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Fracture Resistance of Anterior Endocrown Vs Post Crown Restoration: An Invitro –Study

Manar Al-Fadhli [1], Hesham Katamich [2], Cherif Mohsen [3]

1. PhD Researcher at Fixed Prosthodontic Department, Faculty of Dentistry, Cairo University-Egypt
2. Professor at Fixed Prosthodontic Department, Faculty of Dentistry, Minia University-Egypt.
3. Professorat Fixed Prosthodontic Department, Faculty of Dentistry. Minia University-Egypt

Abstract

Objective: This study aims to examine the resistance to fracture of the front endocrown to post-cronial restauration.

Materials and Methods: For this investigation, thirty caries-free removed human maxillary canines with complete root development were chosen. In addition, IPS e.max press and Celtra Press ceramics were used. Thirty samples were made and separated into two groups (15 samples each) based on the ceramic type used. Then, depending to the kind of restorations, each grouping was separated into three subgroups (5 samples each): Endocrown 6 mm, Endocrown 10 mm, and Post +core +crown. In an automated thermocycling equipment, all specimens were treated to a thermocycling method. The samples were thermocycled for 5000 cycles at temperatures ranging from 5 to 55 degrees Celsius, with a dwell time of 15 seconds. For a fracture resistance test, each sample was separately mounted on a computer-controlled materials testing machine. Following the fracture resistance test, all specimens in the test groups were viewed using a USB digital microscope with a magnification of x35, and the images were captured and transferred to an IBM personal computer running Image-tool software (Image J 1.43U, National Institute of Health, USA) to determine the failure mode pattern.

Results: With regard to the test for fracture resistance, the results of this study have shown that no statistically significant distinction exists between IPS e.max press (235.54N) and Celtra press values for medium fracture resistance (235.98N), both with statistically significantly insignificant resistance to fractures. The results obtained in this study showed that the restoration of the endocrowns and the post & core & crown are not significantly different. Although the fracture resistance values were higher in endocrowns than those of post & core & crown. There was also a considerable variance between restaurants with various designs of the endocrowns. Although the resistance to fracture was better in endocrines (10 mm) than indocrowns (6 mm), the surface area may increase.

Keywords

Endodontically Treated Teeth, Fiber Post , Endocrown ,Celtra, E.max.

Introduction

The restoration of endodontically treated teeth is mainly affected by increased risk of coronal damage that leads to tooth breakage. The coronary restoration endodontiously treated teeth was done mostly with metallic and macro maintained postures before

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adhesion was introduced in dentistry. In the past, a post length equivalent to three fourths or the crown length of the root canal at least[1], [2].

An endocrown can be restored for endodontic treatment. It comprises of a crown extending as a single unit a post into the pulp chamber and/or pulp canals [3]. One of the option of restoring [4] endocrowns, severely destroyed supragingival rear tooth structure. Such retrofitting is the most common for broken molars, small and thin roots, shuttered canals or restricted interocclusal space. [5]. Mechanically anchored endocrowns are in pulp chambers (Element 3-4 mm) [5–7] and firmly adherent to hard-dental dentures employing resin cements. [6]. Preparation of small dental structures in comparison with standard post and cores [7], coupled with the lack of root canal intervention [8]., less time is needed for the restoration process and fewer interactions between component and tooth In comparison with traditional procedures.

One of ZLS classes, celtra press (Dentsply Sirona) is a new material that can deliver the highest level of esthetics mimicking natural teeth based on having an amazing chameleon effect, perfect balance of translucency and natural like opalescence only by polishing the material after pressing it. (Celtra press Fact File, 2017).

The most important material for endocrowns is feldspatient ceramic (e.g. Vitabloc Mark II, Vita Zahnfabirk, Bad Säckingen, Germany, Cerec Blocks, Sirona dental systems, Bensheim), leucite ceramic (e.g. IPS Empress CAD, Ivoclare Vivadent Schaan/ Liechtenstein) (e.g. Lava Ultimate, 3M ESPE, St Paul, MN, USA) [9]. Sintering, pressing and more frequently CAD/CAM technologies produce ceramic endocrowns. The refurbishments have attractive esthetic.

The fracture resistance of ETT was significantly influenced by the amount of the adhesive surface, the amount of the rest of the structure and the adhesion quality. [10]. For posterior teeth where the masticating loads are primarily compressive, the manner a post retains the core material is crucial. 11. In vitro adhesive restore tests tested for analyzing cuspid endodontically treated teeth's fracture strength and failure manner.

Materials and Methods

The 30 cavities are free of human maxillary canine excised with no crack or fracture of the whole root development. Teeth with dental skulls, nylon bristle brush, and pumice with low speed handpiece were purified by calculus and soft tissue. For 15 minutes at room temperature for sterilization of extracted teeth, they were stored in 5% sodium hypochlorite.

In a vertical orientation utilizing the centralizing system, all the teeth were moved into the epoxy resin block with a customized Teflon form holder (2cm length, 2cm internal dimeters). Depending on the manufacturing structure, the amount of mixed material required for use was established.

The teeth were cut by means of a super coarser diamontic and copious irrigation perpendicular to the long axis 2mm above the cemento-enamel junction of the proximal surface (1).

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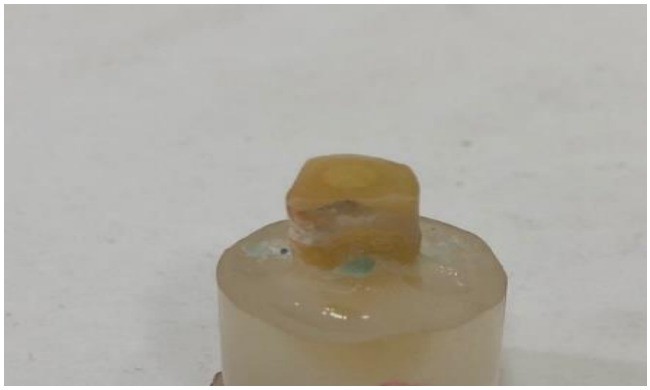

*"**Figure* (1):** Decapitation of the tooth in the epoxy resin block"

The access cavity preparation was done including completely pulp chamber de-roofing and orifice was exposed. Then the radicular pulp was extirpated with a barbed broach.

A size 10 K-type file was inserted into the root canal terminus to determine the canal's working length. Then, using a size 15 K-type file, a glide path was created. The working length was demonstrated by the initial peri-apical x-ray and kept 0.5 to 1mm away from the apical constriction. The filling process is continued by using 20 then 25 sized files respectively. The root channel was used in an adjustable-torque motor* sequence with Pro-Taper Universal instruments (SX, S1, S2, F1, F2) * Following each instrument change, the root canal was irrigated with 2 ml 1% sodium hypochlorite. The channel was flushed with 5 mL of 17 percent EDTA and 5 mL of sodium hypochlorite and then dried with paper dots after the instrumentation.

The master gutta percha cone inserted into the canal for proper working length insurance. Adseal sealer was used to perform the shutting process. Adseal is a twin syringe paste type resin-based root-channel sealer. It provided an easy, standard mixture of the base and catalyst quit volume units (2:1 Wt ratio).They were mixed together on a mixing pad using spatula for 15-20 seconds until creamy homogenous mix was gained. The sealer was applied to the cone size F2 and inserted into the canal. A hot burnisher was used to remove the protruded gutta percha.

Classification of Samples:

Thirty teeth were sorted by restauration into two main groups and three subgroups by preparation designs:

Table 1: classification of the samples

Group (A) LDS (15 samples)	**Subgroup (A1)**	**Post +core +crown**	**5 samples**
	Subgroup (A2)	Endocrown 6 mm	5 samples
	Subgroup(A3)	Endocrown 10mm	5 samples
Group (B) ZN +LDS (15 samples)	Subgroup (B1)	Post +core +crown	5 samples
	Subgroup (B2)	Endocrown 6mm	5 samples

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	Subgroup (B3)	Endocrown 10mm	5 samples

Conventional Postal and Core Group Preparation Supported Crowns:

The preparation of each coolant started with the removal of gutta percha at a depth of 10 mm from the coronary tooth structure by means of gate glidden boxes, the removal of any residual root fill and preparation of a channel with water coolant and at a low speed, radiopaque Glassix fiber composite post drilling (30000 R.P.M). With the cutting of the coronal end with a diamond disks under the copious refrigerant, each glass fiber post was reduced to a length of 12.0 mm, which resulted in a dowel extending 2 mm over its coronal area.

The root canal was etched with 35% phosphoric acid** for 15 seconds, washed with water spray, and then the excess water was removed from the post space using paper points.

The dual-cure RelyX unicem self-adhesive resin cement mortally has been used to laure the fiberglass posting.

The remaining tooth structure was grafted after cementation and the adhesive bonding agent was used in accordance with manufacturing instructions. Composite was used to standardize core heights with increments in the tooth design and polyester crown shapes, and then light for 40 seconds was activated on each surface.

Axial walls have been prepared on the sound tooth structure 1 mm from the cemento-enamel junction with circumferential shoulder margin 90 — 1,000 inches width with round internal line angles. With a diamond stone 10° convergence angle.

For the preparation of teeth, a special frying equipment was employed. The mounting has a standard speed of up to 30,000 RPM perpendicular to the monitoring platform.

Preparation design of Endocrown

The entrance to the pulp canal has been ouvert and Gutta percha can be removed in the access cavity at a depth of 6 mm without undercuts. The coronal pulp chamber and the endodontic access cavity had been made continuous using a cylindrical-conical diamond bur. The entire convergence in the occlusal system is 7°. By maintaining as much fabric as feasible from the canal root walls, the width and thickness of the enamel band should be kept. The cavity depth should amount to 6 mm.

With ultrasonography and its floor, the pulp chamber was fully cleaned. Mesial and distal orientation and undercuts have been preserved with an adhesive and flowing resin system.

The base of the restoration was the stitching joint, or cervical sidewalk, and the surface was stable and able to take the pressure. Parallel to the occlusal plane was created the prepared surface, which ensures the stress resistance along the primary tooth axis. The hollow of the pulp chamber provided stability and retention.

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Extracoronally, it had a shallow, palatal and round inner line angles on a sound tooth structure that prepared the rest of the vertical section of the curvature

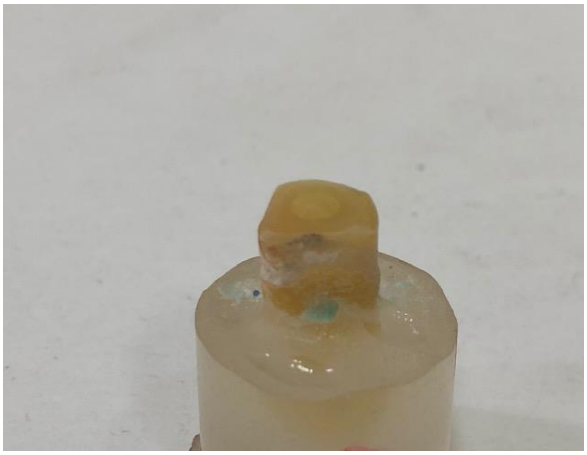

***Figure* (2):** lateral view for preparation of endocrown

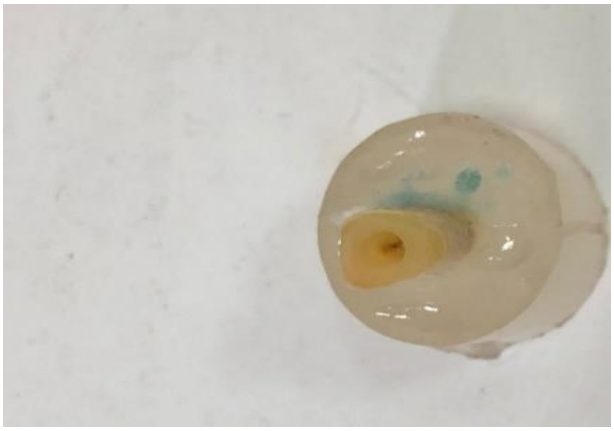

***Figure* (3):** Endocrown preparation without ferrule

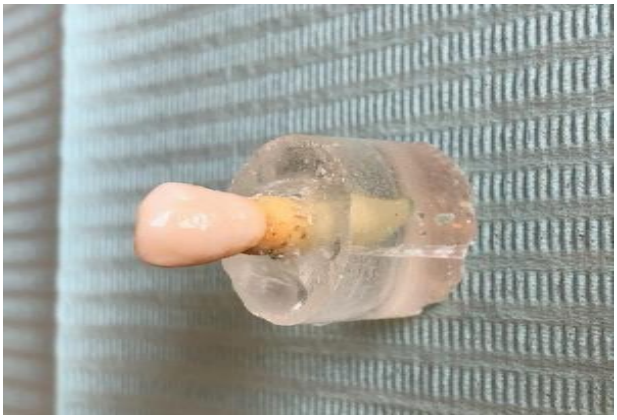

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Figure (4): *Facial and* Lateral view of cemented endocrown

Specimen's classification

The specimens will be divided into 6 sub-groups:

a. The first subgroup consisted of 5 specimens involved "endodontically treated maxillary canine restored with glass fiber posts cemented with" rely x cement, composite filling cores and conventional IPS e.max press crowns following the manufacture instructions.

b. The second subgroup consisted of 5 specimens involved endodontically treated maxillary canine and restored with IPS e.max Endocrown according to design with 6mm preparation.

c. Third subgroup consisted of 5 specimen involved endodontically treated maxillary canine and restored with IPS e.max Endocrown according to design with10mm preparation.

d. The forth subgroup consisted of 5 specimens involved "endodontically treated maxillary canine and restored with glass fiber posts cemented with" rely x cement, composite filling cores and celtra press ceramic crowns following the manufacture instructions

e. The five subgroup consisted of 5 specimens involved endodontically treated maxillary canine and restored with celtra press Endocrown according to design with 6mm preparation

f. The six subgroup consisted of 5 specimen involved endodontically treated maxillary canine and restored with celtra press Endocrown according to design with10mm preparation.

Thermocyclin

All specimens have been exposed to automated thermocycling techniques. The retention test samples were thermocycling 5000 cycles, from 5oC-55oC to 15 seconds, however the number of cycles being employed was 500 cycles between 5oC-55oC for the specimens of the microleakage test, with a duration of 25 seconds.

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Figure (5): Thermo-cycling device

-Test procedure (fracture resistance test):

Bluehill Lite Software from Instron® was used to run tests.

The scans of x35 were taken and images were then transferred to an IBM personal computer equipped with the Image-tool (Image J 1.43U, National Health Institute, USA) to determine failure mode mode pattern according to fracture resistance testing using a USB digital microscope (U500x Digital Microscope, Guangdong, China), magnification (Figure 27).

"Table (2) Classification of failure modes"

"Failure mode A"	The lowest point of fracture line is located above cervical line
"Failure mode B"	The lowest point of fracture line is located between cervical line and tooth root embedded in resin
"Failure mode C"	The lowest point of fracture line is located inside tooth root embedded in resin
"Failure mode D"	More than one fracture lines run vertically and horizontally

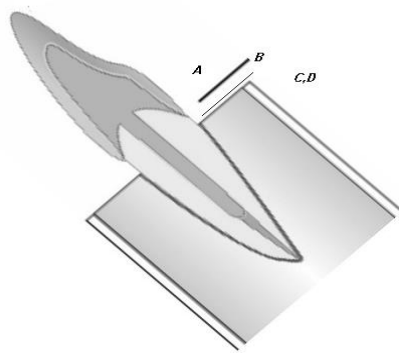

Figure (6): Schematic drawing of failure modes

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2.7. Statistical Analyses:

In numerous steps, data analysis has been carried out. The initial results for each group were descriptive statistics. ANOVA single way and a pair way Post-hoc tests of Tukey have been used to detect meaning among the groups. Between subgroups the student t-test was done. Exact quality testing for failure mode was performed by Fisher. Windows statistics software for Grapg-Pad Instat was used to analyze the statistics (www.graphpad.com). P values = 0.05 in all tests are deemed statistically significant.

Data were shown as medium, standard deviation (SD), trust intervals (low-high) for values. The data have been evaluated by means of the software Graph Pad Instat (Graph Pad, Inc.). Statistically significant was a value of $P < 0.05$. Following confirmation of the homogeneity of variance and normal error distribution, the one-way ANOVA and the student t-test were performed for the comparison of the subgroups and principal groups. The influence of each variable was determined in two ways (material and restorations). Between failure patterns, a Chi square test was performed. Sample size (n = 5) for main effects and pair-sided comparisons was large enough to obtain a high power level of 80 percent and a confidence level of 95 percent.

RESULTS

Fracture resistance

The mean values and standard deviations of fracture resistance (N) are summarized in table (3) and illustrated in figure for both groups in function of restoration types (7).

- "With ***Gr_A***: There was not statistically significant difference ($p < 0.05$) as Subgr***_A3*** recorded mean value (253.86±29.59 N) followed by ***Subgr_A2*** (234.74 ±42.56 N) while ***Subgr_A1*** recorded the lowest statistically significant ($p < 0.05$) mean value (218.01±21.13 N) as indicated by one-way ANOVA test ($p=0.002 < 0.05$). Pair-wise Tukey's post-hoc test showed non-significant ($P>0.05$) difference between ***Subgr_A1, Subgr_A2***. & ***Subgr_A3*** Table (3) and figure (7)"

- "With ***Gr_B***: it was found that ***Subgr_B3*** recorded statistically non-significant ($p > 0.05$) highest mean value (269.39 ±45.34 N) followed by ***Subgr_B2*** (245.54 ±35.39 N) while ***Subgr_B1*** recorded the lowest statistically non-significant ($p < 0.05$) mean value (220.02±18.59 N) as indicated by one-way ANOVA test ($p=0.1235 > 0.05$). Table (3) and figure (7)"

"Table (3) Mean values ± SDs of fracture resistance (N) results for both groups as function of restoration types"

Variable		***Mean***	***SD***
Gr_A	***Subgr_A1***	218.01^{B}	21.13
	Subgr_A2	234.74^{B}	42.56
	Subgr_A3	253.86^{B}	29.59

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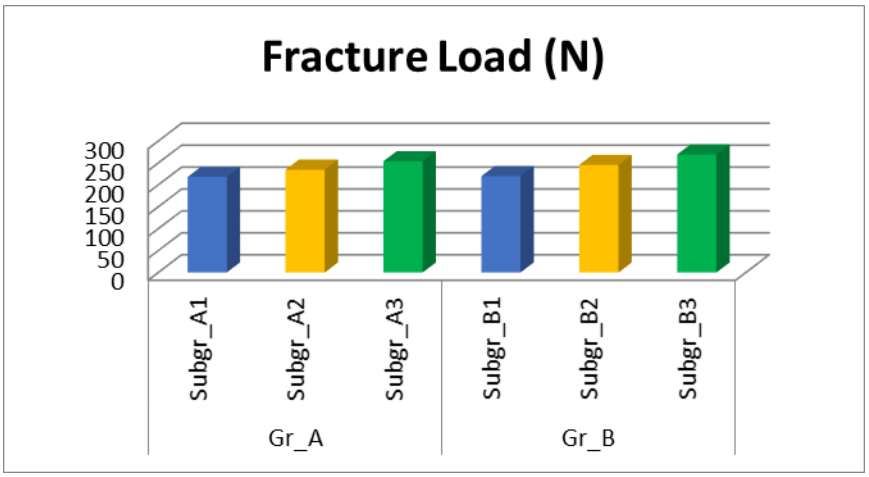
Gr_B	***Subgr_B1***	220.02^{B}	18.59
	Subgr_B2	245.54^{B}	35.39
	Subgr_B3	269.39^{B}	45.34

Various letters in the same column showing a statistically important difference "(p < 0.05*; significant (p < 0.05) ns; non-significant (p>0.05)"



"***Figure (7):*** Column chart of fracture mean values for both groups as function of restoration types"

Group A vs. Group B

- ***"Subgr_1:*** it was found that ***Subgr_B1*** recorded statistically non-significant higher fracture resistance mean value (220.02± 18.59 N) than ***Subgr_A1*** (218.01± 21.13 N) as indicated by student t-test (P=0.8771 > 0.05). Table (4) and figure (8)"
- ***"Subgr_2:*** it was found that ***Subgr_B2*** recorded statistically non-significant higher fracture resistance mean value (245.54± 35.39 N) than ***Subgr_A2*** (234.74± 42.56 N) as indicated by student t-test (P=0.6742 > 0.05). Table (4) and figure (8)"
- ***"Subgr_3:*** it was found that ***Subgr_ A3*** recorded statistically non-significant higher fracture resistance mean value (253.86± 29.59 N) than ***Subgr_ B3*** (269.39± 45.34 N) as indicated by student t-test (P=0.1924 > 0.05). Table (4) and figure (8)"

"**Table (4):** Comparison of fracture resistance (N) results (Mean values ± SDs) between both groups as function of restoration types"

Variable		***Mean***	***SD***	***95% CI***		***t-test***
				Low	***High***	***P value***
Subgr_1	***Gr_A***	218.01	21.13	191.77	244.24	0.8771 ns
	Gr_B	220.02	18.59	196.94	243.09	
Subgr_2	***Gr_A***	234.74	42.56	181.9	287.57	0.6742 ns
	Gr_B	245.54	35.39	201.6	289.47	
Subgr_3	***Gr_A***	253.86	29.59	267.12	340.6	0.1924 ns
	Gr_B	269.39	45.34	213.09	325.68	

"*; significant (p < 0.05) ns; non-significant (p>0.05)"

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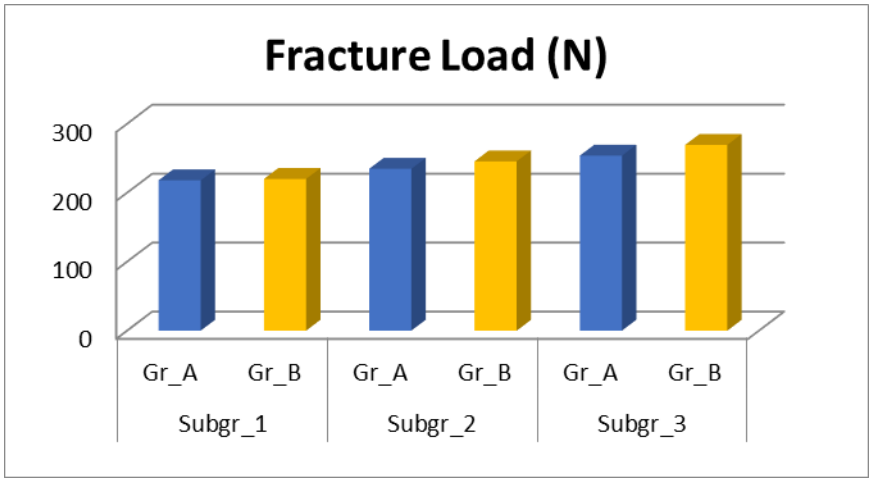


Figure(8): Column chart comparing fracture mean values between both groups as function of restoration types

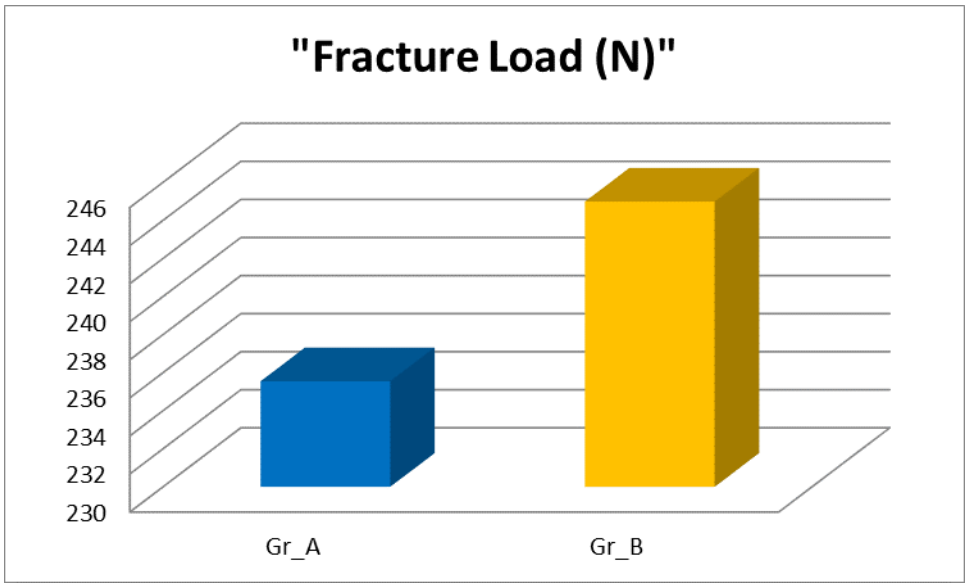
Total effect of material on fracture resistance

Regardless of the restore type, it has been fully observed that Gr A has statistically noticeably recorded a two-way ANOVA test revealed higher mean value of bi-axial flexure strength (235.54± 31.09 N) than Gr B (244.98± 33.11 N). Figure and Table (5) (9)

"Table (5) Comparison between total fracture resistance results (Mean values± SDs) as function of ***material group***"

"Variables"		***"Mean"***	***"SD"***	***"Tukey's rank"***	***"Statistics (p value)"***
Material group	***Gr_A***	235.54	31.09	A	0.543 ns
	Gr_B	244.98	33.11	A	

Various letters in the same column showing a statistically important difference "(p < 0.05*; significant (p < 0.05)" "ns; non-significant (p>0.05)"



"Figure (9) A column chart of total fracture resistance mean values as function of ***material group"***

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Table (6) and Figure show the failure modes of the various groups (10.)

As the chi square test (p<0,05) indicates in table, the distance between the failure modes in Gr A subgroups was statistically significant (6).

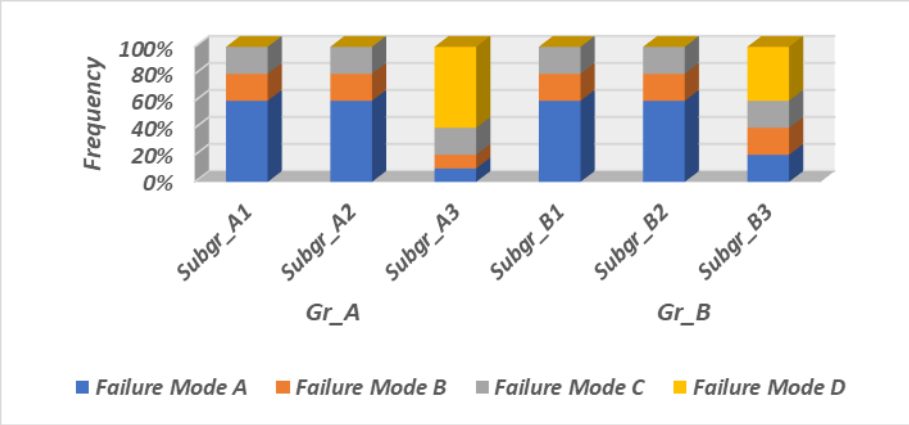
As demonstrated in the table in the chi square test (p<0.05), the difference in the failure modes between Gr B subgroups was statistically non-significant (6).

As the chi square test (p < 0.05) shows in the table, the difference between the failure mechanisms of all subsets was statistically significant (6).

Table (6) Chi square test comparing between failure modes results for both groups as function of restoration types

Variable		***Failure Mode***				***Chi square test***
		A	***B***	***C***	***D***	***P value***
Gr_A	***Subgr_A1***	60%	20%	20%	0%	<0.0001*
	Subgr_A2	60%	20%	20%	0%	
	Subgr_A3	0%	20%	20%	60%	
Gr_B	***Subgr_B1***	60%	20%	20%	0%	<0.0001*
	Subgr_B2	60%	20%	20%	0%	
	Subgr_B3	20%	20%	20%	40%	
Chi test	***P value***	<0.0001*				

*; significant ($p < 0.05$) ns; non-significant (p>0.05)



"***Figure (10):*** Stacked column chart of failure modes for all subgroups."

"Figure (11): Representative microscopic image of failure mode A (X30)"

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"***Figure (12):*** Representative microscopic image of failure mode B (X30)"

"***Figure (13):*** Representative microscopic image of failure mode C (X30)"

"***Figure (14):*** Representative microscopic image of failure mode D (X30)"

Discussion

As a medically compatible and extremely attractive medium, pottery has demonstrated its efficacy. Due to its superior esthetic and fracture resistance, lithium disilicate and their modified class known as zirconia-reinforced lithium silicate are extremely popular. they are strong alternatives to clinic circumstances. [12,13[

In an effort to combine the advantages of both components, lithium silicate pottery reinforced with zirconia fillers were recently launched as zirconia-reinforced parts are intended to boost material strength.

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Celtra® is presented in its fully crystalline form in the dental market, and its mechanical qualities must thus be investigated. While measuring the fracture resistance of the material in vitro cannot be directly associated to clinical survival, it offers a useful clinical insight into the material's clinical performance. [3] The usage of the post, core and cover crown has been the traditional approach to restore endodontically treatable teeth and there is now agreement that the remaining and healthy dental structure must be maintained so that the tooth-restoration complex can be mechanically stabilized as well as the surface adhesive available[14] can be increased.This notion was changed in some respects by the advent of glass fibre posts, since there is lower elasticity modulus compared with metal posts and therefore the benefit of dispersing stress across the postlength and the tooth. (Fokkinga, Vallittu, Kreulen, & Creugers, 2004) [15] This property distinguishes from steel posts, which are more elastic in the apical third of the root, which concentrates streams.

The research nowadays indicates that the use of fiber-glass pillars can reduce root fractures compared to hard metal pillars.

The fiber compounds strengthen the strength of the bending and are easier to restore failures and have the dentin-like module of elasticity. They are loaded, the good absorbs the strength that is focused at the root and so reduces the chance of fracture. [16, 17] [16, 17[

Endocrine restoration on many levels, particularly with regard to clinical treatments, has shown to be easier. It is easier and quicker than the standard post-, core and crown technique and has clinically successfully restored endodontically treated teeth and endocrowns that requires less tooth decrease resulting to sound dental tissue consolidation and preservation. Recent advances in adhesive methods and the latest ceramic materials are referred to in this conservative therapy (Abdel-Aziz & Abo-Elmagd, 2015)[18] (Gresnigt et al. 2016)[19]. Additionally to traditional crown restorations supported by post-core systems, endocrown restauration has been employed for the treatment of teeth with significant crown deterioration.

Under the cemento enamel junction all teeth have been embedded in epoxy resin 2 mm to simulate the root location.

Epoxy resin has been employed as the elasticity modulus (12GPa) near the human bone (18GPa). [20[

All canines were perpendicular to the long 2mm axis above the CEJ to imitate the damaged conditions of endodontically treated teeth. [21[

The crowns and endocrines have been glued with adhesive cement of dual cure. The clinical guidelines for cementation methods have been followed to guarantee that the relevant conditions are closely simulated. [22,23[

The binding strength between the lithium-based resorption and resin adhesives from zirconia has been shown to be depending on restorative surface treatment[24]. The internal surfaces of the restaurants were grafted using hydrofluoric acid for 20 seconds to produce the micro-retention and active surface, according to the directions of the manufacturers. Then a silane-coupled agent with a bi-functional group was applied which serves to obtain a chemical link between silica ceramic and adhesive resin and to strengthen bond strength through improved surface weighting. [25[

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Cementation has been performed with double self-adhesive cement that enables for a simple bonding method and saves time when applying adhesive materials through multiple steps. In addition, numerous authors have described self-adhesive cement as a microleakage and marginal adjustment comparable to sticky cement. [26,27]

In order to eliminate the variable during bonding procedures, rigorous adherence to the bonding techniques for the ceramic material utilized was followed according to the manufacturer guideline.

The dentine and various restaurant materials auto-adhesive cementation has been satisfactorily and comparable with other multistep resin cements, according to Radovic et al [28].

Thermocycling Thermocycling processes in automatic thermocycling machines were applied to all specimens. The retention test samples were thermocycled for 5000 cycles, 5oC-55oC for 15 seconds, however the microleakage test samples utilized for 500 cycles were between 50C-55oC for 25 seconds for dwell time.

With regard to the test for fracture resistance, the results of this study have shown that no statistically significant distinction exists between IPS e.max press (235.54N) and Celtra press values for medium fracture resistance (235.98N), both with statistically significantly insignificant resistance to fractures.

The samples were fitted with a five kN loadcell and data were stored using computer software (Instron® Bluehill software) on a computer controlled material (Model 3344; Instron Industrial Products, Norwood, MA.(

Samples have been secured by tightening the lower fixed compartment of the test equipment. Fracture test was performed with a compressive load mode at the 135° angle, using a metal rod with flat tips (5 mm diameter) attached to the top of the moving test machine that travels at 1 mm/min incisal crosshead speed and with tin foil sheet in the intermediary to obtain an even distribution of stress and a minimization of distress. To imitate the angle of charge in the oral cavity, the angle of the load applied was determined.

Audible crack demonstrated the load in failure and corroborated by a significant drop of the computer's load-deflection curve (Instron® Bluehill Lite software). Software. Newton recorded the load needed for fracture.

All specimens were inspected using a USB digital microscope following the fracture resistance test in the test groups (U500x Digital Microscope, Guangdong, China)

There was a substantial difference between restoration of the endocrown and the post-coeur&crown results observed in this investigation. Although the endocrine levels have increased in relation to the post & core & crown resistance to a fracture. There was also a considerable variance between restaurants with various designs of the endocrowns. Although the resistance to fracture was better in endocrines (10 mm) than indocrowns (6 mm), the surface area may increase.

Lastly, the two ceramics tested did not differ substantially.This may be because the content of zirconia in celtra is according to production only approximately 10%, which has not caused a substantial difference in fracture resistance.

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Price et al.[29] which evaluated lithium disilicate fracture resistance and lithium disilicate strengthened zirconia and obtained the same values. Due to the high crystalline content of fine highly interlocking lithium dilixide crystals incorporated in the glassy matrix upon crystallization, the high fracture-resistance values of E-max CAD were feasible.

There was no statistically significant difference to the results of the mean fracture resistance values of the E-max press and Celtra press. In line with Ap et al[30], the addition of zirconia to the lithium disilicate glass matrix did not boost bending strength due to the increased viscosity due to the ZrO2 concentration and accompanying decreases in the development of crystals.

Chang et al.[31] have indicated that restaurations of leucite-intensified ceramic glass endocystal demonstrate statistically greater fracture resistance than all-ceramic glass fiber-post supported crowns and premolar composite core. The results are the result of improved ceramic material thickness and reduced interface surfaces in post-core crowns for endocrowns [36,37.[

Bindl and Mörmann[32] have shown that endocrowns are more durable than post-core system crowns due to lower stress values, utilizing final element analysis studies18,38). Taking into account the literature, endocrowns with various materials and designs and after core systems were examined in this work.

This indicates that the intracoronal strengthening of any anatomic group of endodontic teeth did not boost the clinical success rate substantially. The coronary coverage of maxillary maxillary, maxillary molars, mandibular premolars and mandibular molars, which were treated by endodontic treatment, greatly improved clinically. The mandibular anterior or maxillary anterior teeth were not considerably affected.

Shaker 2007[33] has observed that the load of endocrowns is lower than the normal crowns. He proposed that glass fiber posts and composite core supporting crowns are an Alternative to endocrowns that demonstrate a rehabilitation if they are restored endodontically treated premolars.

The influence of restore design on the fracture resistance of different ceramics (CAD/CAM) is determined by Ghajghouj & Taśar-Faruk, 2019[34]. The ceramics employed include the intracoronal cavity depth of 2 mm and 3 mm lithium disilicate IPS e.max-CAD, Vita Suprinity and PEEK. PanaviaV5, Relyx Ultimate, or GC were used cements. Results showed that PEEK endocrines had greater resistance to fracture and that the various intracoronal cavity depths had no impact on the resistance to fracture.

The results were also consistent with Hamdy 2015[35] that observed the resistance to fracture of the full crown, which was larger than inlay and endocrown and revealed that the entire coverage crown had the highest fault and inlay pattern.

The results obtained in this study were opposed by change et al 2009[36], who reported that with the adhesive technique that creates enough ferrule the tone could cause the tone of the tooth to lose and lead to the strength of the bonds being impaired, as enamel would rather be used in bonding dentine. Where chang et al., 2009[36] in our investigation employed pro CAD instead of IPS e-max.

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Forberger & Gohring2008[37] concluded that the restoration of the premolars with endocrowns treated with endodontic agents cannot be recommended for post- and core therapy.

The resistance of the anterior teeth was tested endodonstically by the Ramirez et al. 2014[38] and repaired with composite or ceramic crowns and kept without use of post (indocrown) and 5 mm (short) and 10 mm long posts (long). Results showed that there was no significant effect on fracture resistance of the post, postage length and crown material

Conclusion

Within the limitation of this study, based on the result obtained in this current research the following conclusion

1. Restoration endodontically treated maxillary canine with endocrown restorations give rise to higher fracture resistance value than post post and core and crown. although this increase in fracture resistant is not significant.
2. Endocrown(10mm) give highest fracture resistant than endocrown (6mm). yet there was no significant different between the two restorations.
3. The reinforced Lithium silicate (celtra) recorded more significant higher fracture resistance value than Lithium disilicate (e-max)
4. On canine needs further research for being a viable restoration in this condition.

Different materials have no effect on the fracture resistance of endocrown restorations

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