



## Atraumatic Restorative Treatment - ART

### Full Summary

#### Description and Use:

Atraumatic restorative treatment (ART) is an alternative treatment for dental caries used to remove demineralized and insensitive outer carious dentin with hand instruments only. Therefore, no electricity or anesthesia is required and pain, usually experienced in conventional cavity preparation, is kept to a minimum. Originally, ART was developed for use in developing rural countries because it does not require local anesthesia or electricity. More recently, ART has become increasingly accepted in developed countries because of its “atraumatic” approach in relation to the stress and pain experienced by patients. ART conserves tooth structure, minimizing trauma, and has been found to reduce pain perhaps due to the creation of smaller cavities. This technique has been found to be useful in children, elderly, special needs patients and those patients with fear and anxiety about dental treatment<sup>1,3</sup>. Pain and anxiety are significantly lower in both children and adults who receive ART therapy compared to conventional therapy<sup>2,3</sup>. Overall, patients feel less fear and discomfort when receiving ART compared to conventional rotary instruments.

Hand instruments are used to remove carious tooth substance. Anesthesia is not necessary. The cavity is filled and adjacent enamel fissures are sealed with conventional self-hardening glass ionomer restorative cement. Little information is available about use of materials other than GIC in this method<sup>4</sup>. Hence GIC (glass ionomer cement) is the filling material of choice for ART.

#### Effectiveness and Efficacy:

##### Comparisons of ART to conventional treatment

In a meta-analysis of 5 ART effectiveness studies, the retention of ART restorations were compared to those using a conventional method in single surface restorations in



permanent dentition with a follow-up of 2-3 years<sup>5</sup>. One study was a split mouth design<sup>6</sup>, 2 used a parallel group design<sup>7,8</sup> and 2 used a nested split-mouth design<sup>9,10</sup>. Only one study<sup>7</sup> found that the survival rate of amalgams were significantly higher than ART. The 4 other studies found that the difference in survival in the two techniques were not statistically different. The study with the longest follow-up followed 152 school children for 6 years who received either ART or conventional restorations. The survival rate in ART treated surfaces after 6 years was 68.6% compared to 74.5% in conventionally treated surfaces; this difference was not statistically significant. In clinical trials of ART compared to traditional treatment conducted by the Pan American Health Organization (PAHO) in 3 South American countries among children, the odds of failure for ART was 1.75 times the odds of failure in amalgam composites, adjusting for age, sex and country<sup>11</sup>.

One study by Steele et al looked at ART vs. conventional restorations in the elderly (mean age 78.6 years), mostly 1-surface. After 12 months, there were no statistical differences between the two types of restoration in survival rates<sup>12</sup>. A systematic review by Mickenautsch et al. concludes that ART can be used in both primary and the permanent dentitions<sup>20</sup>.

### Survival/Retention of ART

Survival rates of restorations using ART vary depending on several factors. In a meta-analysis of studies reporting survival rates of ART restorations, single surface restorations were found to be more successful than multi-surface restorations in both primary and permanent dentition. High viscosity glass ionomer was retained longer than medium viscosity<sup>13</sup>.

In a study in Kenya of 804 children 6-8 years old, overall survival was 44.8% after 1 year. Survival was highest if the cavities restored were 2-3 mm<sup>14</sup>. Frencken et al's Zimbabwe study in children over 3 years found that experienced operators placed better, longer lasting ART restorations than inexperienced ones. One-surface survival rates were 88.3% in this study<sup>15</sup>. Survival rates differ greatly between studies, but rates



are hard to compare because the populations differ so greatly. A clinical field trial of 53 12-17 year-old Cambodian high school students found that after 1 year 76.3% of restorations were still successful and 57.9% were successful at 3 years<sup>16</sup>. 118 children aged 5 to 18 years old in Mexico were given sealants and/or restorations using ART. After 2 years, 66% of restorations were retained<sup>17</sup>. Lo et al. report a six-year follow up of ART in China, concluding that smaller ART restorations survive longer than larger restorations<sup>21</sup>.

Overall, cavities restored using ART appear to be as effective as conventional methods, most studies report that there is no significant difference between the two methods.

### **Recommendations for community-based protocol:**

ART was developed for use in community and/or field settings and can be used in places where only hand instruments may be available, such as rural settings and developing countries. ART can be useful in an elderly population who may be in nursing homes or confined to their homes where only hand instruments may be available<sup>18</sup>. Schools or clinics in the community may benefit from ART programs as well as it requires little set up time and the equipment is portable.

### **Cost:**

ART costs less than conventional restorations. One study by Mickenautsch et al found that the annual capital cost of the ART approach was 50% less than amalgam and composite resin restorative procedures in a modern dental setting<sup>19</sup>. Costs depend on the time spent on the procedure, who did the procedure (dentist or auxillary) and non-personnel costs (equipment, materials). The most comprehensive assessment of cost effectiveness of ART is described in the PAHO report on Oral Health of Low Income Children: Procedures for ART. Children ages 7-9 from 3 countries (Ecuador, Panama, Uruguay) were included in the PAHO trials if they had enamel caries and/or



dental lesions on first permanent molars. They were randomly assigned to ART or amalgam and evaluated at 12, 24 and 36 months. The costs of ART treatment including pre-treatment were about half the cost of amalgam without treatment. They found that dentists using amalgam cost more than dentists using ART, and this was driven by non-personnel costs. The costs of auxiliaries performing the ART treatment and retreatment (of failures) resulted in substantial cost-savings.

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