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Minimal invasive rehabilitation of generalized tooth wear using a conventional composite and the stamp technique.

By **Prof. Dr. Marleen Peumans**, Belgium

Generalized tooth wear is a common clinical condition that can significantly impact dental function, aesthetics, and patient comfort. It often presents as a gradual loss of tooth structure across multiple surfaces, requiring careful assessment and a tailored restorative strategy.[1] Successful management involves restoring lost anatomy, reestablishing occlusal harmony, and preserving remaining tooth structure – all while meeting the patient's functional and aesthetic expectations. Direct composite restorations offer a minimally invasive solution for managing tooth wear, with the added benefit of reversibility and cost-effectiveness. Traditionally, freehand techniques have been used, which allow for artistic flexibility and adaptability. However, they rely heavily on the clinician's skill and experience, which can introduce variability in outcomes. Guided techniques – such as those using silicone matrices, wax-ups, or digital mock-ups – provide a structured and predictable framework for composite placement. These methods are especially valuable in posterior restorations and in re-establishing occlusal vertical dimension, where precision and repeatability are critical.

This case report describes the full-mouth rehabilitation of a 42-year-old female patient suffering from generalized severe tooth wear due to chronic bruxism **(Fig. 1)**. The patient was referred by her general dentist with the primary complaint of fractured incisal edges on her upper anterior teeth and a desire to improve her smile aesthetics. The treatment plan involved restoring both function and aesthetics through

Fig. 1: Extraoral view before treatment.

a carefully staged approach using direct composite restorations and digital planning tools.

Initial Assessment and Diagnosis

Upon clinical examination, the patient presented with extensive wear across the dentition, most notably on the anterior teeth **(Figs. 2-4)**. The wear pattern was consistent with attrition[2], and the patient confirmed a long-standing habit of bruxism. She had been wearing a night guard for several years, indicating awareness and management of her parafunctional behaviour.

In the lower jaw, agenesis of one central incisor was noted, and several posterior teeth exhibited fractured cusps. The severity of wear necessitated a comprehensive approach to restore both the vertical dimension of occlusion (VDO) and the structural integrity of the teeth.
An orthodontic treatment was indicated to make space for the missing lower incisor, resulting in an ideal overbite. In the present situation, the contact points with the lower anterior teeth were positioned at the cervical third of the upper anterior teeth.

Digital Planning and Bite Registration

Digital impressions of the upper and lower arches were taken to facilitate precise planning. The bite registration was performed in (a so-called) centric relation using a composite anterior jig **(Fig. 5)**. This jig allowed for deprogramming of the masticatory muscles and guided the mandible into a passively retruded position.[3] The vertical dimension of occlusion was increased using this jig, with the final VDO determined by the restorative space required to rebuild the worn dentition.

The dental technician created a digital wax-up of the upper and lower anterior teeth at the newly established VDO **(Fig. 6a-b)**. This wax-up was reviewed and approved using a digital viewer **(Fig. 6c-d)**, after which 3D-printed models were fabricated to

Fig. 2: Intraoral view before treatment, showing signs of generalized severe tooth wear.

Fig. 3: Intraoral view in maximal occlusion.

Fig. 4a: Occlusal view of the upper jaw.

Fig. 4b: View of the lower jaw.

Fig. 5: The bite registration was done was done in (a so-called) centric relation using an anterior composite jig.

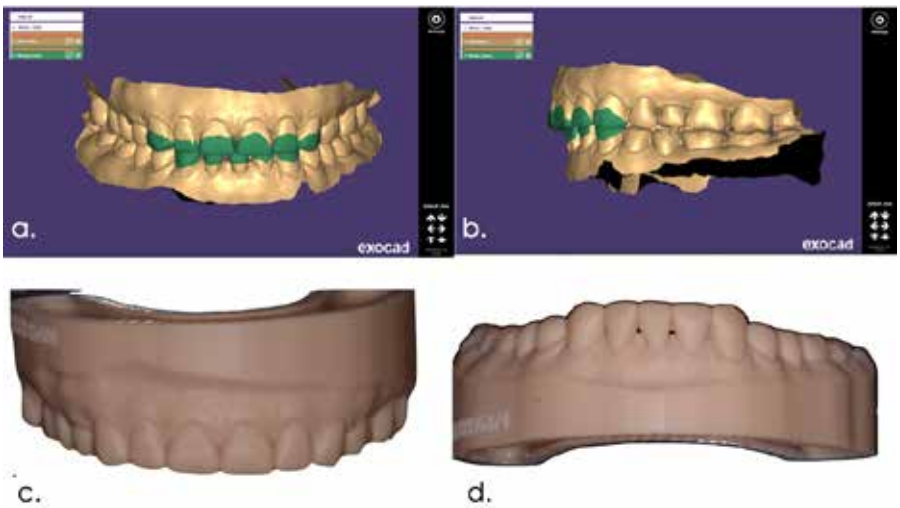

Fig. 6: a and **b:** Digital wax-up of the upper and lower anterior teeth in the desired vertical dimension of occlusion. c and d: After approval of the digital wax-up on the viewer, 3D printed models were made of the upper and lower jaw.

Fig. 7: Mock-up from a dual-cure bisacrylic composite resin (Tempsmart DC, GC).

Fig. 8: Mock-up of the upper anterior teeth. Instructions were given to the dental technician to make the upper central incisors slightly longer (dotted white line).

Fig. 9: Isolation of the lower anterior teeth with the palato-incisal silicone key in position.

Fig. 10: The palatal enamel walls of the lower anterior teeth built up with Essentia DE.

guide the mock-up and restorative phases.

A clear interproximal delineation between the different teeth is important to avoid the composite walls sticking together.

Mock-Up and Aesthetic Evaluation

A hard silicone key was fabricated based on the 3D-printed model, and a mock-up of the anterior teeth **(Fig. 7)** was made using a dual-cure, bisacrylic composite (Tempsmart DC, GC). This step allowed both the clinician and the patient to visualize the proposed changes in tooth length, incisal line, and overall smile aesthetics. Following evaluation, minor adjustments were requested, including a slight increase in the length of the upper central incisors, which was communicated to the dental technician **(Fig. 8)**.

Restoration of the Anterior Teeth

The lower anterior teeth were restored first using the partial stamp technique in combination with direct composite layering. Shade selection was done chairside by applying Essentia Medium Dentin (MD) and Essentia Dark Enamel (DE) to one incisor, yielding a satisfactory aesthetic result.

The lower anterior sextant was isolated with rubber dam, and the palato-incisal silicone key was tested for fit **(Fig. 9)**. No dental preparation was done, except for smoothing sharp enamel margins with a microfine diamond bur and sandblasting of the bonding surfaces with 50 µm alumina powder at a pressure of 4 bar to clean the tooth and remove amorphous enamel, exposing the prismatic structure for improved adhesion.[4]

The palatal enamel walls were built up using Essentia DE with the aid of the silicone key **(Fig. 10)**. The dentin was restored with Essentia MD, and the teeth were completed with a buccal enamel layer using Essentia DE. The restorations were refined and completed using a microfine pointed diamond bur, polishing rubbers, composite finishing discs, metal strips and composite finishing strips to achieve a natural appearance and smooth surface **(Fig. 11)**.

In the subsequent session, the upper anterior teeth were restored using the partial stamp technique. A rigid palato-incisal silicone key was fabricated and modified with a clear silicone (EXACLEAR, GC) to allow light transmission during polymerization **(Fig. 12)**. It ensures that the new contours follow the planned occlusal scheme, recreating the palatal anatomy needed for proper guidance during movements.

Fig. 11: Result after restoring the lower incisors with Essentia MD and DE.

Fig. 12: A rigid palato-incisal silicone key, made on the 3D printed model and adjusted with EXACLEAR (GC) to enable polymerization through the key at the palatal side.

Fig. 13: The fit of the palato-incisal silicone key made is checked.

Fig. 14: Upper anterior teeth after air abrasion of the bonding surfaces. Note the small Class-3 cavities on both centrals because of caries lesions.

Fig. 15: After build-up of the palatal enamel wall of all upper anteriors using Essentia DE.

Fig. 16: Restored upper and lower anterior teeth.

After confirming the fit of the key **(Fig. 13)**, tooth preparation was carried out by removing sharp enamel margins and air abrading adjacent enamel surfaces. Small Class III cavities were prepared on both central incisors due to carious lesions **(Fig. 14)**.

The palatal enamel wall was built using Essentia DE and the silicone key (partial stamp technique) **(Fig. 15)**. The rest of the teeth was built up using a freehand technique. Teeth were separated with clear Mylar strips, and wedges were used in interproximal spaces where needed. The dentin was restored with Essentia MD, followed by buccal enamel layering with Essentia DE. The restorations were finished and polished to match the lower anterior teeth and establish a harmonious anterior guidance **(Fig. 16)**. After restoration, occlusal contacts were evenly distributed across the anterior dentition **(Fig. 17)**.

Fig. 17: Occlusal contacts after restoring the anterior teeth.

Posterior Restorations and Occlusal Rehabilitation

Following the anterior restorations, the new vertical dimension of occlusion was fixed, with initial contact limited to the anterior teeth. A digital scan of the upper and lower arches at the new VDO was taken and sent to the dental technician for wax-up of the premolars and molars.

The wax-up was designed to replicate the anatomy of the planned direct composite restorations, with careful attention to the delineation of occlusal marginal ridges. The wax-up excluded the second molars, which served as reference points for repositioning the silicone keys during restoration, together with the restored canines **(Fig. 18)**.

Hard silicone keys were made and the occlusal area of the teeth to be restored was cut out and relined with EXACLEAR. These were used to transfer the wax-up to the patient's mouth **(Fig. 19)**. An alternative and more precise way to make a transparent rigid key is to rebase a vacuum-formed impression tray (hard resin plate with a thickness of 2 mm) with EXACLEAR. This tray is cut 1.5-2mm further than the margins of

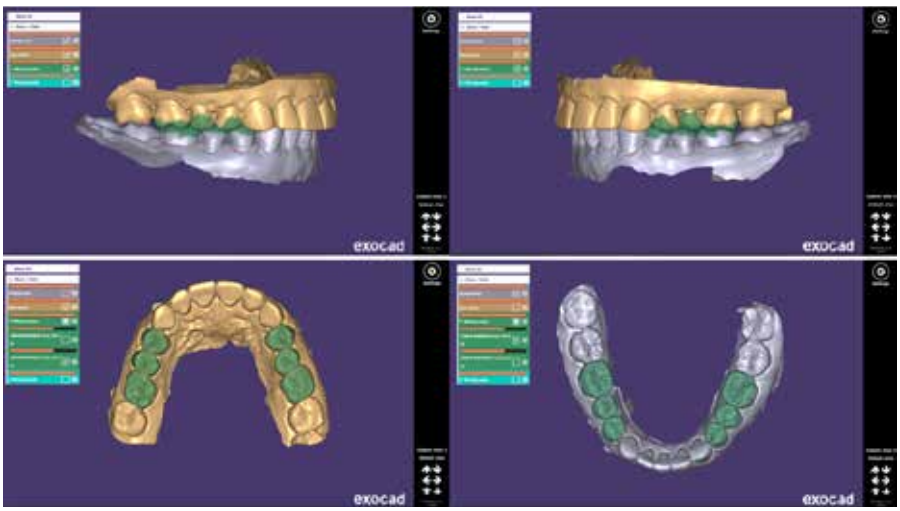

Fig. 18: Digital wax-up of premolars and molars, excluding the second premolar that was kept as a reference point.

Fig. 19: Hard silicone keys relined with Exaclear (GC) used to transfer the morphology of the 3D-printed model into the mouth of the patient.

the worn teeth and sandblasted prior to the rebasing **(Fig. 20)**.

Restoration began with teeth 24 and 26 **(Fig. 21)**, followed by tooth 25. Neighbouring teeth were protected with metal strips during etching with phosphoric acid, rinsing and subsequent adhesive application (G2-BOND Universal, GC). After the adhesive protocol these were replaced with Teflon tape and small wads of Teflon to prevent composite overflow into the cervico-interproximal embrasures.

The silicone key was filled with Essentia DE, positioned in the corresponding quadrant and pressed with gentle pressure until the key fitted the second premolars and canines.

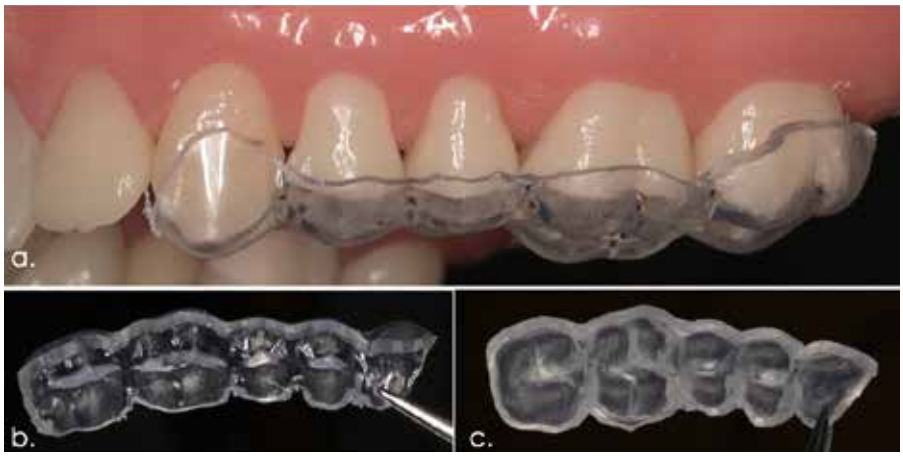

Fig. 20: Alternative stamp technique with vacuum-formed impression tray (2mm thickness) relined with EXACLEAR.

Fig. 21: The keys were filled with composite resin (Essentia DE) and seated.

During placement of the silicone key, excess composite material extruded cervically and interproximally and was subsequently removed. This process was repeated until the key was fully seated. Light-curing was applied to each tooth through the EXACLEAR for 40 seconds, followed by a second curing phase after removal of the key **(Fig. 22)**. The excess cured composite that ran over the occlusal surface of the neighbouring teeth was removed with a scalpel (n°12) **(Fig. 23)**. After interproximal finishing, tooth 25 was restored using the same protocol; tooth 27 was built up with free-hand modellation.

The primary excess composite on the palatal and buccal surfaces was removed using a microfine pointed diamond bur (FG) under water cooling. Buccal margins were further adjusted with a rubber polishing point (Brownie, FG, Shofu) operated at medium speed and low pressure, also with water cooling. Interproximal finishing was performed using a composite polishing disc and a metal finishing strip (GC metal strip – green band) to ensure smooth transitions and optimal contour.

Fig. 22: After removal of the silicone key, each restored tooth was light-cured for an additional 20 seconds. Excess cured composite extending onto adjacent teeth was carefully trimmed.

Fig. 23: After finishing composite restorations on teeth 26 and 24 and before restoring tooth 25.

Fig. 24: Second quadrant before (top) and after (bottom) treatment. The second upper molar (tooth 27) was restored using a freehand technique.

Fig. 25: Third quadrant before (top) and after (bottom) treatment

Fig. 26: First quadrant before (top) and after (bottom) treatment

Fig. 27: Fourth quadrant before (top) and after (bottom) treatment

Final polishing was completed with Identoflex composite polishers (Kerr) and a nylon brush to enhance gloss **(Fig. 24)**.

The same restorative protocol was applied to quadrant 3, including composite build-ups on teeth 34 and 36 using the silicone key **(Fig. 25)**. The second and third molars were restored using freehand modelling techniques. The first and fourth quadrant were restored in the same manner in the following session **(Figs. 26-27)**.

After final finishing and polishing, the restorations exhibited excellent anatomical form and surface texture. The old Class V restorations on the upper premolars and molars were noted for future replacement.

The final result revealed a well-balanced smile with a pleasing incisal line and restored function **(Figs. 28-30)**. The patient expressed satisfaction with both the aesthetic and functional outcomes.

Fig. 28: Result after final finishing and polishing. The old Class-5 composite restorations on the upper premolars/molars still need to be replaced.

Fig. 29: Final result. The smile shows a nice incisal line.

Three years post-treatment, the restorations demonstrate stable clinical performance with no signs of failure. The overall condition of the restorations remains satisfactory, indicating good long-term durability. Minor wear could be seen on the composite surfaces, which is consistent with normal functional use over time **(Figs. 31-33)**.

Conclusion

This case demonstrates the effectiveness of a digitally guided, minimally invasive approach to full-mouth rehabilitation in a patient with severe tooth wear due to bruxism. Through careful planning, mock-up evaluation, and precise execution of the direct composite restorations using the stamp technique, both aesthetic and functional goals were successfully achieved.

A structured treatment protocol consisting of eight sessions ensured predictability and efficiency:

1. Pre-operative documentation: intra-oral and extra-oral photographs, digital scan, and bite registration.
2. Mock-up placement on anterior teeth for functional and aesthetic preview.
3. Direct composite restorations of the lower anterior teeth using the partial stamp technique.
4. Restoration of upper anterior teeth (using the partial stamp technique) followed by digital scans.
5. Posterior restorations in quadrants 2 and 3 using the stamp technique.
6. Posterior restorations in quadrants 1 and 4 using the stamp technique.
7. Final finishing and polishing.
8. Fabrication of a protective bite appliance.

Fig. 30: Final result: occlusal view of the restored upper jaw

Fig. 31: Final result: occlusal view of the restored lower jaw

Fig. 32: Follow-up after 3 years- occlusal view upper jaw. Slight wear of the composite restorations can be noticed.

Fig. 33: Follow-up after 3 years - occlusal view lower jaw.

To maintain the accuracy of the digital wax-up, it is crucial that the time between anterior and posterior build-ups does not exceed two weeks, preventing unwanted eruption of posterior teeth that could compromise the occlusal scheme.[5] The digital wax-up, 3D-printed models, and customized transparent silicone keys played a pivotal role in transferring the planned morphology into the mouth with high fidelity. A well-defined interproximal delineation between teeth is essential to avoid composite bridging and to facilitate clean removal of excess material during posterior build-ups.

Moreover, successful use of a silicone key and conventional hybrid composite for posterior restorations depends on prior management of interproximal caries and replacement of old or inadequate restorations. This ensures optimal adaptation and longevity of the restorations.

Although the choice of optimal material for restoring severe tooth wear remains a topic of ongoing debate, there is increasing evidence supporting the successful use of composite resins for rehabilitating worn dentitions, both anterior and posterior. In this case, direct resin composite was chosen for its simplicity, affordability, and proven functional and aesthetic outcomes. Given its acceptable survival rates and ease of repair, it should be considered a first-line treatment for moderate to severe wear, with indirect options reserved for recurring or major failures. Minimally invasive techniques allow clinicians to refine occlusion while preserving healthy tooth structure, keeping future restorative options open - if ever needed.[6,7]

Overall, this case highlights how digital tools, strategic sequencing, and attention to clinical detail can elevate the quality and predictability of full-mouth rehabilitation in complex wear cases.

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