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RESEARCH ARTICLE

NON-METAL POST IN PRIMARY TEETH: REVIEW ARTICLE

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ABSTRACT

Maintenance of primary anterior teeth in a healthy condition is important for the well-being of children, as it ensures proper mastication, esthetics, phonetics, space-maintenance, and prevention of aberrant habits. Primary dentition is more prone to early childhood caries and restoring them becomes inevitable owing to the pivotal role. Posts are utilized when there is inadequate tooth structure remaining to support a traditional restoration or an artificial crown. Post is cemented into a prepared root canal, which retains a core restoration over which the final crown is retained.

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INTRODUCTION

Early childhood caries is an unexceptional childhood disease. It affects the children at very early developmental stage. It is very common to see children with mutilated maxillary deciduous anterior's due to early childhood caries (American Academy of Pediatric Dentistry, 2014; Shah 1995). The early loss of primary anterior teeth may result in reduced loss of vertical dimension, reduced masticatory efficiency, development of para-functional habits (tongue thrusting and speech problems), and esthetic functional problems such as malocclusion, psychological problems that can interfere in the personality and behavioral development of the child (Usha 2007; Tomer *et al., ?;* Jhavar *et al.,* 2015). Endodontic treatment saves the tooth from extraction, but only adequate restoration is essential for its durability. The endodontically treated tooth must be restored in such a way that it will withstand masticatory forces acting in vertical and lateral direction without being prone to fracture. To reinforce the treated tooth and protect against vertical fracture, some type of stabilization is required that will fasten the restoration to the remaining tooth structure. This is accomplished by using a post (also referred to as a dowel), preferably with a core or coping and a crown or onlay as superstructure to give coronal-radicular stabilization (Jhavar *et al.,* 2015).

Role of Post Material: Posts are more commonly required for anterior teeth rather than posterior teeth.

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The primary reason for this is that multi-rooted teeth have a large pulp chamber which can be utilized for retention of the core and therefore the crown, whereas anterior teeth are much smaller and less retentive. Post are restorative dental material that is placed in the root of a structurally damaged. It is used when coronal structure is missing more than 2 proximal surfaces along with 1 axial wall. It is either cemented or threaded into a prepared channel to retain the restoration and to protect the remaining tooth structure. Posts transmit occlusal forces or masticatory forces favorably to the remaining root structure and periodontium (Shah *et al.,* 2016; Kapur *et al.,* 2006).

Extension of Post In The Primary

Extension of Post in the Primary Root Canal

Innovations for short retentive posts are needed in primarydentitiondue to the physiological resorption that occurs in primary dentition, unlike the post and core used in adult dentition. Innovations for short retentive posts are needed in primary dentition due to the physiological resorption that occurs in primary dentition, unlike the post and core used in adult dentition (Eshghi, 2011). Intra–canal post extension of about 2-3 mm in the root beyond the cemento-enamel junction of the existing root for obtaining enough retention and resistance of the severely damaged tooth restoration and coronally to about 2/3rd the crown length (Shah *et al.,* 2016; Eshghi, 2011).

Characteristics of post in primary teeth

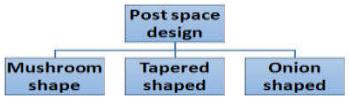
- Should shed in timely manner to allow unimpeded timely eruption of permanent successor.
- well adapted to the inner dentinal wall
- Ease of availability, applicability & Biocompatibility
- Aesthetics and phonetics
- Ability to withstand masticatory force

CLASSIFICATION OF POST USED IN PRIMARY TEETH (Suwarnkar *et al*., 2017)

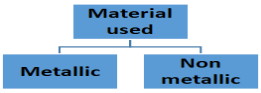
Post which are used in primary teeth can be classified based on

- Based on types of post space design
- Based on material used
- Based on post design
- Based on fabrication
- Based on retention

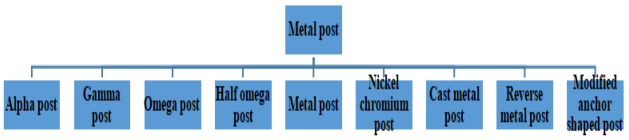
•Based on Post Space Design



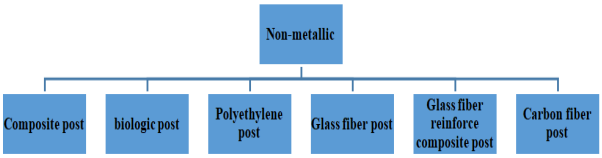
•Based on material use



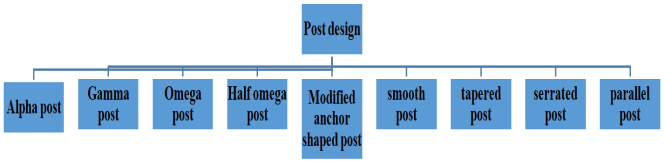
•Metal post



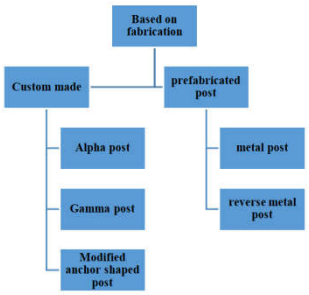
•Non-metallic post



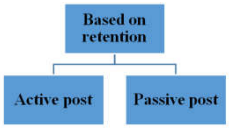
•Based on post design



•Based on fabrication method



•Based on retention



Canal preparation for post 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. (Kumar R, 2014) Other than GIC, Zinc Polycarboxylate cement can also be used. (Shrinivas N CH, 2011)

Various non metal posts which can be used in primary teeth.

Indirect composite post (Motisuki, 2005)

Composite post can also be made in the laboratory to be used as post. For fabrication of indirect composite post, No 4 carbide bur with a lowspeed rotary instrument is used to remove 1/3rd root fillings. Impression of the canal is then made by using low-viscosity elastomeric impression material with preformed wooden sticks. According to the diameter of canals post selection should be done. Thin coat of die isolation varnish should be applied on the canal walls to prevent adhesion of composite to canal walls. A silane primer layer was applied to the post to improve its adhesion to the composite resin. After that composite build upwith embedded post followed by coronal composite build up should be done. After its fabrication trial should be done in patient. The post is cemented in the canal after etching, drying rinsing, adhesive resin application and adhesive resin cement is used for post cementation.

Advantages: Indicated for the reinforcement of enlarged canals.

Disadvantage: Composite posts have low strength-to-load ratios

Fiber based post (Asmussen *et al*., 1999; Vichi *et al*., 2002; Gesi *et al*., 2003**).** Fiber based posts are available in various diameter & length.

Types

- Polyethylene fiber post
- Glass fiber post
- Glass fiber reinforced composite resin Post (GFRP)
- Carbon fiber post

Advantages

- High tensile strength,
- Increased fatigue resistance and inherent rigidity,
- Increased resistance to corrosion, biocompatibility to different core materials,
- Good chemical bonding to Bis-GMA resins,
- A young modulus of elasticity approaching that of dentin

Advantages of fiber post over metal post

- Esthetics
- Translucency
- Resin composite crown reinforcement
- Ease for manipulation

Polyethylene Fiber post (Jain *et al*., 2011; Lopes Vieira *et al*., 2002**).** These posts are preferred as they improve the impact strength, modulus of elasticity, & flexural strength. They are almost invisible in resin matrix, in contrast to glass fibers, which fail to stick to resin matrix. Preparation of this post space first removal of 2 mm of the coronal portion of the root filling should be done. Coronal structures and pulp chamber were etched and conditioned properly. Polyethylene fibers conditioned with bonding agent, placed in the slot of the root canal, are stabilized with composite material. Polyethylene fibers, 2 – 3 mm in length, are maintained above the crown to reinforce the coronal structure.

Advantages

- Are aesthetic demands beneath all restorations
- Provide strength to composite core material replacing the lost tooth structure.
- Does not need a laboratory phase and it takes less treatment time.

Disadvantages: Risk of resin polymerization shrinkage.

Ribbond fibers (de Oliveira Rocha, 2004; Bonchev *et al*., 2017**).** Ribbond are composed of plasma treated ultra-high molecular weight polyethylene fibers woven into three dimensional structure, leno wave or triaxial braid. Due to special patterns of cross-linked threads, a higher mechanical interlocking is provided. Also, the fiber's superficial tension is reduced due to cold gas plasma pretreatment in order to ensure good chemical bond to resin materials. Dual cure resin cement is used with ribbond fibers and final restoration is done with composite resin. These fibres have adequate translucency for cases with great esthetic appeal because they can be camouflaged inside the resin composite structure, as in cases of intracanal reinforcement.

Advantages

- Easy to manipulation
- maintaining unaltered extension after being cut
- Esthetic
- Good fracture resistance with increased incidence of repairable fractures in structurally compromised canals

Disadvantages: The high price limits their use in daily practice

Glass fiber post (Bonchev *et al*., 2017; Mehra *et al*., 2012**).** They are composed of unidirectional glass fibers embedded in resin matrix. The glass fiber posts have a BIS-GM Abased resin matrix. The use of fiberglass post together with flow able composite and bonding agent, where all the components are bonded together to form a firmly attached restoration unit. This technique utilizes the coronal portion of the root, which is the strongest part of the root to transmit any functional stresses and may add to success.

Advantages

- They have advantage of stress distribution over broad surface area and they are increasing the load threshold.
- Better retention and marginal adaptation

Disadvantage

- Post system are failure to stick to the resinous matrix which interferes with the esthetics and interfere with resorption if extended beyond 3 mm.

Glass fiber reinforced composite resin posts (Abd El-Rahman, 1992; Subramaniam *et al*., 2008; Verma, 2011**).** They are new generation of fiber posts composed of densely packed silanated E glass fibers in a light curing gel matrix. They contain different fiber types such as glass fibers, carbon fibers, Kevlar fibers, vectran fibers, and polyethylene fibers have been added to composite materials. Carbon fibers prevent fatigue fracture and strengthen composite materials, but they have a dark colour, which is undesirable esthetically. Kevlar fibers made of an aromatic polyamide increase the impact strength of composites but are unaesthetic, and, hence, their use is limited. Vectran fibers are synthetic fibers made of aromatic polyesters. They show a good resistance to abrasion and impact strength, but they are expensive and not easily wielded. Polyethylene fibers are esthetic but their flexural strength is less as compared to glass fiber-reinforced composite posts. The fibers are 7 to 10 micrometers in diameter and are available in a number of different configurations, including braided, woven, and longitudinal.

The lower flexural modulus of fiber-reinforced posts (between 1 and 4 × 1 0 6 psi) measures closer to that of dentin (2 × 1 0 6 psi) and can decrease the incidence of root fracture. The GFRC post cured for 20 seconds in order to gain rigidity, before insertion into the post space. Light cured flowable composite resin issued into the canal chamber after which the GFRC post is inserted. The fiber post & composite are then cured together. The coronal portion of the glass fibre reinforced composite post is splayed to increase the surface area for the retention of the core.

Advantages

- Ease handling
- Be used in high stress bearing areas.
- Esthetic
- Good retention and marginal adaptation
- Good Bonding with composite material.

Carbon fiber post (King, 1990; Bru *et al*., 2013)

It is non-metallic prefabricated post systems. They are made of equally stretched and continuous aligned unidirectional carbon fibers, 8mm in diameter, embedded in an epoxy resin matrix. The carbon fiber post is a passive post, which is black in color. They are available in different sizes (from 1 to 1.7mm) and shapes (parallel sided, tapered, smooth and serrated forms).

Advantages

- Easy to manipulate,

- Have good mechanical properties (high impact resistance,
- Increased fatigue resistance, shock absorbtion and have low
- Modulus of elasticity, more similar to that of dentin –18-42 GPa

Disadvantages: Are a lack of radiopacity and poor adhesion to composite resin cores

Ceramic post (Abd El-Rahman, 1992): It is made of zirconium oxide ceramic. Yttrium oxide was added as a stabilizing agent. Ceramic post has a cylindro-conical design, where the post tapers in its apical third in order to preserve tooth structure and to facilitate cementation.

Advantages

- Biocompatibility, resistance to corrosion and inability to stain the tooth structure, outstanding esthetics, resulting from the optical properties of the post material,
- The post can be used directly using composite core or indirectly using the heat pressed technique to achieve a ceramic core build up.
- Successful alternative to restore function and esthetics in children with badly decayed primary anterior teeth.

Biologic post (Santos, 1991; Ramires-Romito *et al*., 2000**).** The term biological restoration was introduced by Santos and Bianchi (1991) to describe an alternative technique that uses adhesive capabilities of materials in combination with strategic placement of parts of extracted human teeth. Ramires-Romito*et al* (2000), used teeth from the Human Tooth Bank of Sao Paulo University Dental School to be used as natural posts and crowns to fit into the roots and replace the crowns as well.

Tooth bank procedure

- The collected samples of extracted teeth were thoroughly scaled, polished, and freed of soft tissues and periodontal remnants.
- The pulps were removed from root canals and complete biological preparation was done.
- After preparation, all the sample teeth were placed in the ultrasonic tank operating at 42 GHz and 100 W output, at five working cycles in 6% H2O2.
- Each tooth was sonicated for 30 minutes.
- Teeth were stored at 4 degree C in Hanks balanced salt solution (HBSS) with donor identification till the time it was used

Preparation of biological restoration

- Teeth selected from the tooth bank arereshaped to be used as natural post and crown using crown preparation kit (Shofu).
- The roots that are shaped to function as posts are strengthened by flowable composite material.
- Tooth selected and prepared for use as biological restoration is then autoclaved for 30 minutes at 121 degree C and 15lbs pressure before cementation.
- The tooth is then tried for fit and adjustments to be done.

Advantages

- Natural tooth obtained from patient or from tooth bank
- Easy to perform
- Economical

Disadvantages

- Not acceptable by many patients
- Need of tooth bank
- Donor & recipient acceptance & cross infection make this treatment option largely impractical

Conclusion

Early childhood caries, although not life threatening but early loss of primary anterior causes psychological problems that can interfere in the personality and behavioral development of the child. Through this review, the various Non-metal posts are described for rehabilitation of grossly mutilated primary anterior teeth in children. Each endodontic Non-metal post has its own advantages and disadvantages. The selection of these Non-metal posts depends on the clinician's preferences and patient requirements.

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