Section A-Research paper
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Cention- N: A Comprehensive Review

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Abstract: In pediatric dentistry, resin-modified glass ionomer cement (RMGIC), composite resins, and traditional glass ionomer cement (GIC) are the most frequently recommended restorative materials. The fluoride-releasing properties of GIC and RMGIC, two of the aforementioned materials, help to lower the incidence of secondary caries. Conventional GICs, however, can only be used in locations with low to moderate stress. In terms of retention, RMGICs do better. However, they are not nearly as user-friendly as composite resins. If the proper cement consistency is not achieved, RMGIC may adhere to the tool during cavity implantation and may set quickly without allowing enough time for contouring. Additionally, they still lack the overall strength and aesthetic qualities of resin composites. Composite resins, on the other hand, are well renowned for their strength. This material's primary drawback is the polymerization shrinkage brought on by polymerization stress along the cavity wall, which

frequently results in microleakage. Therefore, a material with good marginal seal, high strength, and fluoride-releasing property is needed for pediatric restorative dentistry, taking the advantages and disadvantages of the current materials into account. The "alkasite" restorative material Cention N is recommended for use in direct restorations. Alkasites are a relatively recent addition to the resin composite class of filler materials. This substance can release fluorides and uses an alkaline filler. It has the ability to self-cure and offers an additional light curing option. The aim of present review of literature is to discuss Cention N in Detail.

Keywords: Cention-N, Alkasite, GIC, Restoration

Introduction: The ability of the human tooth to regenerate is constrained. In order to preserve the shape, function, aesthetics, and clinical longevity of the tooth, it becomes essential to replace the lost tooth structure.[1,2] Studies over the years have demonstrated that conventional restorative materials and techniques fall short of creating a complete seal between the margin and the tooth, allowing fluid to leak and ultimately leading to post-operative sensitivity, marginal discoloration, impaired marginal integrity, and secondary caries.[3,4] In order to counteract numerous dislodging pressures acting on the tooth, modern restorative materials must have good adherence with the dentinal surface.[5]

Dental caries is a problem for doctors despite a variety of preventive measures and due to lack of oral awareness, particularly in pediatric patients.[6] One of the main procedures that young children require is the restoration of carious teeth. Due to the short lifespan of the teeth and the child's lesser biting pressures, restoration in the primary dentition differs from restoration in the permanent dentition.[7]

A modern dentist has access to a wide range of direct filling materials for posterior load-bearing restorations, including bulk fill composites and silver amalgam. These materials' capacity to withstand stress, durability, marginal sealing integrity, and aesthetics are currently the key performance issues.[8] Wilson and Kent invented glass ionomer cement (GIC), which has been widely used in pediatric dentistry ever since. GIC is biocompatible, has anticariogenic properties due to fluoride release, and can be utilised in non-traumatic restorative procedures.[9,10] The substance is useful for both least invasive and maximum preservation of the tooth structure since it also chemically attaches to the enamel and dentin, reducing the requirement for a retentive cavity preparation.[11]

In order to address these problems, new bioactive alkasite dental restorative materials, such as Cention-N, have been introduced in dentistry.[12] A tooth-colored, radiopaque substance called Cention-N releases ions of fluoride, calcium, and hydroxide. Besides self-curing, cention-N can also be treated with visible blue light.[13,14]

Cention-N: It is a brand-new filler that is a member of the alkasite material family. It has an optional extra light cure and is self-curing. It is an Alkasite-based basic filling material that is tooth-colored and was very recently released. It can be utilised as an alternative to amalgam in primary teeth for bulk placement during retentive preparation. By integrating bulk placement, ion release, and durability in a dual-curing, aesthetic solution, Cention N redefines the standard filling and meets the needs of both patients and dentists. Additionally, it contains a unique, proprietary filler called isofiller that functions as a shrinkage stress reliever and decreases microleakage and shrinkage caused by polymerization because of its low elastic modulus. Its great flexural strength is a result of its highly cross-linked polymer structure.[15,16]

Composition of Cention-N: Cention N available in from powder and liquid. **(Table 1)** This substance does not contain Bis-GMA, HEMA, or TEGDMA in contrast to traditional composites. A surface-modified calcium-barium-aluminum-fluorosilicate glass filler and an alkaline calcium-fluoro-silicate glass filler with particle sizes ranging from 0.1 to 35 m are two examples of the ion-leachable glass silicates present in the powder. Along with the catalysts and other additives, the liquid mostly contains organic dimethacrylate monomers such urethane dimethacrylate (UDMA), etc.[17-19]

Table 1 Composition of Cention-N

Powder	
Ingredient	**Function**
Calcium-fluoro-silicate glass	Acts as a filler, Improves strength, Releases F- , Ca_2+, OH ions
Barium-Aluminosilicate glass	Acts as a filler, Improves strength
Ytterbium trifluoride	Acts as a filler, Radiopacifier
A copper salt & thiocarbamide-self cure Initiator or Ivocerin and acyl phosphine	Acts as an initiator and helps in the polymerization process

oxidephotoinitiator	
Pigment	Added to provide appropriate shade
Liquid	
Urethane dimethacrylate (UDMA),	Main reactive dimethacrylate of the resin matrix, High viscous resin, Exhibits good mechanical properties, Hydrophobic resin and exhibits lower water sorption
Tetramethyl xylylendiurethane dimethacrylate	Hydrophobic in nature, Provides more viscosity to the resin matrix
Tricyclodecandimethanol dimethacrylate (DCP)	Diluent resin added to reduce the viscosity
Polyethylene glycol 400 dimethacrylate (PEG400 DMA)	Hydrophilic resin, Improves the flowability of the resin, Also, helps in wetting the natural tooth and adapts well to the smear layer
Initiator (hydroperoxide – self cure)	Helps in the polymerization process
Stabilizer	

Properties of Cention-N

Mechanical Properties: The compressive strength of a direct posterior restorative material should be sufficient to increase restoration durability. When compared to dental composites and silver amalgam, Cention N has compressive strength characteristics that are superior to those of GIC. Cention N has higher strength values may be due to the thick polymer network and the degree of polymerization. The fillers are found in the powder of a material consisting of glass filler barium aluminum silicate, ytterbium trifluoride, isofiller (technology Tetric N-Ceram), glass filler calcium barium aluminum fluorosilicate, and glass filler calcium fluorosilicate and alkaline. These fillers are responsible for providing sufficient strength. [20-22] **(Table 2)**

Table 2 Mechanical Properties of Cention-N	
Compressive strength	133–248 MPa

Tensile strength	50–108 MPa
Modulus of elasticity	10-13 GP
Microhardness	72-103 Mpa
Shear bond strength	14 – 17 MPa

Biological Properties: Due to the release of unreacted monomers and different ions, Cention N demonstrates cytotoxicity similar to that of dental composites. Only undissociated monomers dental composites may leach away, whereas GIC releases specific ions that are the cause of their cytotoxicity. However, compared to composites, this alkasite material releases both unreacted monomers and ions, making it slightly more cytotoxic.[23]

Optical Properties: Considering other glass-based restorative materials, Cention N is somewhat translucent (11% transparency) and radiopaque due to the use of ytterbium fluoride filler. The restorations' surface roughness has a big impact on how attractive they seem. However, it has been noted that Cention N exhibits superior aesthetics and is more resistant to surface roughness during chewing simulation.[24]

Discussion: The choice of an appropriate material for primary tooth restoration is crucial since the outcome of the restoration depends on a number of variables, including the child's participation during treatment, the characteristics of the primary tooth, the clinical need, and the patient's cleanliness. While Qvist et al.[25] in 1997 reported a failure rate of 37% for GIC after 3 years and concluded that GIC is not an appropriate restorative material for Class II restorations in primary molars, Welbury et al.[26] in 1991 reported a lower survival time for GIC (33 months) as compared to amalgam restorations (41 months).

For both permanent restorations of a Class I, II, or V nature as well as for restoring deciduous teeth, Cention N is used. No phosphoric acid etching is done when used without an adhesive. Cention N can be used with or without an adhesive. If without, then retentive preparation (for example, undercuts) similar to that used with amalgam restoration is required and enamel margins should not be bevelled. When used along with an adhesive, then the cavity is prepared according to the modern principles of minimally invasive dentistry, i.e., by preserving as much natural tooth structure as possible.[27]

Making a biocompatible restoration that maintains a proper marginal seal without causing pulp damage is one of the objectives of restorative dentistry. Hypersensitivity, secondary caries, pulpal pathosis, and restorative failure can all be brought on by microleakage. Microleakage is therefore an important factor in determining whether any restorative material is successful. In a different study, Samanta S et al.[28] used dye penetration to compare and assess the microleakage in a permanent class V cavity filled with flowable composite resin, glass ionomer cement, and Cention N. It was found that flowable composite exhibited the highest micro leakage, followed by glass ionomer, while Cention N displayed the least microleakage.

Studies contrasting Cention N's mechanical capabilities with those of other commonly used restorative materials have shown encouraging results in favour of the former. For instance, Chole et al.[29] study comparing the flexural strengths of Cention-N, bulk-fill composites, light-cure nanocomposites, and resin-modified glass ionomer cement revealed that Cention-N demonstrated the highest flexural strength, followed by bulk-fill composites, light cure nanocomposites, and resin-modified glass ionomer cement, which demonstrated the lowest flexural strength.

Occasionally, Cention N components could result in a sensitising reaction. In these circumstances, the product must not be utilised. Areas around the pulp should be protected with an appropriate pulp/dentin protector to prevent any potential irritation (selectively apply a calcium hydroxide-based preparation in areas near the pulp and cover it with an appropriate cavity liner if necessary). Children could also object to the material's bad taste when using it. When used with cationic mouthwashes, plaque-disclosing agents, and chlorhexidine, Cention N restorations may also become discoloured.[27]

Conclusion: Conventional amalgam and GIC are similar to Cention N in bulk placement, but Cention N has a number of advantages over them, including superior mechanical properties (compressive and flexural strength), durability, aesthetics, ion-releasing ability, and patient acceptability. Thus, this upgraded alkasite filling material might satisfy the requirements of both the pediatric dentist and the youngster. However, it is advised to conduct further research on this material in primary dentition as it may prove to be an excellent substitute for the typical pediatric restorative materials.

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