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ATRAUMATIC RESTORATIVE TREATMENT USING HIGH-VISCOSITY GLASS-IONOMER CEMENT IN POSTERIOR PRIMARY TEETH: A CASE REPORT

АТРАУМАТСКИ РЕСТАВРАЦИОНЕН ТРЕТМАН ВО ДЕТСКАТА СТОМАТОЛОГИЈА: ПРЕКУ ЕВОЛУЦИЈАТА НА ПРЕГЛЕДОТ НА ЛИТЕРАТУРАТА

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Abstract

Atraumatic Restorative Treatment (ART) is an alternative approach for improving the accessibility of oral care for underprivileged regions. The **aim** of this study was to report a case in which the technique used was the ART. The study was approved by the Research Ethics Committee from the Faculty of Dentistry of Ss. Cyril and Methodius University in Skopje (N#02-264383), and the Research Ethics Committee of the Dental Chamber of Kosova, Republic of Kosova (N#07). Signed informed consent was obtained from the parent of the participating child. A 7-year-old female child, with complaint of multiple decayed teeth fulfilled the inclusion criteria for ART restoration. The tooth d.64 was prepared according to the ART approach proposed by Frencken et al. ART, with its low cost and atraumatic nature, can be a means to alleviating the problem of access to dental care among underserved populations in Kosova. **Keywords:** Atraumatic Restorative Treatment, high-viscosity glass-ionomer cement, primary teeth

Апстракт

Забниот кариес е една од најраспространетите мултифакторијални болести во светот. Во областа на менаџирањето на забниот кариес, АРТ пристапот е познат по минималната интервенција и како минимално инвазивна процедура која се покажала успешна како во развиените земји, така и во земјите во развој. АРТ е техника која се состои во отстранување на кариесот само со употреба на рачни инструменти, без употреба на анестезија или опрема која функционира со електрична енергија, по кое следи реставрација на кавитетот со леплив материјал за полнење, како што е стаклено јономерниот цемент со висок вискозитет (high-viscosity glass-ionomer cement (HVGIC)). Едноповршинските АРТ реставрации покажале висок процент на ефикасност како кај млечните така и кај постојаните заби, за разлика од мултиповршинските реставрации. АРТ заптивките се покажаа како доста ефективни при превенција на кариесот. Истражувачите треба да се фокусираат во подобрувањето на материјалите за реставрација, и да ги прошират своите знаења за АРТ техниката во однос на болката и аксиозноста и да ја охрабрат употребата на АРТ пристапот во националните системи за орално здравје. **Клучни зборови:** Атрауматски реставрационен третман, забен кариес, стаклено јономерен цемент.

Introduction

Dental caries is one of the most worldwide spread multifactorial diseases[1,2]. In low-budget countries, less investment is made in health care and prevention, therefore people have limited access to oral health, and teeth stay untreated for a long period of time, or very often the main method of treating is the extraction[2].

Atraumatic Restorative Treatment (ART) is an alternative approach for improving the accessibility of oral care for these children[3,4]. ART is a treatment that involves removing carious tooth tissues using hand instruments only, without the use of anesthesia and electrically-driven equipment, and restoring the cavity with adhesive restorative material, usually a high-viscosity glass-ionomer cement (HVGIC)[5,6].

Therefrom, we can talk about the "atraumatic" component of ART, which consists of a low level of pain or discomfort[7,8] and minimal destruction of tooth tissue[9]. The "atraumatic" component of ART makes it a clinically acceptable restorative approach among children, anxious patients, and people with special needs[10,11]. Besides the above, this approach is also considered to be quite economical because it is performed using a simple device[12].

HVGIC is the material of choice for ART - approach because of their biological, physical, chemical properties

as well as because they stand as a rechargeable fluoride release system[13,14].

The systematic reviews and meta-analyses show that the longevity of ART/HVGIC restorations in primary teeth is no different from the one composed using conventional methods with either amalgam or resin composite15,16,17,18.

de Amorim et al.[19] came to the conclusion that ART single-surface restorations presented high survival percentages in both primary and permanent posterior teeth, while ART multiple-surface restorations presented lower survival percentages.

The aim of this study is to report a case in which the used technique was the ART.

Methods

The case presented in the current report participated in the study approved by the Research Ethics Committee of the Faculty of Dentistry of Ss. Cyril and Methodius University in Skopje (N#02-264383), and the Research Ethics Committee of the Dental Chamber of Kosova, Republic of the Kosova (N#07).

Signed informed consent was obtained from the parent of the participating child.

The study was conducted in Ferizaj (Republic of Kosova). Specific location was a village called Jezerc (Figure 1) which is characterized by low economical and infrastructural development where children do not have access to dental care.

Figure 1. *Jezerc, October 2020*

The inclusion criteria for participation in the study were: a) children whose parents or legal guardians accept and sign the consent form; b) children who assent to participation; c) children aged 3 - 8 years; d) cooperative children; e) with good general health conditions; f) children with high risk of caries g) presenting at least one occlusal lesion in a primary teeth molar.

Tooth inclusion criteria were: a) caries involving dentin, b) accessible to hand instruments used in ART c) absence of pain, fistula, or abscess near the selected tooth, d) absence of pulp exposure; e) absence of pathological mobility.

Children were assessed at school in empty classrooms, prepared for the oral-examination, and have received instructions on oral health, particularly in relation to oral hygiene/toothbrushing and sugar consumption.

Case report

A 7-year-old female child, with multiple decayed teeth, had fulfilled the inclusion criteria for ART restoration. Data collection (Figure 2) has been included, social demographic data and dental history. The examinations were performed using ambient light, mouth mirrors, and standard explorers.

Because of low economic conditions and lack of dentists in the area, the child has never been to a dental treatment. The present case had shown no systemic disease and no fluoride exposure. The diet frequency was a maximum of five meals per day and low fermentable carbohydrates. The patient reported that she had brushed her teeth one time per day with irregular technique. The dmft index was 11 (d=9, m=2, f=0), and plaque index (Silness and Loe) index was 1.2.

Figure 2. *Data collection*

The essential instruments for ART technique are: examination dental set, ART instruments (Kit® Duflex® - Rio de Janeiro, Brazil), glass slab or paper mixing pad, spatula.

The essential materials include: cotton wool roll, cotton wool pellet, water, glass-ionomer restorative (GC Fuji

IX GP (EU, Leuven, Belgium), dentine conditioner (GC Cavity Conditioner® (EU, Leuven, Belgium), petroleum jelly, wedge plastic strip, articulation paper. Other instruments and materials include: examination gloves, mouth mask operating light, operation bed/headrest extension, stool, methylated alcohol, pressure cooker, instrument forceps, soap and towel sheet of textile, sharpening stone, and oil.

Figure 3. *Clinical examination under ambient light*

The tooth d.64 was prepared according to the ART approach proposed by Frencken et al.[20,21].

1. A mattress was placed on a table, on which the child has stayed in supine position. All procedures were performed under ambient light (Figure 3).
2. The tooth was isolated with cotton rolls (Figure 4). The tooth surface was cleaned with a wet cotton wool pellet. The cavity was opened with an opener (ART Kit® Duflex® - Rio de Janeiro, Brazil), and the entrance of the lesion was widened with hatches (Kit ART, Duflex® - Rio de Janeiro, Brazil) if necessary, in order to start the excavation. The excavation was performed at the dentin-enamel junction (DEJ) with an excavator: (small, medium, large) before removing caries from the floor of the cavity, which is closest to the pulp. This sequence was performed to minimize sensitivity or discomfort during the excavation procedure.

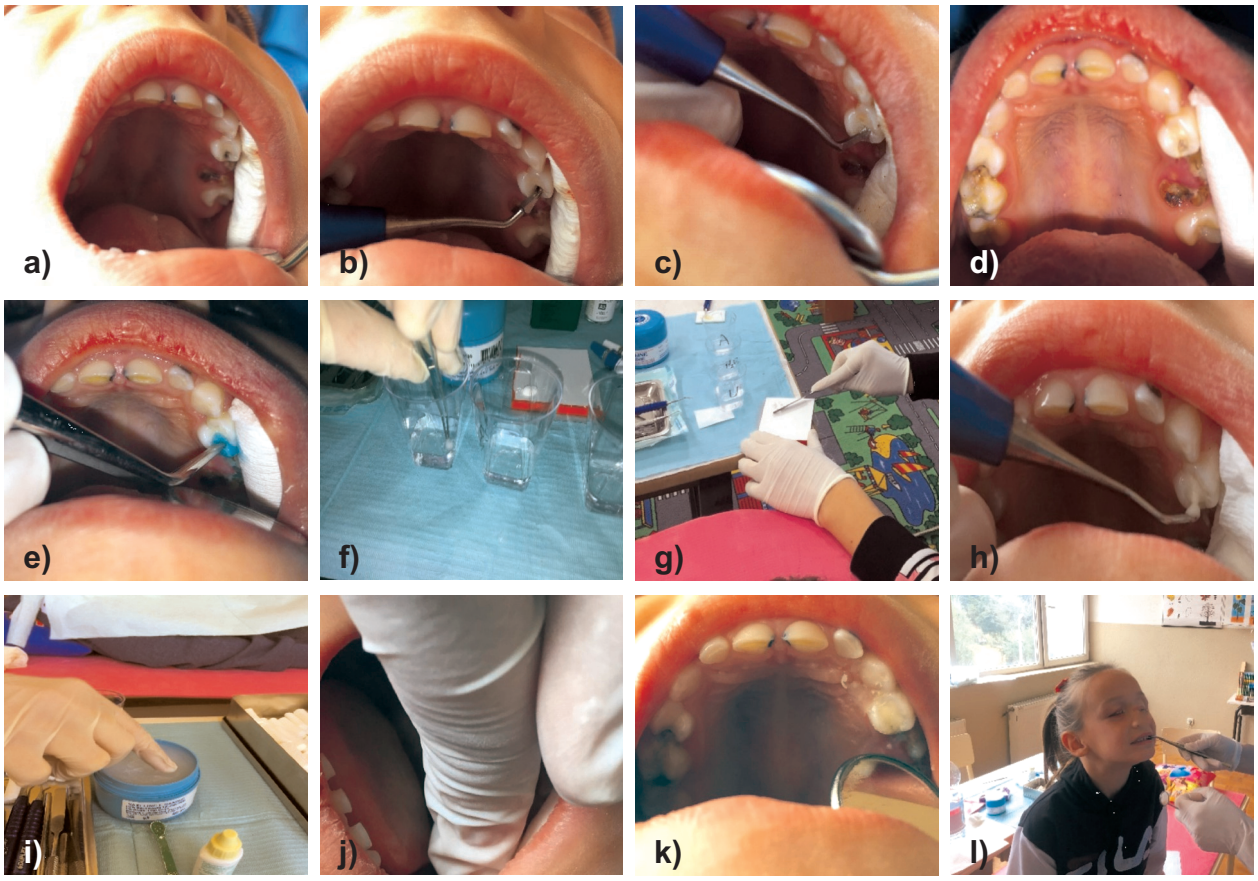

Figure 4. *a) tooth 64, isolated with cotton rolls; b) opening the cavity with opener; c) excavation of lesion; d) cavity after excavation; e) conditioning dentinal surface; f) cavity washed with water and cotton pellet; g) mixing GIC; h) applying GIC; i) finger coated with petroleum jelly; j) application of light pressure with glove; k) finished ART restoration; l) checking the occlusion.*

3. After excavation, the cavity was washed with water on a cotton pellet and was checked for any soft remaining dentin. This verification was carried out with excavators or probes, seeking soft tissue.
4. The cavity was conditioned with GC Cavity Conditioner® (EU, Leuven, Belgium) using a cotton pellet for 10 s. and was washed with water. After washing the cavity with a cotton wool pellet soaked in water, the cavity was isolated with a cotton roll and was dried with dried cotton pellets.
5. The glass ionomer cement GC Fuji IX GP (EU, Leuven, Belgium) was mixed according to the manufacturers' instructions and was inserted into the cavity with the ART applier/carver instrument (ART Kit®). The cavity was slightly overfilled and the material was placed over pits and fissures. The operator had applied light pressure with a gloved and petroleum-jelly-coated finger on the top of the material during the initial setting. This procedure had promoted a better GIC adaptation to the cavity walls and a smoother surface which had facilitated the removal of the excess material.
6. The bite was checked using articulating paper and any premature contact was removed with the ART applier/carver instrument (ART Kit®). Subsequently, a protection varnish was applied on the glass ionomer cement surface aiming to prevent gain or loss of water. The patient was oriented not to eat or drink at least during the first hour after the restoration placement.

Discussion

In the field of dental caries management, the ART approach is known as a minimal intervention and minimally invasive procedure and has shown to be successful in both, developed and developing countries[21].

In developing countries where children have limited access to a dentist, dental caries stays untreated, which can harm the patient on many levels. Mainly, dental caries can cause functional, aesthetic and psychosocial disorders especially in young people and children[22].

Such untreated condition can be a serious health threat to children's general health, there is a huge risk of developing other diseases and conditions such as systemic sepsis, osteomyelitis, and infection of the neck and the floor of the mouth[23].

The ART approach does not require electricity or piped water systems, therefore, is a possible solution for the regions where electricity and piped water system is not available or, in areas where the community cannot provide expensive dental devices. The application of the ART procedure in these areas would have an impact on decreasing the number of tooth extractions and increasing the proportion of teeth that are restored, furthermore, it would promote a better life quality.

Another benefit of the ART procedure is that, as a part of minimal intervention dentistry, preserves the structure of tooth tissue as much as possible[24]. This also approves the atraumatic nature of procedure.

As we have stated previously, the ART approach uses HVGIC as a restorative material. HVGIC possesses chemical bonding and fluoride-releasing properties[25]. It has been shown that glass-ionomer has the potential to enhance remineralization and that these restorations may act as a rechargeable fluoride-release system by first absorbing the fluoride and then releasing it gradually[26]. When compared to amalgam, it has been concluded that glass-ionomer has a higher caries-preventive effect than amalgam for restorations in permanent teeth, and primary teeth, as well[27].

Additionally, children's fear of dental procedures is caused by using needles and drills[28], which are eliminated in the ART treatment. The ART technique has proven to be more acceptable in children as it causes less pain and discomfort compared to other traditional methods[29,30].

Conclusion

Atraumatic Restorative Treatment is a patient-friendly approach that preserves tooth structure and controls caries` lesions economically. Kosovo is a low economic country where a lot of children do not have access to dental care.

The ART, with its low cost and atraumatic nature, can be a tool for alleviating the problem of access to dental care among underserved populations in this country.

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