

Assessment of the Atraumatic Restorative Treatment for the schoolchildren in Egypt

El-Nadeef M¹, Saleh A², Amin S³, Honkala E⁴

Abstract

The aim of this study was to assess the suitability of Atraumatic Restorative Treatment (ART) for 12-year-old Schoolchildren in sub-urban areas of Egypt. The study was conducted in three schools in Tanta. The effectiveness of two minimally invasive restorative techniques were compared; ART and the Minimal Cavity Preparation (MCP). Standard ART technique was applied and electrically driven equipment were used to prepare cavities in MCP group. Glass-Ionomer Cement (GIC) was used as a restoration material. Initial screening was done for 516 subjects out of whom 156 had caries indicated for treatment. Restorations were assessed using Ryge criteria. Results after 17 months revealed a success rate of 88% for ART and 92% for MCP groups. In conclusion, ART is found to be a suitable technique for the sub-urban schoolchildren in Egypt and should be initiated by a systematic screening of the posterior teeth. This approach seems to be helpful for populations where DMFT level is low such as this, where every third child was found to be carious. Therefore an action must be taken to fulfill the treatment needs rather than advocating preventive strategies alone. *First published in Dental News 2006; 13 (2): 13-20.*

¹ PhD, Consultant, Ministry of Health, Dubai, United Arab Emirates.

² PhD, Consultant Conservative Dentistry, Ministry of Health, Ajman, UAE.

³ DDS, Teaching Assistant, Ajman University of Science & Technology, Faculty of Dentistry, Ajman, UAE.

⁴ PhD, Professor, Faculty of Dentistry, Kuwait University, Kuwait.

Address of first author:

Dr. May El-Nadeef
POB 2831, Ajman, UAE.
Mobile: +971 50 5174921
Email: nuraini@emirates.net.ae

Introduction

Restorative care is rarely provided for people living in sub-urban areas in developing countries. Dental caries is virtually left untreated in the majority of people living in such areas and extraction is not an uncommon treatment¹. The Atraumatic Restorative Treatment (ART) was developed in Tanzania², it follows the concept of minimal intervention and does not require electrically driven equipment.

In Egypt population growth is one of the highest in the world. Providing adequate services is difficult and complicated for such a population, which has limited resources. Therefore, the dental profession in Egypt is facing the same problems as most developing countries but the range of dental treatment could vary³. Considerable information on oral health status and care is not available. However, dental caries prevalence among 12-year-olds, in 1959, was 1.2-2.6 and

remained at this level up to 1991⁴. Clearly the availability of dental manpower in Egypt did not seem to improve dental health care or awareness especially in the rural centers⁵. Therefore, it can be stated that a simple numerical increase in oral health facilities, units, services, manpower and financial resources may not be sufficient to achieve adequate oral care according to need⁶.

In principal, the present study was carried out as part of a series of four studies conducted in different parts of the world: in Finland⁷, in South Africa⁸, in Tanzania⁹ and in Egypt to test the appropriateness of the ART approach in different conditions and among a variety of age groups. The justification for these studies was based on the principles of the Alma-Ata declaration 1979¹⁰. The main aim of the study is 1) To assess the suitability of the ART technique for the sub-urban schoolchildren in Egypt and 2) To evaluate the longevity and the quality of GIC restorations, with two different preparation techniques.

Material and methods

This study started in March, 1998 in the sub-urban schoolchildren living in Tanta, the third largest city in Egypt. Out of 6 government schools in the West part of the city, three schools were selected randomly: (Hussni Mubarak, Saad Zagloul, and Mohammad Fareed). The investigation was confined to the WHO index age group (12 yrs).

Screening

The screening of 516 schoolchildren was done using a modified WHO form, where the DMFS was used. The examinations took place in classrooms near the windows under natural daylight.

Restoration

Only occlusal caries (pits and fissure) of molars were restored excluding all the teeth with proximal caries from the study. All the restorations were made within two months and conducted by one operator (A.S.). The children were randomly divided into two groups (**ART**-Atraumatic Restorative Treatment & **MCP**-Minimal Cavity Preparation).

Group (1) ART: In this group, cavities were filled according to the standard ART technique¹¹, by which cavity is cleaned by hand instruments and restored with an adhesive material.

Group (2) MCP: The treatment of this group was done at the school health clinic using electrically driven handpieces and suction¹², where the soft carious dentin was removed by using a stainless steel round bur and principle of extension for prevention was not used. A minimum of one and a maximum of two restorations were placed in one dentition, for the majority of the children. GIC restoration material (Fuji IX) was placed for both the groups according to the manufacturers' instructions.

Evaluation

An independent examiner conducted the evaluations, which were carried out after 17 months in the respective schools. The examiner was kept blind regarding the type of operative technique using a separate form for the evaluation. The assessment criteria, USPHS criteria¹³, for the two techniques are presented in Table 1.

Table 1. Evaluation criteria for ART/MCP restorations (Ryge criteria).

Score	Criteria
Tooth	
1	Present
2	Missing
Restoration	
1	Present
2	Missing but no caries
3	Missing with caries not involving the pulp
4	Missing with caries involving the pulp
Symptoms	
1	No symptoms
2	Pain/discomfort
Disposal of the restoration	
1	No need for replacement
2	Replacement needed
Marginal Integrity	
A	No visible evidence of crevice, explorer can't penetrate the tooth restoration interface
B	There is evidence of crevice, explorer can penetrate the tooth restoration interface but dentin is not exposed
C	There is evidence of crevice, explorer can penetrate the tooth restoration interface and dentin is exposed
D	There is evidence of crevice, explorer can penetrate the tooth restoration interface, dentin is exposed & restoration is fractured/missing in part or in total
Material Loss (anatomic form)	
A	Restoration continuous with the existing anatomic form (cusps, ridges etc.)
B	Slight or moderate under-contouring or material loss, but dentin is not exposed
C	Severely under-contoured or material loss and dentin is exposed
Development of Secondary Caries	
A	No evidence of caries contiguous with the margins of the restoration/restoration
B	There is evidence of caries contiguous with the margins of the restoration/restoration

Results

The baseline epidemiological survey of 516 children obtained after initial screening process revealed 156 subjects had caries that was indicated for treatment with a mean DMFS score of 1.6. The lesions were mainly restricted to the first molars (Fig. 1). The total number of surfaces with caries was 251. The occlusal caries constituted 79% of the D component followed by buccal

(17%) surfaces (Fig. 2). Our initial survey led us to the finding that every third child had decay.

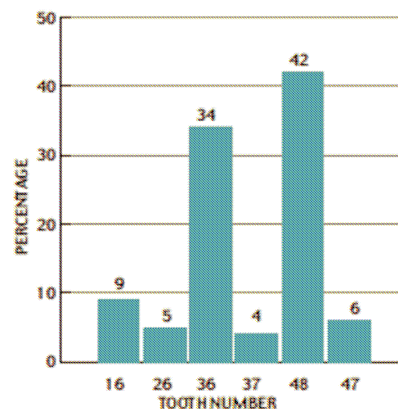


Fig. 1. Distribution of caries lesions according to specific tooth

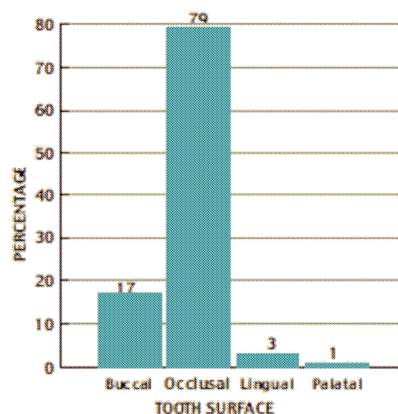


Fig. 2. Distribution of the carious lesions according to the type of the tooth surface

At the evaluation after 17 months, the drop-out in the follow-up was only 4.5% (11 restorations). Eleven restorations were excluded from the evaluation, as a few children were transferred to other schools and 2 were absent. Out of 240 restorations placed, 229 were present for evaluation with a success rate of 92% (Table 2). The success rates for the ART and MCP groups were 88% & 96% respectively. Three restorations were missing at the time of evaluation (Table 3). Only 4% of teeth restored had developed secondary caries, which turned out to be the main reason among the 8% failure rate (Table 4). Out of all the restorations evaluated, 6% required replacement. No discomfort was observed in ART group and children

Table 2. Number of restorations placed and evaluated and the success rates of both techniques.

Technique	Restorations placed March/98	Restorations evaluated August/99	Successful	
			n	%
ART/Hand instruments	122	117	103	88%
MCP/Drill	118	112	107	96%
Total	240	229	210	92%

Table 3. Number of teeth, presence of restorations and need for replacement of the restorations by both techniques.

Technique	Tooth		Restoration		Need for replacement	
	Present	Missing	Present	Missing	No	Yes
ART	116	1	115	2*	111	4 (3%)
MCP	112	0	111	1	103	9 (8%)
Total	228	1	226	3	214	12 (5%)

Table 4. Percentages of quality of restorations concerning marginal integrity, material loss and development of secondary caries in ART and MCP.

Criteria	ART		MCP		Total	
	n	%	n	%	n	%
Marginal integrity						
-No evidence of crevice	114	97	107	96	221	97
-Evidence of crevice/ dentine not exposed	1	1	3	2	4	2
-Evidence of crevice/ dentine exposed	0	0	0	0	0	0
-Evidence of crevice/ restoration fractured	2	2	2	2	4	2
Material loss						
-Restoration continuous with the existing anatomic forms	111	95	111	99	222	97
-Slight or moderate under-contouring/dentine not exposed	6	5	1	1	7	3
-Severely under-contoured/dentine exposed	0	0	0	0	0	0
Development of secondary caries						
-No evidence of caries contiguous with the margins of the restoration	110	94	110	98	220	96
-Evidence of caries contiguous with the margins of the restoration	7	6	2	2	9	4

were satisfied with this painless approach.

Discussion

After examining slightly over 500 children, more than a hundred children seemed to require treatment. The initial screening process revealed that every third child had caries among the sub-urban schoolchildren. This finding cannot be ignored despite the low DMFS found after the initial process. With accurate clinical diagnosis, the occurrence of pit & fissure caries

among these children could be even higher. Hence an early dental screening process could be an important component of any sub-urban school health program in addition to ART itself.

The survival percentage of the restoration was high especially when using MCP operative technique. The restorations were actually to be evaluated 1 year after their placement, but due to the organizational problems, it was delayed. Out of 229 restorations evaluated, 210 were successful. The

17-month survival rate of 88% for GIC using ART in the present study is in line with the 2-year results of comparable restorations from Thailand¹⁴, Hong Kong, China and Zimbabwe¹⁵. This confirms that the restorations placed by the ART technique performed very well, although not as well as the restorations placed through MCP technique that employed electric driven equipment and suction. However, considering the small difference between both groups, it is not unlikely to assume that such a difference may become more apparent after a period longer than 2 years¹². We did not perform a statistical test to evaluate results differences. However, it must be kept in mind that this study was a community field trial rather than an experimental clinical trial. As stated by Phantumvanit¹⁴, the significance of small but statistically different results between two oral care approaches found in a community trial is debatable, and opinions on their importance can vary between clinicians and public health planners. Hence in the mind frame of preventive personnel, such a difference can be neglected.

The failure rate of 12% in ART group could be attributed to factors like moisture control, material weakness, or technical errors by the operator, with secondary caries being the main reason. Another important reason for failure, which has been pointed out in a few previous reports, is too dry cavity or placement of material into a preparation in moist conditions^{16,17}. These could be some of the possible reasons for the loss of the restorations. On the other hand, several studies have suggested that fluoride release from GIC restorative material has an inhibiting effect on cariogenic microorganisms. Fluoride also has a positive influence on remineralization of enamel and dentin¹⁸⁻²³.

However, secondary caries was observed in 9 restorations. It is not apparent whether caries developed because of the presence of the defect created by material failure or as a result of progression of residual caries, or because of the progression of caries from the adjacent fissures¹⁷. This emphasizes the most important principle of ART approach, which is to assure that the outline of the cavity preparation and the DEJ are free of caries²⁴. It is suggested that evaluations in the future studies should specify whether the caries is due to material failure or progression of residual caries.

Compared to some previous longitudinal studies carried out in Tanzania^{12,25} the drop-outs from the follow-up after 17 months was very low, 4.5%, which makes our conclusions even more accurate. This study has demonstrated that the ART could prove a cost-effective approach for the management of dental caries among the 12-year-old school-children. It is important to mention the many benefits of this type of preventive approach that are commonly not considered and that cannot be easily evaluated in terms of money²⁶. ART could help in getting better responses of target group and it seems to be appropriate for the existing conditions in the sub-urban areas of Egypt. The reason for this is because the attitudes of people towards oral care depend on the type of service available, which means that if restorative treatment is commonly provided, people will seek restoration as a solution to their dental problems. Thus ART could very well initiate these kinds of attitudes.

If the ART is to be adopted by the Ministry of Health in Egypt, the cost of the treatment would mainly concern the cost of the material since they can make use of the SHS staff available in most part of Egypt. The present study revealed a low level of DMFT, with decay going

untreated. The results underline the importance and effectiveness of ART approach and it can certainly be considered an effective preventive and restorative treatment option targeting certain age groups, in particular for sub-urban school-children of Egypt.

This study also confirms that the ART approach is very much required in Egypt as in many other African countries, which cannot afford sophisticated equipment, but can certainly make use of recently developed dental materials.

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摘引

该研究的目标在于评估对埃及郊区12岁校童进行防损修复治疗(ART)的适用性。研究在坦塔的三座学校中进行。对于两种最小侵入修复技术, ART 和最小窝洞准备(MCP), 的有效性进行了比较。应用了标准的 ART 技术, 在 MCP 组中则使用了电气驱动的设备进行备洞。使用了玻璃离子接合剂(GIC)作为修补材料。为516名实验对象进行了初步检查甄别, 其中156名有需要治疗的龋齿。修补使用 Ryge 标准进行评估。17个月后的结果表明 ART 组的成功率为88%, 而 MCP 组的成功率为92%。研究结论为, ART 被发现适用于埃及郊区地区的校童, 该项技术的应用应先对后牙进行系统的检查甄别再予执行。这种方法似乎对 DMFT 级别较低的人群具有帮助, 例如像在本项研究中, 每三个孩子中就有一个患有龋齿的情况下实施。因此在宣传防护策略之外, 应采取行动满足治疗的需求。首次发表于 *Dental News* 2006; 13 (2): 13-20.

Resumen

El propósito de este estudio fue evaluar la idoneidad del Tratamiento Restaurador Atraumático (TRA) en escolares de 12 años de edad de áreas suburbanas de Egipto. El estudio se llevó a cabo en tres escuelas en Tanta. Se comparó la efectividad de dos técnicas restauradoras mínimamente invasivas: el TRA y la Preparación Mínima de la Cavidad (MCP). Se aplicó la técnica estándar del TRA, y se utilizó equipo eléctrico para preparar las cavidades en el grupo MCP. Se empleó cemento ionómero vítreo (CIV) como material restaurador. Se llevó a cabo un chequeo inicial en 516 sujetos, 156 de los cuales tuvieron caries indicada para tratamiento. Se evaluaron las restauraciones aplicando el criterio Ryge. Luego de 17 meses, los resultados revelaron un índice de éxito del 88% para el TRA y del 92% para grupos MCP. En conclusión, se encuentra que el TRA es una técnica apropiada para escolares de áreas suburbanas en Egipto, y debería de ser iniciada con un chequeo sistemático de los dientes posteriores. Este enfoque parece ser útil en poblaciones en donde el nivel DMFT es bajo, como en este caso en donde se encontró caries en cada tercer niño. En consecuencia, se debe tomar acción para cumplir con los requerimientos del tratamiento, en lugar de propugnar únicamente estrategias preventivas. Publicado primero en *'Dental News'* 2006; 13 (2): 13-20.

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