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2/26

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Oral microbiome dynamics and biological ageing in dentisty

**case report**
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**Dr Georg Bach**
President
of the DGZI

# The new elegance of precision in modern dentistry

Dear colleagues,

There are moments in the life of a profession when progress is no longer defined by speed, novelty or scale, but by a subtler form of maturity. This issue speaks from precisely such a moment.

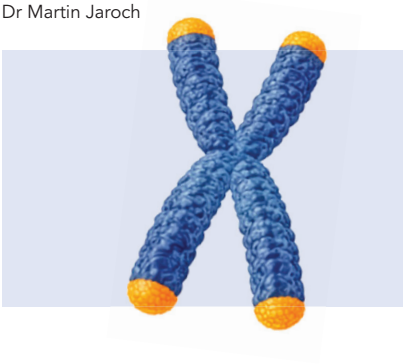
Across these pages, dentistry appears not as a fixed body of techniques, but as a field in transformation—becoming more integrative, more discerning and, in many ways, more human. What emerges is a portrait of a discipline learning to look beyond the surface: beyond the isolated tooth, beyond the single procedure, beyond the seduction of technology for its own sake.

The themes gathered here are remarkably varied, yet they converge with unusual coherence. At one end, we encounter the invisible forces of biological ageing, where telomeres, inflammation and the oral microbiome reveal that oral health is inseparable from the deeper rhythms of the body. At the other, we see the precision of digital workflows, AI-assisted acquisition and biomimetic design reshaping how clinicians plan, restore and preserve. Between them lies the true contemporary terrain of dentistry: a space where biology, engineering, aesthetics and judgement meet.

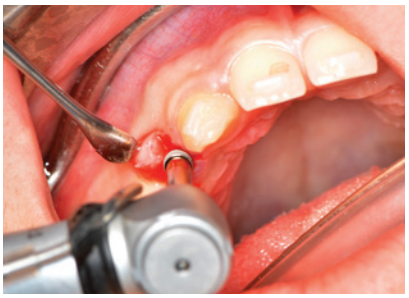
What is most striking is that the most compelling innovations are not the loudest ones. They do not merely promise more; they promise better alignment—with tissue, with time, with

## CONTENT

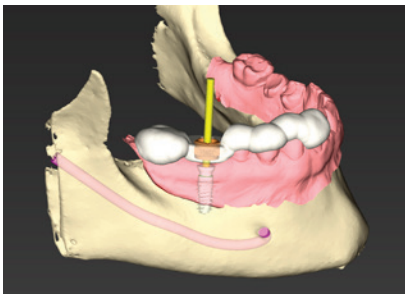














▼

anatomy, with patient expectations, and with the realities of clinical practice. This is a quiet but significant shift. Dentistry is moving away from a model of intervention alone toward one of interpretation: reading the patient more completely, and responding with greater precision and restraint.

That shift requires a certain discipline of thought. It asks clinicians not only to master new tools, but to understand their meaning. A digital workflow is valuable not because it is digital, but because it may allow care to become more accurate, more elegant, less invasive. A regenerative material matters not because it is advanced, but because it serves healing with respect for biological limits. Artificial intelligence earns its place not when it dazzles, but when it simplifies complexity without diminishing clinical judgement.

Running through this issue is a confidence tempered by humility. The finest dentistry today does not seek to overpower biology; it seeks to work in concert with it. It recognises that predictability is not produced by force, but by understanding. It knows that aesthetics cannot be separated from function, that efficiency must remain accountable to evidence, and that innovation without discernment is simply noise in a more sophisticated form.

This broader sensibility is perhaps the true mark of progress. As patient demands grow more nuanced and clinical possibilities more expansive, the challenge is no longer whether dentistry can do more. It is whether it can do what matters, with clarity and coherence.

The answer, suggested throughout this issue, is encouraging. The future belongs neither to technology alone nor to tradition alone, but to the thoughtful convergence of both. It belongs to clinicians and researchers capable of connecting disciplines without reducing their complexity, and of embracing advancement without surrendering judgement.

If there is an enduring lesson here, it is that excellence in dentistry is no longer defined by isolated achievement. It is defined by harmony: between science and skill, innovation and evidence, ambition and restraint. In that balance lies not only the future of the profession, but its enduring elegance.

Sincerely,
Dr Georg Bach
President of the German Association
of Dental Implantology—DGZI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## CONTENT







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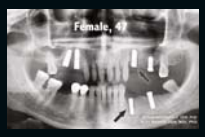


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# Oral microbiome dynamics and biological ageing in dentisty

Ageing is not merely a chronological phenomenon; it is, above all, a biological process shaped by cellular, immunological, and microbial changes. Telomeres play a central role in this process, as their shortening is regarded as a marker of diminished regenerative capacity and an increased inflammatory burden. In the oral cavity in particular—where tissue renewal, microbial exposure, and immune responses are closely intertwined—telomere biology offers new insights into the onset and progression of periodontal disease.

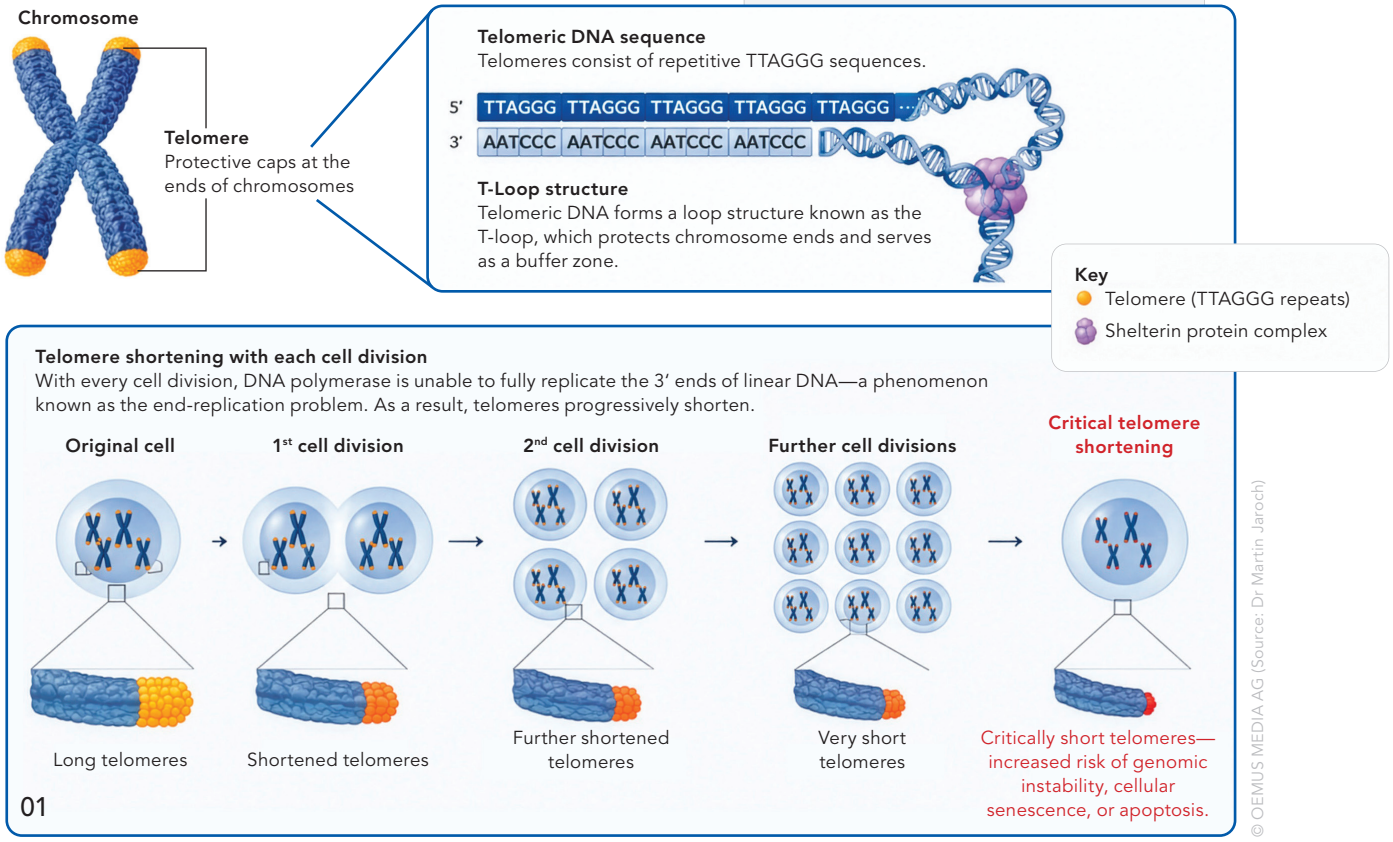
Dr Martin Jaroch, Germany

This article explores the interplay between telomeres, cellular senescence, and the oral microbiome, and illustrates how these factors contribute to a more integrative understanding of biological ageing in dentistry.

The foundations of modern telomere research were laid by the pioneering work of Elizabeth Blackburn, who, together with Jack Szostak and later Carol Greider, elucidated the structure and function of chromosome ends.[1] Telomeres consist of repetitive TTAGGG sequences and protect chromosomes from instability and progressive shortening during each cell division (Fig. 1).[2,3]

**Telomeres—the protective caps of chromosomes**
Telomeres are composed of repetitive TTAGGG sequences and protect chromosomes from instability and progressive shortening during each cell division.

**Functions of telomeres**
- Protect chromosome ends from DNA damage and end-to-end fusion
- Prevent genomic instability
- Preserve genetic information during cell division
- Serve as indicators of cellular ageing and replicative capacity



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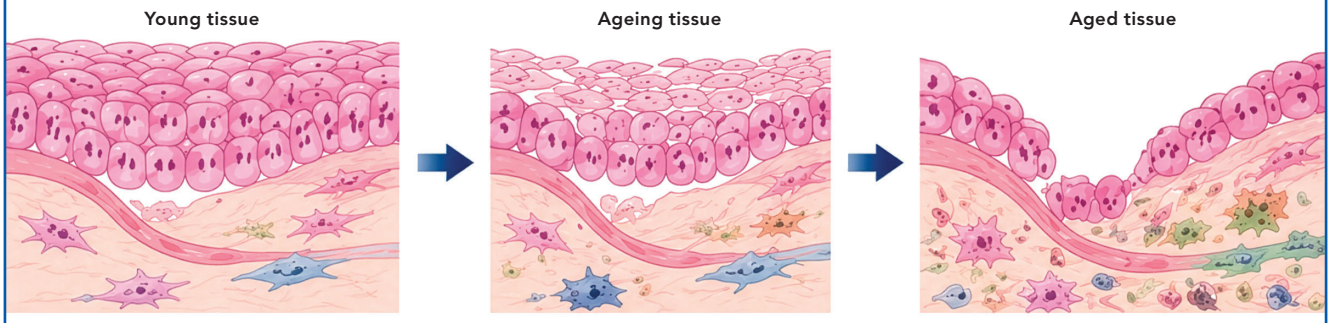
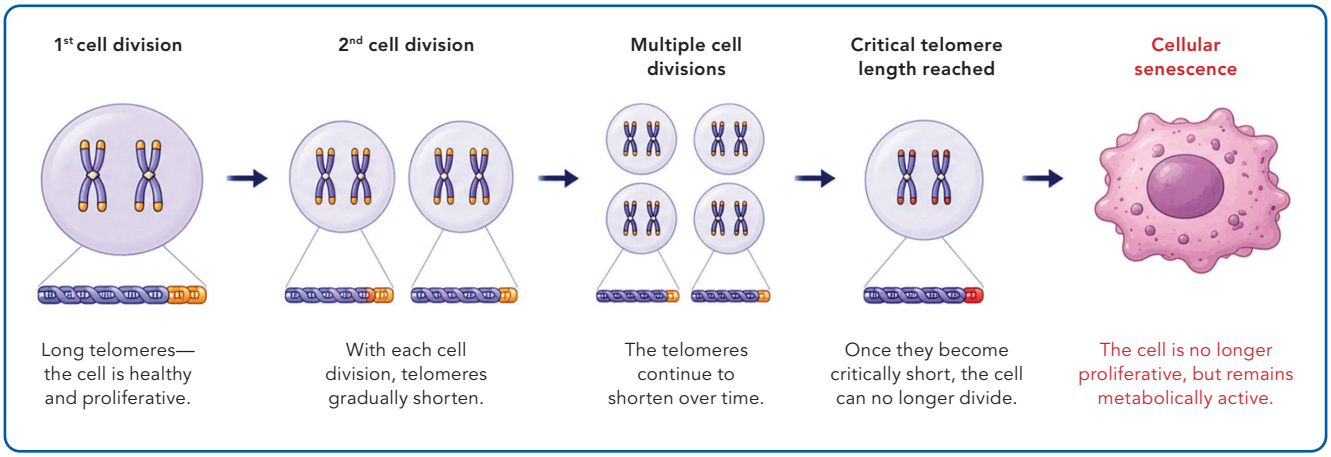


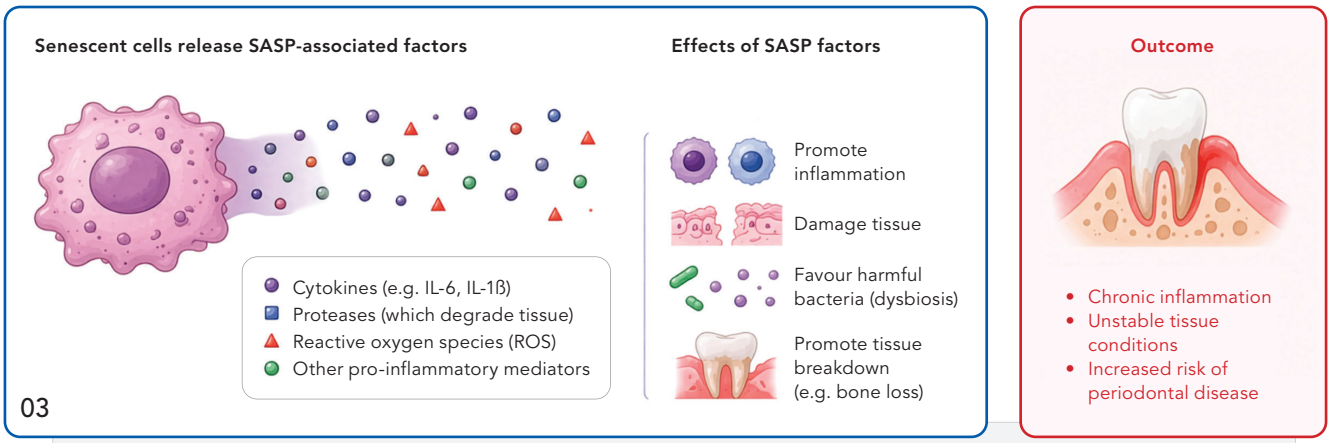

| | | | |
|---|---|---|---|
| Telomerase activity | high | declining | very low |
| Telomere length | long | shortened | very short |
| Cellular regeneration | high | reduced | markedly reduced |
| Tissue stability | stable | increasingly vulnerable | unstable |
| Vulnerability | low | increased | very high |

02



**Effects of advancing age on oral tissues**
With advancing age, low telomerase activity in somatic oral cells contributes to telomere shortening, diminished regenerative capacity, and greater susceptibility to inflammation, tissue breakdown, and periodontal disease.




03



**Telomere shortening leads to cellular senescence and inflammation**
**Key message:** Every cell division shortens telomeres. When they become critically short, the cell enters a senescent state. Although it can no longer divide, it remains metabolically active and releases pro-inflammatory factors that damage tissue and amplify inflammation.

This discovery made it clear that cells possess a biological "clock." This is particularly relevant for tissues with a high turnover rate, such as the oral epithelium and the periodontal apparatus, which require continuous renewal due to mechanical stress, bacterial exposure, and ongoing regeneration.

With the discovery of telomerase, Blackburn and Greider identified an enzyme capable of partially compensating for telomere shortening.[1,4] While stem cells and germline cells exhibit high telomerase activity, its expression is markedly reduced in somatic cells. In oral tissues, this contributes to increased vulnerability with advancing age (Fig. 2). Chronic inflammation, which is common in the oral cavity, further accelerates telomere shortening and promotes the functional ageing of periodontal tissues.

Subsequent studies also demonstrated that psychological stress and systemic inflammation are closely associated with shortened telomeres.[3] This is of particular importance in periodontology, as periodontitis is understood as a multifactorial disease in which bacterial dysbiosis, immune responses, and systemic inflammation interact. In this context, telomere length serves as a biological marker of inflammatory burden and regenerative capacity.

## Telomeres, senescence and immune ageing

With each cell division, telomeres become shorter. Once they fall below a critical length, the cell enters a state of senescence. Senescent cells lose their ability to divide but remain metabolically active, releasing pro-inflammatory mediators. This so-called SASP (senescence-associated secretory phenotype) includes cytokines, proteases, and reactive oxygen species that destabilise tissues and promote chronic inflammation (Fig. 3).

In the oral epithelium and periodontal ligament, this results in reduced regenerative capacity and increased susceptibility to dysbiotic changes. At the same time, telomere shortening also affects the immune system. T lymphocytes and neutrophils, in particular, are highly sensitive to telomere loss. The resulting immunosenescence impairs the control of microbial biofilms and favours a shift toward anaerobic, inflammation-associated species.

Oxidative stress further amplifies these processes.[5] Bacterial metabolites, smoking, alco-

hol consumption, and an unbalanced diet generate free radicals that directly damage telomeres. This creates a self-perpetuating cycle of inflammation, oxidative stress, senescence, and dysbiosis.

## Lifestyle as a modulator of telomere biology

Telomere length is strongly influenced by lifestyle factors. Chronic psychological stress activates inflammatory signalling pathways and increases cortisol release. At the same time, telomerase activity declines while oxidative stress rises. In oral tissues, this leads to reduced regenerative capacity and greater susceptibility to dysbiosis.

Nutrition also has a substantial impact on telomere integrity. Antioxidant nutrients such as vitamin C, vitamin E, polyphenols, and omega-3 fatty acids reduce oxidative damage and help stabilise inflammation-regulating processes. In doing so, they indirectly support the stability of the oral microbiome.

By contrast, smoking and alcohol exert pronounced telomere-shortening effects. Tobacco smoke contains numerous oxidising substances that cause DNA damage and overwhelm repair mechanisms. Alcohol further increases oxidative stress and alters the oral environment in ways that favour pathogenic microorganisms. Clinically, this is reflected in poorer wound healing, greater bone loss, and more aggressive periodontal disease progression.

Sleep deprivation also adversely affects telomere biology. Chronic sleep disturbances increase inflammatory markers such as IL-6 and CRP and impair immune function. Physical activity, by contrast, exerts a protective effect: it reduces oxidative stress, stabilises immune function, and is associated with longer telomeres and a lower prevalence of severe periodontitis (Fig. 4).

## Telomere shortening and periodontitis

Current studies consistently show that patients with periodontitis have shorter telomeres, both in immune cells and in periodontal tissues.[5–7] Telomeres are significantly shortened, particularly in inflamed areas. This finding correlates with attachment loss, periodontal pocket formation, and alveolar bone resorption.

Senescent cells exert a lasting influence on the periodontal microenvironment. Through their SASP profile, they promote inflammatory processes and destabilise microbial balance. As a result, pathogenic species such as *Porphyromonas gingivalis*, *Treponema denticola*, and *Tannerella forsythia* gain a selective advantage.

This dysbiosis, in turn, further increases oxidative stress and DNA damage. Bacterial metabolites such as butyrate impair mitochondrial function and promote senescence-associated processes.[8] At the same time, immune cells produce large amounts of reactive oxygen species which, although intended to exert antimicrobial effects, also cause additional tissue damage and accelerate telomere shortening.

Moreover, telomere shortening affects bone metabolism. Increased RANKL expression and reduced OPG production stimulate osteoclastogenesis and intensify alveolar bone loss. Patients with a high inflammatory burden and short telomeres therefore often show a poorer response to regenerative therapies.

## Lifestyle and telomeres—what protects, what harms?

| Protective factors | | |
|---|---|---|
| **Healthy diet** Plenty of fruit, vegetables, nuts, omega-3 fatty acids, and antioxidants | » | Less inflammation, protects telomeres |
| **Regular exercise** Endurance and strength training | » | Reduces stress, strengthens the immune system, associated with longer telomeres |
| **Adequate sleep** Seven to eight hours per night | » | Supports regeneration, reduces inflammation, protects telomeres |
| **Stress management** Relaxation, meditation, mindfulness | » | Lowers stress hormones, reduces inflammation, protects telomeres |

| Harmful factors | | |
|---|---|---|
| **Smoking** Tobacco smoke damages cells and DNA | » | More inflammation, shortens telomeres, poorer healing |
| **Alcohol** Increases oxidative stress and disrupts the oral environment | » | Promotes inflammation, shortens telomeres, favours dysbiosis |
| **Sleep deprivation** Too little or poor-quality sleep | » | More inflammation, weakens the immune system, shortens telomeres |
| **Chronic stress** Persistent stress increases cortisol levels | » | More inflammation, reduced telomerase activity, shortened telomeres |

04



**Implications for oral health**
A healthy lifestyle helps preserve telomere integrity, supports immune function, and promotes a stable oral microbiome. Unhealthy habits, by contrast, drive inflammation, accelerate cellular ageing, and increase the risk of periodontitis.

**“Current evidence suggests that shortened telomeres and increased cellular senescence may impair the regenerative capacity of peri-implant tissues and increase susceptibility to peri-implant inflammation.”**

## Modern research and precision periodontology

Telomere biology is becoming increasingly important for the diagnosis and treatment of periodontitis.[6,7,9] Assessing telomere length in blood, saliva, or gingival tissue can provide valuable insights into inflammatory status and regenerative capacity. Salivary analysis, in particular, is considered a promising noninvasive biomarker approach.

Modern sequencing technologies have also shown that the composition of the oral microbiome is closely linked to processes of biological ageing. Senescent tissues and dysregulated immune responses create conditions under which pathogenic biofilms can develop more readily. Conversely, bacterial metabolites further promote telomere shortening and inflammation.[8,9]

These findings form the basis of precision periodontology. The goal is an individualised diagnostic approach that integrates telomere length, microbiome profiles, and inflammatory markers in order to predict disease risk more accurately and tailor therapies to the patient’s biological profile.

At the same time, therapeutic strategies aimed at modulating senescence are being actively investigated. Compounds such as quercetin, fisetin and metformin may help reduce the burden of senescent cells. Controlled modulation of telomerase activity is also being explored experimentally.[4,9] In addition, probiotic and biofilm-modulating approaches are gaining importance as means of promoting oral microbiome stability and reducing inflammatory processes.

## Implants, peri-Implantitis and telomeres

The relevance of telomere biology is not limited to periodontitis affecting natural teeth; it is also becoming increasingly important in implant dentistry. Recent studies suggest that shortened telomeres and increased cellular senescence may impair the regenerative capacity of peri-implant tissues and increase susceptibility to peri-implant inflammation. Telomeres may therefore also serve as biomarkers of disease activity, tissue stability, and therapeutic prognosis in peri-implant tissues. The integration of biological ageing markers thus opens new perspectives for the prevention and personalised treatment of peri-implant diseases.[10]

## Conclusion

Telomere research has fundamentally reshaped our understanding of periodontitis. Telomeres lie at the intersection of cellular ageing, immune function, inflammation, and microbial ecology. Their shortening reduces the regenerative capacity of tissues, promotes senescence and destabilises the oral microbiome. At the same time, pathogenic biofilms further accelerate telomere loss through oxidative stress and inflammation.

Periodontitis therefore no longer appears primarily as a local bacterial infection, but rather as the manifestation of a biologically ageing and inflammatorily dysregulated system. These relationships are also highly relevant to implant dentistry, as biological ageing processes and inflammatory dysregulation can likewise affect the stability of peri-implant tissues and increase susceptibility to peri-implant diseases. The integration of telomere biology, microbiome analysis, and individualised therapeutic concepts thus opens new perspectives for diagnosis, prevention and regenerative therapy in modern dentistry.

References

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# Aesthetic rehabilitation of lateral incisor agenesis

## Multidisciplinary clinical approach using narrow-diameter implants

Modern dental rehabilitation relies on the convergence of multiple disciplines to achieve biologically sound, functional, and aesthetically harmonious outcomes. Isolated interventions, while sometimes effective, often fail to account for the complex interactions among occlusal forces, soft-tissue dynamics, and smile aesthetics.

Dr Zafer Kazak, Turkey

Orthodontic therapy establishes ideal space and root positioning, while surgical and prosthetic phases must ensure precise implant placement and restoration in harmony with gingival architecture. A multidisciplinary approach integrating orthodontics, oral surgery, implantology, periodontology, and prosthodontics enables customised treatment planning and precision at every stage.

The prevalence of dental agenesis is more common in females than in males, and the maxillary lateral incisors are the second most commonly affected teeth in congenital hypodontia.[1] This can have a significant impact on aesthetics, occlusal balance and self-esteem, especially in the youth. In such cases, achieving symmetry and proportion requires both careful space management and strategic restorative planning. The challenge intensifies when limited interdental width constrains implant placement. Narrow-diameter implants, such as the bredent medical copaSKY 3.0, offer a reliable, minimally invasive solution that does not require bone augmentation, while maintaining stability and aesthetic integration. Literature indicates that narrow-diameter implants are a predictable treatment option, since they afford clinical results comparable to those obtained with implants of greater diameter.[2]

This report presents a coordinated, interdisciplinary rehabilitation of a young female patient with bilateral lateral incisor agenesis, deep bite, and multiple diastemas, managed through a sequence of orthodontic, surgical, periodontal, and prosthetic interventions.


**01**
Preoperative frontal view of the facial profile.

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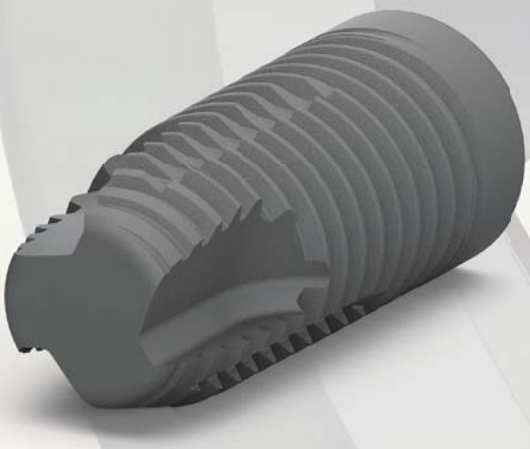
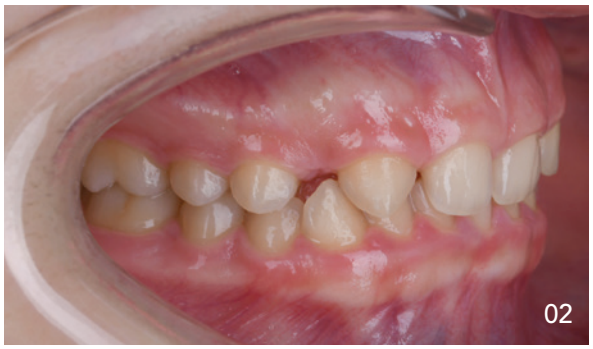
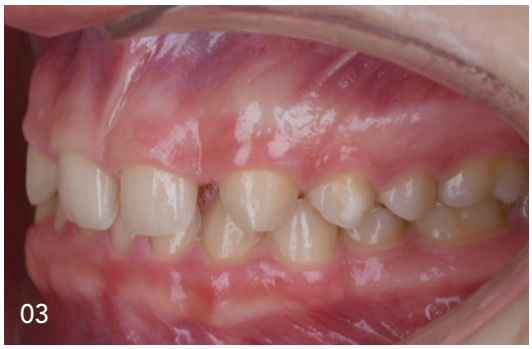


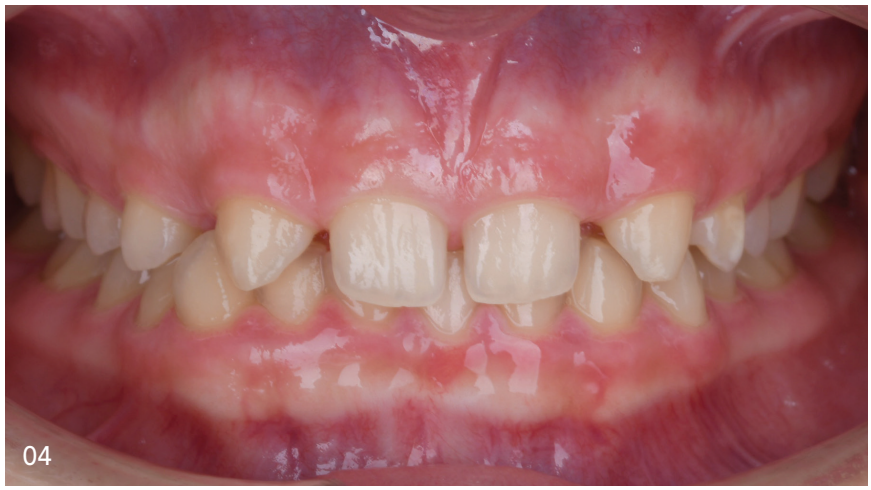
Long term clinical performance of superhydrophilic dental implants with more than 10 years follow-up, Clinical Oral Implants Research, Hassfurther ND, Hassfurther N., EAO-332/PO-SU-022



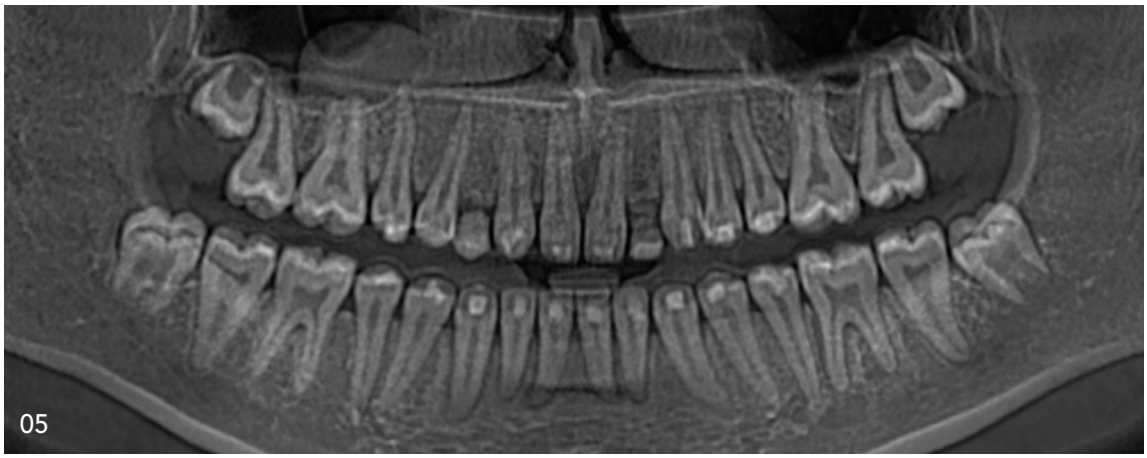


**02**
Preoperative right lateral intra-oral view.

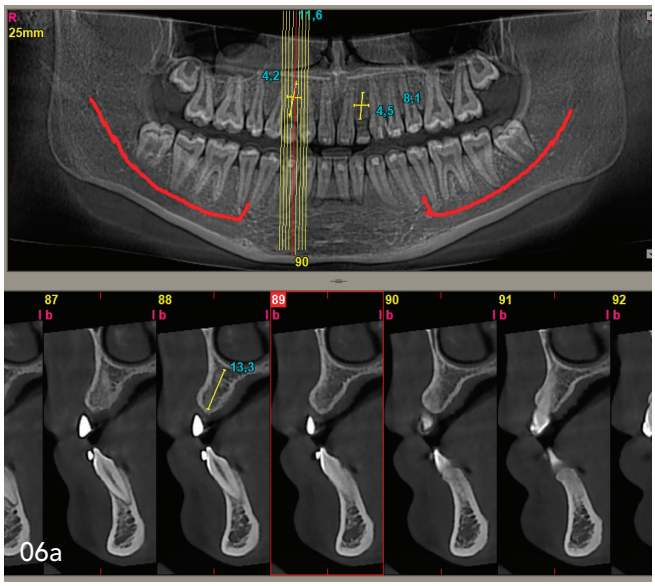
**03**
Preoperative left lateral intra-oral view.



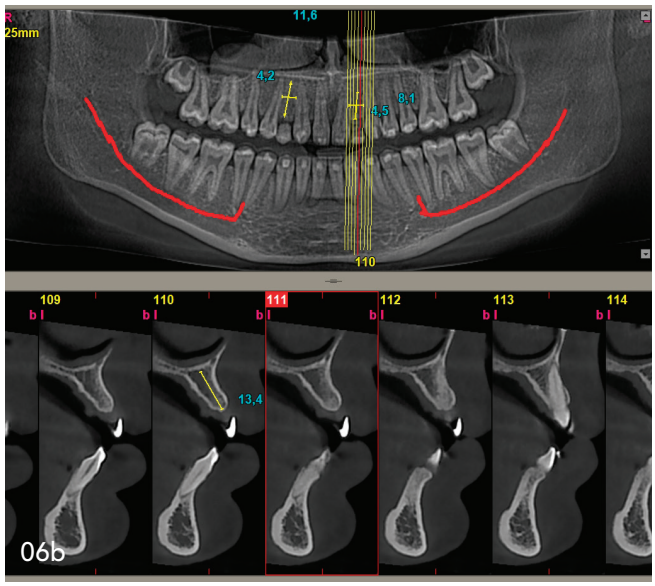
**04**
Preoperative frontal intra-oral view.



**05**
Preoperative OPG.




**06a**
CBCT evaluation of the right canine region.




**06b**
CBCT evaluation of the left lateral incisor region.

## Case presentation

An eighteen-year-old, systemically healthy female patient presented with aesthetic and functional concerns. Extra-oral examination revealed an acceptable facial profile (Fig. 1) with minor lip incompetence, while intra-oral findings included bilateral missing maxillary lateral incisors, multiple anterior diastemas, slightly proclined incisors, an accentuated curve of Spee and a deep bite along with a Bolton discrepancy (Figs. 2–4).

Radiographic evaluation (Panoramic and CBCT) confirmed bilateral agenesis of the maxillary lateral incisors and adequate bone volume for narrow-diameter implant placement following orthodontic space redistribution (Figs. 5–6b).

## Treatment planning

Following cephalometric and model analysis, an interdisciplinary plan was developed. Orthodontic correction was initiated to create space for implant placement at sites #13 and #22, establish appropriate canine guidance, and reduce the deep bite through controlled intrusion of the anterior teeth and extrusion of the posterior teeth. The orthodontic phase was scheduled for approximately 20 months, followed by the surgical placement of two narrow implants, soft-tissue optimisation, and final prosthetic rehabilitation.

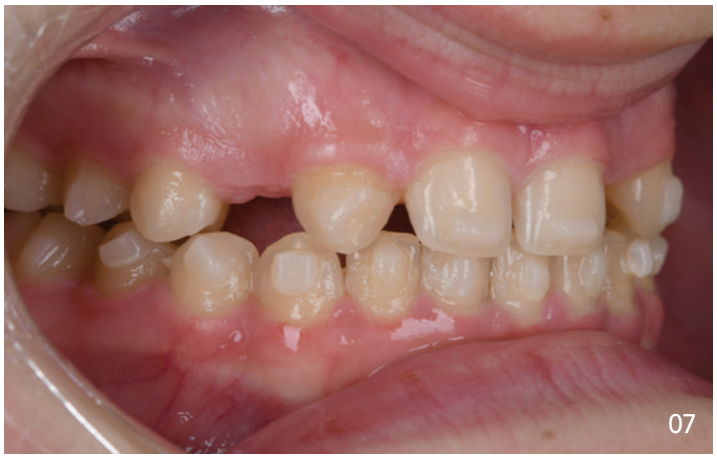
## Orthodontic phase

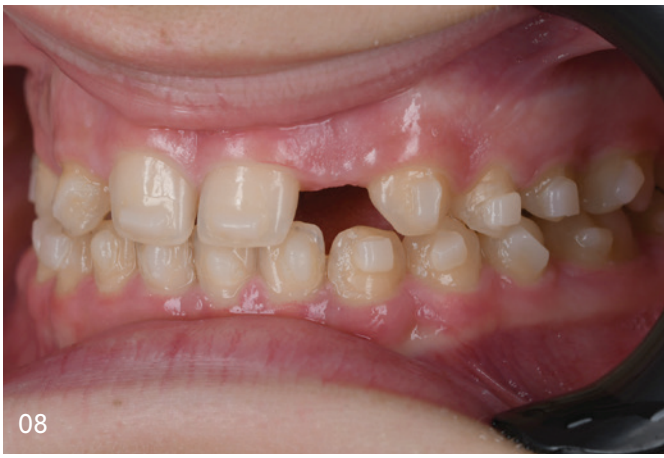
Orthodontic treatment with braces aligned both arches, corrected a deep bite, distributed space symmetrically, creating ideal mesiodistal space for implant placement, and rectified the axial inclination of the teeth. Hence, occlusal correction was performed, and aesthetic space proportions were established for surgical and prosthetic rehabilitation (Figs. 7+8).

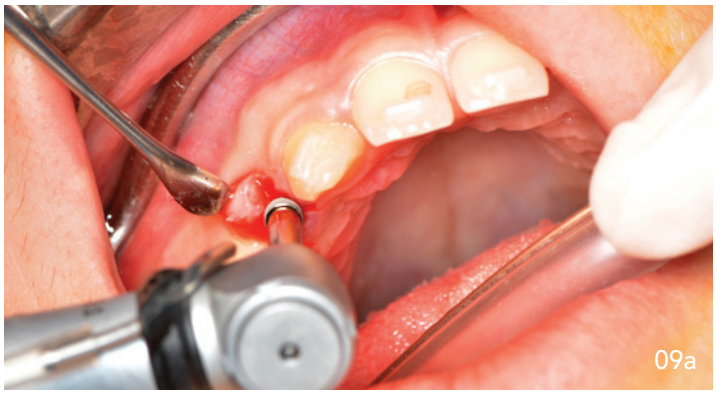
## Surgical phase

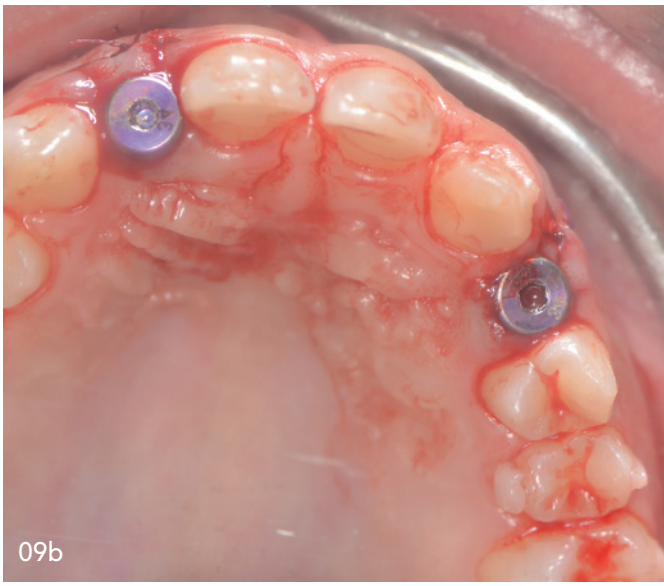
**Implantology**

After creating space orthodontically, two narrow-diameter implants (copaSKY, 3.0 mm, bredent medical) were placed (Figs. 9a+b) using a roll-flap technique in sites #13 and #22, with lengths of 12 mm and 8 mm, respectively.[3] The copaSKY 3.0 implants were ideal in the current clinical situation as they can successfully be used for mesiodistal space less than 6 mm with high primary stability and subcrestal placement for immediate restorations owing to the unique compression thread with a blasted and etched surface characteristic of the implant design.



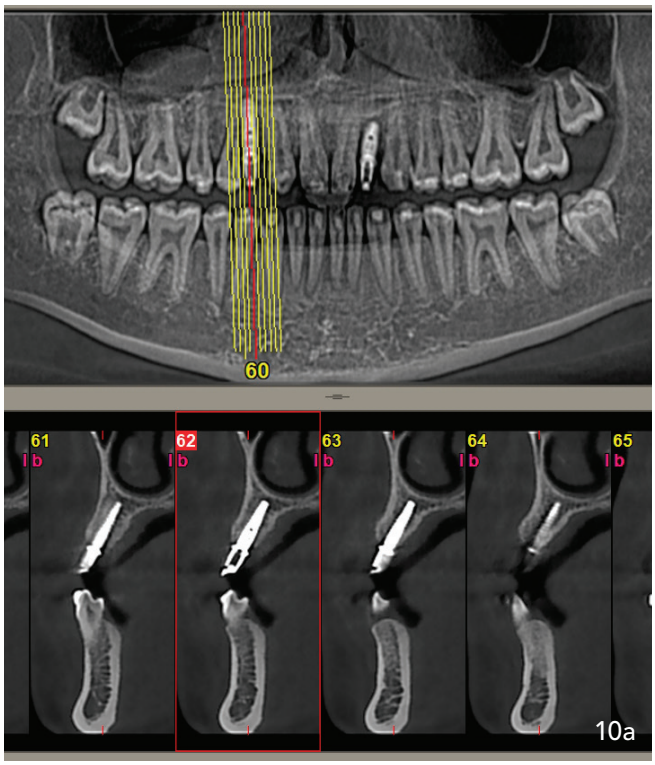



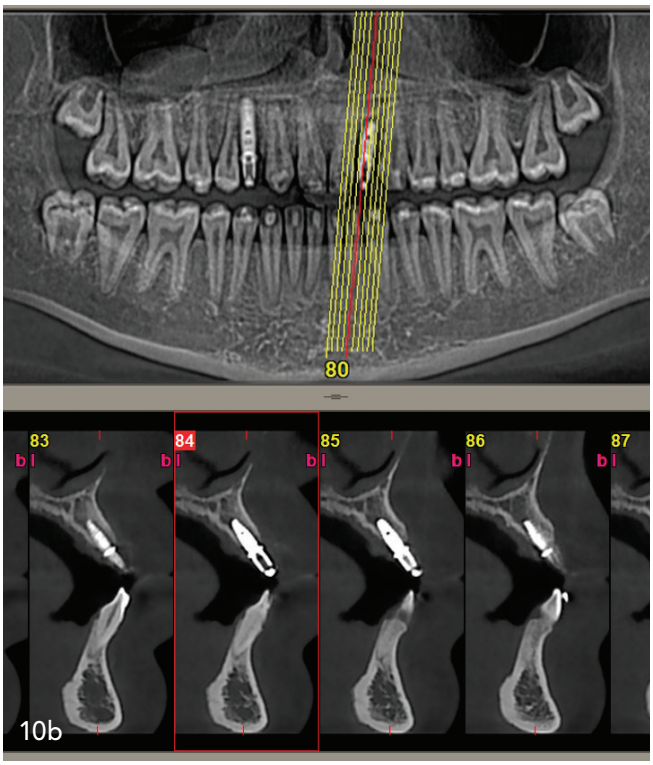

**07**
Postorthodontic space creation for implant placement in the right canine region.

**08**
Postorthodontic space creation for implant placement in the left lateral incisor region.

**09a**
Implant placement with concomitant soft-tissue manipulation using the roll-flap technique.

**09b**
Occlusal view demonstrating implant placement for the missing teeth.

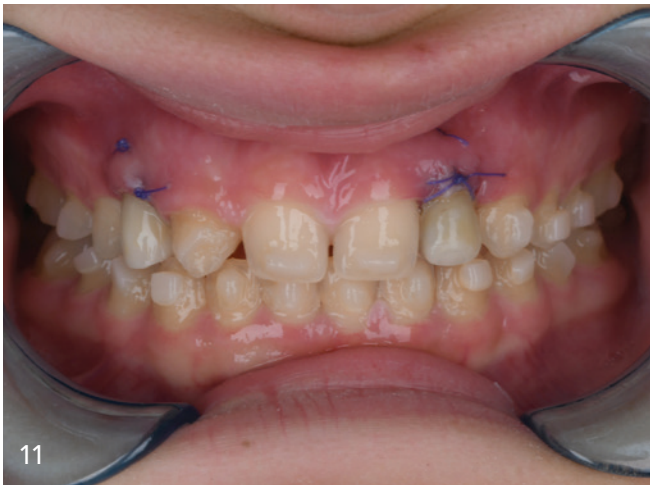


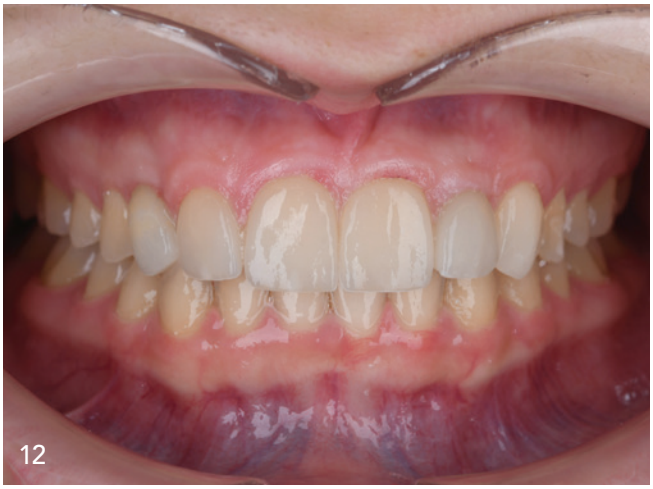




**10a**
Postoperative evaluation of site #13 demonstrating optimal implant positioning.

**10b**
Postoperative evaluation of site #22 demonstrating optimal implant positioning.

**"When congenital agenesis presents with limited interdental space and altered occlusal relation, narrow-diameter implants become a biologically respectful alternative that preserves tissue architecture while avoiding unnecessary augmentation."**



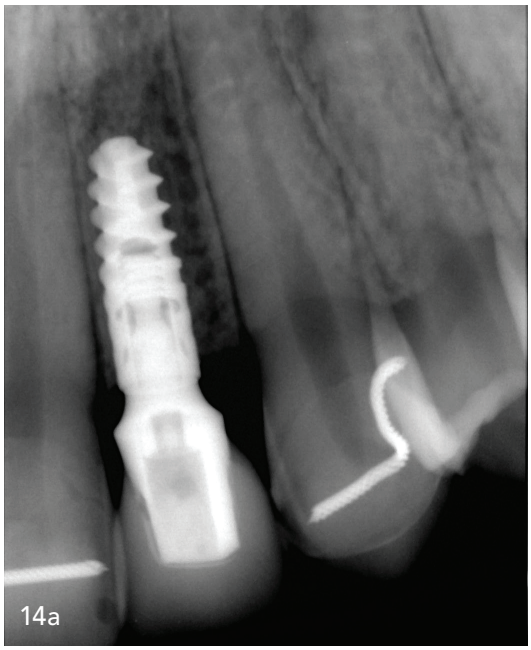

**11**
Immediate implant-supported provisional crowns following placement.

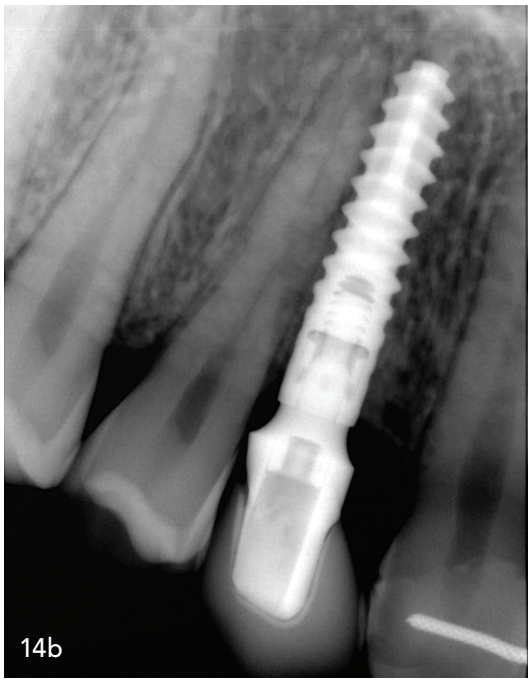
**12**
Definitive prosthetic rehabilitation with IPS e.max veneers and all-ceramic crowns on BioHPP abutments.


13a


13b


13c


14a


14b

**13a**
Immediate posttreatment frontal view of the facial profile.

**13b**
Immediate post-treatment right lateral view of the facial profile.

**13c**
Immediate post-treatment left lateral view of the facial profile.

**14a**
Periapical radiograph of site #22 demonstrating stable crestal bone levels at the six-month follow-up.

**14b**
Periapical radiograph of site #13 demonstrating stable crestal bone levels at the six-month follow-up.

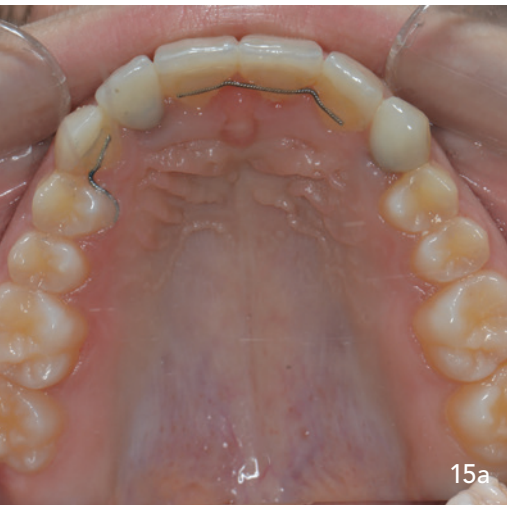
A minimally invasive, laser-assisted approach (Fotona® Er:YAG) was used to aid soft-tissue management during surgery. Implant placement was confirmed with postoperative CBCT scans to ensure accurate angulation and emergence profile (Figs. 10a+b).

**Periodontology**
Gingivectomy was performed on the upper anterior teeth to contour gingival zeniths and optimise crown lengths following orthodontic treatment. This helped achieve a harmonious balance between white and pink aesthetics.

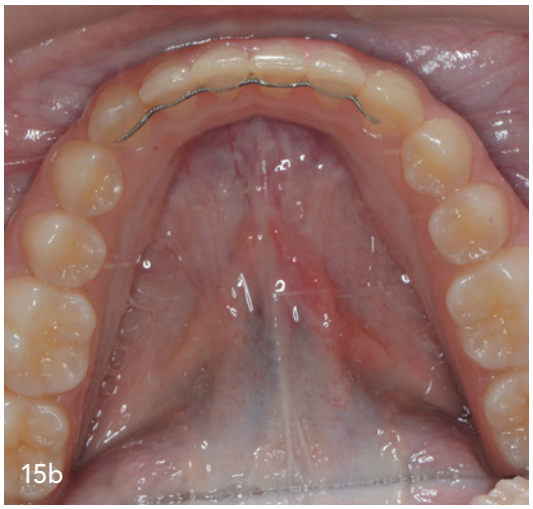
**Prosthodontics**
Immediate function and aesthetics were established by providing implant-supported provisional crowns on the day of surgery (Fig. 11). The final restoration was full ceramic crowns on BioHPP abutments (bredent). BioHPP is a ceramic-reinforced polymer derived from polyether ether ketone (PEEK). Its inherent structural characteristics and surface morphology provide distinct mechanical, biological, and prosthetic benefits, achieving a clinical balance between elasticity and rigidity, low weight and high fracture resistance, along with excellent biocompatibility and reduced plaque accumulation.[4] IPS E.max (Ivoclar Vivadent) laminate veneers were placed in the anterior region to re-establish aesthetics and functional harmony (Fig. 12). The patient was satisfied with the smile-makeover achieved (Figs. 13a–c).

## Follow-up assessment

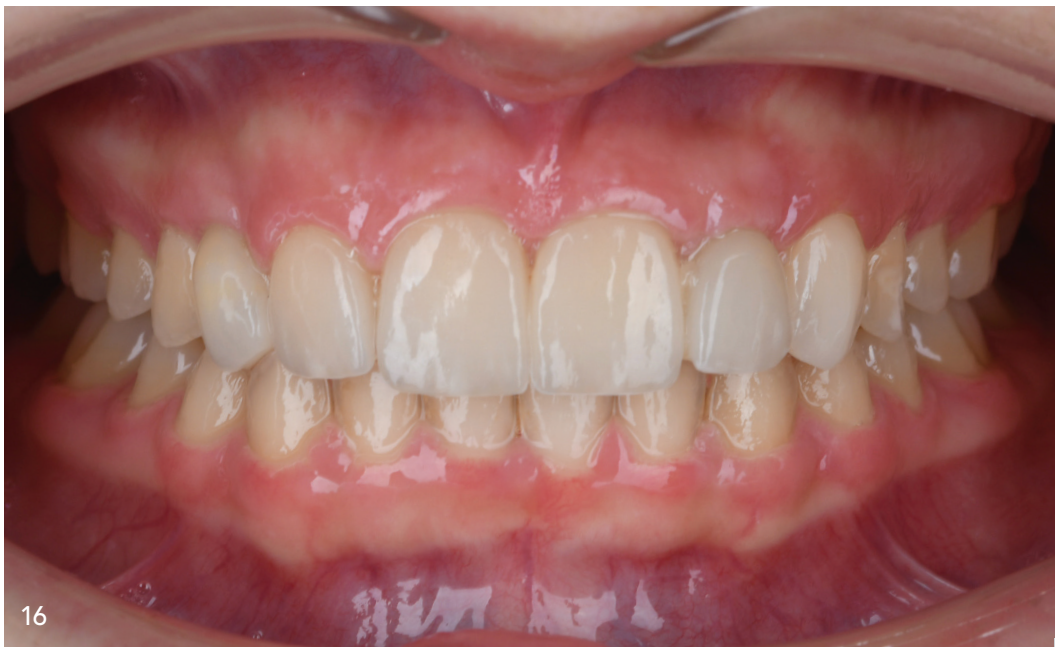
No complications were detected at the six-month routine clinical recall. Radiographic examination revealed stable crestal bone levels (Figs. 14a+b), and clinical evaluation confirmed the orthodontic




**15a**
Occlusal view of the maxillary anterior region at the six-month follow-up.




**15b**
Occlusal view of the mandibular anterior region at the six-month follow-up.




**16**
Clinical view at the six-month follow-up demonstrating a healthy gingival profile.

retainers were in position (Figs. 15a+b), with healthy, firm gingiva and satisfactory pink aesthetics (Fig. 16). The patient was very pleased with her facial profile (Figs. 17a–c) at the follow-up visit.

## Clinical implications

This case highlights that predictable aesthetic rehabilitation of lateral incisor agenesis hinges on coordinated interdisciplinary planning. Narrow-diameter implants can be placed safely in reduced mesiodistal spaces (as little as 6 mm) between dental elements, especially when preceded by orthodontic space optimisation to create more space and followed by precise soft-tissue sculpting and prosthetic control. The multifunctional back-tapered microtextured implant neck (copaSKY 3.0) in combination with the abutment material (Bio-HPP, bredent) are essential prerequisite for the 3D formation of bone and a gingival cuff that protects the implant. It is now generally acceptable that the mucointegration and osseointegration are both important for the successful management of patients with implants. A stable and reversible conical-parallel-walled implant–abutment connection facilitates easy removal of the prosthesis should the need arise in this young adult. BioHPP abutments and modern ceramic systems further support long-term tissue stability by promoting favourable biomechanical behaviour and soft-tissue compatibility. For clinicians treating young patients with congenital agenesis, this workflow reduces the need for invasive augmentation and offers a highly conservative yet stable solution.

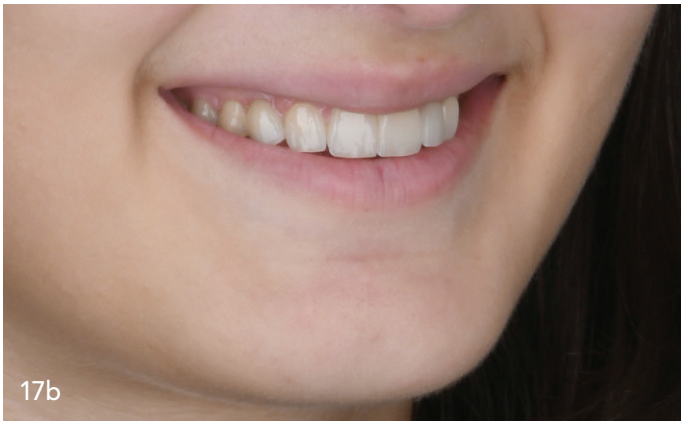
## Future directions

While narrow-diameter implants continue to show promising outcomes in anatomically constrained sites, long-term comparative studies are needed to clarify their performance relative to standard implants in agenesis cases. Additionally, emerging digital workflows—including facially driven implant planning, dynamic navigation, and advanced polymer abutment materials—may further enhance precision and aesthetic predictability. Integrating these technologies into future protocols could refine interdisciplinary treatment standards and expand conservative implant solutions for young adults.

**17a**
Frontal view of the facial profile at the six-month follow-up.

**17b**
Right lateral view of the facial profile at the six-month follow-up.

**17c**
Left lateral view of the facial profile at the six-month follow-up.



## Conclusion

This case reinforces the principle that aesthetic implant dentistry succeeds not through isolated interventions, but through the precise orchestration of multiple disciplines. When congenital agenesis presents with limited interdental space and altered occlusal relationship, narrow-diameter implants become a biologically respectful alternative that preserves tissue architecture while avoiding unnecessary augmentation. Their success, however, is dependent on the preparatory phases such as orthodontic creation of symmetrical space, periodontal refinement of gingival contours, and prosthetic control of emergence profile and load distribution.

By integrating these elements, the present rehabilitation achieved stable peri-implant bone levels, harmonious soft-tissue architecture, and natural anterior aesthetics. More importantly, the outcome illustrates that when biologic limitations are acknowledged and respected, minimally invasive implant designs can restore both form and function without compromising long-term stability. This interdisciplinary pathway offers a predictable template for managing lateral incisor agenesis in young patients, where the demand for precision is high and the margin for error is low.

## Acknowledgements

The implants and prosthetic materials used in this case were provided by the bredent group.

All treatments were carried out at MedicaDent® Oral and Dental Health Clinic in collaboration with Konfor® Dental Laboratory.

Contributing dentists involved in this case report
- Dr Elif Özeren Erdoğan—Orthodontics
- Dr Seda Gönülay—Periodontology
- Dr Mustafa Gürkan—Prosthodontics

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References

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# Transmucosal healing with a biomimetic preshaped abutment

Immediate implant placement and transmucosal healing concepts aim to preserve peri-implant tissue contours and reduce treatment time. The introduction of biomimetic, preshaped healing abutments allows for soft-tissue conditioning immediately after implant placement within a fully digital workflow.

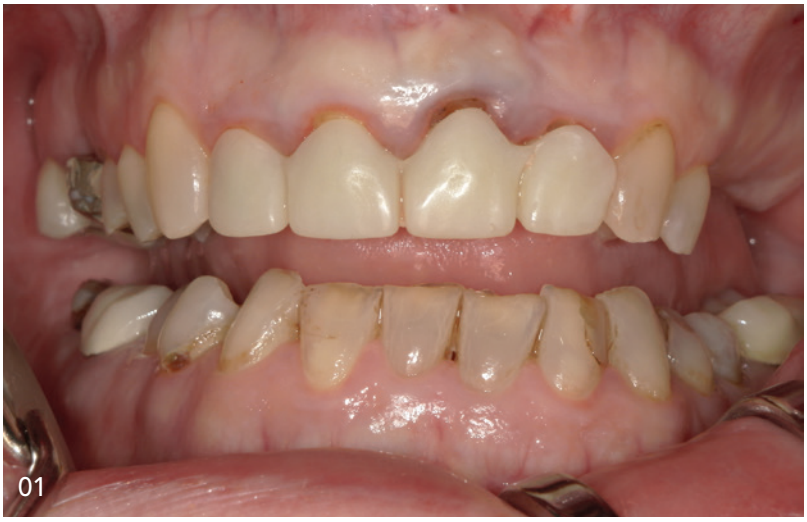
Dr Morse Bayadse & Prof. Dr Dr Keyvan Sagheb, Germany

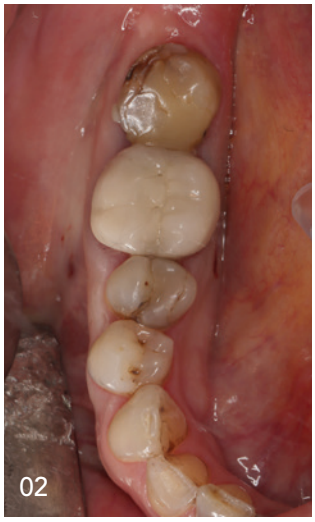
This digital approach accompanies the entire restorative process—from virtual planning and guided surgery to the design of the final prosthesis—while maintaining the patient-specific gingival profile. The established soft-tissue contour can be directly transferred into the digital design of the definitive restoration, enabling the final prosthesis to be created in harmony with the matured peri-implant tissues. As a result, additional soft-tissue manipulation, provisional restorations, or further interventions can often be avoided, leading to improved aesthetic predictability, reduced treatment time, and greater patient comfort.

The presented case illustrates that immediate implantation with a biomimetic preshaped healing abutment simplifies the clinical workflow and communication with the dental laboratory, supports soft-tissue maturation, and favours predictable aesthetic and biological outcomes within a digital restorative approach.

## Introduction

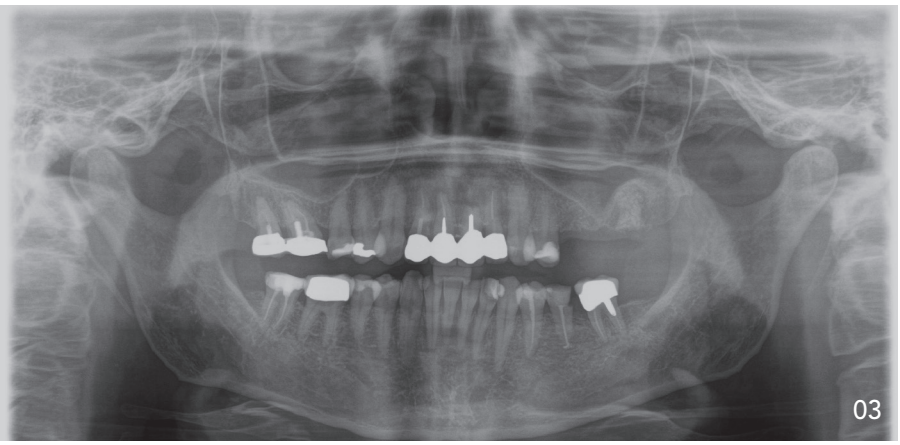
Immediate implant placement has become a predictable treatment preserving the contours of the peri-implant tissue. Achieving stable transmucosal healing with such protocols requires both atraumatic surgical techniques and precise digital planning.[1–3] The biomimetic abutment enhance soft-tissue management and reduce surgery time. By avoiding complex soft-tissue surgical procedures, this approach may contribute to improved patient comfort. The biomimetic healing abutment was developed to guide soft-tissue healing immediately after implant placement and enable the formation of a natural emergence profile without temporary restorations. During the critical healing phase, the zirconium nitride (ZrN) coating of the Healfit® SH may contribute to reducing bacterial adhesion, potentially supporting infection control.[4] The anatomically contoured design of the abutment and the consistent emergence profile of the X-Base® contribute to improved aesthetic

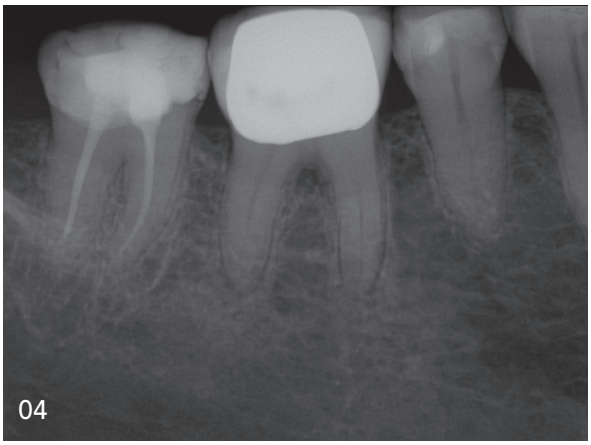


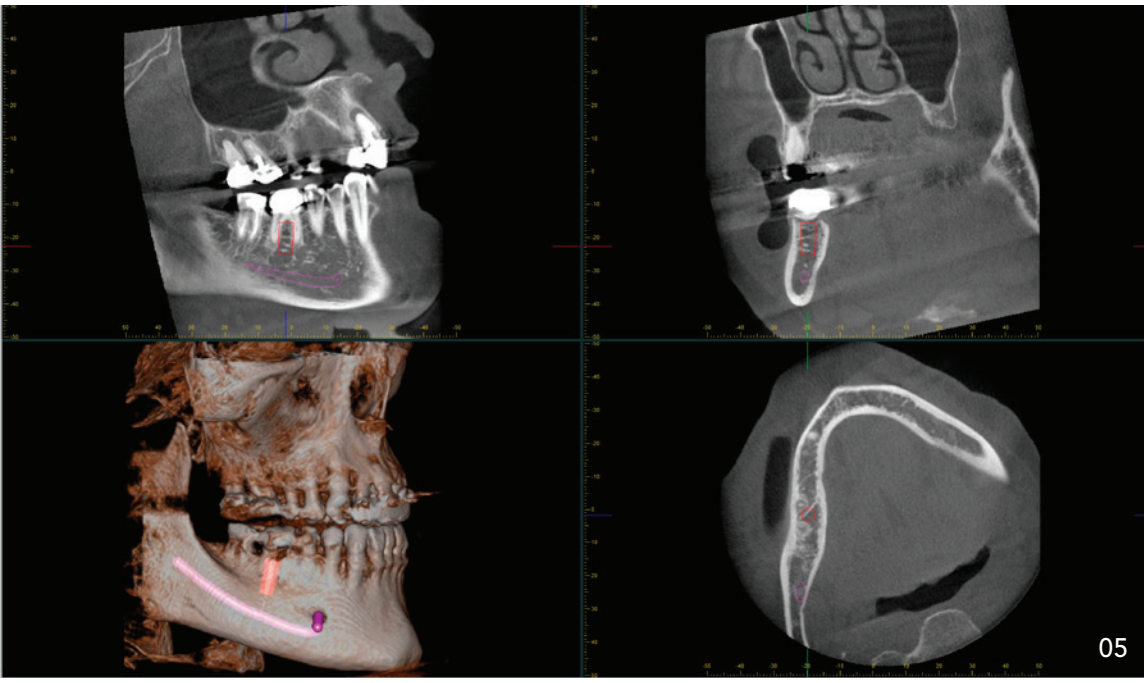




**01**
Clinical presentation of tooth #46 exhibiting a deep carious lesion and extensive coronal structural compromise.

**02**
Occlusal view of tooth #46 demonstrating a deep carious lesion and substantial coronal destruction.







**03**
Preoperative orthopantomogram showing the existing prosthetic restorations.

**04**
Preoperative periapical radiograph demonstrating the existing prosthetic restorations.

**05**
Cone-beam computed tomography (CBCT) confirming preservation of the buccal cortical plate.

outcomes. Compared with conventional healing abutments, the biomimetic design may simplify soft-tissue management by minimising the need for secondary corrective procedures. By enabling direct intra-oral scanning, the healing abutment reduces chair time and simplifies clinical and laboratory workflows, as the definitive scan can be performed immediately after surgery or at an early follow-up appointment, resulting in fewer clinical visits. In addition, the stable transmucosal contour allows the healing abutment to remain *in situ* throughout the healing phase, reducing repeated removal and reinsertion, minimising soft-tissue disturbance, and thereby improving patient comfort while shortening overall treatment time. Within the restorative workflow, the LaserGrip®-treated X-Base® abutment ensures a reliable adhesive connection and mechanical stability, supporting the accuracy and reproducibility of the fully digital workflow.[5–7]

## Case presentation

A 57-year-old female patient presented with complaints related to tooth #46. Clinical examination revealed a compromised crown with deep carious involvement. Pulp vitality testing yielded a negative response,[8] and the patient reported an abnormal taste localised to the region of tooth 46 (Figs. 1+2).

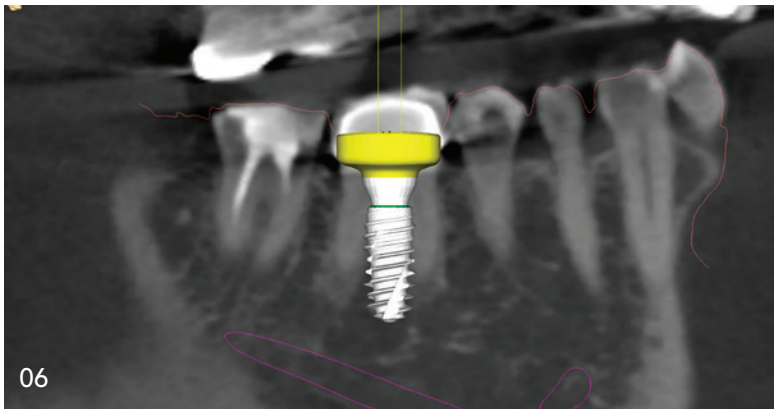
Preoperative radiographs, including a periapical view of tooth 46 and a panoramic radiograph (OPG), showed a partially restored dentition with multiple prosthetic and conservative restorations, as well as crowns requiring replacement (Figs. 3+4).

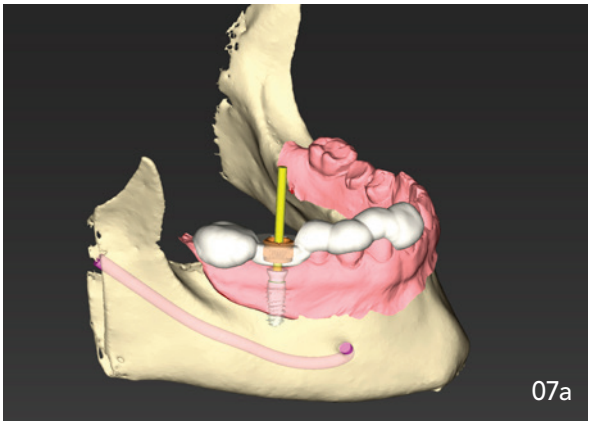
Preoperative cone beam computed tomography (CBCT) demonstrated preservation of the buccal lamella and sufficient interradicular bone volume. Considering the patient's healthy medical background and the unfavourable prognosis of the affected tooth, immediate implant placement was recommended as the treatment strategy (Fig. 5).

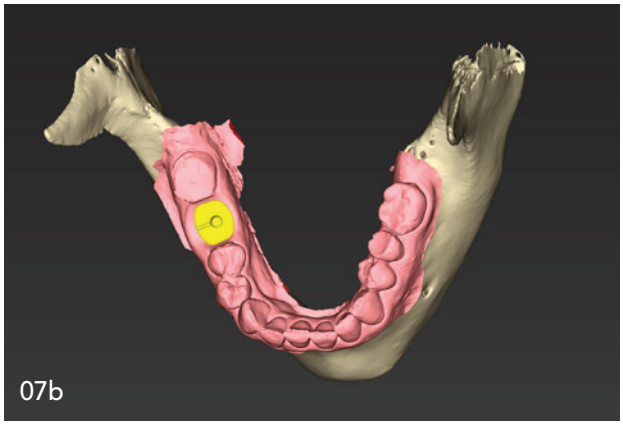
Virtual implant planning was carried out using coDiagnostiX software to ensure accurate three-dimensional positioning. A tissue level (TL) Axiom® X3 4.0 × 10 mm R2.5 implant (Anthogyr) was selected. The chosen implant design and virtual positioning aimed to provide high primary stability. To support optimal soft-tissue healing, a healing abutment

**06**
Virtual implant planning with alignment of the Healfit® SH component.

**07a+b**
Virtual implant planning illustrating alignment of the Healfit® SH component.

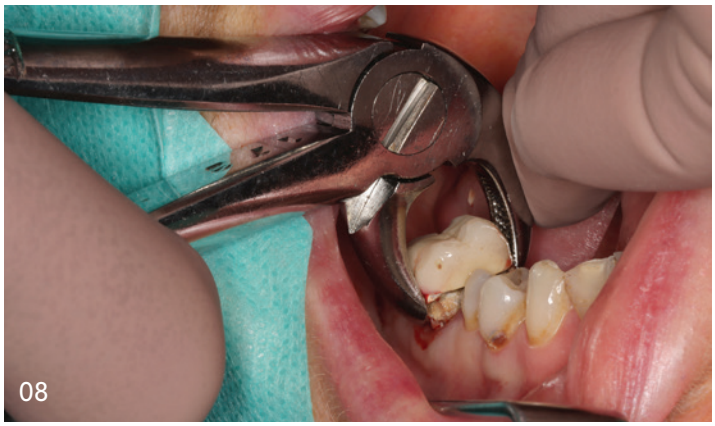


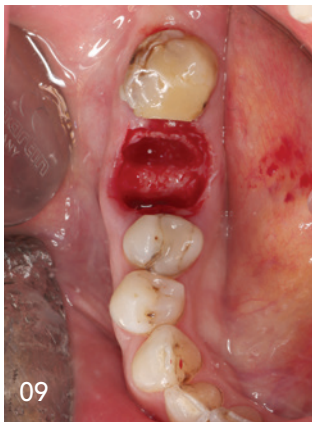




**08**
Atraumatic tooth extraction followed by initial socket preparation.

**09**
Alveolar debridement with preservation of the buccal plate and exposure of the interradicular septum (Socket SII: 3–4 mm).



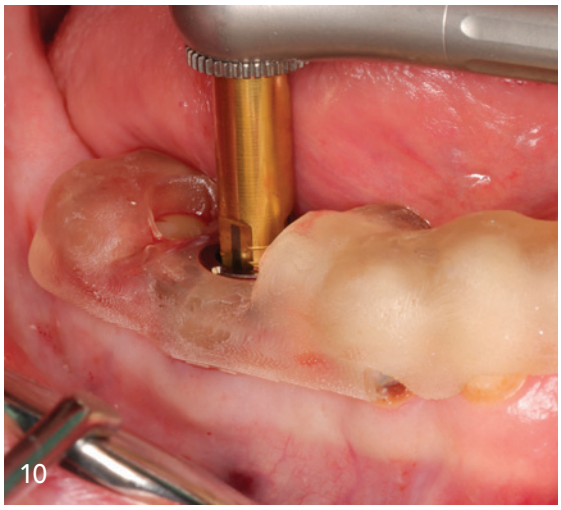

TL R D CH 4.0 (TSHSD-R400) abutment was selected. In combination with the implant position, the Healing abutment covered the extraction socket, preventing collapse of soft tissue while simultaneously shaping the emergence profile (Figs. 6–7b).

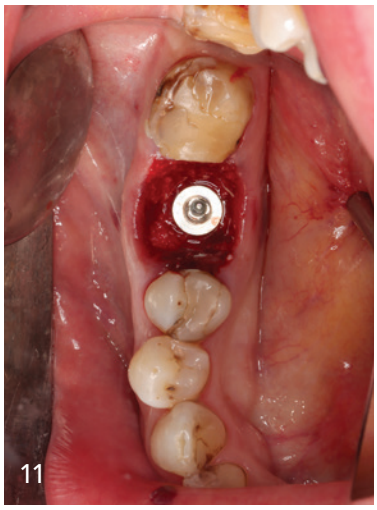
Intraoperatively, atraumatic extraction of tooth 46 was performed while preserving the buccal lamella. The extraction socket was carefully curetted, and the gingival margin was de-epithelialised.

A mucoperiosteal flap was deliberately avoided maintain soft-tissue integrity (Figs. 8+9).

Osteotomy preparation was performed according to the prosthetically driven planning using a surgical guide and guide sleeve. A TL implant was placed in the septum and aligned with the aid of the guide sleeve to ensure correct positioning of the healing abutment. The implant was inserted with a final torque of 45 Ncm, confirming adequate primary stability. The gap between the implant and the extraction socket walls was filled with an allogeneic bone substitute material (maxgraft® cortico-cancellous granules; Figs. 10+11).

The healing abutment was covered with a platelet-rich fibrin (PRF) membrane to enhance socket sealing and then connected to the implant. A simple adaptation suture was performed, achieving complete closure of the extraction socket. The three-dimensional alignment of the Healfit® SH abutment was carried out according to the digital planning, providing biomimetic coverage of the extraction socket. The height of the abutment was selected so that, after the healing process, approximately 1.5 mm of the abutment margin would remain visible and thus scannable for the subsequent digital impression (Figs. 12–14).





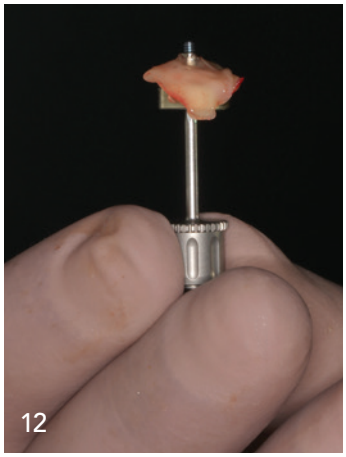
**10**
Guided osteotomy and implant placement.

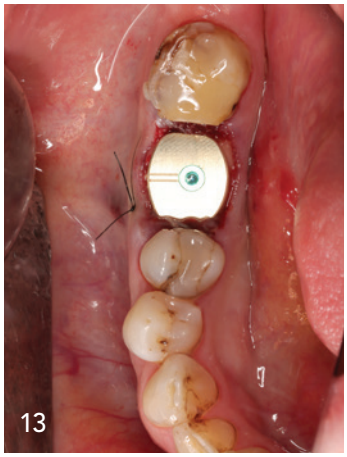
**11**
Final implant positioning with gap augmentation using a xenogeneic bone substitute material.

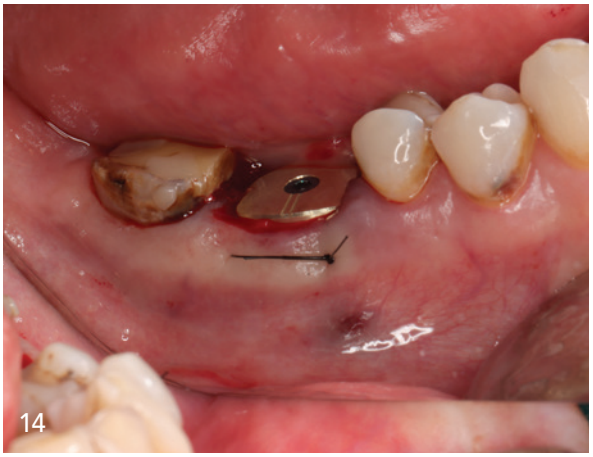
**12**
Coverage with a platelet-rich fibrin (PRF) membrane.

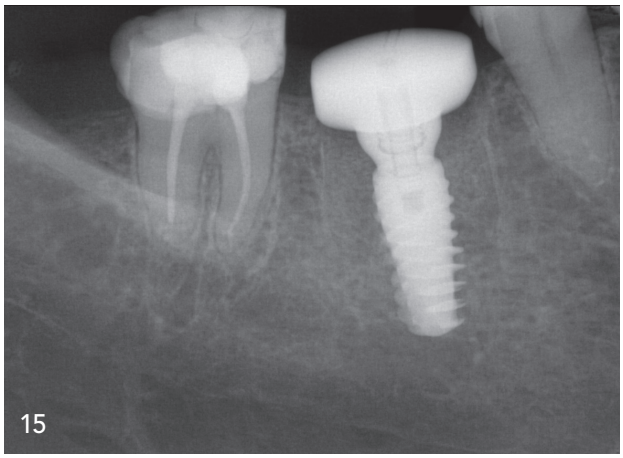
**13**
Placement of the abutment component followed by adapted suturing (occlusal view).

**14**
Placement of the abutment component followed by adaptation suturing (buccal view).



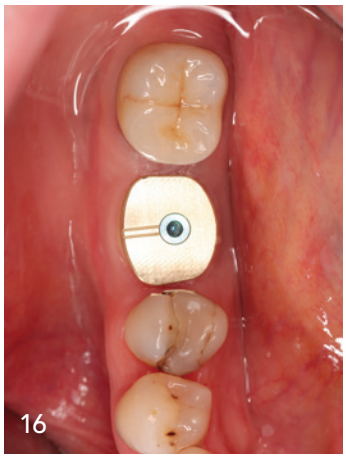


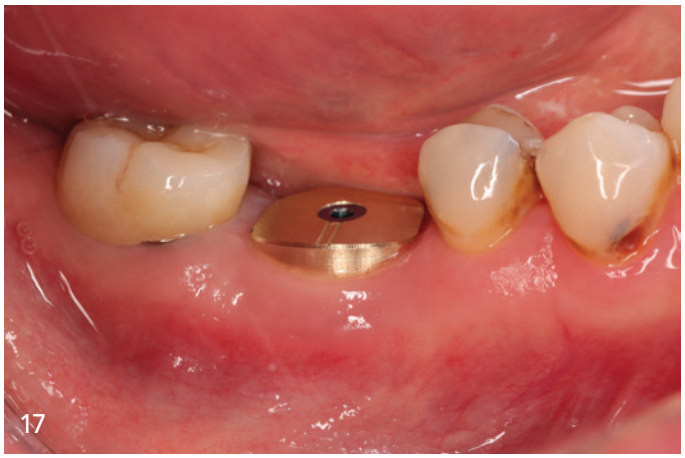




The postoperative radiograph confirmed stable implant seating with precise positioning of the healing abutment, supporting the maintenance of the biological width (Fig. 15).

Three months after healing, the healing abutment remained exposed 1.5–2 mm coronally to the gingiva. The mesial and distal papillae were maintained, thereby reducing the visible abutment height in these regions. Papilla preservation is desirable and did not affect the accuracy of digital scanning. The flat occlusal design of the abutment further supported the healing process by avoiding both static and dynamic occlusal loading. The healing period proceeded uneventfully, without any biological or technical complications (Figs. 16+17).

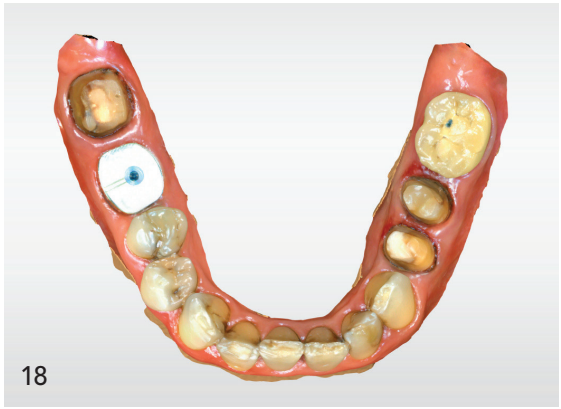


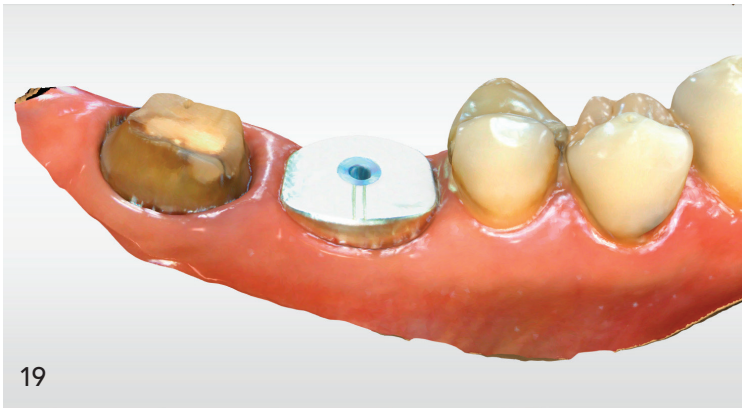


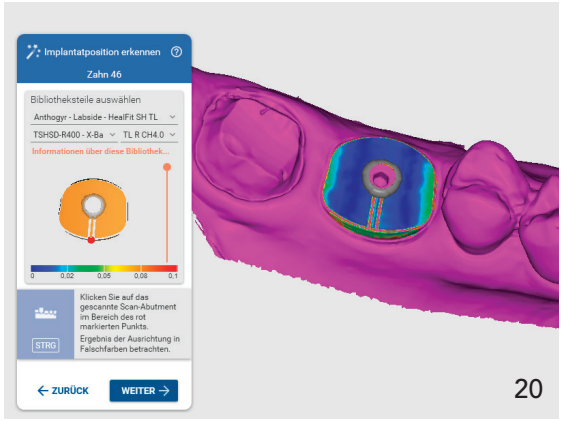
**15**
Postoperative radiograph confirming correct implant position.

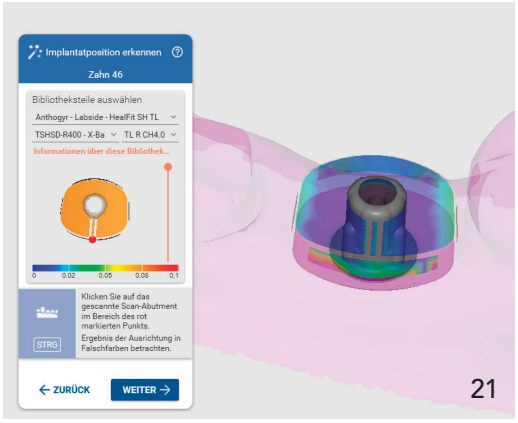
**16**
Clinical healing at three months post-insertion (occlusal view).

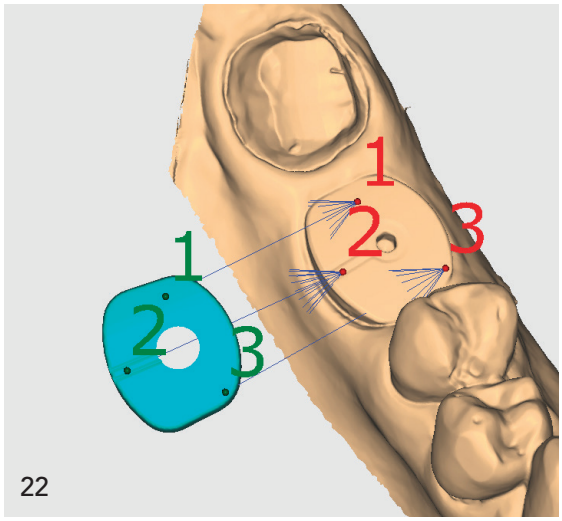
**17**
Clinical healing at three months post-insertion (buccal view).

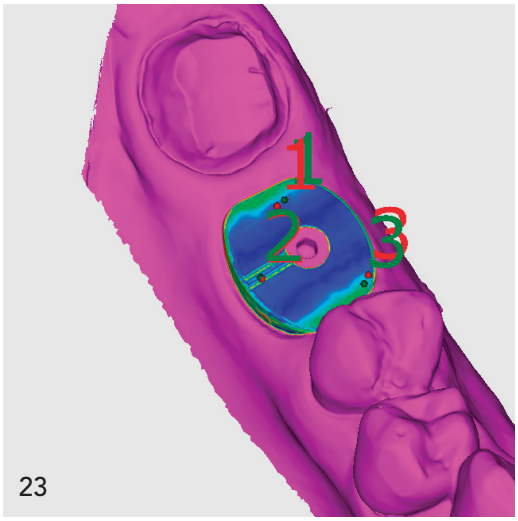



**18**
Intra-oral scanning (IOS) capturing the geometry of the abutment component (occlusal view).

**19**
Intra-oral scanning (IOS) capturing the geometry of the abutment component (buccal view).

**20**
CAD Healfit Scanbody alignment.

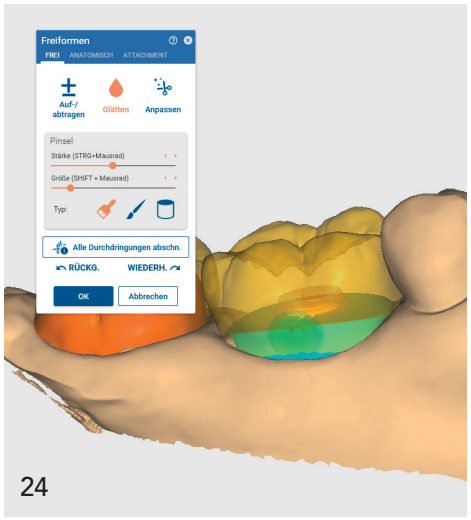
**21**
X-Base® selection within digital workflow.

**22**
Addition of the *in situ* Healfit® SH model.

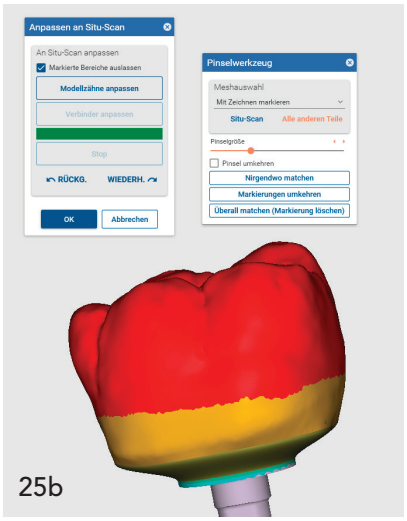
**23**
Merging of the *in situ* Healfit® SH model.

**24**
Digital crown design.

**25a+b**
Replication of the emergence profile using the *in situ* model of the abutment component.







**26**
X-Base®Abutment with LaserGrip® surface details.

**27**
Laboratory workflow demonstrating the X-Base® Ti-Base and LaserGrip® surface characteristics.

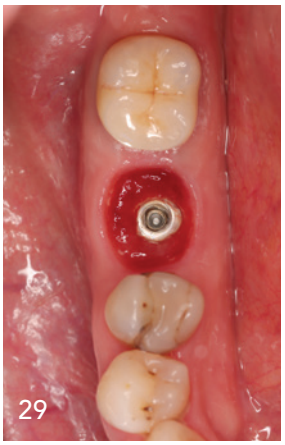
**28**
Crown finalisation.

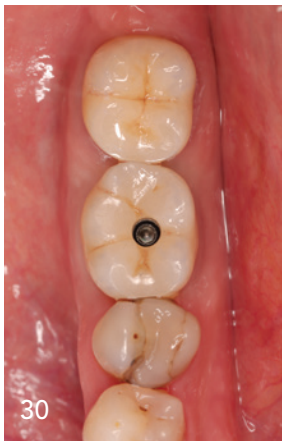
Intra-oral digital impressions were taken, and the workflow for CAD/CAM-based fabrication of the definitive implant crown was initiated (Figs. 18+19). The abutment was identified as a scanbody within the CAD software and used for precise alignment within the digital workflow. The accuracy of the digital match was validated through colour scale assessment. A corresponding Ti-base, X-Base® (TFLEX-R6-S) with an appropriate working height was subsequently selected (Figs. 20+21).

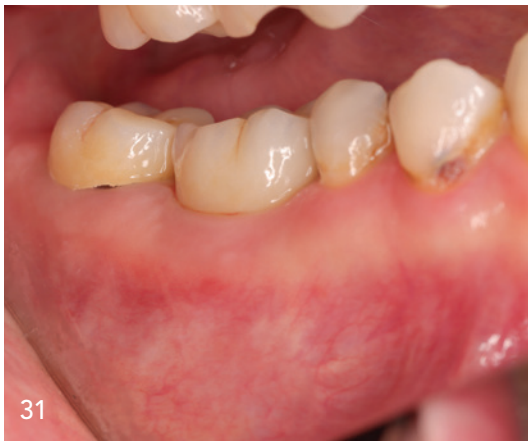
The abutment profile was integrated as an *in-situ* model and aligned with the corresponding healing abutment scan. This enabled accurate transfer and replication of the emergence profile established during the healing phase, ensuring continuity between the surgical and restorative workflows (Figs. 22–25b).

After CAD/CAM fabrication of the definitive crown, the X-Base® abutment was mounted on a manipulation implant using a laboratory screw. This approach protected the Ti-base and facilitated cementation by improving handling. The definitive X-Base® screw was reserved for clinical use to ensure secure screw retention and minimise the risk of screw loosening. The X-Base® abutment surface was pretreated by the manufacturer with LaserGrip® technology, eliminating the need for further surface treatment such as sandblasting by the dental technician, thereby preserving the structural integrity of the abutment and ensuring reliable adhesive bonding (Figs. 26–28).

**“The combination of a tissue-level implant and the healing abutment resulted in a synergistic effect on peri-implant soft-tissue stability and emergence profile control, […]”**




**29** Removal of the abutment component and final contouring of the peri-implant soft tissues.

**30** Final restoration *in situ* (occlusal view).

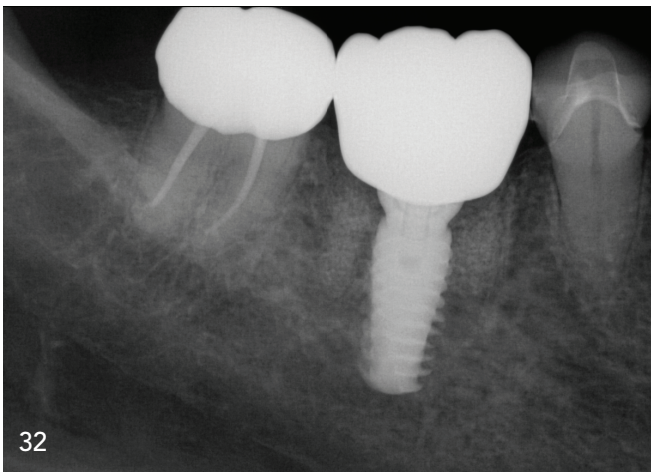
**31** Final restoration *in situ* (buccal view).

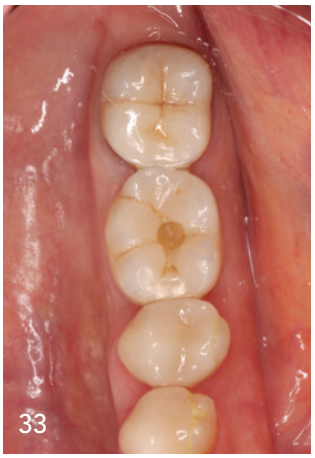
After removal of the healing abutment, sufficient healing of the optimally shaped peri-implant soft tissue was observed. This facilitated the prosthetic workflow and provided a protective barrier to the implant (Figs. 29–31).

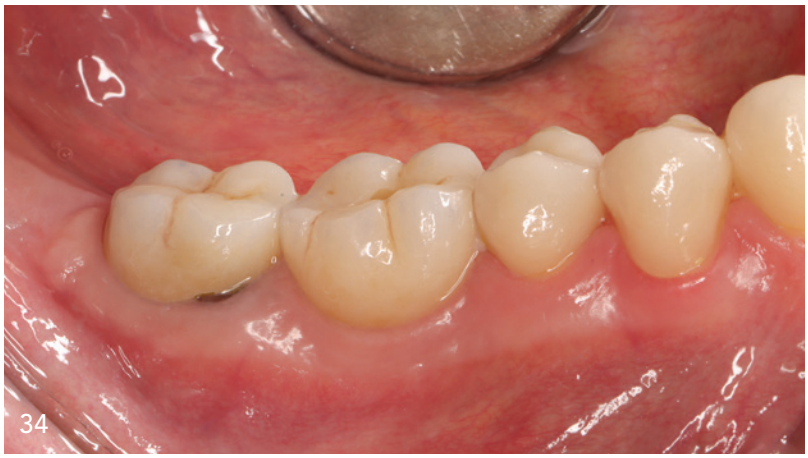
Postoperative radiographic evaluation confirmed correct implant positioning and harmonious emergence profile development in conjunction with the definitive crown (Fig. 32). At the one-year follow-up, the implant-supported crown remained intact, and the peri-implant soft tissues showed stable and healthy conditions (Figs. 33+34).

## Discussion

Immediate placement of a TL implant after atraumatic extraction, guided by CBCT and virtual planning, provided high primary stability and allowed the healing abutment to cover the socket while shaping the emergence profile. The abutment's biomimetic design, combined with a PRF membrane seal, promoted uneventful soft-tissue healing and preserved papillae, eliminating the need for a conventional healing cap or second stage surgery.[5,9,10] By selecting a height that left 1.5 mm of the abutment visible, the abutment functioned as an *in situ* scan-body, enabling precise intra-oral digital impressions and accurate CAD/CAM alignment of the definitive crown. The subsequent use of an X-Base abutment with LaserGrip® surface treatment further simplified the prosthetic workflow and reduced the risk of crown decementing. Compared with traditional protocols, this approach shortens treatment time, maintains biological width, and improves soft-tissue aesthetics. Limitations include the single case nature of the report, and the relatively short-term follow-up; larger and longer studies are needed to confirm reproducibility and long term stability.[2]




**32** Baseline radiographic confirming implant healing and conjunction with the definitive crown.

**33** One-year follow-up (occlusal view).

**34** One-year follow-up (buccal view).

## Conclusion

The present case demonstrates that the Healfit® SH abutment effectively supported immediate transmucosal healing, enabled direct intra-oral scanning for CAD/CAM-based prosthetic fabrication, and maintained stable peri-implant soft-tissue architecture without complications. Compared with a conventional healing abutment approach, the biomimetic design was associated with reduced treatment time, fewer clinical appointments, and simplified soft-tissue management, which may contribute to improved patient comfort, satisfaction, and papilla preservation.

During the critical early healing phase, the zirconium nitride (ZrN) surface coating of the Healfit® SH may have supported favourable soft-tissue interaction, potentially contributing to stable peri-implant conditions. In addition, the ZrN-coated surface may support optical scanability,[11] allowing the definitive digital impression to be acquired immediately after surgery or during an early follow-up visit, thereby facilitating an efficient digital workflow and reducing the overall number of appointments.

The combination of a tissue-level implant and the healing abutment resulted in a synergistic effect on peri-implant soft-tissue stability and emergence profile control, which appears particularly advantageous in posterior regions where predictable outcomes and streamlined workflows are of high clinical relevance. While this report focused on a posterior indication, the underlying principles may also be applicable to anterior sites, where higher aesthetic demands warrant further clinical investigation.

From a laboratory perspective, the integration of the LaserGrip®-treated X-Base® provided predictable adhesive bonding, mechanical stability, and improved reproducibility. The combined use of a tissue-level implant, Healfit® SH, and X-Base® enabled a constant emergence profile and a screw-retained prosthetic solution, offering biological and technical advantages over cement-retained restorations.

Overall, this case highlights the clinical, biological, and digital workflow benefits of an integrated biomimetic concept for immediate implant placement. These findings support the potential of such synergistic approaches to optimise soft-tissue outcomes, streamline clinical and laboratory procedures, and reduce overall treatment burden, warranting further controlled clinical studies.

References

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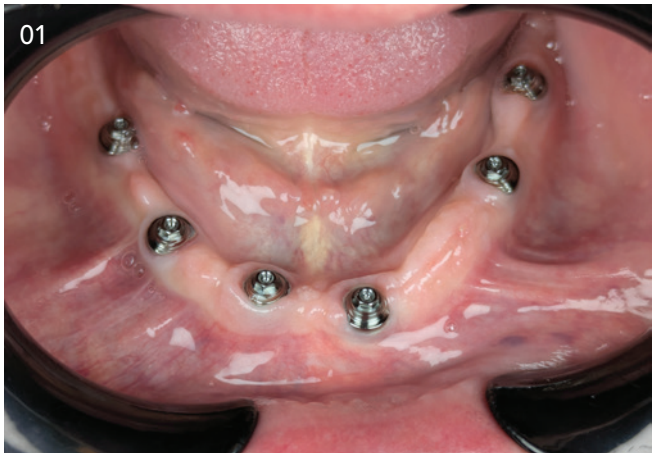
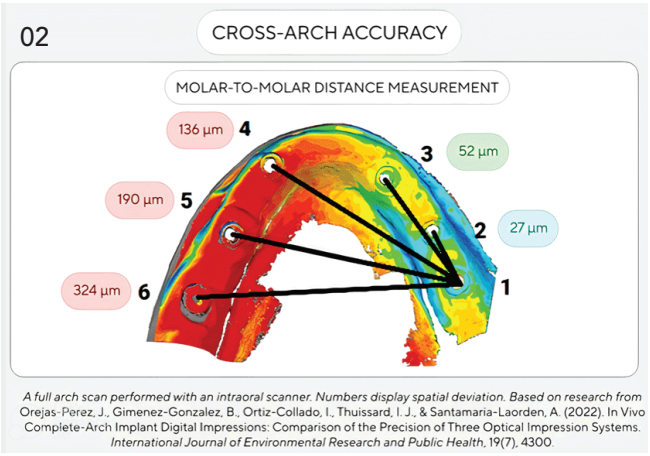
# Modern AI-driven acquisition to simplify full-arch cases management

Digital implantology workflows continue to evolve at a rapid pace as technologies such as intra-oral scanners and CAD/CAM systems advance and digital clinical and laboratory processes become more closely integrated.[1–3]

Drs Enrique Jadad Bechara & Albéric Santamaría-Loisy, Colombia & France

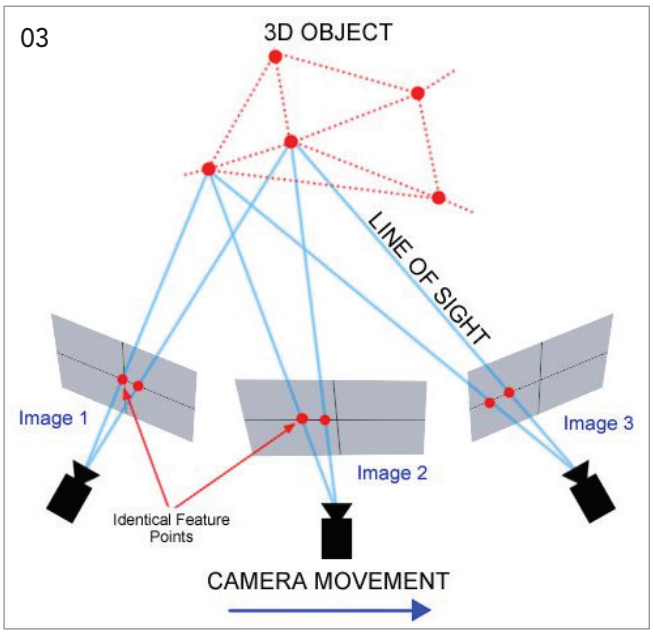





**01**
Edentulous arch with multi-unit abutments.

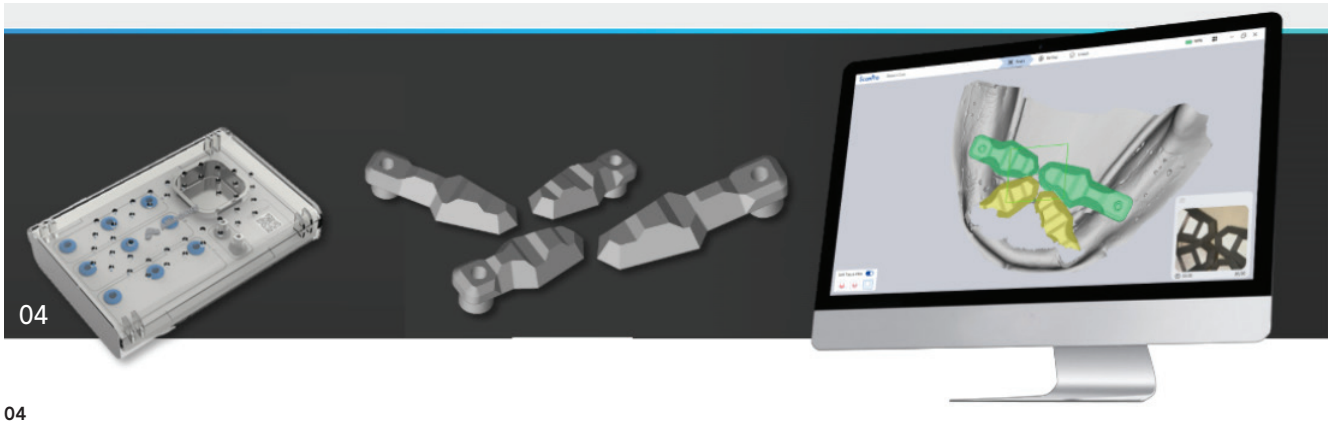
**02**
Cross-arch deviation in a full-arch intra-oral scan. Molar-to-molar distance measurements illustrate how spatial discrepancies can increase across the arch as a result of cumulative image stitching errors.[26]

**03**
Photogrammetry object acquisition.

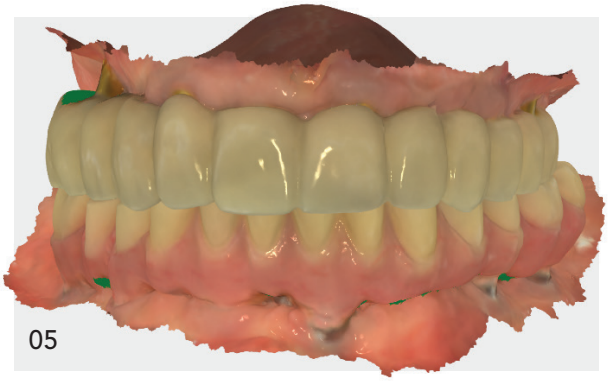


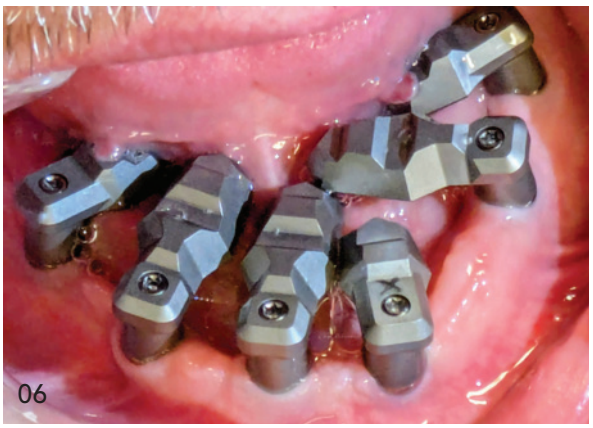

Full-arch rehabilitation presents two specific digital workflow challenges: the accurate capture of implant positions to ensure passive seating of the restoration and the registration of the patient's vertical dimension of occlusion. Accurate transfer of the implant positions is essential for achieving passive fit of the restoration, reducing mechanical complications and supporting long-term clinical success.[4–6]

Although intra-oral scanners have become widely used tools for taking digital impressions, various clinical factors can affect scanning accuracy, especially



**04**
DirectIP geometric scan body overview.





**05**
Initial scan.

**06**
Scan body placement.

in edentulous cases (Fig. 1) or in restoration cases involving multiple implants. These factors include saliva, bleeding, soft-tissue interference and cumulative errors from the image stitching process (Fig. 2).[7–9]

In recent years, photogrammetry systems have emerged as an alternative for improving the accuracy of implant position capture in full-arch cases. These systems employ external cameras and calibrated markers to reconstruct the relative 3D position of the implants with high accuracy (Fig. 3).[10,11] Photogrammetry shows consistent implant capture accuracy of 30–50 µm, but it also has practical limitations. These systems capture only the positions of dedicated scan bodies, so a separate intra-oral scanner is still required to record the soft tissue, opposing arch and occlusal relationship. The resulting datasets must then be matched and aligned in dedicated software. This workflow adds equipment requirements, workflow complexity and cost, making photogrammetry more likely to be employed by more specialised clinics.[12,13]

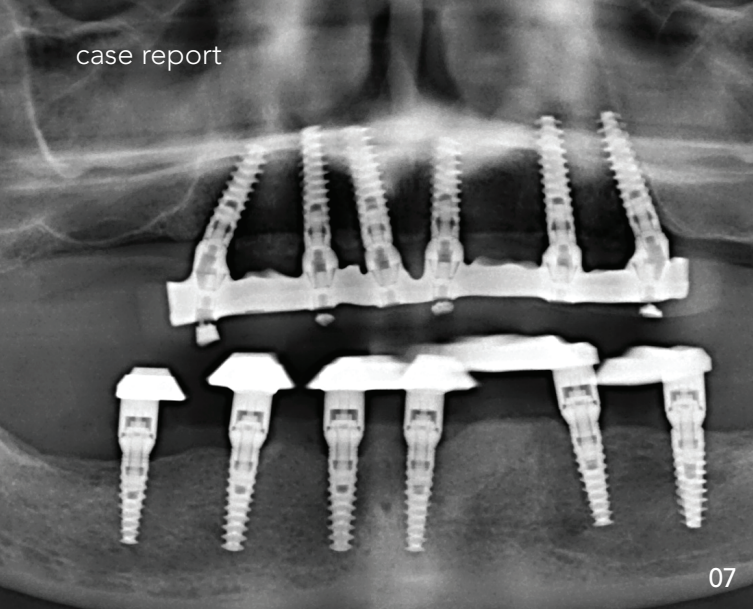
Several more streamlined intra-oral solutions have been developed to manage full-arch acquisitions with sufficient accuracy to support passive fit. One of these is DirectIP (Alliedstar), which uses software based on artificial intelligence (AI) for high-accuracy identification of scan bodies (Fig. 4). We demonstrate the use of this system in the following case report.[14–16]

## Clinical case

A 65-year-old male patient had previously undergone all-on-6 rehabilitation of the maxillary arch and had recently had six implants placed in the mandibular arch and restored with a provisional resin screw-retained restoration. Healing had been uneventful, and the case report begins at the stage of definitive restoration of the mandibular arch.

Intra-oral imaging began with acquisition of the maxillary arch, mandibular provisional restoration and occlusal relationship (Fig. 5). The mandibular provisional restoration was then removed, and a 360° scan was performed to capture its intaglio surface. This allowed the relationship between the provisional restoration, the arches and the vertical dimension of occlusion to be preserved in the digital workflow. The scan bodies were screwed on to the multi-unit abutments (Fig. 6), and radiographic verification was performed (Fig. 7).

The clinical procedure is relatively simple: implant position and soft-tissue data are acquired within a single intra-oral scanning workflow, and no external cameras, reference markers or calibration devices are needed. The DirectIP software analyses the scan using AI-based algorithms that automatically recognise the complex geometry of the scan bodies. During this process, the system is able to filter out any soft-tissue structure that could affect the accuracy of the optical impression



07

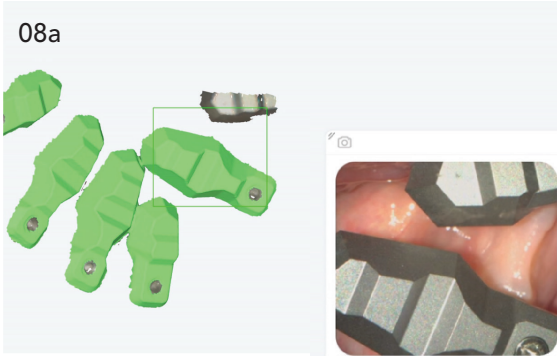
**07**
Radiographic verification.

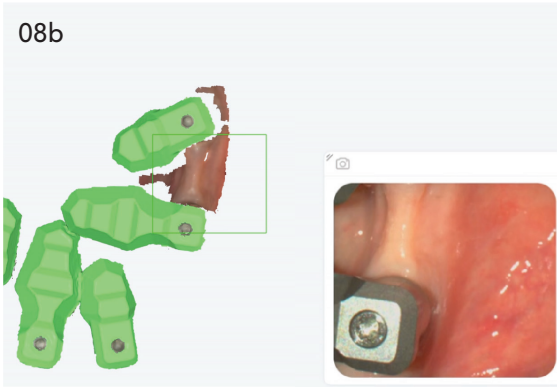
(Fig. 8a).[17,18] After the last scan body has been identified, the software then automatically captures the soft tissue, creating a single continuous workflow (Figs. 8b+c). The final step involves scanning the soft tissue after removal of the scan bodies (Fig. 8d).

In this way, the implant positions are accurately identified through geometric recognition of the scan bodies. The software then automatically generates the corresponding manufacturer-specific virtual scan bodies (Fig. 8e), which can be matched directly with the digital libraries in the dental laboratory's CAD/CAM software (Fig. 9).[15,16]

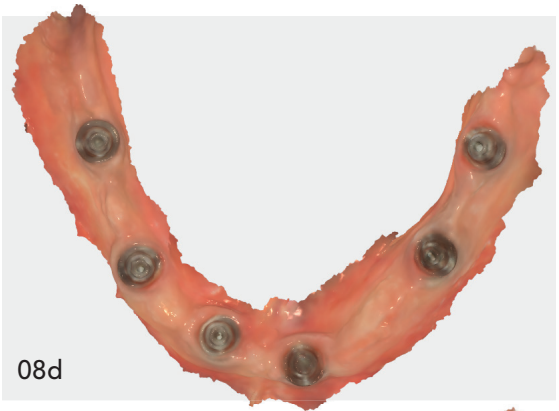
The vertical dimension of occlusion had already been recorded initially. Depending on the clinical situation, this relationship can be recorded from the natural dentition before extractions, from existing complete dentures before implant placement or from the provisional restoration, as in the present case, after the healing period (Fig. 10). This ensures that the implant position data, soft-tissue scan and occlusal relationship are aligned.

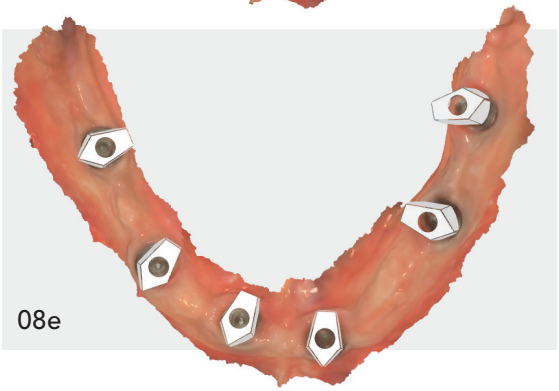
Before fabrication of the definitive restoration, passive fit can be checked using a traditional plaster verification jig (Fig. 11) or a pre-sintered zirconia bar, milled from the implant bar design (Fig. 12). The definitive restoration, consisting of a titanium bar and zirconia superstructure, was then milled (Figs. 13a–d).








**08a–e**
Artificial intelligence-driven acquisition by the DirectIP software. Recognition of the geometry of the scan bodies, actively filtering out soft tissue (a). Soft-tissue acquisition after the last scan body has been acquired (b). Acquisition completed in a single pass (c). Finalisation of soft-tissue and implant acquisition (d). Automatic generation of manufacturer-specific virtual scan bodies (e).

## Sequential scan body capture in limited anatomical spaces

In certain clinical situations, particularly in narrow maxillary arches (Fig. 14), the simultaneous placement of all scan bodies may be physically impossible due to limited inter-implant space, which is a common challenge in full-arch implant rehabilitation. The DirectIP system introduces an innovative solution to this limitation through a sequential capture function that allows clinicians to work without compromising accuracy. Initially, only the scan bodies that can be accommodated within the available space are placed and scanned. The software then preserves those recorded implant positions virtually through a function termed "locking" (Fig. 15a). These scan bodies are then removed, and the remaining scan bodies are placed and a second intra-oral scan is acquired. Through its geometry-based recognition algorithms and advanced data processing, the system integrates both datasets into a single coherent digital model. The previously recorded scan body positions are retained, and the newly captured positions are accurately incorporated (Fig. 15b).

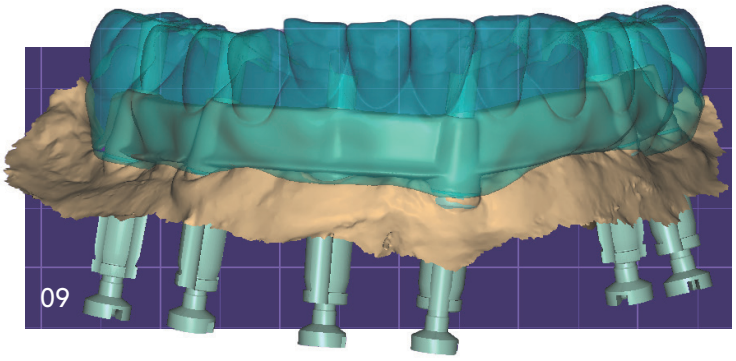
This capability represents a significant clinical advantage, as it allows clinicians to overcome anatomical limitations without resorting to additional techniques or compromising accuracy. Furthermore, it simplifies the clinical workflow and expands the applicability of the system in complex cases that would otherwise be difficult to manage using conventional implant capture methods. Overall, this controlled sequential acquisition function highlights the versatility of DirectIP in digital implantology, demonstrating how AI-assisted geometric recognition can provide precise and practical solutions to real-world clinical challenges. DirectIP is not only limited to full-arch cases, as the system is suitable for any definitive or provisional restoration connected to multi-unit abutments (Figs. 16a–c).

## A new technological approach using AI-assisted data processing

The use of AI is a defining component of the DirectIP system. It uses AI-based algorithms not only to recognise the geometry of the scan bodies but also to filter out irrelevant data and isolate stable geometric features. This capability allows the software to distinguish between scan body geometry and surrounding soft-tissue artefacts, ensuring that implant position identification is based on reliable structural information and is less dependent on operator technique.[17,18]

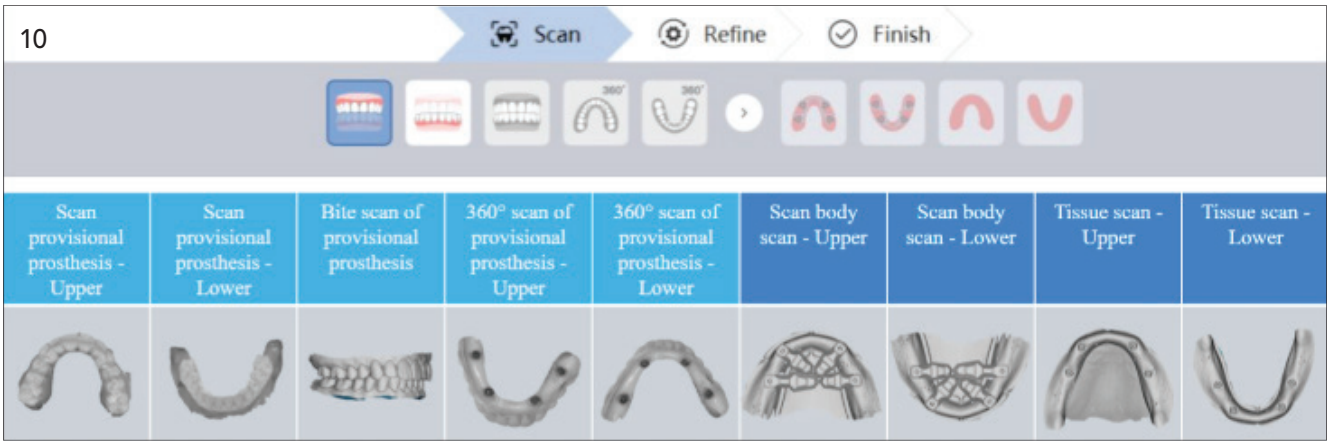
Recent research has demonstrated that AI-assisted workflows can significantly improve the accuracy and reliability of intra-oral scanning, particularly under clinical conditions that are not ideal.[19–21] This is especially relevant in surgical and immediate loading protocols, where ideal scanning conditions are difficult to achieve.

In full-arch implant acquisition, the primary clinical objective is not necessarily an exhaustive digital reconstruction

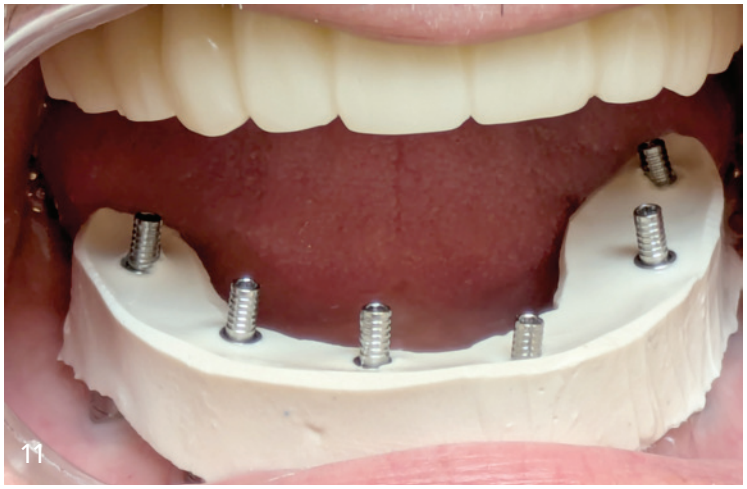



**09**
CAD starting directly from the acquisition files.

**10**
One integrated workflow to capture the provisional restoration, occlusal relationship, soft tissue and implant positions.



**11**
Passivity verification jig.

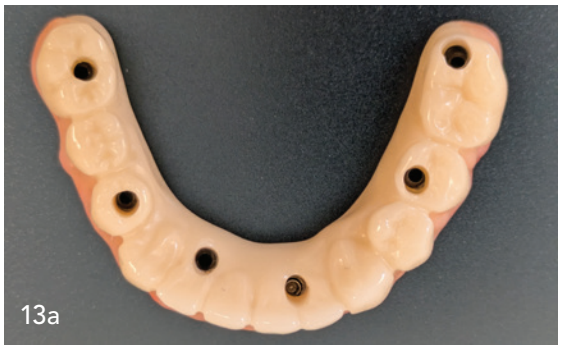


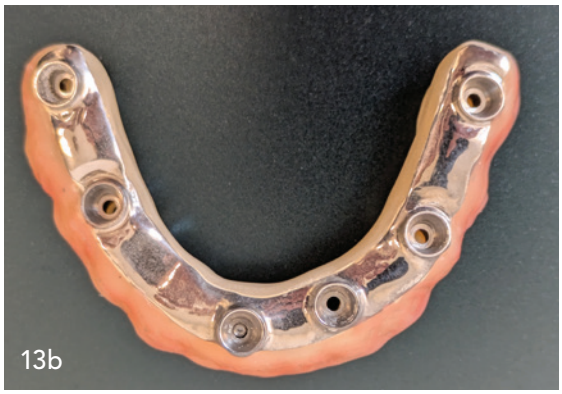

**12**
Zirconia verification bar.

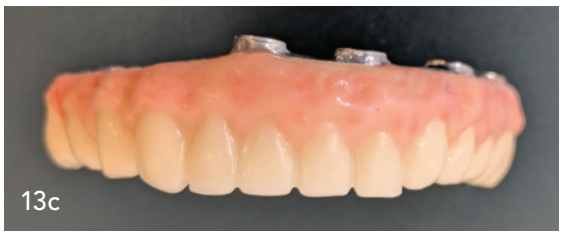

of all intra-oral surfaces, but rather the accurate transfer of the relative positions of the implants to allow for the fabrication of a prosthesis with passive fit.[22,23] From this perspective, DirectIP introduces a different approach: rather than relying on the point triangulation characteristic of photogrammetry, the system is based on the geometric recognition of calibrated scan bodies using data acquired with an intra-oral scanner.

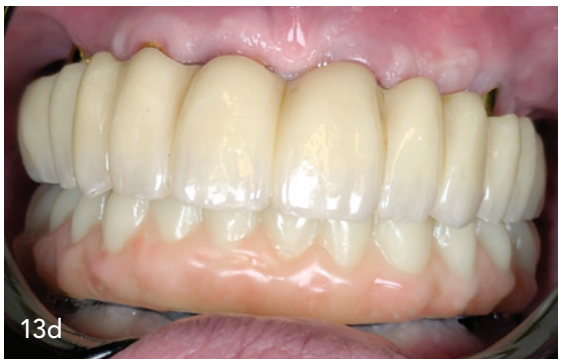
This eliminates elements of the photogrammetry workflow such as external cameras, calibration devices or complex acquisition protocols, reducing potential sources of error and facilitating the integration of the system into daily clinical practice.[14,16,24] By reducing the number of clinical and technical steps required for full-arch implant acquisition, this approach may improve workflow efficiency[25] and reduce the likelihood of cumulative errors, accieving more reliable treatments and more consistent outcomes.

**13a–d**
Definitive restoration consisting of a titanium bar and zirconia superstructure: occlusal surface (a), intaglio surface (b), frontal view (c) and *in situ* (d).

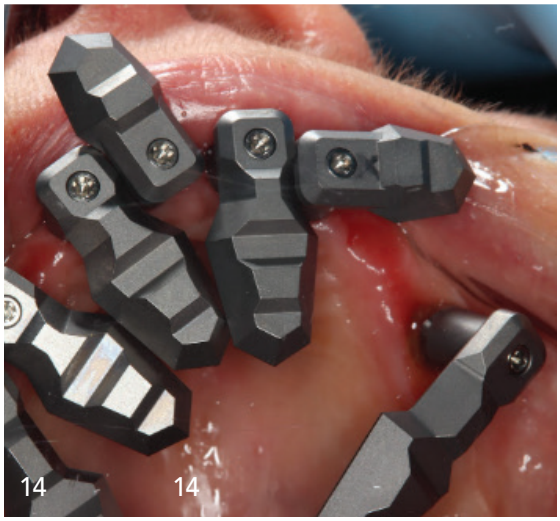


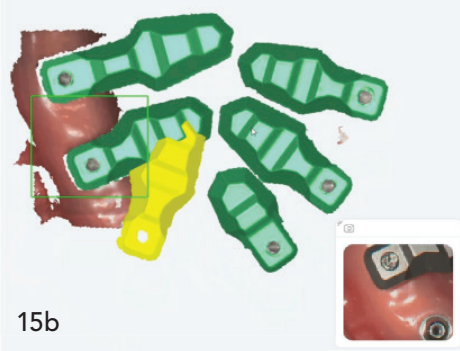



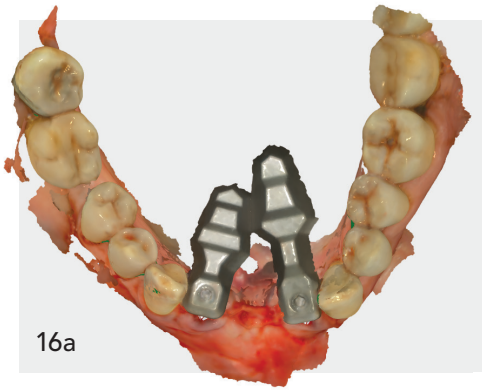



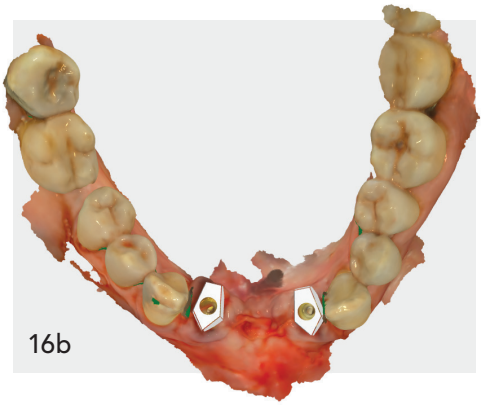

**14**
DirectIP scan body placement in narrow spaces.



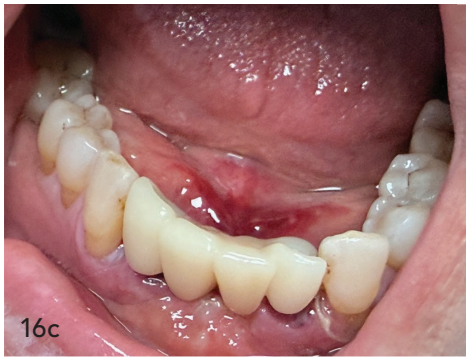




**15a+b**
DirectIP locking function: locking of recorded implant positions by the software (a) and retention of those positions during capture of newly placed scan bodies (b).




**16a–c**
Use of DirectIP for short-span cases. Acquisition of two scan bodies (a). Automatic generation of manufacturer-specific virtual scan bodies (b). Immediate loading of the provisional restoration (c).




Testimonial

**"Choosing a digital technology is not simply a purchasing decision, but a strategic clinical decision that directly impacts the quality of treatments, workflow efficiency and the sustainability of the practice model."**

—Mathieu Mausservey, CEO of the dental lab Axis Dental in Mâcon in France.

## Conclusion

DirectIP enables accurate implant positioning using an intra-oral scanner, allowing full-arch implant scanning to be integrated into established digital workflows. By eliminating the need for additional equipment, calibration steps or separate data alignment procedures, it significantly reduces the number of clinical steps, decreases chair time and technical complexity, and simplifies the workflow. Furthermore, its ability to operate under realistic clinical conditions helps improve the stability of implant position capture and reduce variability among operators. This system demonstrates that the evolution of digital dentistry is not about adding more technology or more steps to the clinical workflow, but rather about developing solutions that simplify processes without compromising accuracy, enabling more predictable results under real-world conditions.

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References

# A legacy of transformation

Few companies can look back on 175 years not simply as a measure of longevity, but as a record of continual reinvention. Geistlich is one of them.

175 years
Geistlich
Pioneering Spirit

From Switzerland's first glue factory to a global leader in regenerative medicine, its story is defined by vision, resilience and a remarkable capacity to evolve.

Founded in 1851 by Heinrich Glättli and Heinrich Geistlich on the shores of Lake Zurich, the company began as a practical industrial business rooted in the nineteenth century. Yet from the start, Geistlich showed a distinctive ability to adapt decisively and intelligently.

## The making of an industrial pioneer

When the company moved to Schlieren in 1869, it became the village's first industrial enterprise. Alongside glue, it produced fertiliser from deglued bones, reflecting an early instinct for finding new value in existing materials.

Under Eduard Geistlich, who took over after his father's death, the company entered international markets despite tariffs and fierce competition. His influence extended beyond business: he helped develop Schlieren by initiating its first electricity supply, supporting the Limmattal railway, installing the area's first public telephone, opening a kindergarten and backing the secondary school.

## Independence, resilience and the long view

Expansion to Wolhusen in 1899 showed the same drive for reinvention. After the Simplon Tunnel opened in 1905, Geistlich used newly available labour to build a water channel and hydroelectric power station that supplied both the company and nearby villages.

1920

1928

1932

1939


All images: © Geistlich Pharma

1943

1944

1976


1987


After Eduard's death, his eight children founded "Ed. Geistlich Söhne AG" in 1909, securing the company's independence as a family-owned business. That long-term perspective proved vital during crisis. In the First World War, Geistlich maintained production despite severe constraints, importing raw materials from Spain, Malta and France. It also invested in employee welfare, and even during the Great Depression continued pensions and introduced unemployment insurance.

## Reinvention through science

By the 1930s, Geistlich was widening its ambitions. In 1933, it launched Tycol, its first synthetic adhesive, patented in 18 countries. The decisive shift came during the Second World War, when the company established a pharmaceutical division.

In 1945, Geistlich introduced Decalcit®, its first pharmaceutical product for human use. Research expanded steadily, and by its centenary in 1951—with the acquisition of Delta-Werke and the launch of GT 50—the company had already moved beyond traditional industrial manufacturing. At the same time, it continued to strengthen its adhesives business, bringing products such as Konstruvit into Swiss homes.

## A new frontier: regenerative medicine

Its most consequential transformation came in regenerative medicine. In 1981, Geistlich began working with Dr Philip J. Boyne on jawbone reconstruction. In 1986, the first clinical results for Geistlich Bio-Oss® were published, and in 1987 the product was approved in the United States, marking a major international breakthrough.

2002

2004

2011


2020

2026

In 1997, Geistlich introduced Bio-Gide®, the first collagen membrane for dental regeneration. The company had evolved from industrial manufacturer to pioneer in a specialised field focused on healing and quality of life.

## Knowledge as legacy

In the twenty-first century, Geistlich has continued to invest in science and education. The Osteology Foundation, established in 2003, underlined its commitment to advancing regenerative dentistry. Modernisation of the Wolhusen site, international subsidiaries, and expansion into soft-tissue regeneration and wound care followed. The company also showed resilience during the pandemic.

Recent acquisitions and partnerships in Italy, the United States, Brazil, France and Germany show that Geistlich remains outward-looking and future-focused.

## Elegance in evolution

To reflect on 175 years of Geistlich is to see more than a list of milestones. Across changing markets, technologies and eras, the company has preserved a clear belief in thoughtful progress rooted in expertise, responsibility and independence.

Looking ahead, from 2025 onwards Geistlich plans to align its portfolio even more closely with customer and market needs. By 2035, it aims to improve the quality of life of more than 80 million people through dental regeneration.

Geistlich has never defined itself by what it once was. Its true legacy lies in what it has repeatedly chosen to become.

**Geistlich Pharma AG**
www.geistlich.com

# Experience the very best of implant dentistry at EAO Congress in Lisbon

Register here

From 24 to 26 September 2026, Lisbon will welcome the 33rd Annual Congress of the European Association for Osseointegration—EAO, an event set to stand out as one of the most significant meetings in the field of implant dentistry. the congress will bring together leading scientific minds from around the world to explore the future of patient care, clinical excellence, and innovation.

More than a traditional scientific meeting, the EAO Annual Congress 2026 is positioned as a defining moment in professional development. It reflects the association's long-standing commitment to supporting clinicians throughout every stage of their careers, from the earliest years in practice to the most experienced phases of professional life. Education, innovation, and community come together in a setting designed to address the realities of daily practice while also opening new perspectives for the future.

The Lisbon programme will centre on "Delivering Health and Predictability: Shaping the Future of Patient Care." Across the congress, participants can expect a strong focus on innovative approaches to improving patient health and achieving reliable clinical outcomes. Internationally recognised experts will present the latest research, emerging technologies, and best practices that continue to shape implant dentistry at the highest level.

A particularly important aspect of the 2026 edition is the special partnership with the Brazilian Society of Periodontics and Implants (SOBRAPI). This collaboration highlights the increasingly global nature of scientific exchange in implant dentistry and promises to broaden discussion through diverse perspectives and shared expertise. The partnership also underlines the value of interdisciplinary dialogue and international cooperation in advancing the field.

Networking will be another central dimension of the congress. Beyond the lecture halls and scientific sessions, the event offers a space where professional relationships can develop across borders and specialties. In a discipline shaped as much by collaboration as by technical progress, these connections often become an essential part of long-term professional growth.

The scientific programme is expected to offer a rich and engaging learning experience. A major theme will be the impact of time in implant dentistry, with interactive sessions examining the critical role that timing plays in treatment planning and outcomes. Among the anticipated highlights is the First Global Consensus for Clinical Guidelines in Implant Dentistry, a milestone that reflects the congress's ambition not only to present knowledge, but also to help define the standards that will guide future practice.

Throughout the event, expert-led sessions will provide direct insight from some of the most respected clinicians and researchers in implant dentistry. The congress is also designed to encourage dialogue across all areas of the discipline, reinforcing the importance of interdisciplinary exchange in delivering better patient care.

Lisbon offers an especially fitting setting for such an occasion. A city where tradition and progress coexist with ease, it provides an inspiring backdrop for a congress devoted to both scientific advancement and professional connection. Its architecture, climate, and welcoming atmosphere add a cultural dimension that will undoubtedly enhance the overall experience.

As the implant dentistry community looks ahead to 2026, the EAO Congress in Lisbon is emerging as a key date in the international calendar. With its blend of cutting-edge science, global collaboration, meaningful networking, and professional enrichment, the event promises to mark an important step forward in the ongoing evolution of dental and implantology practice.

**Source: EAO**

EAO
EUROPEAN ASSOCIATION FOR OSSEOINTEGRATION

*The articles in this category are provided by the manufacturers or distributors and do not reflect the opinion of the editorial team.


# From Vienna to Baku: a milestone year for the EFP

From EuroPerio11 in Vienna to Perio Master Clinic in Baku, the past year has been one of momentum and strategic progress for the European Federation of Periodontology (EFP). Under the leadership of Past President Spyros Vassilopoulos, secretary general Anton Sculean, and treasurer Andreas Stavropoulos, the federation has advanced its Vision 2030 agenda while strengthening partnerships, widening its international reach, and reinforcing financial sustainability.

Vision 2030 remained at the centre of the EFP's work, guiding progress across science, education, sustainability, international collaboration, and influence.

Education was a particular priority. EuroPerio11 in May 2025 and Perio Master Clinic 2026 brought together thousands of oral-health professionals for scientific exchange and continuing education. Another highlight was the 21st European Workshop on Periodontology in La Granja, Spain, which focused on clinical-practice guidelines for periodontal therapy, gingival diseases, and acute periodontal conditions—an initiative Prof. Vassilopoulos described as a strong example of science translated into practice.

EuroPerio11 was a defining moment for the federation. Held in Vienna, the congress attracted more than 10,000 participants and reaffirmed its position as the world's leading event in periodontology and implant dentistry. It also made a major contribution to the EFP's financial stability and strengthened relationships with partners, many of whom expressed interest in future collaborations.

Perio Master Clinic 2026 in Baku marked another strategic step, extending the EFP's reach into Eastern Europe and neighbouring regions. Despite the challenges of regional instability and travel uncertainty, the meeting succeeded in engaging new audiences and delivered a strong programme.

Public engagement also moved forward. The EFP expanded Gum Health Day through a new three-year campaign model, giving member societies greater flexibility to adapt materials locally. In both Vienna and Baku, public events featuring free dental check-ups, educational outreach, and media engagement helped raise awareness of oral health and increase the federation's visibility.

For secretary general Anton Sculean, the year focused on continuity, co-ordination, and cohesion across the federation. Close collaboration with member societies, committees, and the central office remained a priority, alongside support for younger colleagues and the next generation of leaders.

Financial sustainability also remained central. Treasurer Andreas Stavropoulos emphasised prudent budgeting, careful cost control, and transparent governance. While EuroPerio continues to be the EFP's principal source of revenue, its triennial nature makes long-term planning between congress cycles essential.

Together, these achievements have strengthened the EFP's scientific leadership and international profile. With International Perio Master Clinic 2027 and EuroPerio12 ahead, the federation moves into the next phase of Vision 2030 with growing confidence and reach.

**Source: EFP**

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# Complete laser support for implantology


© Fotona

Laser technology from Fotona can support multiple stages of implant treatment, including tooth extraction, post-extraction ridge preservation and peri-implant disease management. Fotona offers a comprehensive implantology solution through three powerful technologies on its LightWalker and SkyPulse dental laser systems: TwinLight, SWEEPS and ComfortLase.

Fotona's TwinLight protocol combines Er:YAG and Nd:YAG wavelengths for two key implantology applications: post-extraction ridge preservation and minimally invasive peri-implant disease management. In post-extraction treatment, Er:YAG supports cleaning and decontamination of extraction sockets, while Nd:YAG enables deep disinfection and biostimulation, promoting healing. In peri-implant disease management, Er:YAG supports effective removal of granulation tissue and cleaning of implant surfaces, while Nd:YAG enables bacterial reduction and biostimulation, supporting re-osseointegration.

Fotona's proprietary SWEEPS Er:YAG photoacoustic technology enables cleaning and decontamination in anatomically complex or difficult-to-reach areas. ComfortLase photo-biomodulation utilises Nd:YAG laser energy to stimulate tissue repair, promote faster healing and support patient recovery. Together, TwinLight, SWEEPS and ComfortLase help clinicians preserve tissue, support healing and improve implant outcomes.

**Fotona**
**www.fotona.com**

# One system. Designed right from the start.

Since 2009, Neoss has taken a consistent and focused approach with its ProActive® implants: one platform, one connection, one surface. This core design has remained unchanged, not because innovation was lacking, but because the system was built for long-term reliability and has consistently proven its clinical performance.

As Fredrik Engman, co-founder of Neoss, explains: "We never had to change our implant design. Because it works." This straightforward statement reflects a guiding principle at the heart of the Neoss philosophy: if something works well, there is no need to make it more complicated.

Long-term clinical data supports this approach. A retrospective study[+] conducted at Zahnimplantat Zentrum & Kieferchirurgie Haßfurther in Wettenberg, Germany, evaluated 1,648 Neoss ProActive Straight implants and reported a ten-year survival rate of 98.4%. The same study showed survival rates of 99.3% after one year and 98.9% after five years, demonstrating stable and consistent performance over time.

Neoss ProActive® represents intelligent simplicity, combining a proven design with dependable long-term outcomes that clinicians can trust.

[+] Long-term clinical performance of superhydrophilic dental implants with more than ten years follow-up, Clinical Oral Implants Research, Hassfurther ND, Hassfurther N., EAO-332/PO-SU-022.

**Neoss**
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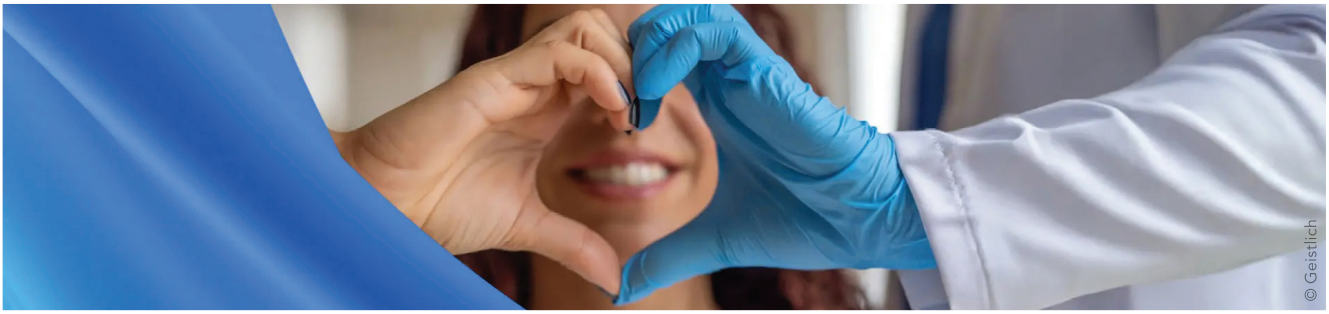


# Support a patient. Apply regeneration. Make an impact.

As part of its 175-year Jubilee, Geistlich has launched a new patient support programme designed to improve access to regenerative dental treatment for patients who would otherwise remain untreated due to financial limitations.

The initiative reflects a central principle of regenerative dentistry: the restoration of oral tissues can also restore function, confidence, and quality of life.

In daily practice, clinicians frequently encounter patients with clear indications for regenerative therapy whose treatment plans are delayed, modified, or abandoned because of cost. Procedures such as ridge augmentation, guided bone regeneration, and soft-tissue regeneration are well established and science-based, yet the financial burden associated with biomaterials, implants, and reconstruction can place them beyond reach for some patients. The new Geistlich programme aims to help close that gap.

### What this means for clinicians

The programme offers clinicians the opportunity to treat patients with a clear regenerative indication without allowing cost to become the determining factor. While support is provided for selected cases, full clinical responsibility remains with the treating clinician, including diagnosis, treatment planning, case execution, and follow-up care.

By focusing on predictable, evidence-based regenerative treatment, the initiative supports clinicians in delivering care that is both biologically sound and potentially life-changing for patients who may have previously declined therapy for financial reasons. Only a limited number of cases will be selected worldwide, underscoring the programme's emphasis on careful case review and meaningful patient impact.

### How it works

To keep participation efficient, the submission pathway has been structured as a simple two-stage process. The first step consists of a short, anonymised application that includes a brief case overview, key clinical details, and the proposed treatment plan. This initial review allows cases to be assessed without requiring full documentation at the outset.

If a case is selected, the second stage requires complete documentation, including patient consent, confirmation of eligibility, and relevant clinical records. This approach is intended to reduce administrative burden while ensuring that selected cases are supported by thorough and appropriate documentation before final approval.

### Eligibility and support

The programme is open to licensed dentists and specialists in their respective countries who are committed to evidence-based regenerative treatment. Suitable patient cases must present a clear clinical indication for regenerative therapy, have a history of treatment being declined due to financial constraints, and offer the potential for a predictable clinical outcome.

Selected cases will receive full coverage of Geistlich biomaterials, along with a 50 per cent contribution toward implant costs and a 50 per cent contribution toward crown costs. Professional fees remain the responsibility of the treating clinician.

### What makes a strong application?

Applications are expected to demonstrate a meaningful opportunity to improve a patient's condition through regenerative treatment that might not otherwise be possible. Strong submissions typically include a clearly defined regenerative indication, a predictable treatment concept using Geistlich biomaterials, and high-quality clinical documentation such as radiographs and photographs.

Cases involving ridge augmentation, guided bone regeneration, or soft-tissue regeneration are particularly well aligned with the aims of the programme. Clinicians with experience in regenerative procedures and a structured approach to documentation are especially well positioned to contribute strong applications.

### A jubilee initiative with clinical and human impact

With this programme, Geistlich is linking its anniversary celebration to a practical effort to improve patient access to advanced regenerative care. The initiative highlights not only the clinical value of regenerative dentistry, but also its potential to address unmet need when financial barriers stand in the way of treatment.

By supporting selected cases around the world, the programme reinforces the importance of combining scientific rigour with patient-centered action. In doing so, it offers a timely example of how industry-supported initiatives can help extend the benefits of modern regenerative therapy to those who need it most.

More information and submission guidelines

**Geistlich Pharma**
**www.geistlich.com**

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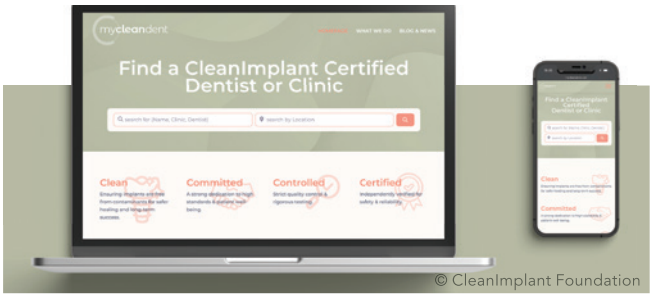
# CleanImplant strengthens the digital presence of certified practices



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The CleanImplant Foundation has launched the new patient-oriented platform mycleandent.com and expanded its membership programme with another exclusive benefit: every CleanImplant Certified Dentist now receives an individual landing page that is search-engine optimised, locally targeted, AI- and SEO-supported, and editorially managed by CleanImplant.

### Excellence deserves visibility

CleanImplant-certified practices benefit from enhanced digital visibility precisely where patients are actively searching for quality and trust in implant dentistry: Certified Dentists work with award-winning implant systems and earn the confidence of their patients through a demonstrated commitment to product quality. mycleandent.com serves as a dedicated search platform where patients can rely on their clinicians' promise of uncompromising quality standards in implant dentistry.

### The range of benefits

For CleanImplant Certified Dentists the range of benefits extends well beyond digital visibility. High-quality marketing materials support consistent and professional communication of the practice's commitment to quality—from personalised quality certificates and acrylic reception displays to patient brochures for waiting areas and consultation rooms. These tools facilitate informed and trust-based patient discussions.

In addition, members gain access to a practice-oriented expert network, professionally designed social media templates, and reliable independent analytical data on dental implant systems.

**CleanImplant Foundation**
**info@cleanimplant.org**
**www.cleanimplant.com**
**www.mycleandent.com**

Further information available on the initiative's website

# Joining forces to inspire better oral health worldwide

TePe Oral Hygiene Products, a leading provider of oral health solutions, and the Swedish Society of Periodontology and Implantology are deepening and extending their collaboration to further inspire global awareness of good oral health.

The Swedish Society of Periodontology and Implantology is one of the most distinguished professional associations within the dental community. It highlights patient compliance as essential and positions interdental cleaning as a cornerstone of both preventing periodontal disease, as well as maintaining lifelong oral health. In the same spirit, TePe's products and solutions are built on the principles of preventive dentistry, with interdental cleaning at their core.

© TePe

Fredrik Ceder, Product Innovation and Scientific Affairs Manager at TePe and Dr Shariel Sayardoust, President of the Board, Swedish Society of Periodontology and Implantology.

Driven by a shared vision to improve oral health outcomes, the partners will continue to collaborate to promote healthy practices and raise awareness of the prevention and treatment of periodontal and peri-implant diseases.

"Our continued collaboration with The Swedish Society of Periodontology and Implantology reflects a shared passion for preventive dentistry and education. Together, we aim to inspire good oral health and strengthen the role of preventive care in periodontology and implant dentistry," said Fredrik Ceder, Product Innovation and Scientific Affairs Manager at TePe.

"Together we are stronger and can increase the awareness of the connection between oral and systemic health. I think we can educate and spread the knowledge on a wider global perspective," said Dr Shariel Sayardoust, President of the Board, Swedish Society of Periodontology and Implantology.

The strengthened partnership aims to elevate the importance of preventive oral care as a key success factor within periodontology and implant dentistry, supporting both dental professionals and patients worldwide.

**Source: TePe**

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