

Type 4 implant placement with custom healing abutment

A completely digital prosthetic workflow

Dr Pál Nagy, Hungary

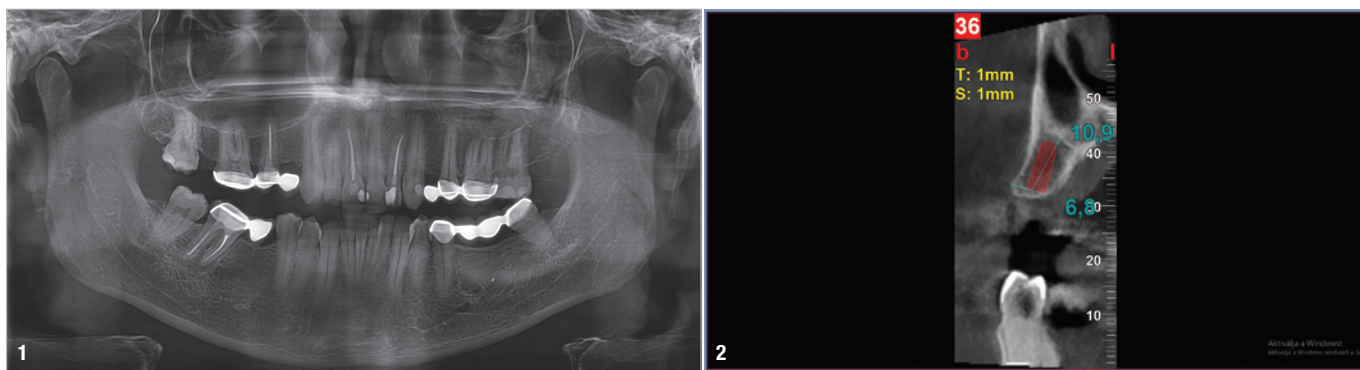


Fig. 1: Pre-op dental panoramic tomogram showing missing maxillary right first premolar and cantilever bridge. **Fig. 2:** Digital planning with CBCT for implant size.

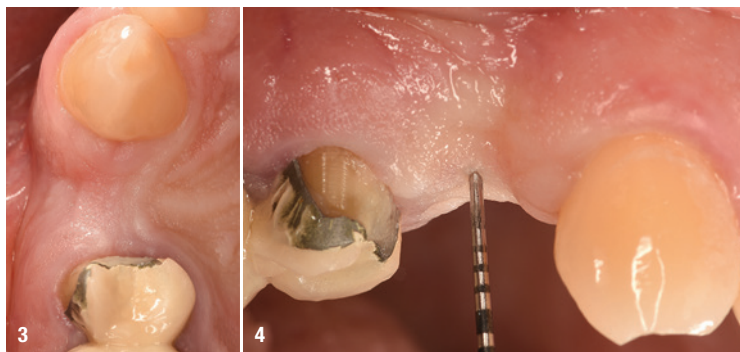


Fig. 3: Buccal soft-tissue defect. **Fig. 4:** Evaluation of biologic width based on vertical soft-tissue thickness.

Introduction

Implant therapy is a safe and reliable method for the replacement of missing teeth. In the past few years, implant dentistry has witnessed several advancements in biomaterial science, treatment technique and even equipment. Digitisation in implant dentistry is one such aspect. The dentist can plan and predict the outcome before performing the surgery. This enables better communication and improves treatment acceptance. Another aspect of improving predictability is giving utmost importance to the soft tissue during treatment planning. Long-term success of an implant restoration is correlated with

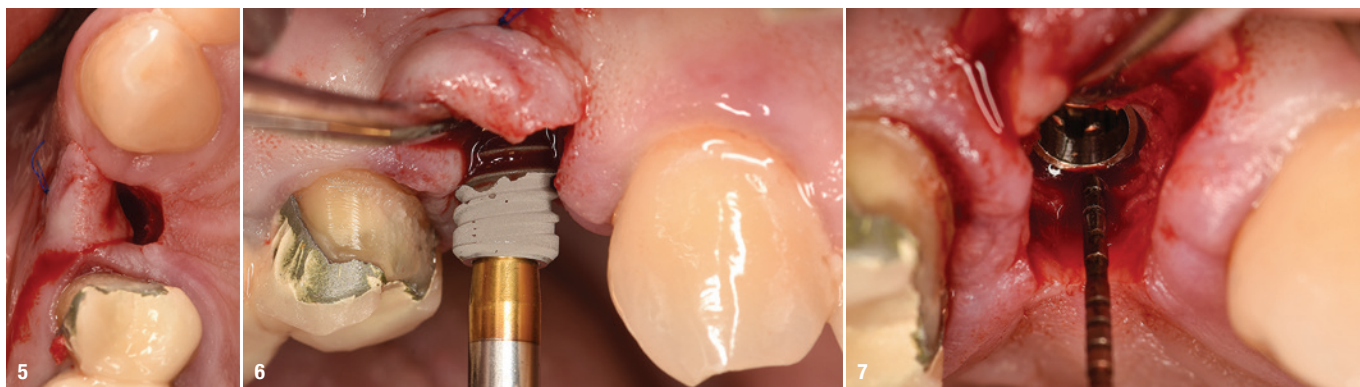
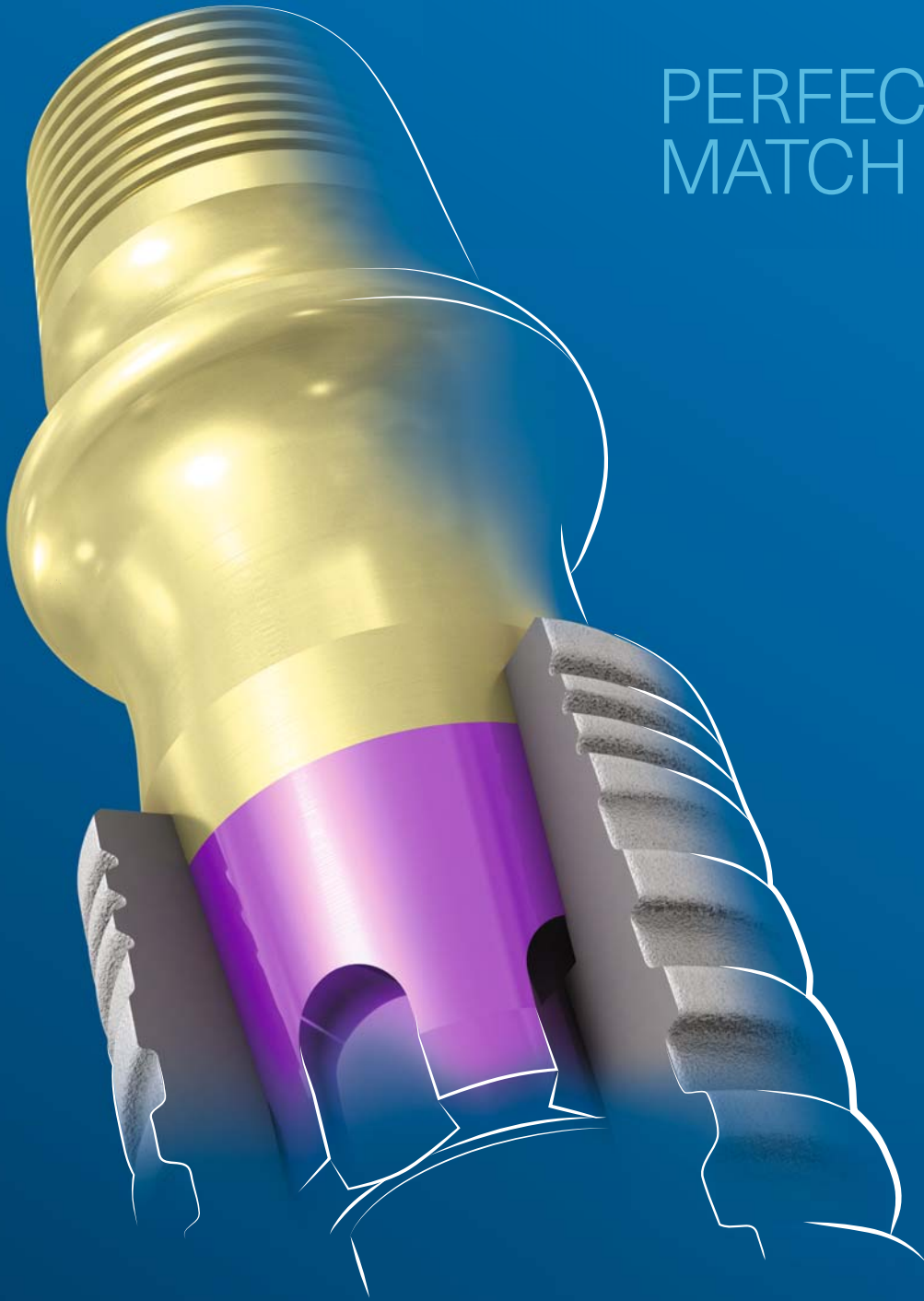


Fig. 5: Palatal roll flap. **Fig. 6:** brented medical copaSKY 4x10 implant placement. **Fig. 7:** Subcrestal implant placement according to expected biologic width.



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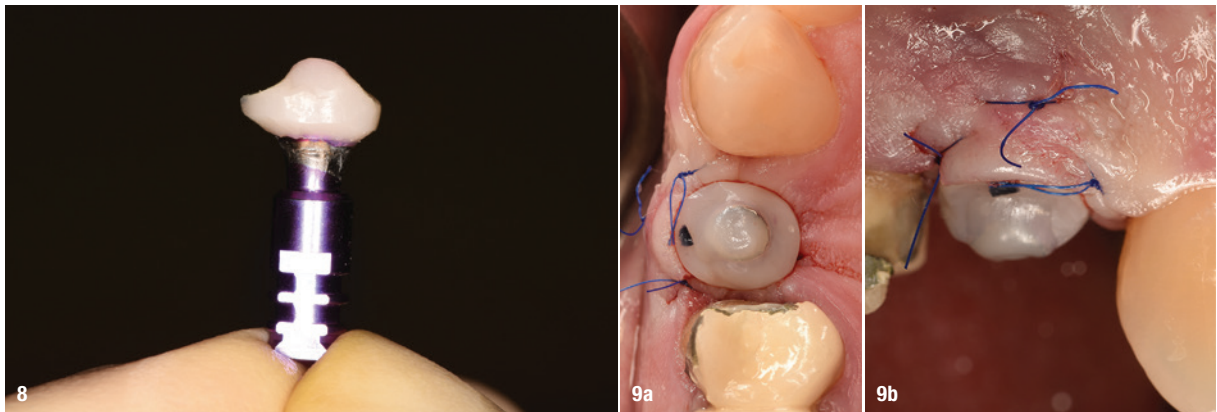


Fig. 8: Customised healing abutment on a titanium base showing a tulip-shaped emergence profile. **Fig. 9a:** Occlusal view of closure. **Fig. 9b:** Buccal view of tension-free closure.

many factors, among others especially peri-implant health. All efforts should be made to achieve a good peri-implant seal. The following case report highlights the combination of soft-tissue management and a completely digital prosthetic workflow for a Type 4 implant placement.

Preoperative phase

A young patient presented with a fractured cantilever prosthesis (Fig. 1). The missing first premolar was indicated for implant-supported restoration. A CBCT assessment with NNT Viewer (NewTom) was used for bone evaluation, and a copaSKY 4 × 10mm implant (bredent medical) was planned (Fig. 2). Soft-tissue evaluation revealed a Seibert Class I ridge defect (Fig. 3).¹ Hence, a palatal roll flap technique was proposed with simultaneous implant placement to compensate for the buccal soft-tissue collapse. The vertical soft-tissue thickness was measured and subcrestal implant placement was planned to correlate with biological width establishment during the transgingival healing period (Fig. 4).

Surgical phase

The procedure was done under local anaesthesia (articaine hydrochloride 4% with 1:100,000 adrenaline).

A papilla-sparing U-shaped palatal incision was made, and a full-thickness mucoperiosteal flap was raised and rolled buccally (Fig. 5). De-epithelisation was done on the buccally rolled part of the flap. This would compensate for the buccal soft-tissue defect. Sequential osteotomy was done and the bredent copaSKY 4x10 implant was placed to a torque of 30Ncm (Fig. 6). The implant was placed 1 mm subcrestally to compensate for future supracrestal soft-tissue widening (Fig. 7).

A customised healing abutment was fabricated by luting composite on to a titanium base for soft-tissue conditioning during the transgingival healing phase (Fig. 8). The individualised healing abutment imitated a tulip shape to create the preferred emergence profile. The soft tissue was sutured with a tension-free closure using a #6/0 non-resorbable monofilament thread (Optilene, B. Braun Deutschland; Figs. 9a & b). A postoperative radiograph was taken, and it showed parallel placement with adjacent teeth (Fig. 10). Postoperative instructions were given to the patient for hygiene maintenance around the implant site.

At the first follow-up visit one week later, the sutures were removed and the site showed satisfactory healing (Fig. 11). Delayed loading after four months was planned according to the patient's wish.

Prosthetic phase

A completely digital prosthetic workflow was executed on exocad software (exocad) for the fabrication of a hybrid screw-retained zirconia monolithic crown over a copaSKY uni.fit titanium base (bredent medical). The implant site showed adequate buccal soft tissue thickness and a favourable gingival contour (Figs. 12a & b). After the removal of the customised healing abutment, a healthy peri-implant soft-tissue collar was observed (Figs. 13 & 14). Furthermore, a preoperative intra-oral scan was immediately taken for soft-tissue profile recording. This was followed by placement of the scan body, and a digital impression was

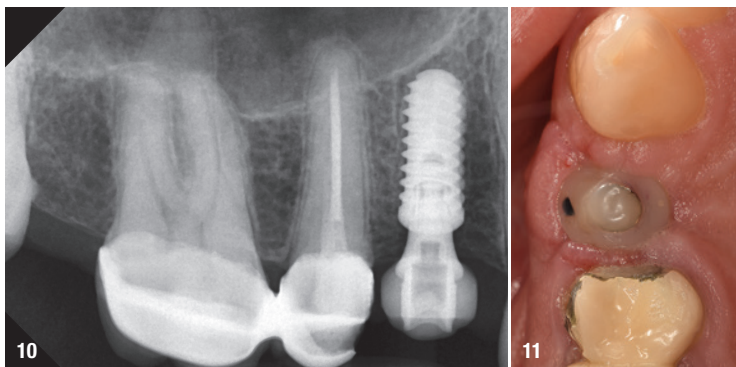


Fig. 10: Immediate post-op radiograph. **Fig. 11:** Suture removal after one week, showing satisfactory healing.

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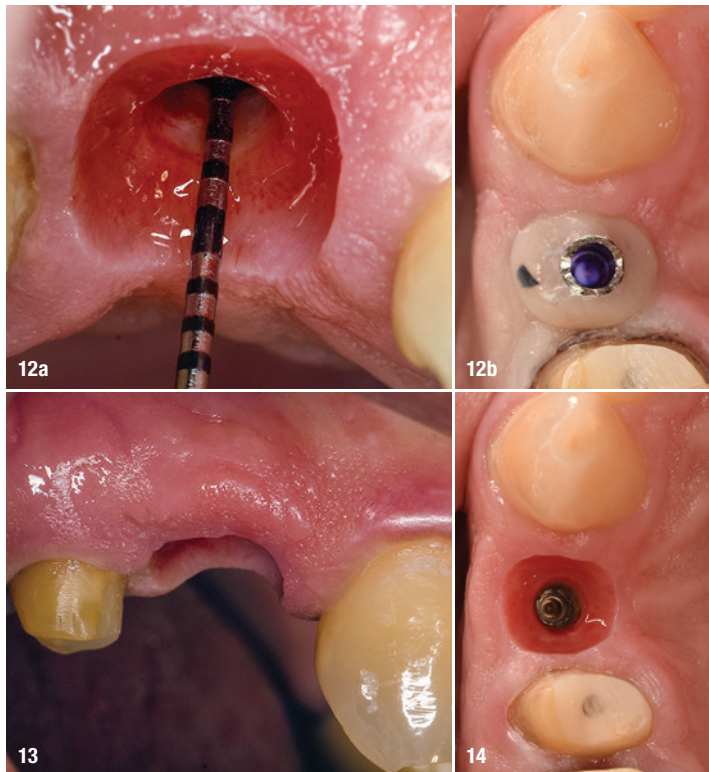


Fig. 12a: Biologic width of 5 mm. **Fig. 12b:** Post-op occlusal view after four months showing adequate buccal soft-tissue thickness. **Fig. 13:** Buccal view after four months showing marginal zenith maintained. **Fig. 14:** Healthy peri-implant soft tissue collar.

performed to record the implant position (Fig. 15). The opposing arch and the bite were also recorded with the same technique. The acquired STL files were digitally

transmitted to the dental laboratory. A PMMA try-in crown was fabricated on the titanium base to check for proximal and marginal fit as well as to harmonise the occlusion (Figs. 16 & 17). A re-scan was carried out once all the adjustments had been completed. The definitive hybrid screw-retained full-contour zirconia crown over a titanium base was fabricated with a highly polished gingival surface and torqued to 25Ncm (Fig. 18). An excellent shade match and clinical outcome was achieved (Fig. 19). The occlusal opening was plugged with PTFE and sealed with composite (Fig. 20). A postoperative control radiograph was taken which showed proper seating of the prosthesis (Fig. 21). At the six-month follow-up, an enhanced soft-tissue profile and maintained crestal bone levels were clearly visible (Figs. 22–24).

Discussion

One of the challenges of delayed implant placement is compensation for post-extraction ridge atrophy. The amount of horizontal and vertical ridge loss may reach up to 60% within two years of tooth extraction, most of it occurring within the first six months of tooth extraction.²

The current case report demonstrates a predictable soft-tissue management technique performed simultaneously with implant placement. A modified palatal roll flap technique was used to compensate for the buccal defect and to achieve a better soft-tissue contour. Unlike a free subepithelial connective tissue graft, this pedunculated approach not only augments the ridge deficiency with better vascularity but also thickens the marginal

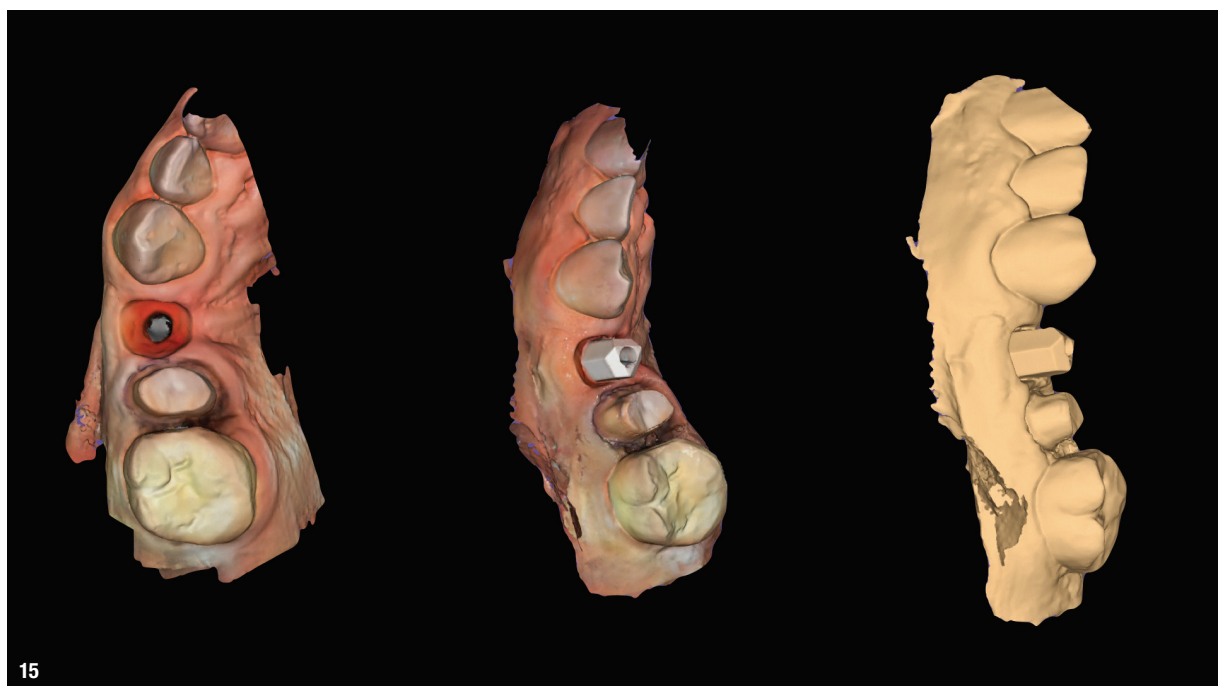


Fig. 15: Intra-oral scanning done sequentially to record the soft tissue, implant position with the scan body and to obtain a digital master cast.

gingiva around the uncovered implant. Biotransformation to a thicker peri-implant mucosa may promote peri-implant tissue stability.³ This approach is also preferable, as there is no secondary donor site or raw area which could cause additional pain and discomfort to the patient during the healing phase. Since it is performed at the same time as implant placement, a second surgery for soft-tissue enhancement is avoided. This improves patient comfort and creates a positive dental experience. Subcrestal implant placement was utilised to compensate for biological width enlargement during transgingival healing. Supracrestal soft-tissue thickness around implant restoration is very important, as it has a direct influence on the peri-implant seal and ultimately the long-term success of the therapy. Violation in this relation between the bone and soft tissue around the implant may be one of the causes of early crestal bone loss.⁴ Marginal bone loss around implants can either affect the long-term aesthetic outcome owing to gingival recession after bone loss or be the initial causative factor of a later peri-implant infection. A one-stage non-submerged protocol is more predictable compared with the submerged technique owing to advantages such as reduced chairside time and a more matured soft-tissue healing, since no additional surgical procedure is required.⁵ When it comes to transgingival healing, a customised healing abutment is preferable in order to achieve a favourable soft-tissue profile for the definitive restoration. Hence, creating a surface with similar dimensions to those of the lost tooth at the level of the gingival margin, together with a narrowing transmucosal part towards the implant platform, help reach this goal. The main advantage of the customised healing abutment is the preformed gingival contours to determine the correct emergence profile of the future prosthetic components when immediate provisionalisation is not an option.⁶ To summarise, the soft-tissue considerations employed in this case report include the following: pouch roll flap, subcrestal placement to avoid biological width violation and customised healing abutment. The implant system used was selected for its unique osseo connect surface (OCS) and because the neck of the implant supports

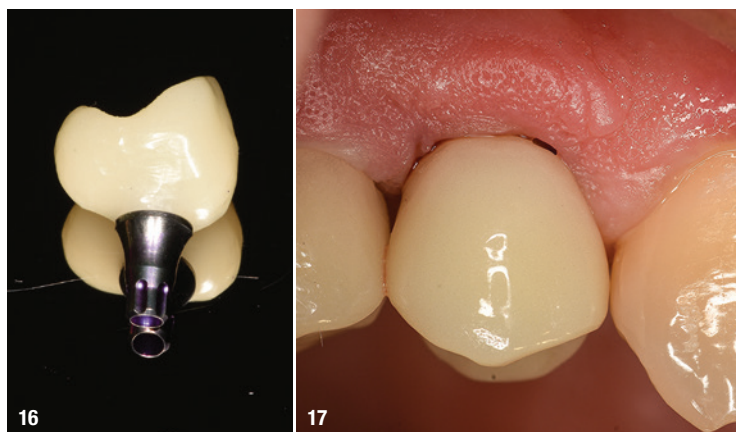


Fig. 16: Fabrication of provisional PMMA crown. **Fig. 17:** Adjustments on PMMA crown. Note the minimal gap between the marginal gingiva and PMMA pseudo-cemento-enamel junction. This is because the soft tissue had already shrunk between the time the healing abutment was removed and the time the first scan was performed. This was easily corrected by the technician through a minimal surface enlargement on the gingival surface of the crown–abutment interface.

soft-tissue attachment for the prevention of bacterial infiltration and protection of the implant. The sandblasted and etched surface enhances rapid osseointegration. It has a back taper design and double self-cutting compression threads, which are important for the attainment of high primary stability. In addition, the copaSKY implant system employs platform switching to minimise crestal bone loss because the minimisation of crestal bone loss is crucial for the long-term success and stability of the implant. The self-tapping double thread achieves faster insertion of the implant with lower heat generation and bone condensation.⁷ Sandblasted and etched implants with a self-cutting thread in a cylindrical and conical hybrid design show statistically higher insertion and removal torque values compared with machined implants, along with enhanced primary stability.⁸ A fully digital prosthetic protocol was followed for fabrication of the definitive prosthesis. Intra-oral scanners are devices used to capture direct optical impressions in dentistry.⁹ A review of the current literature of intra-oral



Fig. 18: Definitive hybrid screw-retained monolithic zirconia crown over titanium base with polished gingival collar without glaze. **Fig. 19:** Buccal view of definitive crown showing excellent shade match and contours.

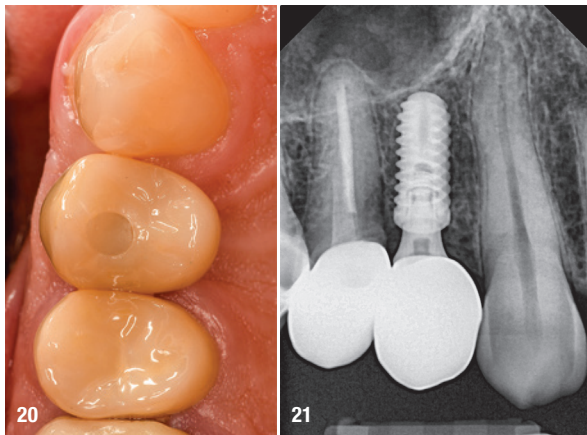


Fig. 20: Occlusal opening sealed with composite. **Fig. 21:** Post-op radiograph after definitive crown placement.

scanners concluded that they are time-efficient, reduce patient discomfort, eliminate the use of plaster models and allow better communication with the dental laboratory technician.¹⁰ A hybrid screw-retained prosthesis

Monolithic crowns are fabricated with CAD/CAM technology and have high flexural strength and fracture toughness, higher than those of alumina-based ceramic crowns.¹⁴

Conclusion

The pursuit of precision and perfection has led to an evolution in the field of implant dentistry. New-age techniques and materials, coupled with rapid digitalisation in dentistry, have improved the patient experience through improved comfort, shorter treatment time and more predictable results. Digital workflows minimise manual and technical errors not only by the dentist but also by the dental laboratory technician. Hence, there being a plethora of implant companies available, it is crucial to choose a provider which enables completely digital workflow options in implant dentistry for both the surgical and prosthetic aspects. Holistic treatment planning with regard to well-laid down biologic principles for the peri-implant soft and hard tissue yields superior aesthetic results and leads to long-term success.

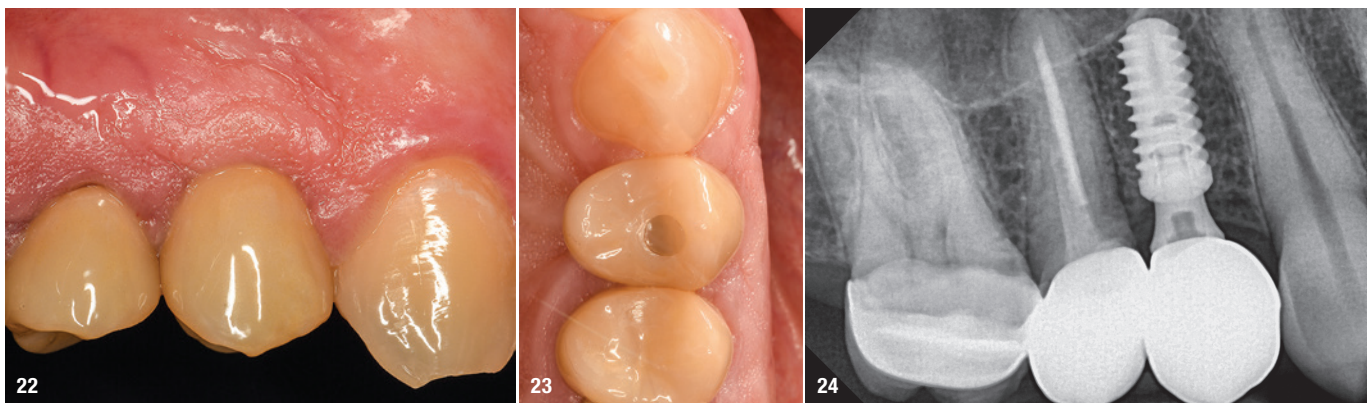


Fig. 22: Six-month follow-up showing excellent emergence profile. **Fig. 23:** Six-month follow-up showing enhanced soft-tissue thickness. **Fig. 24:** Six-month follow-up radiograph showing maintained crestal bone levels.

was planned and executed in this case. A comprehensive review focused on clinical significance of screw-retained versus cement-retained crowns for decision-making found that a screw-retained restoration demonstrates fewer biological complications and has the advantage of easy retrievability without damage to the abutment and the crown.¹¹ The removal of a cement-retained crown is still more challenging and less predictable compared with a screw-retained restoration.¹¹ Thus, a screw-retained prosthesis simplifies case management if any complication arises in the future. Cement extrusion and retention in the peri-implant tissue can result in microbial colonisation and peri-implant tissue damage. With screw-retained restorations, it is easier to evaluate oral hygiene and maintenance procedures are easier to carry out.¹² A polished full-contour zirconia crown was used for the definitive prosthesis. In layered zirconia crowns, the veneering porcelain shows chipping or even delamination after long-term wear, resulting in restoration failure.¹³

about the author



Dr Pál Nagy, DMD, PhD, is a certified clinical specialist in periodontics and dental implantology. He started the DifferENTAL dental clinic together with his brother in Budapest, Hungary. Dr Nagy would like to acknowledge the dental technician and the dental technician's lab: Kapos Dentart Dental Lab – Tamas Cser.

contact

Dr Pál Nagy
Csalogány utca 26
1015 Budapest, Hungary

kardpali@gmail.com
+36 30 9605255



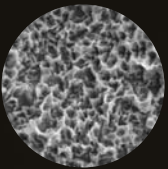
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