WHY TREAT WHEN YOU CAN PREVENT? – PREVENTIVE DENTISTRY

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Introduction

Tooth decay is often called the second most prevalent human disease after common cold. Without effective treatment it can lead to pain, tooth loss or even hamper your smile. It is rightly said, 'PREVENTION IS BETTER THAN CURE'. A major role in decay prevention is to tip the balance in favor of the beneficial processes. Preventive dentistry aims to stop the progression of dental caries by promoting daily habits and clinical therapies that either promote the remineralization of the tooth surface or prevent the formation of the oral biofilm responsible for lowering the oral pH levels in an attempt to prevent cavity formation. This review provides a perspective of the mechanisms and clinical efficacy of several traditional preventive dentistry measures and also describes the newer technology that shows promising results in preventing dental caries.

Preventing Demineralization\ Promoting Remineralization

Pit and Fissure Sealants

Pits and fissures on occlusal surfaces of permanent teeth are particularly susceptible to the development of dental caries .(2-4) This susceptibility is related with the physical size and individual morphology of pits and fissures, which can be considered as being "shelters" for microorganisms and make the hygiene procedures of these areas more difficult, allowing greater plaque retention.(3,5-7)For the prevention of dental caries, fissure sealants application is recommended if pits and fissures are very deep and narrow, creating a physical barrier for the plaque's accumulation, in these specific anatomical areas of the tooth . (8-11)These are based on an attempt to modify the "TOOTH SURFACE" a factor of the KEYES TRIAD necessary for the initiation of tooth decay Fissure sealants application in high susceptibility tooth decay areas is one of the primary preventive measures to minimize the risk, reducing its incidence in pits and fissures, preventing the need for more invasive dental fillings.

Fluorides

The use of fluoride therapy in dentistry aims to replace lost hydroxyapatite material with fluoroapatite in the remineralization process by increasing the amount of available fluoride ions in saliva. Fluoroapatite is

the product of a reaction between fluoride and a calcium phosphate, producing a calcium halophosphate mineral that combines well with the hydroxyapatite structure of hard tooth structures.(1) These fluoroapatite crystals are relatively insoluble in comparison to the hydroxyapatite crystals and as a result, repeated remineralization in the presence of fluoride ions results in a more caries resistant tooth surface.(1)

Topical Fluorides

Topical at-home fluoride uses such as tooth pastes, mouth rinses, and gels remain a cost-effective way to retain a sufficient therapeutic concentration of fluoride within the mouth. (1)

Acidulated phosphate Gel (APF GEL)

APF has a fluoride concenteration of 12300ppm. When APF is applied to tooth it initially leads to dehydration and shrinkage in the volume of hydroxyapatite crystals which on hydrolysis forms an intermediate product called Dicalcium Phosphate Dihydrate (DCPD). Fluoride penetrates into crystals more deeply through openings produced by shrinkage and forms fluorapaetite. APF causes caries reduction of 28%.

Fluoride Varnish

It is composed of a high concentration of fluoride as a salt or as silane preparation in a fast drying, alcohol and resin based solution. Majority of them contain 5% sodium fluoride. It has a slow release mechanism, which would release fluoride when most needed. It helps to prevent decay, remineralize the tooth surface and to treat dentin hypersensitivity.(13)

Fluoride containing toothpaste

It is well recognised that the decline in the prevalence of dental caries recorded in most industrialised countries over the past 30 years can be attributed mainly to the widespread use of toothpaste that contain fluoride. Investigations into the effectiveness of adding fluoride to toothpaste have been carried out since 1945 and cover a wide range of active ingredients in various abrasive formulations. Fluoride compounds and their combinations which have been tested for the control of dental decay include sodium fluoride, stannous fluoride, sodium monofluorophosphate and amine fluoride. The most widely used fluoride compounds in the toothpastes are sodium fluoride and sodium monofluorophosphate.(13)

Fluoride containing mouthwash

These contain Sodium Fluoride 0.044% w/v and are used in the treatment, control, prevention, & improvement of the dental decay in children and adults. Fluoride changes the enamel structure of teeth from predominantly hydroxyapatite to fluoroapetite. It improves the patient's condition by strengthening the teeth and decreasing the effects of acid and bacteria on the teeth. A 'Swish and Expectorate' technique is used. Sodium fluoride usually formulated at concenterations of either 0.2% (900ppm) for weekly use and 0.05% (225ppm) for daily use.(13)

Systemic Fluorides

Systemic fluorides such as community water fluoridation and dietary fluoride supplements are effective in reducing tooth decay. These fluorides provide topical as well as systemic protection because fluoride is present in the saliva.

Community water fluoridation

Community water fluoridation is the cornerstone of caries prevention. It is safe, effective and non-discriminatory in that children of both sexes, all races, and all socioeconomic groups benefit from its use. Community water fluoridation is the process of adjusting the fluoride content of fluoride-deficient

water to the recommended level for optimal dental health, which is currently recommended by WHO as 1parts fluoride per million parts water(13)

Salt fluoridation

Fluoridated salt containing 250 mg of fluoride per kg salt is effective for caries prevention. There is a substantial reduction in caries experience in teeth exposed post eruptively to fluoridated salt. This indicates that a topical as well as systemic action occurs during usage of fluoridated salt. The main advantage of salt as a vehicle of fluoride is its ease of availability and use.(13)

Milk fluoridation

Fluoridated milk may be produced in a no. of different forms like liquid (pasteurized and sterilized) and powder form. Sodium fluoride, calcium fluoride, disodium monoflurophosphate and disodium silicofluoride are used to fluoridate milk. The concentration of fluoride required in the product is dictated by the fluoride dose to be delivered to the recipient children , ranging from 0 to 1 mg fluoride per day according to the age of the child and the fluoride concentration in local water supply. Fluoride concentration of 5-15 ppm fluoride caused a significant caries reduction of 40-50%. The fluoridated milk keeps a low level of ionized fluoride within the oral cavity , promoting remineralization. This contributes to caries preventive effect of fluoridated milk.(13)

Other methods of caries control

Altering Saliva Production

Saliva is a major protective factor in the oral cavity, and a reduction in saliva output can occur from numerous systemic diseases and pharmaceutical interventions. The importance of saliva output in caries prevention is a relatively new topic in preventive dentistry, but pharmaceutical interventions have commonly treated the xerostomia that accompanies many drug therapies (eg. chemotherapy). Loss of antimicrobial capacity, pH buffering, and remineralization properties of saliva may lead to rapid and severe caries formation. The use of sugar-free gums and lozenges increases salivary output for a patient, and still remains the mainstay therapy for patients suffering from xerostomia (dry mouth). The use of sugarfree methods of increasing salivary activity must be stressed, as the additional sugar ‘coating’ would only increase dental caries risk, negating the potential benefits of increased saliva production. Other topical therapies include artificial saliva that attempt to mimic the composition and abilities of natural saliva in the forms of oral rinses, gels, and flavored mouthwashes. These topical treatments are limited however by their transient nature, and stimulating saliva output over a prolonged period of time would be more desirable.(1)

Novel Technology

The aforementioned therapies have all been identified as useful for preventive dentistry and are at various stages of clinical trials. To look into the future of preventive dentistry measures, the literature concerning promising advances in potentially useful technologies for the prevention of dental caries and the control of biofilm was reviewed. The following is a description of potential technologies that may become important in the advancement of preventive therapies, including antimicrobial peptides, immunizations, and probiotics. (1)

Antimicrobial Peptides

Antimicrobial peptides (AMPs) have come forward as agents that exhibit a wide spectrum antimicrobial activity against bacteria, including drug resistant strains. . The 25-dihydroxyvitamin D3 vitamin is a biologically active form of vitamin D that has recently been discovered to induce the expression of the Cathelicidin antimicrobial peptide family in the human genome without a large amount of host immune response. Researchers linked an AMP peptide sequence to the S.Mutans pheromone peptide sequence using a chain of amino acids , termed the linker region. The functionality of the peptide showed specific lethality to the S.Mutans bacteria. Specifically targeted antimicrobial peptides (**STAMP**'s) could be delivered in current oral care products such as mouthwash, toothpaste, or dental floss and could help in the suppression of cariogenic bacteria. Researcher's knowledge of antimicrobial peptides is a rapidly advancing field and AMPs certainly have the potential to become ideal antimicrobial agents in the future of dentistry. (1)

Immunizations

The body's natural lines of defense can also be utilized in the fight against cariogenic bacteria of the mouth. Recent work has focused on using S. mutans antigens to initiate an antibody secretion, and subsequently eliminate S. mutans colonization in the body. The main type of S.Mutans antigen involved for which specific sIgAs have been found is Antigen I/II.(1)

Probiotics

Stemming from the success that the probiotics field have seen in gastrointestinal diseases, probiotics are now being developed that disrupt the attachment of cariogenic bacteria via competition for binding sites at the biofilm, and competition for nutrients within the biofilm. Probiotic strains are also being produced that can secrete antimicrobial compounds, potentially inhibiting pathogenic oral bacterium. Long term consumption of milk containing L.rhamuosus strain reduced the incidence of caries in kindergarten children. (Nase). DNA replacement therapy is the technology that has allowed researchers to mutate S.Mutans into bacteria that lack enzymes to metabolize fermentable carbohydrates into organic acids. Replacing the cariogenic bacteria with less pathogenic clones could someday become a key tool in preventing caries formation. (1)

Dietary modifications

When the consumption of sugars is less than 10kg/person/year the level of dental caries is low. When it exceeds 15kg/person/year dental caries risk increases and intensifies. The people with high intake of sugars have higher levels of caries. The Vipeholm Study has concluded that sugars has little effect on caries if ingested with meals no more than four times a day. Increased consumption of sugars in between meals was associated with an increased risk of caries.(12)

PROTOCOL FOR PREVENTIVE DENTISTRY IN CHILDREN.

1. Placement of pit & fissure sealants in deep grooves, pit & fissures.
2. Application of APF Gel.
3. Application of fluoride varnish.
4. Use of fluoridated toothpaste regularly.
5. Use of fluoride containing mouthrinse regularly.
6. Appropriate teeth cleaning twice a day & tongue cleaning & flossing atleast once daily.
7. Employing community water fluoridation practices

PROTOCOL FOR PREVENTIVE DENTISTRY IN ADULTS.

1. Placement of pit and fissure sealants can be done.
2. Application of fluoride varnish overnight.
3. Use of fluoridated toothpaste on daily basis.
4. Use of fluoride containing mouthrinse once a day.
5. Appropriate teeth cleaning technique twice a day.
6. Tongue cleaning twice a day.
7. Flossing /use of interdental brush atleast once daily
8. Maintaining sufficient levels of saliva through use of salivary substitutes.
9. Use of probiotics containing milk and probiotic curd.
10. Getting a dental check up done preferably twice but atleast once a year.
11. Getting scaling (teeth cleaning) done atleast once a year.

Conclusion

The key primary preventive methods have been well documented and it has been scientifically proven that these measures have good results. Preventive techniques are most often dependent upon the patient's compliance to the prescribed therapy, and motivating the patient to follow the treatment plan plays a key role in a successful outcome. An increased amount of technologies are aimed at promoting tooth remineralization, but fluoride remains the most widely agent in managing the formation of caries due to its strong levels of clinical evidence. When fluoride therapy is not enough to overcome the formation process, dentists should consider a synergistic approach at preventing caries. Combining therapies that promote saliva production, increase the intraoral calcium and phosphate ion concentrations, and provide antimicrobial therapy can
lead to more pronounced results. Novel technologies should also be considered adjuncts
to treatments. Thus ' PREVENT IT BEFORE YOU TREAT IT!'

References

1. Oatmen, Tyler R., "Preventive Dentistry Techniques in the Treatment of Dental Caries and Biofilm Control: A Review" (2011).*Honors Projects*. 88
2. Ahovuo-Saloranta A, Hiiri A, Nordblad A, Makela M,Worthington HV. Pit and fissure sealants for preventing dental decay in the permanent teeth of children and adolescents. *The Cochrane Database of Systematic Reviews*. 2008; Issue 4. Art. No.:CD001831.
3. Fejerskov O, Kidd E (Editors). Dental Caries: The Disease andits Clinical Management (2nd edn.) Oxford: Blackwell Munksgaard, 2003.
4. Pereira AC. Cáries Dentárias – Etiologia e Prevenção. Lisboa:Edição Medisa, 1995
5. Axelsson P (Editor). Preventive Materials, Methods andPrograms (1st edn.) Slovakia: Quintessence Books, 2004.
6. Lima JE. Cárie Dentária: um novo conceito. *Revista DentalPress De Ortodontia e Ortopedia Facial*. 2007; **12**: 119-130
7. Touger-Decker R, Loveren C. Sugars and dental caries. *TheAmerican Journal of Clinical Nutrition*. 2003; **78**: 881-92.
8. Daniel SJ, Harfst SA, Wilder R, Francis B, Mitchell S (Editor).Mosby´s Dental Hygiene: Concepts, Cases and Competencies. (2nd edn.). St. Louis, EUA: Mosby Elvesier, 2008
9. Axelsson P (Editor). Diagnosis and Risk Prediction of DentalCaries (1st edn.) Slovakia: *Quintessence Publishing*, 2000

10. Cortelli SC, Cortelli JR, Prado JS, Aquino DR, Jorge AO.DMFT in school children relate to caries risk factors. *Cienc Odontol Bras*. 2004; **7**: 75-82.
11. Simonsen RJ. Pit and fissure sealant. *Journal of PracticalHygiene*. 1996; **1**: 37-38.
12. Moynihan PJ. The role of diet and nutrition in the etiology and prevention of oral diseases. *Bulletin of the World Health Organization*. 2005;83(9):694-699.
13. Essential of Public Health Dentistry 6th edition- Soben Peter