Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Spl Issue [2] 2022 : 527-530

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD

REVIEW ARTICLE **OPEN ACCESS**

Minimal Intervention Dentistry – A time tested tool for the way forward

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ABSTRACT
The review labels the significance of Minimal Intervention Dentistry (MID) for dealing with dental caries and elaborating the basic principles, restorative and non-restorative modalities meant for repairing restorations instead of replacing them. It gives an overview of various modalities and their basic considerations that may enable reader or dental professional to pick a specific therapy to achieve the much-desired goal of preventive approach. The oral health professionals are currently facing an enormous challenge of managing the high disease burden of the caries present among inhabitants of the entire world. In order to manage development of dental caries one has to evolve from the 'surgical' tactic towards embracing the MID method. The probability for MID to be efficacious will be increased tremendously when dental professionals will consider MID as a life course approach and under the public health significance along with the clinical significance
Keywords: *Minimal Intervention Dentistry, Caries preventive measures, restorative care, repaired restoration, Public Health Significance*

Received 02.08.2022 Revised 21.09.2022 Accepted 26.10.2022

INTRODUCTION

Dentists must place the preservation of healthy natural teeth at the top of their priority list. All work in health-related domains is aimed at maintaining body structures and their functioning. Procedures that are non-invasive are less invasive, and interventions are linked directly to tissue loss. Dentistry is said to minimally invasive when it attains the objectives related to treatment utilizing the slightest invasive approach related to surgery with exclusion of the negligible amount of healthy structures [1,2].

On The basis for minimally invasive care is biological in nature and based on prevention: primary, secondary and tertiary. Main goal of oral disease prevention is to stop the development of new cases. As a secondary prevention measure, it aims to prevent a disease from establishing in an individual and developing in the future. A prevention strategy of tertiary nature, on the other hand, has a vision to prevent relapse of disease and to handle failures of preventive and restorative measures.

The purpose of minimal intervention dentistry (MID) lies in improving quality of life by first understanding the underlying aetiology and prognosis of the disease and then making informed decisions regarding treatment; by educating the patient and providing him or her with means to take responsibility for his or her oral health, as well as by providing preventative measures, and by providing minimally invasive operative procedures for cavitated lesions [3-4].

MID is based on four core principles: Recognition identifying and assessing the risks of dental cavities early through daily routine analysis, salivary testing, and plaque testing; Reduction – addressing lifestyle habits such as smoking and altering fluid balance, as well as reducing consumption of cariogenic foods; (3) Regeneration – by using topical agents such as fluoride and casein phosphopeptides-amorphous calcium phosphates (CPP-ACP); Repair – Large chunk of tooth is preserved by means of traditional approaches of removing caries. Bioactive constituents are utilised to reestablish the tooth structure and help dentin to heal chiefly in the situation of deep dentinal carious lesions in which the danger of injury to the pulp is large [5-6].

It is now established that conventional surgical approach of drill and fill may not be essential as it may only treat the disease symptoms, not the causative factors [8]. Hence, it becomes imperative that we

understand the ideas of minimal intervention dentistry and latest novelties in oral technologies in properly diagnosing and planning for treatment associated with dental caries.

OPTIMAL CARIES PREVENTIVE MEASURES

Remineralising Agents

1. **Casein Phosphopeptide- Amorphous Calcium Phosphate:** It has been found to be cariostatic component of milk with a remineralisation effect between 0.5 and 1 percent of solution of CPP ACP having equivalence up to fluoride level of 500 ppm. It binds with tooth surface under acidic conditions having a localised action buffering the free ions enhancing the calcium phosphate levels in plaque preserving a situation of supersaturation inhibiting demineralising of enamel promoting remineralisation.[7]
2. **Combination of CPP-ACP and fluorides:** Numerous researches have indicated a synergism in remineralising ability when there is a combination of fluoride and CPP ACP[1]
3. **Novamin:** It has a chemical name of calcium sodium phosphosilicate . It is bioactive glass having minerals which are naturally present in the body which react on coming in contact with water or other fluids which leads to the release of silicon sodium phosphate and calcium ions leading to emergence of hydroxycarbonate apatite. they have desensitising proper and are commercially present as pastes varnishes and desensitizer.[8]
4. **TiF4 :** Ions of Titanium can cause hydolysing action on water leading to expulsion of proton rendering the solution a low pH value which attributes to TiF4 solution being acidic in nature . Affinity towards titanium ion with O_2 does impart a propensity to make a complex of phosphate and titanium .there is a strong bond formed which cannot be substituted by protons at lower levels of pH giving resistance to tooth surface against demineralization[9].
5. **Resin infiltrate technology:** Combination of a conservative approach of restoration with a programme of caries remineralisation provides benefits therapeutic in nature reducing restorative needs and cost complementing the technique of minimal intervention in consideration [10].
6. **Tri calcium phosphate:** TCP with a formula Ca3(PO4)2 has existence in double forms mainly alpha and beta . First form is present when enamel is subjected to heating at high temperatures and shows insolubility in environments related to oral cavity. TCP elements can be coated with sodium lauryl sulphate. This organic coating prevents undesirable interaction with fluoride which might dissolve on contact with saliva[11].
7. **Nano hydroxyapatite:** n-(Hap) is a biocompatible material showing bioactivity has achieved wider levels of reception in health field recently. There is a similarity between apatite crystals of enamel vis a vis nano-sized particles in terms of tooth morphology and crystalline structure.
8. **Enamelon:** It is consisted of sodium fluoride with salts of phosphate and calcium which maybe unstabilised . Salt is segregated from phosphate and sodium fluoride through a divider made up of plastic at centre of tubular structure consisting of paste . Enamelon has an issue of unstabilised phosphate and calcium ions of which combine into insoluble particles before coming in contact with enamel or salivary fluid [12].

Chemo mechanical consideration

1. **Caridex-** It has been developed from a formula of N-monochloroglycine along with amino butyric acid which is now obsolete[9].It has a double bottle system. One having sodium hypochlorite and other bottle consisting of glycine aminobutyric acid sodium hydroxide and sodium chloride
2. **Carisolv- two forms are available**

(A) **Single mix system-** Development of modification in gel took place**.** Red coloured gel has three contrarily charged amino acid which are assorted with sodium hypochlorite before treating. Newer gel lacks colouring agent presence , having fifty percent concentration of amino acids along with larger amount of sodium hypochlorite of 0.475 percent double the amount in original gel

(B) **Multi mix system-**It has a twin syringe system having a gel without colour 1.7 ml in quantity along with a liquid transparent in nature of similar quantity .End cap is removed and syringe is held upright .plunger is attached and fluid is pushed out and emptied in a container followed by replacement of end cap promptly which is followed by mixing of fluids to produce a solution homogenous in nature. once mixing of gel is complete it starts declining after a period of 30 minutes

Papacarie: A Brazilian research study led to the emergence if new formulation to globalise the use of chemo mechanical caries removal methods and promote its public health domain usage [9].

Formulation-A gel having a composition of 10% papain, 0.5% chloramine

Which is fundamentally a papain gel - a proteinaceous substance obtained from papaya, Chloramine, a thickener along with toluidine blue.

The Ultrasonic Instrumentation- Vibrations ultrasonic in nature and having high frequency have been suggested since past sixty years to remove caries especially proximal ones with a goal to achieve a conservative preparation of cavity. The technique does not affect the dentin by excision but causes abrasion using a tip coated with diamond wavering with a frequency between 6.5 kHz to 20-40 kHz[1].

Ozone- In the past few years' caries reversal using ozone has been recommended built on the notion that teeth which have been remineralised show greater resistance to decay as compared to sound ones. Treatment using Ozone causes remineralisation of caries associated with deep pits and fissures along with ones that have incipient root caries. Utility in Open lesion is being studied as well [8].There is penetration through decayed tissue causing elimination of cariogenic microorganisms along with priming for remineralisation in the carious tissue

Laser: There is a presence of lasers of three different wavelengths existing for medical usage in hard tissue management which came after a long period of uncertainty.[1] The three being Er:YSGG (λ =2.79μm). Erbium:yttrium-aluminum-garnet Er:YAG (λ=2.94μm), Erbium-chromium:yttrium-scandium - gadolinium-garnet Er,Cr: YSGG, (λ = 78μm).

ATRAUMATIC RESTORATIVE TECHNIQUES (ART):

This Modality can disseminate curative services to the underserved population. It involves removing caries using hand held instrumentation systems along with usage of current restorative cements having good adhesion. Presently Glass ionomer cement that causes fluorides to leach minimizing the onset of caries is being utilized. Although GIC has low resistance to wear and less strength but the minimalistic cavity preparation overcomes this issue. Newer Modification in GIC with enhanced resistance to wear and strength have been established for this practice [13].

SONIC OSCILLATION (SONO-ABRASION):

Recent introduction to the ultrasonic is the usage of sonic air scalars with tips having abrasive property and high frequency scientifically termed SONO ABRASION, Sonicsys micro unit prevalent commercially has hand pieces that vacillate with a frequency of less than 6.5 kHZ. Their tip has an elliptical motion having a distance transversally amid 0.08 and 0.15 millimeters with movement longitudinally amid 0.55-.0.135 mm. There is presence of diamond coating on one of the sides which are cooled by water irrigation with a flow rate lying between 20-30mL/minute. The pressure of operation for finishing the cavity lies near about 3.5 bar. Three different tips are present torpedo shape which is 9.5 mm long and 1.3 mm wide. Small hemispherical tip having a diameter of 1.5 mm and larger hemispherical tip of 2.2 mm diameter [14].

The application of torque on the instrument tip should lie around 2N. If the pressure being applied is large efficiency of cutting may be condensed due to oscillation damping. This system was established utilizing tips which help in preparing outline for cavities which work efficiently in eliminating hard tissues during prepared cavity finishing. Outcomes from researches utilizing this technique to eliminate soft dentin have pointed towards the possible usage in the future.

PUBLIC HEALTH PERSPECTIVE

Minimally invasive form of Dental Treatment is a broader concept and is still in its nascent stages. Extensive research in the domain related to MID maybe required which include experimental studies linked with tooth strengthening comparison with more invasive modalities being propagated. More Efforts should be made in educating the masses regarding preventive modalities. Research work in the direction of cost effect analysis associated with MID in comparison with conventional procedures in public health setup maybe the need of the hour. Descriptive studies related to acceptance of MID among dental professionals such as Graduate dentists and Pedodontists maybe need that will assess the attitudes and behaviour of such professionals concerning MID modalities touching the need to have behaviour change exercises if needed

The presence of high-grade evidence might eventually inspire dentists to use more conservative procedures. The progress of this current approach should encourage Public Health dentists to actively participate in their foremost duty if preventing oral conditions

MID as a life course approach

Minimal intervention dentistry is a current oral health exercise planned with primary goal of conservation of natural tooth structure copiously. This approach uses comparable procedures for preventing Dental caries, and is envisioned to be a comprehensive treatment solution for carious teeth. The Dental Professionals should be invigorated to implement a renewed approach while repairing and restorating demineralized tooth structure.

The life course approach goes back at an individual or groups experiences or influences on present forms of healthy wellbeing. It also takes into account the current and previous experiences which may be influenced by wider societal economic and cultural milieu. This approach is to assess the association among factors seen in early stages of life and along the course of one's lifetime and the initiation of dental caries in people from young stage to later parts of life.

CONCLUSION

It is evident that time has come to transform restorative dentistry. It may not be imaginable to replicate natural structure of tooth for an extended time, thus it becomes imperative that retention is done for the longest conceivable time. Dental profession is now more considerate towards prevention of oral disease, usage of fluorides, with the arrival restorative substances with better adhesion and bioactivity, Dental professionals should adopt a conservative attitude while treating dental caries caused by tooth structure demineralization. There should be elimination of disease first and followed by removal of existing lesions le through procedures based on remineralisation. When there is failure then the surgical repair should be undertaken as the last option that too with minimal intervention

It is now mandatory that the dental professionals embrace current scientifically sound techniques and progress into the future. They should assume a responsibility to shift from maximally interventional method, which was the go-to practice prior to dawn of fluorides, adhesives, and restorative materials having biocompatibility

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CITATION OF THIS ARTICLE

Ankita, S Tandon, S Chand , A Bhargava. Minimal Intervention Dentistry – A time tested tool for the way forward. Bull. Env. Pharmacol. Life Sci., Spl Issue [2]: 2022: 527-530