*Compiled by Geoffrey M. Knight*

# A light at the end of the tunnel?

**Monopoly is the comfortable umbrella that has sheltered the professions from competition in the workplace while at the same time becoming their Achilles heel. Instead of directing research towards efficiency, it has been directed towards complexity to the extent that many professional services have become irrelevant and out of reach to large sections of the community they wish to serve.**

In an attempt to make dentistry more affordable, government and third party intervention has threatened the standards of care and the future of private practice and many members will be aware of the ill advised plan for a pilot scheme to have school dental therapists treating Health Card holders throughout Australia.

The profession can respond to this environment in various ways:

- Cling to traditional techniques and philosophies and have the viability of the private sector further eroded.
- Make the public more aware of the value of dental health so that the community is prepared to invest more resources into dental care.
- Set about to improve the quality and efficiency of delivering dental care so that improved productivity will drive down costs for patients and give practitioners a better hourly return on their chairside time.

There are many opportunities within dentistry for productivity improvements. The traditional Class II cavity preparation has been identified as the point at which the countdown for the life of a tooth begins. Class II cavity preparations restored with dental amalgam weaken cusps that eventually fracture, requiring full coverage that often succumbs to recurrent caries and pulp death.

The introduction of glass ionomer cement in the late 70s created opportunities for the development of new clinical procedures. Dentists now had a restorative material that was user friendly, tooth-coloured and predictably bonded to both dental enamel and dentine with the added advantage of the ongoing release of fluoride ions that protected the tooth/restorative interface from further caries attack. The big disadvantage of this material was the poor resistance to occlusal wear and so its use was generally limited as a restorative material for Class III and V cavities. Class ionomer cements also became popular as a biologically compatible liner and base under restorative materials with a higher resistance to occlusal wear.

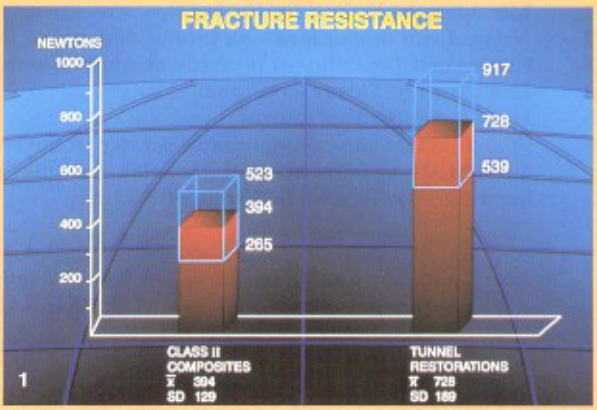
The tunnel restoration was introduced in the early 80s as a technique that utilized the adhesive and caries resistant properties of glass ionomer cements to enable a biologically conservative tooth preparation that retained the critical marginal ridge.

Not only did this preparation reduce the biological costs to the tooth but afforded practitioners significant savings in time by not having to recreate contact areas and carve marginal ridges. In effect dentists were placing Class I restorations into teeth with matrix bands around them. Such improvements in productivity can be applied to reduce the fiscal costs for patients while still affording an improved hourly return for the practitioner.

As with the introduction of any new clinical procedure, there have been a number of attempts to find flaws in the tunnel technique. It has been suggested that tunnel preparations produce a weakened restoration compared to a Class II resin and the cavity design reduces access for diagnosis and removal of caries.

However, when the fracture resistance of a tunnel restoration is compared to a conventional Class II resin it proves to be 50 per cent stronger (Fig. 1).

Improved access in both the bucco-lingual and mesio-distal planes may be gained by extending the access cavity from the occlusal fossa bucco-lingually, parallel to the marginal ridge and ➤



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about 2 mm from the margin and along the central fissure away from the margin so as to form a 'T' shaped access cavity (Diagram 1). The 'T' shaped design, aided by a proprietary caries detector gives much better access than the original 'O' type cavity preparation and enables accurate diagnosis and removal of caries from the lesion (Fig. 2).

Since its introduction eleven years ago, the technique is now taught in many

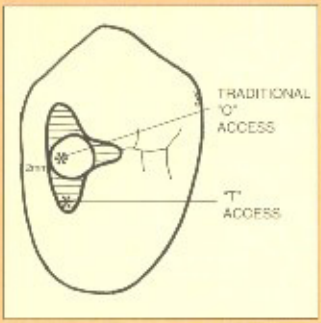


*Diagram 1*


dental schools throughout the world and the increasing popularity amongst general dentists confirms it as the emerging preferred treatment option for restoring initial Class II lesions. Furthermore, it may well be argued that a cavity design for the restoration of an initial proximal lesion that requires removal of the marginal ridge fails to provide a patient with the optimal level of clinical care.

The long-term clinical performance of different restorative materials used for tunnel restorations suggests that Type III glass ionomer cements are the materials of choice. These materials are cost effective, user friendly and the release of fluoride ions assures long term protection from caries at the cavo margins. Figure 3 shows a Ketac Bond restoration after four years in an upper first molar showing minimal occlusal wear. Figure 4 shows the cavity preparation in a lower first molar that was restored with a Type II aesthetic glass ionomer cement (Ketac Fil) and has functioned satisfactorily for over 13.5 years (Fig. 5).

The recent introduction of another reinforced glass ionomer cement, Fuji 9, for use as an 'atraumatic restorative treatment' material signals a shift in the delivery of dental care. Type III glass ionomer cements have immediate applications in Third World environments that lack access to modern dental equipment, but they also have applications within sophisticated delivery systems where atraumatic and minimally invasive modalities of intervention are seen as the foundations of optimal clinical care.

The fracture of a marginal ridge after placement of a tunnel restoration has been one of the arguments for avoiding the technique. Figure 6 shows a tunnel restoration that lost the marginal ridge after 13 years. The tooth was repaired by cleaning out the fracture area with a high speed diamond bur, etched with 37 per cent phosphoric acid, washed and dried with oil-free air, prior to a small resin repair being placed into the defect (Fig. 7). In a matter of minutes the defect was repaired and the patient dismissed (Fig. 8).







In a political environment that places dentists under increasing pressure to find alternatives to dental amalgam a tunnel restoration using a Type III glass ionomer cement is the preferred option for restoring an initial proximal lesion.

### Operative technique

- The tooth may be isolated with rubber dam or with cotton wool rolls during placement of the restoration.
- Anaesthetize the tooth as required and make a small access cavity in the occlusal fossa above the lesion.
- Extend the preparation bucco-lingually about 2 mm in either direction and about 2 mm in from the marginal ridge.
- Prepare further access to the lesion by extending a preparation 2 mm along the central fissure away from the marginal ridge forming a 'T' shaped preparation affording access to the caries below (Diagram 1).
- Remove carious dentine with a small slow speed round bur. The use of a caries detector facilitates and speeds up complete caries removal (Fig. 9).
- Remove the smear layer from the dentine with either phosphoric acid or a manufacturer's proprietary tooth conditioner, wash and dry with oil-free air.
- Place a matrix band and wedge firmly with a wooden wedge.
- Using a capsulated Type III glass ionomer cement (Ketac Bond) or an uncapsulated Type III cement in a Centric syringe (Fuji 9), insert the syringe tip to the base of the preparation and slowly withdraw, at the same time injecting the glass ionomer cement until the cavity is slightly overfilled.


- Wait until the cement has reached the gelatinous stage of setting and further compact it with a ball ended burnisher as shown in Diagram 2. This will eliminate voids and maximize the integrity of the proximal margin.
- Wait about 4 minutes for the glass ionomer to set and trim it back free of the occlusion with a slow speed round bur.
- Remove the matrix band and contour the proximal margin with an abrasive strip. Check for remaining overhangs with dental floss.
- Finally, check to establish that the restoration is clear of the occlusion.

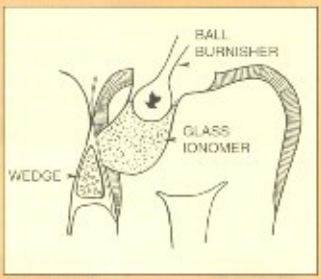


***Diagram 2. Glass ionomer cement at the gelatinous setting stage is packed into the preparation with a ball burnisher to eliminate voids and maximize the integrity of the proximal margin.***

### Conclusion

For the past decade and a half the standard solution to the economic problems of dentistry has been based upon developing marketing techniques that encourage patients to accept increasingly complex and expensive treatment plans. Apart from high fiscal costs, these techniques often involve high biological costs for patients and the emotional commitment of the practitioner increases with the complexity of the procedure involved.

The refreshing alternative was discovered by businesses that survived the 'shakeout' of the early nineties. Increasing efficiency will improve both the profitability of your business and the quality of the goods and services you provide while at the same time reducing the costs of providing them.

Advances in adhesive restorative materials enable dental practitioners to offer their patients minimally invasive restorative procedures at levels of efficiency far beyond traditional techniques. Increased productivity and lower patient costs is the emerging solution to the future viability of dentistry. □