

Restoring Smiles, The Smart Way

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Abstract

Over the past three decades, dentistry is seeing a shift from reactive treatment of dental disease to a preventive and aesthetic model with bioactive technologies. Bioactive materials are “smart,” moisture-friendly and dynamic. By responding to ambient conditions in the mouth, these materials knit the restoration and tooth together. These materials remineralize dentin, maintain long-term bonded restorations, guard against recurrent caries and prevent the staining associated with microleakage and failure.

ACTIVA KIDS is the first dental resin with a bioactive ionic resin matrix, shock-absorbing rubberized resin component and reactive ionomer glass fillers that mimic the physical and chemical properties of natural teeth. It is a two-part, light and self-cure material, available in an opaque, light B shade suited for pediatric dentistry. This paper highlights one of the currently available “smart materials” in pediatric dentistry which may over the course of years help us move towards a new era of aesthetic bio-smart dentistry.

Key words: Bioactive material, primary teeth, anterior teeth, aesthetics, Activa Kids, anterior restoration

Introduction

Early childhood caries (ECC) is one of the most prevalent diseases in children worldwide.¹ By definition, early childhood caries is the presence of one or more decayed, missing or filled tooth surfaces in any primary tooth in a child 71 months of age or younger. It mainly affects the primary maxillary incisors followed by maxillary and mandibular first molars and mandibular cuspids.² The early loss of primary teeth may result in reduced masticatory efficiency, loss of vertical dimension and development of parafunctional habits. Esthetic-functional problems such as malocclusion and space loss, and psychologic problems that can interfere in the personality and behavioral development of the child.³ Dentofacial aesthetics is an important determinant of overall physical esthetics. From the standpoint of child psychology, a healthy smile is conducive in building up interpersonal relationships and self-esteem.⁴

ACTIVA KIDS was reported by the manufacturer, Pulpdent, to be the first bioactive dental material with an ionic resin matrix, shock-absorbing resin component, and bioactive glass fillers that display similar chemical and physical properties to natural teeth.⁵ They are durable, wear and fracture resistant. ACTIVA KIDS chemically bonds to teeth and seal against bacterial microleakage. It also releases and recharges with calcium, phosphate, and more fluoride ions as compared to glass ionomer cement. In addition, ACTIVA KIDS contains no bisphenol A (BPA), bisphenol A glycidyl methacrylate (bis-GMA), or BPA derivatives.⁶ This case report describes esthetic restoration of primary anterior teeth using bioactive material – Activa Kids in a 4 1/2-year-old female patient.

Case Report

A healthy 4 1/2-year-old girl child reported to Department of Paedodontics and Preventive Dentistry, Terna Dental College with the chief complaint of decayed upper front teeth. Intra oral examination in relation to the area of chief complaint revealed smooth surface caries with respect to 51, 52, 61 and 62 (*Fig 1*). Radiographic examination using intraoral periapical radiograph of 51, 52, 61 and 62 showed no pulpal involvement and there were no pathologic findings in the surrounding area.

Local anesthesia was achieved by infiltration of 2% lignocaine with 1:80,000 adrenaline (Lignox 2%) and rubber dam isolation was carried out (*Fig 2*). Caries debridement was performed using a slow-speed round bur (*Fig 3*). After complete caries excavation, the prepared surface was etched with 37% phosphoric acid for 20 seconds, followed by rinsing with water (*Fig 4*). The surface was

later air dried. ACTIVA KIDS was applied slowly, from the bottom of the preparation to the top, taking great care to cover every surface with the cement while avoiding air incorporation (*Fig 5*). The proximal surfaces were contoured using matrix with wedges. After a delay of 20 seconds to allow for the acid component to react with the tooth surface, it was light cured for 20 seconds (*Fig 6*). The restoration was then finished and polished using Shofu's Super Snap kit (*Fig 7,8*). After a follow up period of six months, the teeth showed no detectable wear, all margins were clinically sound, and no fracture lines could be detected in the filling material or associated enamel margins (*Fig 9*).

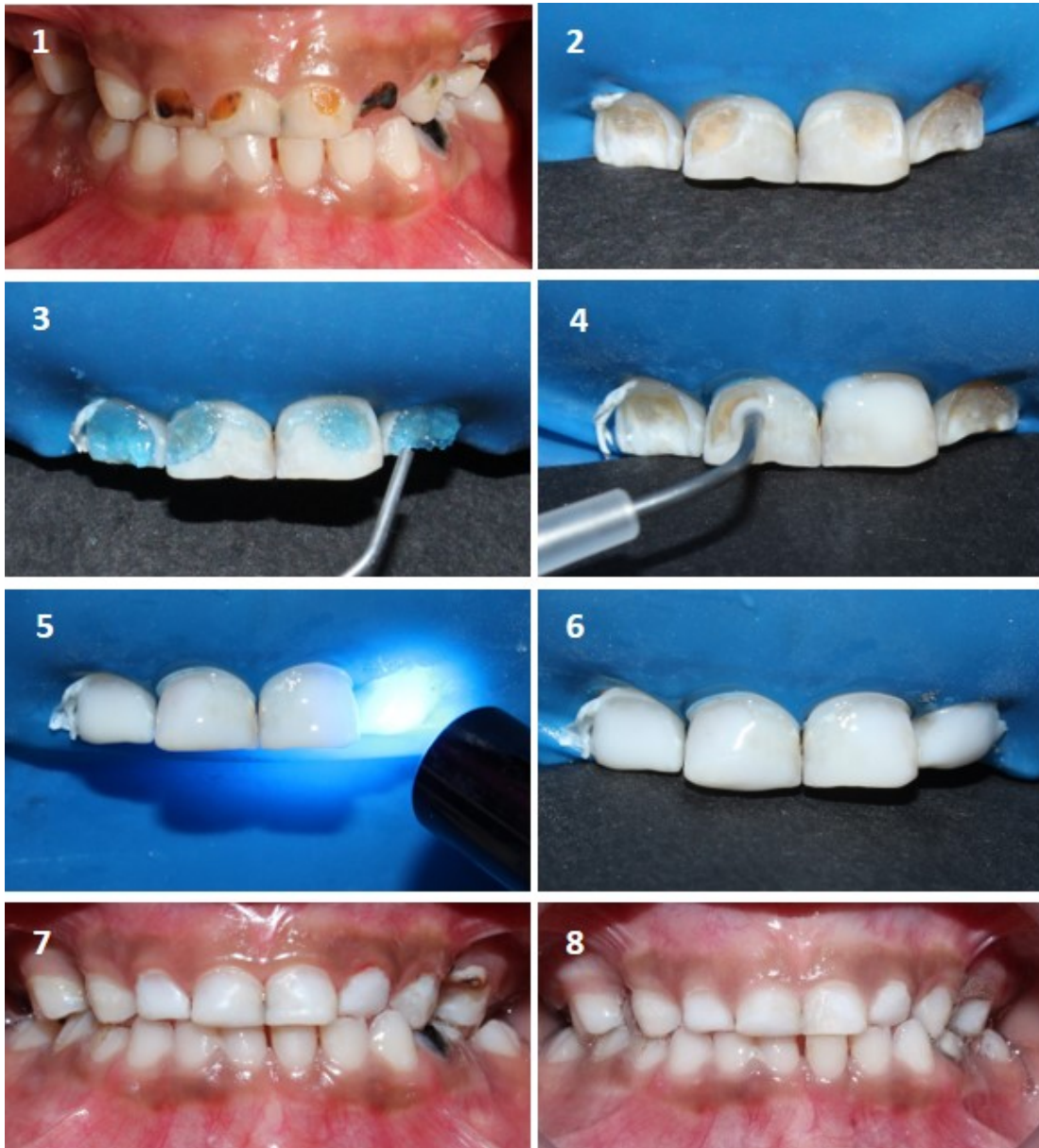


Fig 1: Pre-operative photograph, **Fig 2:** Caries excavation, **Fig 3:** Etching with 37% phosphoric acid, **Fig 4:** Application of activa kids-restorative, **Fig 5:** Curing for 20 seconds, **Fig 6:** Finishing and polishing, **Fig 7:** Post-operative photograph, **Fig 8:** 6 months follow-up

Discussion

ACTIVA™ KIDS is an esthetic, bioactive resin restorative material that stimulates apatite formation and the natural remineralization process with discharge and recharge of calcium, phosphate and fluoride. It is an opaque white shade ideally suited for pediatric dentistry. ACTIVA is the first bioactive restorative with an ionic resin matrix, a shock-absorbing resin component, and bioactive fillers that mimic the physical and chemical properties of natural teeth.⁷

It is a two-part, light- and self-cure material loaded in double-barrel automix syringes. It eliminates safety concerns for children and does not contain bisphenol A (BPA) and its derivatives. ACTIVA KIDS delivers all the benefits of glass ionomers and has the esthetics, strength and durability of composites.⁸

Various studies have been conducted on Activa restorative material over the past several years.⁹ In summary, those test results show that Activa has physical characteristics closely resembling the strengths and wear resistance of composites. Physical properties for ACTIVA listed by the manufacturer are shown in Table below.

Physical properties

ACTIVA™ KIDS

Light-cure setting time	20 sec
Depth of light-cure	4 mm
Self-cure setting time at 37°C	2 min
% filler by weight	56%
% reactive glass by weight	21.8%
Fluoride release, 1 day	230 ppm
Fluoride release, 28 days (cumulative)	940 ppm
Flexural strength	102 MPa/14,790 psi
Flexural modulus	4.3 GPa
Compressive strength	280 MPa/40,600 psi
Diametral tensile strength	42 MPa/6,090 psi
Water sorption, 1 week	1.65%
polymerization shrinkage	1.7%

A study conducted by Theodore P Croll using ACTIVA-RESTORATIVE, observed that the material handles like most injectable resin-based composites. Also, no bonding agent was needed while repairing primary teeth. Although in most cavity preparations, mechanical undercutting augments retention achieved with adhesive bonding. He also stated that the chemical cure of the ACTIVA products was reassuring to the dentist, if in some cases the light-beam penetration is not ideal. In such cases the material hardening is completed by chemical curing reaction and the acid/base neutralization hardening reaction of the glass ionomer components.⁶

Two common pediatric restorative techniques are interim therapeutic restorations (ITR) and atraumatic restorative technique (ART). Although the techniques of these procedures are similar, their therapeutic goals are quite different. ITR is primarily for patients who are very young and uncooperative, or who require special care. ITR is also used for caries control (prior to restoration) in children with multiple open carious lesions. The purpose of ART is to restore and prevent caries specifically in populations with little access to dental care.⁵

A case report by Ewoldsen described a modified ART technique using ACTIVA in the management of caries. The author concluded that the bioactive materials exceed the service of the previously classified interim or temporary materials owing to their ionic properties and remineralization potential. Thus, these materials provide long-term therapeutic restorations with aesthetics and durability comparable to composite restoratives which are technique sensitive.¹⁰

Activa kids has an unparalleled combination of physical and chemical properties which delivers bioactivity, toughness, resilience, durability and marginal integrity. The other key properties include:¹¹

- Provides natural esthetics as it is highly polishable
- Resists fracture, wear, chipping and crumbling
- Moisture tolerant, thus making it a pediatric dentistry friendly material
- Automix syringe allows unique precise placement of material
- No bonding agents required when retention form is adequate
- Ideal for bulk filling
- Light cure and self-cure

Conclusion

Activa is a moisture-friendly, flowable material applied directly from the syringe using an injection technique. Because of its low surface tension and intimate adaption to tooth structure, Activa

penetrates and flows into every nook, which is unusual for a resin-based material. We can now quickly deliver esthetic restorative solutions with materials that have a great affinity for tooth structure, provide the ionic exchange and full benefits of bioactivity and rival the physical properties of composites on the market today.

The judicious use of Aactiva may offer certain clinical advantages in restorative procedures, although further evidence is needed to substantiate any benefits in these indications. The mechanisms of adhesion, integration, and sealing of dentin for these new bioactive materials are still not proven and require more research before we can fully understand and prove whether bioactive materials are able to restore the form and function of the natural tooth.

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