Minimally invasive restoration of a worn smile using a digital workflow

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Introduction and main complaint

Tooth surface loss is a condition which affects many of our patients and has a multifactorial aetiology1,2. This gentleman aged 40 presented to the clinic as a new patient, unhappy with his smile and concerned about the wear of his front teeth (*Figures 1 and 2*).

Medical, dental and social history

The patient was medically fit but had a history of drinking fizzy drinks and was aware of nighttime parafunctional habits. He had asymptomatic temporomandibular joints and no history of muscle tenderness.

Clinical examination

A full clinical examination was carried out, together with a photographic and video record series. Apart from the tooth wear, he had an otherwise intact and healthy dentition with no obvious caries lesions and only some mild to moderate gingival recession on isolated teeth (*Figures 3-9*).

Diagnosis

A diagnosis of tooth surface loss due to parafunctional habits and dietary factors, with a Class III ACE3 score was established. The gingival recession seen was mild to moderate and its distribution suggested it could possibly be related to the patient's bruxing habit.

Treatment options and discussion

The patient's main objective was to restore his teeth to their original condition. Alternatives of direct resin bonding and porcelain veneers were discussed however the patient desired the more cost effective, minimally invasive option of direct resin restoration. There was also discussion regarding his bruxing and lifestyle habits that have resulted in the damage and the ongoing risk these would pose both to the teeth and to the restorations. The need for a hard bite guard for nighttime wear was discussed.

When discussing the restorative options of direct composite resin bonding it was mentioned to the patient that the restoration would be

Figure 1

Figure 2

Figure 3

Figure 4

Figure 5

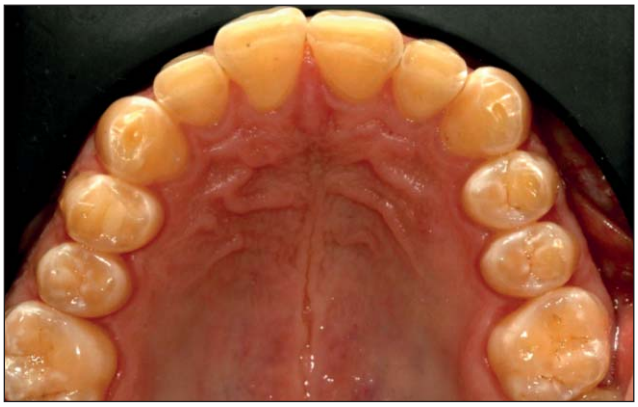


Figure 6

Figure 7

Figure 8

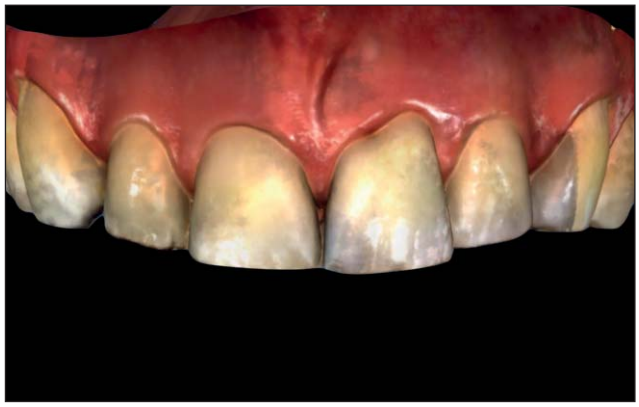
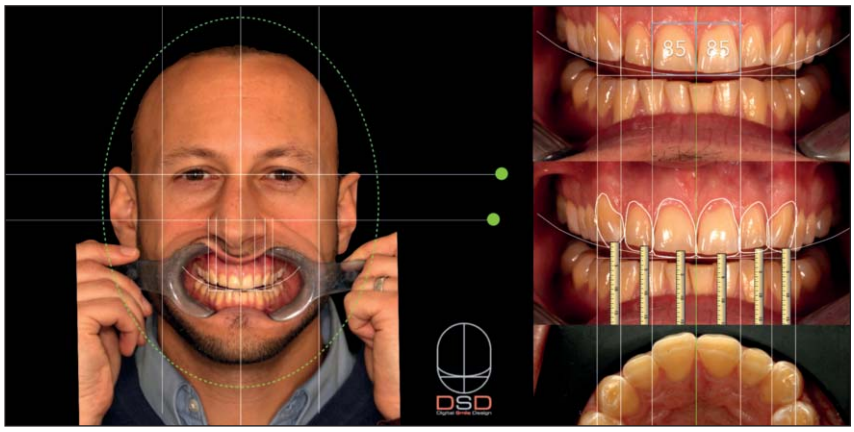


Figure 9

made to match his existing tooth shade unless he wanted any whitening carried out prior to the restorative work. The patient indicated his preference to have lighter teeth and a treatment plan of tooth whitening and aesthetic resin bonding was agreed.

The restorative plan was to functionally and aesthetically return the patient to a 'canine-guided'

Figure 10



occlusion with a cosmetically pleasing positive smile curve, while preserving as much of his natural tooth structure as possible. The occlusion in ICP as shown in the pre-op digital scan (*Figures 4* and *9*) was stable and thus a conformative approach to the centric occlusion was decided upon.

Treatment

A digital intra-oral scan was carried out using the Cerec Omnicam and CEREC ortho software (CEREC, Dentsply Sirona). These models were 3D printed from Infinident and were used to fabricate tooth whitening trays. The patient carried out night-time tooth whitening using 10% carbamide peroxide (White Dental Beauty, Optident) for four weeks.

During this whitening period the dental technician Eddy Marku fabricated a digital wax up using the InLab 16 software (Dentsply Sirona).

This digital wax up was guided from a facially generated treatment plan utilising digital smile design. This ensured that the teeth were not over lengthened aesthetically and the wax up was validated using the planned measurements (*Figure 10*). A silicone index was made using the 3d Printed models of the digital wax-up and then Luxatemp was used to transfer the design to the patient's mouth (*Figure 11-13*).

The wax up was shown to the patient using the full DSD trial smile video protocol. Following aesthetic confirmation from the patient a palatal stent was fabricated using light and heavy body silicone (Provil) to provide an accurate guide for the restorative procedure.

Tokuyama Estelite Asteria nanohybrid composite (Tokuyama) was chosen as the restorative material due to its polishability and durability. Prior to rubber dam isolation small buttons of the enamel and body shades were

Figure 11

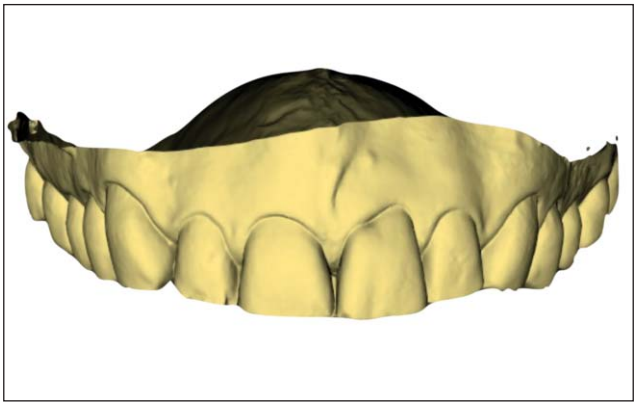


Figure 12

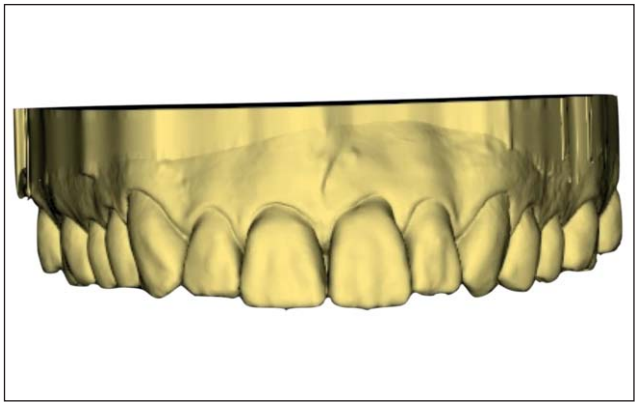


Figure 13

Figure 14

Figure 15

Figure 16

placed on the teeth and cured for 10 seconds to determine and confirm restorative material shade prior to dehydration. A1B Body and WE enamel shades were selected based on this pre-operative shade assessment.

Rubber dam isolation was carried from the upper right first molar to upper left first molar so as to allow easy insertion of the palatal silicone stent. No floss ligatures were required as only edge bonding was carried out, however the rubber dam was inverted so as to achieve good isolation and ensure minimal leakage of moisture (*Figure 14-16*).

The teeth were prepared with air abrasion using 27micron Al2O3 so as to improve adhesion and remove aprismatic enamel. Following this the teeth were etched and Optibond FL 4th generation adhesive applied. The silicone stent was then positioned against the teeth and used to guide the incisal edge position and palatal contour. Palatal shells were constructed using Tokuyama A1B shade and the cosmetic bonding was built up in a palato-labial direction. In order to achieve effective aesthetic integration, Venus Pearl white tints were added to the sub-surface enamel layer so as to mimic the fluorotic white lesions of the patient's natural dentition. Following addition and curing of the final layer of WE enamel composite, the restorations were cured through glycerine gel for 10 seconds per tooth so as to prevent an oxygen inhibited layer.

Figure 17

The refining and polishing protocol was started with a red band (finishing) flame diamond in a speed increasing handpiece running at approximately 10 000Rpm. This was used to homogenise the surface texture as well as introduce some secondary and tertiary anatomy. A combination of soflex discs and Astropol polishers (Heraeus Kulzer) were then used to achieve a good shine to the composite. This was finished using a goat's hair wheel and diamond polishing paste of 3µm and then 1µm (*Figures 17,18*).

Final Occlusion: While a conformative approach was adopted with regard to the occlusion, it was necessary to make changes to the patient's lateral excursive scheme.

Figure 18

Figure 19

These were carried out without effecting any changes to the MI occlusion and resulted in massive improvements. Whereas prior to treatment the patient was in group function with non-working side interferences (NWSI) in both right and left lateral excursions, following treatment the patient was fully canine guided with no interferences and thus in a much more mutually protected occlusal scheme.

Figure 20

Conclusion

Full video and photographic documentation of the patient was taken before and after the procedure and he was thrilled with the final result. Utilising the best of digital and analogue techniques, we have achieved a dramatic aesthetic improvement whilst functionally protecting the patient in excursive movements so as to reduce future issues (*Figures 18-20*). The risk to his dentition remains because of the parafunctional habits and it remains to be seen what improvements he can persist with as far as dietary habits. A Dual laminate bite guard was provided.

References

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