

The art of hiding art with CAD/CAM dentistry

By Geoff Staples



“Stress-free all-ceramic restorations require an understanding of the various materials and techniques that are available. Stress free and aesthetic bonded all-ceramic restorations are achieved through planning which offers predictable outcomes...”

Successful stress-free all-ceramic restorations require an understanding of the various materials and techniques that are available. Stress free and aesthetic bonded all-ceramic restorations are achieved through planning which offers predictable outcomes.

The following case on tooth 46 was completed over an extended one appointment visit with the aim of replacing the amalgam filling with a bonded all-ceramic restoration. Figure 1 shows the amalgam filling in place with various repairs that have occurred over its life. The reason for an extended appointment in this instance was due to this restoration being completed on a course.

What will be discussed are some guidelines in deciding which CAD/CAM materials (IPS Empress® CAD or IPS e.max® CAD) and cementation considerations are to be used and the landmarks that can be seen by all of the chairside CAD/CAM software.

The image of the scanned preparation (Figure 2), which allows us to view several aspects, influences the decision regarding which material and technique is suitable for this restoration. The interproximal mesial contact was broken. This allows good access to all margins when finishing the restoration and the patient maintenance.

A decision was made to reduce the height of the disto/lingual cusp due to the lack of underlying support in this area. The finish lines of this restoration are crisp and recognizable by the software. The



neighbouring tooth 45 (distal) was slightly re-contoured to provide the ideal contact profile for the new restoration.

The cavity was prepared with a thin layer of AdheSE® which was then light cured. This was applied to improve the bond strength of the indirect restoration.¹ From a milling perspective, a well rounded and smooth cavity form is ideal for the milling process. There should be no binding of the restoration on insertion. This allows space for the luting cement to flow and contact all surfaces (restoration and tooth). The exception to this is the interproximal contact. This will lead to a stress free insertion of the soon to be bonded restoration.

The restoration has been proposed in Figures 3 and 4 and further decisions then need to be made. Are the finish lines located in enamel? In this instance yes. What is the minimum thickness of the

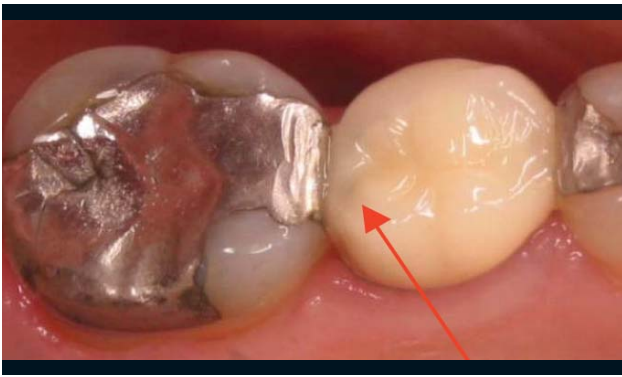


Figure 1. Tooth 46. View of the occlusal surface and note the greying effect from the amalgam on the distal of tooth 45 from the 46.



Figure 2. View of the occlusal surface after the application of an immediate dentin seal with AdheSE. Note the smooth surface and clean margin which is ideal for missing.

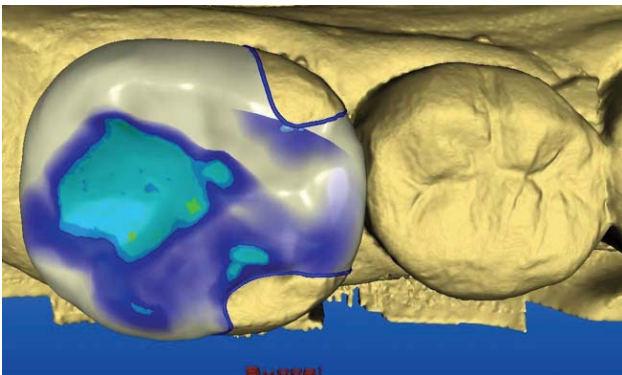


Figure 3. View of the occlusal surface indicating the interocclusal clearance with a heavy opposing dentition.

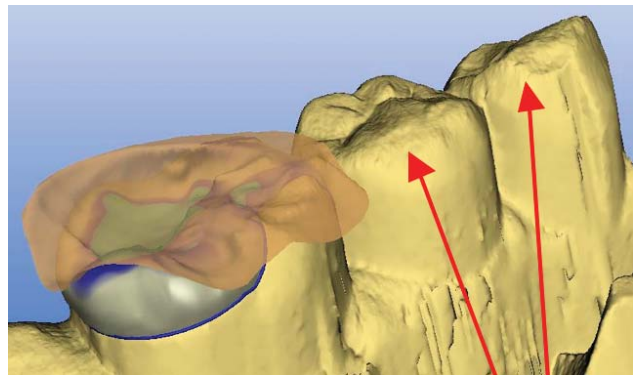


Figure 4. View of the antagonist surface. Note the flat occlusion and wear facets.

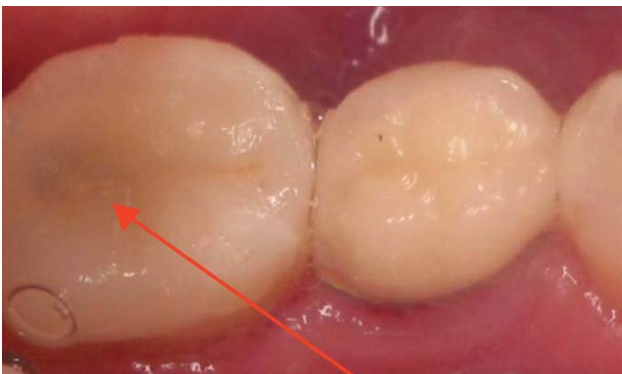


Figure 5. Completed restoration. Note the greying effect in the distal of the 46 from the underlying tooth colour.



Figure 6. IPS Natural Die.

restoration and what influence has the patient's occlusion on the decision of the material to be milled? The restoration's minimum thickness is approximately 1mm, the patients occlusion is fairly flat and there are wear facets (Figure 4) seen in the teeth 44 and 45. The other area of note is the opposing dentition in relation to the finish line on the cavo/mesio/lingual margin. This finish line is very close to the junction of ceramic/bond/tooth. This is another powerful advantage in the use of either the Antagonist or Bite Registration in your CAD/CAM software.

A lithium disilicate (LS₂) glass ceramic block (IPS e.max CAD A2 HT) was chosen for this particular restoration due to the minimal occlusal clearance and heavy occlusion. The HT block offers an enamel like translucency and as this restoration is predominately in enamel, HT is the ideal choice. If, however, IPS e.max CAD was not available, a highly polished IPS Empress CAD Multi would offer a true to nature highly aesthetic restoration with its typical

lifelike chameleon effect. This restoration is to be bonded adhesively into enamel which results in enhanced "(overall) strength" of the seated restoration. This effect is even more important to provide support to a leucite glass like IPS Empress CAD.

The restoration was placed (Figure 5) using Multilink® Automix Transparent with the block shade selection in mind. On insertion and after cementation, there is a noticeable greying effect through the ceramic restoration. This could be confused with secondary caries, however this is not the case in this situation. There is a discolouration on the occlusal floor of the prepared tooth. This underlying discolouration could have been overcome with a layer of a flowable composite like high value Tetric® flow (i.e. shade A1 or B1). The use of the Natural Die Material shade guide in selecting the dentin shade is another guide indicating the desired block and translucency to be milled.

Selection of the correct shade based on the shade of the prepared

tooth is an important pre-requisite for restorative success and a true to nature all-ceramic restoration. The use of the Natural Die Material shade guide (Figure 6) is therefore vital to the overall aesthetic result. Remembering that glass is a translucent structure - you will see underlying flaws in the tooth structure through a translucent glass. So consideration to not covering these flaws prior to the optical/digital impression will affect the overall aesthetic result of an all-ceramic restoration. A simple check list for determining what CAD/CAM block is to be milled would include the following factors:

- What is the shade of the underlying prepared tooth colour, core build-up or implant abutment?
- What block shade is to be used for the selected technique?
- What is the desired translucency of the selected block (i.e. LT or HT or MO)?
- The shade of the luting cement (i.e. use translucent cement for shades A1, A2, B1).

In selecting the shade of cement with the selected ceramic, consider the following guidelines:

- Transparent cement with shades A1, A2, B1;
- Yellow cement for shades A3, B2, etc; and
- Opaque cement for the bleach shades or masking discolourations.

You could even utilise Variolink® II with its various try in pastes to mask the restoration.

Information on the correctly shaded IPS e.max CAD block to be milled, matching the technique used, can be found in the back of the Instructions for Use (IFU's) in the IPS e.max CAD booklet.

In Figures 7-9, a simple checklist produced a stress free, aesthetic all-ceramic bonded restoration. The restoration on tooth 26 was an MOB amalgam filling that was restored using IPS e.max CAD HT shade B1. The reason for choosing lithium disilicate (LS₂) for this patient case is the increased strength in comparison to IPS Empress CAD. The patient's occlusion is very heavy (Figure 8) and this can be seen in the occlusal wear on the neighbouring teeth 25 and 27 as well as in the CAD/CAM software. There was no discrepancy or staining in the underlying tooth colour. The HT translucency was chosen because the restoration was mainly in enamel. The restoration was bonded stress free (Figure 9) with Multilink Automix transparent. So in combining the translucent lithium disilicate (LS₂) glass ceramic with the translucent cement, a true chameleon effect was achieved, while letting the natural colour of the tooth do the work for you.

Conclusion

Understanding and matching materials for the desired highly aesthetic restoration requires planning. Follow a simple checklist such as:

- Determine the underlying shade of the tooth;
- Am I bonding in enamel or dentine?;
- Where are the margins?;
- What influence will the patient's occlusion have on my material block selection; and
- What shade of luting cement matches to the selected block shade and tooth colour?

Should you have any questions, please call or email Ivoclar Vivadent and ask about the range of Professional Development courses available throughout Australia.

Reference

1. Pascal Magne, DMD, PhD, Tae Hyung Kim, DDS, Domenico Cascione, CDT, and Terence E. Donovan, DDS. Immediate dentin sealing improves bond strength of indirect restorations. (J Prosthet Dent 2005; 94:511-9.)



Figure 7. Tooth 26 MOB.

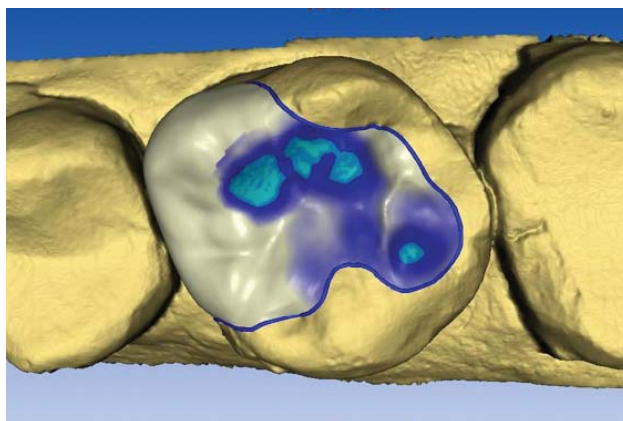


Figure 8. Tooth 26 MOB. Occlusal contact heavy as well as the heavy occlusal wear on the two abutment teeth.



Figure 9. Completed IPS e.max CAD shade B1 HT.

About the author

Geoff Staples is the National Sales Manager at Ivoclar Vivadent, currently based in Brisbane. He is well known in the dental industry and in particular with CAD/CAM technology having being involved with the CEREC® system in the Australasian market since Cerec 1 (1994). Being a specialist for CAD/CAM and all-Ceramics, he has been involved in numerous CAD/CAM Professional Development courses, events and symposiums. He regularly lectures at various universities and dental schools, both in Australia and internationally. He is very keen to impart knowledge and his skills in the area of CAD/CAM Technology and why it works. For more info, call 1300-IVOCCLAR or ivocad@ivoclarvivadent.com.au