## Journal of Advanced Medical and Dental Sciences Research

@Society of Scientific Research and Studies **NLM ID:** 101716117

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr Indian Citation Index (ICI) Index Copernicus value = 100

(e) ISSN Online: 2321-9599;

(p) ISSN Print: 2348-6805

# **Original Research**

## Comparative evaluation of fracture resistance of edelweiss post and glass fiber post in endodontically treated teeth – An in vitro study

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#### ABSTRACT:

**Aim-** The aim of the study was to determine the fracture resistance of Edelweiss post and Glass fiber post in endodontically treated tooth. **Methodology-** 60 human extracted mandibular premolars were splits into 3 groups at random, administered root canal therapy, and then obturated with gutta percha, in all the 3 groups respectively. Group 1 is control group, In Group 2 (n=20) resin composite post and core single unit (Edelweiss post and core, Edelweiss dentistry products GmbH, Austria) were placed. Glass fiber post was cemented after the post space preparation in teeth under Group 3 (n=20), and a separate composite core build up was completed. The fracture resistance was tested using a compressive load in an universal testing machine. The fracture force was measured in Newtons. **Results-** A statistically significant difference between the two groups (p<0.05) was noted. **Conclusion-** The prefabricated Edelweiss resin composite post and core single unit has greater fracture resistance than the post made of Glass fiber post.

Keywords- Edelweiss post and core single unit; Fracture resistance; Glass fiber post

Received: 08 April, 2023

Accepted: 11 May, 2023

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This article may be cited as: Banarase T, Gupta PK, Sneha, Jaju N, Dhote S. Comparative evaluation of fracture resistance of edelweiss post and glass fiber post in endodontically treated teeth - An in vitro study. J Adv Med Dent Scie Res 2023;11(6):12-14.

#### **INTRODUCTION**

Endodontically treated teeth are known to present a higher risk of biomechanical failure compared to vital teeth. Posts are needed restoring endodontically treated teeth with insufficient coronal tooth structure to retain a core for definitive restoration. Various techniques and materials for post and core restorations have been advocated. They vary from custom made cast metal posts to prefabricated metal and non-metal post, aesthetic posts and bonded posts, each with their own merits and demerits.<sup>1</sup>

The prime objective of post and core treatment procedure is to build up missing coronal structure and provide sufficient retention and resistance form to final restoration for maintaining structural integrity of tooth and withstand occlusal masticatory forces. Endodontically treated teeth restored with metal free physiochemically homogenous material similar to dentin has become an essential in dentistry.<sup>1,2</sup>

Edelweiss post system is unique, single piece, high strength and customisable composite post and core

system. This makes treatment easier, simpler, and more predictable, its composed of barium glass, strontium and zinc oxide which are embedded in resins, its translucent and improved adhesion with root d Glass fiber post can be bonded to the tooth structure which allows more homogenous stress absorption and force distribution on the residual root consequently reinforcing the tooth structure this property has been reported to reduce catastrophic fracture of the root and offer better distribution of the stress; Glass fiber post provides excellent esthetic and light transmission results, it requires less dentin removal, and can be bonded to dentin.<sup>6</sup>

### MATERIALS AND METHODS Preparation of specimens Specimen Grouping

<u>Procedure</u>- Procedure for Group A: After decoronation of crown, access opening was done followed by biomechanical preparation with copious

irrigation, then obturation was done by 2% gutta percha by lateral condensation technique.

- **Procedure for Group B:** After access opening, biomechanical preparation with copious irrigation, then obturation was done by 2% gutta percha by lateral condensation technique.
- In edelweiss post and core method, post space preparation was done with drill which was provided with edelweiss post and core system, and leaving 4mm of apical gutta percha obturated material for apical seal
- Then fit of post was checked first, then etching of post space was done for 15 second then post space was rinsed, dried, and bonding agent (VENNER BOND) was applied for 20 seconds and cured for 20 seconds

After that post and core cementation was done using dual core adhesive cement and polymerisation was done for 60 seconds.

• **Procedure for Group C:** After doing access opening, biomechanical preparation by crown

down technique, and obturate the canals by 2% gutta percha by lateral condensation technique.

• After obturation , post space was created by removing gutta percha with the peeso reamer corresponding to diameter of the selective post and leaving 4mm of apical gutta percha obturated material.

Then core build up of glass fiber post was done to the height of 4mm with dual cure adhesive cement. Resin blocks were made using these prepared teeth. Then compressive load at 130 degree angle was applied to the long axis of tooth with 1mm diameter using universal testing machine until visible or audible evidence of fracture was observed, and the fracture force was measured in Mpa.

#### STATISTICAL ANALYSIS

The fracture resistance was determined using a universal testing machine and data was subjected to statistical analysis.

Statistical analysis was performed using SPSS software – ANOVA with POST HOC BONFERRONI test.

#### RESULTS

Fracture resistance of different post (Mean and Standard deviation values)

Group	Ν	Mean	Std. Deviation	Minimum	Maximum	Std. Error of Mean
Group: Control (I)	20	182.8050 N	7.06894	171.40	195.60	1.58066
Group: Edelweiss (II)	20	296.2350 N	16.43031	273.90	330.30	3.67393
Group: Glass Fiber (III)	20	237.1700 N	12.49716	219.60	262.40	2.79445

It is a descriptive table showing the mean and the standard deviation of two different post and control group. It shows that the fracture resistance are greater for Edelweiss post (296.23) compare to Glass fiber post (237.17) and control group (182.80).

Graph -	(1) Comparison	<b>Of Mean Fractur</b>	e Resistance And	l Standard Deviati	on Between T	hree Groups
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#### DISCUSSION

Recently a new type of post was introduced by Edelweiss Dentistry (Austria). They have created a prefabricated single unit tooth-colored post and core employing high density laser sintered composite material that has the elastic modulus akin to that of dentin to resolve this drawback of using a separate core<sup>1</sup>. This post has a shape that replaces the coronal part of the abutment aiming to provide a simplification of the build-up steps, the core material being part of It is made of translucent resin the post itself. composite and without fibers. Edelweiss post consists of barium glass, strontium and zinc oxide (antibacterial) embedded in resin. The Edelweiss post and core system is a laser sintered nanohybrid composite monobloc. The posts have a conical shape and avoid wedging effects.

Edelweiss post is available in different types like anterior, premolar, and molar.Edelweiss post comes with a specific drill provided by the manufacturer which allows inward progression of drill flutes designed to allow debris out of the canal with improved metallurgy. Solid center core maintains centrality within the canal and allows for ideal post fit. Additional stepped cutting tip enhances cutting and shaping of post space.

The post material should have the same modulus of elasticity as the root dentin to distribute the applied forces evenly along the length of the post and the root. Post with modulus of elasticity significantly greater than that of dentin might create stresses at the tooth/cement/post interface, with the possibility of post separation and failure. Modulus of elasticity of glass fiber post is approximately 13-40 Gpa and of Edelweiss post 20 Gpa which is similar to that of dentin 18 Gpa.<sup>3</sup>

**Anusavice et al** recorded in their study that the maximum biting force is about 756N.<sup>33,34</sup> The maximum biting force suggested by Anusavice was substantially lower than the estimates for the glass-reinforced fiber post's fracture resistance. Thus, even if the glass fiber post's fracture resistance is lower than that of the Edelweiss post and core combined, it may not have any clinical relevance in function.<sup>1</sup>

The present study evaluates and compares the fracture resistance of Edelweiss post and Glass fiber post and highest fracture resistance was observed with Edelweiss post (296.2) N followed by Glass fiber post (237.2) N. The edelweiss composite post and core system demonstrated a high fracture resistance.

#### CONCLUSION

Within the limitations of this study, the following conclusion was drawn:

The Edelweiss resin composite post and core single unit demonstrated much greater fracture resistance (approx 20%) than the Glass fiber post with a separate composite core build-up.

#### **CONFLICT OF INTERESTS** Nil

#### SOURCE OF FUNDING Nil

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