

Arrest of Caries Technique (ACT): Appropriate Technology For The Clinician and For Disadvantaged Communities in Nepal

Dr. DAVID WALKER B.D.S. (Syd), M.H.P.Ed. (U.N.S.W.)

Dr. Robert Yee B.Sc. D.D.S. MSc. Dental Public Health

Introduction

The most prevalent oral disease of Nepal is dental caries. Recent dmft data show that dental caries affects approximately 65% of Nepali 6 year old children (UMN Oral Health Programme, 2000, unpublished report) and further studies indicate that this level of dental caries is increasing (van Palenstein Helderma et al., 1998; McDonald, 1999). Almost 99% of these children remain untreated due to limited access to services. This makes untreated dental caries one of the most prevalent childhood diseases, more prevalent than malnutrition and Vitamin A deficiency which is reported to affect 53% and 58% of the child population respectively (Ministry of Health, 2000).

To make the treatment of dental caries more affordable and accessible for poor communities, the Atraumatic Restorative Treatment (ART) technique has been recommended by WHO (Pakhomov, 1999). Even though ART is more affordable and cost-effective than the traditional amalgam restoration (Bhudhasri et al., 1995), it is limited to small and medium sized one surface restorations (Frencken et al., 1998a, 1998b, Holmgren et al., 2000), and may still be unaffordable by most disadvantaged communities in Nepal.

Arrest of caries techniques (ACT) present an alternative set of appropriate oral health care technologies for disadvantaged communities. These techniques aim to arrest decay but do not aim to restore the damaged tooth structure. Arrest of caries techniques include those using silver fluoride and stannous fluoride; silver diamine fluoride; low viscosity glass ionomer cement; and supervised toothbrushing programmes using fluorides.

Many of these techniques were originally developed for the care of dental phobic children. Silver fluoride and silver diamine fluoride have been used in this way for more than twenty-five years. They provide an important technology for the clinical dentist in their care of the difficult child patient. ACT are non-invasive, painless and quick. The silver based ACT lead to a black deposit on the area of arrested decay.

Research is now being developed to determine the appropriateness of ACT for the control of dental caries in children in disadvantaged communities of developing countries. ACT are low cost, simple, non-invasive and quick. They are particularly appropriate for children with moderate and severe caries which often involve more than one surface of the tooth.

Silver Based Arrest of Caries Techniques

Silver Fluoride

In 1978 Craig et al. (1981) developed a simple 'paint on' technique to arrest dental caries in children who would not accept normal dental treatment. The technique

uses a 40% solution of silver fluoride (SF) followed by 10% solution of stannous fluoride. This technique has subsequently been used to prevent and arrest caries in Western Australia in both disadvantaged communities and the school dental service. The outcomes of these programmes were not subject to rigorous evaluation, however; evidence suggests that a positive preventive effect was achieved with use of silver fluoride on decayed primary dentition in over 400,000 children (Lamplough and Jarman, 1987, personal communication).

Silver Diamine Fluoride

A similar agent, silver diamine fluoride $\text{Ag}(\text{NH}_3)_2\text{F}$ [SDF], has been used to arrest caries since 1972 (Yamaga et al, 1972). Reports of use of SDF in varying concentrations to control caries have been published from Argentina, Brazil, China, Japan, Mexico, Spain, Turkey and the United Kingdom. SDF is currently in use in public health oral disease prevention and control programmes in Brazil and Argentina.

Mode of Action

Studies have shown that SDF and SF can inhibit the progression of caries (Klein et al., 1999; McDonald and Sheiham, 1994) and investigations confirm that enamel and dentine are harder and less soluble after application of SDF. Histological assessment of extracted teeth treated with silver fluoride revealed significant remineralisation of the dentine through increased odontoblastic activity (Gotjamanos, 1996). The silver component of the silver fluoride may act in two specific ways (Gotjamanos, 1996; Thibodeau et al., 1978):

- 1) inactivation and destruction of plaque bacteria, including *Streptococcus mutans*
- 2) mechanical sealing of carious and sound dentinal tubules.

Arrest of Caries Technique Used in the United Mission to Nepal Oral Health Programme

Below is a brief overview of the silver fluoride technique and silver diamine fluoride used in the United Mission to Nepal Oral Health Programme.

Indications

Dental caries in the primary dentition which does not involve the dental pulp. Contraindications include pain and abscess. The technique may also be used to arrest caries in adult teeth in remote areas until restorative care can be sought. SF and SDF are most successful in open areas of decay, which support re-mineralisation by saliva and which do not allow food impaction.

Warn patients and parents that SF will turn the carious lesion black; that SF and SDF may cause mild, damage to soft tissue, which will disappear in several days and may stain clothing. Gain informed consent from child and parents.

Patient and operator are to wear protective glasses. These should be in place before dispensing silver fluoride. Have patient close eyes during treatment. Do not pass material over the patients face.

Instruments and Materials

Dental mirror, tweezers, mixing pad or glass slab. Hand instruments such as gingival margin trimmers may be needed to remove overhanging dentine, open cavity to saliva and prevent food impaction. Silver fluoride or silver diamine fluoride, stannous fluoride or tannic acid, cotton rolls, cotton pellets.

Preparation

Dispense one drop of each of silver fluoride or silver diamine fluoride and stannous fluoride on the mixing pad. Do not allow drops to mix. Prepare several very small cotton pellets. Place cotton rolls to exclude saliva. In rampant caries it may be useful to treat one quadrant per visit. Consider use of Garmers Clamps or Isolators if multiple caries in one quadrant.

Cavity preparation

Have patient brush carious lesions with toothbrush WITHOUT toothpaste prior to isolation. Remove overhanging enamel and free contact points with hand instruments if necessary - to allow easy access of saliva and to prevent food impaction. Clean the lesion with cotton pellet and water; dry with cotton pellets.

Application

Rub a very small amount of SF or SDF onto the carious lesion for 1-2 minute using the closed beak of tweezers or a VivaBrush applicator (normally used to apply dentine conditioner; order number Vivadent #533664) can be used. Dental floss or toothpick can be used to assist in application to proximal caries. Avoid excess material as this will increase risk of mild damage to gingiva or mucosa. Apply a very small amount of stannous fluoride or tannic acid similarly until lesion turns black. Use of stannous fluoride or tannic acid is optional. Use no more than 2 drops of SDF at any one appointment. With a Vivabrush applicator 2 drops can be applied to 10-12 carious teeth. Remove cotton rolls. If possible reappoint for a second application in 7 days.

Clinical Teaching of Prevention

Patients in pain are not good candidates due to their focus on the pain and its treatment. Patients with no signs or symptoms of caries are similarly not good candidates for the clinical teaching of prevention due to lack of motivation.

The silver fluoride technique integrates well into the clinical teaching of prevention to the patient and parents as the areas of decay are made obvious to the patient and parents providing motivation for learning.

Conclusion

Arrest of caries techniques can be of value to both private dental practitioners and public oral health care programmes.

The advantages of these techniques include:

- atraumatic procedure which allows treatment of rampant caries in very young children, the handicapped and the fearful without having to resort to general anaesthesia;
- simple and non-invasive procedure which facilitates basic oral care at the community level;
- reduces the number of patients attending hospital outpatient departments.
- reduces need for invasive treatments with their inherent risk of transmission of infections
eg. Hepatitis B and C, HIV, TB.
- has been researched for more than 25 years.
- portable and lightweight;
- low cost and cost effective: one application of SDF and stannous fluoride, including materials is approximately 5 NRs. Cost of 5 ml. bottle of SDF, approximately 500 applications, is approximately 2,171 Nrs. SDF is available through a local dealer in Kathmandu.

The principle disadvantage of the technique is that it stains carious lesions black which favours its usage in the primary dentition and as a temporary measure in the permanent dentition.

For further information please contact:

Dr. Robert Yee
United Mission to Nepal
Oral Health Programme
P.O. Box 126
Kathmandu, Nepal
977-1-257612
email: rtsyee@hotmail.com

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Bee Brand Medico Dental Co., Ltd.
2-3-6 Kitahama, Chuo-ku,
Osaka, 541-0041
Japan
bee@bee.co.jp

MEDIAIDS (NURAZ) PTE. LTD.
P.O.Box 748,
Putali Sadak, Kathmandu, Nepal
Tel.01-437410
Fax.01-437404
E-mail:nuraz@ntc.net.np
Attn.Mr.Suresh Ghimire