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Comparison between Glass Ionomer, Alkasite, and Composite Resin in Early Childhood Caries Treatment: A Case Report

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Abstract: ***Introduction: Dental caries has been considered as the most common chronic health problem in childhood. Early childhood caries (ECC) is a significant global health problem affecting millions of children's quality of lifethrough painful episodes and severe eating difficulties. Case Report: A4-year-old girl came to Universitas Padjadjaran Dental Hospital with complains of cavities as well as aesthetics matter. Glass Ionomer, Alkasite, and Composite Resin were performed and evaluated in one week. Discussion: Three type of restoration in this article was evaluated clinically. Conclusion: A week after application, all restorations were found still adapting well, there was no gum inflammation and there was no color change in the fillings either.***

Keywords: Early Childhood Caries, Glass Ionomer, Alkasite, Composite Resin

1. Introduction

Dental caries has been considered asthe most common chronic health problem in childhood, as dental care for children is the least likely to be properly fulfilled.[1]The Centers for Disease Control and Prevention (CDC) in the United States reported that the prevalence of dental caries among children aged 2-5 years was 24.2%, and National Health and Nutrition Examination Survey (NHANES) reported27.9% prevalence of dental caries between 1999–2004. Japan's national survey in 2007 showed the ECC level was 2.8% among children aged 18 months and 25.9% among children aged 3 years.[2]

Damaged and untreated teeth can negatively children's growth and development. Although fluoride toothpaste and continuous use of fluoride in various forms are effective in caries prevention, ECC is still prevalent among children in disadvantaged communities, especially in developing countries.[3,4]Over the past years, aesthetic dentistry has shown progress on the development and improvement of restorative materials.

Since its introduction in 1972, glass ionomer cement (GIC) has been widely used as a restoration material, cement luting, and base material with the advantages of chemical bonding and fluoride release. Aesthetically Bonded composite is the best in cervical restoration.However, the disadvantage of resin composite is polymerization shrinkage, which can cause microleakage and often result in post-application sensitivity, discoloration, and secondary caries. Alkasite is a new restorative material, similarly with compomer or orococer, and basically is a subgroup of resin composite.[5]There has been a shift in paradigm regarding parents'attitude.Most parents prefer to maintain primary teeth in children for as long as possible. It is the responsibility of the child's dentist to choose techniques and materials that are most suitable for the patient's conditions. [6] Pediatric dentists will face two challenges: restoring children's teeth and dealing with children that have difficulties to adapt. [7, 8]

This article aims to compare three types of restoration materials, including glass ionomer, composite resin, and alkasite, to treat early childhood caries (ECC).

2. Case Report

A 4-year-old girl came to the Dental Hospital Department of Dentistry Universitas Padjadjaran with complaints of cavities in the front and back teeth as well as aesthetics matter.Intraoral examination showed caries in the posterior and anterior teeth of the maxilla and mandible as seen in figure 1. Treatment began with tending the primary complaint, and then proceeded to other teeth with caries.

Figure 1: Initial conditions there were caries in tooth 52, 51, 61, 62, 63, 64, 74, 84, 85; (a) Anterior, (b) Maxilla, (c) Mandible

Treatment plans included dental health education, oral hygiene instruction, pulpotomy, and crown strip restorations in teeth 64, 74, 84, pulpectomy, fiber post, and strips crown on teeth 51, 61, 62, strip crown on teeth 52, filling of teeth 54,63,85. Topical fluoride wasthe last treatment.Glass ionomer was used as restorative material in teeth 51 and 84, composite resin was used in teeth 62 and 74, while alkasite in teeth 52, 61, 64, 54, 63, and 85as shown in figure 2.

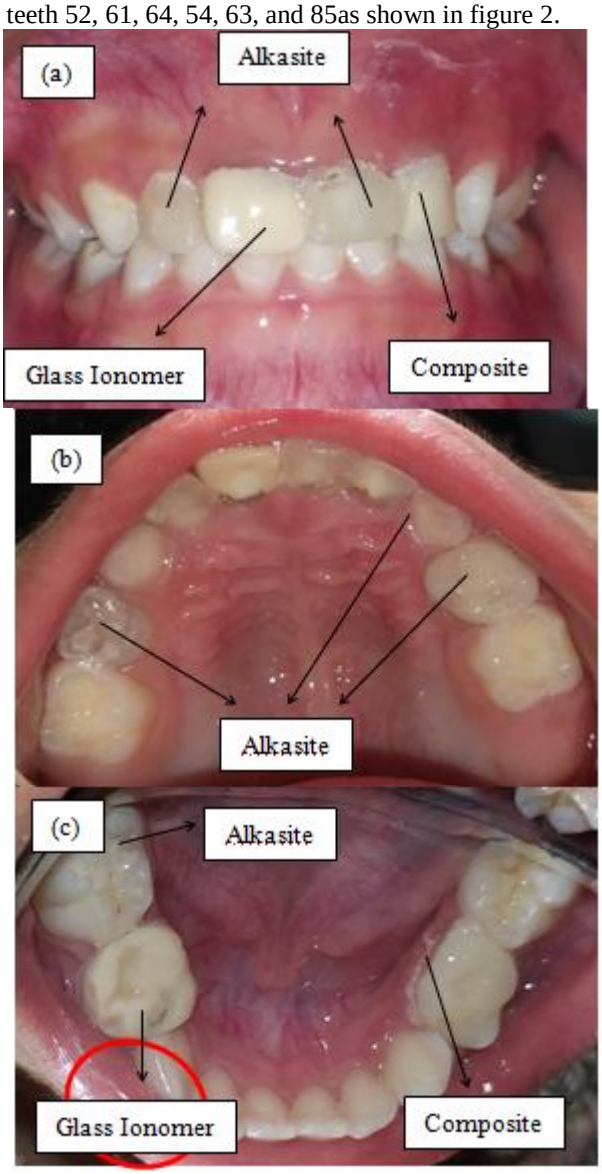

Figure 2: After Restoration (a) Anterior (b) Maxillary (c) Mandible

Restoration control is done 1 week after application. As shown in figure 3, nodifferences in shape and color were found in restoration (Fig. 3).

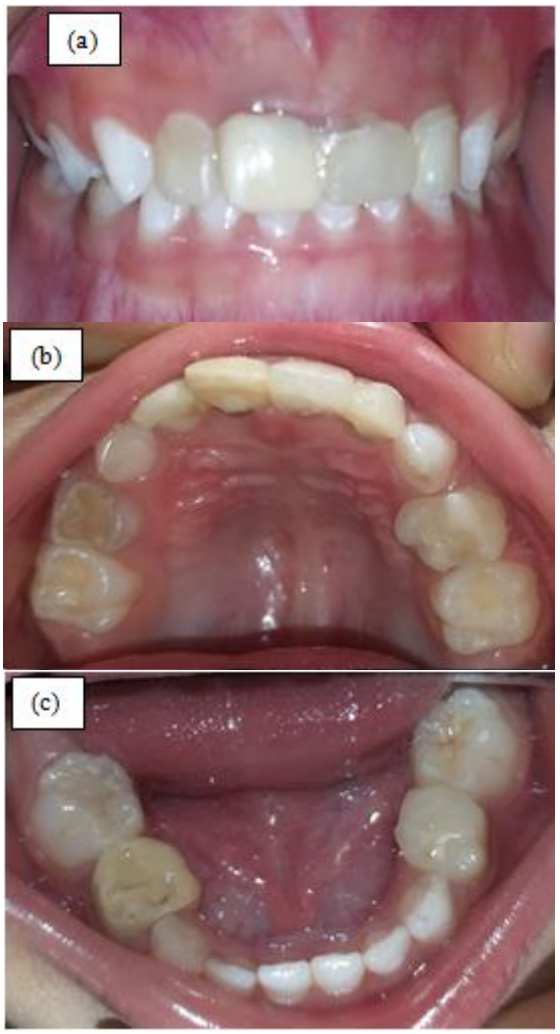

Figure 3: One week control (a). Anterior (b). Maxillary (c). Mandible

3. Discussion

Dental care in children is a challenge. It requires behavior modification in order to give understanding and direction to pediatric patients. [9, 10] In addition to functional rehabilitation, children's aesthetic rehabilitation is also important for their personality and self-confidence. [11, 12]. The low cooperative capacity in children highlights the importance of being able to determine the causes of dental caries in children, provide education about oral health problems to their parents or caregivers, and control demineralization. [2, 13]

This case report intends to exploredifferent restorative materials, which are glass ionomer restorations, composite resins, and alkasite, in ECC restorations. Microleakage is an important criterion that has been used to assessthe success rate of restoration, but this remains an undesirable possibility for advances in dentistry restoration.

The development of composite resins nowadays still allows shrinkage during polymerization that can cause

microleakage. [5, 14] Composite resins experience volumetric contractions ranging from 2.6% to 4.8%. The thermal expansion coefficient of composite resin (25 to 60×10(-6)/°C) is several times higher than that of enamel (11.4×10(-6)/°C) and dentin (8×10(-6)/°C). This physical attribution is also reported to be responsible for microleakage in resin-based restorations. Research conducted by Samanta et al showed that there was microleakage in teeth with composite resinrestoration.[5]

Glass Ionomers chemically bind the tooth structure, which is achieved through ion exchange in teeth and restorations that lead to the formation of calcium-polyacrylate bonds. Thermal expansion coefficient of conventional glass ionomer cement (11×10(-6)/°C) has been shown to be the closing to the tooth structure enamel (11.4×10(-6)/°C), dentin (8×10(-6)/°C)),compared with resin composite, there is a small possibility of forming voids or gaps in the dental restoration interface when temperature changes occur.Glass ionomer is a very sensitive technique, and the most important aspect is isolation from moisture for the first 30 minutes after applying. [5]

Alkasite is a tooth-colored, self-curing as well as optional additional light-curing restoration material. The liquid consists of dimethacrylate and initiator, while the powder contains various glass materials, initiators and pigments. This material's sole usage of cross-linking methacrylate monomer combined with a stable and efficient self-cure initiator is the reason why alkasite shows high density polymeric tissue and a polymerization rate above the restoration depth.

The isofiller in Alkasiteminimizes the stress reliever shrinkage force. [5] Organic monomer comprises of urethane dimethacrylate (UDMA), tricylodecan-dimethanoldimethacrylate (DCP), tetramethyl-xlylen-diurethanedimethacrylate (aromatic aliphatic-UDMA) and polyethylene glycol 400 dimethacrylate (PEG-400 DMA) which form part of the liquid. Fillers containing barium aluminium silicate glass, ytterbium trifluoride, Isofiller, calcium barium aluminium fluorosilicate glass, calcium fluorosilicate glass are found in the powder. The particle sizes of these fillers range between 0.1 m and 35 m.[2]

The three ingredients used in this article have their own characteristics, each with its own advantages and disadvantages. Even though Alkasite has the smallest microleakage compared to other ingredients,it was more difficult to use. We had to isolate the tooth before application. In comparation, glass ionomer, similar to composite, were easier to apply. [5, 15, 16] One week after application, the restorationsthat had been applied showed hardly any difference in appearance, and were still similar with when the materials were first applied. From aesthetic perspective however, the patient's parents prefer the usage of alkasite and composite resin than glass ionomer.

4. Summary

A week after application, all restorationswere foundstill adapting well.There was no gum inflammation found and there was no color change in the fillings either. The next control will be done after 1 and 3 months of application.

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