

Oral Health Committee



The commercial case for MINIMAL INTERVENTION DENTISTRY

Mark Twain once said that everyone talks about the weather but nobody ever does anything about it. These days there seems to be more discussion about rain fall and temperature than ever before. There is broad agreement on a link between carbon dioxide and climate change but, despite this, few wind farms or solar energy plants are presently under construction.

In dentistry, one subject there is general agreement on is the philosophy of minimal intervention (MI). Most dentists identify themselves as practitioners and, whenever possible, lecturers point to how their procedures conform to MI principles. It has virtually become a modern paradigm.

In reality, though, MI dentistry is usually endorsed more as a high minded aspiration than a raft of techniques suitable for busy general practice. When faced with mesial or distal decay, most of us still cut proximal ridges and enamel walls and we routinely remove caries affected dentine close to vulnerable pulps. Everyone speaks politely about MI dentistry but, like the building of wind farms, not a great deal is actually being done.

There are a number of reasons. Paradoxically one is that MI dentistry involves little capital outlay and, in many cases, little special expertise. Browse through a commercial dental magazine or even just open the daily mail and one is inundated with advertisements for expensive equipment and training courses. Technologies such as CAD/CAMs and implants are exotic and exciting. While they are costly to bring to the profession they also involve high profit margins for manufacturers and retailers and accordingly are heavily marketed. They can easily be perceived as the essence of modern dentistry.

In most cases this type of *high intervention* is usually the latest in a long series of treatments which have failed to arrest deterioration. Graeme Mount¹ wrote recently, "As suggested by GV Black, operative dentistry must begin with cariology and it is essential that it again become the dominant discipline in the profession." Advanced technology is applaudable but its glamour and promotion can distract from the basics of treating primary caries.

APPROXIMAL DECAY

It is widely accepted that many of Black's teachings have been superseded. In a post fluoridation era fissures are rarely drilled out and, when adhesive materials are being used, undercuts are not deliberately prepared. However, the approach to, for instance, approximal caries is in most practices substantially the same as Black advocated, albeit on a smaller scale.

The 'tunnel preparation' that Knight and Hunt^{2,3} described 28 years ago represented an alternative approach, but it has not become

popular. It is seen, rather unfairly, as difficult to perform since the operator must angle the preparation diagonally while avoiding damage to the adjacent tooth. A certain percentage of marginal ridges are known to fracture and there are concerns about the ability of the glass ionomer cement (GIC), at the base of the tunnel, to ultimately resist dissolution from oral acidity.

In 1990 Hunt⁴ wrote about a variation that was even less invasive. It accessed, and removed, curiously infected dentine but left the side enamel intact. "The enamel porosity is allowed to remain to avoid trauma to the wall and retain a shell of porous enamel, allowing for remineralisation...Retention of the original enamel will ensure the maintenance of a stable approximal contact." Effectively, what might have been considered a Class II cavity was treated as a type of Class I.

The resultant internal restoration, as he called it, was simple to execute and suffered less incidence of ridge fracture because the ridge had not been undermined. The criteria that determined whether the proximal wall was breached was simply whether or not the lesion had created physical cavitation. Most proximal caries, as detected radiographically, do not, in fact, suffer changes in morphology.

CHANGES IN DENTINE

Apart from its configuration, two features of the internal restoration were interesting. Hunt recommended glass ionomer cement "as the body of the restoration." Research has continued to confirm GIC adheres effectively to both enamel and dentine, suggesting it is capable of sealing the inner part of a tooth against the biofilm that drives the caries process. It is also known to inhibit bacterial growth, possibly through raising pH.

Importantly, GIC releases a range of minerals, most notably fluoride, which retard softening and stimulate remineralisation in both enamel and dentine. Laboratory studies have shown it can actually lead to hypermineralisation of dentine tubules in artificial lesions, so increasing the acid resistance of the tissue.

Secondly, Hunt advised removing rubbery, *infected* dentine while retaining stained, *affected* dentine at the base of the cavity. This reflected the profession's growing insight that decay could be considered in different levels and the belief that bacteria were confined only to a zone of soft, demineralised dentine.

Today, we know that some microbes do, in fact, inhabit the affected layer, although their significance may be minor. We also realise that lesions can be active, arrested or slowly growing. In the latter cases the inner dentine once again hypermineralises, narrowing the diameter of tubules, and the pulp lays down tertiary dentine to further block the transmission of microbial products.

Distinguishing between the two layers is sometimes difficult but, to reduce the risk of pulp damage, it would seem desirable to avoid cutting affected dentine. On the other hand, removing the infected layer would appear *essential*, since a central tenet of dentistry has long been that all decay must be excised.

THE IMPLICATIONS OF SEALING

In 1998 this basic assumption was called into question. Mertz-Fairhurst *et al.*⁵ published the results of a 10 year study involving over 100 patients with frank, cavitated occlusal cavities.

One group of cavities was treated conventionally with classical amalgam restorations; another simply had the caries sealed over with composite resin, following no preparation except for bevelling of the enamel margins. They wrote "It is reasonable to expect that if the source of nutrition for the cariogenic bacteria could be eliminated, the organisms would die, thus arresting the caries process." After a decade the sealed 'restorations' performed as well as the amalgams and 'arrested the progress of the lesions.'

It would seem that the situation with sealed, *residual* decay is very different from that of *recurrent* decay. The latter is often linked to pulpal damage and is usually associated with poorly sealed margins that leak both bacteria and nutrient. Very often deep preparations have already exposed millions of tubules, opening up pathways to the pulp for microbial by products.

So, is it essential to remove all decay, especially when it is deep and approaching the pulp? Some authorities advocate removing only gross and peripheral caries, particularly at the enamel-dentino junction (indirect pulp capping). The remaining softened dentine is sealed with GIC and serves as a protective mat over the pulp.

This strategy of inactivating microbes has an analogy with the advice dentists give their patients about controlling the bacteria in plaque – their number will inevitably drop if they are deprived of substrate (food debris).

A MEDICINAL APPROACH

Perhaps eliminating bacteria should not be seen as synonymous with physically excising them, together with their housing of dentine. Treating decay *medicinally* rather than *surgically* may be another viable alternative and not lead to complications such as mechanical weakening and pulpal trauma.

In the late seventies Graham Craig⁶ used ammoniated silver fluoride topically to manage gross decay in deciduous molars. After two years 74% of the cavities had not progressed.

Silver fluoride stimulates remineralisation and is intensely bactericidal. Silver ions are lethal to *streptococcus mutans* at concentrations of 20-200 ppm, while a 40% silver fluoride solution achieves levels of 3,000-12,000 ppm.

A potential complication of AgF is its unsightly staining of surrounding enamel. Craig has suggested that, when used on a cavity of prepared carious dentine, its application should immediately be followed by that of potassium iodide. Staining is avoided because the resultant precipitate of silver iodide is yellow-white rather than black. *In vitro* studies have confirmed that AgF and KI, used in combination, inhibit both caries progression and demineralisation.

Silver fluoride has great potential. It has been used intermittently for many years in the Atraumatic Restorative Technique for deciduous teeth, but it also has broad application for treating permanent teeth.

When deep decay is being managed and the clinician seeks to limit the extent of preparation, it can almost immediately disinfect the surface of exposed dentine. When approximal caries is being

treated, it complements the internal preparation by disinfecting chalky, porous enamel and stimulating remineralisation. Used in conjunction with GIC, it would appear there may be the capacity to both kill cariogenic bacteria and seal the dentine in otherwise deep preparations.

THE BOTTOM LINE

The clinical case for MI dentistry should be compelling but it has failed to significantly alter day-to-day practice. Too often it is seen as impractical and finicky and more suited to academics than general practitioners aiming to run a successful business. Marketing executives might say it has an image problem.

Occasionally its promotion lacks conviction. A few years ago, one researcher⁷ wrote in the *News Bulletin* about the "demanding nature" of the internal restoration and commented "it requires excellent lighting, magnification aids and good visual access." This does the restoration a disservice because it is, in fact, much easier to perform than a traditional Class II filling.

More than anything, though, work practices are difficult to alter because they become engrained. Techniques that are familiar instil ease and confidence; new approaches are awkward and daunting. It takes quite an incentive to bring about change.

If the clinical argument has faltered perhaps the commercial case may prove more appealing. The reasoning is straightforward.

Profitability depends largely on efficiency. Treating caries remains a major part of any practice and, if it can be accomplished smoothly and quickly, the number of units performed per hour can rise significantly.

Minimal intervention dentistry is certainly efficient. Occlusal cavities require less depth of preparation. Most approximal lesions do not need enamel walls and ridges removed and matrices need not be placed. The time taken for shaping and polishing is reduced markedly.

In addition, less preparation leads to less incidence of sensitivity and pulpal complications. When any restoration precipitates a need for endodontic treatment, credibility can unfairly be undermined, irrespective of the original decay's depth. It goes without saying that patient flow and perceived credibility are closely related.

Back in 2004 the respected British academic Edwina Kidd⁸ wrote in a landmark paper "The concept of removing infected, demineralised tissue and its replacement by a filling material has spawned a profession, a public, and political paymasters who consider that removing infected tissue and filling teeth is an essential management of dental caries."

Some years earlier, today's author had waited patiently for the paymaster to forward on his cheque. It never arrived in the mail. He eventually decided it was better for his patients' dental health, and better for his cash flow, to adopt a more minimal intervention style of dentistry.

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REFERENCES

References supplied by the author are available from newsbull@ada.org.au

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