the dental team jointly decided on zirconia for the prosthetic restoration as well. Therefore, after receiving the data from the practice, we fabricated the final restorations in zirconia. Our laboratory has preferred monolithic restorations since 2005.

The restoration was constructed as three bridges. This approach takes into account cranial respiration, ensuring that no pressure is exerted on the delicate masticatory and cranial bone system. Based on the silicone impression, we produced a plaster model according to the usual procedure (Fig. 5). We scanned this and digitally designed the desired bridges (Figs. 6 & 7). In our approach, we always design all basal surfaces that rest on the gingiva to be fully sealed from the outset. We then sent the data collected in this way to our milling centre, which sent us the three unprocessed milled bridges (Fig. 8).

After the first firing, the advantages of the zirconia chosen (VITA YZ ST, VITA Zahnfabrik) were already evident from the impressive aesthetics (Fig. 9). The shade characterisation of the bridges was then carried out using the VITA AKZENT Plus stains. For even better aesthetics, additional individualisation was carried out with the VITA YZ EFFECT LIQUID infiltration shades. After the final glaze firing, we polished the aesthetically important areas and all the areas that would be in contact with the gingiva to a high gloss like we usually do (Figs. 10 & 11). In our opinion, this creates a restoration that is supportive of gingival health, having the advantage of what is described in bionics as the lotus effect, which refers to the low wettability of a surface, as can be observed on the lotus plant. Water gathers on the leaves in spherical droplets or slides off the leaves, taking all dirt particles on the surface with it.[5] In principle, this surface not only improves aesthetics, but also reduces plaque adhesion to the restoration, promotes long-term stability and reduces abrasion on the



Figs. 14–17: Final restorations in place.



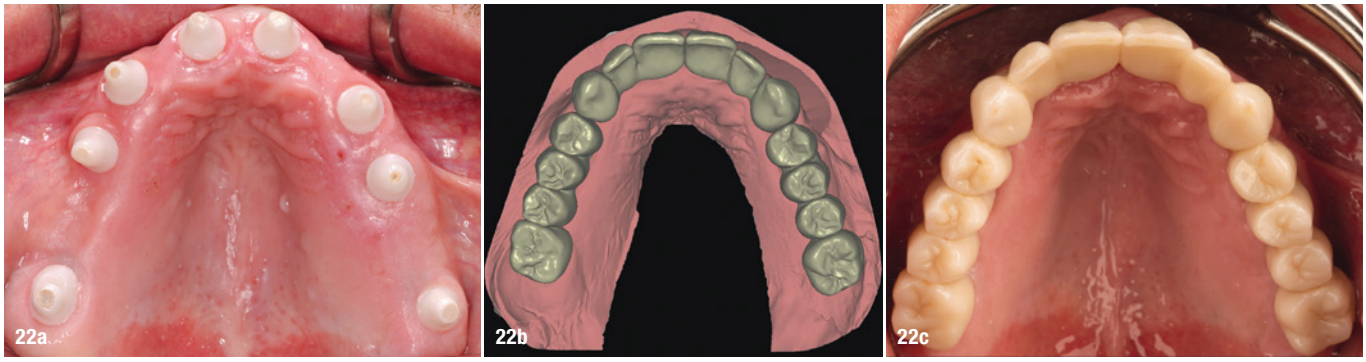
Figs. 18–21: Harmonious integration of the restorations into the oral and facial situation and pleasing aesthetics of the anterior teeth.

(natural) antagonist.[6] Our procedure enables us to avoid any cleaning niches. We regard this as a significant advantage, as constant interdental cleaning often irritates the gingiva unnecessarily and poses a risk of recession. Finally, the restorations were disinfected and packaged according to the standard plasma cleaning protocol we follow (Highfield Clean Prosthetics)[7] and handed over to the practice for the placement appointment.

Placement appointment

Once the final restorations have been received from the laboratory, the bridges were placed on the implants and firmly cemented in, and the fit was visually checked (Figs. 12–17). It was gratifying to see how harmoniously the restorations integrated into the patient's mouth and face, and the optimised aesthetics of the anterior teeth were particularly notable (Figs. 18–23). Finally, the situation was checked radiographically (Fig. 24).

The patient had been delighted with the appearance of his temporary restoration. Because we had transferred his individual masticatory behaviour from the temporary restoration directly to the final restoration, the final zirconia restorations blended harmoniously into the overall oral structure and did not feel foreign to the patient.



Figs. 22a–c: Visual summary of the workflow from the implants **(a)** via the digital design **(b)** to the integrated restoration **(c)**.

Fig. 23: Patient delighted with the natural-looking aesthetics of the final restoration.

Conclusion

In our opinion, this case demonstrates the impressive results that are possible when the dentist, dental technician and patient work together and all the tools available to us are used at the appropriate time. We regard disinfection using plasma as essential, whether during implant placement or in the fabrication of restorations. The cleaner the materials used, the more healthy tissue is supported and the lower the risk of contamination of the materials jeopardising the longevity of the entire implant–restoration system.

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Dr Michael Rak qualified as a dentist from Heidelberg University in 2008 and then went on to study human medicine at LMU Munich, both in Germany, and in 2014 gained his licence to practise medicine. While still studying human medicine, he completed his dentistry residency at Dr Georg Hägler's practice for oral and

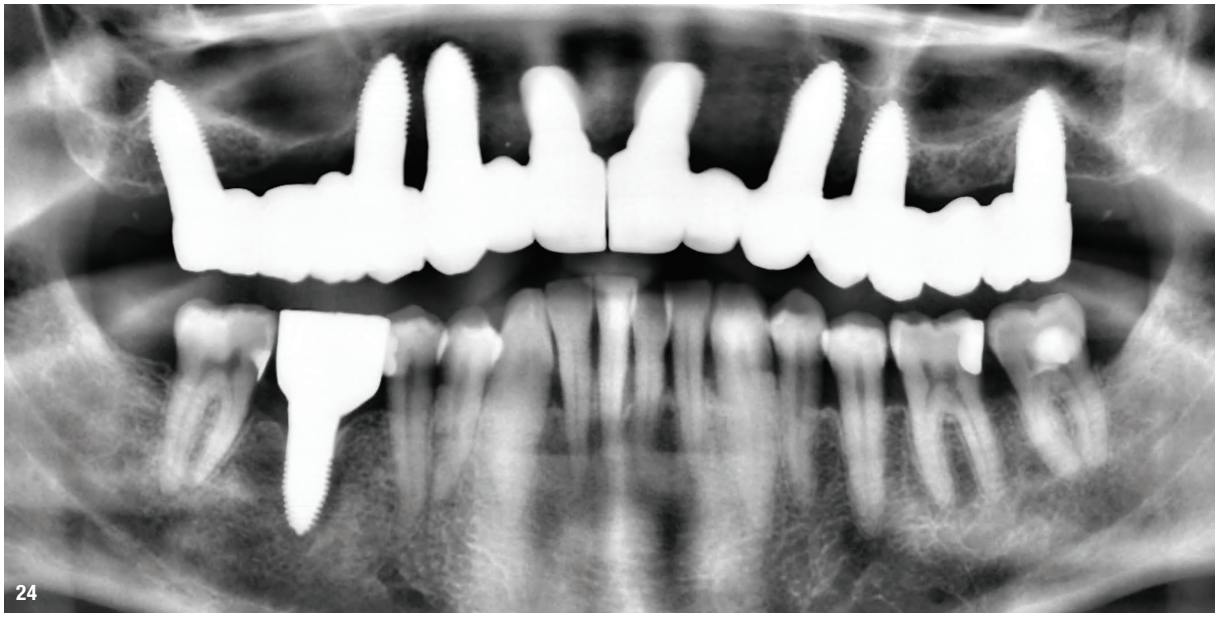


Fig. 24: Final radiograph.

maxillofacial surgery and at Susanne Berthold's practice for holistic dentistry, both in Munich. Since 2014, he has continued his education and training in biological dentistry with Dr Karl Ulrich Volz at the SWISS BIOHEALTH CLINIC in Kreuzlingen in Switzerland. Between 2015 and 2019, he specialised in biological dentistry and ceramic implantology at the SWISS BIOHEALTH EDUCATION CENTER. Dr Rak has also studied environmental dentistry and dental hypnosis.

Norbert Wichnalek passed his journeyman's examination in 1987 and then his master's examination as a dental technician in Munich in Germany in 1993. One year later, he opened his own dental laboratory. From 1996 to 2014, Wichnalek taught specialist dental technology practice at Berufsschule 2 in Augsburg in Germany. He has been a pioneer and developer in the use of plasma technology in dental technology since 2013 and a speaker on environmental dental technology for the German society for environmental dentistry (Deutsche Gesellschaft für Umwelt-ZahnMedizin) since 2012. Wichnalek is the author of more than 100 specialist publications in Germany and abroad. His laboratory focus is on dental restorations in harmony with the human body, metal-free dental restorations and plasma technology.

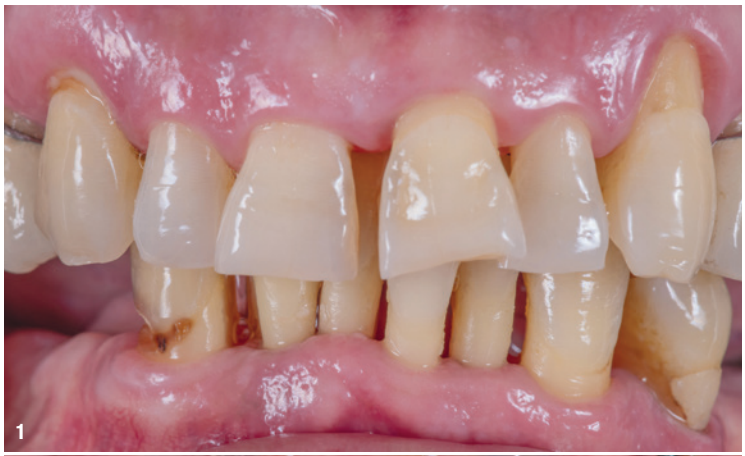
Arbnor Saraci began training as a dental technician in 2014 after completing an internship at the Wichnalek dental laboratory in Augsburg in Germany and attending Zirkonzahn's Military School beginners' training programme in Mühlen in Taufers in Italy. After passing his journeyman's examination in 2016, he attended Zirkonzahn's advanced training programme. In 2017, he completed intensive training at the Novadent international training centre in Manila in the Philippines under Shoji Sasaki from the Osaka Ceramic Training Center in Japan. In 2018, he completed the curriculum of the German society for environmental dentistry (Deutsche Gesellschaft für Umwelt-Zahn-Medizin) to become an environmental dental technician and then advanced training at the Novadent centre in Manila. Saraci continues to pursue his education at home and abroad on dental technology topics and dental photography. In 2018, he took joint first place with Lukas Wichnalek in Zirkonzahn's 10 Years of Prettau Zirconia competition and published his first article. In addition, he serves on the editorial board of a journal for young dental technicians.

Lukas Wichnalek started his training as a dental technician in 2014 and attended Zirkonzahn's Military School beginners' training programme in Mühlen in Taufers in Italy in 2015 and Zirkonzahn's Ranger School in Bruneck in Italy one year later. This was followed in 2017 by intensive training at the Novadent international training centre in Manila in the Philippines under Shoji Sasaki from the Osaka Ceramic Training Center in Japan. He sat for his journeyman's examination in 2018, then completed the curriculum of the German society for environmental dentistry (Deutsche Gesellschaft für Umwelt-ZahnMedizin) to become an environmental dental technician and thereafter undertook further intensive training at the Novadent centre in Manila. Wichnalek regularly attends continuing education courses at home and abroad on dental technology topics and dental photography. In 2017, he won first place in the Kuraray Noritake Award's Level 2 CAD category, and in 2018, he took joint first place with Arbnor Saraci in Zirkonzahn's 10 Years of Prettau Zirconia competition. He has been publishing articles in professional journals since 2018 and serves on the editorial board of a journal for young dental technicians.

Straumann Pro Arch with BLT implants in a periodontal patient with hopeless dentition: A five-year follow-up

Dr Amin Motamedi, Iran

Nowadays, patients are not merely concerned with the functionality of their dentition, but aspire for natural aesthetics and predictable results. Consequently, the comprehensive rehabilitation of edentulous patients has emerged as a critical challenge, needing a fusion of diverse dental specialties, advanced technologies, and innovative treatment modalities.



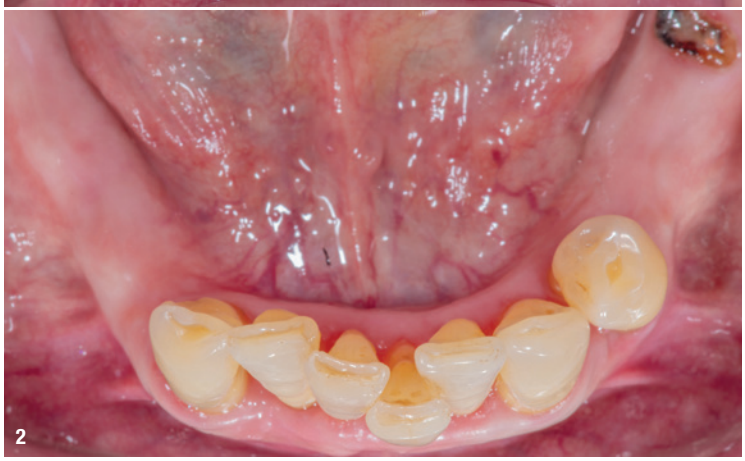


Fig. 1: Initial intra-oral situation. **Fig. 2:** Mandibular occlusal view after scaling and root planing.

Full-arch fixed dental prostheses present high survival and success rates. In recent years, several clinical studies and systematic reviews have demonstrated that the early and immediate functional loading of dental implants can be as effective as conventional loading protocols.[1, 2] Immediate loading of dental implants offers various advantages, including time-savings, enhanced aesthetic and occlusal function, elimination of the need for provisional removable prostheses, avoidance of secondary surgical procedures and preservation of the residual alveolar ridge.[3]

The following case report demonstrates the successful management of a patient with a hopeless dentition and the desire for a long-term fixed solution. Through periodontal and orthodontic treatment and implant-supported rehabilitation with four Straumann Tissue Level implants in the maxilla and six Straumann Bone Level Tapered (BLT) implants in the mandible, we fulfilled her expectations. The interdisciplinary approach employed in this clinical scenario reflects the collaborative synergy between dental professionals, each contributing their expertise to create a customised treatment plan that renewed not only the patient's smile but also her confidence and quality of life.

Initial situation

A 67-year-old female patient without any relevant medical history came to the clinic seeking a solution for her oral health concerns. She stated that for as long as she could remember she had been experiencing feelings of embarrassment about her mouth. Her ongoing struggles with bleeding gingivae and mobile teeth had significantly hindered her ability to eat and smile confidently. She expressed her desire for fixed rehabilitation of her failing dentition and emphasised her inability to tolerate traditional removable complete dentures at any treatment step.

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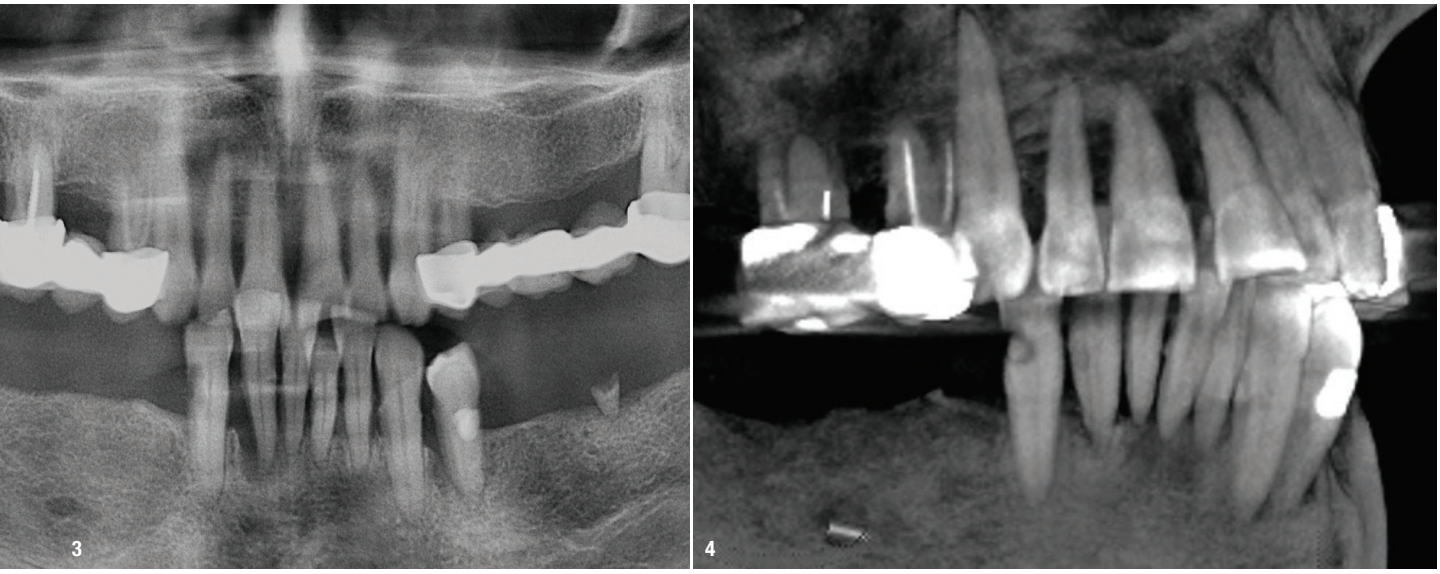

Fig. 3: Panoramic view: severe bone loss in the anterior mandible. **Fig. 4:** Right side 3D CBCT view: severe bone loss in the anterior mandible and posterior maxilla.

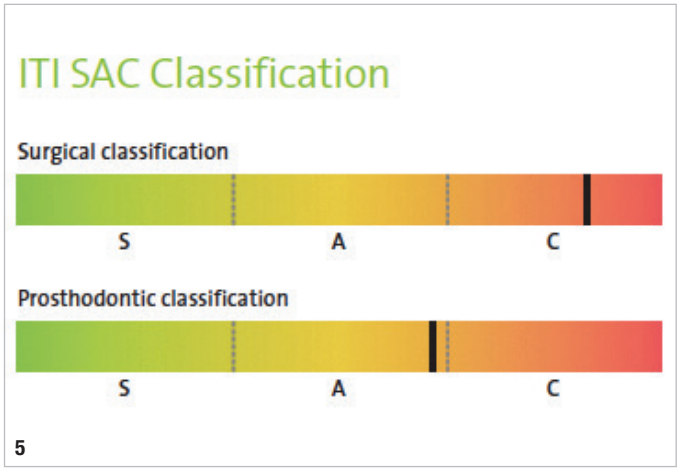

Fig. 5: ITI SAC classification tool indicates high surgical and medium prosthetic complexity.

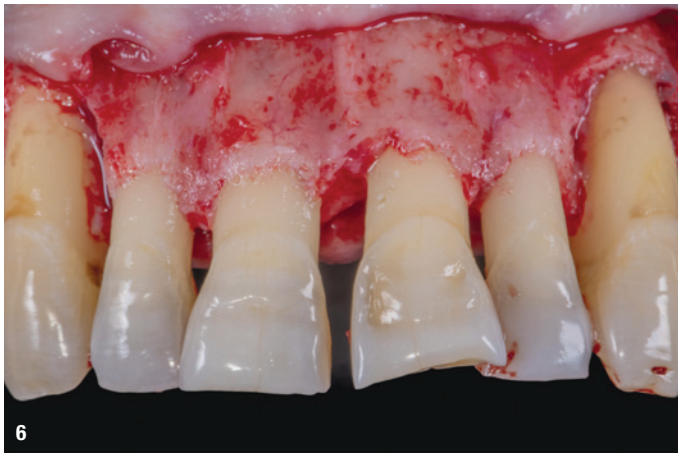

Fig. 6: Periodontal therapy in the maxilla including root planing, GTR, and soft-tissue grafting.

The intra-oral examination revealed inadequately treated teeth and dentition with a mostly poor prognosis in terms of preservation and prosthetic restoration. In the maxilla, she presented with two metal–ceramic bridges from tooth #16 to tooth #14 and from tooth #24 to tooth #27, and the abutment teeth presented with mobility and cervical caries. The mandible presented with deep periodontal pockets, active infection, mobility, suppuration and bleeding on probing, especially regarding tooth #42, and only the root of tooth #36 remained (Figs. 1 & 2).

The radiographic assessment showed moderate bone resorption around the maxillary anterior teeth and bone loss around the abutment teeth. In the lower jaw, severe alveolar bone resorption was observed, particularly in the anterior around tooth #42 (Figs. 3 & 4). According to the International Team for Implantology's SAC classification, the patient case was categorised as complex in terms of the surgical classification and advanced in terms of the prosthodontic classification (Fig. 5).

Treatment planning

Through a comprehensive discussion of the available treatment options with the patient, it was determined that a comprehensive periodontal treatment would be carried out in the upper jaw, and all the mandibular teeth would be extracted. Immediately thereafter, BLT implants using the Straumann Pro Arch system would be placed.

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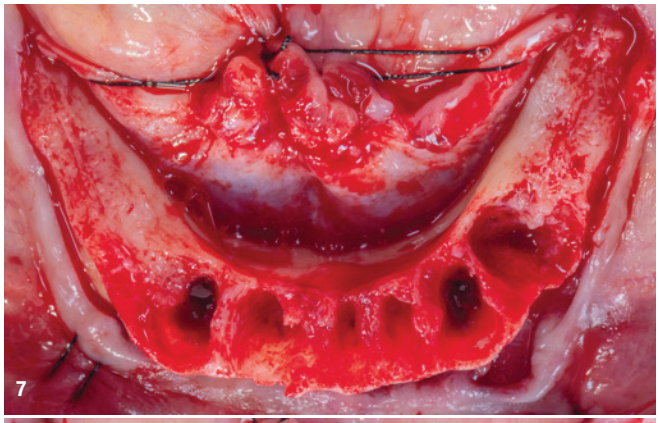
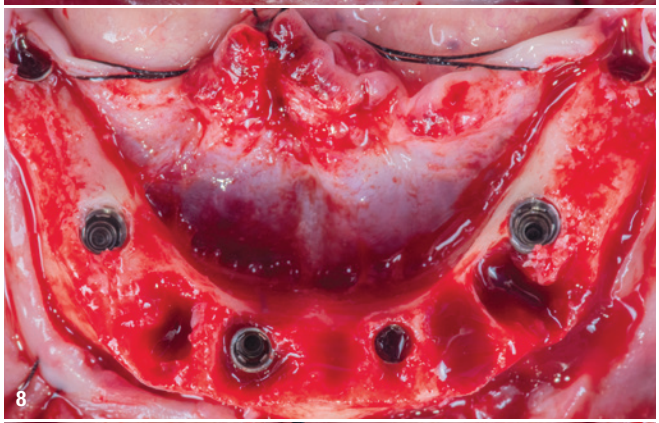
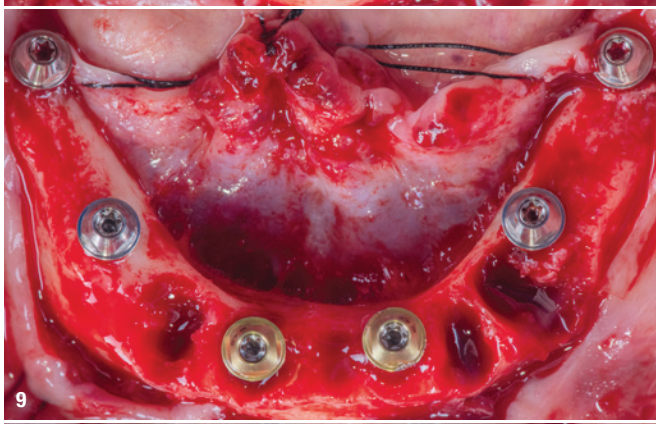






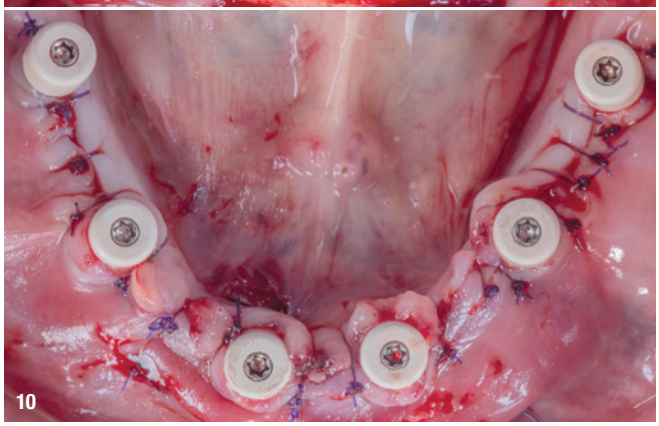


Fig. 7: Bone reduction due to severe alveolar bone destruction. **Fig. 8:** Placement of six Straumann® BLT implants with optimum anterior posterior distribution to ensure an optimal force distribution. **Fig. 9:** A minimum of 2 mm buccal bone thickness to create stable long-term bone around implants. **Fig. 10:** Tension-free softtissue closure by periosteal releasing and apical mattress sutures.

The treatment workflow included:

1. full-mouth scaling and root planing and oral hygiene instructions;
2. periodontal surgery and soft-tissue grafting of the maxillary anterior teeth;
3. orthodontic treatment of the maxillary anterior teeth;
4. implant placement in the posterior maxilla;
5. extraction of the mandibular teeth;
6. prosthetic and aesthetic analysis;
7. preparation of a provisional mandibular full-arch prosthesis;
8. preparation of an analogue implant insertion guide;
9. immediate implant placement and bone augmentation in the mandible;
10. immediate loading of the mandibular implants;
11. placement of the final monolithic zirconia screw-retained prostheses; and
12. supportive periodontal therapy (every three to four months).

Surgical procedure

Initially, the patient was scheduled to undergo a comprehensive periodontal treatment regimen that included oral hygiene instructions, scaling and root planing, and regular follow-up evaluations. Clinically, significant improvements were noted in oral hygiene, gingival health and periodontal pocket depths. Subsequently, periodontal therapy was performed in the maxilla, including root planing, guided tissue regeneration and soft-tissue grafting (Fig. 6). As the patient also expressed a desire for enhanced aesthetic outcomes, it was decided to improve the alignment of the maxillary teeth through orthodontic treatment before implant placement in the maxilla.

In the maxillary arch, two 4.1 × 12.0 mm Straumann Tissue Level implants and two 4.8 × 10.0 mm Straumann Tissue Level implants were surgically positioned in regions #16, 14, 24 and 26. After this, under local anaesthesia, a mucoperiosteal flap was elevated, and an atraumatic extraction technique was employed to remove all the mandibular teeth with the aim of preserving the soft and hard tissue and minimising any potential trauma. Furthermore, reduction of the crestal alveolar bone was carried out using a straight surgical handpiece with copious sterile saline irrigation to address the significant bone deficiency, thereby augmenting the available bone volume to optimise the placement of dental implants (Fig. 7). The same day, a thorough prosthetic and aesthetic analysis was conducted for the fabrication of the immediately loaded fixed mandibular full-arch prosthesis, along

with the preparation of an analogue implant insertion guide.

The drilling sequences for the BLT implants were performed in accordance with the manufacturer's instructions. Six BLT implants (SLActive, Roxolid; 3.3 × 12.0 mm, 4.1 × 12.0 mm, 4.1 × 10.0 mm) were then strategically positioned with an anterior–posterior distribution, carefully planned to ensure the most effective distribution of forces (Fig. 8). The implants were placed utilising the Pro Arch guide. The insertion torque was between 35 and 55 Ncm, measured using a torque wrench. The decision was made to use Straumann BLT implants owing to their design, which facilitates primary stability, allows for immediate loading and can be seamlessly integrated with Straumann Pro Arch for the creation of implant-supported fixed full-arch prostheses, ensuring predictable outcomes.

Bone augmentation was performed to establish a stable buccal bone thickness of at least 2 mm for the implant placement (Fig. 9). Straight screw-retained abutments (Narrow CrossFit 3.5 × 4.0 mm, Regular CrossFit 4.6 x 4.0 mm and Regular CrossFit 4.6 x 2.5 mm) were chosen based on soft-tissue thickness. Healing caps were then screwed in place. The soft tissue was closed without tension through periosteal releasing and apical mattress sutures (Fig. 10).

Impression copings were seated and splinted to guarantee an immediate, precise and passive fit of the prosthesis (Fig. 11). An impression was taken using polyvinylsiloxane material, and it was sent to the laboratory for the production of a full-arch provisional prosthesis. The provisional prosthesis was delivered on the same day and was inserted to a torque of 15 Ncm. The occlusal contacts were carefully adjusted to align with centric relation to prevent excessive stress on the implants during the healing period (Fig. 12).

Prosthetic procedure

At the three-month follow-up after implant placement, osseointegration of all the implants had been achieved. It was also noted that there was sufficient buccal keratinised tissue, which plays a crucial role in ensuring the long-term stability of the soft tissue and facilitating proper oral hygiene maintenance (Fig. 13). The screw-retained definitive prostheses made of monolithic zirconia were then placed (Fig. 14). The patient received oral hygiene instructions, and the occlusion was checked. She was scheduled for supportive periodontal therapy sessions at intervals of three to four months.

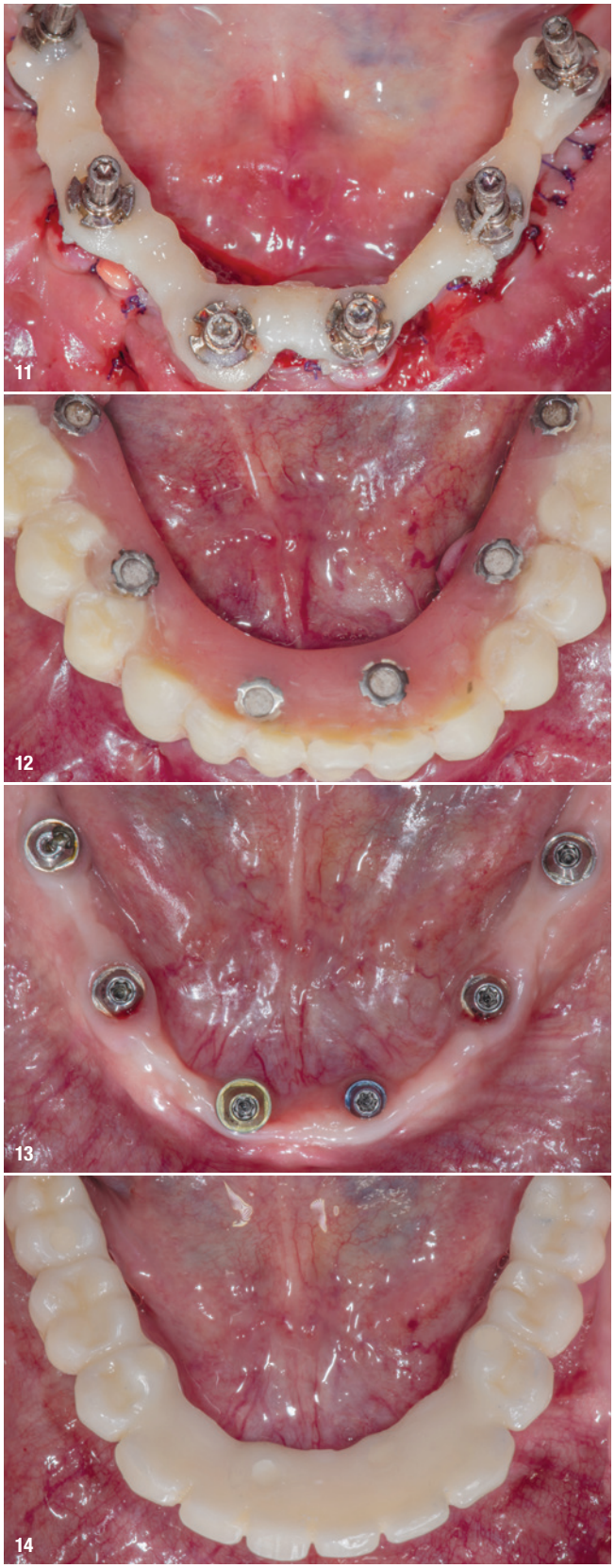
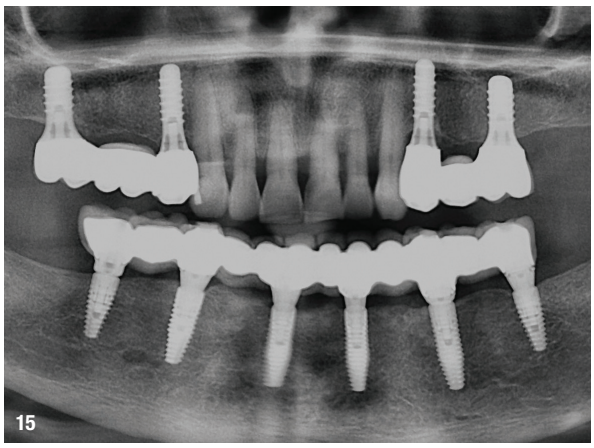


Fig. 11: Impression copings are splinted to ensure immediate passive fit of the prosthesis. **Fig. 12:** Occlusal contacts in centric relation to avoid implant overloading during the healing period. **Fig. 13:** Adequate buccal keratinised tissue guarantees long term soft-tissue stability and proper oral hygiene. **Fig. 14:** Monolithic zirconia final restoration.



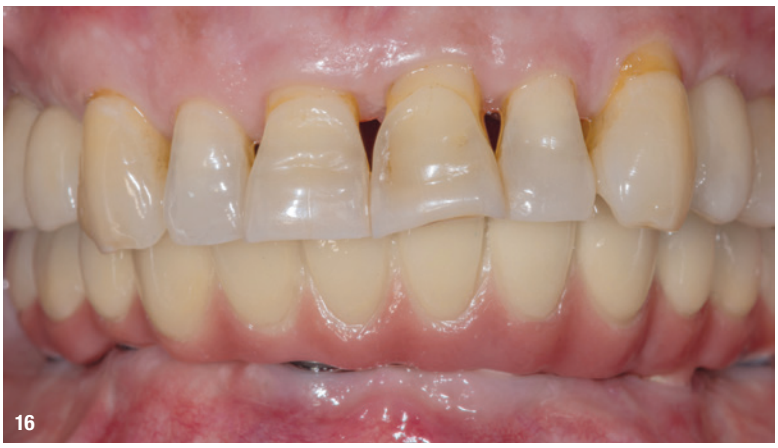


Fig. 15: Three years follow-up panoramic view demonstrates stable periodontal and peri-implant bone. **Fig. 16:** Three years follow-up shows healthy, stable soft tissue and prosthesis.

At the three-year follow-up, the periodontal and peri-implant bone was stable, demonstrating the long-term success of the initial treatment (Figs. 15 & 16). After five years, clinical and radiographic examination of the implant rehabilitation were carried out and demonstrated the continued long-term success of the initial treatment (Fig. 17).

Treatment outcomes

Utilisation of BLT implants following the Straumann Pro Arch concept in a patient with compromised periodontal health delivered exceptional results, including the health of both soft and hard tissue, functional improvement and enhanced aesthetics. This system allowed for immediate implant loading and successful osseointegration. The patient was satisfied with the results.

Author's testimonial

"Full-arch immediate implant restorations in patients with advanced periodontal deterioration can be challenging for any practice. The Straumann Pro Arch workflow offers a more predictable and simplified approach with a proper anterior–posterior distribution that provides optimum force distribution and also, for your patients, reliability, comfort and compliance for an excellent long-term result."

Literature

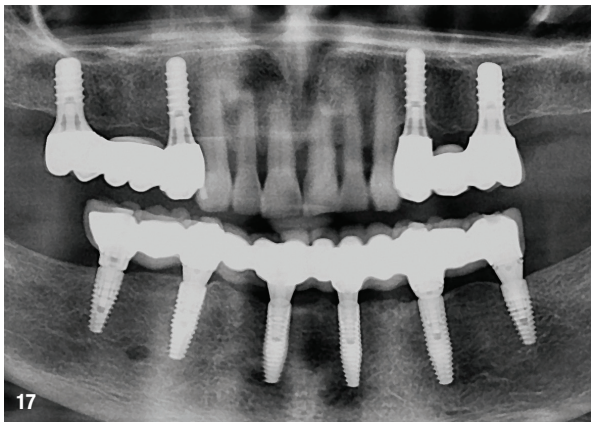


Fig. 17: Stable periodontal and peri-implant bone at five years follow-up panoramic view.

about the author

Dr Amin Motamedi holds a DDS and an MSc in periodontics from Shahid Beheshti University of Medical Sciences in Tehran in Iran and completed the fellowship in laser therapy in dentistry at the Aachen Dental Laser Center in Germany and the master clinician programme in implant dentistry at the Global Institute for Dental Education in Los Angeles in the US. He is a fellow of the International Team for Implantology and served as the chair of and postgraduate programme director in the periodontics department at the dental school of Kerman University of Medical Sciences in Iran. He runs his own specialist practice in Kerman.

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OEMUS MEDIA AG celebrates three decades of influence in the dental market. To mark this milestone, the upcoming issues of *implants* 2024 will feature short background stories on our team.

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Aniko Holzer
Graphic designer

Aniko Holzer has been a member of the OEMUS team since 2022. As a talented graphic designer, she oversees several publications in our publishing house and is responsible for the conceptual design management of these projects. With her creative talent, she consistently creates impressive layouts for our magazine that always inspire our readers. Throughout her career, she has acquired extensive knowledge in marketing and web design, further enhancing her expertise. Her professional experience enriches our team in many ways. Outside of her professional activities, Aniko shares a great passion for football with her son. Together, they enthusiastically cheer on their team, RB Leipzig, at every game. Additionally, Aniko is an enthusiastic "hobby sewer", dedicating her free time to sewing clothes and bags.

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Big data in implant dentistry—"We are standing at the beginning"

An interview with Prof. Arjan Vissink on the current state of big data in implant dentistry

Big data and artificial intelligence in implant dentistry have become significant topics in contemporary discussions. In this interview, Prof. Arjan Vissink, a renowned oral and maxillofacial surgeon from the Faculty of Medical Sciences of the University of Groningen in the Netherlands, provides an insightful exploration of this subject. He delves into the current state of big data in implant dentistry, its future uses and its challenges.

Prof. Vissink, what possibilities does big data offer in dentistry right now, and what does the future hold?

Very few studies have used big data in implant dentistry. We are standing at the beginning. Not much can be said yet of the impact of observations from big data in implant dentistry with regard to diagnostics, risk profiles and prognosis. So far, there has only been cursory study done in this area. Some aspects explored include implant type and diameter used (irrespective of the brand), indication and application, for example immediate or delayed loading, and whether bone augmentation was needed, in addition to general health perspectives, such as smoking, diabetes, immunological diseases, radiotherapy in the head and neck region, and bisphosphonates, with regard to overall implant survival. It has also been investigated whether an oral surgeon or periodontist has a better implant outcome, but the indications for implant placement were not assessed. Whether implants are good solutions in elderly patients has also been studied, specifically for supporting prosthetic restorations and how underlying diseases could compromise the outcome in this situation. The data reported so far is not sufficiently robust to guide decision-making.

Technical innovations are being developed faster than ever before. When will big data be more commonly used in dental practice?

At the moment, there is no direct use of the results of big data studies in implant dentistry for daily dental practice. Only very rough overall data is available, and it is not tailored to the individual patient. There is no data available on immediate or delayed placement, immediate or delayed loading, one- or two-stage procedures, or when an implant site should be considered compromised, etc. We should first begin to better record implant procedures, restorations, procedures used in the upper and lower jaw, situations that necessitate bone regeneration, the implant platform used and more. From such data, better general conclusions could be drawn, and eventually, better recommendations for the individual patient could be made. Although innovations are evolving rapidly, it will be quite some time before the dental practice and the individual patient in particular will benefit from these achievements.

Can you share some tips for dental professionals who want to get more involved with artificial intelligence and the use of big data?

Dentists should first start with a uniform description of procedures, such as a standardised questionnaire for the initial data collection for as many patients as possible. Better conclusions could be formulated from such data even if they are not yet tailored for the individual and apply just at a group level. It will take much longer before the conclusions drawn from big data research will have a direct impact on individual patient care.

What challenges does the use of big data in dental practice entail?
Big data in implant dentistry is in its infancy. First, a standardised database should be designed in which all details of implant placement and restoration can be recorded in a standardised manner. Standardisation of the data entries will be a starting point for many future studies. Next, dentists who place implants and/or make the prostheses for these implants should take the time to create a record in the database for every patient they treat. Time spent on building the database is time that cannot be used for patient treatment, but it will bring implant dentistry further in the long run. Once the data entry process becomes routine for the dentist, the time requirement will become minimal.

The use of modern technologies also raises concerns regarding data protection. How can this issue be addressed? And are there any other issues that need to be considered when handling personal medical data?
All data can be collected in an anonymised way. We must ensure that insurance companies or organisations who could gain financially cannot access this data. For example, all patient data could be coded in the database using a code only known by the treating physician. Thereafter, all implant-specific data could be added to that database. An example of big data documentation is the case of the database used for patients with Sjögren's syndrome, a rare autoimmune disease affecting, among other things, the eye (keratoconjunctivitis sicca) and the mouth (hyposalivation, xerostomia). More than 15,000 well-classified Sjögren's patients are anonymously registered in a very valuable database documenting their disease. Those responsible for using the data and writing arising research reports have no access to the patient files. When data is missing or incomplete, the treating clinician is asked to provide the missing data where possible. Financially, there is barely any support.

What are the three most vital things about big data's role in implant dentistry to remember?
Big data in implant dentistry is just getting started. There is no generally approved protocol as to what parameters to evaluate and how to score. First, the content of the questions through which data will be gathered must be arranged, in addition to determining how those responses will be reported.

Thus far, only very general trends have been reported with regard to implant dentistry.

We have to agree on the creation of a standardised database in which all results related to implant treatment will be recorded.

Editorial note: This interview was conducted by Franziska Beier, Dental Tribune International, and first published in *today EAO Berlin 2023*.

about the interviewee

Prof. Arjan Vissink is a renowned expert in oral medicine at the University Medical Centre Groningen in the Netherlands. His extensive expertise in implantology and reconstructive surgery has led to significant contributions in these fields. Globally recognised, he is frequently invited to speak at international conferences and has authored numerous publications.

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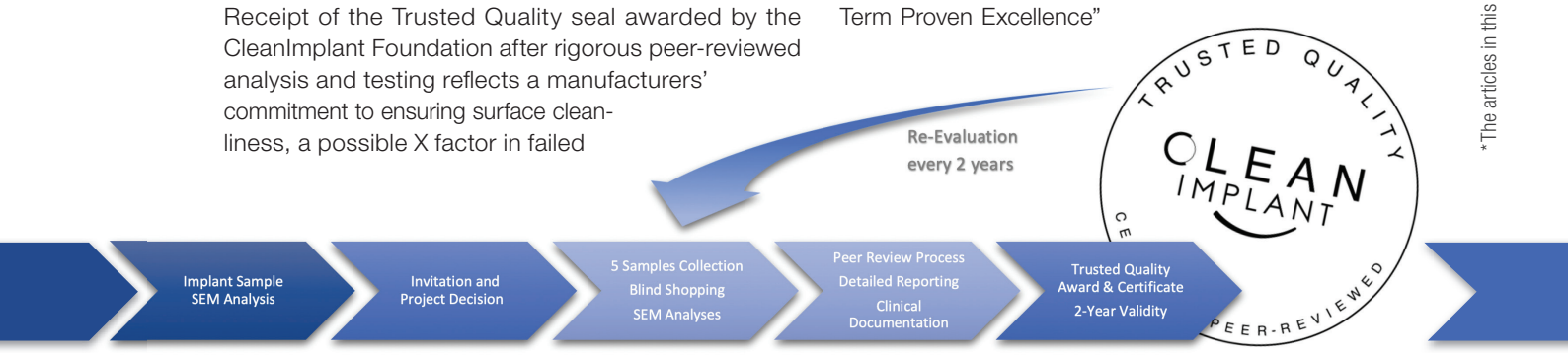
Commitment to safety

Celebrating extended and new Trusted Quality seals awarded by the CleanImplant Foundation

More and more implant manufacturers recognise the value that the CleanImplant award brings to practitioners and their patients.

The plethora of implants available from an increasing number of companies brings into question whether a universal standard of quality in production and packaging exists for surface cleanliness. This presents as a conundrum for dentists worldwide regarding their choice of fixture to provide optimal patient care. The increased incidence of peri-implantitis warrants a revisiting of critical thinking as to its source. The presence of surface contaminants is recognised as a contributing factor of the sequelae of biological complications that can occur.

Receipt of the Trusted Quality seal awarded by the CleanImplant Foundation after rigorous peer-reviewed analysis and testing reflects a manufacturers' commitment to ensuring surface cleanliness, a possible X factor in failed osseointegration. The Trusted Quality seal remains in place for a two-year cycle after which the implant must be retested to re-establish its surface cleanliness status determined within the framework of the CleanImplant consensus-based guideline. "After rigorous and extensive testing, we are pleased to extend the CleanImplant Quality seal for an additional two years to the products from Swiss Dental Solution from Switzerland and German manufacturer medentis medical, BTI from Spain and the Korean producer MegaGen", Dr Dirk U. Duddeck, Founder and Head of Research at CleanImplant pointed out. "The implant UnicCa from BTI and MegaGen's AnyRidge System went through a fourth re-evaluation process for which they were awarded the special CleanImplant award for "Long-Term Proven Excellence"



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recognising companies' continued pursuit of perfection in quality for their client base."

As well, the Foundation wishes to congratulate Ritter (Spiral SB/LA) and Dentis (s-Clean SQ-SL) who earlier this year received the Trusted Quality award. The presence of the CleanImplant team at the Academy of Osseointegration annual meeting in Charlotte, North Carolina, afforded the opportunity to present the seal in person to representatives of the companies.

Companies establish trust for their end users by following through on their professional commitments, by working to amend deficits in production standards, and by making changes where needed. The continuously updated CleanImplant Foundation website and the quarterly newsletters advise their subscribers and members whether that confidence is being earned. Dirk U. Duddeck concludes: "A duty of care must be sacrosanct for all, that is both mandate and responsibility for those in the industry and the profession."

Implant systems currently carrying the "Trusted Quality" award are: AnyRidge (MegaGen), Astra Tech EV (Dentsply Sirona), BlueDiamond (MegaGen), ICX-Premium (medentis medical), In-Kone (Global D), Inverta (Southern Implants), Kontact S (Biotech Dental), (R)evolution (Champions-Implants), s-Clean SQ-SL (Dentis), SDS1.2 (Swiss Dental Solutions), SDS2.2 (Swiss Dental Solutions), Spiral SB/LA (Ritter Implants), SuperLine (Dentium), T6 (NucleOSS), T6 Torq (NucleOSS), UnicCa (BTI Biotechnology Institute), whiteSKY (bredent medical).

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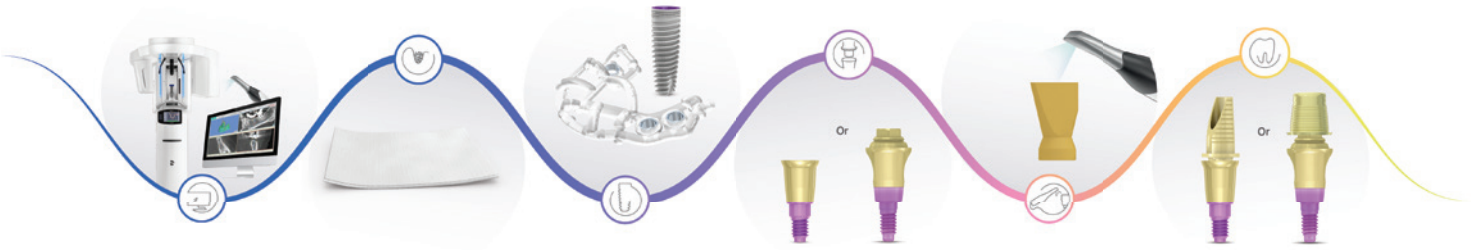
Insights in modern dentistry

Making implantology simple with the MIS digital workflow



MIS digital workflow for conical connection implants.

Digital workflows connect the dots in modern dentistry by merging several connected procedures into one complete treatment. The harnessing of digital tools facilitates accurate diagnosis and treatment planning, significantly improving patient outcomes and clinical efficiency. Being part of Dentsply Sirona, MIS Implants Technologies is uniquely positioned to offer its customers comprehensive digital workflows, combining MIS solutions with the latest Dentsply Sirona equipment and materials.

MIS has been investing in digital solutions for many years, and the company has watched with enthusiasm as its digital workflow has been adopted by clinicians around the world. The workflow incorporates digital imaging, intra-oral scanning, guided surgery and CAD/CAM technologies designed to enhance every step of the treatment process. According to Orit Kario, digital solutions product manager at MIS, the aim is to simplify treatment for clinicians, laboratories and patients through seamless communication and data transition.

MIS offers workflows for single-tooth, partial-arch and full-arch procedures that are tailored to general dentists and specialists and the setting, whether chairside or laboratory. They include implant-level and tissue-level solutions and enable implant-to-crown procedures.

For example, the company's workflow for conical connection implants begins with a Primescan intra-oral scan and efficient prosthetically driven MSOFT planning, assisted by the MCENTER team, which provides comprehensive digital dentistry services and detailed surgical plans. In the surgical step, bone augmentation is done with the use of OSSIX biomaterials, and clinicians benefit from the advantages of the unique MGUIDE surgical guides. The C1 implant and MIS CONNECT stay-in abutment provide primary and long-term stability and offer the ability to maximise tissue-level restoration, and the use of a computer-guided approach contributes to the reduction of patient visits, treatment steps and corrections. For final restoration, MIS customers are offered a wide range of implant-level and tissue-level digital prosthetic solutions, all implemented in leading CAD software.

Kario said that being a Dentsply Sirona company allows MIS to offer clinicians significant advantages. She explained: "MIS can offer its customers a complete digital workflow that incorporates the MIS guided surgery system, the unique implant connections and the comprehensive digital prosthetic line, in combination with Dentsply Sirona equipment and materials, all under one roof. We believe that providing tools of this quality strengthens the brand and contributes to customer trust."

What can clinicians and laboratories gain from adopting the digital workflow? Kario emphasised: "Digital workflows address procedural challenges that impact clinical efficiency, may improve profit potential and drive actual practice growth."

To learn more, visit www.mis-implants.com/products/digital-workflow.

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Patient-customised concepts: “Implantology 4.0” in Düsseldorf this November

On 8 and 9 November 2024, the 53rd International Annual Congress of the German Association of Dental Implantology (DGZI) will be held in Düsseldorf, centered on the theme “Implantology 4.0—on the way to patient-specific concepts.” This congress promises to be an enlightening event, guiding the future of dental implantology, fostering insightful discussions, and unveiling innovative approaches through the dynamic interaction between participants, speakers, and the industry.

For decades, dental practitioners have relied on standardised, evidence-based implantological treatments applicable to all patients. However, recent studies indicate a pressing need to reassess this one-size-fits-all methodology. What ensures success in one patient might not yield the same result in another. Hence, the focus is shifting towards patient-individualised concepts.

At the forefront of this transformation, the congress will showcase the latest scientific and practical findings. Renowned speakers will engage with participants to explore the full spectrum of dental implantology, fostering a collaborative environment where future advancements can take root. Traditionally, the congress kicks off with a forward-looking perspective, featuring presentations from the emerging generation of DGZI professionals who will share their current research and projects in a dedicated forum.

This year’s DGZI Annual Congress will also include two in-depth tutorials: one on digital impressions in implantology and the other on immediate implantation and immediate loading. These sessions are designed to provide practical insights and hands-on experience. Additionally, the ever-popular table clinics return, offering participants the chance to discuss specialised topics with distinguished experts, thereby expanding their knowledge beyond their usual practice.

Complementing the scientific sessions, a separate congress for implantological assistants will take place, ensuring that the entire practice team benefits from comprehensive training and education.

Set against the backdrop of Düsseldorf, a city renowned for its vibrant culture and dynamic atmosphere, the congress offers more than just professional development. It promises an enriching and holistic experience that combines cutting-edge knowledge with the charm of one of Germany’s most fascinating cities. The DGZI Annual Congress is a must-attend event for anyone involved in dental implantology, offering unparalleled opportunities for learning, networking, and professional growth.

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Long-awaited Digital Dentistry Show to premiere in Berlin in June 2024

Fig. 1: The Badeschiff is a picturesque floating public swimming pool area overlooking the Spree river.

Fig. 2: The Escobar is an extension of the Badeschiff that includes a covered bar area.

Now is an exciting time for dentistry. Technological innovations lie at the heart of the profession and are significantly advancing personalised dental care. To provide a platform to celebrate digital innovations in the field and educate the dental team, DDS.Berlin has collaborated with the Digital Dentistry Society, and they are bringing a highly immersive experience to the capital of Germany—the Digital Dentistry Show. Scheduled for 28 and 29 June 2024 at the Arena Berlin, the event promises to deliver engaging educational and social opportunities with a special focus on digital products and the digital workflow in dentistry.

Through live product presentations, workshops, discussion sessions and an exhibition, the 2024 Digital Dentistry Show seeks to provide attendees with first-hand knowledge of digital dental products and services and to offer space for personalised advice and face-to-face interactions with industry leaders. With the focus on robust research evidence, the scientific programme will feature presentations by prominent opinion leaders, including Drs Henriette Lerner, Alessandro Cucchi, Raquel Zita Gomes, Paul Schuh and Marcus Engelschalk, and cover a wide range of topics, such as artificial intelligence, the digital workflow in maxillofacial surgery and full-arch rehabilitation, and digital bone surgery. Attendees will have the opportunity to earn up to 16 continuing education credits.

Fig. 3: Attendees will also have access to the Sonnendeck of the Escobar, where they will be able to enjoy delicious food and drinks.

Besides a strong educational aspect, the 2024 Digital Dentistry Show will serve as a social hub for dental experts, professional organisations, manufacturers and publishers who are looking to form or expand their network of like-minded, future-oriented individuals. To be hosted at one of Berlin's industrial pearls, the unique event location offers a rich history and a distinctive modern feel. The adjacent Escobar and the Badeschiff spaces will enhance the relaxed and jovial atmosphere, underlining the informal and engaging nature of the show.

The 2024 Digital Dentistry Show is expected to attract over 2,000 eminent dental professionals from around the world. You are invited to be one of them!

More information on registration and the scientific programme can be found at www.dds.berlin. Admission to the event is free of charge.

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Nobel Biocare

The swiss company launches Zygoma academy

At the recent Envista Summit in Barcelona in Spain, Nobel Biocare announced its latest advancement in professional development: Zygoma Academy. This community-driven initiative includes one-to-one mentorship sessions with international experts and will enable more clinicians to provide immediate full-arch restorations in highly complex cases.

Personalised learning experiences

Zygomatic implants are primarily for the severely resorbed maxilla, and they provide a faster and more comfortable alternative to sinus lift or other types of bone grafting. To support clinicians' skill in providing such advanced treatments, the Zygoma Academy programme offers several levels of mentorship and training to meet various needs:

- ZYGOMA 1 on 1: individualised mentorship and expert guidance in specific areas of interest or concern
- ZYGOMA 1 on 2: small-group discussions for case reviews and problem-solving, providing a platform for sharing experiences
- ZYGOMA 1 on 3: in-person courses with hands-on training that enables participants to develop practical skills and confidence.

In addition, one of the standout features of Zygoma Academy is its over-the-shoulder offering, which provides a rare opportunity for clinicians to observe mentors in action.

A new era for the zygomatic implant community

The academy boasts an impressive roster of mentors and trainers, including Drs Rubén Davó, Paulo Maló, Enrico Agliardi and Chantal Malevez. These experts, hailing from more than ten countries, bring with them diverse perspectives and a wealth of knowledge for the next generation of best-in-class surgeons.

Visit the academy website for more information

Zygomatic implants provide a faster and more comfortable alternative to sinus lift or other types of bone grafting and Nobel Biocare's new Zygoma Academy will enable more clinicians to provide immediate full-arch restorations in highly complex cases.

Commitment to excellence

Zygoma Academy represents Nobel Biocare's ongoing commitment to advancing dental education and practice. By creating a supportive, collaborative environment, the academy will not only enhance individual skills but also contribute to the advancement of the dental community and delivery of oral care. For clinicians seeking to master this complex area of practice, Zygoma Academy offers a new opportunity to learn, grow and excel.

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Fotona

Redefining dental laser technology

Fotona's LightWalker is a revolutionary dental laser system with 20 W of power, two wavelengths, five pulse durations and four special pulse modes, offering an unparalleled range of clinical applications.

Practitioners are thrilled by the LightWalker's SWEEPS mode for its efficacy in endodontics, witnessing the power of bubbles in cleaning narrow root canal spaces, removing the smear layer, debris and biofilm. SWEEPS also enables non-surgical removal of biofilm and calculus in periodontal and peri-implant therapy.

The LightWalker's patented QSP mode makes it invaluable for hard-tissue treatments, debonding of veneers and orthodontic brackets, dental aesthetics and surgery. With the laser's SMOOTH mode, dental practices can even perform a wide range of cutting-edge aesthetic and anti-snoring laser therapies, thus attracting new patients and revenue.

Embrace the power of LightWalker's unmatched versatility.

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Statement on the decision of the Berlin Regional Court regarding two-piece ceramic implants

In its ruling dated 6 June 2023 (case reference: 24 O 184/21), the Berlin Regional Court (LG) made a determination that diverged from the expert opinion procured, refusing to acknowledge the medical necessity of treatment involving two-piece ceramic implants. Conversely, the Ulm Regional Court, in its judgement of 28 July 2023 (Ref.: 3 O 75/22), affirmed the medical necessity based on the expert testimony presented.

In response to the Berlin Regional Court's decision of 6 June 2023, the Implantology Consensus Conference (KK) issues the following joint statement: "Two-piece ceramic implants fulfil the criteria of a medically necessary treatment modality provided that the same standards applied to titanium implants are adhered to during implant planning and indication determination."

A task force convened by the DGZI, comprising Dr Elisabeth Jacobi-Gresser, board member and continuing education officer, along with Assoc. Prof. Dr Stefan Röhling, board member, and including specialist lawyer for medical law and certified compliance officer Anja Mehling and Dr Alexander Raff, dentist and editor of the dental fee commentary Liebold/Raff/Wissing, unequivocally asserts its position on this matter.

Evidence supporting two-piece ceramic implants

Two-piece ceramic implants have emerged as a viable alternative to titanium implants, demonstrating equivalency in restoration while offering superior biocompatibility. Notably, they exhibit reduced bacterial adhesion

Fig. 1: Dr Elisabeth Jacobi-Gresser, Member of the Board and advanced training officer of the DGZI.

Fig. 2: Assoc. Prof. Dr Stefan Röhling, Member of the Board of the DGZI.

Fig. 3: Anja Mehling, specialist lawyer for medical law and certified compliance officer.

and heightened corrosion resistance compared to titanium counterparts. These advantageous material properties render them particularly suitable for patients prone to inflammation due to genetic predisposition, as evidenced by defined laboratory measurement parameters.

Moreover, patients with biotype 1, especially in aesthetically sensitive areas, stand to benefit from two-piece ceramic implants. Over the past 15 years, the utilisation of two-piece systems has facilitated more flexible prosthetic treatment options compared to one-piece systems. Expert experience, including long-term studies, has been amassed and recognised, even within academic settings.

> "Two-piece ceramic implants fulfil the criteria of a medically necessary treatment modality provided that the same standards applied to titanium implants are adhered to during implant planning and indication determination."

Fig. 4: Dr Alexander Raff, dentist and editor of the dental tariff guide Liebold/Raff/Wissing.

Further advancements and enhancements in implant–abutment coupling have been integrated into various systems over several years. The culmination of these positive strides is reflected in an S3 guideline endorsing the utilisation of two-part ceramic implants as an alternative therapy following informed patient consent.

Material selection and health insurance coverage

The undersigned individuals emphasise the imperative that reimbursement authorities should not dictate the utilisation of two-piece ceramic implants in patient treatment. This determination should squarely rest upon patients and their attending dentists, contingent upon a robust and substantiated body of evidence.

Adhering to the tenets of the Berlin judgement would precipitate a significant impediment to medical treatment involving novel therapeutic methodologies lacking S3-level guideline endorsements. This would, in effect, impose substantial limitations on the adoption of emerging medical interventions.

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Congresses, courses and symposia

FDI World Dental Congress

12–15 September 2024
Istanbul, Turkey
www.fdiworlddental.org

National Osteology Symposium

26–28 September 2024
Paris, France
osteology.org

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congress.eao.org/milan/en/

53rd International Annual Congress of DGZI

8–9 November 2024
Düsseldorf, Germany
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