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Atraumatic Restorative Treatment

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1. Introduction

Atraumatic Restorative Treatment (ART) is a preventive and restorative approach for managing carious lesions of the teeth. It is based on modern knowledge about minimal invasion, intervention, and minimal cavity preparation. It is a procedure based on removing carious tooth tissue using hand instruments along and restoring the cavity with adhesive material. This treatment approach has the advantages of being relatively easy to use after proper training and has shown to be cost-effective. It also hardly induces dental anxiety amongst children and adults. Additionally, ART does not require extensive dental equipment. ART offers an opportunity for preventive and restorative dental treatment under field conditions where there is lack of electric dental facilities.(1)

2. Indication and Contraindication

ART can be carried out when: -

1) There is a cavity/hole in the tooth.
2) The hole can be reached with your instruments.

ART should not be used when: -

1) There is presence of swelling (abscess) or pus pr fluid coming out (opening from abscess to the oral cavity) near the carious tooth, -
2) The hole is too deep (so that the core/pulp of the tooth is exposed),
3) Teeth have been painful for a long time and there may be chronic infection of the pulp of the tooth
4) There is an obvious carious cavity, but the opening cannot be reached by your hand instrument,
5) There are clear signs of a cavity, for example on the side of a tooth, but the cavity cannot be entered from the side or from the top of the tooth direction.(2)

3. Advantages of Art

ART is the biological approach that required minimal cavity preparation that conserve sound tooth tissue and cause less trauma to the tooth. As ART is painless, the need for local anesthetics is reduced and reduced psychological trauma to the patient. Simplifies infection control as hand instruments can easily be cleaned and sterilized, no electrically driven and expensive dental equipment needed which enable ART to be practiced in remote areas and in the field. This technique is simple enough to train non-dental personnel or primary healthcare worker. ART approach is very cost effective (3)

Glass-Ionomer as a Restorative Material in ART

Glass-Ionomers is very useful restorative materials. They are available as a powder and liquid that has to be mixed together. Since they chemically (not mechanically) bind to the teeth, the need to cut sound tooth tissue to prepare the cavity is reduced. These materials continue to release fluoride after setting which has the added advantage of arresting and preventing caries around the restorations.(4) Glass-ionomers are harmless to dentine and pulp tissues. However compared with other materials glass-ionomers are not strong enough and are currently being improved by the manufacturers

4. Requirement for ART

Instruments

Mouth Mirror, Explorer, Pair of tweezers, Dental Hatchet, Spoon Excavator, small Spoon excavator, medium Spoon excavated, large Applier/carver, Glass slab or paper mixing pad and Spatula

Materials

Cotton wool roll, cotton wool pellet, Clean water, Glassionomer restoration material, Liquid and powder measuring spoon, Dentine conditioner, Petroleum jelly, Wedge Plastic strip, Articulation paper

The principal steps of ART are described below

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 0 to 5 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.(5)

5. Clinical factors responsible for ART failures are

1. Material Factor
2. Operator Factor
3. Technique Factor

Material factor

Material factors are directly related to material (GIC) properties, such as physical strength, flow rate and Material consistency. With the development of newer high strength glass ionomer cements, physical properties have been improved. However, the strength of GIC remains inferior to traditional restorative materials, particularly amalgam and composite resin. The flow rate of GIC is directly related to the adaptability to the cavity surface. Improved GIC flow rate may reduce void formation.(6) In addition, small void formation (diameter < 0.1 mm) within the restoration may depend on the type of material mix, capsule or hand mix. Hand mix is operator depended and thus may incorporate more air entrapments then capsule mixing. A large number of voids may weaken the material and make it prone to higher wear and material loss on restoration margins (7)

Operator factors

Operator factors relate to failures caused by insufficient operator performance, particularly in the areas of incorrect clinical indication, caries removal, moisture control, cavity conditioning, material mixing (hand mix) and material insertion. Operator decisions leading to incorrect application of ART under clinical conditions not favourable for ART may result in a too large restoration, with constant exposure to masticatory forces, exceeding GIC strength. In combination with limited physical strength of GIC (material factor) this may lead to restoration fracture and subsequent loss of restorative material. Insufficient removal of infected dentine, particularly on the cavity circumference may cause a reduced chemical bond between tooth tissue and material, higher residual bacteria count and the access of those bacteria to substrates via occurring leakage with subsequent further

6. Atraumatic Restorative Treatment versus Conventional Restorative Treatment

Traditional restorative care requires expensive equipments, while the ART approach is cheap, simpler, and cause less anxiety in children than the traditional restorative approach (8). The Atraumatic Restorative Treatment (ART) was developed in the middle of 1980s for non industrialized countries whose population are low socioeconomic status and in which there is no electricity available. The ART uses manual excavation of dental caries, which eliminates the need for anaesthesia and use of expensive equipment, and restores the cavity with high viscosity glass ionomer cement, an adhesive material that bonds to the tooth structure. Furthermore, glass ionomer cement releases fluoride leading

to down regulation of demineralization of teeth, potential re-mineralization, and antibacterial effect. The ART approach reduces the overall costs of restorative care, because capital investment and maintenance costs for ART are lower than those for traditional restorative care (9).

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