REVIEW ARTICLE

POSTS IN PRIMARY TEETH-A SILE FOR BETTER SMILE

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ABSTRACT:
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. Post can be effectively used in such severely decayed teeth to restore the lost form and function and it also helps the coronal restoration by providing retention.
Key-words: Post, Primary teeth, Metal post, Fibre post, Dentin post

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INTRODUCTION

Severe early childhood caries is a devastating condition for both the child undergoing dental treatment and the concerned parents. It is also challenging for pediatric dentists to restore badly broken down teeth.The goal of dental treatment is to restore the lost tooth structure in order to maintain function and prevent changes in mastication, phonetics, development of para-functional habits and psychological problems that will affect a child's self-esteem.

Clinicians have made several attempts to restore such grossly carious primary anterior teeth with different and innovative root canal retentive post and core systemsso that the primary teeth can be retained until their replacement by successors.

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.

INDICATION OF USING POST IN PRIMARY TEETH[1, 2]

- 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 reestablish the shape and form of a severely decayed or fractured maxillary anterior tooth crown while it provides support for the final restoration.
- The posts also increase the resistance of the restored teeth to mechanical load.

PROBLEMS WHILE PLACEMENT OF POST IN PRIMARY TEETH[3, 4]

- The morphology and histology of primary teeth present a less surface area for bonding, relatively large pulp chamber, and aprismaticenamel which is difficult to etch
- The destruction of the tooth structure frequently involves the entire crown leaving just the root dentine for bonding of the restorative material and thus increasing the failure rate.

EXTENSION OF POST IN THE PRIMARY ROOT CANAL[5]

- Innovations for short retentive posts are needed in primary dentitiondue to the physiological resorption that occurs in primary dentition, unlike the post and core used in adult dentition.

- Intra-canal placement 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.

CLASSIFICATION OF POST USED IN PRIMARY TEETH:

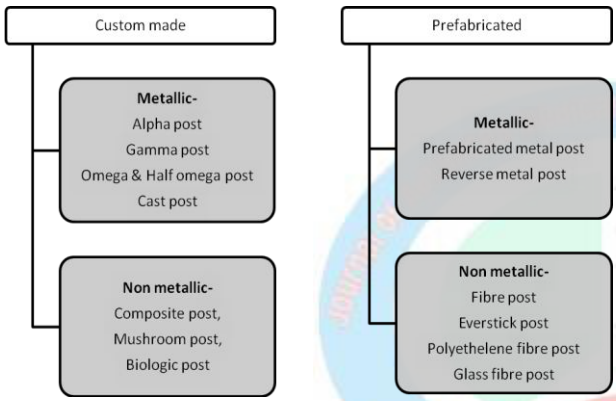
Post which are used in primary teeth can be classified based on-

1. Based on types of **post space design**
2. Based on **material used**
3. Based on **post design**
4. Based on **fabrication**

Based on post space design[6]

▶Mushroom shaped
▶Tapered shaped
▶Onion shaped

Based on material used-



Based on post design-

▶Threaded
▶Non-threaded
▶Alpha
▶Half omega shaped
▶Omega shaped
▶Modified anchor shaped
▶Gamma shaped

Based on fabrication method-

Direct method	Indirect method
Metallic post	Resin composite post
Fiber posts	Cast metal post

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

VARIOUS POSTS WHICH CAN BE USED IN PRIMARY TEETH

METAL POST

Custom made

▶Omega post and its modifications
▶Alpha post
▶Gamma post
▶Modified anchor shaped post

Prefabricated post

▶Metal post
▶Reverse 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 mayinterfere with physiologic root resorption if they are placed beyond 3 mm in the canal.

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

Omega post

The use of Omega loop was introduced by Mortada and Kingas intracanal retainer in the year 2004.[7]

Total of 5 mm long post is used in primary teeth. Both 3mm long free ends of post is placed inside the canal. Remaining 2 mm of omega post provides retention to the coronal restoration.

Advantages[8]**:**

▶Quick process
▶Wire does not cause any internal stresses in the root canal as it is incorporated in the restorative material mainly and it can be done with minimal chair side time.
▶Coronal extension provides retention to coronal restoration

Disadvantages:

▶The adhesion between Omega wire and dentinal wall is mechanical.
▶The wire adaptation to the internal walls is inadequate, leading to dislodgement of the wire, and radicular fracture due to excessive masticatory forces.
▶Hence retention of Omega loop is less compared to GFRC(Glass Fibre Reinforced Composite).

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.[9]

ALPHA POST

Stainless steel wire is bent into Alpha shaped and placed in the canal and here also the extention of the post in the canal should not be more than 3 mm.[10]

GAMMA POST

0.6-mm orthodontic wire is bent to form the Greek letter "y". 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.[11]

MODIFIED ANCHOR SHAPED POST[12]

It was introduced to overcome the retentive problems of omega posts.A 19-gauge orthodontic wire, 1.5 inch in length, is bent using a universal plier. For post fabricationone of the arms of wire is bent downwards and turned it to the opposite side.Repeat the same procedure for the other arm.Bend the free end of the arms towards the curved end.Cut the excess wire as required.By compressing the curved end, the free end opens up to adapt to the walls of the root thereby giving extra mechanical retention. Excess compression is not advised as it may cause root fracture.The post is placed in the prepared root canal and checked for adaptation. Mushroom shaped retention grooves are placed on the inner side of the root to create locking mechanism thereby increasing retention.

Advantages over Omega post-

- The free end has two arms crisscrossing to the opposite side which adapt to the walls of the root- extra retention
- The curved end provides strength to the coronal structure.
- Adaptation can be enhanced by compressing at the curved end which opens up the arms at the free end.
- Hence it is a simpler, easier, and inexpensive technique for treating severely damaged teeth.

NICKEL CHROMIUM POST WITH MACRO-RETENTIVE ELEMENT[13]

Rodrigues Filho and co-workers (1995)" described the use of nickel-chromium (Ni-Cr) cast posts with macroretentive elements. Such posts varied from 1.5 to 3.0 mm in diameter. For cementation of this post dual-cured adhesive or resin composite is used. The objective of this technique is to increase the resistance of the restored teeth to mechanical loading by bonding the intra canal retainer.

The round macroretentive elements in Ni-Cr cast posts offer a better distribution of masticatory loading forces.The possibility of chemical/mechanical adhesion by using adhesive systems allows for the integration of restorations to the dental structure. These posts are indicated for the reinforcement of enlarged canals, considering that limited amounts of dentin tissue are available, which is a common situation during restoration of primary anterior teeth. They are prefabricated in several diameters, and therefore can be readily used.

CAST METAL POSTS[14, 15]

They are fabricated by using indirect method of fabrication. They have disadvantages like they are expensive and require an additional laboratory stage for preparation of post and they could pose problems during the natural tooth exfoliation.

REVERSE METAL POST[16]

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 was positioned out of the canal as a core for coronal restoration. Bevelling should be done to reduce the stress concentrated at the dentinal walls and then the head of the post was try-fitted with the coronal 3 mm of the canal.

Canal preparation:

3 mm of the coronal part of the canal was prepared for future replacement of post. Canal is prepared almost rectangular with semi-rounded line angles in order to match with the quadrangle core of a prefabricated metal post that is planned to be placed reversely into the prepared canal. Core length of prefabricated metal posts is 3mm.

Advantages

- ▶Easy-to-perform and economical procedure with adequate retention and good esthetic.

Disadvantages

- ▶The possibility of cracked root subsequent to long-term function, especially in children with heavy occlusion or parafunctional habits.

Glass Ionomer short post[17]

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.

COMPOSITE POSTS

Composite short post[18, 19]

They are fabricated directly in post space by using composite material. It provides satisfactory esthetics but retention due to polymerization contraction & shrinkage could be a risk.

Inverted mushroom shaped design post[18]

No. 6 round bur was used to create a 360º "inverted mushroom undercut" in the apical 2 mm to the gingival margin of the tooth. To prepare the undercut, the bur aligns parallel to the long axis of the root and the maximum lateral extension of the bur was limited by the shank of the bur as it contacted the dentinal wall.The prepared canal and coronal structure were then cleaned, rinsed, and air-dried. A light-cured bonding agent is appliedLight-cured composite resin in 2, 1.5 mm increments to fabricate the composite short post. The crown is reconstructed with the same composite resin using appropriate celluloid crowns.

Indirect composite post[20]

Composite post can also be made in the laboratory to be used as post. For fabrication of indirect composite post, No 4 carbide burr with a low-speed 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.

Fibre based post[21- 23]

Fibre based posts are available in various diameter & length.

Types:

- Polyethylene fibre post
- Glass fibre post
- Glass fibre reinforced composite resin Post (GFRP)
- Carbon fibre 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 fibre post over metal post

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

Polyethelene Fibre posts[24]

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. For the step wise preparation of this post system 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.Polyethylenefibers 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.

Ribbond fibres[25]

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.They have advantages of easy to manipulate, fall apart, or rebound, maintaining unaltered extension after being cut.Dual cure resin cement is used with ribbond fibres and final restoration is done with composite resin.

Glass fibre post[26, 27]

They are composed of unidirectional glass fibres embedded in resin matrix. They have advantage of stressdistribution over broad surface area and they are increasing the load threshold. Disadvantage of this 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 fibre reinforced composite resin posts[27]

They are new generation of fiber posts composed of densely packed silanated glass fibers in light cure gel matrix. The fibers are of 7 to 10 µm in diameter. Its flexural strength is 1280 MPawhich is closer to dentin so decrease root fracture. They have greater ease of handling and can be used in high stress bearing areas. They are invisible in resin matrix so are the most suitable for esthetic needs. The GFRC post cured for 20 seconds in order to gain rigidity, before insertion into the post space. Light cured flowable composite resin is

used 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. Eg. Everstick post.

Carbon fibre post[28]

It is non-metallic prefabricated post systems. Carbon fiber based posts are essentially composite materials. 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 colour. They are available in different sizes (from 1 to 1.7mm) and shapes (parallel sided, tapered, smooth and serrated forms).

Ceramic post[27]

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

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.[29]Ramires-Romitoet 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.[30]

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 Hank.s 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

LUTING_AGENTS

Many luting agents can be used for the cementation of post in primary canal. The selection of luting agents mainly depends on the type and material of the post being used.

Luting agent	Suggested by
Zinc phosphate cement- for revere metal post	Eshghi A, Esfahan RK, Khoroushi M (2011, 2014)
Glass ionomer cement- for Omega (Metal post)	Ganesh R et al (2012)
Flowable composite- for Metal as well as Fibre posts	Shrinivasan CH (2011)- half omega post Kumar R Gajjar (2010)- gamma post Mehra M (2012)- glass fibre post Yusuf K (2011)- GFRC
Dual cure resin- for Metal as well as Fibre posts	Wanderley MT (1999)- Ni-Cr post with macroretentive element

Difficulties of post in primary teeth:

- Difficulty in extension of post length due to short length of primary roots & primary tooth roots can resorb over a period of time
- Due to short post length , Retention is compromised
- Chances of loss of crown due to trauma

Coronal restorations after post placement:

Remaining coronal structure can be restored with direct or indirect technique or with single tooth prostheses like-

- Strip crowns
- Stainless steel crowns
- Porcelain veneers
- Polycarbonate crowns
- Acrylic resin crowns

CONCLUSION

Following conclusions can be made from this review article-

- For placing post in primary teeth 3 mm radicular extension and 2-3 mm coronal extension of post should be used to prevent interference in shedding procedure.
- Omega post and its modifications are the most frequently used post in the primary teeth.
- When composite post is used the inverted mushroom shaped canal preparation is most suitable for the retention of composite post.
- Fibre posts can also be used effectively in primary teeth. Amongst various available fibre posts,polyethelene fibre post has proved to be better.
- Biologic post can also be successfully used in the primary teeth if tooth bank facility is available.
- Selection of luting agent completely depends on type of post.
- Coronal restoration should be done by using direct or indirect restorative techniques. Full coronal restoration is must after placement of post.

REFERENCES

1. Wanderley MT, Ferreira SLM, Rodrigues CRMD, Filho LER. Pdmary antedor tooth restoration using posts with macroretentive elements. Quintessence Int 30:432-436, 1999.
2. Guimaraes CS, Ribeiro SC, Biffi JCG, Mota AS. Comparative analysis of retention in prefabdcated and fixed intracanal posts with differetit cement agents. RPG Rev Pos Grad 6:354-360, 1999.
3. MortadaA,King NM. A simplified technique for the restoration of severely mutilated primary anterior teeth. J ClinPediatr Dent 2004;28:187-92.
4. Papathanasiou AG, Curzon ME, Fairpo CG. The influence of restorative material on the survival rate of the restorations in primary molars.Pediatr Dent1994;16:282-8.
5. Kapur A, Chawla HS, Goyal A, Gaube K. An esthetic point of view in very young children. J Clin Pediatr Dent 2005;30:99-103.
6. Prashant Babaji. Crowns in Pediatric dentistry, 1st ed, 2015, Jaypee publications.
7. Mortada A and King NM, "A simplified technique for the restoration of severely mutilated primary anterior teeth," Journal of Clinical Pediatric Dentistry, vol. 28, no. 3, pp. 187–192, 2004.
8. Kumar R, Sinha A. Restoration of primary anterior teeth affected by early childhood caries using modified omega loops - A case report. Annals of Dental, 2014; 2(4): 24-6.
9. Srinivas N CH, Jayanthi M. Post Endodontic Restoration of Severely Decayed Primary Dentition: A Challenge to Pediatric Dental Surgeon. World Journal of Dentistry, January-March 2011; 2(1):67-69.
10. Pinheiro SL, Bönecker MJS, Duarte DA, Jmparato JCP, Oda M Bond Strength Analysis of Intracanal Posts used in Anterior Primary Teeth: an in vitro study. J Clin Pediatr Dent, 2006; 31(l): 32-34.
11. Kumar RG, Indushekar KR. Comparison of the Retentive Strength of 3 Different Posts in Restoring Badly Broken Primary Maxillary Incisors. J Dent Child 2010; 77: 17-24.
12. Rajesh R, Baroudi K, Reddy BK, Praveen BH,Kumar VS,Amit S. Modified Anchor Shaped Post Core Design for Primary Anterior Teeth. Case Reports in Dentistry, 2014: 1-4.
13. Wanderley MT, Ferreira SLM, Rodrigues CM, Rodrigues LE. Primary anterior tooth restoration using posts .with macroretentive elements. Quintes Int, 1999; 30: 431-36.
14. Motisuki C, Santos-Pinto L, Giro EM. Restoration of severely decayed primary incisors using indirect composite resin restoration technique. Int J Paediatr Dent 2005;15:282-6.
15. McDonald RE, Avery DR. Restorative dentistry. In: McDonald RE, Avery DR, Dean JA, editors. Dentistry for the chil and adolescent. 8th ed. St. Louis: Mosby; 2004. p. 376.
16. Eshghi A, Esfahan RK, Khoroushi M. A simple method for reconstruction of severely damaged primary anterior teeth. Dental Research Journal, Oct 2011; 8(4): 221-25.
17. Carranza F, Garcia GF: Esthetic restoration of primary incisors. Am J Dent 12: 55-58, 1999.
18. Judd PL, Kenny DJ, Johnston DH, Yacobi R. Composite resin short-post technique for primary anterior teeth. J Am Dent Assoc 1990;120:553-5.

19. Ram D, Fuks AB. Clinical performance of resin-bonded composite strip crowns in primary incisors: A retrospective study. Int J Paediatr Dent 2006;16:49-54.
20. Motisuki C, Santos-Pinto L, Giro EMA. Restoration of severely decayed primary incisors Restoration of severely decayed primary incisors using indirect composite resinrestoration technique. International Journal of Paediatric Dentistry 2005; **15:** 282–286.
21. Asmussen E, Peutzfeldt A, Heitmann T. Stiffness, elastic limit and strength of newer types of endodontic posts. J Dent 1999; 27: 275-278.
22. Alessandro V, Simone G, Marco F. Comparison between two clinical procedures for bonding fiber posts into a root canal: A microscopic investigation. J Endod 2002; 28: 355-360.
23. Gesi A, Magnolfi S, Goracci C, Ferrari M. Comparison of two techniques for removing fiber posts. J Endod 2003; 29(9): 580-582.
24. Jain M, Singla S, Bhushan BAK, Kumar S, Bhushan A. Esthetic rehabilitation of anterior primary teeth using polyethylene fiber with two different approaches. J Ind SociPedodPrevet Dent, 2011; 29(4): 327-32.
25. Oliveira Rocha R, Das Neves LT, Marotti NR. Wanderley MT, Pires Correa MSN. Intracanal reinforcement fiber in pédiatrie dentistry: A case report.Quintessence Int 2004:35:263-268.
26. Mehra M, Grover R. Glassfibre post: An alternative for restoring grossly decayed primary tooth. Int J clinPeadiat dent 2012; 5(2): 159-62.
27. Abd El-Rahman AM, El-Kateb MA: Evaluation of a method for restoring severely decayed primary anterior teeth. Al-Azhar Dent J 7(4): 875-894, 1992.
28. King A, Setchell D. An in vitro evaluation of a prototype CFRC prefabricated post developed for the restoration of pulpless teeth. J Oral Rehabil 17: 599-609, 1990.
29. Santos J, Bianchi J. Restoration of severely damaged teeth with resin bonding systems. Quintessence Int 1991; 22: 611-5.
30. Ramires-Romito AC, Wanderley MT, Oliveria MD, Imparto JC, Pires Correa MS. Biological restoration of primary anterior teeth. Quintessence Int 2000; 35: 405-11.

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