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Research Paper

Comparative Evaluation Of Frature Resistance Of Teeth Restored With Biological Dentine Posts And Fiber Posts. – An Invitro Study

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ABSTRACT: ***Aim*** *of the study is to evaluate and compare the fracture resistance between biological dentine posts and fiber post. A sample of ten permanent anterior teeth and five maxillary canines were collected. The roots of the canines were used to prepare five dentine posts of a standardized shape and dimensions. After receiving proper filing and endodontic radicular preparation, the ten anterior teeth were divided into two groups. The first group were restored with biological dentine posts, and the second group were restored with fiber posts. For both groups, fracture resistance testing was performed using universal testing machine. Student t test was used to compare between the two post types. The results showed that biological dentine posts offered better fracture resistance when compared to fiber posts.*

KEYWORDS: *Biological dentine posts, Fiber post, Fracture resistance, universal testing machine.*

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I. Introduction:

Anterior tooth fracture is a commonly encountered scenario in pediatric dentistry with prevalence rate of 8.1 in 1000[3]. It usually occurs as a result of trauma due to road traffic accidents, sports injuries or various other activities and problems.

A proper coronary reconstruction that produces satisfactory aesthetic and functional conditions for endodontically treated and extensively damaged teeth is still a challenge for dentistry[1]. The chief concern while restoring severely damaged teeth is to ensure adequate retention and strength of the dental fragments, while keeping in mind the modulus of elasticity of dentin. This can be obtained by employing posts, which are restorative dental materials placed in the root portion of the damaged tooth to provide retention for the coronal portion of the tooth[3].

Many types of posts are routinely suggested as retention techniques for anterior teeth restoration such as metal posts, stainless-steel orthodontic wires, polyethylene fiber posts. Nowadays relevant post systems such as glass fiber, carbon fiber, fiber-reinforced composite, and zirconium oxide posts are used these posts provide brilliant characteristics involving corrosion resistance, fatigue, and biocompatibility, and mechanical features like dentin. However, there is no post material demonstrated to be as efficient as natural biological structure especially in the biological and mechanical features[5].

The use of biological posts made from natural, extracted teeth represents a feasible option for strengthening root canals, thus presenting the potential advantages such as:

✓ preserving and reducing undue stress on dentinal walls.

✓ They also presents total biocompatibility and adapts to conduct configuration, favoring greater tooth strength and greater retention than prefabricated posts.

✓ In addition they also shows resilience comparable to the original tooth, and offers excellent adhesion to the tooth structure and composite resin at a low cost[1].

Therefore, In this study, biological posts were used which were composed of dentinal structure from freshly extracted teeth thus having a similar isotropic structure like that of the tooth[5]. The purpose of this study is to compare and evaluate the fracture resistance of teeth restored with biological dentine posts and fiber posts.

II. Materials And Methods:

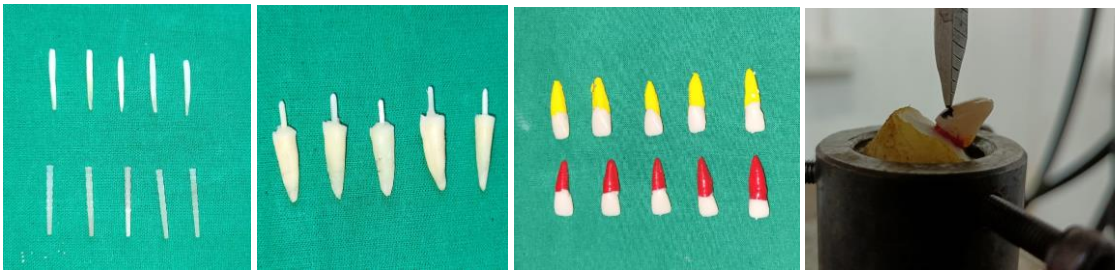
A comparative study was performed at the Department of Pediatric and Preventive Dentistry, Lenora Institute of Dental Sciences, Rajahmundry. A total of 10 maxillary anterior teeth were selected for the study as per the inclusion criteria: Permanent maxillary incisor teeth extracted for periodontal reasons. Exclusion criteria: Tooth with cracks, fissures and fractures ,Incomplete root apex formation, Calcified tooth, Resorbed roots. and five maxillary canines were also collected for biological post preparation.

Clinical procedure: fracture resistance

The roots of the canines were used to prepare five dentin posts of a standardized shape and dimensions. The prepared dentin posts were all autoclaved at 121 C for 20 min before use to insure all biosecurity standards for teeth disinfection and to simulate clinical condition. The fiber posts used in this study were the red color-coded posts . and were silanized using silane. The ten anterior teeth were cross-sectioned 1 mm above the cement-enamel junction (CEJ). Bio mechanical preparation was done and irrigated with normal saline solution and then dried with paper points. Obturation was done using gutta percha and zinc oxide eugenol sealer and then teeth were randomly divided into two groups: Group [1] biological dentin posts and Group [2] fiber posts.

Post space preparation was done by leaving 5mm of gutta percha at apical region. All the posts were trimmed to obtain 11mm of length. Posts were then inserted into each root canal according to their respective groups and cemented. 3mm of each post were left coronally for all the samples and crown build up was performed using polycarbonate crowns.

The fracture resistance was measured using the Universal Testing Machine. Each specimen was held in a specially constructed attachment that was fixed to the lower compartment of the machine so that the specimen's inclination was 45degrees. A specially constructed load applicator in the form of metallic rod with a ball end 1 mm in diameter, was fixed to the upper compartment of the machine so that the dislodging force was at the junction between the incisal and middle thirds of the crown. The specimens were loaded at a cross head speed of 1 mm/min. and the values obtained during fracture were recorded in Newtons.



III. Statistical Analysis

The data was collected, tabulated, and statistically analyzed using SPSS version 21 statistical analysis package software. The fracture resistance values (MPa) were analyzed using student t test. Statistical significance was considered at $p<0.05$.

IV. Results:

Table 1: Shows mean fracture resistance and standard deviation for group 1 and group 2 mean fracture resistance of (116.740) , (54.580) were respectively and standard deviation (8.4174) , (11.2442) respectively.

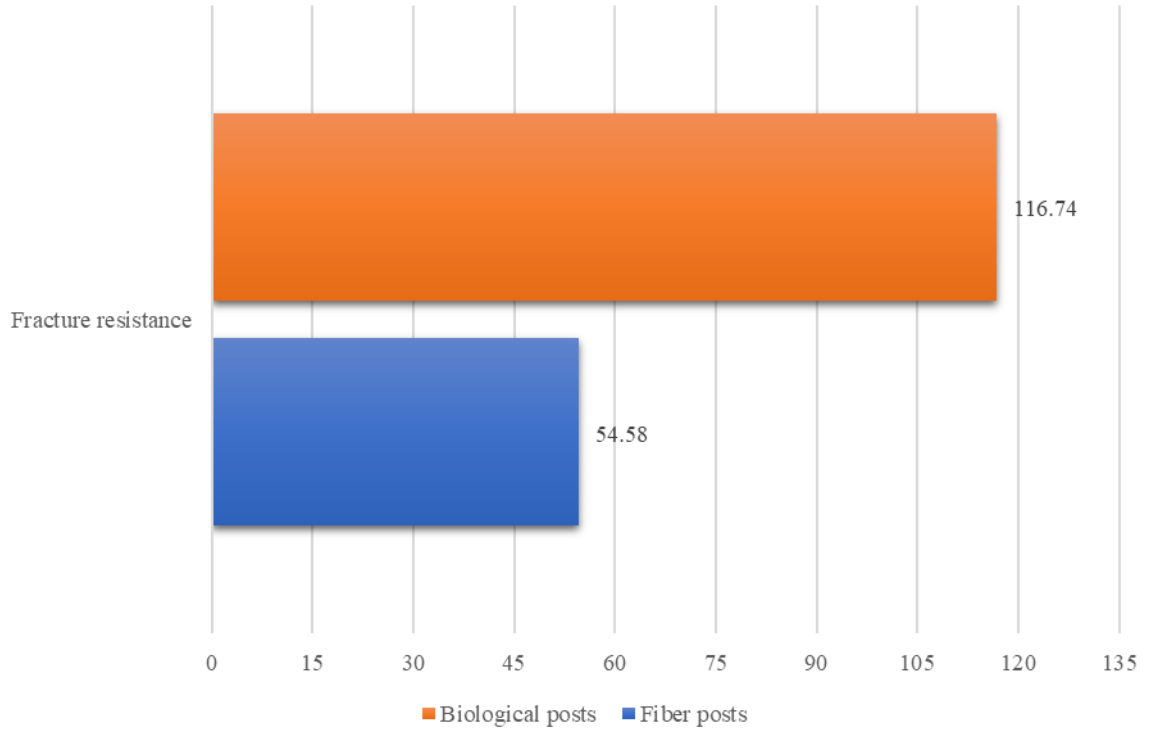
The results of student t tests indicated that there was highly significant difference found between the two groups. The group 1 shows highest fracture resistance where as group 2 shows least fracture resistance.

Table 1. Descriptive statistics and results of student-t test for comparison of fracture resistance between the two posts:

Post type	Mean	SD	Minimum	Maximum	P-value
Biological post	116.740	8.4174	107.3	128.2	0.462*
Fiber post	54.580	11.2442	38.5	66.5	

*P≤0.05 is considered statistically significant

Figure: 1 Comparison of fracture resistance between the two posts



V. Discussion:

this study evaluates and compare the strength between biological dentine posts and fiber post.

A proper coronary reconstruction that produces satisfactory esthetic and functional conditions for endodontically treated and extensively damaged teeth is still a challenge for dentistry, to achieve these conditions. The use of a biological dentin post provides biocompatibility and resilience that is comparable to the original tooth[1].

In the current study biological dental posts showed higher fracture resistance than the fiber posts. **B. Suresh Kumar, et al** reported that biological dentinal posts have the same resilience as the remaining tooth, ensuring the advantage of allowing a better distribution of stress along the root, minimizing the rate of adhesive and cohesive failure. Their main objective would be a restoration in "mono block" form, that is, through adhesion, to form a unique biomechanical compound between the dental structure and the restorative materials (biological post, cementing agent, and root canal dentin). This fact may explain the good fracture resistance presented by dentin posts[1].

According to **Karine et al. (**2014) no commercially available prefabricated post meets all ideal biological and mechanical requirements. which was similar to**Kathuria et al.** (2011) and **Ambica et al.** (2013).

Biological posts are superior than any other restorative or fiber posts as they have the mechanical and aesthetic properties of the dental structure.

The use of a biological post as an intracoronary retention aid should be encouraged by clinicians since the post used in this study presented satisfactory fracture resistance, easy to obtain, biosafe (after sterilization), and similar to human teeth both histochemically and anatomically.

VI. Conclusion:

Biological Posts offers excellent esthetic, functional, results. Hence the use of biological posts is justified to achieve morphological and functional recovery of extensively damaged teeth. With respect to the biological post, long term studies are needed to assess certain parameters such as adhesion and longevity of these posts.

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