

The Pharmacological Management of Dental Caries

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Every two years, IDS in Cologne showcases the latest in dental technology and points to the future direction of dentistry.

About 75 percent of the products on display this year indulged in high-tech manifestations of operative dentistry that were predicated on the ongoing progression of dental disease and tooth loss. One had to sift carefully through the manufacturers to find anyone vaguely promoting preventive care.

Dental schools around the globe teach students that the preparation of a carious lesion for a restoration requires removal of all infected dentine (dentine where the collagen within the tissue has been broken down and bacteria are present within the dentinal tubules) however there is a growing consensus that affected dentine (partially demineralized dentine, where the collagen matrix remains in tact and the odontogenic processes remain viable) can be remineralized and does not require removal. However, the clinical determination between these layers remains one of the challenges of restorative dentistry.

Although every clinician has observed arrested caries amongst their patients the link between this and a tooth's ability to heal itself under certain clinical conditions appears to have little traction within the profession.

The removal of carious dentine during cavity preparation flags the dentine pulp complex as the only vital tissue within the body without a front line defence against bacterial infection. It can be argued that carious dentine is in effect an inflammatory reaction within the dentine pulp complex and progression to arrested caries is the protective formation of dental scar tissue, the same as skin creates scar tissue to keep invading bacteria at bay.

This concept creates a pivotal shift in the management of dental caries, for instead of removing carious dentine, clinicians can now be seeking a medicament that assists healing

within the carious dentine (similar to iodine on a wound) that will form a protective barrier against ongoing decay, observed clinically as arrested caries (dental scar tissue)

As regulators are winding down the global use of dental amalgam, manufacturer's are searching for an alternative material that provides the same level of forgiveness and predictability of service plus the biomimetic properties that prevent the onset of further caries as well as helping a tooth remineralize any carious tissue remaining under the restoration.

Composite resin has excellent aesthetics, acceptable physical properties and will bond predictably to dental enamel. However polymerization shrinkage and the unpredictable nature of conventional dentine bonding systems creates liabilities especially on the floor of a proximal restoration extending beyond the dento enamel junction. Furthermore composite resin does nothing to assist with the remineralization of caries affected dentine or enamel.

Glass ionomers cements lack the aesthetics and physical properties of composite resin, however they bond chemically onto tooth structures, do not undergo polymerization shrinkage (no marginal stress) and the fluoride release protects cavo margins from ongoing carious attack as well as fluoride penetration up to a concentration of one percent into carious dentine is sufficient to kill bacteria to a depth of about 300 microns. This enables clinicians to leave a thin layer of carious dentine at the base of a preparation thus avoiding the dilemma of determining the demarcation between infected and affected dentine.

Looking at the current state of play, an amalgam replacement material will be based more upon glass ionomer technology that that of composite resin. Currently a glass ionomer, composite resin sandwich restoration combines the best of both materials and although somewhat complicated to place, offers clinicians the most satisfactory direct restorative available.

Direct pharmacological intervention onto a carious lesion prior to placing a restoration is an opportunity to assist with

the remineralization of carious dentine. There are a few options currently available that include ozone and Diamine Silver Fluoride (SDF) although ozone presents clinical challenges in delivery and adaption around a lesion.

SDF has been used since the 70's and shown to be an effective means of arresting caries. To date staining issues has limited its use beyond arresting caries within the primary dentition.

The application of SDF followed by potassium iodide (Riva Star: SDI Australia) has been shown to prevent stain formation and potentially increase the effectiveness of SDF alone as a caries inhibitor by depositing silver iodide salts into the dentinal tubules of carious dentine. As well as preventing staining of surrounding enamel, the application of potassium iodide reduces the caustic eschar that forms on the gingival tissues following the application of SDF alone.

EPMA studies have shown that the fluoride ions in Riva Star penetrate through a carious lesion into the sound dentine beneath at concentrations up to two percent, effectively killing all the bacteria within the lesion and creating a high fluoride layer of arrested caries turning the carious dentine into a decay resistant barrier within the tooth.

To maximize the effectiveness of the Riva Star, it is necessary to cover the treated tooth surfaces with a glass ionomer dressing for at least one week to enable maximum penetration into the tooth without being washed away by saliva.

Riva Star has the potential for a wide range of applications in the treatment of dental caries and as no tissue preparation is required the need for dental operative equipment is greatly reduced.

In private practice, Riva Star will painlessly arrest caries in the primary dentition and facilitate the restoration of asymptomatic caries in the secondary dentition without staining. It is a useful adjunct for root canal treatment prior to obturation, as biofilms will not form on dentine surfaces treated with Riva Star.

In the public sector, where there are long waiting lists for treatment, Riva Star has profound benefits for the triage of carious lesions focusing on stopping the caries rather than

restoring the teeth. A food pack is rarely the cause for attending an emergency room. Once the caries have been managed more sophisticated treatment can be provided.

For emerging economies Riva Star can be applied with a minimum of equipment even if electricity is not available. This enables an important triage service for communities where high carbohydrate diets follow supposed modernization and whole populations suffer from extensive dental disease.

Dentistry is at a diverging fork in its history. One group using technology to treat the ongoing propagation of caries and another focusing upon the causal factors and searching for a pharmacological solution based upon the medical model used to treat bacterial infections elsewhere in the body. **OH**

Oral Health welcomes this original article.

Disclaimer: The author has a financial interest in Riva Star and is a non executive board member of SDI.



Geoff Knight is a general dentist and internationally noted dental speaker from Melbourne, Australia with special interests in Minimal Intervention Aesthetic Dentistry. He has pioneered protocols for the pharmacological management of dental caries and periodontal disease. He has introduced the concepts of tunnel restorations and co-curing to MID and developed a number of innovative aesthetic techniques for

the placement of direct laminates veneers, direct resin bridges and occlusal rehabilitation using composite resins. He has consulted widely across the dental industry and is named on several patents.

Apart from his broad clinical base, he has been State President of his Dental Association and has extensive political and economic experience within the profession.

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