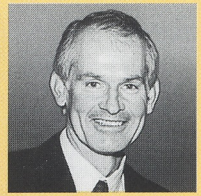
AESTHETIC UPDATE



Compiled by Geoffrey M. Knight

The proximal resin restoration – an alternative technique

This article further develops the concept of applying a bonded sandwich restoration to a proximal lesion as presented in Aesthetic Update (*News Bulletin* July 1998).

The use of glass ionomer cements as a cavity base is enhanced by the emerging therapeutic benefits of this material and the possible harmful effects of HEMA (used in resin based bonding systems and resin modified glass ionomer cements) to cause post-operative sensitivity in susceptible individuals.

The new wear resistant glass ionomers may be used as restorative materials in their own right when the surrounding cusps are not undermined and there are no centric stops on the occlusal surface (small occlusal surface and tunnel restorations).

Cavity preparation with a high speed rotary instrument is likely to cause micro fractures along the enamel margins due to bur eccentricity (a good case for single use disposable burs) (Fig. 1, Diagram 1).

SEM of enamel surfaces showing micro fractures after preparation with a tungsten carbide bur (Fig. 2).

Air abrasion of the enamel margins will eliminate these micro fractures and improve retention of the restoration. Practitioners who do not have access to air abrasion can use an appropriate hand instrument.

Air abrasion of the dentinal surfaces increases the surface area and improves bonding potential. Furthermore, the preparation of a small groove at the dentino enamel junction at the floor of the cavity increases physical retention and helps to assure that caries have been removed from this critical area (Fig. 3, Diagram 2).

The cavity is etched with 37 per cent phosphoric acid for 10 seconds, washed and dried with oil free air (Fig. 4, Diagram 3). ▶

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The decision to either etch a tooth with phosphoric acid or condition the surface with polyacrylic acid is not clear cut.

While it may be argued that 37 per cent phosphoric acid will remove minerals from the dentine surface required for adhesion, a 10 second application of 37 per cent phosphoric acid will:

- Etch the enamel surface.
- Remove the smear layer from the dentine surface and have little effect upon underlying dentine.
- Remove any contaminates such as handpiece oil.
- Assure the practitioner that the mat surface is clinically prepared for placement of the restoration.
- A dentinal surface slightly depleted of calcium ions will rapidly be reconstituted by minerals from the tubular exudate and glass ionomer base.

The tooth is isolated from the oral environment with either rubber dam or strategically placed cotton wool rolls.

A paper point is wedged lightly interproximally prior to matrix band placement. The paper point adequately resists the placement forces generated during a non metallic restoration, will reflect easily when a matrix is placed and will absorb any proximal exudate generated during restoration placement. The Palodent matrix system gives anatomical contouring and a sound proximal contact (Fig. 5, Diagram 3).

A wear resistant glass ionomer cement (Fuji IX*, Ketac Molar†, Ionofil Molar‡) is placed into the base of the cavity up the dentino enamel junction, avoiding contact of the glass ionomer with the enamel margins (Fig. 6, Diagram 4).

Resin modified glass ionomer cement (RMGIC) (Fuji Bond LC, Fuji II LC*, Vitremer§) is then smeared across the surface of the still curing glass ionomer cement and the enamel walls (Fig. 7, Diagram 5).

Condensable composite resins (Glacier‖, Tetric Ceram¶, Prodigy**) are best suited for this technique. Puddle into the preparation with a ball burnisher to assure that the still malleable glass ionomer cement completely fills the cavity base and eliminates any marginal voids. Prior to polymerizing, the occlusal margins are burnished with a ball burnisher to minimize the presence of RMGIC at the cavo margins (Fig. 8, Diagram 6).

Simultaneous photo-initiation (co-curing) of the composite resin and RMGIC is commenced and continued for 20 seconds. Curing and polymerization shrinkage of the composite resin occurs before the RMGIC to create stress free margins at the enamel interfaces. The resin in the RMGIC chemically bonds to the composite while the glass ionomer in the RMGIC chemically bonds to the glass ionomer base. Clinicians must wait for four minutes from placement of the glass ionomer cement to allow sufficient chemical curing prior to removing the matrix band (Fig. 9, Diagram 7).

After removal of the matrix band, the composite resin and RMGIC in the proximal areas are further cured for 20 seconds on the buccal and lingual surfaces (Fig. 10).

The restoration is then contoured, adapted into the occlusion and polished (Diagram 8).

Finally, the occlusal and proximal surfaces are coated with a light cured resin (Resist††) to enhance wear resistance and to protect the surface of the maturing glass ionomer cement (Fig. 11, Diagram 9).

The completed restoration has composite resin on the occlusal surface and contact areas to resist occlusal and proximal wear, whilst

Condition or etch – comments by Dr Graham Mount, AM

After the cavity preparation or just before restoration placement should the cavity be 'conditioned' or 'etched'? Although often regarded as interchangeable there is a **specific purpose** for each.

'Conditioning' was developed in relation **to glass-ionomers** to allow the development of the **ion exchange adhesion** between the restoration and both the enamel and dentine. It involves:

- A **mild** polyacrylic acid applied for 10 seconds only.
- Removes smear layer and other contaminants completely.
- **Does not** demineralize underlying tooth structure to any extent.
- **Does not** open dentine tubules to any extent.
- Improves wetability of the tooth surface to encourage adaptation of the cement to the tooth.
- Makes possible the full development of the ion exchange adhesion layer between the glass ionomer and tooth structure.

'Etching' was developed in relation to **composite resin** to assist development of the micro-mechanical attachment between enamel and the restoration. Its use has since been extended in an attempt to allow micro-mechanical attachment to dentine as well. It involves:

- A **stronger** orthophosphoric acid applied for 15-30 seconds.
- Removes the smear layer and other contaminants.
- Demineralizes enamel to depths of 30-50 microns.
- Demineralizes dentine to depths of 100 microns.
- Opens dentine tubules and allows **copious outward fluid flow from dentine.**
- Allows excellent micro-mechanical attachment to enamel *in vivo.*
- May allow a degree of micro-mechanical attachment to dentine *in vivo.*

Recommendation – Always use the right material in the right place.

*G-C, Japan.
†ESPE Australia Pty Ltd, Alexandria, NSW.
‡VOCO Australia Pty Ltd, Carnegie, Vic.
§3M Australia Pty Ltd, Pennant Hills, NSW.
‖Southern Dental Industries Ltd, Bayswater, Vic.
¶Ivoclar Pty Ltd, Noble Park, Vic.
**Kerr Australia Pty Ltd, North Ryde, NSW.
††NSI, Nulite Systems International Pty Ltd, Hornsby, NSW.

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the remainder of the tooth enjoys the benefits of being restored with glass ionomer cement (Fig. 12).

Namely:

- A stable, low sensitivity restoration with a history of successful clinical performance.
- A chemical (ionic) bond between the restoration and tooth structure.
- Remineralization of affected dentine.
- Fluoride release to inhibit plaque formation.
- Neutralizing pH falls in the proximal region.

This is a restoration that takes less time to place than a standard Class II resin, gives a predictable result and has a successful clinical track record of almost 20 years.

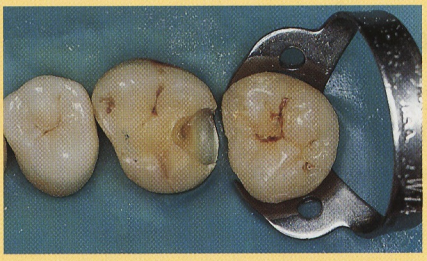

Fig. 1.

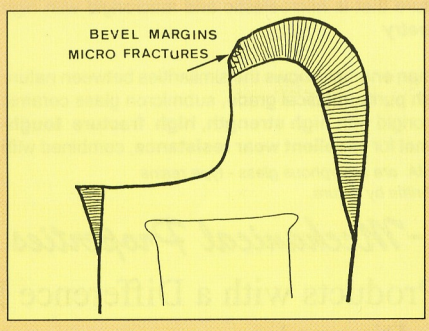

Diagram 1. Cavity preparation showing micro fractures at enamel margins caused by eccentric high speed rotary preparation instruments.

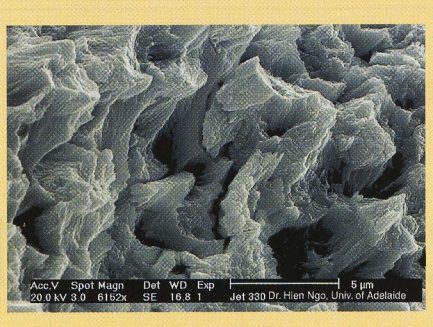

Fig. 2. *Courtesy of Dr Hien Ngo, University of Adelaide.*

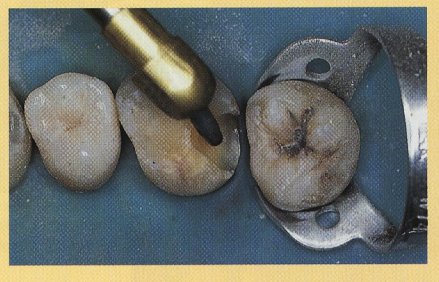

Fig. 3.

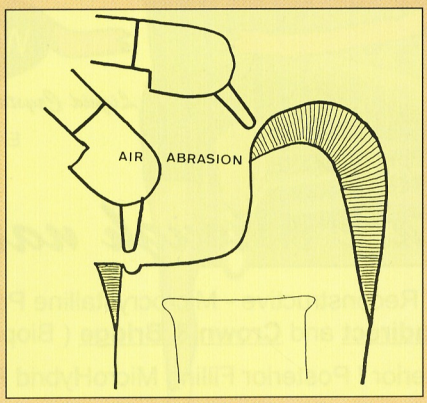

Diagram 2. Air abrasion will remove the micro fractures at the enamel margins, increase the surface area of dentine, provide a retention groove at the dentino enamel margin and assure the removal of caries from this critical area of the preparation.

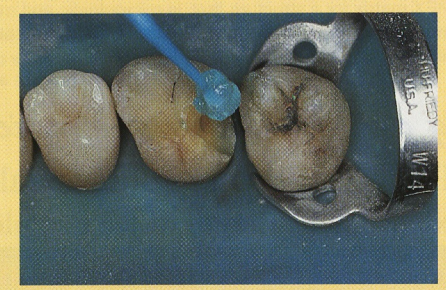

Fig. 4.

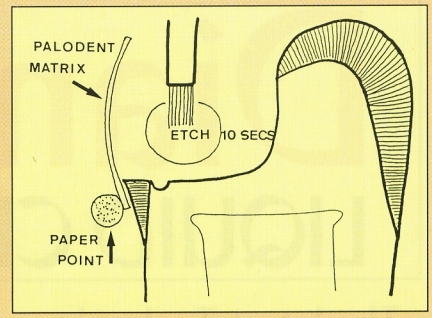

Diagram 3. The preparation is etched with phosphoric acid for 10 seconds to etch enamel margins and remove the smear layer from the dentine. A Palodent sectional matrix is placed and wedged with a paper point.

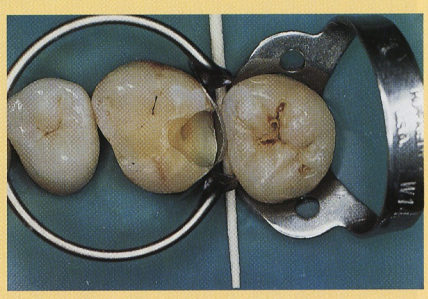

Fig. 5.

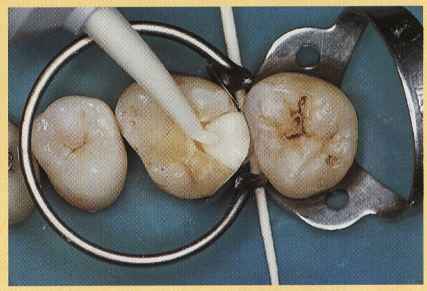

Fig. 6.

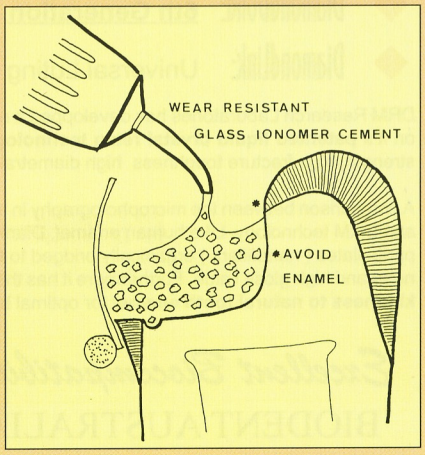

Diagram 4. A wear resistant glass ionomer cement is placed at the base of the cavity up to the dentino enamel margin.

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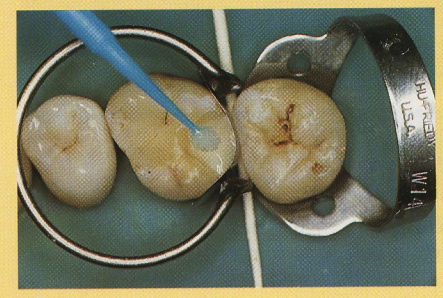

Fig. 7.

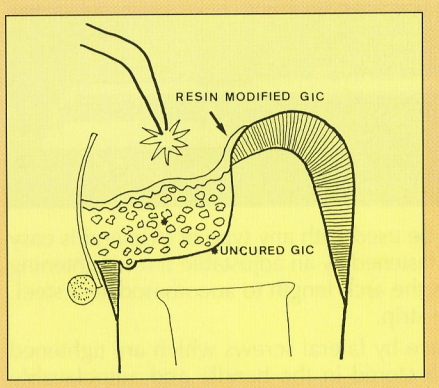

Diagram 5. While the glass ionomer cement is still malleable, a resin modified glass ionomer cement is smeared over the surface and the enamel margins of the preparation.

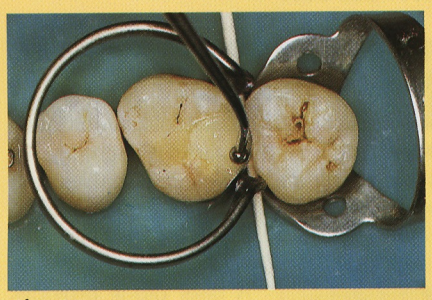

Fig. 8.

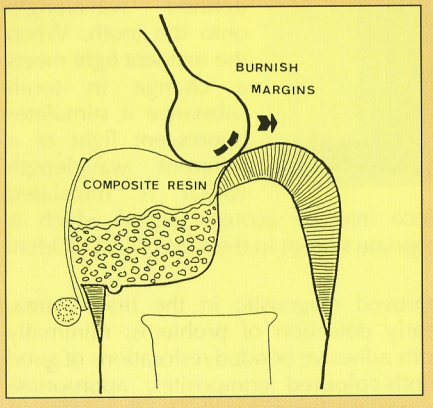

Diagram 6. A compactable composite resin is placed into the cavity and the cavo margins are burnished with a ball burnisher to minimize the exposure of resin modified glass ionomer cement at the cavity margins.

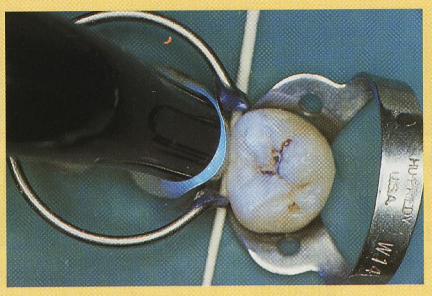

Fig. 9.

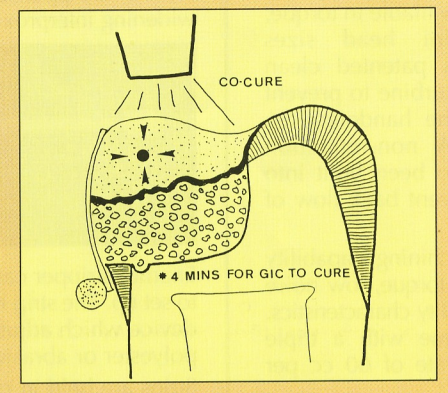

Diagram 7. Simultaneous photo-initiation of the composite resin and resin modified glass ionomer cement is commenced (co-curing) to minimize polymerization stress at the restorative interface. Removal of the matrix band is delayed for four minutes to allow the glass ionomer to cure and bond to the resin modified glass ionomer cement.

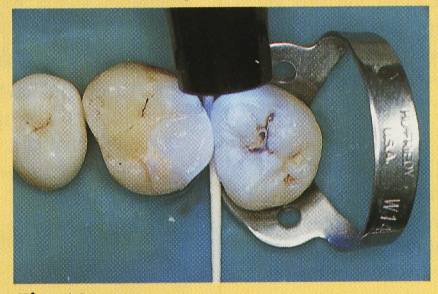

Fig. 10.

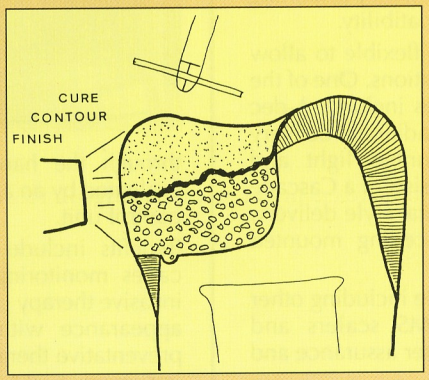

Diagram 8. After removal of the sectional matrix the proximal areas are further light cured for 20 seconds and the restoration is contoured within the occlusal table and finished.

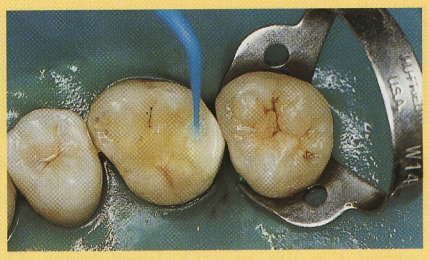

Fig. 11.

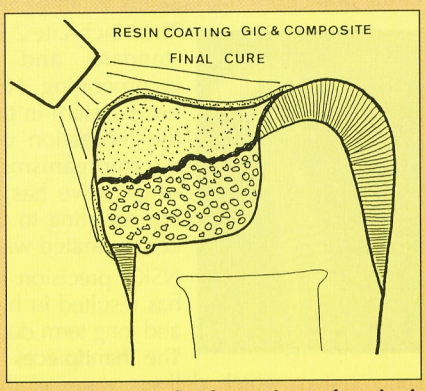

Diagram 9. A final coating of resin is applied over the restoration to improve the wear resistance of the composite resin and to protect the maturing glass ionomer cement. A final light cure of 20 seconds is applied to the restoration.

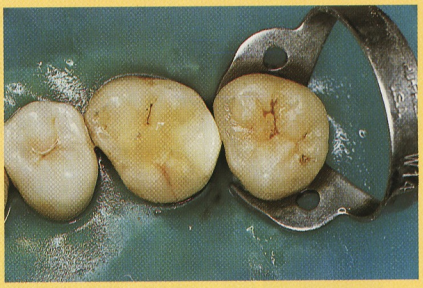

Fig. 12.

Finally – Australia vs West Indies

Cricket fans will be interested to learn that the Barbados Dental Association is planning a Conference with the theme 'Dentistry in the New Millennium' from 26 to 29 February 1999. Just in time to catch the start of the First Test in Trinidad on 5 March. Continuing education and an overdose of cricket in the Caribbean. For contact details see Dental Calendar on page 48 of this issue.