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Fracture resistance of simulated human immature teeth reinforced with anatomic post and MTA as apical barrier

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Abstract
Background: The development of immature teeth can be arrested because of various harmful stimuli such as trauma, caries, and anatomic variations such as dens evaginatus. The present study was conducted to compare fracture the resistance of simulated human immature teeth treated with anatomic post and MTA as apical barrier.
Materials & Methods: 32 permanent mandibular incisors were randomly divided into two groups of 16 each. Group I—apical barrier using Biodentine and Group II—apical barrier using MTA (MTA Plus). Fracture resistance was compared.
Results: Fracture resistance of control was 640.4 and in group II was 613.5. Everstick showed value of 1476.3 MPa in group I and 1290.5 MPa in group II. Inter- group comparison was significant (P<0.05).
Conclusion: Authors found that everstick post is a viable option for reinforcement of teeth with immature root apex.

Keywords: Bio dentine, everstick post, MTA

Introduction
The development of immature teeth can be arrested because of various harmful stimuli such as trauma, caries, and anatomic variations such as dens evaginatus [1]. Trauma to the anterior teeth is the most frequent cause for pulpal necrosis and cessation of root development. Because of open apices and weak dentinal walls, the management of such cases is both an endodontic and restorative challenge which predispose such teeth to root fractures at the cervical dentin [2]. Apexification is one of the best treatment modality in such cases. Apexification with long-term calcium hydroxide is reported to have a success rate of 79–96% [3]. However, the unpredictable time for apical barrier formation, increased brittleness of the tooth, and susceptibility to root fractures are its major disadvantages. Numerous bio ceramic materials with superior properties such as oestrogenic potential, sealing ability, and antibacterial property have been used for single visit apexification [4]. Glass fiber posts which exhibit a modulus of elasticity similar to that of the dentin has been investigated extensively. MTA is considered to be the gold standard material as an artificial apical barrier inducer in immature and incompletely developed teeth. Various studies have reported that complete obturation of immature teeth with MTA can enhance their resistance to horizontal as well as vertical root fractures [5]. The present study was conducted to compare fracture the resistance of simulated human immature teeth treated with anatomic post and MTA as apical barrier.

Materials and Methods
The present study was conducted on 32 permanent mandibular incisors. The study was approved from institutional ethical committee.
The root canals were prepared as per standardized protocol. The 32 teeth were then randomly divided into two groups of 16 each. Group I—apical barrier using Bio dentine and Group II—apical barrier using MTA (MTA Plus). Each group was further divided into four subgroups:

Group I (n = 16), subgroup A (n = 4)—apical barrier using Biodentine with no obturation, Subgroup B (n = 4)—apical barrier using Bio dentine, subgroup C (n= 4) apical barrier using Bio dentine and the same Bio dentine as complete obturation material. Subgroup D (n = 4)—apical barrier using Bio dentine with prefabricated glass fiber post as reinforcement. Group II (n = 16) the subgroups (n = 4 each) were same as Group I, but Bio dentine was replaced by MTA as apical barrier as well as canal reinforcement material (subgroups IIA, IIB, IIC, IID). All samples were incubated for two weeks at 37 °C before subjecting to fracture testing using the Universal Testing Machine. A compressive load was applied at 135° to the long axis of the tooth. Results were tabulated and subjected to statistical analysis. P value less than 0.05 was considered significant.

Results

Table I: Distribution of teeth

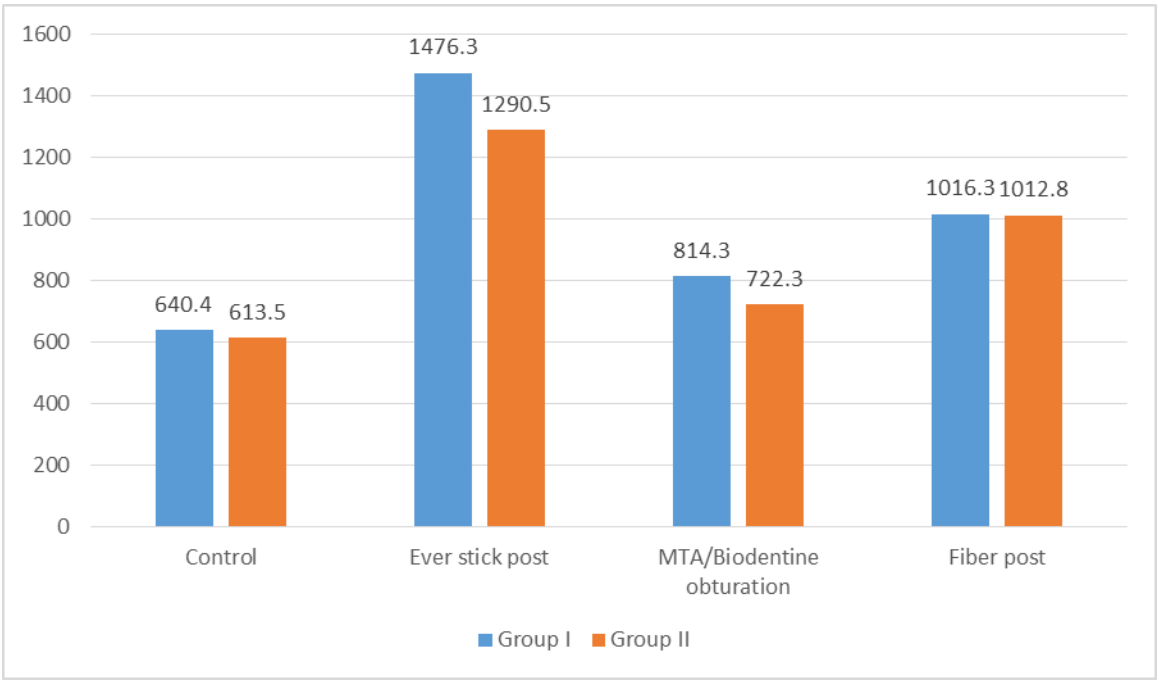
Groups	Group I (biodentine)	Group II (MTA)
Sub group A	No obturation	No obturation
Sub group B	Biodentine+ Everstick post	MTA+ Everstick post
Sub group C	Complete obturation with biodentine	Complete obturation with MTA
Sub group D	Biodentine + prefabricated glass fibre post	MTA + prefabricated glass fibre post

Table I shows distribution of samples in group I and II and subgroups A, B, C and D based on materials used.

Table II Fracture resistance of teeth

Group	Group I	Group II	P value
Control	640.4	613.5	0.05
Ever stick post	1476.3	1290.5	0.02
MTA/Biodentine obturation	814.3	722.3	0.04
Fiber post	1016.3	1012.8	0.81

Table II, graph I shows that fracture resistance of control was 640.4 and in group II was 613.5. Everstick showed value of 1476.3 MPa in group I and 1290.5 MPa in group II. Inter-group comparison was significant (P<0.05).



Graph I: Fracture resistance of teeth

Discussion

An optimal treatment protocol for immature permanent teeth with necrotic pulp is to regenerate functional pulp tissue and facilitate continuation of root development and apical closure [6]. although it has potential for clinical success, it may not be successful in every case. It requires strict adherence to treatment protocol and takes longer time for completion of treatment, and possible failure may make further treatment difficult.[7]

Mineral trioxide aggregate (MTA), a powder aggregate containing mineral oxides, has been recently recommended for apexification [8]. Properties like high pH, antimicrobial action, biocompatibility, low cytotoxicity, good sealing ability, and ability to set in the presence of blood and moisture are all advantages offered by MTA [7]. Various materials have been verified for increasing the fracture resistance of endodontic ally treated teeth [9]. The present study was conducted to compare fracture the resistance of simulated human immature teeth treated with anatomic post and MTA as apical barrier.

We found that fracture resistance of control was 640.4 and in group II was 613.5. Everstick showed value of 1476.3 MPa in

group I and 1290.5 MPa in group II. Nikhil *et al* [10] compared the fracture resistance of simulated immature teeth restored with gutta-percha, glass fiber posts (GFP), experimental dentine posts (DP) or Intracanal composite Resin (ICR). 50 maxillary canines were decorated, standardized and enlarged until, number 5 Peso reamers were allowed to simulate immature teeth. After placement of 5 mm of MTA, the canals were divided into 5 groups and filled as follows: Group 1: AH plus + gutta-percha, lateral compaction; Group 2: GFP luted with PARACORE dual cure resin; Group 3: DP luted with PARACORE dual cure resin; Group 4: PARACORE dual cure resin. A standardized core was built in all groups except in Group 5. Each of the specimens was tested for fracture resistance by universal testing machine. The mean fracture resistance were 817± 27.753, 1164.6 ± 21.624, 994.4 ± 96.8747, 873.8 ± 105.446 and 493.7 ± 6.945 newton's for Groups 1, 2, 3, 4, and 5 respectively. Independent "*t*" test revealed statistically significant discrepancies, in the fracture resistance among the 4 groups except Group 1 and Group 4.

Dholakia *et al* [11] included 80 extracted maxillary central incisors which were divided into two groups (n = 40 each) as group I—apical barrier using Biodentine and group II—apical barrier using MTA. A novel anatomic post, everstick post is a viable option for reinforcement of teeth with immature root apex and thin dentinal walls after apexification. Silujjai *et al* [12] in their study 46 cases (29 cases of apexification and 17 cases of revascularization) were recruited. Patients' preoperative and postoperative information was analyzed. Treatment outcomes were categorized as a success or failure and functional retention. Further root development was assessed in terms of the percentage changes in root length and root width. The success rates of mineral trioxide aggregate apexification and revascularization were 80.77% and 76.47% and functional retention was 82.76% and 88.24%, respectively. Revascularization provided significantly greater percentage changes in root width (13.75%) in comparison with mineral trioxide aggregate (MTA) apexification. The mean percentage change of increased root length was 9.51% in the revascularization group and 8.55% in the MTA apexification group. Interestingly, revascularization showed various degrees of increased root length ranging from 4% to 58%. Fracture was the main cause of failure in MTA apexified teeth. All failed revascularized teeth presented with signs and symptoms of apical periodontitis caused by persistent infection.

Conclusion

Authors found that everStick post is a viable option for reinforcement of teeth with immature root apex.

References

1. Schmoldt SJ, Kirkpatrick TC, Rutledg RE, *et al*. Reinforcement of simulated immature roots restored with composite resin, mineral trioxide aggregate, guttapercha, or a fiber post after thermocycling. J Endod. 2011;37(10):1390-1393.
2. Lawley GR, Schindler WG, Walker 3rd WA, *et al*. Evaluation of ultrasonically placed MTA and fracture resistance with intracanal composite resin in a model of apexification. J Endod. 2004;30(3):167-172.
3. Cvek M. Prognosis of luxated non-vital maxillary incisors treated with calcium hydroxide and filled with gutta-percha. A retrospective clinical study. Endod Dent Traumatol. 1992;8(2):45-55.
4. Topçuoğlu HS, Kesim B, Düzgün S, *et al*. The effect of various backfilling techniques on the fracture resistance of simulated immature teeth performed apical plug with Biodentine. Int J Paediate Dent. 2015;25(4):248-254.
5. Desai S, Chandler N. The restoration of permanent immature anterior teeth, root filled using MTA: a review. J Dent. 2009;37(9):652-657.
6. Stuart CH, Schwartz SA, Beeson TJ. Reinforcement of immature roots with a new resin filling material. J Endod 2006;32(4):350-353.
7. Katebzadeh N, Dalton BC, Trope M. Strengthening immature teeth during and after apexification. J Endod. 1998;24(4):256-259.
8. Sorensen JA, Martinoff JT. Clinically significant factors in dowel design. J Prosthet Dent. 1984;52(1):28-35.
9. Sorensen JA, Ahn SG, Berge HX, *et al*. Selection criteria for post and core materials in the restoration of endodontic ally treated teeth. Acad Dent Mater. 2001;15:67-84.
10. Nikhil V, Jha P, Aggarwal A. Comparative evaluation of fracture resistance of simulated immature teeth restored with glass fiber posts, intracanal composite resin, and experimental dentine posts. The Scientific World Journal. 2015.
11. Dholakia, Mrunalini J Vaidya. Comparative Evaluation of the Fracture Resistance of Simulated Immature Teeth Reinforced with a Novel Anatomic Post and MTA or Biodentine as an Apical Barrier: An *in vitro* Study. Journal of Operative Dentistry and Endodontics. 2019. 10.5005/jp-journals-10047-0081.
12. Silujjai J, Linsuwanont P. Treatment outcomes of apexification or revascularization in nonvital immature permanent teeth: a retrospective study. J Endod 2017;43(2):238-245.