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RESEARCH ARTICLE

“MANAGEMENT OF GROSSLY DECAYED PRIMARY ANTERIORS USING VARIOUS INTRACANAL POST SYSTEMS: AN IN VIVO STUDY”

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Abstract

Restoration of severely decayed primary maxillary anterior teeth is a big challenge to the pediatric dentist. For the management of such teeth, pedodontists must use intracanal posts such as prefabricated, orthodontic wire in α or Ω forms, metallic posts with macroretention, short posts with composite resin, polyethylene ribbon posts, and biologic posts. A total of 30 severely decayed primary maxillary anterior teeth from children aged 3 to 5 years with at least one-third of the root present were selected. The teeth were randomly divided into 3 groups: Group 1 (Omega Post), Group 2 (Biological Post) and Group 3 (Glass Fibre Post). Retention, marginal adaptation and marginal discoloration were clinically evaluated during follow up of 3, 6 and 9 month intervals. The results showed a significant difference in retention of Group I when intragroup comparison between baseline and 9 months time interval was done. However there was statistically non significant difference in retention of group II and III. A non significant result was seen in marginal adaptation and marginal discoloration of all three groups. Hence it was concluded that glass fibre post showed excellent results which allows its recommendation for management of grossly decayed anteriors with better esthetics and minimum discomfort to children.

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Introduction:-

Caries has affected the human race since prehistoric times and still is one of the most prevalent oral disease of modern times.^[1] Despite the fact that it is largely preventable, dental caries is the most common chronic disease of childhood.^[2] Most cases of mutilated primary anterior teeth among children are observed with early childhood caries.^[3] According to the American Academy of Pediatric Dentistry, early childhood caries (ECC) is the presence of one or more decayed (non-cavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger.^[4]

The etiology of ECC is multifactorial. The main culprit is prolonged bottle feeding containing sweetened milk, fruit juice, honey dipped pacifiers, diet rich in sugars and improper oral hygiene.^[5] 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 first primary molars. The maxillary primary incisors are the most severely affected with deep carious lesions usually involving the pulp.^[2]

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In the past, the most expedient treatment was to remove the involved teeth. This treatment was justified on the basis that the permanent teeth would eventually replace the extracted ones. However, the importance of preserving the primary dentition until its appropriate exfoliation time is now well recognized.^[1] In many cases, the destruction of the tooth structure involves the entire crown, leaving just the root and hence, only dentine for bonding of the restorative materials.^[6] The use of different intracanal posts can increase the survival of the restoration. Intracanal posts enable the reconstruction of severely affected anterior primary teeth and provide a functional and aesthetic solution without interfering with root resorption.⁷ There are several types of root canal posts available for use in pediatric restorative dentistry, including prefabricated, orthodontic wire in α or Ω forms, metallic posts with macroretention, short posts with composite resin, polyethylene ribbon posts, and biologic posts.^[8]

The introduction of fiber posts in the 1960s provided the dental profession an alternative treatment modality to cast/prefabricated posts, pins, and orthodontic wires.^[9] Dental manufacturers have developed glass fiber posts, which are available in different diameters.^[10] These posts are composed of unidirectional glass fibres embedded in resin matrix that strengthens the dowels without compromising the modulus of elasticity.^[11]

The use of omega loop as an intracanal retainer was introduced by Mortada and King in 2004 for primary teeth.^[9] A custom-made "omega wire extension" placed inside the root cavity and fixed with a composite resin.

In an attempt to widen the treatment options to rehabilitate severely destroyed tooth, as biologically and conservatively as possible, several authors have suggested the use of tooth structure available from tooth bank as restorative material.^[12] The biological posts use natural extracted teeth that are prepared in a post shape for cementation in the root canal.^[11]

The present study was undertaken to clinically evaluate and compare the efficacy and retention of various types of intracanal posts in the restoration of grossly decayed deciduous anterior teeth.

Materials and Method:-

A total of 30 severely decayed primary maxillary anterior teeth from children aged 3 to 5 years with least one-third of the root present were selected. The lower age limit was kept as 3 years as children below this age group would not comply with treatment procedure and allow for local anaesthetic administration, ultimately affecting the overall treatment efficacy, hence generating false results. While keeping the follow up in mind, the upper age limit was kept 5 years because of eruption and shedding sequence of teeth. According to the inclusion and exclusion criteria, a total number of 30 grossly decayed primary anterior teeth were selected. Relative isolation was achieved with the help of cotton rolls since the remaining tooth structure did not allow for absolute isolation with rubber dam.

Endodontic treatment was completed in grossly carious teeth and at the subsequent appointment, obturating material was removed according to the root length present with the help of reamer. About one-third of the root length was needed for adequate retention for all posts placed in primary teeth and at least two-third of root length should be present below the post so that there is no interference in the process of eruption of the permanent teeth.

1. In group A omega loop was selected. Omega loop was constructed with 1.5 cm length of 0.6 mm/23 gauge stainless steel orthodontic wire using orthodontic plier.
2. In group B biological post was constructed using premolar teeth extracted for orthodontic treatment. The root part was used for making posts. Dentine of approximately 6-7 mm length was cut and shaped. The shaped dentine posts were autoclaved at 121°C at for 15 min. Trial fit of dentin post and reshaping if necessary was performed.
3. In group C (n=10), according to the intracanal dimension of the tooth, specific size of glass fibre post was selected. The post was cut with a diamond bur under water cooling system to equal the measured depth for each canal and equal the height of the future coronal restoration.
4. The post space and the post in all the groups were acid etched for 7 seconds with 37% phosphoric acid, rinsed and dried.
5. Single bond universal adhesive was applied according to the manufacturer's instructions.
6. The tip of flowable composite was placed 2-3 mm apical to CEJ and flowable composite was injected in the post space created.
7. Then, respective post was inserted inside the canal using cotton pliers and light cured
8. Final buildup was done with composite material using incremental technique. Polishing and finishing was performed with composite finishing and polishing tips.

9. Patients were called after 1,3,6 and 9 months for evaluation of retention, marginal adaptation and marginal discoloration. They were evaluated using **Modified Ryge Criteria (table 1)**. The data was statistically analysed using Chi-square test.

Table 1:- Comparative Parameters Of The Study.

Criteria	Material and method	Rating	Scoring
Retention loss	Visual inspection with explorer and mirror	Retained Partially retained Lost	Alpha Bravo Charlie
Marginal discoloration	Visual inspection with explorer and mirror	No discoloration anywhere along the margin Superficial staining Deep staining	Alpha Bravo Charlie
Marginal adaptation	Visual inspection with explorer and mirror	Undetectable crevice along the margin Detectable crevice along the margin	Alpha Bravo

Result:-

The data for the present study was entered in the Microsoft Excel 2007 and analyzed using the SPSS statistical software 23.0 Version. The descriptive statistics included frequency and percentage. The inter group comparison was done using the chi square test to find the difference between the individual groups. The level of the significance for the present study was fixed at 5%. A total of 30 grossly decayed teeth were randomly treated with 10 glass fibre post, 10 biological post and 10 omega post. Then they were evaluated in terms of retention, marginal adaptation and marginal discoloration at 3 month, 6 months and 9 months interval.

Intragroup comparison for retention of all the three groups at baseline and at 9 months follow up is shown in table 2. At baseline 100% samples in Group I, Group II and Group III were completely retained. At 9-month time interval 75% of the samples in Group I were completely retained. In Group II as 2 samples were lost in 3rd month so n(no. of samples) was taken as 8 in both 6 and 9 month follow up which showed 100% retention. All the samples in Group III showed 100% retention till 9 month follow up. The intragroup comparison between baseline and 9 months time intervals was statistically significant in the Group I and non-significant in the Group II and Group III.

Table 2:- Intragroup comparison of all three groups at baseline and at 9 Months for Retention.

	Baseline (Alpha)	9 Months (Alpha)
Group I	10 (100%)	06 (75.0%)
Group II	10 (100%)	08 (100.0%)
Group III	10 (100%)	10 (100%)

Intragroup comparison for marginal adaptation of all the three groups at baseline and at 9 months follow up is shown in table 3. At baseline 100% samples in Group I, Group II and Group III showed complete marginal adaptation. At 9 month time interval 66.7% samples in Group I, 87.5% samples in Group II and 90% samples in Group III showed complete marginal adaptation. The intragroup comparison between baseline and 9 month time interval was statistically non-significant in Group I, Group II and Group III

Table 3:- Intragroup Comparison of all three groups at baseline and at 9 Months for marginal adaptation.

	Baseline (Alpha)	9 Months (Alpha)
Group I	10 (100%)	04 (66.7%)
Group II	10 (100%)	07 (87.5%)
Group III	10 (100%)	09 (90%)

Intragroup comparison for marginal discoloration of all the three groups at baseline and at 9 months follow up is shown in table 4. At baseline 100% samples in Group I, Group II and Group III showed no marginal discoloration.

At 9 month follow up 83.3% samples in Group I, 87.5% samples in Group II and 90% samples in Group III showed no marginal discoloration. The intragroup comparison between baseline and 9 monthtime interval was statistically non- significant in Group I, Group II and Group III.

Table 4:- Intragroup Comparison of all three groups at baseline and at 9 Months for marginal discoloration.

	Baseline (Alpha)	9 Months (Alpha)	Chi square test	P value
Group I	10 (100%)	05 (83.3%)	1.782	0.182
Group II	10 (100%)	07 (87.5%)	1.324	0.249
Group III	10 (100%)	09 (90%)	1.053	0.304

Discussion:-

Primary anterior teeth are the most commonly affected teeth due to early childhood caries and trauma. Loss of primary anterior teeth leads to mastication problems, speech disorders such as difficulty in pronunciation, development of parafunctional habits, hesitation to play among the peer groups due to esthetic concerns and reduction in vertical facial height.⁹ Endodontic techniques give a chance to save compromised primary teeth and reduce the chances of extraction.^[13] Intracanal post and core system are used to regain the lost tooth structure and bring back the original smile of the patient.^[9]

Literature suggested that research into new materials focused on those systems which have elastic modulus close to dentin and strength equal to or higher than dentin. Biological post is a technique in which post is made up of dentinal structure which is considered most suitable.^[14] Introduced by **Santos and Bianchi**^[15] in 1991 biological posts are cheap, esthetically acceptable. Its bonding to tooth structure with use of resin cements gives good result and it has same modulus of elasticity as that of tooth to be restored. But this treatment procedure is objectionable and is not easily acceptable by the parents.^[14] Decrease in retention of biological post may be because of less accurate adaptation of the post to the root canal.^[12] Fabrication of dentinal post may require a technically sound system to get an exact fit post, crack free dentinal structure and shade guide system for color matching.^[14] Disadvantages of biological post include patient acceptance, difficulty in retrieval, availability of teeth with similar tooth color as stated by **Wadhvani KK et al(2013)**^[14]

In our study, some parents found this technique objectionable and unacceptable. However, after counselling and assurance about harmless nature of this technique, this problem was resolved.

Ambica K et al.^[16], and **Kathuria A et al**^[17]. in their in vitro study reported that dentin posts demonstrated higher fracture resistance than Carbon Fiber posts and Glass Fiber posts.

Similar studies were carried out by **Ramires-Romito ACD et al**^[18] and **Sanches Ket al**^[19] which stated that biologic post shows desirable esthetics, it is a cost effective treatment for restoration of severely mutilated primary anterior teeth.

On the contrary, **Mittal NP(2014)**^[20] concluded that limitation of using biologic restorations is pre-operative preparation such as sterilization and preparation of natural tooth to make dentine post/ post and core/shell crown.

A cheap as well as easily acceptable option of omega post was described by **Mortada and King**^[6], in which direct composite resin restoration reinforced with mechanically retained orthodontic wire was used. A custom made omega wire extension is placed inside the root cavity and luted to restore grossly decayed crown structure.^[11] Though it is an easy and inexpensive technique but esthetics are compromised and there is a need of using opaque resin to mask the metallic post which may effect the final restoration's appearance.^[9] Also omega post does not get an adequate adaptation to the canal wall, which may lead to fracture on excessive masticatory forces.^[11] **Nilavarasan N et al.**^[9] stated that failure of retention of omega post could be because of the compromised bonding between the wire post and the tooth material. The wire is unable to adequately adapt the canal form, because it is not the exact copy of the canal which may lead to radicular fracture on excessive masticatory forces.

Arora K^[21] and **Rifkin**^[22] concluded that placement of simple wire posts in primary teeth has not been widely accepted in pediatric dentistry possibly because of the perceived potential for interference with normal physiologic

rootresorption if the wire extends a long way into the root canal. The color of metal posts do not meet the esthetic requirement so they require masking with opaque resin which in turn effect the final appearance of the restoration.

On the contrary, **M.Usha et al**^[23](2007) concluded that direct composite resin restoration using a custom made orthodontic wire demonstrated good retention and esthetics. The technique was easy to perform and benefited the child immensely.

Glass fiber post, which can overcome the drawback of poor esthetics and the method which is easily acceptable by the parents was introduced by **Duret et al**^[24]Glass post was made of unidirectional glass fibers embedded in resin matrix.^[25]Fibre posts are aesthetic, easy to use and are available in different sizes which makes these posts a suitable alternative than others.^[10,35]

Similar study was conducted by **Arora K**^[21]in which she compared fibre and omega posts in grossly destructed primary maxillary incisors. Fibre posts proved to have better retention, which can be due to the chemical and mechanical bonding to tooth surface. It was concluded that fibre post systems seem to be a suitable alternative for omega posts, due to better retention and more esthetic appearance as compared to omega shaped stainless steel wire posts.

Sharaf^[15], **Oner R et al**^[7] and **Mehra M et al**^[11] concluded that glass fibre posts provide high resistance to bending and torsion forces. Maximum retention and marginal adaptation was noted in all the cases treated with glass fibre post.

On the contrary **Suwarnkar SD**^[26] and **Nilavarasan N**^[9]stated that most of the parents disagreed to get glass fibre post because of the cost when considered for pediatric group.

When overall results were compared, Glass Fibre Post showed better results clinically when compared to Omega Post and Biological Post. The reason of retention loss of omega post is due to the bonding between the wire post and the tooth material is compromised.⁹ The wire is unable to adequately adapt the canal form, because it is not the exact copy of the canal which may lead to radicular fracture on excessive masticatory forces.¹¹ Biological post showed acceptable results with only two failures in retention till the end of follow up period. The reason of retention loss of biological post can be due to less adaptation of the biologic post to the root canal.¹⁴ Thus its fabrication may require a technically sound system to get an exact fit post. Best results were seen in glass fibre post with no retention loss due their availability in different diameters which makes them a suitable alternative than others.⁹ Also these posts have advantage of stress distribution over broad surface area thus increasing the load threshold.¹¹

Decrease in marginal adaptation was seen in all three groups and non significant result was found in all three groups. According to **Priyalaxmi S.**^[27] failure in marginal adaptation with composite restorations is related to some factors like type of dentin adhesive, restoration technique, accuracy in finishing restoration.

Decrease in marginal discoloration was seen in all three groups and non significant result was found in all three groups. According to **Priyalaxmi S.**^[27] the reason behind marginal discoloration could be the marginal gap formation that may exist when the composite resin is placed on dentin or cementum. This gap predisposes the restorative margin to microleakage, further causing marginal discoloration.

Conclusion:-

Glass fibre post was better in all parameters as compared to biological post and omega post when evaluated at 1 month, 3 month, 6 month and 9 month interval. Therefore the study suggests that Glass Fibre Post is superior to Omega post and Biological Post. When Biological and Omega posts were compared Biological posts showed better results. Thus, we conclude that excellent results were found in Glass Fibre Post which allow its recommendation for management of grossly decayed anteriors with better esthetics and minimum discomfort to children.

Figure 1:- Clinical Photographs Of Teeth Restored With Omega Post.**Figure 2:-** Clinical Photographs Of Teeth Restored With Biological Post.**Figure 3:-** Clinical Photographs Of Teeth Restored With Glass Fibre Post.**Referencing:-**

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