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.

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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

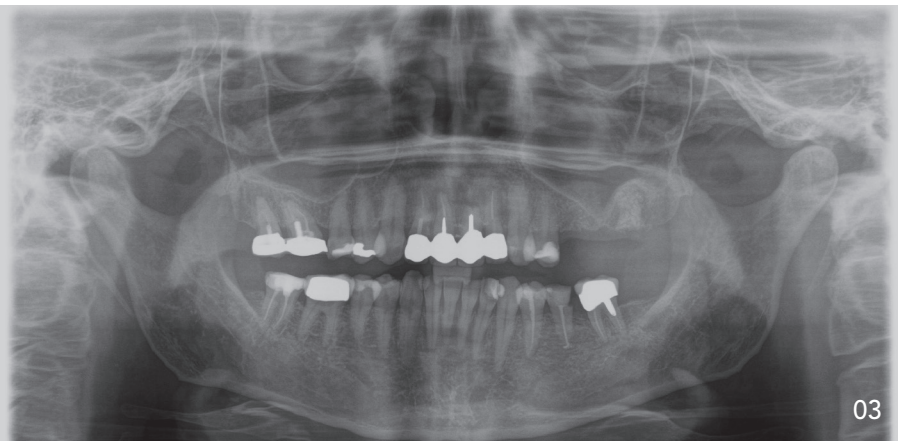
Immediate implant placement has become a predictable treatment preserving the contours of the peri-implant tissue. Achieving stable transmucosal healing with such protocols requires both atraumatic surgical techniques and precise digital planning.[1–3] The biomimetic abutment enhance soft-tissue management 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



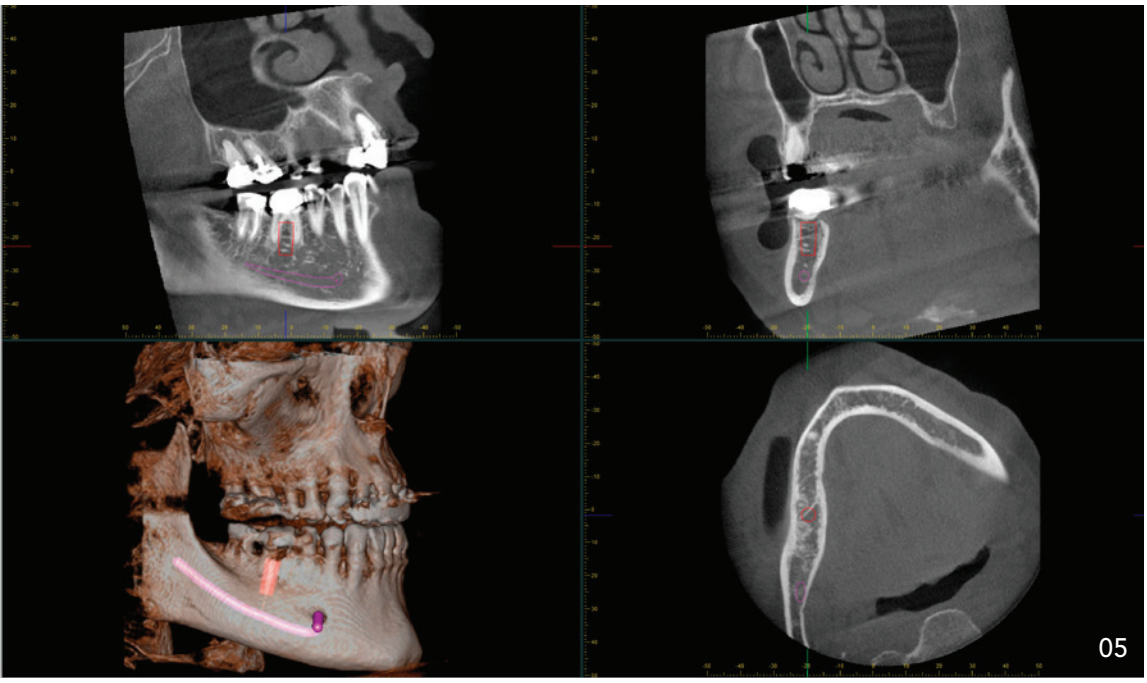


01
Clinical presentation of tooth #46 exhibiting a deep carious lesion and extensive coronal structural compromise.

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).

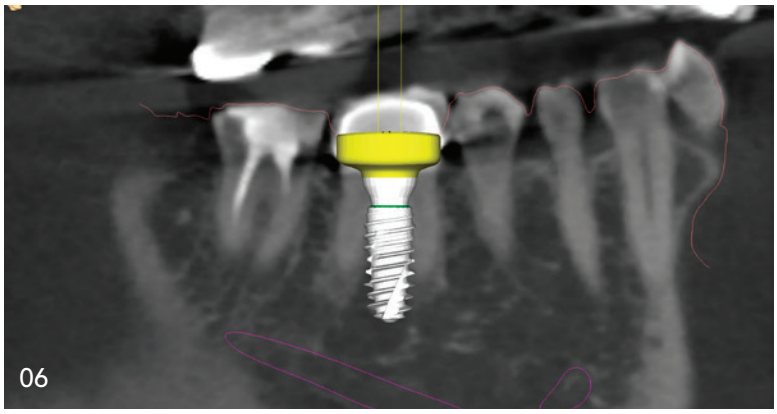
Preoperative cone beam computed tomography (CBCT) demonstrated preservation of the buccal lamella and sufficient interradicular bone volume. Considering the patient's healthy medical background and the unfavourable prognosis of the affected tooth, immediate implant placement was recommended as the treatment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

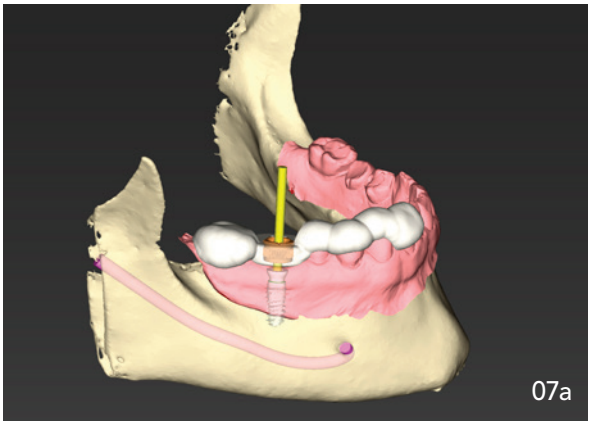
Virtual implant planning was carried out using coDiagnostiX software to ensure accurate three-dimensional positioning. A tissue level (TL) Axiom® X3 4.0 × 10 mm R2.5 implant (Anthogyr) was selected. The chosen implant design and virtual positioning aimed to provide high primary stability. To support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

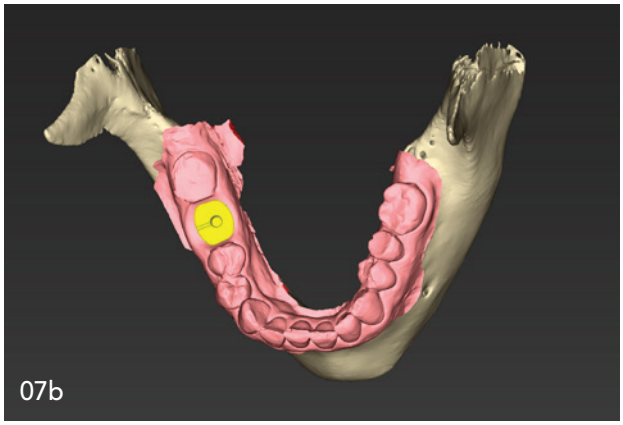
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06
Virtual implant planning with alignment of the Healfit® SH component.

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).





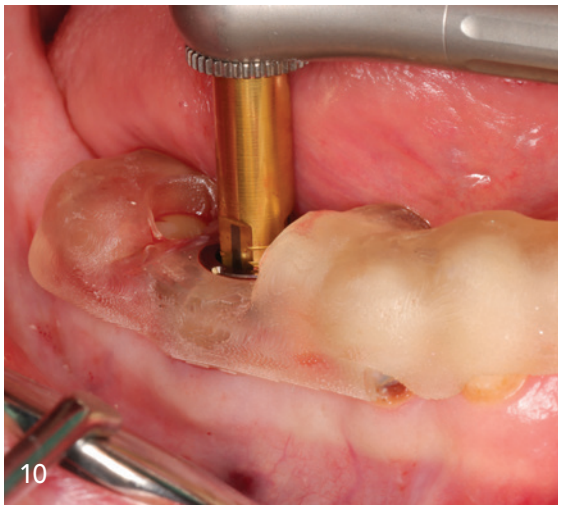
TL R D CH 4.0 (TSHSD-R400) abutment was selected. In combination with the implant position, the Healing abutment covered the extraction socket, preventing collapse of soft tissue while simultaneously shaping the emergence profile (Figs. 6–7b).

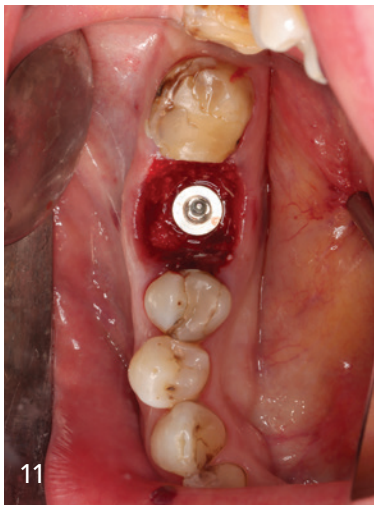
Intraoperatively, atraumatic extraction of tooth 46 was performed while preserving the buccal lamella. The extraction socket was carefully curetted, and the gingival margin was de-epithelialised.

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).





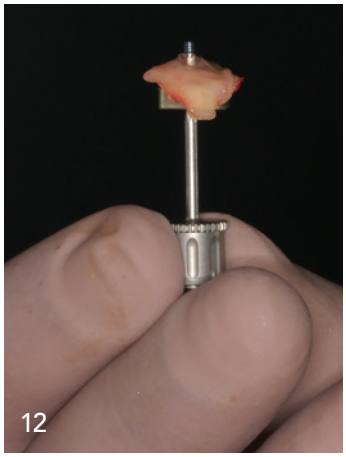
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Guided osteotomy and implant placement.

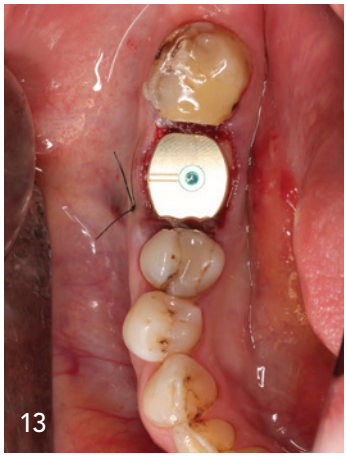
11
Final implant positioning with gap augmentation using a xenogeneic bone substitute material.

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

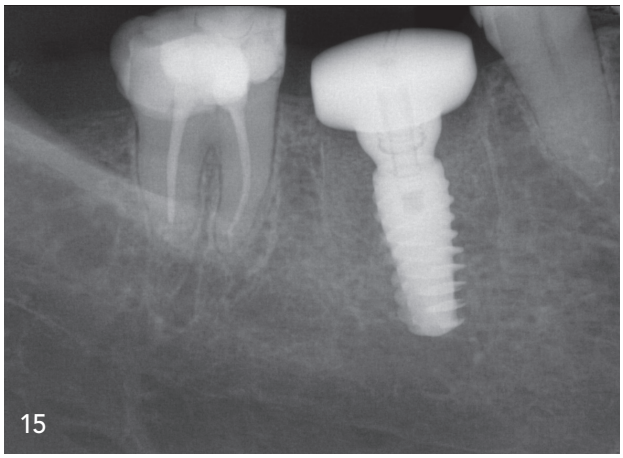
13
Placement of the abutment component followed by adapted suturing (occlusal view).

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



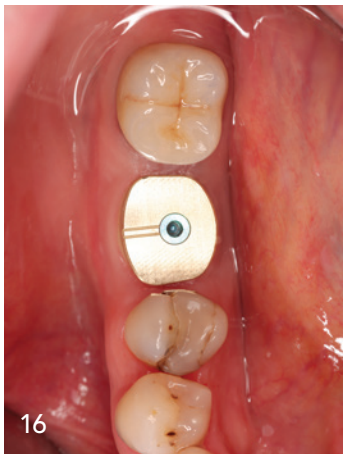






The postoperative radiograph confirmed stable implant seating with precise positioning of the healing abutment, supporting the maintenance of the biological width (Fig. 15).

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).





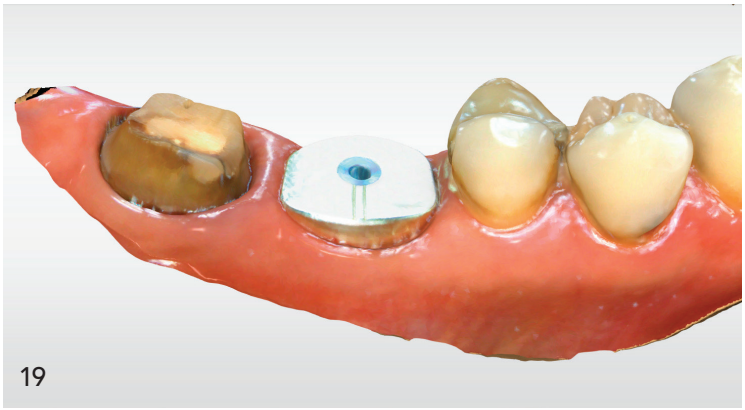
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Postoperative radiograph confirming correct implant position.

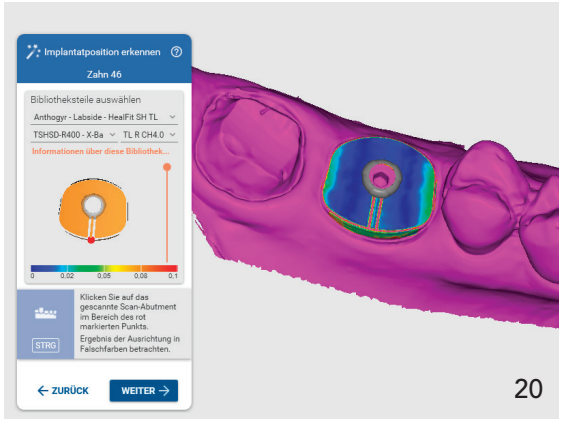
16
Clinical healing at three months post-insertion (occlusal view).

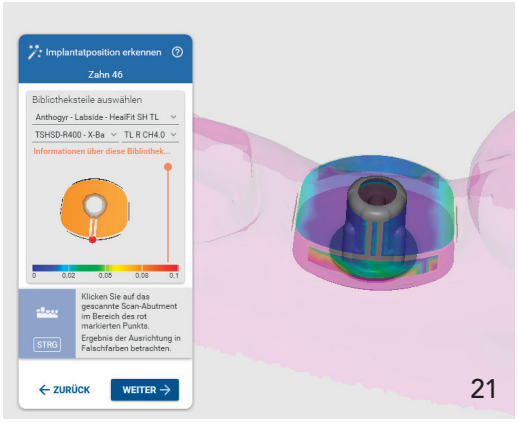
17
Clinical healing at three months post-insertion (buccal view).

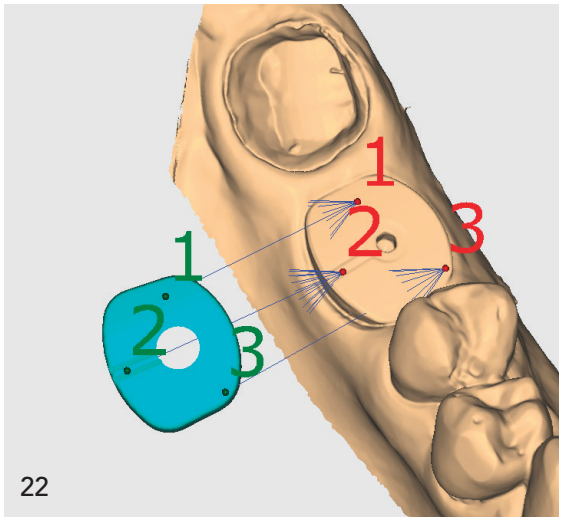
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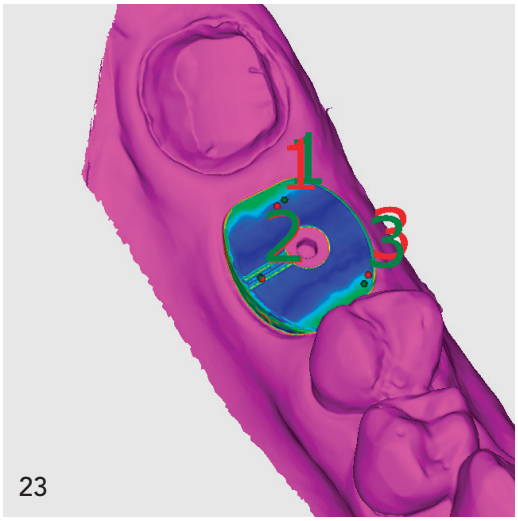












18
Intra-oral scanning (IOS) capturing the geometry of the abutment component (occlusal view).

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

20
CAD Healfit Scanbody alignment.

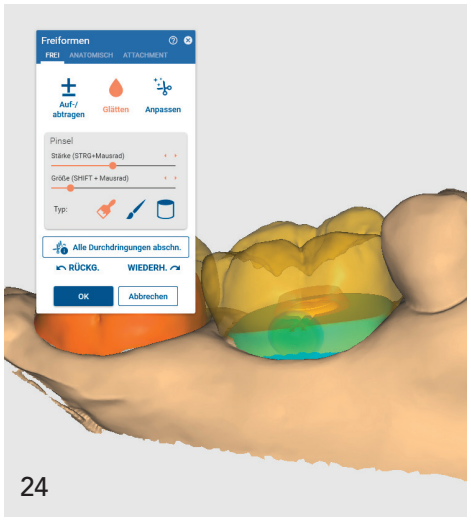
21
X-Base® selection within digital workflow.

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

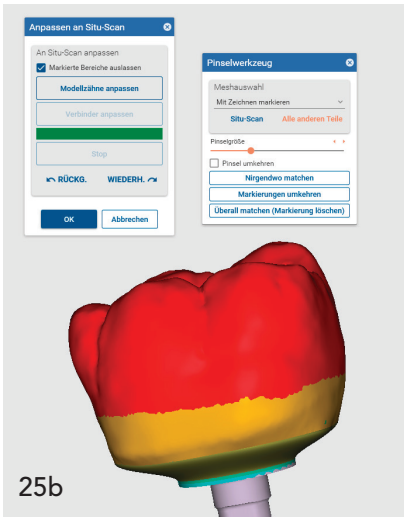
23
Merging of the *in situ* Healfit® SH model.

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.



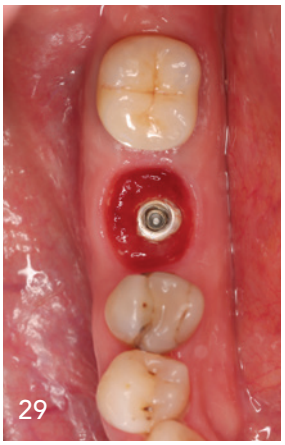
Intra-oral digital impressions were taken, and the workflow for CAD/CAM-based fabrication of the definitive implant crown was initiated (Figs. 18+19). The abutment was identified as a scanbody within the CAD software and used for precise alignment within the digital workflow. The accuracy of the digital 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, […]”

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

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

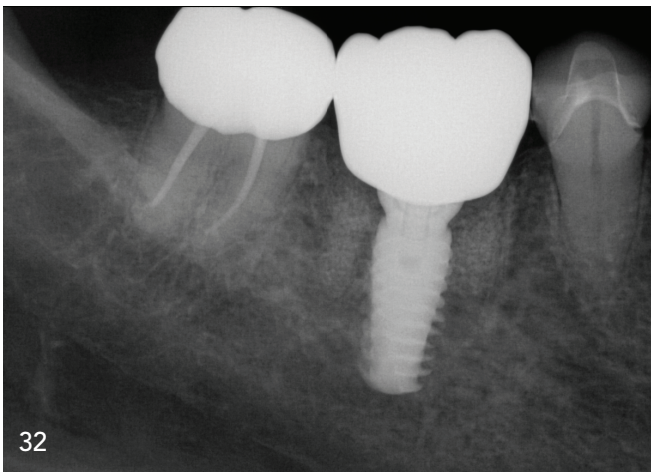
31 Final restoration *in situ* (buccal view).

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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