

Posts in Primary Teeth: A Comprehensive Review

¹Dr. Abhilasha Agarwal, Junior Resident, Department of Paediatric and Preventive Dentistry, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh

²Dr. Niharika Sharma, Postgraduate student, Department of Pediatric and Preventive Dentistry, Kothiwal Dental College and Research Centre, Moradabad., Uttar Pradesh

³Dr. Shreya Sharma, Postgraduate student, Department of Prosthodontics, Hitkarini Dental College and Hospital, Jabalpur, Madhya Pradesh

⁴Dr. Jay Somkuwar, Postgraduate student, Department of Paediatric and Preventive Dentistry, King George's Medical University, Lucknow, Uttar Pradesh

⁵Dr. Dipika Yadav, Postgraduate student, Department of Paediatric and Preventive Dentistry, King George's Medical College, Lucknow, Uttar Pradesh

⁶Dr. Akshita Govind Rathi, Postgraduate student, Department of Conservative Dentistry and Endodontics, V.Y.W.S Dental College and Hospital, Amravati, Amravati, Maharashtra

Corresponding Author: Dr. Abhilasha Agarwal, Junior Resident, Department of Paediatric and Preventive Dentistry, Faculty of Dental Sciences, King George's Medical University, Lucknow, Uttar Pradesh

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Abstract

The primary goal of pediatric dentistry is to treat primary and/or young permanent teeth that have lost their normal form and function due various reasons such as caries and trauma. Restorative treatment of anterior primary teeth that are severely decayed due to ECC pose a challenge for dentists due to difficulty with retention, aesthetic reconstruction, and lack of cooperation from younger children. Early loss of anterior primary teeth causes not only aesthetic problems but also reduced masticatory

efficacy, speech problems, emergence of abnormal oral habits, neuromuscular imbalances, and psychosocial adaptation problems for the child. Therefore, treatment of anterior primary teeth is crucial. When the dental crown is severely decayed, the use of intracanal retention is necessary to provide stability following endodontic treatment. Mechanical retention achieved with the use of intracanal posts in the root canals following pulpectomy procedures allows for successful restoration by providing resistance against mastication forces. Hence the aim of

present review of literature is to discuss different post and core system used in pediatric dentistry.

Keywords: Primary teeth, Pediatric dentistry, Post and core

Introduction: Dental caries is most common childhood disease which affects children in their very early stages of development. This severe form of caries is also associated with the deleterious effects like difficulties in phonation, mastication and alters esthetics.¹

Caries in very young children known as early childhood caries may be defined according to the American Academy of Pediatric Dentistry “as the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger”.² Clinical examination of this condition discloses a distinctive pattern, and the teeth most often involved are the maxillary central incisors, lateral incisors, and the maxillary and mandibular 1st primary molars. The maxillary primary incisors are the most severely affected with deep carious lesions usually involving the pulp. In extreme cases, early childhood caries can even lead to total loss of the crown structure. Until very recently, the only treatment option for early childhood caries has been extraction of the affected primary anterior tooth, which resulted in severe coronal destruction.³

Treatment of preschool children and restoration of primary anterior teeth with the severe loss of coronal structure is a challenging task for the pediatric dentists. The main aim is to preserve teeth and restore them so that child is able to perform normal like mastication, speech, and esthetics. The failure rate is high in such type of cases due to the absence of tooth structure, poor adhesion of bonding agent of primary teeth, limited availability of material and technique.⁴ In cases where the teeth are severely damaged with loss of crown structure, these

materials fail to withstand the occlusal forces. Thus, post and core systems were introduced which provide retentive features for the successful completion of endodontic therapy.⁵ Hence the aim of present review of literature is to discuss different post and core system used in pediatric dentistry.

Rationale of saving primary teeth	Rationale for preserving primary teeth is mainly to maintain arch length, healthy oral environment, functions of chewing and speech, to improve appearance as well as for prevention and relief of pain. ⁶
Ideal property of post	An ideal post and core should be resorbable but it should provide adequate retention and resistance. Post should be well adapted to the inner dentinal wall as it is one of the factors governing factors for the retention of the restoration. ⁷
Indication of using post in primary Teeth	2/3rd of tooth structure left- not indicated ½ crown structure lost- indicated At least 1 mm of tooth structure supragingivally Reduced crown tooth structure. The main reason for using a post is to re-establish the shape and form of a severe decayed or fractured maxillary anterior tooth crown while it provides support for the final restoration. ⁷
Extension of post in the primary root canal	Innovations for short retentive posts are needed in primary dentition due to the physiological

	<p>resorption that occurs in primary dentition, unlike the post and core used in adult dentition.</p> <p>Ideally, intra-canal placement of post in primary tooth is around 3mm that is the cervical one-third of the canal so it does not interfere with deciduous tooth root resorption and permanent tooth eruption.⁷</p>
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Type of post^{7,8}

Based on material used	<p>Metallic: Stainless steel, nickel-chromium, cast metal</p> <p>Non Metallic: Fiber composite post, Glass fiber reinforced composite post, Ribbon or Tapes used along composite resin, Ceramic post, Carbon post, Biologic post</p>
Based on post space design	Mushroom, Tapered, Onion shape
Based on post design	Threaded, Non- threaded, Alpha, Omega, Half Omega
Based on fabrication	<p>Direct method- Metal, Fiber post (Ready-made post)</p> <p>Indirect method- Custom made post</p>

Canal Preparation for Post and Core in Primary Teeth

About 4 mm of root canal filling material is removed from the canal. 1 mm of cement is placed over the filling material of the canal. The rest 3 mm canal space is used for the placement of post. For that Glass Ionomer Cement can be used as a 1 mm GIC button over the filling material. Knibbs and Walls (1989)⁹ reported that glass

ionomer cements were more sensitive to moisture and contamination than zinc phosphate cements. Keyf et al. (2007)¹⁰ reported that zinc phosphate cements are more resistant to liquid absorption. For these reasons, zinc phosphate cement can be preferred to eliminate these problems with glass ionomer cements.

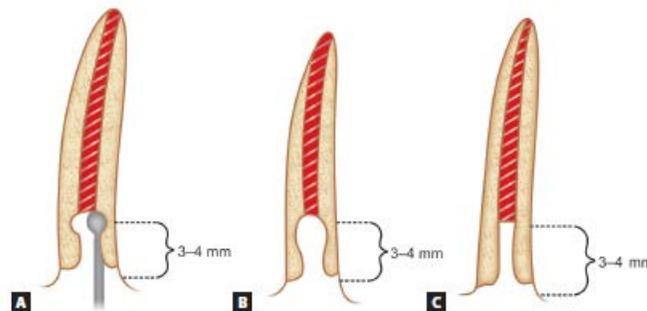


Figure 1: Post space shapes (Mushroom, tapered and onion shapes)⁸

Different type of post used in pediatric dentistry

Metal post: Metal posts are made up of stainless steel wire of 22 gauge/0.7 mm. They are rigid but not esthetic. Retention can be increased with addition of serration in the post. They may interfere with physiologic root resorption if they are placed beyond 3 mm in the canal.⁷

Post length: 3 mm – radicular; 2 to 3 mm - coronal

Omega post: Use an omega shaped stainless steel wire loop which was introduced in 2004 by Mortada and King. In this method, omega shaped loops wire extensions are placed at 3-4 mm inside pulp chamber and the projected coronal portion of the omega loop is used for construction of the coronal restoration or crown. Omega loop wire in the canal does not cause any internal stresses. Its coronal part is incorporated in the restorative material or crown. It can be done with less chair side time.¹¹

Half Omega post: Stainless steel wire is bent to half omega shaped to make the post. Serrations are added to increase the potential surface area for attachment of the restorative material and consequently increase the long-

term stability of an esthetic restoration. Serrations should be made on the stainless steel wire to get better mechanical retention. The incisal end of the loop of the wire should project 2 to 3 mm above the remaining root structure.¹²



Figure 2: Half omega shape post with serrations¹²

Alpha post: Stainless steel wire is bent into Alpha shaped and placed in the canal and here also the extension of the post in the canal should not be more than 3mm.¹³

Gamma post: 0.6-mm orthodontic wire is bent to form the Greek letter "gamma". The loop portion is placed inside the post space, and the 2 free ends are placed toward the coronal portion and help to provide retention to coronal restoration.¹⁴

Glass ionomer post: Carranza F, Garcia GF in 1999 has used glass ionomer cement directly as post in primary anterior teeth to increase the retention of coronal restoration.¹

Mushroom Restorations (Composite short post): Dogan S et al. in 2020 used a mushroom restoration technique for rehabilitation of severely decayed primary anterior teeth and found that the short-post (mushroom restorations) technique is a clinically acceptable alternative method for restoration of severely decayed primary teeth.¹⁵

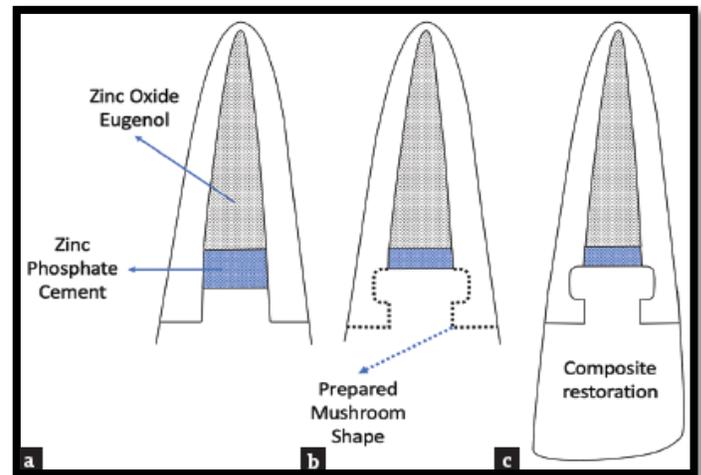


Figure 3: Root canal filling (zinc oxide-eugenol) and the cement base (zinc phosphate cement). (b) Preparation of the mushroom shape. (c) Completion of restoration with the composite material¹⁵

Cast metal posts: They are fabricated using indirect method of fabrication. They have disadvantages includes higher cost and requires an additional laboratory stage for preparation of post and they could pose problems during the natural tooth exfoliation.¹⁶

Reverse metal post: Short prefabricated metal post is used as reverse metal post. The post is inserted upside down so that the 3-mm head into the canal and the remaining 5 mm of the threaded section is positioned out of the canal as a core for coronal restoration.¹⁷

Fiber post: The development of the fibre-reinforced composite technology has brought a new material into the realm of metal-free adhesive esthetic dentistry. Different fiber types such as glass fibers, carbon fibers, Kevlar fibers, vectran fibers, and polyethylene fibers have been added to composite materials.¹⁸

Glass fiber-reinforced composite resin posts: GFRC are new to the pediatric world and can be used as an alternative to the other post systems. The properties of fiber-reinforced posts are dependent on the nature of the matrix, fibers, interface strength, and geometry of

reinforcement. The advantages of this material over the older fibers are greater flexural strength (1280 MPa), and over 650 MPa of the older fibers, greater ease of handling, can be used in high stress-bearing areas and can be bonded to any type of composites.¹⁸

Biologic post: The term ‘Biological restoration’ was introduced by Santos & Bianchi in 1991; it is an alternative technique that uses adhesive capabilities of materials in combination with strategic placement of parts of extracted human teeth to achieve better esthetics and more conservation of sound dental tissue. Ravi R et al. in 2020 described a case in which root stump of primary molar were used successfully as intra-radicular biological post and core. The biological post and crown restoration is less expensive and represents a feasible option for strengthening the root canal, as it preserves the internal dentine wall of root canal, providing greater tooth strength and retention. It has some drawbacks like need for the tooth bank, agreement by donor and recipient of tooth fragment.¹⁹

Luting Cement: Various luting cements are available for the cementation of post in primary tooth. The selection of luting agents mainly depends on the type and material of the post being used.

Post type	Luting cement
Modified omega loop	Flowable composite ¹²
Biologic post	Glass Ionomer cement ¹⁹
Glass fiber-reinforced composite resin posts	Flowable composite ²⁰
Fiber post	Flowable composites ²¹
Revere metal post	Zinc phosphate cement ²²

Core material used in primary teeth: After placement of post remaining coronal structure can be restored with direct or indirect technique or with single tooth prosthesis like strip crown, stainless steel crown, zirconia crown, acrylic crown.⁷

Conclusion

Restoring primary teeth is important not only for mastication, speech, alveolar growth and harmonious stomatomusculoskeletal system, but also for psychological well-being of the child. Restoring grossly carious primary teeth is challenging compared to permanent teeth which have greater bulk of tooth structure to offer promising retention for restorations. Pulpal involvement in primary teeth is faster and endodontic intervention further leaves very little tooth structure. It is very common to see primary anterior teeth with complete coronal destruction. To prepare these mutilated primary anterior teeth to receive complete coronal restorations, retention is gained from short intracanal posts. Various types of posts can be used for primary teeth including prefabricated metal posts, customized metal posts like alpha, gamma, omega, half omega, modified anchor stainless steel wire posts, polyethylene fibre post, glass fibre post, composite post and biologic post. The choice of type of post and/or technique should be based on clinical condition of tooth to be restored, finances and operator as well as patient and/or parent’s preference.

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