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Original Research Article

"Comparative Evaluation of Fracture Resistance of Custom Cast Post and Core, Pre-Fabricated Post and Core and CAD/CAM Fabricated Post and Core: An In-Vitro Study"

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Abstract: The aim of the study was to compare and evaluate fracture resistance of Custom Cast post and core, Pre-fabricated post and core and CAD/CAM fabricated post and core. ***Material and Methods*:** 60 transparent endoblocks with single root canal that simulated natural teeth were randomly divided into 3 groups of 20 endoblocks each. The working length of the root canal in the transparent endobloc was determined. The canals were prepared with K-file sizes 10,15 and 20 followed by Protaper Ni-Ti files (sizes S1, S2, F1 and F2); Dentsply by using the crown down technique to the full working length. Gutta percha was removed from the root canals with Peeso drills to a depth of 12 and post spaces were prepared in all groups with the special preparation drills of each system leaving 5mm of gutta percha in all specimens. For group 1, after root canal treatment of 20 samples, Prefabricated plastic burnout posts were coated with pattern resin and then inserted into the canal with slight pressure to take the canal impression which was further send for casting followed by using GC gold label glass ionomer resin for luting. For group 2, the Prefabricated EDELWEISS post and core were placed into the canal and the cement was allowed to set. For group 3 impression of the canal was made using pattern resin. The burnout post was scanned with a lab scanner and designing was done using the designing software. CAD-CAM fabricated post and core was placed into the canal and luted with the help of glass ionomer cement. Composite core fabrication was done and the specimens were secured in a universal load-testing machine at an angle of 130^0 to the long axis of the tooth. Until fracture occurred, a compressive force was applied at a crosshead speed of 1 mm/min. The fracture loads were determined. Mean failure load for each group was recorded in N. ***Results*:** The mean fracture load of Group 1, was found to the maximum followed by Group 3 & Group 2 samples, in decreasing order. ***Conclusion*:** The mean fracture loads of the Custom cast post and core system were significantly higher, even more than the acrylic endoblocks indicative that when placed in natural teeth might lead to its fracture. Due to high rigidity and higher modulus of elasticity of the cast metal post the fracture susceptibility of endodontic tooth is high.

Keywords: Post and core, fracture resistance, prefabricated, CAD/CAM, endoblocks.

INTRODUCTION

When there is an inadequate amount of sound tooth structure remaining to retain a conventional crown, a post and core crown is a type of dental restoration required in such cases. Before the tooth is restored with post and core, teeth that have been endodontically treated, they first must meet certain criteria such as it should have a good apical seal, no sensitivity to pressure, no exudate, no fistula, no apical sensitivity and no active inflammation [1].

Posts are restorative dental materials placed in the root canal of a structurally damaged tooth after the biomechanical preparation is done to provide adequate retention for the core and the coronal restoration. The

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core is retained by the post. The root retains the post, the post retains the core and the core retains the crown. It is best to leave 5mm of the gutta percha to avoid disturbing the apical seal as curved and lateral canals may be present, the absolute minimum is 3mm. Long posts which are about $2/3^{rd}$ of the root length are more retentive than short posts which are more likely to cause a root to fracture. The post diameter should not be greater than one-third the root diameter. Post length is more important than width as wide posts generates more stresses when it is short. So, medium to wide posts should be avoided if the post is short as it generates more stresses. Presence of serrations, roughening and grooves increases the retention of posts. There are different shaped posts such as; parallel, tapered, threaded (screw) with threaded post being the most retentive[1]. Posts can be preformed or prefabricated or custom-made. Custom made posts such as custom cast post, the split shank threaded post (flexipost), prefabricated posts such as titanium, carbon fiber, glass fiber and ceramic posts.

Core are restorations placed in order to build up a broken-down tooth replacing carious, fracture or missing coronal structures before the final indirect restoration. Amalgam and composite resins can be used as core materials. In MOD cavities, composite is preferred over amalgam as an acceptable restorative material for endodontically treated posterior teeth as it makes the tooth more resistant to fracture and even if the core fails, the tooth can usually still be restored.

The longevity of the post and core system depends highly on how well they adhere together whether between the post and core, post and tooth, core and tooth or between the post-core and the coronal restoration. The different indications for post-core system are excessive loss of tooth from caries, fractures or previous restoration weakened tooth or abutment tooth for fixed or removable denture that is compromised or teeth liable to fracture following endodontic treatment, vital tooth with insufficient coronal tooth that will support the indirect restoration [1].

Custom cast metal post-cores have been successfully used to restore teeth from a very long time, although esthetic concerns have in increased the use of tooth-colored glass fiber and zirconia ceramic posts, which provide the necessary retention for the core. The core replaces any lost coronal tooth structure either due to fracture or endodontic failure, enabling optimal tooth preparation geometry. The custom-made post is the time-proven accurate method for post and core construction. When properly designed, the custom-made post can conform to a canal of any shape to provide maximum retention and allow a more even distribution of stresses throughout the tooth structure [2]. The metal posts are a type of rigid post with a high modulus of elasticity. Metal cast posts exhibits high fracture resistance [3].

Cast post and cores can be made of various metal alloys such as gold, titanium or another metal. Where a metal post could be difficult to conceal, a custom post made of zirconia can be constructed; its tooth color leaves less of a shadow under the final restoration. To achieve optimal internal seating; a cast post and core restoration needs to be slightly undersized in comparison with the canal crown, in contrast, needs to be slightly larger to achieve optimum seating. Metal prefabricated posts are also called as screw posts. This is because they are screwed inside the root space with specific screw-keys. On the other hand, fibre-reinforced posts are cemented inside root canals with composite material.

In the last decade computer supported technologies for building prosthesis such as CAD/CAM has become very popular. CAD/CAM milling though expensive has eliminated manufacturing and human errors and improved the accuracy of fitting using the traditional casting technique. CAD/CAM uses the same initial procedures for creating a metal post-core[3].Then it is scanned and digitized by the dental laboratory before the zirconia is milled and sintered. Strong, esthetic post and core restorations can be fabricated from strong zirconia with CAD/CAM technology. Fabrication of durable esthetic restorations in cases with high functional loading done by the reinforced zirconia ceramics and the unification of the post, core, and crown in a single unit decreases the frequency of failure by creating a monobloc effect. The option of expeditiously preparing these high-strength all-ceramic restorations is provided by the use of CAD/CAM technology for designing and fabricating ceramic restorations offers.

Automation of fabrication procedures with increased quality in a shorter period of time. They are able to minimize inaccuracies and reduce hazards of infectious cross-contamination. The machinable zirconia ceramics are extremely suitable for the fabrication of restorations by CAD/CAM technique as they can be designed and milled in their soft presintered condition and subsequently sintered to achieve their physical benefits. The CAD/CAM technique offers these advantage of reducing the chair side time by reducing the number of clinical procedures involved in fabrication [4]. But it has one disadvantage that it is difficult to remove if an endodontic re-treatment is indicated.

Recently prefabricated post and core systems have come into existence. Typically, prefabricated posts are used in a two-step procedure in conjunction with a plastic material such as composite resin, glass ionomer, or amalgam: first the post is cemented; then the selected core material is applied. After shaping of the core and remaining tooth structure to optimal crown preparation form, an impression is made and a crown fabricated. The EDELWEISS POST & CORE system, which is a simple and a quick solution for all post-endodontic needs is also currently in use. The one piece composite post and core can be customized as per the needs of the tooth with a true monobloc effect. It is an ideal choice for rebuilding and strengthening broken down teeth. Cementation is done using edelweiss flowing composite, dual care composite material or adhesive resin cement.

The purpose of this study is to compare the fracture resistance of 3 different types of post-core systems i.e. custom cast, prefabricated and CAD/CAM fabricated post and core and to evaluate which post-core system can withstand the maximum masticatory loading in the human mouth.

MATERIALS AND METHODS

60 transparent endoblocks with simulated single root canal were used in the study. The working length of the root canal in the transparent endoblock was determined. The canals were prepared with K-file sizes 10,15 and 20 followed by Protaper Ni-Ti files (sizes S1, S2, F1 and F2; Dentsply by using the crown down technique to the full working length. Root canal were obturated with laterally compacted with gutta percha and root canal sealer. Gutta percha was removed from the root canals with Peeso drills to a depth of 12 mm, and post spaces were prepared in all groups with the special preparation drills of each system leaving 5mm of gutta percha in all specimens. For group 1, after root canal treatment of 20 cast post samples, Prefabricated plastic burnout posts were coated with pattern resin and were marked at 12mm on metallic scale. Pattern resin powder and liquid was mixed in container according to manufacturer's instructions. Posts were coated with pattern resin and then inserted into the canal with slight pressure to take the canal impression. After 30 seconds post patterns were removed with impression of canal and excess material was trimmed with air rotor. Posts were again inserted into thecanal and then pattern resin was mixed to build the core. The projecting portion of the post was coated with pattern resin and core was formed. After 10-15 seconds core were finished with air rotor. Sprue wax were attached on core patterns with PKT instrument and fitted to crucible former. Casting ring was then placed over crucible former and sealed properly. Phosphate bonded investment material was mixed according to manufacturer's instructions with a mixture of its special liquid and double distilled water at the recommended ratios [160 gm of investment material to 24 ml of liquid] mixing was done for 60 seconds in a vacuum mixer. Mixed investment was poured in the ring with mild vibration on an investment vibrator. The mould was kept for 30 minutes to bench set. All the castings were done in an induction casting machine with nickel chromium base metal alloy which was molten at the manufacturers recommendations by preheating in crucibleat 950 degree Celsius and then, at casting temperature of 1490 degree Celsius. After casting procedure moulds were allowed to cool down until warm to touch. The castings were divested by removing the investment material in a sandblasting unit 0.4MPa pressure and then ultrasonically cleaned in distilled water for 15 minutes, rinsed and dried. After washing sprues were cut with carborundum disk and cast patterns were examined under 10 magnification for any casting defects. Casting having more than one internal nodule were rejected and all castings were steam jet cleaned. The fitting of each casting was verified on its respective tooth and adjusted as needed and finishing was done with straight fissure and round bur (no. zero). Final polishing was done with rubber disk and buff with polishing cake. The prepared post space was then dried with paper points. GC gold label glass ionomer resin was mixed with an agate spatula and was carried into the prepared space for luting, then the cast post and core were inserted into the canal and excess cement was removed. For group 2, after root canal treatment of 20 prefabricated post samples, the GC gold label Glass Ionomer resin was manipulated with agate spatula and with the help of carrier was placed in the post space. The Prefabricated EDELWEISS post and core were placed into the canal and the cement is allowed to set. Excess cement was carved out. For group 3, after root canal treatment of 20 CAD-CAM fabricated post samples, Prefabricated plastic burnout posts were coated with pattern resin and were marked at 12mm on metallic scale.Posts were coated with pattern resin and then inserted into the canal with slight pressure to take the canal impression. Then the burnout post was scanned with a lab scanner and designing was done using the designing software. After the designing was done, the zirconia disks were loaded and in the machining software, the command to manufacture was given. After the cutting was done, the obtained post and core was sintered by keeping in the sintering machine for 18 hours. Glazing was done and the CAD-CAM fabricated post and core was placed into the canal and luted with the help of glass ionomer cement.

Composite core fabrication was done on the 20 Samples of Custom cast post and core, 20 Samples of Prefabricated post and core and 20 samples of CAD-CAM fabricated post and core. Block and the core was etched for 45 seconds. After washing bonding agent was applied on the tooth and post. Light polymerization was done for 10 seconds. The composite crown was made and light polymerized. Tooth is prepared with air rotor and bur. Specimens were secured in a universal load-testing machine with the use of a device that allowed loading perpendicularly and the palatal surface of tooth placed at an angle of 130^0 to the long axis of the tooth. The load head was placed on the specially formed palatal step. A compressive force was applied at a crosshead speed of 1 mm/min until fracture occurred. The fracture loads were determined. Mean failure load for each group was recorded in N.

RESULTS

Intergroup comparison of Mean fracture load was done using one way ANOVA. A statistically significant difference ($F=619.623$, $p = <0.001$) was found among three study groups regarding Fracture load.

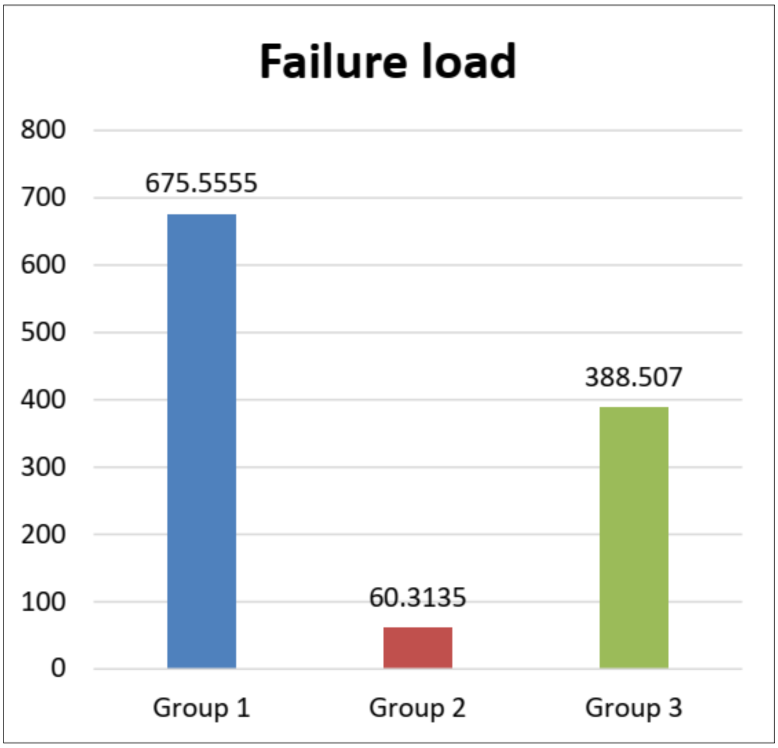
(Table 1). Post hoc pairwise comparison was done using Tukey's test. It showed that a statistically significant difference was found, among Gr 1 & Gr 2, Gr 1 & Gr 3 and Gr 2 & Gr 3. In other words, the mean fracture load of Gr 2 samples was found to be significantly lower than that among Gr 3, which was further significantly lower than that among Gr 1. (Table 2), The mean fracture load of Group 1, was found to the maximum followed by Group 3 & Group 2 samples, in decreasing order. (Graph 1).

Tables 1: Intragroup and Intergroup comparison for fracture resistancde

Failure load					
	Sum of Squares	**Df**	**Mean Square**	**F**	**P value**
Between Groups	3790870.222	2	1895435.111	619.623	<0.001, S
Within Groups	174363.731	57	3059.013		
Total	3965233.953	59			

Table 2: Analysis of mode of failure with Post hoc Tukey's test

Multiple Comparisons						
Dependent Variable: failure load						
Tukey HSD						
(I) group	**(J) group**	**Mean Difference (I-J)**	**Std. Error**	**P value**	**95% Confidence Interval**	
					Lower Bound	**Upper Bound**
Gr 1	Gr 2	615.24200*	17.49003	<0.001, S	573.1537	657.3303
	Gr 3	287.04850*	17.49003	<0.001, S	244.9602	329.1368
Gr 2	Gr 3	-328.19350*	17.49003	<0.001, S	-370.2818	-286.1052



Graph 1: The overall fracture resistance (in N) of the test groups

DISCUSSION

Endodontically treated teeth are considered by many clinicians to have an increased susceptibility to fracture. The reasons postulated relate mainly to the loss of internal dentine during root canal therapy, and a change in the mechanical properties of dentine due to desiccation. It is common to find the suggestion that a post can serve not only to retain an artificial crown but also to 'reinforce' the remaining tooth structure. For this reason, posts are sometimes inserted in root treated teeth even when the crown remains relatively intact. Until recently this practice has been based on anecdotal evidence [5].

Management of mutilated teeth involves post and core. Most often trauma and decay are associated with an extensive loss of tooth structure, necessitating restoration of the tooth with a complete crown for esthetic and functional rehabilitation. When a large portion of clinical crown has been lost, it is often impossible to achieve sufficient anchorage for a restoration in the remaining dentine. In such situations, a root canal retained restoration is required and indicated [9].

Post-core restoration is recommended for endodontically treated teeth when a restoration fulfilling the tooth's masticatory and esthetic functions is hampered and unable to put to use the coronal tissue. Custom cast metal post-cores have been used for a long time, to successfully restore teeth. Custom cast posts continue to be used, despite the arrival of prefabricated post systems, which are recommended due to their fast application, easy manipulation, and advanced physical properties. Differing stress distributions within the root dentin is due to the variable physical properties of post-core systems cause which can cause failure of the post, root fracture, or core fracture [3].

Beside these complications, the major factor leading to catastrophic failures (non-repairable) is the elasticity modulus. A rigid post is defined as a cast metal post alloy with a high modulus of elasticity. In vitro studies have shown that the stress distribution is more uniform along the root and coronal structures when the cast-posts are well supported. However, metal cast posts also exhibit high fracture resistance. Several metal alloys have been used to manufacture cast posts such as cobalt–chromium (Co-Cr), nickel–chromium (Ni-Cr), and gold alloys due to their hardness, price, and tensile strength. However as an alternate, fiber posts are strong but have significantly less stiffness and strength than metal posts [3].

In the last decade, computer supported technologies for building removable and fixed partial prosthesis, such as computer aided design (CAD) and computer aided manufacturing (CAM), have become very popular. These technologies are used in dentistry to fabricate a variety of prostheses ranging from crowns to long-span fixed partial dentures and removable partial dentures. CAD/CAM milling and direct metal laser sintering (DMLS) are used to fabricate Co-Cr products and these two techniques have decreased cost, eliminated manufacturing (time-consuming processing) and human errors (distortion of wax patterns and irregularities in the cast metal), and improved the accuracy of fitting using the traditional casting technique.

Intraoral digital scanners with CAD/CAM and rapid prototyping have been popular to fabricate post and core with accelerated techniques [3].

Ideal post and core system should have the following features: physical properties similar to dentine, maximum retention with little removal of dentine, maximum distribution of functional stresses evenly along root surface, esthetic compatibility with the definitive restorations and surrounding tissue, good core retention, ease of use. The post should be as long as possible without jeopardizing the apical seal or the strength or integrity of the remaining root structure. A minimum length of 4.0 mm of gutta-percha should remain at the apex to prevent dislodgement and leakage [6].

According to Rosensteil, six features of successful design are identified for post and core such as adequate apical seal, minimum canal enlargement (no undercuts remaining), adequate post length, positive horizontal stop (to minimize wedging), vertical wall to prevent rotation, extension of the final margin onto sound tooth structure [1].

Previously, posts were cast in a precious alloy, or prefabricated posts made of stainless steel, titanium, or precious alloy were used. Recently, several new types of post material have been introduced to the dental community: These are zirconia, titanium specially treated to give adherence to a composite core, or resin reinforced with carbon fibers. These posts are intended to be adhesively cemented into the root canal [9]. Success of post and core treatment depends on case selection, type of post and core used, adhesive resin cement, and operator caliber. Post restoration depends on esthetic need, amount of remaining tooth structure, tooth position, and functional load on tooth. Posts can be classified as custom made or prefabricated, metallic or nonmetallic, flexible or stiff, esthetic or nonesthetic types [8].

A cast post and core may be indicated when a tooth is misaligned and the core must be angled in relation to the post to achieve proper alignment with the adjacent teeth. Cast post and cores also may be indicated in small teeth such as mandibular incisors, when there is minimal coronal tooth structure available for antirotation features or bonding [10]. Cast post and cores are generally easy to retrieve when endodontic treatment is necessary [11]. Cast post may also create root discoloration and ''blue-gray'' effect; if thin bone and gingival tissue are present [6].

The EDELWEISS POST & CORE system is a laser sintered monobloc, designed to prevent the wedging effect. The posts have a conical shape for perfect post space adaptation. The translucency of the fibre free post, supported by the lens design, allows uninterrupted light transmission for complete polymerization. It is an ideal choice for rebuilding and strengthening broken down teeth. Cementation using edelweiss flowable composite, dual cure composite material or adhesive resin cement.

In the last decade computer supported technologies for building prosthesis such as CAD/CAM has become very popular. CAD/CAM milling though expensive has eliminated manufacturing and human errors and improved the accuracy of fitting using the traditional casting technique. CAD/CAM uses the same initial procedures for creating a metal post-core [3]. Then it is scanned and digitized by the dental laboratory before the zirconia is milled and sintered. Strong, esthetic post and core restorations can be fabricated from strong zirconia with CAD/CAM technology. The reinforced zirconia ceramics allow fabrication of durable esthetic restorations in cases with high functional loading and the unification of the post, core, and crown in a single unit decreases the frequency of failure by creating a monobloc effect. In addition, the use of CAD/CAM technology for designing and fabricating ceramic restorations offers the option of expeditiously preparing these high-strength all-ceramic restorations [1]. The superior mechanical properties and esthetics of zirconia made it a promising material for endodontic posts.

The CAD/CAM systems offer the advantage of automation of fabrication procedures with increased quality in a shorter period of time. They are able to minimize inaccuracies and reduce hazards of infectious cross-contamination [4].

Failures of post and core, can often occur as a result of their insufficient physical and mechanical strength. The endodontically treated teeth restored with post and core can produce stresses concentrated at the coronal third of root and at the interface of post and core material. If the moduli of elasticity differ between materials, there is potential for separation of core from the post. 1-piece post and core are more reliable than prefabricated post with direct core [6]. Preventing microleakage within post-and-core restorations is of primary importance. Once the coronal seal is broken, the root canal is susceptible to bacterial penetration, and endodontic failure may occur. Therefore, separation of the core material from the coronal tooth structure is of clinical relevance because it will almost certainly cause microleakage. It was found that the post length had a statistically significant effect on the fracture resistance of post-and-core systems when resin cement was used. Thus, a shorter post may provide adequate retention for a core, but may not provide as much resistance to bending and may place more stress on the root dentin when loaded. Clinically, it could be argued that a longer post is preferable to a shorter post, but is of even greater importance when horizontal stresses on the coronal tooth are great [7].

Post and core interface is the most common site for tooth fractures. Fracture resistance of restoration with post is directly related to post design, post length, post diameter, core material, and type of cement used. It has been observed that core structure provides stress transmission from crown then to post core structure to remaining root dentin. Root fracture occurs when this stress transmission exceeds the withstanding resistance. Physical properties differ from one post type to other. An ideal post system should have higher fracture resistance than average masticatory forces and should have physical properties such as modulus of elasticity, compressive strength, and coefficient of thermal expansion similar to those of dentin. Fracture above the alveolar bone is considered favorable but below the alveolar bone is unfavorable. Posts with significantly greater modulus of elasticity than dentin may create stress at tooth–cement or tooth–post interfaces [8].

In the present study, a total of 60 samples were grouped in three main groups consisting of 20 samples each based on the type of post and core material used the samples being evaluated for fracture strength were prepared according to the stated methodology and stored in water one month prior to fracture. The fracture strength test was performed in Universal Testing Machine at a cross head speed of 1mm/min on the cingulum of the palatal aspect placed at an oblique angle of 130degrees. For statistical analysis, the natural logarithms of the measured force values were used. Following a test of homogeneity of variances, a 1-way analysis of variance (ANOVA) with post material as the fixed-effects factor was performed. Tukey's Honestly Significant Difference (HSD) test was used for comparisons between groups (α=.05).

The results obtained showed that the mean recorded for 20 Samples of Custom Cast post and core in which the fracture strength of the Custom cast post and core was more than the transparent acrylic blocks due to which the block fractured instead of the post and core implying its higher strength. The mean was 675.55 with a Standard deviation of 57.94. The maximum limit recorded was 778.05N and the minimum limit was 778.05 N.

For 20 Samples of Prefabricated EDELWEISS post and core it was seen that the mean was 60.31 with a standard deviation of 15.57. The maximum limit recorded was 83.38 N and minimum was 41.21N.

For 20 Samples of CAD/CAM fabricated post and core, the mean was 388.50 with a standard deviation of 74.68. The maximum limit recorded was 472.29 N and minimum was 283.76 N.

It is seen in Table 1 that the fracture resistance force was more for Custom Cast post and core (M - 675.55 $\pm$ 57.94) as compared to CAD/CAM fabricated post and core (M- 388.50 $\pm$ 74.68) and prefabricated EDELWEISS post and core (M- 60.31 $\pm$ 15.57).

The EDELWEISS post & core system is a simple and a quick solution for all your post-endodontic needs. The one-piece composite post & core can be customized as per the needs of the tooth with a true monobloc effect. The material of the edelweiss post & core is barium glass, strontium and zinc oxide (antibacterial) embedded in resin. The crystals are sintered to a monobloc which leads to perfect mechanics within the material. The flexural strength is similar to that of natural tooth. Congruent precision dental drilling creates a perfectly prepared post space. Different sizes of drills enable therapy for all dental anatomies. There are three different types of the edelweiss post & core: anteriors, premolars and molars." However when comparing the fracture load to Custom cast and CAD-CAM fabricated post and core its fracture strength is low.

Intergroup comparison of Mean fracture load was done using one way ANOVA. A statistically significant difference (F=619.623, p = <0.001) was found among three study groups regarding Fracture load Post hoc pairwise comparison was done using Tukey's test. It showed that a statistically significant difference was found, among Gr 1 & Gr 2, Gr 1 & Gr 3 and Gr 2 & Gr 3. It was concluded that the mean fracture load of Group 1, was found to the maximum followed by Group 3 & Group 2 samples, in decreasing order.

No post and core system provides an ideal solution for all clinical cases. The ideal post and core system would be the one that ideally meets all the mechanical requirements of a prosthesis and absorbs as much of the loads as possible without transmitting them to the root dentin. Maximal conservation of dentin remains a key factor in the choice of restoration procedure for endodontically treated teeth. The cervical ferrule prevents the wedge effect and improves load distribution. The physical resistance of a tooth is improved significantly when it is restored with materials that have a low modulus of elasticity rather than with materials having high modulus of elasticity [2].

However it was evident from this study that Custom cast post and core had a fracture strength so high, even more than the acrylic block in which the post was luted which fractured under load when placed in UTM. The CAD-CAM fabricated custom post and core had a fracture strength higher than prefabricated EDELWEISS post and core.

CONCLUSION

Endodontic therapy is used routinely in contemporary dentistry, but a satisfactory restorative solution is necessary after the root canal has been treated. Root canal treated teeth are generally weakened by caries and subsequent restorative procedures. Loss of dental tissue, due to either caries or cavity preparation, reduces tooth stiffness and fracture strength of the remaining tooth structure in proportion to the increase in cavity width and depth. Endodontically treated teeth which are to be used as abutments in prosthodontic reconstructions, must be judged carefully regarding their ability to withstand a higher load than a single tooth normally is exposed to.

Within the limitations of this study, the following conclusions were drawn:

1. The Prefabricated EDELWEISS post and core system demonstrated the least resistance to fracture loads and the most catastrophic failures.
2. Significantly higher fracture resistance was observed in teeth restored with the CAD-CAM Fabricated post and core system than teeth restored with the other 2 systems tested.
3. The mean fracture loads of the Custom cast post and core system were significantly higher, even more than the acrylic endoblocks indicative that when placed in natural teeth might lead to its fracture. Due to high rigidity and higher modulus of elasticity of the cast metal post the fracture susceptibility of endodontic tooth is high.

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