ATRAUMATIC RESTORATIVE TREATMENT (ART)

CONTENTS

INTRODUCTION

Although dental caries has decreased substantially in the industrialized countries over the last two three decades but form a global perspective yet it remains a wide spread problem. Carious lesions not only tend to go untreated in people living in underprivileged communities of the developing countries but also in highly industrialized countries. Untreated caries often progresses to a stage such that, when treatment is provided, all that can be done is extraction of the decayed tooth.

Alternative restorative treatment(ART), formerly known as Atraumatic restorative treatment, is a minimally invasive treatment technique for restoring teeth by means of hand instrumentation for decay removal and fluoride releasing adhesive materials(glass ionomer) for filling.

A new method for treating dental caries that involves neither drill, water, nor electricity was presented at the headquarters of the WHO Geneva, April 7, 1994 an occasion that marked the beginning of the oral health 91994-95). The procedure called, “Atraumatic Restorative treatment”, (ART) consists of manually cleaning dental cavities with hand instruments and filling them with an adhesive, fluoride releasing material. To use this procedure, oral health care workers need only a few instruments that can be carried easily.

The Atraumatic Restorative Treatment approach for dental caries is often abbreviated to the acronym ART. In the ART approach, caries is removed by hand instruments only. The cavity and the pits and fissures in the same tooth surface are then carefully cleaned with a weak acid. Restorative material that bonds chemically to tooth tissue is applied to the cavity and the pits and fissures of the same surface. In this approach, a restoration and a sealant are obtained in one procedure. It removes the need for expensive dental equipment – no drill, no electricity, just simple hand instruments. ART is patient – friendly with only a minimal potential for pain.

Infection control is relatively simple, as only a small set of hand instruments is used. This approach is a breakthrough towards achieving the goal that all people should retain as many teeth as possible: "Teeth for life".

Who benefits from ART?

- Remote communities with no dental services.

- Towns and villages without electricity.
- Housebound elderly.
- Elderly living in nursing homes
- The physically or mentally handicapped.

"Is ART really a new approach?"

The answer is both "yes" and "no".

No, because for generations dentists have relied on hand instruments only; when equipment was out of order, electricity unavailable or the patient too frightened to accept the normal equipment in the dental office. However, only temporary filling materials were applied which would not last long? Such an approach was seldom studied and publications are hard to find.

And **yes**, because ART is an innovative approach for several reasons:

- ART is a determined effort to make long lasting restorations with hand instruments only.
- The idea of ART is strongly supported by the modern scientific approach to controlling caries: maximal prevention, minimal invasiveness and minimal cavity preparation. The use of hand instruments alone leads to preservation of tooth structure.
- Recent improvements in restorative materials, the chemical bonding to the tooth and fluoride release by, e.g., glass ionomers have given ART a solid practical basis.
- From the outset, a determined effort has been made to investigate the appropriateness, acceptability and effectiveness of ART.

HISTORY OF ART:

Some 10 years ago, the WHO Collaborating Centre for Oral Health Services Research at the University of Groningen, the Netherlands, worked on a proposal for the Minister for Development Cooperation of the Netherlands – to develop a model for primary oral health care for refugees and displaced persons. From the issue of refugees,

forced migration deprived and undeserved populations it is only a small step to become aware of the other main issue. That is, dental caries is left virtually untreated in the majority of people living in the non-industrialized, economically less developed countries of the world. In fact, this group with no access to proper oral care – constitutes at least two thirds of the world's population.

At that time – 1988 Dr.Jo Frencken was in the Netherlands, in between his assignments out in Africa. He persuaded Taco Pilot to include in the refugee project the treatment of caries by hand instruments only, as had been pioneered in Tanzania in the mid 1980s.

The community field trial compared ART with the mobile conventional equipment – cavity preparation – amalgam approach started in 1991 in rural Thailand with the assistance of Professor Prathip Phantumvanit, Dr.Yupin Songpaisan and the staff of the University of Khon Kaen, in North Eastern Thailand. Subsequently, reports at IADR meetings and abstracts appeared.

In April 1994, the World Health Organization introduced ART as part of the World Health Day and the celebrations of the Year of Oral Health in Geneva with a press conference, demonstrations, a brochure, etc.

A symposium devoted to ART was held at the 1995 IADR Singapore meeting and the proceedings have been published in a special volume of the Journal of Public Health Dentistry.

A manual was produced especially for those oral care workers who are not familiar with the standard restorative treatment procedures for caries. The present manual is the third updated edition. The original English version has been translated into French, Spanish, Portuguese, Japanese, Chinese, and Arabic and into the languages of Thailand, Laos, Cambodia, Vietnam, Indonesia, Malaysia and Mongolia. In fact, even more versions might exist.

Drawing on his experiences in Thailand, Dr. Jo Franken started another series of community field trials in Zimbabwe in 1993. This was followed by Dr. Evert Van Amerongen in Pakistan, Dr.Christopher Holmgren in China and Dr.Frencken and

Dr.Beiruti in Syria. Other studies have been conducted or are still in progress – in Cambodia, Argentina, Papua New Guinea, Tanzania, South Africa, Hong Kong, Malaysia, Poland and Sweden. Smaller, unpublished studies have been carried out in Fiji and other South Pacific Islands, Philippines, Indonesia, Vietnam and Gambia. At least 10 universities around the world are carrying out clinical or laboratory experiments on ART related questions.

ART has been placed on the agenda of the International Dental Federation (FDI) and the FDI Commission to consider ART's appropriateness, effectiveness and potential training programmes.

MAJOR MILESTONES IN DEVELOPMENT OF ATRAUMATIC RESTORATIVE TREATMENT, 1992-95:

- ART forms a major component in a model for community oral health care in refugee and displaced persons encampments.
- The Basic Oral Health Workers training in restorative care in one of the refugee camps in Thailand was solely based on ART.
- WHO adopted ART as a principal theme on World Health Day for the Opening session of the year of Oral Health in April 1994. Since then, interest in ART from all parts of the world has been overwhelming, as shown in the remainder of this list.
- Information on ART has been requested from and provided to 75 countries.
- Promotional presentations and lectures have been given in 28 countries.
- ART courses have been held in 19 countries attended by representatives from a total of 75 countries.
- Requests for clinical courses have been received from an additional 18 countries.
- ART is now part of the regular training program of oral health personnel in Cambodia, Fiji and Zimbabwe.

- ART is now being used in 25 countries.
- ART field trials are in progress in 11 countries and a further 17 countries have plans to bring field trials.
- ART related clinical and/or laboratory studies are in progress at the universities of Adelaide, Amsterdam, Hong Kong, Ho Chi Minh city, Cape Town, Kuopio, Milano, and Nijmegen.
- The ART manual is available in English, Spanish, and in the languages of Thailand, Laos, Cambodia, Vietnam, and Japan. Translations into Chinese and French are in progress, while translation into Arabic is under consideration.
- Guideline for a research protocol or clinical studies of the ART technique and materials have been developed.
- An Electronic information network (ART-ODONT) was launched at the 73rd IADR Meeting in Singapore in 1995.

DEVELOPMENT OF THE ART APPROACH:

The early ART studies could be considered pilot studies where the approach was being defined and developed. Later studies in Zimbabwe and those being carried out in Pakistan, Hong Kong and China have benefited from the experiences gained from the earlier ART studies. For example the "press finger" technique was first introduced in the Zimbabwe study in 1993. In this technique, glass ionomer material is pressed over the total tooth surface, filling the cavity with a top layer and sealing the adjacent pits and fissures. The pressure is executed with a petroleum jelly coated gloved finger (Frencken 1996). In addition, the newer glass ionomers developed for ART has shown higher survival results in the most recent studies.

ART SEALANTS

The most caries-susceptible period for molars is during eruption, and this can take 1-11/2 years. The main problem is that the child and parents do not realize that a new tooth is

emerging and is usually difficult for the child to clean the erupting tooth surface because it is below the level of the arch. Several non-operating measures have been developed. These include cleaning the occlusal surfaces with a tooth brush and fluoridated tooth paste, application of a fluoride varnish, application of a Chlorhexidine varnish, sealing pits and fissures with a composite resin and/or a glass-ionomer, and combinations of these. The most appropriate measure very much depends on the ability of the child and parent to co-operate with the cleaning regimen. This approach requires that the dental team regularly examines the child with the parents so that the non-operative care of the erupting tooth can be reinforced. However in the communities where the ART approach was developed there was no dental team and no opportunity for recall.

The advantage of sealant over the other non-operative treatments referred to above is its cost effectiveness in the situation where dental recalls are not possible. If applied properly and retained for a substantial period, sealants may have a long-lasting caries preventive effect. There are several ways of applying a low-viscosity glass-ionomer into pits and fissures. These include the use of a hand instrument , e.g. a ball ended probe, plugger, ball burnisher or using an explorer to teaser the material into fissures, or the use of digital pressure over a thin lead foil to force the material into place. The ART sealants using high-viscosity glass-ionomers are placed under finger pressure. The fissure penetration depth and marginal leakage of ART glass-ionomer sealants were not different from those obtained using a resin-based sealant material(Smales et l., 1997); neither were they different when the glass-ionomer was inserted with a ball-ended burnisher compared with finger pressure(Beirutti et al., 2006).

Principles of ART

The two main principles of ART are:

- removing carious tooth tissues using hand instruments only, and
- restoring the cavity with a restorative material that sticks to the tooth.

Instruments and materials used

The essential instruments for ART are:

1. Mouth mirror

2. Explorer
3. Pair of tweezers
4. Dental Hatchet
5. Small, medium sized spoon excavators
6. Glass slab
7. Spatula
8. Carver

To improve working visibility, a special light source fixed to a pair of spectacle frames that is powered by a rechargeable battery source is used.

The essential materials are;

1. Gloves
2. Cotton wool and pellets
3. Glass ionomer restorative material (powder/liquid)
4. Dentin conditioner
5. Petroleum jelly
6. Wedges
7. Plastic strips and water.

ART APPROACH

Frencken J.E. (1996) reported that ART approach to the management of dental caries which has become available through the combination of a better understanding of the dental caries process that permits the employment of minimal cavity preparations and the development of reliable and effective adhesive restorative materials. The approach involves excavating cavitated dentine caries with hand instruments, then restoring the cavity and sealing any associated fissures and pits with an adhesive restorative material. As such it is a combined preventive and restorative procedure, resulting in a sealant restoration.

Frencken J.E. (1998) stated that, unlike conventional cavity preparations, where sound tooth tissue is inevitably removed either intentionally for mechanical retention or unintentionally, the use of hand instrument with the ART approach limits tooth tissue removal to removal of dead tissue and therefore insensitive carious dentine. Local anesthesia is therefore rarely required to make this approach atraumatic to both the patient and the tooth.

Until recently ART has mainly been used under field conditions, and thus the adhesive restorative material used has been glass ionomer which does not require mixing machines and curing lights. The further advantages of this material include chemical bonding to enamel and dentine (Wilson, 1988), Long term and slow release of fluoride into enamel, dentine, saliva and plaque (Retief 1984, Forss 1991, Hatibovic 1991, Forsten 1996), Reduced caries progression in tooth tissues that are in contact with the material (Tencate 1995, Qvist 1997), and pulp friendly material (Hume W.K. 1988).

The use of other adhesive materials such as resin-modified glass ionomers, compomers and composite resins are also likely to be suitable materials for ART, but their application for this approach requires evaluation.

IS ART REALLY ATRAUMATIC?

The atraumatic restorative treatment (ART) approach was originally developed in the 1980s as a means of managing dental caries in disadvantaged areas where extraction would otherwise prevail (Frencken et al 1994). The name of this approach implies that the treatment is atraumatic. In the context of ART, atraumatic could mean the treatment causes no or minimal trauma.

- To the patient in terms of pain or discomfort.
- To the decayed tooth both in terms of conservation of sound tooth tissue and with respect to the pulp; or that,
- Any trauma experienced is less than in other invasive techniques.

The question arises whether to promote ART as a truly atraumatic approach to the management of carious lesions. Compared to non-invasive approaches such as diet counseling, oral hygiene promotion, fluoride applications and other chemical treatments to arrest the carious process, the answer must be ‘no’. However, ART must be considered in the context of other restorative procedures for caries. These are all invasive since it is not possible to remove soft, carious tooth tissue prior to restoration without some form of drilling vibration or scraping. Thus, irrespective of the form of invasive intervention

some patients will always consider they have experienced some discomfort. This in turn could be considered to be a form of trauma to the patient.

On the other hand, if the ART approach to cavity preparation uses hand instrument alone, is more acceptable to patients and therefore less traumatic. The study conducted by Destri 1997 incorporated a modified ART group where carious cavities were opened with rotary instruments followed by the removal of all remaining soft carious tissue with hand instruments. Despite this small difference in treatment approach, there was significantly more discomfort reported in the modified ART group than in the ART group ($P<0.05$). It is unlikely that the opening procedure with rotary instruments itself caused physical pain. Either the use of rotary instruments induced anxiety in the patients thereby leading to an expression of discomfort or the vibration induced by the drill was considered uncomfortable. Regardless of the reasons it is apparent that patients prefer the ART approach to the use of rotary instruments. This holds true irrespective of the person who performed the treatment.

DESCRIPTION OF THE ART TECHNIQUE

Atraumatic Restorative treatment for dental caries is based on the minimum intervention concept in removing carious tissues in addition to the preventive restoration for controlling dental caries. The two principles of ART are to remove soft dentinal caries with hand instruments and to fill the cleaned cavity with glass ionomer that can release fluoride. As with any other oral treatment procedure, ART requires a proper patient-to-operator position. This requirement usually is not a problem in a dental surgery, but requires particular attention in other working environments. A number of devices have been developed and one that is very useful is a light weight, cushioned headrest attached to the short end of a table combined with a foldable cushion for the comfort of the person receiving the treatment.

Since its inception, the ART technique has undergone revisions aimed at improving the basic technique. Unlike many other restorative procedures, usually there is no need to give local anesthesia when using the ART technique because temperature induced pain from using a drill is avoided. Because the technique mainly involves the removal of decalcified tooth tissue, pain can be minimized, and often does not occur at all. Thus, fear of dental procedures is reduced.

The principal steps of ART are described:

1. **Isolate the tooth with cotton wool rolls.** Only the tooth or teeth to be treated need to be isolated. Rationale: It is easier to work in a dry environment than a wet one. Cotton wool rolls are available in all parts of the world.
2. **Clean the tooth surface to be treated with a wet cotton wool pellet.** Have a small cup of water available. Separate the cotton wool pellets from each other. Then dry the surface with a dry pellet. Rationale: The wet cotton wool pellet removes debris and plaque from the surface, thus improving visibility. The extent of the lesion and any unsupported enamel then can be identified.
3. **Widen the entrance of the lesion.** This step is necessary only if the entrance is small. Place the working tip of the dental hatchet in the entrance and rotate it backwards and forwards. For opening very small cavities, the corner of the working tip is placed in the cavity first and rotated. *Rationale*: The hatchet replaces the bur. By rotating the instrument tip, unsupported enamel will break off, creating an opening large enough for the small excavator to enter.
4. **Remove caries :** Depending on the size of the cavity, use either the small or the medium sized excavator. Remove caries at the dentin-enamel junction before removing caries from the floor of the cavity. If working without an assistant, deposit the soft, excavated caries on the cotton wool roll placed next to the tooth. Thin unsupported enamel can be broken away carefully by placing the hatchet on the enamel and pressing gently downward. Wash the cavity with lukewarm water or a small cotton wool pellet. *Rationale* : All soft caries should be removed. Thin, often decalcified, unsupported enamel is relatively easy to break off. The enamel and the dentin-enamel junction need to be thoroughly cleaned to prevent caries progression and to obtain a good seal of the coronal part of the restoration. By cleaning the cavity in the proximity of the dentin-enamel junction before that closest to the pulp, any pain caused through the cleaning process is limited to a few moments at the end of cavity preparation.
5. **Provide pulpal protection if necessary.** This step is used only for very deep cavities and is achieved by applying a setting calcium hydroxide paste to the deeper parts of the floor of the cavity. The cavity floor does not need to be covered completely because it will reduce the area available for adhesion of the filling material. *Rationale* : Calcium hydroxide stimulates repair of dentin and glass

ionomers are biocompatible. In a recent study on the fate of soft caries dentin left under glass ionomer fillings, hardening after seven months was reported.

6. **Clean the occlusal surface.** All pits and fissures should be clear of plaque and debris as much as possible. Use a probe and a wet pellet for cleaning. *Rationale* : The remaining pits and fissures will be sealed with the same material used for filling the cavity.
7. **Condition the cavity and occlusal surface.** Use a drop of dentin conditioner on a cotton wool pellet and rub both the cavity and the occlusal surfaces for 10 to 15 seconds. The conditioned surfaces should then be washed several times with wet cotton wool pellets. The surfaces are then dried with dry pellets. *Rationale* : Conditioning increases the bond strength of glass ionomers.
8. **Mix glass ionomer according to manufacturer's instructions.** Do not alter the powder liquid ratio.
9. **Insert mixed glass ionomer into the cavity and overfill slightly.** The mixed material is inserted using the flat end of the applier, and plugged into corners of the cavity with the smooth side of an excavator or with a ball burnisher. Avoid the inclusion of air bubbles. The material also is placed over pits and fissures in small amounts.
10. **Press coated gloved finger on top of the entire occlusal surface and apply slight pressure.** Petroleum jelly (Vaseline) is used to coat the gloved finger to prevent the glass ionomer from sticking to the glove. Place the finger on top of the mixture, apply slight pressure for a few seconds, and remove the finger. *Rationale* : The finger pressure should push the glass ionomer into the deeper parts of the pits and fissures. Any excess material will overflow the occlusal surface and can be removed easily. A smooth restoration surface will result and reduce the need for carving.
11. **Check the bite :** Place articulating paper over the filling / sealant and ask the patient to close. The petroleum jelly (Vaseline) left on the surface will prevent saliva contact with the filling / sealant while the bite is checked.
12. **Remove excess material with the carver.** Usually only small corrections are required.
13. **Recheck the bite and adjust the height of the restoration until comfortable.**
14. **Cover filling / sealant with petroleum jelly (Vaseline)** once again or apply varnish.
15. **Instruct the patient not to eat for at least one hour.**

For restoring proximal cavities, a plastic strip and wedges are used to produce a correct contour to the filling.

ADVANTAGES OF ART:

The advantages of ART include the following:

- The use of easily available and relatively inexpensive hand instruments rather than expensive electrically driven dental equipment.
- A biologically friendly approach involving the removal of only decalcified tooth tissues, which results in relatively small cavities and conserves sound tooth tissue.
- The limitation of pain, thereby minimizing the need for local anesthesia.
- A straightforward and simple infection control practice without the need to use sequentially autoclaved handpieces.
- The chemical adhesion of glass ionomers that reduces the need to cut sound tooth tissue for retention of the restorative material.
- The leaching of fluoride from glass ionomers, which prevents secondary caries development and probably demineralize carious dentin.
- The combination of a preventive and curative treatment in one procedure.
- The ease of repairing defects in the restoration ; and
- The low cost.

From experience gained thus far, the ART technique is a non threatening oral procedure. This characteristic has the great advantage of making oral care more popular

among the population – in particular, the young. Fear inducing situations caused by threatening dental equipment are not involved, and there is no noise from a drill or from suction equipment. The maximum number of instruments in the mouth at anyone time is similar to that used during an oral examination, the mirror in one hand and a work instrument in the other. ART is therefore, patient –friendly.

Obviously, one of the greatest advantages of ART is that it makes it possible to reach people who otherwise never would have received any oral care. The technique allows oral care workers to leave the clinic and to visit people in their own living environments, e.g. in senior citizen homes, institution for the handicapped, villages in rural and suburban areas in economically less developed countries, and in their own homes. From a health point of view, these possibilities must be considered a huge advantage.

Furthermore, ART supports health education and promotion programs, particularly in areas where oral care relies heavily on pain relief through extraction and oral health education. Using ART, a comprehensive package of education / promotion, prevention, curative treatment, and pain relief can be established and delivered to the population through a low cost, out reach oral health program.

LIMITATIONS OF ART;

- Long – term survival rates for glass ionomer ART restorations and sealants are not yet available; the longest study reported so far is of three year's duration.
- Absence of radiographs which can aid the detection of the lesion and also indicate lesion depth and pulp proximity. The techniques acceptance by oral health care personnel is not yet assured.

- At the moment tissue is limited to small and medium sized, one-surface lesions because of the low wear resistance and strength of existing glass ionomer materials.
- The possibility exists for hand fatigue from the use of hand instruments over long periods.
- Hand mixing might produce a relatively unstandardized mix of glass ionomer, varying among operators and different geographical/climatic situations.
- The misapprehension that ART can be performed easily – this is not the case and each step must be carried out to perfection.
- The apparent lack of sophistication of the technique, which might make it difficult for ART to be easily accepted by the dental profession; and
- A misconception by the public that the new glass ionomer "white fillings" are only temporary dressings.

Some of these disadvantages of glass ionomers, such as low wear resistance and reduced strength, are being addressed. When improved materials become available, larger one surface and small to medium sized multi-surface lesions might also be managed with the ART technique. Also, the variation in mixtures of hand mixed glass ionomer can be reduced by making the materials more user friendly, a particularly important factor in the economically less developed countries where less than optimal operating conditions exist. The development of appropriate hand instruments will facilitate the execution of the ART technique and, one hopes, reduce the possibility of hand fatigue.

CONTRAINDICATION:

- Presence of swelling (abscess) or fistula (opening from abscess to the oral cavity) near the carious tooth,
- Pulp of the tooth is exposed,
- Teeth which has been painful for a long time and there may be chronic inflammation of the pulp,

- When there is an obvious carious cavity, but the opening is inaccessible to hand instruments,
- There are clear signs of a cavity, for example in a proximal surface, but the cavity cannot be entered from the proximal nor the occlusal directions.

EVALUATION CRITERIA USED TO ASSESS ART RESTORATIONS

CODE	CRITERION
0	**Present satisfactory**
1	**Present, slight deficiency at cavity margin of less than 0.5mm**
2	**Present, deficiency at cavity margin of 0.5mm or more**
3	**Present fracture in restoration**
4	**Present, fracture in tooth**
5	**Present, overextension in approximal margin of 0.5mm or more**
6	**Not present, most or all of restoration missing**
7	**Not present, other restorative treatment performed**
8	**Not present, tooth is not present**
9	**Unable to diagnose**
C	**Caries present**

WHY A NEW RESTORATIVE:

⇨ **Because of the need to find an alternative to AMALGAM….**

Discussion in many parts of the world on the continued use of amalgam as a restorative filling material has caused certain countries to actively encourage dentists to cease using such materials by the year 2000. In other countries, no recommendation

have been made either way. However with the rapid development of new adhesive dental restoratives that have become available over the past few years, it would seem sensible to try and find modern purpose designed materials that can be used as an alternative to amalgam in Class I and Class II situations.

⇨ **Because the very young have special needs….**

For many years pediatric dentists have been looking for an aesthetic posterior restorative that contains fluoride, adheres chemically to tooth structure without the need for an additional adhesive bonding system and with adequate strength that can be finished and polished in one visit. Such a material would not necessarily need to last as long as amalgam but rather be capable of lasting the time that deciduous teeth are retained in the mouth.

⇨ **Because the very old have special needs….**

Geriatric patients have particular needs because many times the dentist is working outside the dental surgery – may be in a nursing home or in the patient's own home. For these occasions they need a new generation, simple to use adhesive restorative that releases fluoride and can be applied quickly, effectively and allow the restoration to be completed in a matter of minutes.

⇨ **Because a real long term temporary with Fluoride release is required…**

Thirty years ago, temporary or intermediate restorative zinc oxide material became popular with the dental profession because they fulfilled a need to provide patients with a restoration that could perhaps last for a few months. Today, with modern technology, the new generation of intermediate restorative materials should be able to provide better aesthetics, last longer and provide real long term results lasting years rather than perhaps a few months.

ART AND THE PUBLIC'S ORAL HEALTH:

In common with other treatment procedure, ART should not be used in isolation. It should be supported by measures that control the reasons why a treatment was needed

in the first place. These measures usually include educational and promotional oral health activities, as well as preventive services, other restorative procedures and methods for the control of pain.

The first step in introducing ART into a primary health care system is to teach the skill required to perform the technique. A manual is available that, in its present format, is largely oriented toward non-dentally trained personnel. The best way to learn how to perform the ART technique is to participate in a clinical course. To date, courses have been held in some 19 countries.

In Zimbabwe, the entire government dental workforce has been oriented towards ART. In various parts of the country, oral care programs have been initiated bringing oral care to a larger part of the population than ever before. The incorporation of ART into primary oral health care was considered a great step forward in the government's endeavor to improve and extend oral health care to a much greater part of the population. A demonstration program was developed focusing initially on students in their first year of secondary school. The following describes the demonstration program.

The oral health services and promotion program consists of the following elements;

1) Examination of students to identify those who need care;
2) Delivery of oral health promotional activities to individual in both the school class room settings and outside;
3) Provision of preventive oral health measures, including scaling and the sealing of tooth surfaces using glass ionomer;
4) Treatment for dental caries using ART;
5) Discussions with school staff on maintaining good oral health in their students after the oral health team has left; and
6) Evaluation of the overall program and the care provided each year.

The program started in March 1993 in six secondary schools in the Greater Harare area. Of all the students examined, 95 percent required some form of preventive or curative treatment. The program currently is carried out by dentists and newly qualified dental therapists. In addition, the program is being incorporated into the teaching of third year dental therapy students where the students assist the operators, provide oral health education, and carryout scaling and ART as time permits.

So far, the program has been well received by school staff and students, the vast majority of whom are very pleased with the care that they otherwise never would have received.

COMPARISON OF PRESERVATIVE DENTISTRY AND ATRAUMATIC RESTORATIVE TREATMENT (ART) :

Preservative dentistry represents an ultraconservative philosophy of delaying the placement of the first restoration or replacement of restorations until evidence of cavitation or definite failure is observed or is highly likely. This approach places the primary emphasis on accurately diagnosing carious lesions; monitoring the progression, arrest, or remineralization of incipient lesions; educating patients to shift them to a low caries risk; and varying the treatment protocol and recall interval according to the patient's estimated risk of caries initiation or progression. Teeth with cavitated lesions are restored. Non-cavitated lesions in high risk patients are arrested by reducing bacterial levels and potentially remineralized through the application of fluoride and/or chlorhexidine or other appropriate bactericidal agents at specific intervals. Successful application of preservative dentistry principles should lead to maximum conservation of sound tooth structure, minimal use of anesthetic, minimal pain, a reduced risk for endodontic treatment and tooth extraction, and an increase in the mean survival time of the affected teeth.

Atraumatic restorative treatment is based on the treatment of cavitated lesions by excavation of carious tissue and restoring the site with a relatively technique insensitive fluoride releasing material such as a highly viscous glass ionomer. The material must be placed and finished in treatment areas that lack electricity, radiography equipment, dental handpieces, curing lights, and air water syringes. In principle, atraumatic restorative treatment should yield outcomes similar to those associated with preservative dentistry, including avoidance of pain and need for local anesthetic injections, minimal surgical intervention, conservation of sound tooth structure, reduced risk for subsequent endodontic treatment and tooth extraction, and increased survival time of the affected teeth.

In underprivileged communities of developing countries as well as under served populations of industrialized nations, operative dentistry and endodontic therapy are not economically feasible and extraction is the main option for treating teeth with extensive caries damage.

In contrast, preservative dentistry focuses on avoiding or delaying the placement of the initial restoration and subsequent replacements of restorations. The philosophies of preservative dentistry and ART may be similar in that the greatest emphasis is placed on those individuals at highest risk for caries progression.

When the benefits and drawbacks of a given caries treatment are considered, the treatment in question is usually compared with traditional alternatives for treating the population under the specific economic and personnel constraints in question. For preservative dentistry in industrialized countries, the delayed placement and replacement of restorations is contrasted against traditional surgically invasive restorative treatment.

IDEAL ART MATERIALS :

The ideal direct filling, ART material should;1) be biocompatible; 2) be tooth colored; 3) have “forgiving” handling properties; 4) be insensitive to moisture or desiccation; 5) harden without special equipment; 6) form stable bonds to enamel and dentin; 7) seal margin gaps against bacteria; 8) release fluoride and/or remineralization agents; 9) release a chemotherapeutic agent when required to arrest disease; and 10) exhibit excellent durability. Fluoride released from restorative material serves three principal roles. It inhibits bacterial action as the pH of plaque fluid decreases, inhibits demineralization as the pH decreases, and enhances remineralization as the pH increases.

The highly viscous glass ionomer materials currently used for ART meet several of these criteria. However, they may be quite deficient in their ability to seal marginal gaps against bacteria and in their sensitivity to desiccation. Furthermore, although they release fluoride over the lifetime of the restoration, this fluoride release alone may not prevent caries progression in all cases. In fact, it is highly unlikely that fluoride alone will prevent caries for patients at the highest risk of the disease. Katz 1982 pointed to use chlorhexidine in conjunction with fluoride to achieve caries arrest and remineralization of adjacent areas of the affected teeth.

Frencken et al reported 3 year results for a study of secondary school children whose teeth were treated by two dentists or two dental therapists with either Type II glass ionomer sealants (ChemFil Superior, Dentsply, DeTrey) or one surface ART restorations using the same material. The sealant was applied to teeth with early enamel lesions and some small dentinal lesions. They found that 85.3% (80.9% to 89.7%) of the ART restorations survived at 3 years compared with 50.1% (25.9% to 68.5%) of partially and fully retained sealants.

Dunne et al in 1996 found that the depths of caries inhibition of Fuji II LC glass ionomer cement and the conventional ChemFil glass ionomer cement were comparable. Although resin modified glass ionomer cements may be more durable than conventional glass ionomer, these materials typically require occlusal adjustment with a handpiece and bur and finishing with abrasive disks. These material would be unsuitable for ART in situations where electricity is not available.

WHY NEW FUJI IX GP :

When it comes to restorative dentistry, the introduction of a new generation wear resistant, high strength, fluoride releasing, and adhesive glass ionomer must be of significant importance. Therefore, the introduction of **Fuji IX GP** for general practice is a real breakthrough in many ways…

- Simplicity of use
- Time saving technique
- Packable and condensable consistency
- Extra strength and wear resistance
- Lowest solubility of any glass ionomer restorative material
- Extra fast placement / finishing technique.

Added to this the ionic bond to tooth structure, excellent biocompatibility and remineralisation effect from good continual fluoride release.

FUJI IX GP :

Glass Ionomer for Posterior Use:

⇨ Packable

⇨ Fast setting

⇨ High strength

⇨ Wear resistant

⇨ Chemical bonding

⇨ Significant fluoride release

⇨ Lowest solubility

⇨ Radiopaque

⇨ 6 Vita shades A2, A3, A3.5, B2, B3 C4

⇨ Choice of Capsules or Powder & Liquid Presentation

FUJI IX GP : General Practice Glass Ionomer Cement :

Indications for Use:

1. Final restorative Class I, II deciduous teeth.
2. Geriatric restorative Class I, II, III, V cavities and cervical erosions.
3. Final restorative Class and Class II adult dentition in non-load bearing situations.
4. Intermediate restorative for heavy stress Class I, II cavities.
5. Sandwich and core build-up material.
6. Fissure sealing material for permanent teeth.

COMPOSITION

Fuji IX has a smaller mean particle size than earlier self cure glass ionomer restorative materials. The smaller particle size is purported to give improved wear rates and faster setting time than earlier materials.

Powder

95%-Alumino fluoro-silicate glass with 55 polyacrylic acid powder

Liquid

50%- distilled water

40%-Polyacrylic acid

10%-Polybasic carboxylic acid

Powder-liquid ratio is 3.6:1

Mixing time- 25-30 secs

Working time- 2 mins

Net setting time- 2mins and 20 secs

Final finishing and polishing may be initiated 6 mins from the start of mixing the material. The material should be protected with either Fuji varnish or Fuji coat L C during initial setting and after final finishing prevent material degradation from corresponding moisture contamination or desiccation.

Advantage over older GIC

Decreased moisture sensitivity, improved wear characteristics and no requirement for visible light cure unit.

Available in powder-liquid and encapsulated delivery system.

FUJI IX IS A.R.T. :

When GC, learned of the field trials in Thailand involving the ART technique, the Research and Development Department made available for evaluation their most advanced conventionally cured glass ionomer cement.

This material exhibited significantly improved physical properties as well as uncharacteristic packability and condensability not normally found in glass ionomer cements.

The W.H.O. evaluation team quickly adopted this new material for use because of ease of handling, speed of set and obvious strength.

The new material was subsequently named after the ART Technique which teaches 9 steps in cavity preparation and placement for glass ionomer cements… Hence Fuji IX.

Fuji IX GP has been modified slightly from the original Fuji IX formulation and is being released in a range of shades and in both capsule and powder/liquid delivery.

RETENTION AND CARIES PREVENTIVE EFFECT OF ART SEALANTS

There are basically two families of dental materials in use to seal pits and fissures; composite resins and glass-ionomer cements. It is generally accepted that composite resin sealants are retained longer than low-viscosity glass-ionomer sealants(Simonsen, 2002; Locker et al., 2003).However which of the two types of sealant is more able to prevent caries development is less clear. However current evidence shows that glass-ionomer sealants are as good as resin based sealants in preventing dental caries(Beirutti et al 2006), high viscosity glass-ionomer sealants applied without finger pressure(Weerheijm et al., 1996). Using the weighted mean to reflect the number of sealants and /or restorations of the individual studies in the final outcome, a meta-analysis was carried out to assess the survival of ART sealants and ART restorations. The analysis showed a weighted mean survival rate of fully and partially retained ART sealants using high viscosity glass-ionomers after 1,2 and 3 years of 90%, 82% and 72% respectively(Vant Hof et al., 2006). These relatively high retention rates resulted in a weighted mean annual failure rate (completely lost high-viscosity glass-ionomer ART sealants) in permanent teeth of 9.3% over the first 3 years. The caries preventive effect of high viscosity glass-ionomers ART sealants appears to be very high. High viscosity glass ionomer ART sealants had a 4 times higher chance of preventing caries development in re-exposed pits and fissures on occlusal surfaces in first molars than is achieved using light-cured composite resin sealant material over a 1-3 year period(Beiurutti et al., 2006).

ART RESTORATIONS IN THE PERMANENT DENTITION

The majority of studies evaluating ART have been made in the permanent dentition.
Overview of survival of single-surface ART restorations in the permanent dentition

Country	Period	Operator	Material	Age	No of last evaluation	% Survival Years		
						1	2	3
Thailand	1991-94	D, DT	Chemfil	7-58	144	93	83	71
Zimbabwe	1993-96	D, DT	ChemFil Superior	13-16	197	93	89	85
Zimbabwe	1994-97	D, DT	Fuji IX	13-16	206	99	94	88
Hong Kong	1995-97	D	ChemFil Superior and Fuji IX	17-49	84	98	93	-
China	1996-98	DT	Ketac Molar	12	273	97	93	-

D-Dentist; DT-Dental Therapist

A review of the published studies indicates that the outcomes are to some extent dependent upon the material used, operator experience and presence of caries. The latest study in Zimbabwe has reported about the perceived reasons for failure. Of the 28 failed restoration, 11 each were ascribed to the material used and to handling of the operators. The presence of caries as a reason for failure has been reported in all studies cited. It ranged from 6.3% in the early study (Thailand) to 3.6-0.4% in the more recent studies (Zimbabwe).

Material related factors

The early studies made use of glass-ionomers that were manufactured for use in non-stress bearing situations such as cervical cavities. These were placed largely in occlusal surfaces, thus in stress bearing situations. It was considered ethical to do this in spite of possible shortcomings because the only alternative treatment in the health systems of the countries where these studies were conducted was extraction. This has been clearly shown in the study from Thailand where over a 3 year period, on average one additional tooth was extracted in those subjects who did not receive either ART or conventional treatment.

Based on the success of the early ART studies, dental manufacturers produced glass-ionomers specially formulated for the ART with improved strength and wear

resistance. These materials have been used in the more recent ART studies in Zimbabwe and most probably play a role in the improved success rates seen in these studies.

Operator considerations

Evidence that operator has an influence on survival outcomes is seen in the studies from Zimbabwe where senior dentists performed better than some junior dental therapists. This was ascribed to the senior dentists having more experiences in performing ART and in oral care in general.

Total loss of restoration is considered a technical error of the operator. It is ascribed to insufficient caries removal, improper insertion of mixture into the cavity and/or application of a mixture that is too dry or too wet. In the studies in Zimbabwe, the percentage of tooth loss of restoration ranged from 6.1% in the early to 1.9% in the latter study. The operator dependency of ART can be reduced through attending an ART course prior to applying the approach in a patient.

ART RESTORATIONS IN THE DECIDUOUS DENTITION

To date the study in Thailand is the only one that has reported on the use of ART restorations in the deciduous dentition. Using an early type of glass-ionomer, the one year success of single surface ART restorations was 79%. The success for multiple surfaces ART restorations was 55%. While it is anticipated that ART will be particularly useful in providing care for the young child, there is a need for further research to be carried out in this area. Currently studies carried in China, Syria, and South Africa are underway investigating ART in the deciduous dentitions using newer glass-ionomers and compomers in both single and multiple tooth surfaces.

Clinical trials using the ART approach

The initial investigations of ART restorations were typical feasibility studies focusing on the retention of the glass ionomer material. Subsequent studies have included glass ionomer sealants and dental amalgam in conventionally

Prepared cavities as controls or as comparison groups. Results from a three-year observation period have been published. These results have been confirmed and improved

findings have been reported in recent studies. However, ART using materials other than glass ionomers has not been studied.

The long term predictions made indicate that the median survival time for ART restorations would be about five years and for conventional amalgam restorations seven years which compares favourably to recent longevity data from the UK. No statistical differences were found between restoration survival data for children and adults in one study while another study indicated a lower success rate in children. Marked operator effects on the three-year survival rates of ART restorations have also been demonstrated. Single surface restorations have a better success rate than multi-surface restorations. It is noteworthy that most clinical trials involve one-surface restorations.

Specially designed criteria have been used to evaluate success and failure of ART restorations. These criteria focus on marginal defects and wear. Caries lesions adjacent to restorations have also been recorded, but a differentiation between secondary (recurrent) caries and remaining primary caries was difficult to assess. Sealants were not retained as well as ART restorations, but surfaces sealed with glass ionomer materials showed a marked decrease in the development of carious lesions compared to unsealed surfaces. The ART approach has been received well by both children and adults who belong to population groups not previously exposed to regular oral health care.

Rahimtoola *et al.* showed that the operative sensitivity as reported by the patients related to the ART technique was 19.3 per cent, while 35.7 per cent reported sensitivity to restorative techniques using rotating instruments. The treatment is non-threatening, and there is no extensive equipment, no noise of the handpiece, no water cooling, and no suction. By cleaning the cavities with hand instruments only, pain can be kept minimal with no need for anaesthesia in most cases. Thus, the ART technique may be useful to treat children, particularly those who present with management problems, and it could also be extended as an alternative treatment in a school dental service, homes for mentally and physically disabled, and the elderly.

Cost

The operator time is the most important factor in an estimate of the cost of restorations, including ART. Frencken *et al*. indicated that the time required to place one-surface ART restorations without chairside assistance was about 22 minutes with a mean average range of about 20–24 minutes per operator. This operator time was more than twice that

required for placement of sealants. In a discussion of the time required to insert ART restorations, reference is made to Thai studies where the time recorded was 17 minutes for ART restorations. This study also pointed out that the time required to complete ART restorations decreases as a result of increased experience with the ART techniques. Cost effectiveness of ART and conventional amalgam therapy was reported in a Thai study based on the total cost (equipment, material and wages) and survival rates of the restorations. Cost-effectiveness ratios of 0.77 for ART and 0.82 for amalgam were reported for one-surface restorations after three years.

Phantumvanit *et al*. reported no statistically significant difference between the survival curves for ART restorations inserted by dentists and dental nurses. Since the operator time represented a considerable component of the total cost, salary level of the operator will be important. This report also indicated no statistical difference in the occurrence of secondary caries between ART and amalgam restorations after three years.

AN EVALUATION OF ART

Many of the publications on ART are based on excavation of carious lesions by hand instruments and restoration with glass ionomer materials under field conditions without electricity available. These studies have focused on the technique *per se* and on the retention rate of the restorations. Control and comparison groups have been included in some studies, including the application of glass ionomer sealants and conventional amalgam restorations. The results from these comparisons indicate limited advantage of ART compared to conventional amalgam treatment. Although studies of ART using amalgam have not yet been published, such studies are in progress (Frencken, 1998, personal communication). Although the glass ionomer sealants have a poor retention rate, few caries lesions develop on the treated surfaces. However, ART offers an opportunity for restorative dental care under field conditions where no electricity is available. Since the cost effectiveness of conventional and ART restorations is similar for the two types of treatments, it is unlikely that ART will have much impact on dentistry in urbanised areas. Advantages such as reduced discomfort for the patients, the use of operators with minimal training, and the low cost must be confirmed in long term studies.

These long term studies must include adequate and relevant comparisons of alternatives, including the use of relatively technique insensitive materials like amalgam as the restorative material following excavation of the carious tissue and various preventive treatments including topical fluoride applications. It is considered important in future studies of ART, and other alternative restorative treatments, that the criteria used to evaluate the restorations are similar, or

Preferably identical, to those used to assess conventional restorative treatment. The United States Public Health Service (USPHS) criteria16 are considered to be as easy, quick and relevant as those employed for ART restorations. The USPHS criteria have been widely used for decades and are the only internationally accepted criteria for direct clinical evaluations of restorations. They include all the criteria employed in the ART studies, namely lost restoration, marginal breakdown, and wear. It is surprising to the present authors that the ART technique had largely been limited to one surface restorations and to populations with a DMFT in the 1.0–1.5 range.

In future investigations ART should be tested on populations with a much higher incidence of caries lesions. Such patients are available both in low income areas in industrialised and developing countries where no alternative restorative treatment is available. These clinical studies using appropriate control or comparison groups and common criteria, like the USPHS criteria, should allow definitive conclusions on the validity and advantages of the ART technique.

A study conducted to compare the effectiveness of high-viscosity Atraumatic restorative treatment with glass ionomer sealant (ARTGIS) on the development of caries in a population of children living in two distinct localities in Diyarbakir City in southeastern Anatolia, Turkey showed that ART-GIS procedure can be used as a preventive method in rural and/or suburban areas where other preventive approaches are neither available nor economical.

A study was conducted on the longevity of fillings and sealants placed using the technique under field conditions in rural Thailand. Dental caries was treated using the ART technique in one village, whilst the population in a second village received restorative care (amalgam fillings) through mobile dental units. A third village was the control. After one year, 79 per cent of single surface ART fillings and 55 per cent of ART fillings of greater than one surface placed in deciduous teeth were judged successful. The

success rate of ART fillings in the permanent dentition (mainly single surface fillings) was 93 per cent and the retention rate for sealants was 78 per cent. Children were pleased at having received treatment by this technique and showed little fear. The ART technique is a promising caries treatment procedure for use in rural and sub-urban areas in less-industrialized countries.

A pilot study on the use of Atraumatic Restorative Treatment (ART) as a means to provide access to oral health care was conducted in a Mexican village with no access to electricity, running water and basic health services. A total of 120 ART restorations and 95 sealants were placed in 82 schoolchildren ages 5-18 years by 3 dentists and 9 students. Standard ART instruments and glass ionomer (Fuji II XTGC) were used. Satisfaction with the procedure was high: 85% reported no pain during treatment and 93% were comfortable with their restorations. Outside examiners evaluated the restorations at 6 months, one year and two years. Not all the children were present during each follow-up. 22 restorations were lost when families moved out of the area. On the two year evaluation results show 66% (n=59) of ART restorations and 24% (n=59) of sealants placed were retained. The study shows that ART is an acceptable and effective approach to control and prevent decay in a socio-economically deprived community.

A total of 370 restorations were performed, and 193 sealants were placed. Treatment time ranged from 10 to 80 minutes, with no significant time difference between professional dentists and dental students. Results showed a restoration retention rate of 81% in the first year and 66% in the second year; the highest rate was in the central and distal surfaces in posterior permanent teeth. These results were comparable to those of other studies—78% to 90% retention rate in the first year and 63% to 86% in the second year.The probability for failure is less in restoration of occlusal surfaces (P=.004). Retention rate in the sealants was quite low (51%); the highest rate was in the buccal and lingual surfaces. This may be attributed to poor moisture control and the lack of comprehensive strength of glass ionomers in high-wear areas. A significant result is the absence of recurring decay related to the atraumatic restorative treatment restorations and the absence of caries in children where sealants were placed, but later lost.

Patient satisfaction with atraumatic restorative treatment was high. Most did not experience pain during excavation (68%) and during filling (85%). Of the patients treated,

93% were comfortable with their restorations. One child was sent to the dental clinic in the town of Aculco because of pulp exposure.
Retention rates for the restorations were higher in the first than in the second year, which suggests a wear and tear in the restorations. Glass ionomers are reported to have a medium-term wear of 1 year, and resistance to wear of glass ionomers is lower than that of composite resins or amalgam. The retention rate was higher in 1 surface restoration, which may reflect high compressive strength but low resistance to flexural forces of glass ionomers.

The absence of caries in teeth with atraumatic restorative treatment restorations or sealants indicates that atraumatic restorative treatment is an effective preventive measure for caries even in the presence of other factors that may contribute to the development of caries. It has been noted that fluoride from glass ionomers produces an environment that controls the development of caries, and surfaces that were not sealed had a 4 times greater chance of developing caries. It is possible that some of the children would have needed teeth extractions were it not for the atraumatic restorative treatment restorations and sealants.

The lower rate of retention as compared with other field studies may be attributed to the inexperience of the students and dentists, especially in the mixing of glass ionomers, which affects its compressive strength. The absence of a significant difference between the performance of dentists and dental students may indicate that less experienced personnel or no dentists can be trained to do atraumatic restorative treatment. Dental nurses and therapists can successfully place atraumatic restorative treatment restorations.

A study to compare the success rates of glass-ionomer cement restorations placed with the atraumatic restorative treatment approach and conventional cavity preparation methods showed in a clinic setting, the use of atraumatic restorative treatment hand instruments for cavity preparation is more time consuming, and the method may also provide less mechanical retention and/or bulk of glass-ionomer cement for some Class II preparations in primary molars than does the use of conventional rotary instruments.

A study conducted in Pondicherry among 1500 patients for whom glass ionomer fillings were given following the principles of Atraumatic Restorative Treatment subsequently

the cases that were treated with glass ionomer were followed for 6 months and 3 months period, to assess the effectiveness of the restoration given in both deciduous and permanent dentition. Overall it was found that the retention of glass ionomer in deciduous teeth for single surface restoration had a success rate of 91.3% with 95% of Confidence Interval of 87.96 to 94.8 and similarly for permanent teeth retention level was found to be 95.7% with confidence interval of 95% of 94.29 to 97.13.

Three year study conducted in Netherlands in deciduous teeth for single surface restoration had survival rate of 86.1 and 48.7 for multiple surface restoration (J.E.Frencken et al., 2002). Two other study in deciduous teeth have reported a success rate of 51% in deciduous dentition among 3 to 6 yrs old after 2.5 yrs (Lo and Holmgren,2001) and 42.6% survival amongst 6 to 14 year olds after 2 years (Lo et al., 2001). Marks et al., (2001) reported a 1 year survival of multiple surface glass ionomer restorations in deciduous dentitions of 92% and Rutar et al. (2000) a 2-year survival of 93% using a capsulated glass-ionomer in a comparable type of restorations.

Study conducted in Zimbabwe for ART restoration and glass ionomer sealants, survival after 3 years showed a success rate of 88.3%. A similar study done in Chinese school children for ART and glass ionomer sealants for single surface restoration had a survival rate of 99% in 1st year and 92% in 3 year evaluation.

Similarly retention level of multiple surface ART fillings reveals a success rate of 92.6% in deciduous and 95.7% in permanent teeth in our study. The results obtained reveals a good level of retention of Glass Ionomer filling in the simplified ART technique, similar findings were also recorded in one year study conducted by D.F.G.Cefaly et al in Thailand where the survival rate of class III and class IV restorations using ART approach in permanent anterior teeth was 91%. The study is only encouraging to note that the usage of Glass Ionomer fillings as an ideal filling material in ART which is more practical as well as simplified so that it can be applied in the conditions suitable to our country.

A study conducted using the ART approach in pre-school children in Southern China in a kindergarten environment, using a high-strength glass-ionomer restorative material showed that the ART approach be acceptable to Chinese pre-school children for providing restorative dental care outside the traditional clinical setting. The success rates were high for Class I and V restorations in primary teeth, modest for Class II, and low success seen

for Class III and IV restorations.

This study aimed to evaluate the clinical performance of atraumatic restorative treatment (ART) restorations placed in school children in China over a 6-year period. The 6-year survival rate of the class I ART restorations in this study, especially the smaller ones, was satisfactory. This suggests that the ART approach can be used in the school setting to improve the oral health of large populations of underserved children.

A comparison of the retention rate of glass ionomer ART restorations and conventional amalgam restorations over a 3-year period expressed as the percentage of retained restorations. (Based on data from Phantumvanit *et at.*). These tooth-colored restorative materials have enhanced physical properties and maintain the two major advantages of glass ionomer materials: they chemically bond to mineralized tissues and they release fluoride which may assist in remineralization of demineralized tissue, thereby possibly preventing the development of secondary caries.

CAUSE OF FAILURE OF ART RESTORATIONS

The main reported reason for the failure of single surface ART restorations in primary and permanent teeth is dislodgement of the restoration and part of it (Frencken et al., 1998, 2007 Taifour et al., 2002, Lo et al., 2007). This is due to material and operator related effects. Glass-ionomer material can become dislodged for a number of reasons:

- Insufficient removal of caries
- Improper mixing of the glass-ionomer powder/liquid
- Level of humidity and temperature of mixing glass-ionomer
- Incomplete filling of the cavity with hand mixed glass-ionomer
- Saliva and/or blood contamination
- Insufficient and or no conditioning of the cleaned tooth cavity
- Level of co-operation of the child
- Skill of the operator

CONCLUSION

The greatest part of the world's population has no access to restorative dental care.

One of the main obstacles is the traditional manner of treating caries, which relies on electrically driven equipment. Compared to conventional treatment approaches, ART is still very young.

The basic concepts of the ART technique are the removal of decalcified dental tissue using only readily available hand instruments, following the modern concepts of cavity preparation, and the use of a high technology adhesive restorative material.

Much progress has been made in researching various aspects of the ART approach. More experience in the actual technique of cleaning carious cavity with hand instrument has been gained and newer, physically stronger glass ionomers have been marketed as a result of its existence. These developments have most probably led to the higher survival results of ART restorations in permanent teeth in the more recent studies.

ART is based on a sound concept of caries management. This fact and the results achieved from field studies, should guide oral health care work towards considering ART as an additional means of providing care to the general public.

ART has gained popularity ever since its inception. It has become a subject for study in many countries. This is an essential and welcome development that will assist the oral health community in understanding the limitations and strength of ART not only in clinic but also in the field. This technique has the potential to make oral health care more available to a larger part of the world's population than before.

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REFERENCES :

1. Anusavice KJ. Does ART have a place in preservative dentistr?. Community dentistry and oral epidemiology. 1999 Dec;27(6):442-8.
2. Basso ML, Edelberg MH. Atraumatic restorative treatment-one year clinical report (Temporary teeth restorations). Journal of Dental Research 1997 Jan 1 (Vol. 76, Pp. 2938-2938). 1619 Duke St, Alexandria, Va 22314: Amer Assoc Dental Research.
3. Frencken J, Van Amerogen E, Phantumvanit P, Songpaisan Y, Pilot T. Manual for the Atraumatic Restaurative Treatment approach to control dental caries. Dental Health International Nederlant ISBN90-803296-1-4. 1997.
4. Tak Ho TF, Smales RJ, Sang Fang DT. A 2‐year clinical study of two glass ionomer cements used in the atraumatic restorative treatment (ART) technique. Community dentistry and oral epidemiology. 1999 Jun;27(3):195-201.
5. Council O. This draft does not constitute an official AAPD health oral policy or clinical guideline until approval by the General Assembly. Circulation is limited to AAPD members. risk.;74:2630.
6. SGDamle, Pediatric Dentistry, 1st edition, 154-156.
7. Frencken JE, Peters MC, Manton DJ, Leal SC, Gordan VV, Eden E. Minimal intervention dentistry for managing dental caries–a review: report of a FDI task group. International dental journal. 2012 Oct 1;62(5):223-43.
8. Ercan E, Dülgergil ÇT, Dalli M, Yildirim I, Ince B, Çolak H. Anticaries effect of atraumatic restorative treatment with fissure sealants in suburban districts of Turkey. Journal of Dental Sciences. 2009 Jun 1;4(2):55-60.
9. Frencken JE, Songpaisan Y, Phantumvanit P, Pilot T. An atraumatic restorative treatment (ART) technique: evaluation after one year. International dental journal. 1994 Oct 1;44(5):460-4.
10. Lopez N, Simpser-Rafalin S, Berthold P. Atraumatic restorative treatment for prevention and treatment of caries in an underserved community. American journal of public health. 2005 Aug;95(8):1338-9.
11. Yip HK, Smales RJ, Yu C, Gao XJ, Deng DM. Comparison of atraumatic restorative treatment and conventional cavity preparations for glass-ionomer restorations in primary molars: one-year results. Quintessence international. 2002 Jan 1;33(1).
12. Lo EC, Holmgren CJ, Hu D, Van Palenstein Helderman W. Six‐year follow up of atraumatic restorative treatment restorations placed in Chinese school children. Community dentistry and oral epidemiology. 2007 Oct;35(5):387-92.