Aesthetics in the anterior maxilla

By Drs Sofie Velghe and Aryan Eghbali, Belgium

Multidisciplinary collaboration plays a significant part in achieving predictable treatment results. This article demonstrates the importance of accurate case analysis and pre-operative planning.

This case report describes the reconstruction of two lost central incisors in the anterior maxilla. After tooth #11 had been extracted, measures for preserving the alveolar ridge were performed. After eight weeks, an implant was placed and a screw-retained temporary bridge was fabricated. Prior to inserting the temporary bridge, tooth #21 was extracted and immediately replaced with an implant.

Introduction

The impending loss of a tooth in the aesthetic zone can be a distressing experience for the patient. As the success rates and predictability of dental implants have improved over the years, implant-based treatments have gained in popularity. Osseointegration is no longer the only criterion for successful implant therapy; the aesthetic outcome of the implant reconstruction is also important.

The aesthetic peri-implant tissue should be in harmony with the healthy surrounding dentition in terms of height, volume, shade and contour. The restoration should appear lifelike and imitate the appearance of the missing tooth in terms of shade, shape, structure, size and optical properties. In a multidisciplinary team approach, several treatment modalities, such as minimally invasive methods, ridge preservation protocols, connective tissue grafting, provisionalisation and plastic-aesthetic periodontal surgery, should be considered. In addition, a thorough analysis, for example with digital smile design, is crucial.

Case report

A few years ago, both central incisors of this young male patient were restored with metal-ceramic crowns. From today’s perspective, the restoration would be categorised as an aesthetic failure. Both teeth showed significant amounts of gingival recession, visible crown margins, and a loss of harmony between the gingival architecture and the restoration. The treatment plan was to replace the two central incisors with two implants with screw-retained monolithic lithium disilicate crowns. In order to create a harmonious aesthetic appearance, the two lateral incisors would be built up with composite material.

Surgical phase

The initial assessment resulted in a treatment plan in which both incisors were to be replaced with implants (NobelActive, 2017).
Nobel Biocare). In order to maintain the central papilla between the incisors, a gradual extraction of the two teeth was performed, starting with tooth #11. A few weeks later, tooth #21 was extracted, followed by immediate implant placement. A temporary bridge with an extension as pontic #21 was fabricated in order to contour the soft tissue.

Figures 2 to 5 show the surgical phase aimed at preserving the soft tissue.

Prosthetic phase
Preserving the soft tissue plays an important part in the success of treatment. Transmitting this data to the dental technician presents a challenge. In order to replicate the soft-tissue architecture, a standard impression coping on implant #11 was individualised. Then, an impression was taken of the implants at sites #11 and 21 using an individualised and standard impression coping, respectively (Figs. 6a & b). The resulting plaster model was modified by grinding at site #21. Then, a silicone impression material was used to record the emergence profile of pontic #21 of the temporary bridge (Figs. 7a–c). This information was transferred to a standard impression coping, which resulted in an individualised impression at implant site #21 (Figs. 8a & b). At the next step, the situation was assessed using digital smile design analysis (Figs. 9a & b). The evaluation revealed a disproportionate distribution of volume between the central and lateral incisors. The lateral incisors were too narrow compared with the wide and square shape of the central incisors. In order to enhance the harmony, the volume should be distributed across the four incisors. New screw-retained temporaries were fabricated. Prior to this, a wax model was adapted and tested intra-orally to visualise the outcome. A silicone key was created to first build up the lateral incisors with a temporary composite material.

With the temporary crowns and the composite mock-up of the lateral incisors, the shape of the wax-up could be transferred. This blueprint served to evaluate the new smile intra-orally prior to fabricating the permanent restorations. Shade selection was performed with the help of cross-polarised light. Unwanted reflections were effectively eliminated with a polar eye filter. In order to fabricate the final prosthetic restorations, the temporaries were duplicated and 1:1 copies were made using IPS e.max Press (monolithic lithium disilicate; Ivoclar Vivadent). Screw-retained IPS e.max Press crowns were placed on the implants and the screw openings were filled with PTFE and covered with composite. Once the restorations had been placed, the lateral incisors were built up with IPS Empress Direct composite (Ivoclar Vivadent). A palatal ma-

Figs. 10a–e: Individual stages in the intra-oral fabrication of the composite build-ups on the lateral incisors.—Figs. 11a & b: Result: the shape, shade and size of the anterior teeth created a harmonious appearance.
trix made of silicone putty was used as an auxiliary. The shade match of the chosen composite and the IPS e.max ceramic was deemed ideal. A rubber dam was used for isolation (OpttraDam Plus, Ivoclar Vivadent). A composite stratification technique was used to build up the incisors (Figs. 10a–s). The enamel was slightly roughened, etched (37% phosphoric acid, 15 seconds, total etch) and then coated with a light-curing adhesive (Adheese Universal, Ivoclar Vivadent). The adhesive was scrubbed into the bonding surface and then light cured (Bluephase Style, Ivoclar Vivadent). First, the palatal enamel shell was built up using IPS Empress Direct Enamel A2 and a palatal silicone key created from the mock-up. Dentin A3 was used for the dentine core and the mamelons. A natural-looking result was achieved owing to the transparent incisal effect created between the mamelons using IPS Empress Direct Trans Opal. After that, the build-up was covered with a layer of IPS Empress Direct Enamel A2. The morphological structures were contoured and accentuated using fine diamond grinders, Arkansas stones, green grinders and polishing discs. Silicone polishers and diamond paste were used for polishing. The outcome was a harmonious appearance of the maxillary anterior in terms of shape, shade and size (Figs. 11a & b).

Discussion
Although the presence of the papilla may not be the key issue after single implant treatment, preserving the papilla between two implants remains a challenge. The decision in this case was to extract the two teeth in stages and use temporary restorations to preserve the papilla. In addition, connective tissue grafts carried out at various points ensured ideal soft-tissue contours. Although only a few references regarding the predictability of connective tissue grafts can be found in the literature, recent studies have shown promising results.

Since the aim is to establish a harmonious balance between the teeth and ensure appropriate white aesthetics, pre-operative planning and a detailed case analysis are advisable. It is also important to consider carefully which materials to use. In contrast to zirconium dioxide and titanium, monolithic lithium disilicate restorations do not stimulate subgingival attachment to the soft tissue. Therefore, a hybrid abutment including zirconium dioxide or titanium could present an alternative.

Conclusion
A multidisciplinary team approach is essential to achieve a predictable treatment outcome. In addition, a detailed analysis and pre-operative planning procedure play a crucial part. Here, photograph- and video-based evaluations present powerful instruments.

Acknowledgements: All prosthetic procedures were conducted by Dr Sofie Velghe and all restorations were fabricated by dental technician Stephan van der Made. The authors wish to acknowledge the Kwalident dental laboratory and especially Mr van der Made for their contribution.

Editorial note: A list of references is available from the publisher.