Late implant placement following bilateral sinus floor elevation

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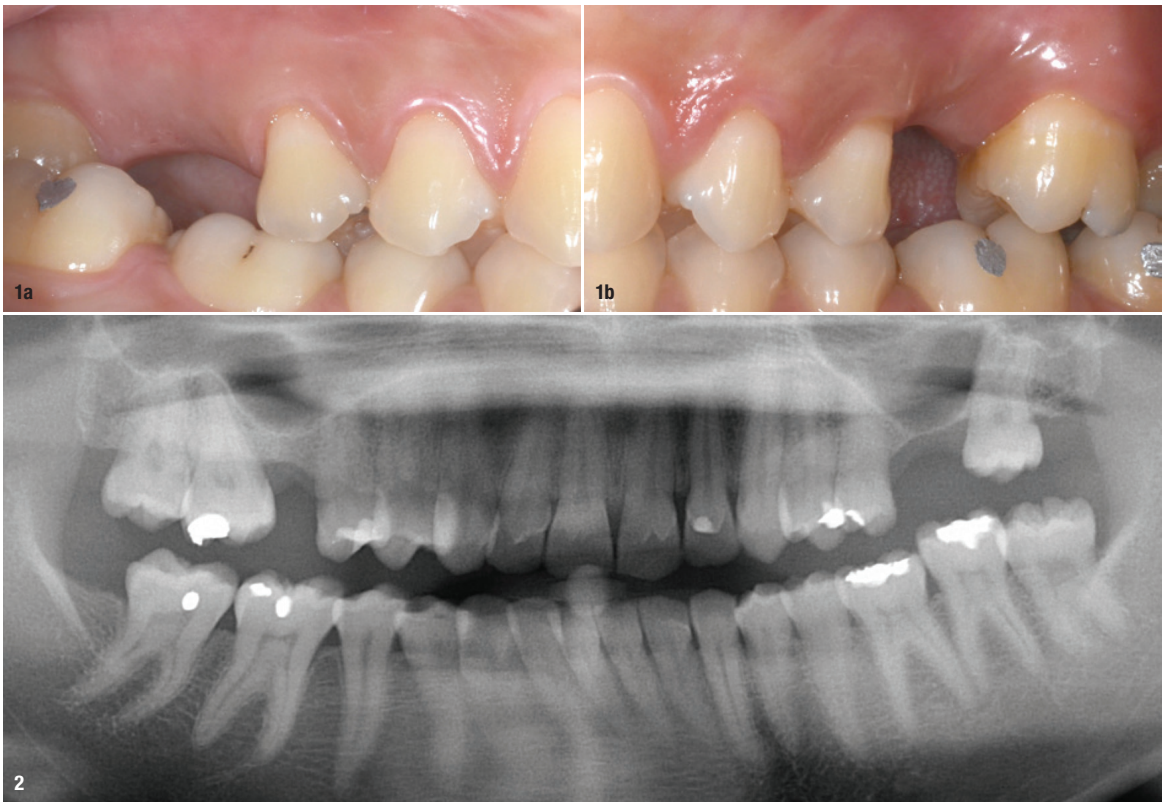
Partial tooth loss in the posterior region can lead to significant functional deficits and, particularly in young patients, may also result in aesthetic concerns. If left untreated, the loss of vertical dimension and subsequent tooth migration can lead to temporomandibular joint (TMJ) disorders. Additionally, untreated partial malocclusion in the posterior region is a primary cause of maxillary sinus pneumatisation and vertical bone loss.

When the residual crestal bone volume is minimal, preserving the surrounding native bone is crucial for the long-term stability of implants after bone regeneration. Several factors, including implant geometry and prosthetic connection, play a role in crestal bone resorption. In this context, iSy implants offer features that support the long-term preservation of marginal bone. Notably, their macro-geometry, non-tapered implant neck, and conical prosthetic internal configuration with integrated platform switching are particularly advantageous.[1,2]

Diagnostics

A 28-year-old woman sought further treatment in our practice following the extraction of her posterior teeth #16, #26, and #27 alio loco over five years ago. She requested reconstruction of the edentulous regions with dental implants. Upon initial oral examination, it was noted that the absence of tooth #16 had caused a mesial inclination of tooth #17, resulting in a reduced interproximal space. The orthopantomograph (OPG) revealed a mesioangulation of tooth #28 and several minor fillings (Figs. 1a & b). Additionally, significant bone height reduction was observed



Figs. 1a & b: Clinical situation pre-op in the first and second quadrants. **Fig. 2:** The OPG reveals pneumatisation of the maxillary sinus and tooth inclination.

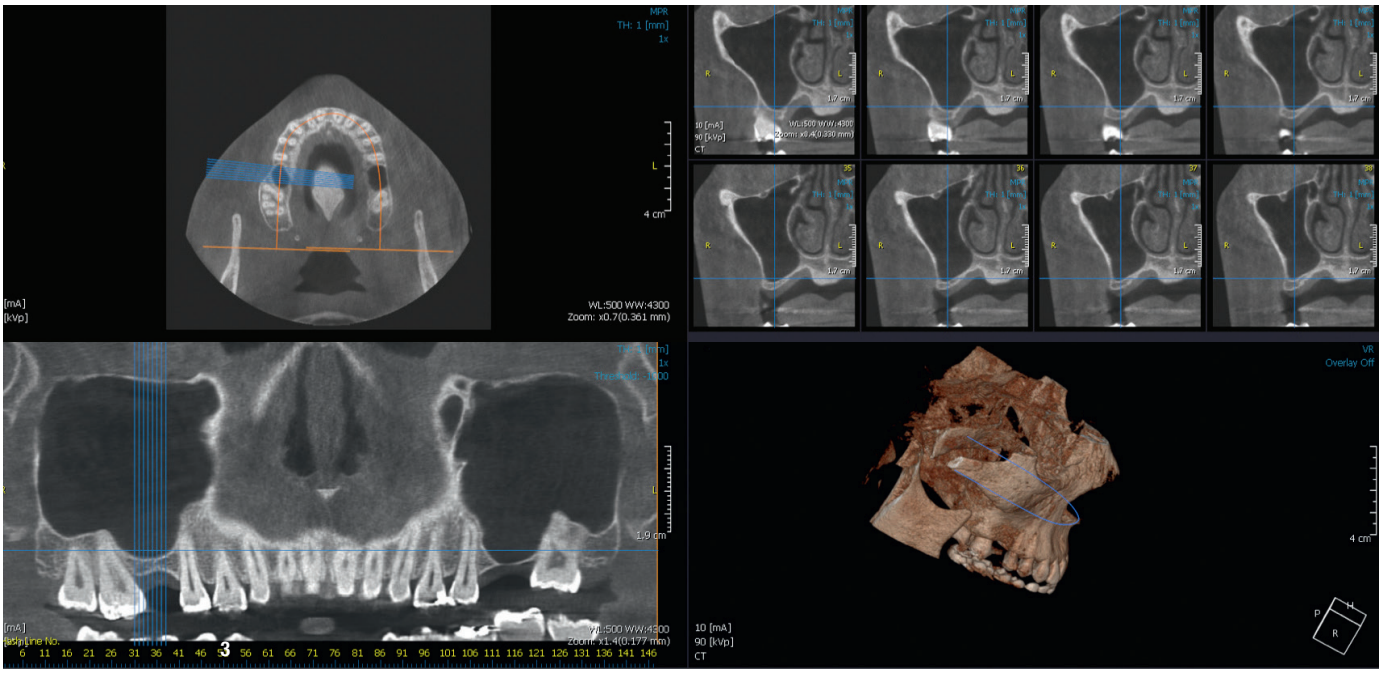
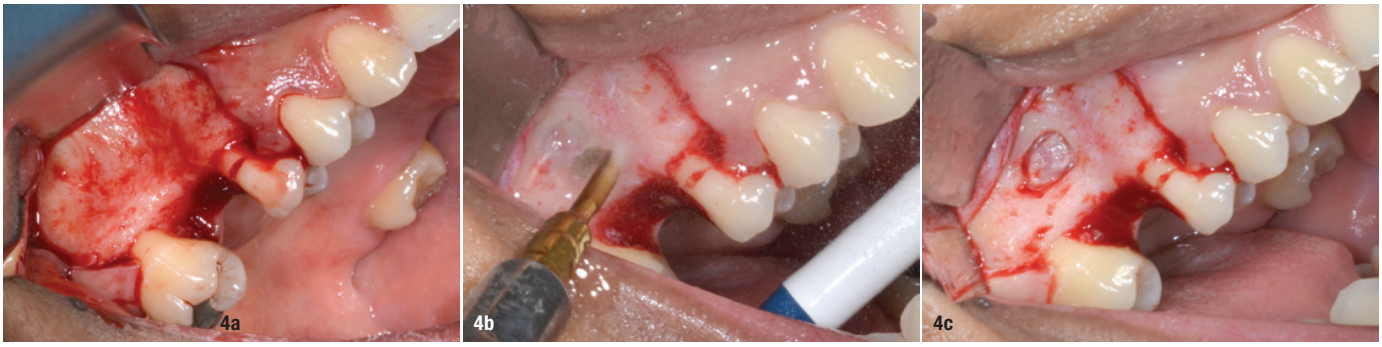
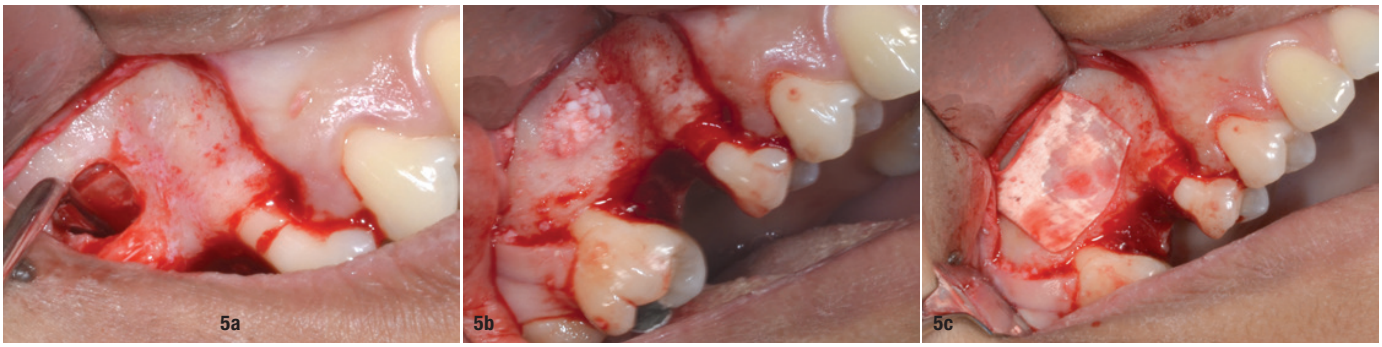


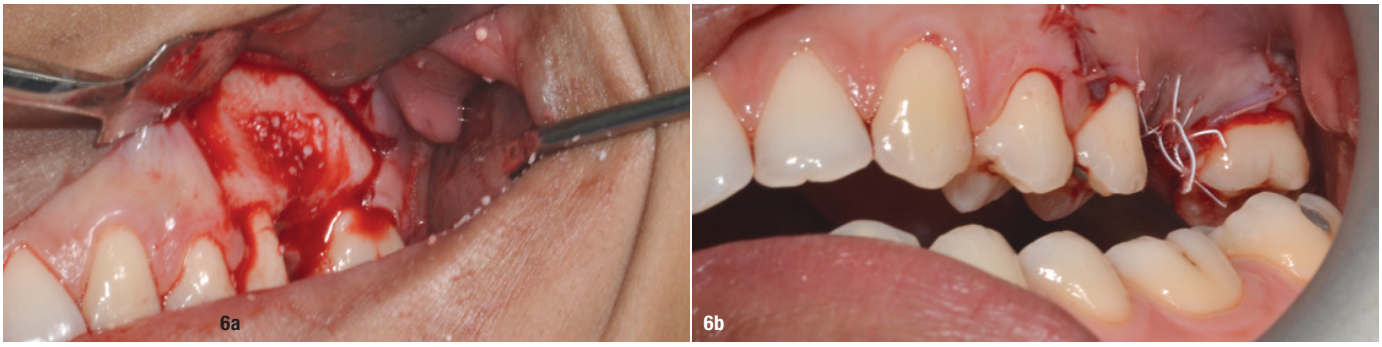
Fig. 3: A CBCT scan was deemed necessary to determine the appropriate therapeutic approach.



Figs. 4a–c: Following mucoperiosteal flap elevation, a lateral window was prepared using the piezo technique.



Figs. 5a–c: The caudal osteotomy line was positioned approximately 3 mm above the estimated sinus floor. The membrane was carefully detached using a specialised sinus instrument. A particulate xenograft was employed to augment the maxillary sinus, and the bone window was covered with a collagen membrane, which was stabilised by soft-tissue closure.



Figs. 6a & b: Successful augmentation of the maxillary sinus using a particulate xenograft, followed by secure wound closure.

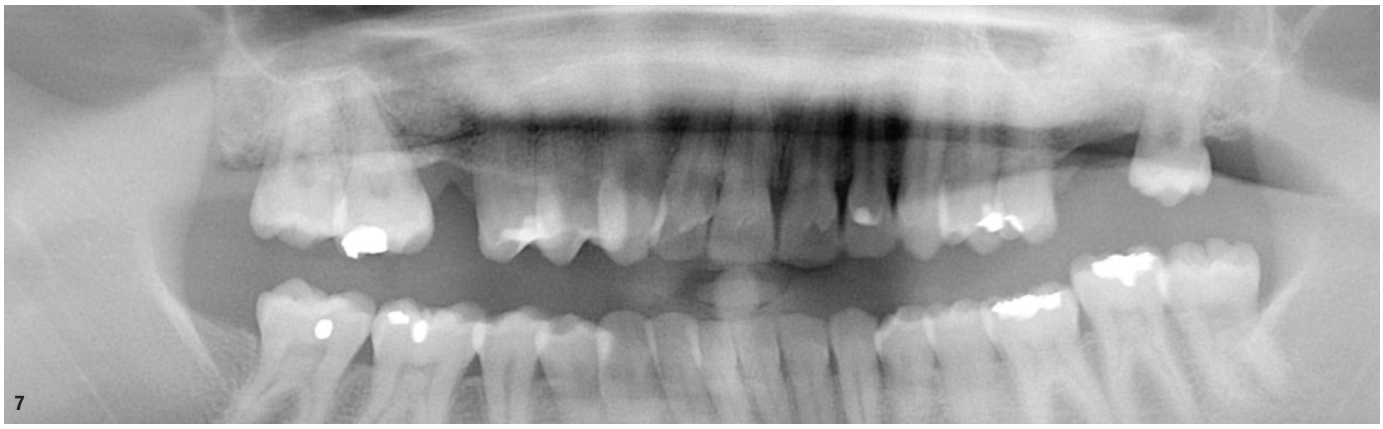


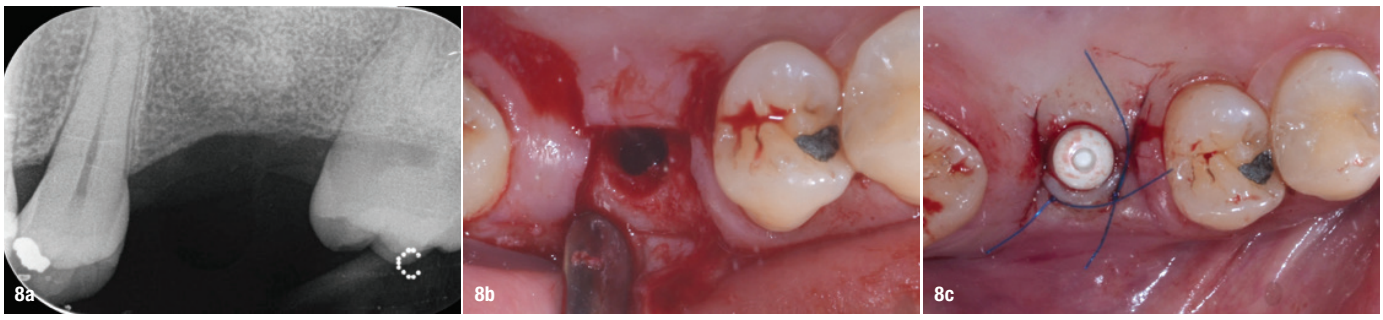
Fig. 7: Post-augmentation X-ray imaging to verify the efficacy of the procedure.

in the areas where teeth #16 and #26 had been extracted, due to vertical crestal bone resorption and sinus pneumatisation (Fig. 2).

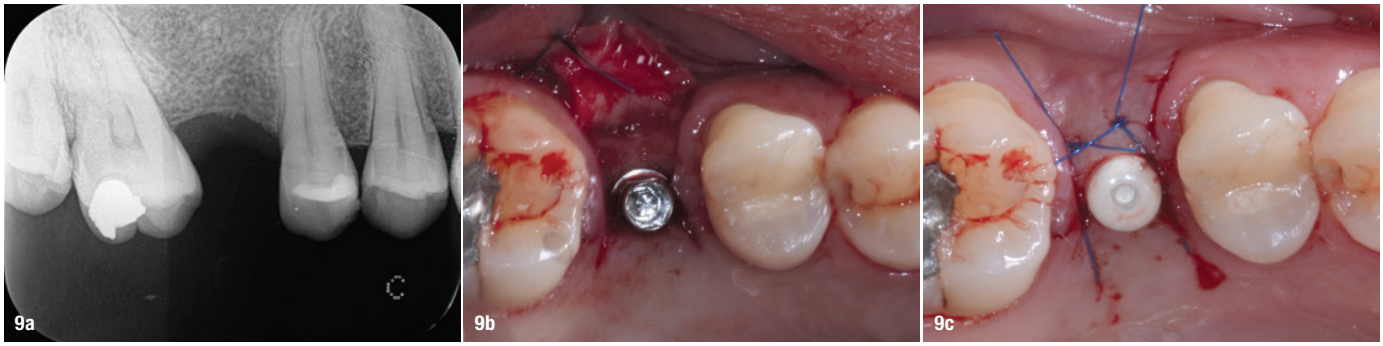
To ensure the stable placement of implants, bone augmentation in the maxillary sinus was necessary. The CBCT scan showed a residual bone height of less than four millimetres, leading us to opt for an external approach to the maxillary sinus (Fig. 3). The sinus floor needed to be elevated by more than three millimetres to counteract the pneumatisation and restore the bone height. Given the circumstances, we chose a two-stage approach,[3,4] as primary stability of the implants is significantly influenced by preoperative bone height and quality.

Surgery

Following comprehensive radiological diagnostics and a detailed consultation, the treatment was executed on the same day under local anaesthesia. A trapezoidal incision was made with a 15-c bistoury blade to prepare the mucoperiosteal flap. The lateral window was created on both sides using a piezoelectric device, which employs ultrasonic technology to ablate only hard tissues and bone



Figs. 8a–c: At the time of implantation, the augmented area exhibited sufficient height and stability to support implant anchorage. The implantation site was exposed using a modified mucosal flap technique and an iSy implant was placed according to the drilling protocol. The pre-assembled base remained in the implant, a gingiva former was attached, and the soft tissue was closed with a non-absorbable monofilament suture.



Figs. 9a–c: The implant was similarly inserted in the left quadrant, with incisions made 1.5 mm from the mesial and distal papilla.

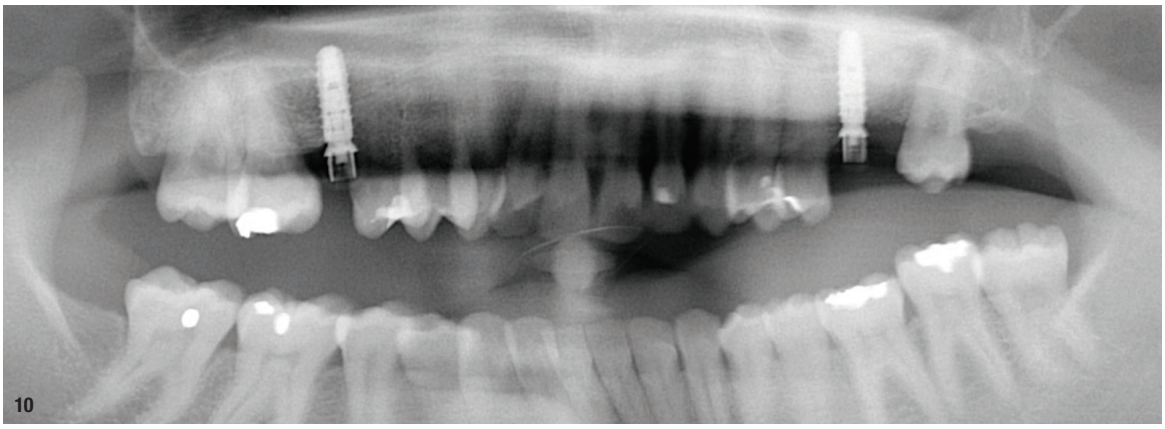


Fig. 10: The two implants (Ø 3.8 mm, L 11 mm) were inserted with primary stability in the augmented region.

while preserving surrounding soft tissue. Care was taken to position the caudal osteotomy line approximately three millimetres above the estimated maxillary sinus floor.

After fenestrating the vestibular bone wall, the bone flap was delicately separated from the membrane and immersed in saline. Schneider's membrane was carefully detached from the palatal side using specialised hand curettes, with constant bone contact maintained to minimise the risk of perforation (Figs. 4a–c). The cavity between the alveolar bone and the sinus membrane was filled with particulate xenograft. A collagen membrane was then placed over the window to prevent washout.

The mucoperiosteal flaps were repositioned to secure the collagen membrane in place without the need for pins. The flaps were precisely adapted to the wound margins and closed with individual button sutures, ensuring a saliva-proof seal (Figs. 5–7).

Implant insertion

After an eight-month healing period, an intra-oral X-ray and CBCT scan were performed, revealing sufficient bone regeneration at the grafted site. Nine months post-sinus floor augmentation, an iSy implant was placed in each edentulous area, following the open treatment protocol designed for the system.

The alveolar bone was exposed at the predetermined implant sites using a minimally invasive, modified mucosal flap technique. Incisions were made 1.5 mm away from the mesial and distal papillae to prevent their collapse or regression. The implant bed was prepared according to the efficient drilling protocol provided by the manufacturer. A round bur was used to punch-mark the implant position, and subsequent pilot drilling determined the depth and axis of the implant site. Final drilling was carried out using the single-patient form drill included in the package.

One iSy implant (Ø 3.8 mm, L 11 mm) was placed on each side, achieving the necessary primary stability for open healing (Figs. 8a–9c). Despite the parallel shape of the implant, which is not ideal for achieving high primary torque stability, the design of the implant base—with an abutment diameter slightly larger than the implant diameter—prevents sinus migration during the healing phase.

In cases like this, where primary stability of 20 Ncm torque or greater is achieved, transgingival healing can be selected as the treatment option (Fig. 10). PEEK healing caps were mounted on the implant base, and the flaps were sutured tightly around the healing caps with surgical knots, using 5/0 non absorbable monofilament. An intra-oral X-ray was taken as a baseline to verify the first bone–implant contact (BIC) at the implant shoulder (Fig. 11).

The prosthetic restoration

The prosthetic restoration began 16 weeks after the implant placement and regular follow-up appointments. The PEEK healing caps were removed, and multifunctional caps were clicked into place. An analogue impression of the two implant positions was taken intra-orally using an

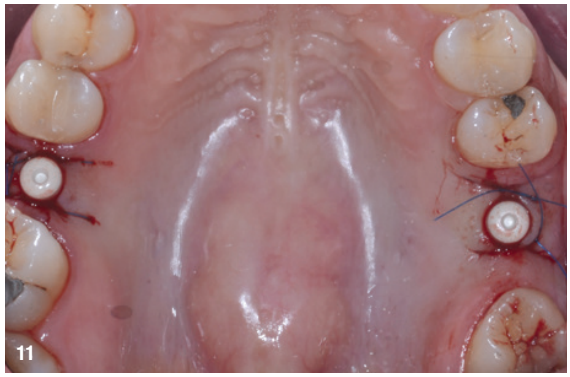
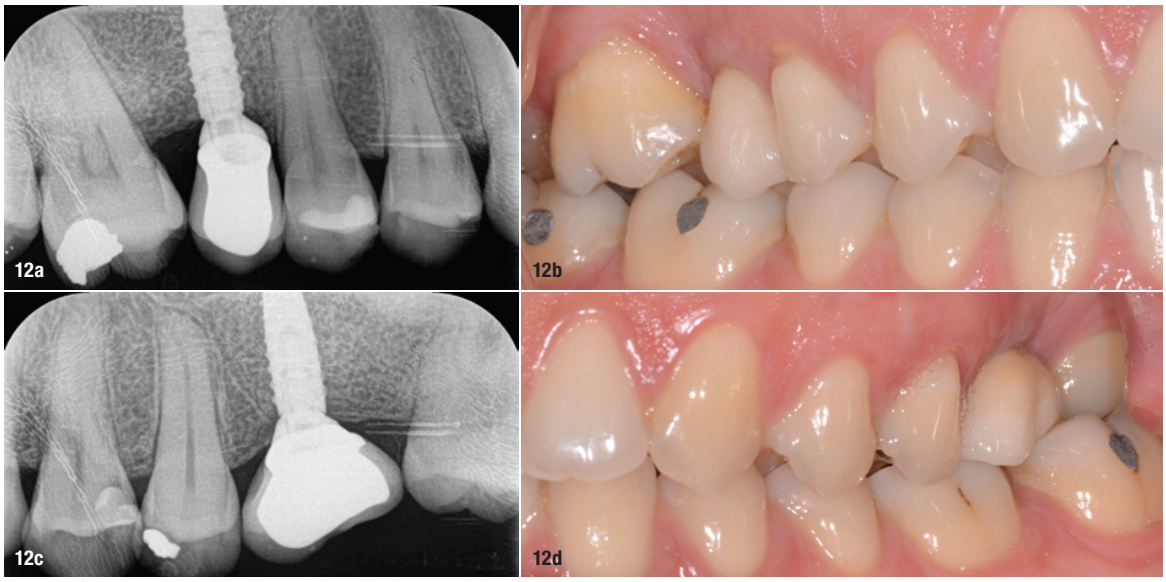


Fig. 11: The implant bases were fitted with healing caps for an open healing approach.



Figs. 12a–d: The final metal-ceramic crowns *in situ*, featuring aesthetically pleasing crowns #16 and #26. The Platform Switching concept of the system facilitates the stable attachment of peri-implant tissue.

impression key. In the laboratory, a model was fabricated to replicate the implant positions precisely. Custom-made iSy Universal abutments were then screwed onto the implant analogues and modified to accommodate the peri-implant soft tissues, implant angulation, and the insertion direction of the crowns. Metal-veneered porcelain crowns (PFM) were fabricated and subsequently cemented.

Given the clinical diagnosis and the patient's parafunctional habits, PFM crowns were selected over zirconia to minimise the risk of chipping or wear due to the reduced height of the TiBase and limited retention. For the final restoration, the pre-assembled iSy implant bases were removed from the implants for the first time using the abutment disconnector. A stable peri-implant mucosal tissue was observed, and the titanium abutments were inserted and screw-retained to the implants with an abutment screw (20 Ncm). After functional and shade verification, the two metal-ceramic crowns were cemented onto the roughened abutments (Figs. 12a–d).

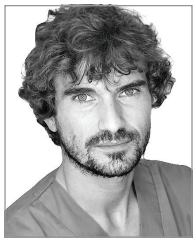
Conclusion

After six months of functional loading, the hard and soft tissues remained stable. A significant advantage of the iSy treatment concept is the minimal unscrewing and screwing required for prosthetic restoration, reducing the risk of bone remodeling at the implant shoulder caused by inflammatory connective tissue (ICT). The treatment successfully achieved aesthetics, patient satisfaction, and functional rehabilitation.

Literature

about the authors

Prof. Dr Paolo Maturo is employed in the Department of Surgical Sciences at the Faculty of Medicine and Surgery at the University of Rome Tor Vergata. He holds a PhD in Biochemistry and Molecular Biology and is engaged in clinical research in the fields of preventive and pediatric dentistry, the application of lasers in dentistry, and the simplification of protocols in oral implantology and bone regeneration. He completed his implant prosthetic training at Boston University in 2005 and at the Kirsch-Ackermann Clinic in Filderstadt in 2013. In recognition of his outstanding work, he was awarded the Axel Kirsch Prize by the former Italian Camlog Academy in 2012.



Dr Edoardo Magnanelli earned his DDS degree in Dentistry at the Universitat Internacional de Catalunya (UIC) in Barcelona and obtained a certificate in implant-based therapy from the EAO in 2019. In the same year, he also completed his International Master's degree in Oral Surgery at UIC in Barcelona.

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