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The Journal of Dental Panacea

Journal homepage: <https://www.jdentalpanacea.org/>

Review Article

Various materials which can be used as restorative materials in pediatric dental treatment: A Review

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ARTICLE INFO

Article history:

Received 24-12-2023

Accepted 11-02-2024

Available online 05-04-2024

Keywords:

Restorative treatment

Restorative dental materials

Amalgam

Glass ionomer cement

Composite resins

Primary teeth

ABSTRACT

The most common disease affecting the oral cavity is found to be dental caries, and is found to be the most common infectious disease affecting the children. The risk of having dental caries is found to be more in children, belongs from rural areas, and to those children who have very much little access to the dental care. Restorative treatment plan should be and must be included in an integral part of the treatment planning.

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1. Introduction

Dental caries is found to be the most common disease, which is chronic in nature and affecting the oral cavity of the children. The prevalence of dental caries is found to be more than prevalence of asthma and is found to be more common than Hay fever. The ideal and traditional approach in the treatment of the dental caries is placement of the ideal dental restoration. There are different options available for pediatric restorative materials, out which choosing the choice of the restorative material would depends on various aspects, like esthetics and strength. There are different factors which helps in choosing the right dental material for the pediatric patient, are as, age of the patient, caries risk, whether the child is cooperative or un-cooperative in nature while undergoing the oral dental procedure, whether the tooth is located in anterior region or in posterior region. Which so ever material selected for the restorative material should and must survive in extreme environmental

conditions of the mouth.^{1–7}

2. Different Materials Which can be Used as Restorative Materials are as Follows

2.1. Silver amalgam

Silver amalgam has been into the use as a restorative material in dentistry since more than 1 years and is still in used extensively. Dental amalgam was first used as a restorative material by Strockerus in the year of 1528, for the purpose of restoration in primary molars amalgam and stainless steel crown was used extensively. The British Society of Paediatric Dentistry studied and analyze the use of amalgam in united kingdom and along with some of the other European countries and found that the regardless no policy, which is concerning the use of amalgam but most of the parents of the children ask for aesthetic restoration as compared to amalgam restoration. It has been observed that some countries like Sweden banned the usage of amalgam, due to only environmental issues. It has also been reported

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that from July 1st, 2018, the usage of dental amalgam banned in 28 countries, for children, under the age of 15, as well as for pregnant and nursing mothers.^{5–9}

2.2. Glass ionomer cement

Glass ionomer cement is found to be most common restorative cement which can be used in children as well as in adult patients. Glass ionomer cement falls under the category of acid-base cement. Glass ionomer cement formed by the reaction between the acids, which are weak in nature and the powdered glasses of basic nature. Setting of the cement occurs in the water and the final structure, which is obtained contains a substantial amount of glass which is unreacted in nature, and it acts as a filler to reinforce the cement. According to international organization for standardization, the proper name for glass ionomer cement are as glass polyalketonoate cement, but on the other side glass ionomer is found as recognized and accepted name and is used as such widely in the dental practice.^{10–14}

Advancement in glass ionomer cements, in anhydrous modification, the liquid which is supplied for the mixing of the cement is supplied in a freeze dried state which is then mixed with the powder, this helps in maximizing the shelf-life of the material.^{2–9}

2.2.1. Resin modified glass ionomer cement

In this formulation small amount of resin incorporated into the liquid.

2.2.2. Nano ionomers

The nano ionomers which gets incorporated into the formulation, helps in providing good wear resistance, good aesthetics and polishing ability as compared to other glass ionomer cements.

2.2.3. Glass ionomer reinforced with ceramic

Incorporation of ceramic in the glass ionomer cement provides stronger compressive, flexural and tensile strength, which can be comparable to the amalgam.

2.2.4. Zirconia reinforced with glass ionomer

It is found to be a novel material of use as a tooth colored restorative material. It comprises of zirconium oxide, powder of glass, tartaric acid, poly acrylic acid, it provides better compressive strength, comparable to amalgam.

Composite resins when gets incorporated with glass ionomer forms a new material, which is known as compomer, it provides good aesthetic properties as well as strength as compared to normal glass ionomer cement.^{3–6}

GC America introduced a newer system known as Equia, it is a mixture of self-adhesive and highly filled glass ionomer along with self-adhesive filled resin. It constitutes of three systems i.e. self-adhesive, it can be used with or

without cavity conditioner. It has also been stated that usage of self-adhesive without using cavity conditioner helps in better establishment of the chemical bond. The second type is filled glass ionomer, which provide better esthetics, better handling properties, and it shows decrease water resistance. The third type is sealant, it provides multiple advantages, it helps in filling the voids of the restorations, it helps in reducing the surface irregularities by filling up the voids, it also helps in providing the better marginal integrity, by the sealant application glass ionomer can cure chemically that too without desiccation.^{11–15}

2.3. Composite resins

Composite resins are found to be the most commonly used restorative material which is tooth colored. Composites were made combining the powder of salinized quartz with dimethacrylates. Composites have gained their place as a restorative material of choice in adult patients as well as in child patient because of the better aesthetic properties, and better properties in terms of adhesiveness. Composite material is formulated by the addition of three materials namely, resin matrix, fillers and the coupling agent.^{14–20}

Some of the advancement of the composites materials are as, fiber reinforced composite, in this modification of composite, there is small addition of glass fibers as a part of the filler system, which results in formulation of composites with good strength.

2.3.1. Self-healing composites

This is formed by combining the dicyclopentadiene filled micro capsules with urea formaldehyde, which is dispersed in an epoxy matrix. In this technique, when a crack front reach the micro capsule, the shell was ruptured and dicyclopentadiene released into the crack by the action of capillarity. Polymerization results in by triggering the contact with a metal catalyst, which is incorporated into the matrix.

2.3.2. Remineralizing composites

The particles of calcium orthophosphate has been found as ion releasing filler in various composites which are resin based in nature, the ions namely calcium and phosphate which has been released from the composites helps in making the surrounding super saturated, there by favoring the deposition of enamel hydroxyapatite crystals. Composites materials which constitutes of calcium and phosphate are known as smart materials.

Recent advances includes SDF (silver diamine fluoride), it is basically a silver based fluoride liquid which is used to arrest and control the carious lesion by denaturing and helps in breaking down the bacteria in the infected lesion. Silver diamine fluoride has the ability to penetrate the dentinal tubules and helps in preventing the sensitivity in the deep carious lesions, when used in indirect pulp therapy. Silver

diamine fluoride itself has the ability to arrest the initial lesions.

In recent advancement the other material is biodentine, which is a calcium silicate based material, it is used in various clinical applications like root perforation, apexification, resorption, pulp capping procedures.^{18–23}

3. Conclusion

There are so many newly developed materials in the restorative dentistry for the children, but choosing the right material is of greater value. One should go through the clinical examination of the patient well and prepare a definitive treatment plan for the particular patient. Success of the material to be used depending on the age of the patient, site of the lesion, preservation of the tooth structure. One should have a thorough knowledge of all the restorative materials along with the how to use the material well.

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Cite this article: Fatima A, Ghosh D, Sharma I. Various materials which can be used as restorative materials in pediatric dental treatment: A Review. *J Dent Panacea* 2024;6(1):34–36.