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## New dentistry, caries and amputation

During the American Civil War, a soldier who developed gangrene in a foot had his leg amputated. One hundred and fifty years later, the dental profession retains a similar philosophy to treating dental caries.

Graham Mount's statement, that dentistry remains the only health care profession today that treats a bacterial disease with amputation is a timely call to review current restorative techniques.

Fusayama has identified four different zones of dentine in a carious tooth.

The outer zone consists of a demineralized dentine where the collagen matrix has been broken down into an amorphous mass invaded by bacteria. This zone has been described as the infected zone and believed to be incapable of remineralization.

The zone directly beyond the infected zone has been termed the affected zone where there are no bacteria, with some partial dentine demineralization, although the collagen matrix remains intact. It is generally accepted that this dentine is capable of remineralization if the tooth is restored with glass ionomer cement (GIC).

The next one is the transparent zone caused by crystalline deposits from demineralized dentine precipitating in the dentinal tubules that change the refractive index.

Traditional tooth restorative techniques have required removal of all softened dentine to a firm

base. The relatively gross techniques employed and inaccuracies in identifying the healthy dentine

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interface inevitably result in the substantial and unnecessary amputation of healthy dentine during cavity preparation.

The advent of adhesive dentistry had the potential of heralding a new era of minimal tooth preparation. However, resin based dentine bonding techniques require placing a restoration on a firm dentine base to form the hybrid layer for mechanical retention, continuing the culture of amputating healthy tooth structure. Furthermore, mechanical adhesion of resin based systems cannot be relied upon to penetrate the dentinal tubules whose contents are heavily impregnated with crystalline deposits from the demineralizing dentine above.

The composite resin bond is shown schematically in Fig. 1.

The remineralizing properties of glass ionomer cements enable restorations to chemically bond directly onto affected dentine that will remineralize over time. GIC restorations do not require removal

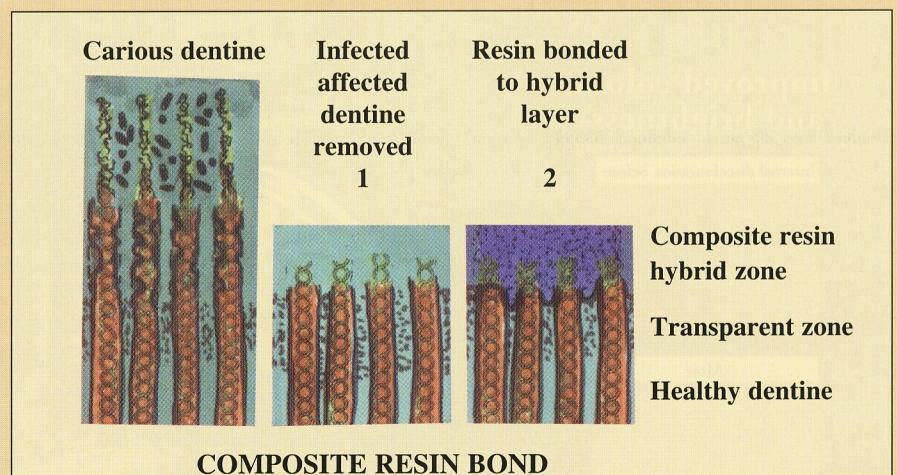


Fig. 1. Restoring a tooth with a resin based dentine bonding system inevitably requires the removal of remineralizable, affected dentine and healthy dentine.

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of tooth structure down to healthy dentine for adhesion.

The glass ionomer cement bond is shown schematically in Fig. 2.

There are inherent problems with any restorative system that requires

identification of the interface between the different types of dentine associated with the carious process.

Chemical removal of carious dentine using Carisolv is one system currently available that enables dentists to accurately remove

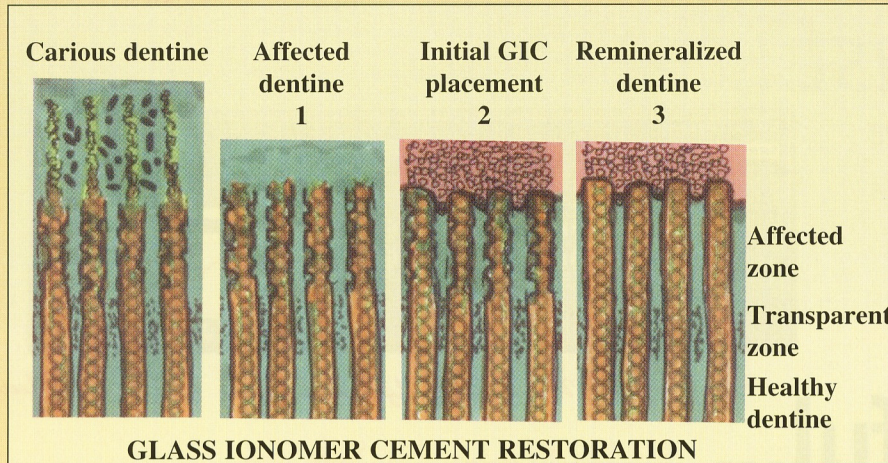
carious non remineralizable dentine. This identifies the affected or remineralizable zone upon which the successful placement of glass ionomer cement can be achieved.

There is a need to develop an adhesive system that incorporates a modified carious dentine (that is disinfected and capable of remineralization) into the restorative process to eliminate the problem of identifying the interface between infected, non remineralizable dentine and the affected remineralizable dentine layers.

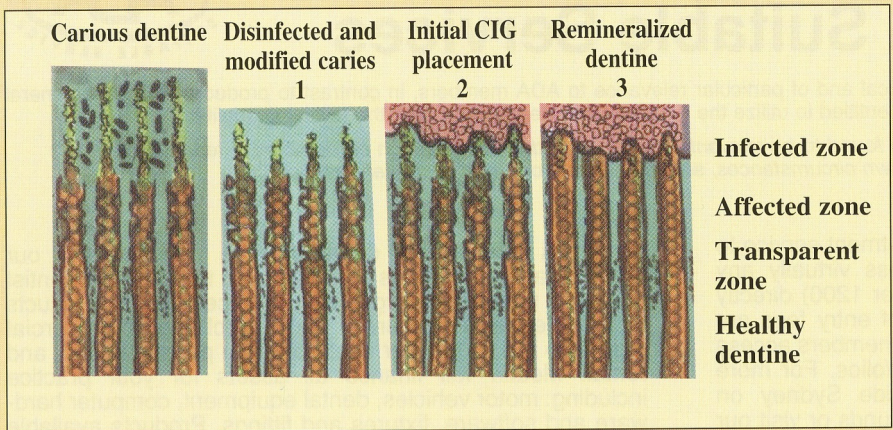
The modified caries, glass ionomer cement bond is shown schematically in Fig. 3.

Ideally, a dentine bonding system incorporating carious dentine bonded to glass ionomer cement would have the following attributes:

- Destroy bacteria and arrest caries in carious dentine.
- Protect the underlying pulpal tissues.



*Fig. 2. Restoring a tooth with glass ionomer cement challenges a clinician to identify the infected, affected dentine interface.*



**Fig. 3. Modifying carious dentine to incorporate it into the restorative process minimizes the amputation of salvageable tooth structure.**

- Provide a biological seal at the cavo margins.
- Create a remineralization matrix within the carious dentine.
- Initiate dentine remineralization in both infected and affected dentine.
- Provide a stable long term adhesive interface.

Apart from providing the dental profession with a non amputative

restorative option, such an adhesive system would have significant benefits for ART dentistry. The current model does not address the problems associated with sealing the restorative margins that inevitably results in caries progressing along the interface.

Hopefully, it won't be too long before the treatment of dental caries is based upon the principles of contemporary medicine. □