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## Minimal intervention dentistry: A review

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**Abstract**--This publication describes the history of Minimal Intervention Dentistry (MID) for managing dental caries and presents evidence for various carious lesion detection devices, for preventive measures, for restorative and non-restorative therapies as well as for repairing rather than replacing defective restorations. It is a follow-up to the FDI World Dental Federation publication on MID, of 2000. The dental profession currently is faced with an enormous task of how to manage the high burden of consequences of the caries process amongst the world population. If it is to manage carious lesion development and its progression, it should move away from the 'surgical' care approach and fully embrace the MID approach. The chance for MID to be successful is thought to be increased tremendously if dental caries is not considered an infectious but instead a behavioral disease with a bacterial component. Controlling the two main carious lesion development related behaviors, i.e. intake and frequency of fermentable sugars, to not more than five times daily and removing/disturbing dental plaque from all tooth surfaces using an effective fluoridated toothpaste twice daily, are the ingredients for reducing the burden of dental caries in many communities in the world. FDI's policy of reducing the need for restorative therapy by placing an even greater emphasis on caries prevention than is currently done, is therefore, worth pursuing.

**Keywords**--minimal intervention dentistry, caries lesion detection, caries risk assessment, caries preventive measures, restorative care, plaque control, repaired restoration.

## Introduction

The earliest stage of dental caries remain hidden until there has been surface to the tooth crown and it becomes visible to the naked eye as a white spot lesion. The rules for dentistry were invented in late 1800s by Dr G.V Black father of modern dentistry. As G.V Black in 1893, proposed the principle of extension for prevention in the operative treatment of carious lesion <sup>3</sup>. The philosophy of minimal intervention dentistry has now arisen in an attempt to combine all the present knowledge of prevention, remineralization, ion exchange, healing, and adhesion with object of reducing carious damage in the simplest and least invasive manner possible. It is obvious that restorative dentistry, based on surgical approach developed by Dr G.V Black, is highly destructive and leads to the point where majority of the dentists time is occupied in replacement dentistry. Restorative materials are not a perfect and everlasting replacement for tooth structure. Therefore one restoration leads to another, with each replacement, the cavity becomes larger until eventually very little of the original crown is left to support a further restoration. <sup>2,3</sup>

### Minimal intervention dentistry techniques

Minimal invasive dentistry utilize techniques and materials to access caries that can be remineralised and to restore the tooth with minimal loss of healthy structure. <sup>4</sup>

### Classification of various tooth cutting techniques

<b>Category</b>	<b>Technique</b>
Mechanical, rotary	hand piece + burs
Mechanical, non rotary	Hand excavator, Air abrasion, Air polishing, ultrasonic, sonic
	Abrasion
Chemo mechanical	Caridex, Carisolv, Enzymes
Photo ablation	Lasers <sup>5</sup>

### The Atraumatic Restoration Treatment (ART)

ART restoration involves the removal of soft, completely demineralized carious tooth tissue with hand instruments. This is followed by restoration of the cavity with an adhesive dental material that simultaneously seals any remaining pit and fissure that remain at the risk. <sup>6</sup>

The main difference between the ART approach and other minimally invasive operative intervention is that ART uses hand instrument only. However, in practice, glass ionomer cement (GIC) has become the most predominantly used material mainly because of its delayed setting reaction that allows handling of the material before it is completely set. Composite resin has also been used to restore primary molars with hand instruments only. <sup>6</sup>

### **Excavator, hand piece and burs**

Even though the rotary bur is universal use, there are still problems that need to be overcome. Five factors are potentially responsible for the discomfort and pain that is associated with cavity preparation:

- The sensitivity of vital dentin
- Pressure on the tooth
- Bone conducted noise and vibration
- The high pitched noise of air turbine
- Development of high temperature at the cutting surface.<sup>7</sup>

### **Chemo mechanical cavity preparation**

Chemo mechanical elimination of carious dentin has so far been promising particularly in pediatric dentistry especially for anxious or medically compromised patients. The indication for using chemo mechanical caries removal are exposed buccal lesion cervical or root caries very deep carious lesion as well as treatment of the uncooperative pediatric patient or the older frightened child.<sup>7</sup>

### **Preparations available for chemo mechanical cavity**

Preparation

- a. Cardex
- b. Carisolv 1, Single mix system 2, Multiple mix system
- c. Paparine.<sup>8</sup>

#### 1. AIR abrasion

Air abrasion was originally developed by Robert Black in 1945 as an alternation pseudo mechanical method for dental tissue removal and the first air abrasion until markers was called the airdent by SS White. This technique involve bombarding the tooth surface with high velocity aluminum oxide particles carried in a stream of air.<sup>8</sup>

#### 2. Air polishing

Air polishing is the process by which water-soluble particles of sodium bicarbonate, to which has been added tricalcium phosphate to improve the flow characteristic are applied onto a tooth surface using air pressure shrouded in a concentric water jet.<sup>8</sup>

#### 3. The ultrasonic instrumentation

This technique does not physically excise the dentin but abrade it using a diamond coated tip oscillating at a frequency of about 6.5 kHz ranging to a maximum frequency of 20- 40kHz<sup>9</sup>. Systems available; a new ultrasonic system now available on the market uses chemical vapour deposition diamond tip which have a better resistance and durability<sup>8,9</sup>

#### 4. Ozone

Ozone gas the tri atomic state of di oxygen was proposed as an antimicrobials agent that could reduce the number of microorganisms on tooth surface. Ozone has the effect through its powerful oxidizing properties, of not only removing the protein protection and being

bactericidal but also oxidizing the biomolecules that allows that niche to survive and expand.<sup>10</sup>

5. Lasers

Laser technology was introduced in dentistry by Goldman in 1967<sup>8</sup>

6. Enzymes

Studies have examined the possibility that carious dentin might be able to be removed by using certain enzymes In 1989, Goldberg and Keil successfully removed soft carious dentin using bacterial Achromobacter collagenase, which did not affect the sound layers of Dentin beneath the lesion.<sup>8</sup>

## **Cavity Design for Minimal Intervention**

### **Cavity design principles**

1. Gaining access to the body of the lesion without being destructive.
2. Removal of the tooth structure that is infected and incapable of regeneration
3. Avoiding the exposure of dentin unaffected by carious process
4. Retaining and reinforcing sound but undermined enamel.
5. Reducing perimeter of the restoration
6. Keeping the margins of the restoration away from the gingiva.
7. Reducing occlusal stress on the final restoration<sup>8,9,10</sup>

### **Design of Cavity Preparation**

Specific designs for proximal lesion

1. Tunnel preparation.
2. Micro chip cavity preparation.
3. Mini box cavity preparation.
4. Full box cavity preparation.<sup>6,11</sup>

### **Conclusion**

It is apparent that its time for a change in operative dentistry. It is not possible to really imitate natural tooth structure on a long time basis, so it is best that it to be retained as far as possible. Therapeutic methods for the control of the disease are available and these should be the first line of defense. The presence of early carious lesions., there is no justification for removal of tooth structure simply to provide a theoretic resistance to further carious attack or to develop mechanical retention for Restorative material.

With the development of new dental restorative materials and advances in adhesive dentistry, a better understanding of the caries process and tooth's potential for remineralization and changes in caries prevalence and progression, the management of dental caries has evolved from G,V Black extension for prevention to minimally invasive. This concept includes early detection of lesion, individual caries risk assessment; non-surgical intervention and a modified surgical approach that includes delayed restoration smaller tooth preparation with modified cavity design and adhesive dental materials and repair rather than

replacement of failing restoration .The goal is preservation of natural tooth structure.

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