GC get connected 17

Your product and innovation update

2021

Since 1921
100 years of Quality in Dental

Contents

Dear readers

Welcome to the 17th edition of GC's Get Connected newsletter.

We are very pleased in this issue of GC Get Connected, to present you with a number of specifically selected cases in which both dentists and dental technicians have used GC products to return patients back to their carefree smile, reduce pain or correct aesthetic defects.

In reports from several users, you will discover G-aenial® A'CHORD, our new universal composite restorative material with only five core shades. Thanks to numerous material improvements it has been optimized for use in the anterior and posterior areas.

You can also experience the special advantages of Gradia® Core in a post-core build-up case. On one hand, the case shows the variety of indications of the product and on the other hand the combination of stability and high fluidity thanks to a pronounced thixotropic effect. The latter is just an example of the many GC products with sophisticated properties which make them easy to use.

This is undoubtedly also applicable to G-aenial® Universal Injectable. In this issue you can discover its use in a creative case where composite veneers are placed after an orthodontic treatment.

It is the special handling properties of GC products which always inspire dentists.
Freely adapted from J.W. von Goethe: "If you don't feel it, you will not chase it".

With this in mind, I remain, with warm regards
Yours,

André Rumphorst
General Manager Marketing & Product Management
GC Europe NV

Restoration of proximal caries lesions in the posterior area with tight proximal contacts

By **Dr. Radoslav Asparuhov,** Bulgaria

Dr. Radoslav Asparuhov *graduated with Honours from the Faculty of Dental Medicine of the Medical University in Sofia (Bulgaria) in 1998. He specializes in aesthetic dentistry and dentistry with Minimum Intervention in his own private practice in Sofia that he started in 1999. Since January 2003, he is a consultant for GC Europe NV.*

Direct posterior proximal restorations can be a real challenge for the dentist. With easy handling, good aesthetic properties and the proper operative techniques, it is possible to retrieve predictable and excellent results with posterior composites.

Case report

A 38-year-old female patient consulted the dental office because of food impaction and moderate pain when eating sweet or sour food. Upon clinical and radiographical examination, secondary caries was found on the proximal areas of tooth #16 (Fig. 1).

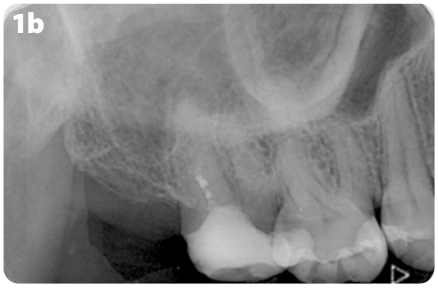


Fig. 1: Initial situation. **a)** Intraoral view, showing an MOD restoration with discoloured margins on tooth #16; **b)** Radiograph of the initial situation revealing secondary caries on tooth #16.

Fig. 2: After rubber dam isolation.

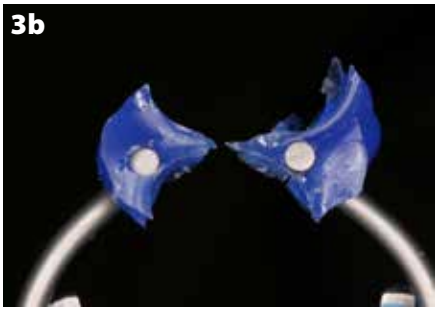


Fig. 3: a) Customising the ring tines to recreate the anatomy of the contact point. **b)** Close-up of the custom-made ring tines.

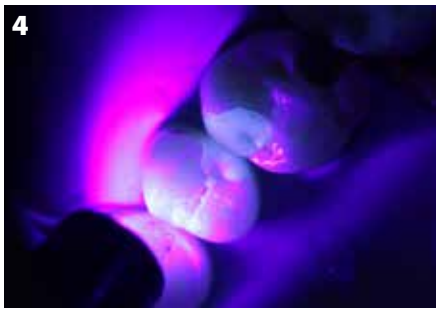


Fig. 4: D-light PRO in 'Detection mode' to distinguish composite from tooth tissue.

Fig. 5: Wooden wedges placed to separate the teeth and to improve the view on the cervical margin.

Fig. 6: a) After selective caries removal. Adjacent teeth were protected during sandblasting of the cavity with metal strips; **b)** After cavity preparation.

The tooth had a large MOD restoration with discoloured margins. The gingiva was healthy and the overall over oral hygiene was good. The tooth was isolated with rubber dam (Nic Tone Thick, MDC Dental; Fig. 2). As the mesial contact point was very nice, a custom separation system (myCustom ring, Polydentia) was used to recreate the interproximal anatomy (Fig. 3). During cavity preparation, the D-Light Pro (GC) was used in the Detection mode to verify the location of the composite (Fig. 4). Before the preparation wooden wedges were placed to separate the teeth, to move the papilla away and to have a better view on the cervical margin -so called pre-wedging (Fig. 5).

Once the majority of the inner part of the restoration was removed, the thin remaining composite surroundings loosened and could be easily removed. This way, unnecessary removal of healthy tooth tissue could be avoided. After selective caries tissue removal, the cavity was sandblasted with AquaCare Twin (Velopex) at 2 bars and from approx. 1 cm distance. To avoid iatrogenic damage to the neighbouring teeth, metal strips were placed during the procedure (Fig. 6).

The contact points were built consecutively using separation rings (mesially: myCustom ring; distally: myRing forte, Polydentia), thin (25 µm) sectional matrices and wooden wedges to ensure a tight contact[1]. Wooden wedges expand with moisture, providing a better seal (Figs. 7-8).

Fig. 7a and 7b: Restoring the mesial contact point.
a) Selective enamel etching; **b)** After restoration of the mesial contact point.

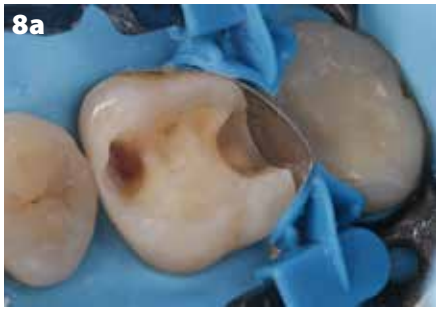


Fig. 8: Restoring the distal contact point.
a) Use of separation ring and sectional matrix; **b)** After restoration of the distal contact point.

Fig. 9: everX Flow was placed on the bottom of the cavity to reinforce the weakened tooth.

Fig. 10: a) Restoration before polishing. **b)** Restoration after polishing.

The enamel was etched selectively (Fig. 7a) and a universal bonding agent (G-Premio BOND, GC) was used[2]. The tooth was restored with G-ænial A'CHORD (GC) following a centripetal build-up technique. This composite has a high-viscosity consistency, which ensures tight proximal contacts[3]. Due to its thixotropic property, it adapts very well to the cavity and it is really easy to shape with sculpting instruments as well as brushes.

Moreover, G-ænial A'CHORD has an excellent mimicry and with one of the 5 core shades, the natural tooth colour can be matched easily. In this case, shade A2 was used. The proximal walls were built first, converting the Class II cavities into Class I cavity according to the Centripetal Build-Up technique[4]. Because of the extent of the cavity and the absence of both marginal ridges, it was chosen to reinforce the tooth by using the fibre-reinforced composite everX Flow (GC) as dentine replacement at the bottom of the cavity (Fig. 9)[5], which was covered with G ænial A'CHORD with cusp by cusp layering technique.

The restoration was quickly polished to high gloss with EVE DiacompPlus Twist Medium & Fine rubbers (EVE), with approx. 10000 rpm without pressure and followed by goat hair brush with Diapolisher paste (GC; particle size 1µm) (Fig. 10).

Fig. 11: Final result after removal of rubber dam.

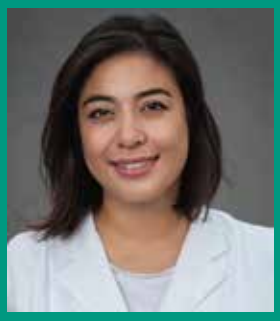
The final restoration showed good integration and tight proximal contacts. An adequate anatomical shape prevents food impaction and can be easily cleaned by the patient. Reliable materials with good mechanical properties and a good operative technique are important to obtain clinical longevity.

References

1. Loomans BA, Opdam NJ, Roeters FJ, Bronkhorst EM, Burgersdijk RC. Comparison of proximal contacts of Class II resin composite restorations in vitro. Oper Dent. 2006;31(6):688-93. doi: 10.2341/05-133.
2. Rosa WL, Piva E, Silva AF. Bond strength of universal adhesives: A systematic review and meta-analysis. J Dent. 2015 Jul;43(7):765-76. doi: 10.1016/j.jdent.2015.04.003.
3. Loomans BA, Opdam NJ, Roeters JF, Bronkhorst EM, Plasschaert AJ. Influence of composite resin consistency and placement technique on proximal contact tightness of Class II restorations. J Adhes Dent. 2006;8(5):305-10.
4. Bichacho N. The centripetal build-up for composite resin posterior restorations. Pract Periodontics Aesthet Dent. 1994 Apr;6(3):17-23.
5. Lassila L, Keulemans F, Säilynoja E, Vallittu PK, Garoushi S. Mechanical Properties and Fracture Behavior of Flowable Fiber Reinforced Composite Restorations. Dent Mater. 2018;34(4):598-606.

Diagnose and Therapy of Molar-Incisor-Hypomineralisation

Interview with **Dr. Dana Adyani-Fard**, Germany



Dr. Dana Adyani-Fard *graduated as a dentist at the Johann Wolfgang Goethe-Universität in Frankfurt am Main (Germany) in 2006. She has worked in several practices and has her own private practice since 2015. She is currently working as a consultant for several dental companies.*

How do you currently diagnose molar incisor hypomineralisation (MIH) in your practice? What are typical features of MIH?

Dr. Adyani-Fard: Currently, the diagnosis is made first clinically and by questioning for symptoms. Typical features are opacities with and without enamel defects, post-eruptive enamel breakdown and hypersensitivity.

What do you attach great importance to and what is important to consider in MIH therapy?

Dr. Adyani-Fard: Primary therapeutic goals are the pain control, the mitigation of hypersensitivity to cold and defect stabilisation in case of tooth substance loss in the enamel-dentine area.

Which forms of therapy do you currently use and which ones are successful?

Dr. Adyani-Fard: In practice, the pain is currently controlled by sealing with glass ionomer and a combined chairside application of high-dose CPP-ACP and fluoride preparations. For home use, the patient receives CPP-ACP and fluoride-based remineralisation pastes.

How often does MIH occur?

Dr. Adyani-Fard: The prevalence is increasing. About 24% of primary school children in Germany are affected. We also see an increased prevalence in our practice.

First publication by Quintessenz: Quintessenz Zahnmedizin 2019; 70(5) 2–3. Reprinted with permission.

How often do you recall the patients (and their parents)?

Dr. Adyani-Fard: Following the initial therapy, a follow-up check will be carried out, approximately 4 weeks after the initial presentation. Subsequently, controls are carried out as part of individual prophylaxis if there are no complaints or tooth breakdown.

Which recommendations do you have for your colleagues?

Dr. Adyani-Fard: It is advisable to start with remineralising preparations at an early stage, to seal them and not to treat lesions in the initial phase with composite. Glass ionomers help to control hypersensitivity quickly and efficiently.

How do you explain MIH to the parents?

Dr. Adyani-Fard: MIH is a systemic qualitative defect of the enamel. The etiology of this disease is not yet clear, and numerous pre-and postnatal influences are discussed. Evidence-based data and studies are not yet sufficiently available.

In your practice, what are the key elements for successful treatment of MIH and where do you see the limits?

Dr. Adyani-Fard: The focus is on the pain control of hypersensitivity by means of remineralising preparations and glass ionomer based sealants and a close monitoring of the defects. Important is the attempt of tooth preservation by early start of treatment to avoid extraction therapy.

Implant shape and immediate loading: the Aadva solutions

By Dr. **Matteo Basso** and **Dr. Arturo Dian**, Italy

Dr. Matteo BASSO, *DDS, PhD, MSc Dentist, PhD in oral implantology and implant-prosthetic rehabilitation, specialist in oral surgery. Adjunct Professor of the University of Milan for the courses of Ergonomics, Business Economics and Periodontology.*
He is actually the head of the Minimally Invasive, Aesthetic and Digital Oral Rehabilitation Center (CROMED) at the IRCCS Galeazzi Orthopedic Institute in Milan. Member of IADR, ORCA and TRAP-Active member. Founding member of the Minimum Intervention Treatment Plan Advisory Board.

Dr. Arturo DIAN, DDS
Dentist and university tutor of the dental clinic of the University of Milan at the IRCCS Galeazzi Orthopedic Institute of Milan.
He focuses his activity on digital, prosthetic and implant procedures.

Nowadays, immediate load rehabilitations are a very widespread practice in modern dentistry. Faced with the clinical need to proceed with the elimination of dental elements that are no longer maintainable, it is now possible to efficiently replace the teeth within a few hours of surgery, with a reduction in the discomfort and social difficulties of patients.
However, in order to prevent adverse events and complications in the early and later stage - cfr. the non-integration of titanium dental implants - immediate loading rehabilitation requires a very careful planning at the patient as well as at the implant and prosthetic materials level.

It is evident that the central issue to be observed during an immediate loading procedure is the creation of a good primary stability of the dental implant[1-3]. There is sufficient scientific evidence available to proof that the degree of primary stability achieved during immediate loading protocols depends on several factors: bone density and quality, surface design and characteristics, surgical technique and implant shape. Conical implants seem by far the ones that can most easily guarantee the achievement of primary stability[2-3]: on average they require a higher insertion torque than cylindrical implants, they allow to perform bone thickening and compaction on the osteotomy walls during their insertion and their shape allows them to be equipped with even quite large turns without considerably increasing the overall diameter of the implant and the need for bone volumes. According to some authors, the advantage given by the choice of a conical implant for primary stability is even higher than that given by the choice of the surgical technique[3].

CLINICAL CASE

A 78-year-old female patient requested an urgent treatment for the instability of a metal-ceramic prosthesis of the upper arch she received about 20 years earlier (Figure 1). Clinical and radiographic examination showed (Figure 2) that the abutments of many natural elements were fractured, carious and periodontal lesions were detected not allowing the dental elements of the upper arch to be retained. In addition, the panoramic X-ray showed 2 visible dental implants: a monobloc blade implant in position 24, which was mobile and surrounded by fibrous tissue, and a cylindrical implant with wide spires, with an internally cemented abutment, stable but not ideally positioned for an immediate loading procedure.
A CT scan of the upper dental arch was performed revealing a sufficient amount of bone for the All-on-4 rehabilitation technique with the placement of dental implants in site 15, 12, 22. In site 25 the placement of a fourth implant was planned. Nevertheless, a guided bone regeneration (GBR) had to be planned because of a fibrous lesion due to the loss of the integration of the previous blade implant. On top, the preservation of the old implant in position 23, to still allow an immediate loading procedure without loading the implant 25, was not possible in this case as a good primary stability of this new implant could not be guaranteed. Before the intervention, alginate impressions were taken to create a surgical guide to also be used as a support to register the vertical height. In order to reduce the risk of passage of periodontal pathogenic bacteria in the blood, the patient was then

Fig. 1: Initial situation. The bridge in the upper arch is mobile and can no longer be recovered due to the breaking of numerous abutments.

Fig. 2: Initial panoramic radiography. The presence of 2 old-type implants is noted in the second quadrant, with a peri-implant lesion extended on the 25-blade implant.

Fig. 3: Extraction of the natural dental elements in the upper arch.

Fig. 4: Opening of a flap from 16 to 26 and removal of the odontogenic cystic lesions with contextual osteoplasty.

Fig. 5: Elimination of the blade implant in position 25, which was mobile and lacking in osseointegration.

Fig. 6: Appearance of the blade implant and attached peri-implant cyst.

prescribed with antibiotic and prophylactic antiseptic therapy with amoxicillin + clavulanic acid tablets 1g every 12 hours for 6 days, starting the night before (Augmentin, GSK, Great Britain) and with chlorhexidine 0.20% with anti-pigmentation system and Sodium-DNA rinsing every 12 hours for 14 days, starting 3 days before (Curasept ADS-DNA, Curasept SpA, Italy). On the day of surgery, under conscious sedation, opper teeth were extracted (Figure 3) and a full-thickness flap from 16 to 26 was opened (Figure 4). In region 25, the mobility of the blade implant was immediately evident and could easily be removed by levering distal to it (Figure 5), eliminating the massive cystic lesion that extended to the adjacent mesial implant (Figures 6 and 7). The implants selected for the patient's rehabilitation were 4 Aadva Tapered implants (GC TECH, Germany) with a diameter of 4.0 mm and a length of 14 mm, with a conometric connection. The 2 anterior implants were then inserted (Figure 8) with subsequent insertion of the abutments (Figure 9) and the inclined implant in position 15 (Figure 10) with the SR abutment

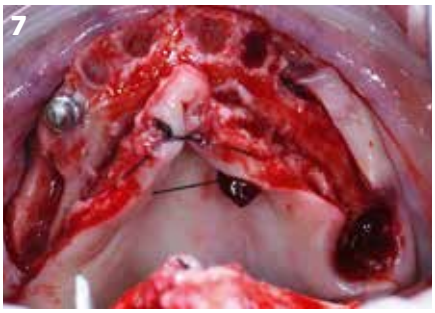


Fig. 7: Appearance of the upper arch after osteoplasty, removal of cysts and curettage of the alveoli.

Fig. 8: Insertion of the Aadva tapered implants in orthogonal position 12 and 22.

Fig. 9: Insertion of the straight Aadva SR abutments on implants 12 and 22.

Fig. 10: Insertion of the tilted implant in place 15. The bone volume appears sufficient.

angled at 30 ° (Figure 11).
Subsequently, the last implant was inserted in site 25.
Surprisingly, despite the large cystic lesion after the removal of the blade, it was possible to insert the implant with a torque of 50 Newton (Figures 12 and 13).
Decision was taken not to keep the old implant on site 23 and to remove it during the procedure.
A guided bone regeneration of the area of 25 with deproteinized bovine bone (Bio Oss, Geistlich) and resorbable collagen membrane (BioGide, Gestlich) was therefore performed (Figures 14, 15, 16).

Fig. 11: Application and verification of the orientation of the 30 ° SR inclined abutment.

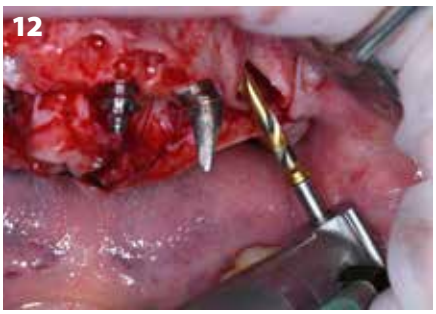


Fig. 12: Preparation of the implant site of 25. The site coincides with the osteolytic area linked to the presence of the previous blade implant and the bone volume appears reduced.

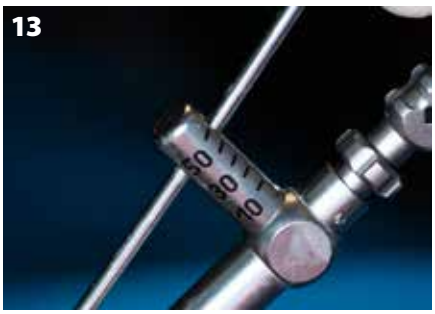


Fig. 13: Despite the reduced bone volume, the conical implant allowed an insertion torque of 50 N.

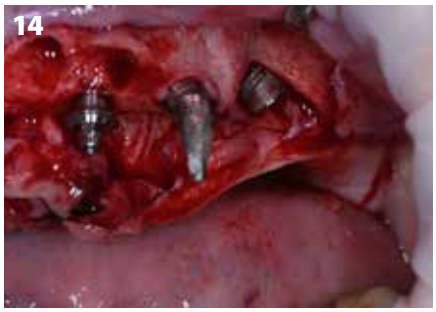


Fig. 14: The implant on 25 position is not fully inserted as planned in the preoperative planning and guided bone regeneration was required in the crest area.

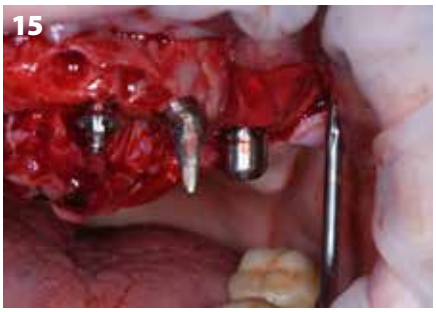


Fig. 15: Application of the 30° SR abutment, the healing screw and the bone graft covered by a reabsorbable bovine collagen membrane.

Fig. 16: Elimination of the implant in position 23, which was useless for temporary rehabilitation due to the high primary stability of the new implant in site 25.

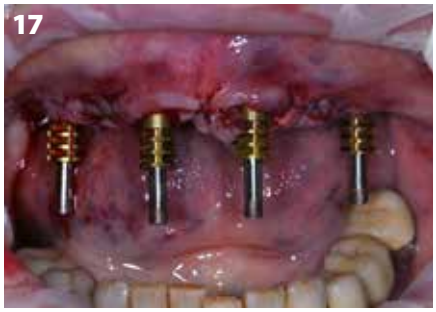


Fig. 17: Positioning of the coping transfers for open tray technique for taking the silicone impression.

Fig. 18: Application of the special healing screws on the SR abutments for the discharge of the patient pending the fabrication of the temporary prosthesis.

Fig. 19: Provisional prosthesis, front view. In agreement with the patient, no pink gingival compensations were inserted.

Resorbable suture (Vycril 5/0, Ethicon, US) was placed and a polyvinylsiloxane impression was taken (Figure 17).

After application of the protective cap on the SR Abutments (Figure 18), the patient was discharged.

The following day, as requested by the patient, a reinforced resin prosthesis without a pink resin part (Figures 19 and 20) with a correct prosthetic emergency for conditioning the tissues in the healing phase (Figures 21, 22 and 23) was delivered.

The screws were tightened to 15 Newton and the access holes were temporarily sealed with impression silicone to facilitate removal of the prosthesis, if required during follow-up. The final radiograph showed a correct fit of the prosthesis on the SR prosthetic abutments (Figure 24).

Fig. 20: Provisional prosthesis, occlusal view. Note the correct emergence of the path of the connecting screws, which also allowed the insertion of the first molars for the reduced distal cantilever.

Fig. 21: Appearance of the mucous membranes 24 hours after surgery. There is edema and swelling, which may require the execution of anesthesia for the placement of the temporary prosthesis.

Fig. 22: View of the temporary prosthesis in position: note the absence of ischemia or excessive compression of the tissues traumatized by surgery.

Fig. 23: Soft tissue conditioning is important especially at the level of the aesthetic area.

Fig. 24: Final x-ray after placement of the provisional upper prosthesis showing the correct coupling of the prosthetic connections and the correct and symmetrical positioning of the implants.

Fig. 25: Aspect of the soft tissues, 7 days after immediate loading.

Final remarks

The use of AADVA tapered implants with internal conometric connection allowed a correct positioning according to the All-on-4 immediate loading rehabilitation technique. The particular conical shape of the implants and the aggressive wide pitch thread allowed a high primary stability even at implant site 25, where the volume and the quality of the bone were not ideal compared to other implant sites. This means that the particular shape and design of AADVA tapered implants, when positioned in an area without a satisfactory bone volume, can facilitate immediate loading, eventually contextual to a regenerative procedure, since it guarantees optimal primary stability. As a final consideration, the particular shape of the conometric connection with platform switching[4] can also be particularly advantageous in the early healing phases of an immediate loading for both soft and hard tissues.

Bibliography

1. Valente ML, de Castro DT, Shimano AC, Lepri CP, dos Reis AC. Analysis of the influence of implant shape on primary stability using the correlation of multiple methods. Clin Oral Investig. 2015 Nov;19(8):1861-6.
2. Karl M, Grobecker-Karl T. Effect of bone quality, implant design, and surgical technique on primary implant stability. Quintessence Int. 2018 Jan 22:189-198.
3. Elias CN, Rocha FA, Nascimento AL, Coelho PG. Influence of implant shape, surface morphology, surgical technique and bone quality on the primary stability of dental implants. J Mech Behav Biomed Mater. 2012 Dec;16:169-80.
4. Macedo JP, Pereira J, Vahey BR, Henriques B, Benfatti CAM, Magini RS, López-López J, Souza JCM. Morse taper dental implants and platform switching: The new paradigm in oral implantology. Eur J Dent. 2016 Jan-Mar;10(1):148-154.

Injectable technique- lateral incisors reshaping after orthodontic treatment

Dr Milos Ljubicic, *prosthodontic resident at Clinic for Prosthodontics, School of Dental Medicine, University of Belgrade, Serbia. Winner of Dental Photography Competition at IDS 2019 in Cologne, and the ESCD dental photography competition, St. Petersburg 2019.*

Dr Marija Zivkovic, *orthodontic specialist, PhD. Associate Teacher at Clinic for Orthodontics, School of Dental Medicine, University of Belgrade, Serbia. Passionate about both scientific and clinical work in orthodontics and general dentistry.*

By **Dr. Milos Ljubicic** and Dr. Marija Zivkovic, Serbia.

The patient, a 17 years old girl, came to the dental office with the aim of improving the aesthetics of her smile. Her main complaint related to prominent mandible, (in front and profile) and small lateral incisors (figures 1a and 1b).

Fig. 1a: Initial situation (Front)

Cephalometric analysis showed decreased value of ANB angle, retrognathic maxilla (decreased SNA angle) and slightly proclined upper and lower incisors. Based on clinical features, model and cephalometric analysis, an orthodontic treatment plan was made. Treatment objectives were to obtain normal overjet and

Fig. 1b: Initial situation (Right and left profile)

overbite and stable static and functional occlusion. The orthodontic treatment included fixed appliances in both upper and lower dental arch, interproximal reduction in frontal region of lower dental arch, followed by class III intermaxillary elastics which aid in lower incisor retraction and molar correction (figure 2a).

Space for normal-sized upper lateral incisors was needed because they were planned to be reshaped after orthodontic treatment.
Orthodontic treatment was finished after 16 months. The patient was satisfied with her new smile, but she wanted to improve even further her upper lateral incisors which she found small. Since she wanted to avoid prosthodontic solutions, she asked for the best non-invasive option with the natural aesthetic result (figure 2b).

Composite veneers are a great way for closing spaces between teeth, since they are perfectly suitable for minor aesthetic interventions in situations with minimal functional stress. Especially if the ideal position of the teeth is set after orthodontic treatment, high levels of aesthetic can be achieved.

To achieve excellent results, an adequate design of the restoration is needed. Impressions were taken, and CDT Vladimir Veselinovic designed the future shape of lateral incisors (figure 3a) and made a wax-up (figure 3b).

Fig. 2a: Brackets on upper and lower teeth

Fig. 2b: Final result after orthodontic treatment

Fig. 3a: Design made by CDT Vladimir Veselinovic

Fig. 3b: Wax-up

Based on the wax-up, a transparent silicone key was made using EXACLEAR (GC), a clear vinyl polysiloxane material.

The impression tray was prepared with silicone stoppers in the posterior region so that the clear silicone thickness would remain the same in every section of the transparent silicone key (figure 4)

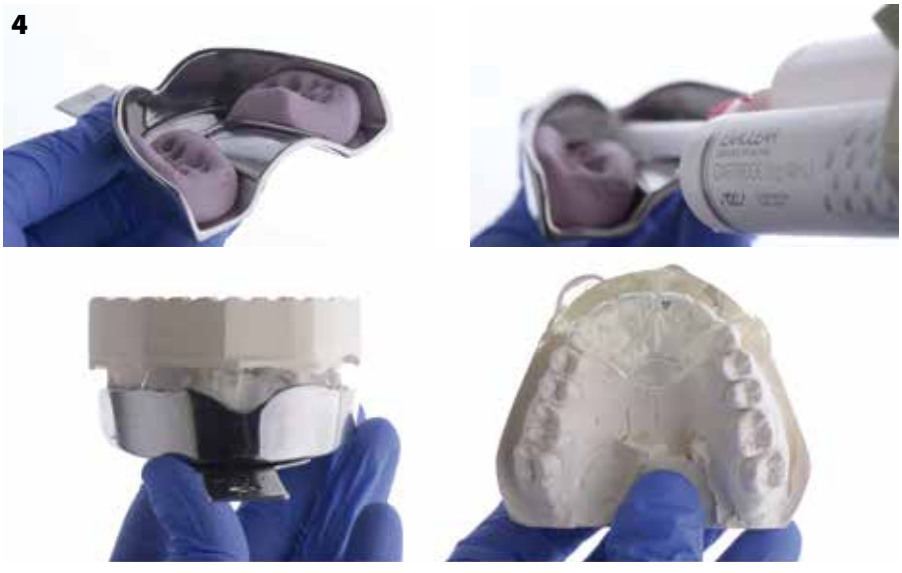


Fig. 4: Confection of the transparent silicone key

Injection channels were created using the syringe tip, ending at the incisal edge so the composite sprue could be easily removed without altering the shape of the restoration (figure 5).

Fig. 5: Injection channels made with the tip of the G-ænial® Universal Injectable syringe (GC)

Another silicone key using a putty material was made based on the wax-up model and cut in 2 parts (buccal and lingual), to check the necessary space for the restorative material (figure 6).

Fig. 6: Silicone index to guide the tooth preparations if necessary

The color of the teeth should be determined at the very beginning of the intervention, after they are cleaned and polished, but before the enamel becomes dehydrated.
The right color was done by placing a small amount of composite on the buccal surface of the teeth to be restored (button technique) and the A1 shade was selected for this patient.
The photos of composite buttons with cross-polarization filters were taken for more accurate color determination (figures 7a and 7b).

Figs 7a and **b:** Shade selection using the "button technique" checked under cross-polarization filters

The silicone key was positioned to check the amount of tooth substrate needed to be removed from tooth 22 to have the same thickness of composite material on both lateral incisors. Tooth 22 was prepared using fine red bur and the putty silicone key was used to check the tooth preparation (figure 8).

Fig. 8: Guidance of the silicone index for the preparations

Retraction cord was placed in subgingival space (figure 9a) and the transparent silicone key was positioned on the teeth to check if everything was positioned, like on the wax-up model (figure 9b).

The results with injection moulding technique are predictable, highly aesthetic and the technique is cost- and time-effective.
The composite material chosen for this intervention was G-ænial Universal Injectable (GC) as it has excellent physical properties and wear resistance.

The teeth were separated and isolated from the adjacent teeth using teflon tape as the use of rubber dam makes more difficult the fitting of the transparent silicone key.

The injections were done one tooth at a time, to avoid the teeth to be bonded to each other.
The teeth were etched with 37% phosphoric acid, rinsed and dried leaving a frosty surface.
The universal adhesive G-Premio BOND (GC) was applied according to manufacturer's instructions (figure 10).

The transparent silicone key was positioned and G-ænial Universal Injectable (GC) was injected and light-cured (figure 11).

After removing the silicone key, a sharp blade was used to remove the excess of composite material (figure 12a) and a glycerin gel was applied (figure 12b).

Fig. 9: The importance to check the fitting of the transparent silicone key

Fig. 10: Etching with 37% phosphoric acid and bonding with G-Premio BOND (GC)

Fig. 11: G-ænial Universal Injectable (GC) being injected through the injection channels

Fig. 12a: Excess removal

Fig. 12b: Glycerin gel to minimize the oxygen inhibation layer

By polymerizing through a glycerin gel for 5 sec. per surface an oxygen-inhibited layer can be avoided.

However, complete polymerization through the silicone key itself should provide the same result.

The same procedure was repeated for the other lateral incisor.

After this minimally invasive restorative treatment was finished, new clear thermoplastic retainers were made to prevent changes in tooth alignment after the orthodontic treatment (figures 13a and 13b).

With injectable technique we achieved highly aesthetic results, improving patient's confidence and self-esteem (figure 14).

Fig. 13a: Aesthetic improvement of the smile

Fig. 13 b: Open mouth showing the color and shape integration of the restorations

Fig. 14: Light behaviour on the composites matching with the natural teeth

Dr Anthony Mak *graduated with multiple awards from the University of Sydney in 2002 and completed his Post Graduate Diploma in Clinical Dentistry (Oral Implants). Anthony is the author of two compelling compendiums and has published numerous articles for known dental bodies and associations. Anthony's interest lies in dental technologies, advances in materials and techniques specially CAD/CAM digital dentistry. Anthony runs two practices in metropolitan Sydney, focusing on quality modern comprehensive care, including aesthetic and implant dentistry and is a key opinion leader for several global dental companies. He also sits on the Restorative Advisory Board for GC Europe, the Executive planning committee for the Graduate Diploma in Implant Dentistry (Sydney University), an executive committee member for the Dental Alumni of the University of Sydney, and is the team leader in Australia for the BioEmulation Group.*

Dr Andrew Chio *completed his dental degree from the University of Melbourne in 1995 where he graduated at the top of his year and was awarded with several awards for clinical achievement. While practicing dentistry predominantly in a private setting, Dr Chio has also previously worked in the public system, participated in clinical programs with the Royal Flying Doctors and worked in a rural hospital in Nepal, giving him a wide perspective of the demands and challenges of general dentistry. Dr Chio maintains an active role in dental education through his involvement with university undergraduate programs (La Trobe University) and his involvement in various Continuing Education Programs. He has published articles in restorative dentistry in various dental publications as well as in peer-reviewed journals.*

Class IV restoration
with direct composite resin:
A case study utilising the layering-stratification technique with the G-ænial A'CHORD composite system

By **Dr. Anthony Mak and Dr. Andrew Chio**, Australia

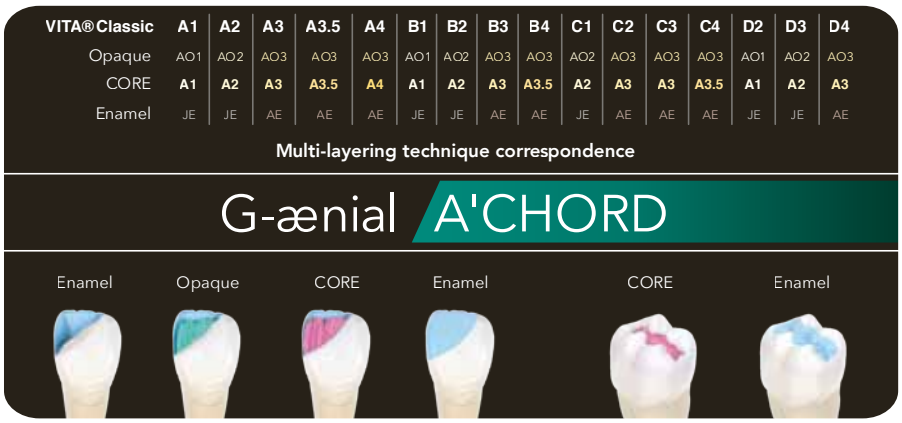
The concept of layering or stratification of direct composite restorations utilises the combination of optical properties from the different resin layers with the aim of emulating the natural colour, characteristics and translucency of the natural dentition.

Progressive improvements in composite resin technologies have led to the simplification of this treatment procedure that is commonly perceived as complex. However, difficulties exist in mimicking the remaining tooth structure when restoring teeth in the anterior segment of the dentition because of the variety of shades, chroma, and translucency levels of many current composite resin systems.

The G-ænial A'CHORD represents the evolution of the highly successful G-ænial system that has been utilised in dental practices throughout the world for the past 10 years. Compared to its predecessor, the G-ænial A'CHORD system provides an upgrade from the original G-ænial system in the following aspects:

- Beautiful and harmonious under any light with a natural fluorescence.
- Optimal handling properties allowing for the material to be easily sculpted with conventional composite manipulation instruments or brushed with restorative brushes.

- The Full-Coverage Silane Coating (FSC) technology that covers the nano-fillers with silane coupling agent leads to high polish and gloss with only a few steps.
- The incorporation of additional opaque and enamel shades allows an infinite range of opacity and value possibilities.
- Simplification with 5 CORE shades which covers all 16 Vita shades.



CASE REPORT

The following case study demonstrates the use of the G-ænial A'CHORD (GC Europe) direct composite system in the restoration of a complex class IV in a 22-year old female patient. The patient presented to the practice relaying her dissatisfaction of an existing restoration on her upper left central incisor (FDI tooth 21). She requested its replacement with a new restoration that was conservative and "invisible" when she smiled or engaged in normal conversation. She also relayed that the existing class IV restoration had been done 4 times by her previous dentist without an outcome or result that was satisfactory to her.

Clinical examination revealed a high smile-line with a symmetrical and aesthetic gingival architecture. The existing composite restoration on the tooth 21, while clinically acceptable, did not integrate with the shade of the tooth and to the other teeth in her dentition. The discolouration and minor ledging on the disto-labial aspect of the existing restoration also indicated the likelihood of marginal leakage in the region.

The pre-operative colour assessment showed that the upper left central incisor (21) was slightly more chromatic than the adjacent upper right central incisor (11). The upper left central incisor (21) also exhibited a very slight labial displacement in its alignment compared to the adjacent right central incisor (11).

The patient's health history was unremarkable.
Radiographic and periodontal examination showed that the tooth 21 demonstrated no pathology or issues requiring intervention prior to the commencement of the restoration. The 21 exhibited a normal response when the vitality was thermally tested.

The treatment options were discussed with the patient and the advantages and disadvantages of each of the options were carefully identified. The options presented were:

1) A single reductive ceramic veneer on tooth 21.
2) A full surface composite veneer on tooth 21. The patient was advised that due to the slight labial displacement of tooth 21, a very small labial reduction would be required to allow the space to mask the chromatic dentine.
3) A conservative complex class IV on the tooth 21 to be completed additively to minimise any preparation and reduction of the natural tooth structure.

She preferred the conservative approach to her treatment involving an additive protocol (option 3). She relayed that she would be happy with a harmonious composite restoration on tooth 21 and did not feel that the slightly chromatic upper left central (21) would be an aesthetic concern for her.

From the clinician's perspective, final plan and goal of the treatment was to restore the tooth 21 with a durable and long-lasting conservative direct composite restoration with a final result that is biomimetic with optimal aesthetic and morphological integration with her existing natural dentition.

STEP BY STEP

Prior to the commencement of the restorative process, diagnostic images and the selection of the estimated shade was completed. Diagnostic impressions were also taken to allow the fabrication of silicone palatal stent or matrix that would facilitate the three-dimensional blueprint for the layering of the composite increments.

Figure 1: Pre-Operative unretracted view illustrating the unaesthetic and failing direct composite restoration on the upper left central incisor (tooth 21).

Figure 2: Pre-Operative Retracted a) with regular flash b) with Polarized filter.

Figure 3: The working field was isolated with the use of the rubber dam. The existing restoration and caries was removed and a 2 mm bevel prepared on the labial margin of the preparation to facilitate the aesthetic and functional integration of the restoration to the remaining natural tooth structure.

Figure 4: The bevel was prepared and finished with a tapered diamond bur (Komet 6862.314.012 and 8862.314.012). All the transition angles of the cavity were rounded with an oval or egg-shaped polishing diamond bur (Komet 8379.314.023). The burs form part of the "Dr Anthony Mak Custom C&B Selection" Kit from Komet Dental.

Figure 5: The palatal stent was trimmed and tried-in to verify the fit of the silicone matrix and to ensure the absence of any interferences to its seating from the rubber dam and clamps.

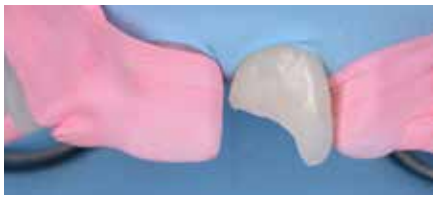


Figure 6: The cavity was lightly air abraded with a 29-micron aluminium oxide powder AquaCare (Velopex) prior to the adhesive procedure and Teflon (PTFE) tape was utilised to prevent the inadvertent bonding to the adjacent teeth.

Figure 7: The adhesive procedure commenced with the with the cavity selectively etched with 37% phosphoric acid gel Ultra-Etch (Ultradent). The etching gel was rinsed away and the adhesive protocol was completed by the application of a universal bonding agent, G-Premio BOND (GC Europe). The universal bonding agent was then air dried for 5 seconds with maximum air pressure and light-cured for 10 seconds according to the manufacturer's instructions.

Figure 8: Following the adhesive protocol, a thin layer of semi-translucent enamel, G-ænial A'CHORD shade JE (GC Europe), was used to create the palatal shell.

Figure 9: The interproximal wall was then completed utilising the same semi-translucent enamel shade, G-ænial A'CHORD shade JE (GC Europe). The interproximal wall was formed with the use of a plastic myeloid strip and pull through technique to help developing an anatomical contour.

Figure 10: The dentine layer was then completed by the application of an opaque shade, G-ænial A'CHORD shade AO2 (GC Europe). This increment was shaped to emulate the extensions of natural dentine core morphology and was extended just slightly short the prepared bevel. The dentine or opaque shade provides the correct opacity to the final restoration.

Figure 11: A chromatic body shade, G-ænial A'CHORD shade A2 (GC Europe) was then applied and extended beyond the bevel to mask the transition line. Internal anatomy (i.e. mamelons) in the incisal third was also sculped and formed in this increment of composite resin.

Figure 12: White tints, Essentia White Modifier (WM) (GC Europe) was utilised to accentuate the mamelons and to replicate the similar characteristics and features present in the adjacent right central incisor (tooth 11). Comparisons to the polarised diagnostic images taken prior to commencement of the restoration provided a reference for the incorporation of these internal features.

Figure 13: A final translucent shade of G-ænial A'CHORD shade JE (GC Europe) was then layered to bring the anatomy to full contour and to achieve a natural optical blending effect.

Figure 14 a, b: Glycerine gel was then applied over the buccal surface of the restoration and light-cured to maximise the polymerisation of the layered direct composite restoration due to the absence of the oxygen-inhibition layer.

Figure 15: The restoration was then polished and finished to incorporate the primary, secondary and tertiary anatomy with the aim to produce a life-like restoration that mirrored the adjacent right central incisor (tooth 11).

Figure 16: The polishing and finishing protocol employed the use of abrasive discs (Soflex; 3M-ESPE), polishing diamond burs (Komet), followed a graded sequence of silicone polishers and finishers (Astropol; Ivoclar-Vivadent). The restoration was then completed using a Diapolisher paste (GC Europe) on a felt-buff (Flexi-Buff; Cosmedent Inc) to recreate the gloss of natural enamel.

Figure 17: Immediate post-operative (Unretracted). The finished and polished G-ænial A'CHORD (GC Europe) restoration demonstrates the morphological and optical aesthetic integration of the completed restoration to the existing natural dentition.

Figure 19: 2-week review demonstrating the complete optical and functional G-ænial A'CHORD restoration on the tooth 21.

Figure 20: 2-week review demonstrating the complete optical and functional G-ænial A'CHORD on the tooth 21.

Figure 18: Immediate post-operative (Retracted)
a) regular flash
b) polarised filter

CONCLUSION

While developments in single shaded universal composite systems for the anterior dentition continue to improve and advance layering techniques for the placement of a truly aesthetic anterior direct composite restoration will always be necessary in the contemporary aesthetic dental practice. This is due to the intrinsic anatomy of the natural tooth where the emulation of the optical and morphological properties cannot be achieved by a single mass of restorative material. The G-ænial A'CHORD (GC Europe) composite system has a simplified approach to the shading/layering process while providing a final result that is truly biomimetic, aesthetic and long-lasting.

One-step post-and-core build-up of an endodontically treated tooth

By **Dr. Giancarlo Pongione**, Italy

Dr. Giancarlo Pongione *(Italy) obtained the degree of 'Doctor of Dental Medicine' at the University "Tor Vergata" in Rome (Italy) in 1991 and concluded his PhD on the biocompatibility of dental materials (University of Siena). In the past, he was a Visiting Professor at the University "La Sapienza" in Rome. He is an active member of the Bioemulation Group, the Italian Society of Endodontics (SIE) and the Italian society of restorative dentistry (SIDOC) and a certificate member of the European Society of Endodontology (ESE). He has authored more than 90 articles on endodontics and aesthetic dentistry and has lectured at numerous national and international congresses. Currently, he has private practices in Naples and Rome, specializing in "aesthetic adhesive restorations" and "endodontics".*

A 48-year-old patient came to our dental clinic because she wanted a more beautiful smile. The central incisors had a tooth size discrepancy because of incisal wear.

Tooth #21 had suffered a trauma in the past and had been treated with a PFM crown that did not match the adjacent teeth (Fig. 1).

Radiographic examination of that tooth showed that the root canal was slightly underfilled and a persistent

Fig. 1: Initial situation. a) intraoral view; b) extraoral view.

Fig. 2: Radiograph of initial situation; a persistent apical radiolucency and slightly underfilled root canal can be seen on tooth #21.

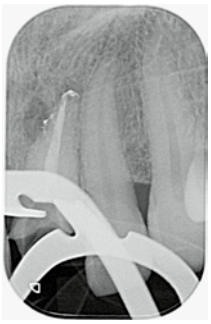


Fig. 3: Radiograph after endodontic retreatment of tooth #21.

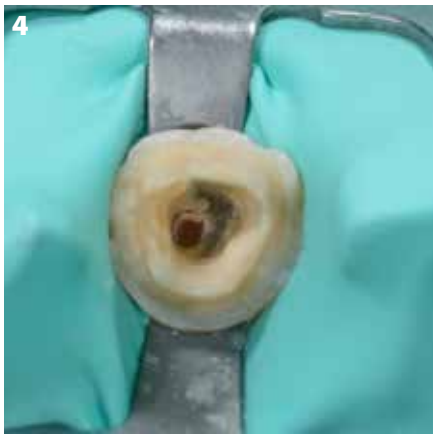


Fig. 4: Coronal view before post insertion.

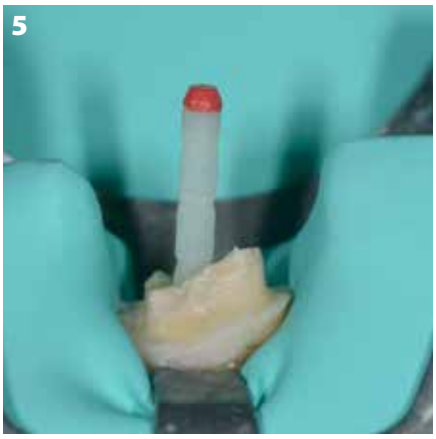


Fig. 5: Fit of the glass fibre post.

Fig. 6: After core build-up.

Fig. 7: After preparation of tooth #11 and #21 for a veneer and crown, respectively.

apical radiolucency was present (Fig. 2). The decision was taken to do an endodontic retreatment (Fig. 3) and restore tooth #21 with a glass fibre post, core build-up and crown. A veneer on tooth #11 was planned as well, to correct the shape and maintain symmetry.

For the post and core build-up, GRADIA® CORE (GC) was chosen. When the post space was prepared, an apical seal of 5 mm was left (Figs 3 and 4).[1]
The reason why GRADIA CORE (GC) was chosen is that it is a dual-cure composite that can be used as luting cement as well as for core build-up. Because of the thixotropy of the material, it easily retains its shape during the build-up. However, during the fiber glass post insertion (Fig. 5), sheer thinning occurs, which makes the material more fluid and easily adapted to the shape of the rooth canal.

The universal adhesive G-Premio BOND was used in conjunction with GRADIA CORE. Prior to its application inside the root calan, it was mixed with the dual cure activator (G-Premio BOND DCA) to ensure proper curing over the entire depth.

After the build-up, both central incisors were prepared (Figs. 6-7) to be treated with lithium disilicate restorations (Fig. 8). The end result was aesthetically pleasing: the restorations were fully integrated in the surroundings and the patient was very satisfied with the appearance of her new smile (Fig. 9).

Fig. 8: Lithium disilicate restorations.

References

1. Abramovitz L, Lev R, Fuss Z, Metzger Z. The unpredictability of seal after post space preparation: a fluid transport study. J Endod. 2 001 Apr;27(4):292-5.

Acknowledgement

The author would like to thank MDT Roberto Della Neve for his diligent work.

Fig. 9: Result after treatment a) intraoral view b) and c) extraoral view

Conclusion: A post-and-core build-up often comprises a multitude of treatment steps. With GRADIA CORE, the luting and build-up material can be done with one material, which simplifies the procedure considerably and minimizes treatment errors, as all steps and components are optimally adjusted to each other.

Bob Bosman Elst *graduated in 1991 as a dental technician. While working at his own independent dental lab in Belgium, he has continuously been working on expansion and developing innovative techniques for the dental industry. Over the years, He has participated in more than 40 master-courses including those from Brüsch, Tyszko, Calgaro, Adolfi, Galle, Hegenbarth, Sieber, Polansky and many more, either as a lecturer or as an active participant. His work has been recognized by many in the field. In 2007, Bob won the '3rd Prize worldwide' (in the category 'Young Ceramics') during the world tour of Nobel Biocare in Las Vegas. He came in as the 1st European of all participants of this highly reputable event. He set up a helpdesk for dentists covering all aspects on implant-supported restorations and porcelain. In 2017, he became a trainer of the GC Europe Campus, where he found a perfect forum to share his passion and experience.*

Marco Tudts *graduated as a dentist at KULeuven (Belgium) in 1991. He completed his Postgraduate in Aesthetic and Prosthetic Dentistry in 1994. For 12 years, he was a part-time associate at KULeuven with complex rehabilitations as his major research topic and participated to various multicenter studies. In 1996, he started a multidisciplinary private practice, specialised in complex rehabilitations, which he is still running to date. In 2004, he obtained a Master of Science in Dentistry Implantology at NY Montefiore Medical Centre (USA). In 2008, he opened a Look-over-Shoulder Training Facility for dentists focusing on implantology, 3D technology, CAD/CAM and 3D guided surgery. He is the founder of the BIOMET 3D Guided Navigator©system. Since 2015, he is a staff member at the Department of Periodontology and Implantology at UGent. Here, he is currently preparing his PhD dissertation on 3D guided surgery under the promotership of Prof. H. De Bruyn.*

Full Digital workflow with a twist

Drs. Marco Tudts and **CDT Bob Elst**, Belgium

A male 61-year-old patient was suffering from severe wear, which can be classified as attrition, abrasion and erosion depending on its cause. The entire smile line was lost and even became negative (Fig. 1). The patient was a real extravert smiling person, hence a new nice smile would impact his future social life. The destructive wear of his teeth caused already several endodontic treatments and TMJ dysfunction caused by the loss of the vertical dimension with caused tense and tired muscles.

Fig. 1: Smile before treatment.

Severe tooth wear caused morphological change of occlusal tooth, decrease of vertical dimension, pulp pathology, occlusal disharmony and change the masticatory function. In this condition, more complex therapies are needed such as endodontics, periodontics, and full coronal coverage.

A digital impression was made and the master model was printed. A digital wax-up/mock-up was made in Exocad, using the 'Digital Smile Creator' module. A standard length of 10.8 mm and width of 8.4 mm was used like described by Mauro Fradeani. This set-up was for this patient's biotype a really nice starting point. The idea was to verify the integration because the vertical dimension had to be increased with several mm and the patient wanted to rejuvenate his smile inconspicuously, so as natural as possible in addition to all the comfort of a balanced occlusion.

Fig. 2: Mock-up (GC Temp PRINT) in the mouth.

This digital wax-up/mock-up was printed with GC Temp PRINT as veneers so that it could be placed in front of the teeth (Fig. 2); a small support towards the palatal side was present so it could be placed over the natural dentition in a stable manner. This gave the possibility to evaluate the aesthetics but also the musculature response to the new occlusal height. The patient could also take this printed wax-up back home. This gave the patient the opportunity to show it to his partner but also to check it for himself in his own private space and without any pressure from time or strangers. Starting a remodulation of somebodies smile is something really drastic so the patient should be given as much time as he needs with all possible tools.

Fig. 3a: Printed temporary restorations relined with G-ænial Universal Injectable.

Fig. 3b: Temporary restorations in the mouth after relining with G-ænial Universal Injectable.

After patient's consent to proceed with the treatment plan, the veneers were adapted in Exocad and printed again as temporary crowns (GC Temp PRINT, Light shade). These crowns were relined with G-ænial Universal Injectable composite (Fig. 3a), shade A2 and manually polished. Optionally, they could have been glazed with OPTIGLAZE color. The cervical border was kept sandblasted (50 µm is sufficient) so that it could easily be connected to the G-ænial Universal Injectable composite. Then, only the relined part had to be polished again (Fig. 3b).

The vertical dimension was increased with 8 mm. To ensure that this would be comfortable for the patient, 3 months were taken to revise the situation. The patient was not suffering any headaches, muscle stress or any other problems. Hence, the first phase of the aesthetic adaptation was started. A small gingivectomy with bone correction was carried out first. An impression was made and long-term provisional restorations were manufactured in full zirconium. Those were characterised with Initial Lustre Pastes NF and cemented temporarily (Fig. 4).
A recall was planned after 3 months. This period also allowed the soft and

Fig. 4: Smile with temporary restorations in zirconia, characterised with Initial Lustre Pastes NF.

hard tissues to heal properly after the periodontal surgery.
Everything was ready to go and start with the definitive work. Due to a ski accident, the definitive impression needed to be postponed for another 3 months. This did not pose a problem because of the highly durable temporary restorations. For cases like this, the comfort of the patient is always the priority.

Hence, after 6 months, the definitive impressions were taken, both digitally and conventionally.
The conventional impression was used to create the master working model.

Fig. 5a: Putty key on the temps.

Fig. 5b: Putty key on the substructure.

Fig. 6a: Washfire: Initial Lustre Pastes NF.

Fig. 6b: Washfire: Initial Lustre Pastes NF, sprinkled with CL-F (anterior).

Fig. 6c: Washfire: Initial Lustre Pastes NF (posterior).

This was mostly out of familiarity with the procedure, with the creed "Murphy doesn't like our industry, never change a winning team". What gives our mind comfort, also will give the best possible end result. However, a digital impression could have been used as well.
For the substructure, multi-layered zirconia was used, shade A2. The design was a small adapted copy of the temporaries. A 0.4 mm buccal cut-back was done for the posteriors and the canines. For the 4 anteriors, a 0.6 mm cut-back was done and the incisal height was decreased for 0.4 mm.
To keep control of the horizontal line, a palatal putty of the temps was made, which could be used as a key during the ceramic build-up (Fig. 5).

The zirconia substructure was slightly adapted and went into the furnace for a regeneration fire.
Thereafter, the workflow continued with the washfire. After applying the Initial Lustre Pastes NF (Fig. 6a), the Initial CL-F (Clear Fluorescence) powder was sprinkled on top of the wet Initial Lustre Paste NF (Figs. 6b and 6c). This gave the opportunity to sandblast after the washfire without damaging the colour. Moreover, it is ensured that the colours won't slip down.

Zirconia does not absorb heat well; hence, the heating program should be carefully adjusted to avoid chippings. Our chipping problem is also a consequence of a bad adjustment of our heating programs. The bigger the zirconia volume, the slower the heating and cooling down should take place. In this case, the heating temperature was dropped to 30° per minute and the cooling down should have a similar timeflow. To keep it simple: the time to heat up should be more or less the same as the cooling down.
The part until the CL-F is the first layer. For the neck, IN-42 (Terracotta; 40%) was used with A2 (60%), then the main colour A2 (Fig. 7). After the full contour with DA2 (Dentin A2), the horizontal line was checked with the putty key (Fig. 8).

After the cutback, the mamelons were shaped. FD-91 (Fluo Dentin Light; 50%) with DA2 (50%), A1 and A1 (50%) with E58 (Enamel 50%) were alternated, as shown in Fig. 9.

Fig. 7: Creation of the neck.

Fig. 8: After the dentine, the horizontal line is checked with the putty key.

Fig. 9a: Mamelons and cervical: Green: 50% FD-91 + 50% DA2; Dark Pink: A1; Blue: 50% A1 + 50% E58.

Fig. 9b: The "enamel blocker" (50% A1 + 50% E58; blue) was also used on the cervical part.

In the cervical part, this mixture was also used. This mixture could be called an "enamel blocker"; it works as a softer transmitter of the colour. This mixture can also be used as a transition towards the enamel in the incisal third; however, in this case, it was used as a softer, lighter, cervical part. It's all about breaking the light with a chameleon effect inside the material.

If the mamelons have to "jump out" of the dentine, CL-F should be applied on top of the mamelons (Fig. 10). For "floating mamelons" a wall of CL-F is applied the cut-back, then the mamelons are created and then again a layer of CL-F. In this case, it was chosen to let them "jump out" of the dentine.

This first bake is the colour-fire (Fig. 11); if the colour is not chromatic enough or already too chromatic, it's easier to adapt in this phase. After applying the enamel, colours should not be adapted anymore because it will destroy the appearance and could become very greyish.

The enamel fire could be considered as the "morphology fire". For the enamel, a mixture of E58 with EI-14 (Enamel

Fig. 10: Central Incisor with CL-F.

Fig. 11: First bake/colour-fire with CL-F.

Intensive Yellow) and EOP Booster in three equal parts were used (Fig. 12). The program was exactly the same as for the colour-fire.

The correction-fire was done with the same mixture but diluted with a fourth part of CL-F. The temperature was dropped with 5°. In case another fire

Fig. 12: Enamel fire.

would be necessary, the temperature can be dropped with an extra 2°.

After finishing the structure, the crown was glazed with just some liquid, 50° lower than normal. The intention was to "close" the surface. After this fire, the crowns were hand polished with a mixture of pumice and 50 µm Al_2O_3 (Fig. 14).

Fig. 13 and b: Correction fire.

Fig. 14a: Restorations before polishing.

Fig. 14b: Restorations after polishing.

The preparations were cleaned and isolated with retraction cords (Fig. 15). The crowns were cemented with a resin-modified glass ionomer (Fuji PLUS Capsule, GC). The cement excess was easily removed when the rubbery state was reached and margins were polished.

Increasing the vertical dimension is often a challenging task. The temporization phase was used to evaluate the influence of the increase on the tempomandibular function. Aside from the function, restoring the vertical dimension also had a positive influence on the aesthetic appearance. After treatment, a better balance in the facial dimensions as well as a fuller, more youthful smile can be seen (Figs. 16, 17 and 18).

Fig. 15: Prepared teeth before luting.

Fig. 16: Final result in occlusal bite.

Fig. 17: Night guard to protect the restorations and periodontal tissues of the patient.

Fig. 18: Final result - portrait. Patient satisfied with the aesthetic and function of his new smile.

References:

1. Bettie NF, Kandasamy S, Prasad V. Management of Tooth Surface Loss of Varying Etiology with Full Mouth all Ceramic Computer-Aided Design/Computer-Aided Manufacture Restorations. J Pharm Bioallied Sci. 2017 Nov;9(Suppl 1):S302-S305.
2. Chu FC, Yip HK, Newsome PR, Chow TW, Smales RJ. Restorative management of the worn dentition: I. Aetiology and diagnosis. Dent Update. 2002 May;29(4):162-8.
3. Edelhoff D, Ahlers MO. Occlusal onlays as a modern treatment concept for the reconstruction of severely worn occlusal surfaces. Quintessence Int. 2018;49(7):521-533. doi: 10.3290/j.qi.a40482.
4. Fradeani M. Esthetic rehabilitation in fixed prosthodontics: Esthetic analysis: A systematic approach to prosthetic treatment. First Edit. Quintessence Publishing, 2004.
5. Green JI. Prevention and Management of Tooth Wear: The Role of Dental Technology. Prim Dent J. 2016 Aug 1;5(3):30-33.
6. Koubi S, Gurel G, Margossian P, Massihi R, Tassery H. A Simplified Approach for Restoration of Worn Dentition Using the Full Mock-up Concept: Clinical Case Reports. Int J Periodontics Restorative Dent. 2018 Mar/Apr;38(2):189-197.
7. Wetselaar P, Lobbezoo F. The tooth wear evaluation system: a modular clinical guideline for the diagnosis and management planning of worn dentitions. J Oral Rehabil. 2016 Jan;43(1):69-80.
8. Warreth A, Abuhijleh E, Almaghribi MA, Mahwal G, Ashawish A. Tooth surface loss: A review of literature. Saudi Dent J. 2020 Feb;32(2):53-60.

Dr.Alex Dagba *graduated from Paris V University Descartes (France) in 2009. After obtaining his DDS, he practiced in Paris for four years and completed several University Certificates (C.E.S) in Periodontology, Biomaterials and Fixed Prosthodontics. To improve his skills in Implant Dentistry he followed the New York University (NYU) Advanced Education in Implant Dentistry program for the years 2013-2015. The following year he became ICOI diplomate. His activities in Paris are now focused on implant dentistry and aesthetics. Since 2016, he is Chief Editor of the French Quintessence-International Implant Journal, "Titane".*

Dr. Romy Makhoul *graduated from Paris V University Descartes in 2012. She was a resident in Oral Surgery from 2012 to 2016 at Clermont Ferrand Faculty and is working at the Faculty of oral Surgery of University Lyon I since 2016. She is a member of the SFCO (French Society of Oral Surgery) and has a private practice in Paris, focusing on oral surgery, dermatology and implantology.*

Dr. Julien Mourlaas *graduated from Paris V University Descartes in 2011. After a few years as a general dentist, he enrolled the International Implant program at NYU. Back in France, he limited his practice in the field of Periodontology and Implant Dentistry with a special tropism for perioplastic surgery. Dr Julien Mourlaas is also involved in managing publications (co-Chief Editor at "Titane") and microsurgical training (Paroplastic).*

Single tooth replacement in the aesthetic zone: contribution of the socket preservation technique to a durable end result

By **Dr. Alex Dagba, Dr. Romy Makhoul** and **Dr. Julien Mourlaas**, France

Aesthetic restoration of anterior teeth with implant-supported restorations is one of the most difficult procedures to execute, in particular when deficiencies exist in the bone and soft tissues. Nowadays, implant survival rates are rather high, with reported rates over 95% after ten years.[1]

Hence, the focus in dental implantology has shifted from survival of the implant to soft tissue management, alveolar ridge preservation and obtaining an aesthetic end result. Complete reconstruction of tooth and gingival related aesthetics remains the primary objective and in some instances can be very difficult to achieve.

Case report

A 42-year-old female patient was referred to our clinic to have her tooth #21 replaced, which was painful and had slightly migrated coronally. She had a history of trauma from when she was a teenager. The patient had an average smile line with extrusion of tooth #21 (Fig. 1). The gingival biotype was reasonably thick associated with a pronounced scallop. A fistula with pus was related to the apex of the tooth. A CBCT was made to assess the bone thickness and to determine the alveolar shape and sagittal root position of the tooth (Figs. 2-3).

Fig. 1: Preoperative extraoral view: lips in rest **(a)**; smile **(b)**.

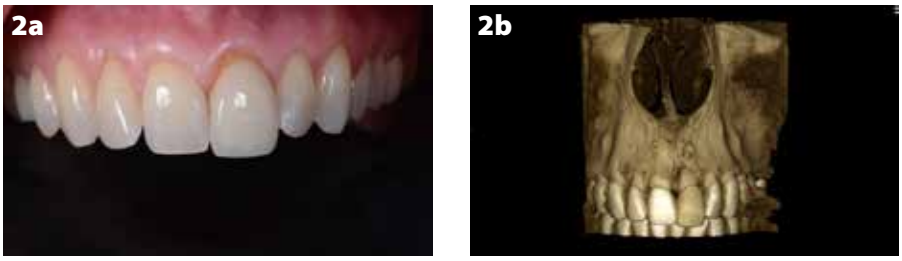


Fig. 2: Preoperative intraoral view **(a)**; 3D rendering from CBCT of the bony structures **(b)**. The periapical fenestration is clearly visible.

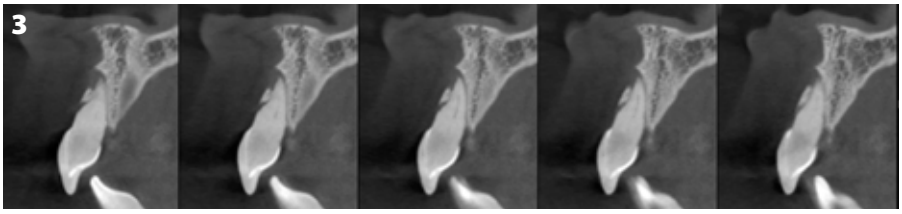


Fig. 3: CBCT sagittal view of tooth 21. Notice the buccal dehiscence.

The patient was primarily referred to an endodontist to assess the predictability of an endodontic treatment, but the prognosis of such an approach wasn't favourable. This was due to an important bone dehiscence buccally associated with a fenestration localised at the root apex. The intraocclusal space was narrow due to the deep overbite. Hence, it was decided to replace tooth #21 with an implant-supported crown, leaving the adjacent teeth in their current state.

Ideally, 2 mm of bone at the buccal side of the implant is considered necessary to ensure proper soft tissue support and to avoid gingival recession after treatment.

In this case, the soft tissues were well positioned: the tooth was extruded but no recession was present. The buccal bone was partially absent, corresponding to a socket type II according to Elian et al.[2]

Clinical protocol

The most difficult aspect in such a case is to maintain the soft tissue architecture and to keep the adjacent papillae. Because of the bone dehiscence, a socket preservation approach was chosen.

Surgical phase

Tooth #21 was atraumatically extracted using a periotome, following the periodontal ligament (Fig. 4) and stored

Fig. 4: Atraumatic extraction of tooth 21 using a blade in the sulcus.

in an isotone saline solution to be used as a provisional restoration in the second treatment phase. The goal was to preserve the surrounding tissue as much as possible and to limit any further bone resorption.

The socket was filled with allograft particles (Phenix, TBF; Fig. 5), gently packed and covered with an L-PRF membrane to protect the socket graft (Fig. 6). The role of the L-PRF membrane is that case is essentially mechanical, to avoid any eventual dispersion of the graft material in the early stage of the healing until a stable blood clot occurs. No tissue graft harvest was needed.

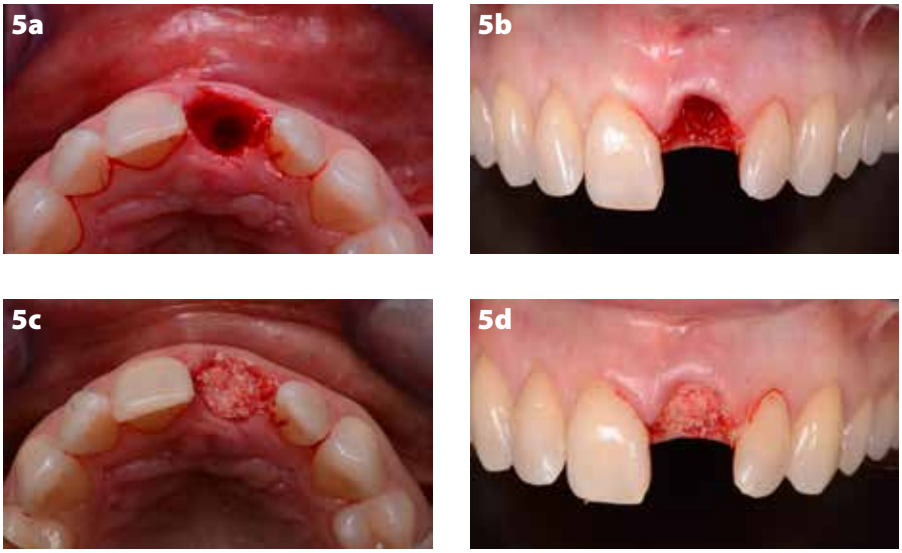


Fig. 5: Occlusal and frontal views following the extraction **(a&b)**, and after filling with allograft particles (Phenix, TBF) **(b&d)**.

During the whole socket healing period for 4 months[3], a composite provisional tooth was bonded to the adjacent teeth. Some composite was placed palatally in the coronal part to avoid discomfort during occlusion. The provisional was placed slightly buccally to decrease the load in occlusion (Fig. 7).

Fig. 6: Socket coverage with L-PRF membrane.

Fig. 7: After the socket preservation procedure, a composite-resin provisional tooth was bonded to the adjacent teeth with a flowable composite occlusal view **(a)**; buccal view **(b)**; vestibulo-occlusal view **(c)**.

The ovate shaped pontic of this provisional extended into the extraction socket in order to shape the soft tissue and to support the adjacent papillae (Fig. 8).[4] Without support, there is more risk of papilla collapse.

Fig. 8: X-ray of the extracted site, 4 months post-op. Note the composite pontic extending into the extraction socket.

Four months later, the site had healed properly (Fig. 9): the soft tissue was well positioned and the papilla was preserved. The bone volume was well maintained; there was no buccal concavity and a proper ridge contour (buccal-palatal) could be seen. At this point, the main objective was reached: good post-surgical healing could be observed. The focus from then on was to preserve the healed soft tissue architecture: scar tissue development and cutting of the blood supply had to be avoided: therefore, a narrow flap raising was used, combined with guided surgery with a pilot drill guide (Fig. 10).

Fig. 9: Clinical views of the extracted site after a healing period of four months with **(a)** and without the provisional tooth **(b, c)**.

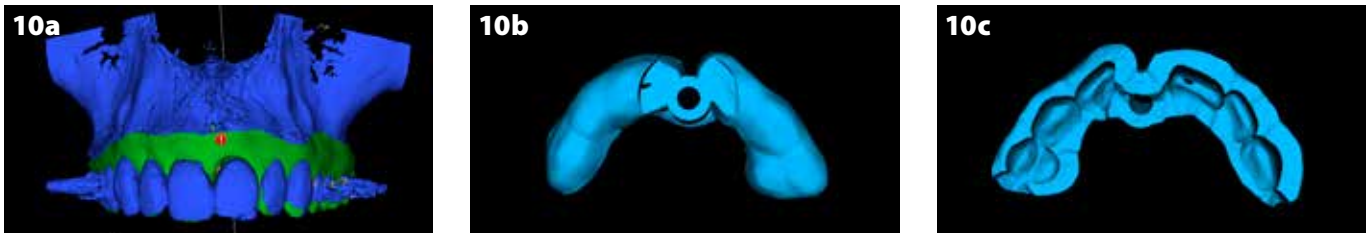


Fig. 10: A pilot drill guide was planned and designed based on STL files.

An implant (Aadva Regular, GC Tech) with conical internal connection and platform switch was placed (Figs. 11-12).

Fig. 11: Surgical guide **(a)** optimising the drill position of the pilot drill **(b)**.

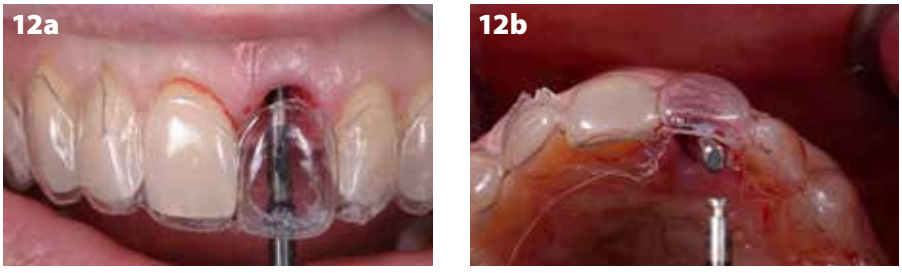


Fig. 12: A second guide is based on diagnostic wax-up. Tooth morphology and emergence profile were reproduced and served as a reference for the implant positioning **(a & b)**.

After placement, the provisional restoration was rebonded to the adjacent teeth (Fig. 13a). Four months later, the implant was osseointegrated. Once again, good soft tissue integration was obtained (Fig. 13b). From that step, the prosthetic phase could begin.

Fig. 13: Clinical frontal views immediately **(a)** and four months **(b)** after implant placement.

Prosthetic phase

A customised screw-retained provisional was prepared using a shell from the buccal part of the extracted tooth (Fig 14a).[5]

The shell was placed over a titanium provisional abutment (Provi Abutment, Aadva) and fixed with composite (Fig. 14b). Then, the transgingival part of the temporary crown was shaped to create a suitable emergence profile.[5] This step is critical for the optimization of the pink aesthetics during tissue maturation.

The occlusion was adjusted to attain even centric occlusal contacts and subsequently reduce anterior guidance of the implant.

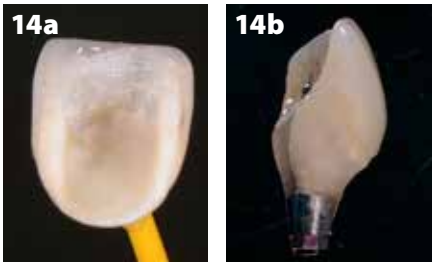


Fig. 14: Utilization of the extracted tooth buccal shell **(a)** on a provisional abutment to shape a screw-retained implant supported provisional **(b)**.

One of the customised provisional goals is to enable the creation of an exact replica of the emergence profile on a custom impression coping.
To prepare the customised impression coping, an implant analogue was fixed inside a Dappen dish and the customised temporary restoration was screwed on top (Fig. 15). The Dappen dish was filled with impression silicone to copy the trans-gingival profile of the temporary restoration (Fig. 16). The impression coping was then screwed onto the implant analogue, so the emergence profile could be duplicated with flowable composite (Fig. 17).

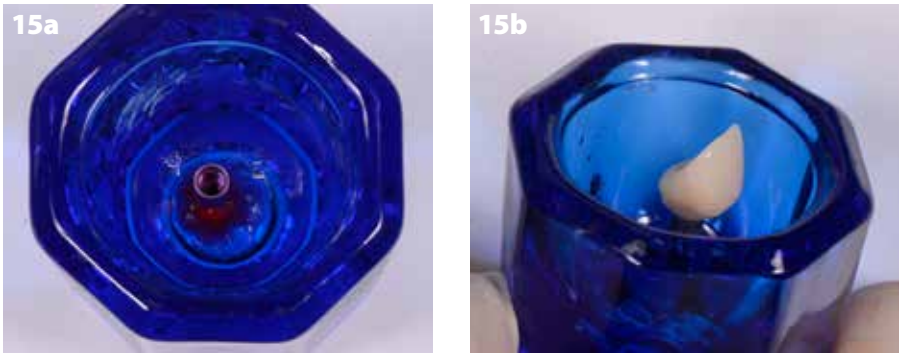


Fig. 15: The implant analogue was fixated inside a Dappen dish **(a)** and the customised temporary restoration was screwed on top **(b)**.

The instant a temporary restoration is unscrewed, the tissue shape begins to collapse. Hence, a customised impression coping was used to provide a model for transferring the position of the implant, the hex orientation of the connection as well as the soft tissue contour.

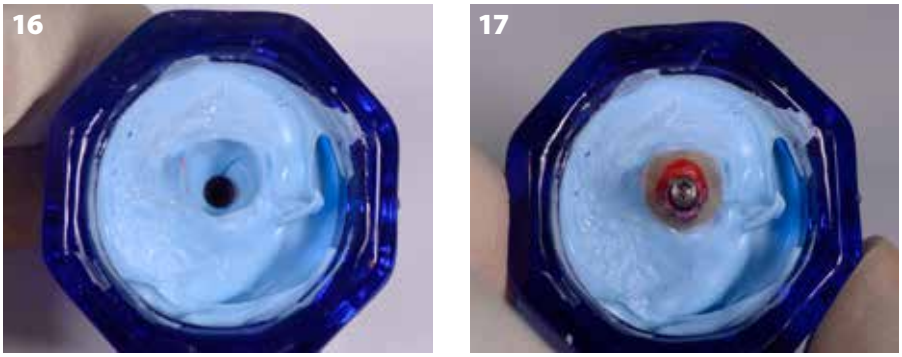
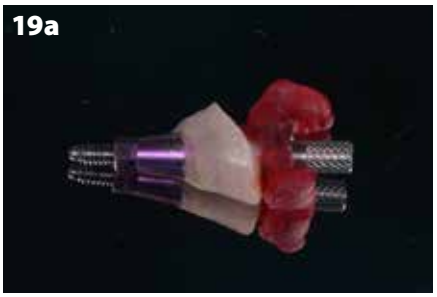


Fig. 16: The Dappen dish was filled with impression silicone to copy the emergence profile of the customised temporary restoration.

Fig. 17: The impression coping was then screwed on top and the emergence profile was duplicated with acrylic resin.

The custom impression coping was therefore positioned onto the implant inside the mouth (Fig. 18), seated with a direct pick-up coping screw and an impression was taken with the pick-up technique (open tray; Fig. 19). The temporary crown was then immediately repositioned to avoid further shrinkage of the soft tissues. With this impression technique, the technician can make an accurate soft tissue model.

Fig. 18: The impression coping was screwed onto the implant.



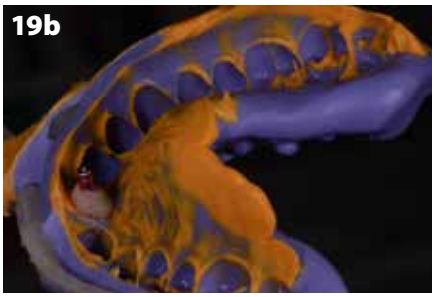


Fig. 19: (a) customised impression coping and **(b)** final impression with the customised impression coping.

A screw-retained lithium disilicate crown was finally placed (Fig. 20) and torqued following the recommendation of the manufacturer, 20 Ncm.

At the follow-up after 5 years, an aesthetic result was seen with adequate position of the crown and surrounding implants (Fig. 21). The radiograph showed an adequate bone level and tight implant-abutment connection (Fig. 22).

Fig. 20: Clinical view of the final crown **(a)** extraoral view and **(b)** occlusal view.

Fig. 21: Smile **(a)** before and **(b)** after treatment.

Fig.22: Follow up after 5 years: X-ray of the implant with the crown.

Discussion

In this case, the amount of buccal bone adjacent to tooth #21 was limited. An immediate implant placement could have been considered in such a case, although with less predictable outcomes. It would have posed a risk of soft tissue recession and could potentially lead to a suboptimal result: hence, a socket preservation technique was chosen.
A soft tissue graft was dispensable since the soft tissue had a proper thickness, with sufficient amount of keratinised tissue and the contour was preserved.

No guided bone regeneration was expected from the L-PRF membrane, but it was used to stabilise the graft material. Even though it might strictly not be necessary, it was one more security that had been built in.
A bonded bridge could also have been an alternative in this case. However, because of the patient's age, the narrow intraocclusal space and to preserve the adjacent teeth, implant treatment was preferred. Indeed the overbite was low and the overbite was more than 3mm.
After implant placement, a screwed provisional could have directly been placed, since a high insertion torque was reached (>40 Ncm). However, since the bonded provisional was comfortable for the patient and it was fast and easy to replace, the customised provisional was prepared in a next session.

Conclusion

Sometimes it is forgotten that socket preservation is a still a nice weapon in our arsenal. For challenging cases as this one, with a bone deficiency in the aesthetic zone, it is extremely important to follow the basic rules, respecting biological concepts and natural healing to obtain a stable result in a predictable way.

Let's get social

As part of our service to customers to keep them up to date about our products and to help them use our products in a correct way, GC has an extensive presence across the social media channels. Be sure to connect with us here:

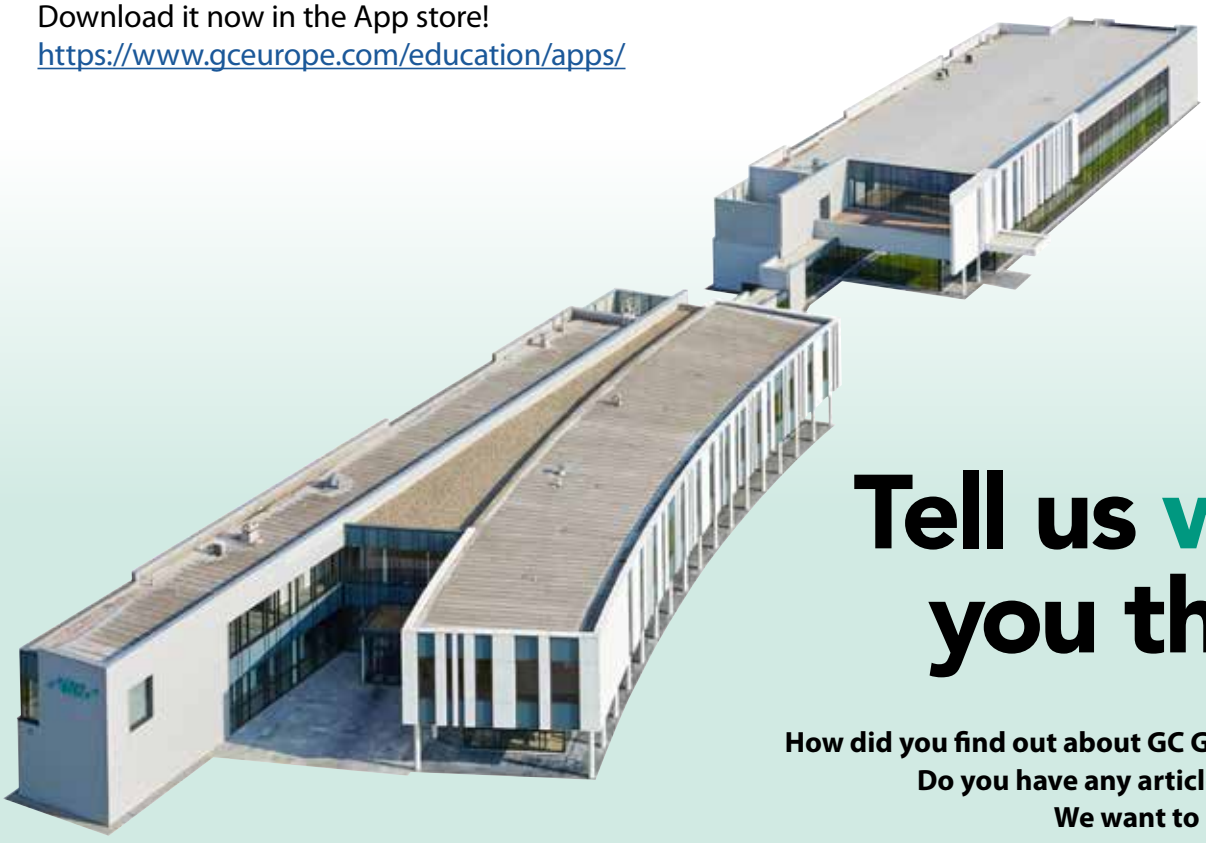
Subscribe to the GC YouTube channel

Like us on Facebook

Follow GC on LinkedIn

Follow GC on Instagram

Customer Loyalty Program Get Connected
Download it now in the App store!
https://www.gceurope.com/education/apps/



Tell us what you think!

How did you find out about GC Get Connected?
Do you have any article suggestions?
We want to hear from you!
Please send your comments and feedback to marketing.gce@gc.dental

Notes

Notes

Notes

GC EUROPE

GC EUROPE N.V.
Head Office
Researchpark
Haasrode-Leuven 1240
Interleuvenlaan 33
B-3001 Leuven
Tel. +32.16.74.10.00
Fax. +32.16.40.48.32
info.gce@gc.dental
https://europe.gc.dental

GC AUSTRIA GmbH
Swiss Office
Zürichstrasse 31
CH-6004 Luzern
Tel. +41.41.520.01.78
Fax. +41.41.520.01.77
info.switzerland@gc.dental
https://europe.gc.dental/de-CH

GC AUSTRIA GmbH
Tallak 124
A-8103 Gratwein-Strassengel
Tel. +43.3124.54020
Fax. +43.3124.54020.40
info.austria@gc.dental
https://europe.gc.dental/de-AT

GC Europe NV
Benelux Sales Department
Researchpark
Haasrode-Leuven 1240
Interleuvenlaan 33
B-3001 Leuven
Tel. +32.16 74.18.60
info.benelux@gc.dental
https://europe.gc.dental/nl-NL

GC EUROPE N.V.
East European Office
Siget 19B
HR-10020 Zagreb
Tel. +385.1.46.78.474
Fax. +385.1.46.78.473
info.eeo@gc.dental
http://eeo.gceurope.com

GC FRANCE s.a.s.
8 rue Benjamin Franklin
94370 Sucy en Brie Cedex
Tél. +33.1.49.80.37.91
Fax. +33.1.45.76.32.68
info.france@gc.dental
https://europe.gc.dental/fr-FR

GC Germany GmbH
Seifgrundstraße 2
D-61348 Bad Homburg
Tel. +49.61.72.99.59.60
Fax. +49.61.72.99.59.66.6
info.germany@gc.dental
https://europe.gc.dental/de-DE

GC IBÉRICA
Dental Products, S.L.
Edificio Codesa 2
Playa de las Américas 2, 1°, Of. 4
ES-28290 Las Rozas, Madrid
Tel. +34.916.364.340
Fax. +34.916.364.341
comercial.spain@gc.dental
https://europe.gc.dental/es-ES

GC ITALIA S.r.l.
Via Calabria 1
I-20098 San Giuliano
Milanese
Tel. +39.02.98.28.20.68
Fax. +39.02.98.28.21.00
info.italy@gc.dental
https://europe.gc.dental/it-IT

GC NORDIC AB
Finnish Branch
Lemminkäisenkatu 46
FIN-20520 Turku
Tel. +358.40.900.07.57
info.finland@gc.dental
https://europe.gc.dental/fi-FI

GC NORDIC AB
Strandvägen 54
S-193 30 Sigtuna
Tel: +46 768 54 43 50
info.nordic@gc.dental
http://nordic.gceurope.com

GC Nordic Danish Branch
Scandinavian Trade Building
Gydevang 34-41
DK-3450 Allerød
Tel. +45 51 15 03 82
info.denmark@gc.dental
https://europe.gc.dental/da-DK

GC Europe N.V.
Türkiye İrtibat Ofisi
Caferağa Mah.
Albay Faik Sözdener Cad.
İffet Gülhan İş Merkezi No:9 D:4
TR-34710 Kadıköy / İstanbul
Tel. +9002165040601
info.turkey@gc.dental
https://europe.gc.dental/tr-TR

GC UNITED KINGDOM Ltd.
Coopers Court
Newport Pagnell
UK-Bucks. MK16 8JS
Tel. +44.1908.218.999
Fax. +44.1908.218.900
info.uk@gc.dental
http://uk.gceurope.com