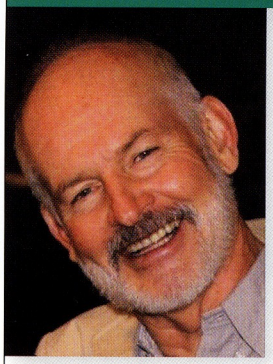

Compiled by
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Zirconia RESTORATIONS

INTRODUCTION

During his recent program in Australia, Gordon Christensen stated that around 20 per cent of all indirect restorations inserted in the US were made of zirconia. One of the early lessons a new dental graduate learns is that no dental procedure works on everyone all the time. So it is with restorative dentistry that some patients are able to destroy every direct restoration irrespective of the techniques deployed to place them.

WHY ZIRCONIA?

Zirconia has many advantages as a restorative material. The material is exceptionally robust; it can be milled to thicknesses to within half a millimetre and has a fracture strength of 1,100 MPa. In the 'green stick' form it can be easily milled using a CAD/CAM system and impregnated with the desired shade. After sintering for about eight hours at 1550°C, the restoration achieves its full structural strength. Its fine crystalline structure means that it will abrade natural tooth structure similarly to gold. Coloured tints can also be fired onto the surface after sintering. The downside of zirconia is that after sintering the material is so hard that it is difficult to adjust the occlusion after seating.

One of the major challenges with indirect restorations is the luting materials used to cement them. Resin-based products offer no protection against caries, especially if the proximal margins are below the cemento-enamel margin. Once the bond fails there is no protection to prevent caries extending along the cavo margins deep into the body of the tooth. Resin-modified glass ionomer cements provide protection against caries proliferation. However, there is a tendency for small amounts of HEMA to remain unpolymerised in areas inaccessible to photo polymerisation. This has the potential to create sensitivity within the restored tooth.

Auto cure glass ionomer cements are ideal biologically-compatible restorative materials, especially when deep cavities are present. Open sandwich restorations have the propensity for the glass ionomer to degrade in the proximal areas but closed sandwich restorations do not develop this problem. Glass ionomer cements do not make good luting materials as they require some bulk to maintain their structural integrity. However, if an indirect restoration was to be constructed that allowed space between the base of the inlay and the surface of the tooth, then glass ionomer cement would also be an excellent luting material.

"Auto cure glass ionomer cements are ideal biologically-compatible restorative materials."

Current generation CAD/CAM machines have sophisticated programs that allow for spacing between the tooth and the base of the restoration. Further to this, with an opposing arch and a bite registration they are able to create a functional occlusal surface on the restoration. Preparing the occlusal just below the occlusal table, with a long proximal contact allows the restoration to erupt into the occlusion without loss of proximal contact and eliminates the need for adjusting the occlusal surface of the zirconia restoration.

CLINICAL CASE STUDY

The following clinical case* was performed on a patient who presented with a fractured amalgam restoration and defied every attempt to restore the tooth with a composite glass ionomer cement sandwich restoration.

There were extensive caries present beneath the original amalgam restoration. The caries directly adjacent to the pulp these were treated with silver fluoride and potassium iodide and left *in situ*.

Cusp overlays on the buccal and lingual walls were prepared and apart from cleaning up the cavo margins little further preparation was carried out. Following tooth preparation a triple tray impression was taken and a shade chosen prior to sending to the laboratory for construction. The preparation was temporised and the patient dismissed.

**The restoration placed in this clinical case was milled with a Roeders 5 axis simultaneous milling machine at Andent Laboratories in Melbourne.*

THE RESTORATIVE PROCESS

Figures 1 and 2 show the onlay on the model prior to cementation. Figure 3 shows the under surface of the restoration.

Figure 4 shows the model sectioned in the mid line to expose the space between the base of the restoration and the cavo surface. There is an ample distance within the preparation for sufficient bulk of the glass ionomer yet there remains knife-edge margins and close adaption to the model at the periphery.

Fig 1. Onlay on the model prior to cementation.

Fig 2. Onlay on the model prior to cementation.

Fig 3. Under surface of restoration.

"Current generation CAD/CAM machines have sophisticated programs that allow for spacing between the tooth and the base of the restoration."

Fig 4. Model sectioned in the mid line.

Fig 5. Tooth prior to cementation.

Figure 5 shows the tooth prior to cementation. Tooth contact analysis has been applied to the gingival tissues to prevent cervical seepage and enhance the definition of the cavo margins at the gingival floor. An auto cure glass ionomer cement (Ketac Fill, 3M ESPE: Fuji IX, GC Corp: Riva SC, SDI) was applied conservatively to both the internal surface of the onlay and the preparation. After seating the restoration, the patient was asked to bite firmly on a cotton roll until the cement had set, as the occlusal table of the restoration was slightly below the occlusion.

Once the glass ionomer had set, tags were removed from the margins of the restoration. Figures 6 and 7 show the seated onlay.

Fig 6. The seated onlay.

Fig 7. The seated onlay.

An alternative technique is to place a glass ionomer lining in the tooth prior to taking the impression. Apart from requiring another step in the restorative process it may inhibit the ability of the CAD operator to design the restoration.

CONCLUSION

Irrespective of the technique used, auto cure glass ionomer cement has specific advantages as a biologically-compatible luting material. The bulk of the cement allows for structural integrity of the cement as well as providing a reservoir for fluoride release into the surrounding tooth. Should caries attack the margins of the restoration the amount of glass ionomer cement present will buffer the acidic pH back to neutral and prevent caries extension into the tooth.

Practitioners who try this restorative technique will understand why it has grown so rapidly in popularity in the United States.

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The author has a financial interest with some of the companies mentioned in this article.