RESEARCH ARTICLE

Evaluation of fracture resistance of Cerasmart and lithium disilicate ceramic veneers with different incisal preparation designs: an *in vitro* study [version 1; peer review: 1 approved, 1 not approved]

Bushra Mohammed ^{1,2}, Jylan EL-Guindy¹

¹Department of Fixed Prosthodontics, Faculty of Dentistry, Cairo, Cairo, 11553, Egypt

²Department of Fixed Prosthodontics, Faculty of Oral and Dental Medicine, Sana'a, Sana'a, Yemen

V1 First published: 23 Aug 2019, 8:1491
<https://doi.org/10.12688/f1000research.20103.1>
 Latest published: 23 Aug 2019, 8:1491
<https://doi.org/10.12688/f1000research.20103.1>

Abstract

Background: Cerasmart hybrid material offers specific advantages such as less fragility and more flexibility than glass ceramics. This material also has the option of readily modifying or repairing the surface and favorable stress-absorbing characteristics. In our study, Cerasmart hybrid and lithium disilicate ceramic laminate veneers with two different preparation designs were compared with regards to their fracture resistance.

Methods: A total of 52 of comparable human central maxillary incisors were used. Group A (n=26) was made up of Cerasmart hybrid ceramic laminate veneers were fabricated from Cerasmart blocks, while Group B (n=26) was made up of lithium disilicate ceramic laminate veneers were made of IPS e.max pressable ingots. Each group was subdivided in two equal subgroups according to preparation designs. Subgroup I comprised Featheredge preparation design and subgroup II: Wraparound preparation design. All samples were subjected to thermocycling between 5°C and 55°C in a water bath for a total of 1750 cycle with 10 seconds dwell time at each bath. The fracture load strength test was performed using a universal testing machine.

Results: There was no statistically significant difference between all groups. E.max wraparound group recorded the highest fracture resistance mean value (422.1 N) followed by Cerasmart wraparound group (317.23 N), then e.max featheredge group (289.6 N), and finally Cerasmart featheredge group (259.3 N) had the lowest value as analyzed by one-way ANOVA.

Conclusions: The Cerasmart hybrid material could be considered as a valid alternative to the widely used IPS e.max material. The fracture resistance of laminate veneers is not influenced by different type of preparation designs.

Open Peer Review

Approval Status

	1	2
version 1		
23 Aug 2019	view	view
1. Khalid M. Abdelaziz , King Khalid University, Abha, Saudi Arabia		
2. Uwe Blunck , Charité-Universitätsmedizin Berlin, Aßmannshauser, Germany		

Any reports and responses or comments on the article can be found at the end of the article.

Keywords

Laminate veneers, Lithium disilicate ceramic, Hybrid ceramic, Fracture resistance, Preparation designs.

Corresponding author: Bushra Mohammed (Ariqi.b@gmail.com)

Author roles: **Mohammed B:** Conceptualization, Data Curation, Funding Acquisition, Investigation, Methodology, Project Administration, Writing – Original Draft Preparation; **EL-Guindy J:** Conceptualization, Supervision, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The author(s) declared that no grants were involved in supporting this work.

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How to cite this article: Mohammed B and EL-Guindy J. **Evaluation of fracture resistance of Cerasmart and lithium disilicate ceramic veneers with different incisal preparation designs: an *in vitro* study** [version 1; peer review: 1 approved, 1 not approved] F1000Research 2019, 8:1491 <https://doi.org/10.12688/f1000research.20103.1>

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Introduction

Laminate veneer restorations have gained popularity and patient contentment owing to their good esthetics and highly conservative tooth preparation designs¹. Pressable and machinable ceramics have developed as an option to the conventional porcelain layering manufacturing method². Ceramics have the benefits of elevated flexural strength and stability of color, while their drawbacks include elevated antagonistic tooth wear and less conservative tooth preparation³. Composite resins can overcome these two drawbacks, although wear of the material itself is higher⁴. While ceramics have higher stiffness and hardness values than the natural tooth, reduced values are shown by composite resins. Therefore, a material is needed that combines the benefits of ceramics with those of composites, causes minimal wear of both the material itself and the antagonistic tooth and preserves the structure of the sound tooth³.

The success rate of ceramic laminate veneers has been clinically evaluated and has shown range from 18 months up to 15 years; the rate of success varies between 75% and 100%. De-bonding, fracture and micro-leakage failures are seen in ceramic veneers⁴. Fractures accounted for 67% of the total failures over a 15-year clinical performance period⁵.

This research aimed to compare the impact of hybrid and lithium disilicate ceramic laminate veneer on their resistance to fracture with two distinct preparation configurations after thermal cycling.

Methods

Ethical approval

This study was approved by the Research Ethics Committee of the Faculty of Dentistry, Cairo University. Approval number 15531.

Sample preparation

A total of 52 human central maxillary incisors were selected for the present study. Teeth scaling and polishing was done to remove any remnants, then they were stored in saline solution at room temperature. To facilitate the handling of teeth, the root of each tooth was mounted vertically with its long axis in Epoxy resin blocks (CMB, Egypt).

Teeth were divided into two equal groups (n=26) according to material: Group A (Cera), Cerasmart laminate veneers, and Group B (e.max), IPS e.max Press laminate veneers). These groups were further subdivided into two subgroups according to preparation design (subgroup I, Featheredge preparation design, and subgroup II, Wraparound preparation design).

Standardized teeth preparation was done using a five-axis computer numerically controlled (CNC) milling machine (Centroid M400 CNC, USA) with water coolants. The labial surface preparation was performed in mesio-distal direction in two planes (cervical one third and incisal two thirds) (Figure 1). The incisal reduction was only performed in wrap-around design (Figure 2). The parameters are summarized in Table 1.

Cerasmart laminate veneers were fabricated using a CAD/CAM system (Omnicam, CEREC MC XL SW 4.0; Sirona Dental Systems GmbH, Germany) using Cerasmart blocks (GC Corporation, Tokyo, Japan). The spacer was adjusted at 30 μ m and laminate veneer thickness at 0.5 mm cervically and 0.8 mm incisally (Figure 3, Figure 4).

IPS e.max Press laminate veneers were fabricated in two steps; first, digital waxing up automated by Exocad CAD software (Exocad GmbH, Germany) to overcome the variation of manually fabricated restorations and to standardize the thickness

Figure 1. Featheredge design labial view (left), palatal view (right).

Figure 2. Wraparound design reduction, labial view (left), palatal view (middle), top view (right).

Table 1. Preparation parameters.

Location	Feather edge design	Wrap around design
Cervical one third	0.5 mm	0.5 mm
Incisal two thirds	0.8 mm	0.8 mm
Finish line	1 mm supragingival chamfer	1 mm supragingival chamfer
Incisal edge reduction	-	1.5–2 mm 1 mm palatal chamfer finish line and thickness of incisal edge was 1mm incisal edge thickness

Figure 3. CAD/CAM virtual veneer (wrap-around design). **Figure 4. Veneer thickness adjustment using Cerec CAD/CAM software. (a) Cervical, (b) middle, (c) incisal.**

of all samples. Second, the pressing procedure was done using IPS e.max Press ingots (Ivoclar Vivadent AG, Principality of Liechtenstein) according to the manufacturer's instructions.

Finally, all laminate veneers were checked on the corresponding prepared tooth for proper seating and marginal adaptation (Figure 5, Figure 6).

All restorations were cleaned using an ultrasonic cleaner (Shenzhen, China) for 180 seconds, the fitting surfaces of the veneers were etched with 9.5% hydrofluoric acid gel IPS Ceramic Refill (Ivoclar Vivadent AG, Principality of Liechtenstein) for 60 seconds for Group A teeth and for 20 seconds for Group B teeth, followed by thorough washing by air/water spray for 30 seconds and drying using air spray. Silane coupling agent Monobond-S (Ivoclar Vivadent AG, Principality of Liechtenstein) was applied for 60 seconds and air-dried before cementation.

The prepared teeth were acid etched using 37% phosphoric acid Scotchbond Universal Etchant (3M ESPE, USA) for 15 seconds and rinsed with air/water spray for another 10 seconds then

dried with air spraying. With a fully saturated micro-brush tip two consecutive coats of Single Bond Universal adhesive (3M ESPE, USA) were applied on the prepared enamel surface and thinned gently by air spray for 2–5 seconds. Light cure RelyX Veneer cement (3M ESPE, USA) was used to lute the laminate veneers on their corresponding prepared teeth. The cement was applied on inner surface of the veneers and the veneers were seated with gentle finger pressure on the prepared teeth. Excess cement was removed immediately with an explorer, the exposed margins were covered with glycerin gel to prevent formation of an oxygen-inhibiting layer and ensure the complete polymerization of the cement. Margins were light cured for 20 seconds from the incisal, lingual, mesial and distal directions each respectively.

Fracture resistance test

All samples were subjected to thermocycling between 5° and 55°C in a water bath at each temperature for a total of 1750 cycles with a dwell time of 30 seconds at each temperature (water bath) and 10 seconds transport time between the two baths. Fracture resistance test of all samples was performed using a universal testing machine (Instron, Model 3345; Instron industrial, USA) by compressive mode of load applied at 135° angle to the lingual

Figure 5. Verifying veneer adaptation over prepared tooth (Featheredge design).

Figure 6. Verifying veneer adaptation over prepared tooth (Wraparound design).

surface of the tooth to simulate the clinical situation as closely as possible⁶. The load was applied using a metallic rod with flat tip (3.8 mm diameter) attached to the upper movable compartment of testing machine traveling at cross-head speed of 1 mm/min with tin foil sheet in-between to achieve homogenous stress distribution and minimization of the transmission of local force peaks (Figure 7). The load required to fracture was recorded in Newtons.

Statistical analysis

Data were gathered, tabulated and analyzed statistically using SPSS statistical software (Version 21, Chicago, IL, USA). One-way ANOVA followed by pair-wise Tukey's post-hoc tests were performed to detect significance between groups. Student t-test was performed to detect significance between paired groups. The level of significance was set at 5% for all statistical analyses and confidence interval at 95%.

Figure 7. Load application using the universal testing machine.

Results

Fracture resistance

E.max wrap-around group recorded statistically non-significant ($P>0.05$) highest fracture resistance mean value (422.1 N) followed by the Cera wrap-around group (317.23 N), and then E.max feather-edge group (289.6 N), while Cera feather-edge group recorded the lowest fracture resistance mean value (259.3 N) (Table 2 and Figure 8).

The e.max groups recorded statistically non-significant ($P>0.05$) higher fracture resistance mean values than Cera groups. Wrap-around groups recorded statistically non-significant higher fracture resistance mean values than feather-edge groups as indicated by the results of Student's t-test.

Mode of fracture of the tested samples

The following aspects were considered to assess the failure:

- 1- Tooth (Intact or fractured)
- 2- Veneer (Intact or fractured)
- 3- Tooth-veneer junction (Intact or debonding)

The behavior of samples differed; the results are tabulated in Table 3. None of the restorations tested were fractured. The fracture when occurred was in the tooth structure; root, cervical or incisal edge fracture. The type of failure was either cohesive; fracture in the tooth, adhesive; debonding of the veneer without fracture of the tooth, or adhesive-cohesive; debonding of the veneer with fracture of the tooth (Figure 9, Figure 10). E.max groups showed cohesive type of failure only. Cera groups showed all types of failure.

Discussion

Ceramic laminate veneers are a popular, safe and successful technique to restore discolored, worn, malformed or broken teeth⁷. The ongoing development of esthetic and functional ceramic adhesive restorations allows the patient's smile and self-esteem to be improved⁸.

For this research, maxillary incisors were chosen as more fractures are observed in veneers prepared on maxillary incisors and due to the elevated demand for aesthetics in this area⁹.

Although some investigators^{10,11} used periodontal ligament simulation material, it was not used in this research so that the gradual load applied to the coronal part of the embedded tooth would not have been lightened by the interposition of the

Table 2. Comparison between four groups regarding fracture resistance.

e.max feather-edge, N		e.max wrap-around, N		Cera wrap-around, N		Cera feather-edge, N		P value
Mean	SD	Mean	SD	Mean	SD	Mean	SD	
289.6	88.1	422.1	203.6	317.2	108.6	259.3	109.1	0.06 NS

SD, standard deviation; NS, not significant.

Figure 8. Column bar chart showing a comparison between the four groups examined.

Table 3. Number of samples in each group relative to their fracture behavior.

Group	Tooth		Veneer		Tooth-veneer junction	
	Intact	Fractured	Intact	Fractured	Bonded	Debonded
E.max feather-edge	0	13	13	0	13	0
E.max wrap-around	0	13	13	0	13	0
Cera feather-edge	7	6	13	0	6	7
Cera wrap-around	5	8	13	0	8	5

Figure 9. Fracture of tooth root without debonding of the veneer (cohesive failure).

Figure 10. Veneer debonding. (a) Intact tooth (adhesive failure); (b) fractured incisal edge (adhesive-cohesive failure).

simulation material between the tooth root and the surrounding epoxy resin¹².

Different designs of incisal edge teeth preparations for laminate veneers were suggested by multiple authors^{6–9}. Meijering *et al.*¹³ found that the incisal edge preparation design was not linked to the restoration success in a 2.5-year clinical study. Prasanth and Friedman¹⁴ found that both feather-edge and butt joint preparations were superior to the palatal chamfer. Moreover, Prasanth *et al.*¹⁵ suggested that the feather-edge offered advantages in tooth reduction, veneer preparation and cementation.

On the other hand, the benefits of the palatal chamfer margin can be explained both mechanically and adhesively. The mechanical advantage of the palatal extension of ceramic veneer is that it serves as a shear key and holds the veneer against the tooth. The adhesive advantage is the increased surface area for adhesive interface bonding on the palatal aspect¹⁶. Hence, it is critical to understand whether different preparation designs can affect longevity of ceramic veneers.

In this research, 0.5–0.8 mm labial reduction was performed to assure that the reduction is restricted to enamel, which increases the bonding and the strength without over-contouring^{17,18}.

The materials used in this study were lithium disilicate and Cerasmart. IPS e.max lithium disilicate glass ceramic has a distinctive mixture of strength and optical characteristics and is available as pressable ingots or machinable blocks. The higher flexural strength and fracture toughness of IPS e.max press over e.max CAD made it the material of choice in our study¹⁹. The Cerasmart hybrid ceramic was selected as it is less brittle, more flexible and has better stress-absorbing characteristics than standard ceramics²⁰.

In vitro simulation of oral conditions allows better evaluation of performance of dental materials. Thus, thermal cycling was used to simulate oral cavity thermal modifications that can introduce stresses to the bonded interfaces²¹.

Our fracture resistance results for both IPS e.max lithium disilicate and Cerasmart hybrid materials showed non-significant differences, indicating that Cerasmart is a comparable material to IPS e.max and may represent alternative material for laminate veneers. This result could be related to the favorable association of low flexural modulus and proper flexural strength of the hybrid material, which improves the capacity to resist loading by more elastic deformation before failure²². By contrast, ceramic materials showed comparatively elevated flexural strengths and flexural modules, which reduced the capacity to undergo deformation to absorb the stress of enhanced loading²³. Another crucial aspect that illustrates this point is the behavioral synergy between the hybrid and adhesive structure with comparable compositions and elevated bonding ability¹⁸.

Regarding the fracture mode, it could be linked to the materials' flexural strength and modulus of elasticity. Whenever the

veneer's flexural strength cannot offer tooth protection, its fracture will occur to prevent the delivery of the applied force to the tooth²⁴. Additionally, the low modulus of elasticity correlates to increased deformation under load¹⁸. Accordingly, Cerasmart veneers were more likely to absorb the stresses which is considered a benefit to endure intra-oral forces and protect the underlying tooth structure against fracture. The e.max veneers showed only teeth fractures (cervical/root) following stresses.

Castelnuovo *et al.*¹² reported the presence of coronal, cervical and root fractures of teeth could be restored with leucite glass ceramic veneers. This is because the enamel not only generates an extremely predictable and stable bond, but also gives the tooth a stiffness that seems appropriate to replicate the tooth's initial stiffness²⁵.

The findings of this study showed that the feather-edge group had a statistically non-significant reduced mean value of fracture resistance than the wrap-around group in terms of preparation design, regardless of the material.

This was in agreement with the results of Highton *et al.*²⁶, showing that the incisal wrap-around design reduces the stresses in laminate veneers by distributing the occlusal force to a wider region. Additionally, De Andrade *et al.*²⁷ found that incisal wrap-around design were three times more resistant to the axial forces than feather-edge design. Moreover, Duzyol *et al.*²⁸ found that incisal overlap design had the highest values of fracture resistance and justified this by their efficient ability to distribute the applied forces on the teeth.

Conversely, Hui *et al.*²⁹ showed that the overlap design will transmit maximum stress on the veneer and increase the risk of cohesive fracture. In a systematic review by Albanesi *et al.*³⁰, ceramic laminate veneers generally had high survival rates regardless of the preparation designs including incisal edge or not.

In the current study, the mean value of the force of fracture was greater than average chewing forces (20–160 N) recorded in the anterior teeth⁹. Consequently, our findings presented are clinically important.

Finally, our ultimate goal in prosthetic dentistry is to provide our patients with the most conservative and satisfactory results. Therefore, careful selection of the most suitable restorative material and tooth preparation design for each clinical case needs to be done.

The test used in this study is considered a limitation, as the specimens were subjected to static rather than cyclic loading.

Conclusions

1. The material used in this study for fabrication of the laminate veneers restorations has no crucial effect on its performance with regard to fracture resistance. Thus, the Cerasmart hybrid material could be considered a valid alternative to IPS e.max material.

2. The fracture resistance of laminate veneers is not influenced by different preparation designs (feather-edge and wrap-around).
3. Cerasmart veneers are more likely to absorb stresses and protect the underlying tooth structure than e.max veneers.

Data availability

Underlying data

Open Science Framework: Evaluation of Fracture Resistance of Cerasmart and Lithium Disilicate Ceramic Veneers with Different Incisal Preparation Designs. (In vitro Study). <https://doi.org/10.17605/OSF.IO/83N96>³¹.

This project contains the following underlying data:

- Fracture resistance (All groups).xlsx (containing the fracture resistance load in N).

- Fracture resistance (Paired groups).xlsx (containing comparisons of the indicated groups).

Data are available under the terms of the [Creative Commons Zero "No rights reserved" data waiver](#) (CC0 1.0 Public domain dedication).

Grant information

The author(s) declared that no grants were involved in supporting this work.

Acknowledgements

We thank Omnia Nabil [MSc, PhD, Fixed Prosthodontics Department, Faculty of Dentistry, Cairo University] for her efforts, valuable guidance and support for completion of this project.

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<http://www.doi.org/10.17605/OSF.IO/83N96>

Open Peer Review

Current Peer Review Status:

Version 1

Reviewer Report 03 March 2021

<https://doi.org/10.5256/f1000research.22071.r78234>

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Uwe Blunck

Department of Operative and Preventive Dentistry, Charité-Universitätsmedizin Berlin, Aßmannshauser, Berlin, Germany

In general:

The authors are using incorrect terms for describing the tested material: the tested CERASMART is not a hybrid ceramic!

Today, a large number of tooth-colored materials for CAD/CAM milling machines are available. These include silicate ceramics (i.e. feldspar ceramics, leucite-reinforced glass ceramics, lithium disilicate-based ceramics, and zirconia-reinforced lithium silicate ceramics), oxide ceramics (i.e. zirconium dioxide ceramics), and a new category of hybrid materials (organic resin matrix highly filled with porcelain particles) recently classified as resin matrix ceramics: these can be further subdivided in ceramics with a “resin-infiltrated matrix”, referring to the so-called polymer-infiltrated ceramic network, and “resin-based composites”, referring to industrial polymerized resin-based composites produced under high-pressure and in a high-temperature environment. The composition of Cerasmart (GC Corp, Tokyo, Japan): Bis-MEPP, UDMA, DMA, 71 wt% of Silica (20 nm) and barium glass (300 nm).

From the literature:

CERASMART® blocks (GC Dental products Europe, Belgium) are composite resin nanoceramic blocks that consist of a polymeric matrix reinforced by ceramic nanohybrid fillers. Goujat *et al.* (2018¹).

The company itself refers to a publication (Lauvahutanon *et al.*, 2014²) which defines Cerasmart as a CAD/CAM composite resin block.

This need to be corrected within the entire paper.

The manuscript also needs the following corrections:

Abstract:

Change to: “All samples were subjected to thermocycling between 5°C and 55°C in a water bath

for a total of 1750 cycle with **30** seconds dwell time at each bath.”

Change to: “The fracture resistance of laminate veneers is not influenced by different **types** of preparation designs.”

Title:

This reviewer also supports the suggestion of the first reviewer for the title ***“Fracture Resistance of Teeth Restored with Hybrid and Glass-based Ceramic Veneers”***. (see below).

Methods:

The term “wrap-around preparation” is not common in the scientific literature. In Figure 2 it looks like a butt joint preparation and it might be helpful for the reader to get more specific details of this preparation design.

The description for the loading process “The load was applied using a metallic rod with flat tip (3.8 mm diameter) attached to the upper movable compartment of testing machine traveling at cross-head speed of 1 mm/min with tin foil sheet in-between to achieve homogenous stress distribution and minimization of the transmission of local force peaks” clearly shows that the mechanical stress is transferred to the tooth and not to the veneer itself. Therefore, this study evaluated the measurement of the stability of the incisors and not of the different veneers.

Conditioning of the veneers:

The authors describe: “the fitting surfaces of the veneers were etched with 9.5% hydrofluoric acid gel IPS Ceramic Refill (Ivoclar Vivadent AG, Principality of Liechtenstein)” There is one hydrofluoric acid on the market (Porcelain Etch, Ultradent) with the concentration of 9.5 % HF, however, IPS Ceramic Etch from Vivadent has only a concentration of 4.5 % HF!

Fracture resistance test:

If the load is - as described before - applied to the “lingual surface of the tooth” the last sentence of this paragraph should be changed to: “The load required to either fracture of the tooth or debonding of the veneer was recorded in Newtons.” Otherwise, the end of the loading should have resulted in tooth fracture, different from Figure 10.

Results:

The sentence “E.max wrap-around group recorded statistically non-significant ($P>0.05$) highest fracture resistance mean value (422.1 N) followed by the Cera wrap-around group (317.23 N), and then E.max feather-edge group (289.6 N), while Cera featheredge group recorded the lowest fracture resistance mean value (259.3 N)” is misleading.

Whenever a statistical evaluation finds no significant difference between the results of two groups, the two groups are considered equal. However, the sentence suggests that there are differences, which is from a statistical point of view not the case, since the differences are - as seen from the statistics - just by incidence.

Discussion:

It would be helpful for the readers to mention in the discussion why the Cerasmart CAD-CAM

composite resin blocks can be conditioned by hydrofluoric acid. Usually it is recommended to pretreat CAD-CAM composite resin blocks by sandblasting with Al₂O₃ (Lise *et al.*, 2017³).

However, Cekic-Nagas *et al.* reported that HA had no effect on the bond strength in CER, ENA and LAV specimens. The main compositions of these materials are silica and silicate compounds, and HA partially dissolved those silicas (Cekic-Nagas *et al.*, 2016⁴).

Manufacturer's instruction recommends both approaches:

CEMENTATION:

With Sandblasting technique:

- 1) Sandblasting with 25-50µm alumina 0.15MPa/1.5bar is recommended.
- 2) Blow the restoration with an oil-free air syringe or clean with an ultrasonic cleaner and dry.
- 3) Clean with alcohol to remove oil residue.
- 4) Treat the surface with a silane coupling agent such as CERAMIC PRIMER II or G-Multi PRIMER.
- 5) Cement with an adhesive resin cement such as G-CEM LinkForce.

With hydrofluoric acid etching:

- 1) Treat with hydrofluoric acid (5%) for 60 seconds.
- 2) Wash with water spray or an ultrasonic cleaner and dry.
- 3) Treat the surface with a silane coupling agent such as CERAMIC PRIMER II or G-Multi PRIMER.
- 4) Cement with an adhesive resin cement such as G-CEM LinkForce.

The authors write: "The findings of this study showed that the feather-edge group had a statistically non-significant reduced mean value of fracture resistance than the wrap-around group in terms of preparation design, regardless of the material."

Whenever a statistical evaluation finds no significant difference between the results of two groups, the two groups are considered equal. Therefore, the sentence should be revised.

Conclusion:

The authors write: "Cerasmart veneers are more likely to absorb stresses and protect the underlying tooth structure than e.max veneers."

This statement by the authors is based on the results that in the two Cerasmart groups 5 and 7 teeth respectively were intact after the loading. However, just the same numbers were found for debonded veneers. It should have been at least discussed in the paper whether the reason could also have been the less effective bonding of the luting resin to the CAD-CAM composite resin, which also might result in a loss of retention of the veneers.

References

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3. Lise DP, Van Ende A, De Munck J, Vieira L, et al.: Microtensile Bond Strength of Composite Cement to Novel CAD/CAM Materials as a Function of Surface Treatment and Aging. *Oper Dent.* **42** (1): 73-81 [PubMed Abstract](#) | [Publisher Full Text](#)
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cements to ceramic/glass-polymer CAD-CAM block materials. *J Prosthodont Res.* 2016; **60** (4): 265-273 [PubMed Abstract](#) | [Publisher Full Text](#)

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

No

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Adhesive Dentistry: adhesion to enamel, dentin, ceramic, composite.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Reviewer Report 27 July 2020

<https://doi.org/10.5256/f1000research.22071.r67491>

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Khalid M. Abdelaziz

Department of Restorative Dental Sciences, King Khalid University, Abha, Saudi Arabia

This article aimed to evaluate the fracture resistance of two different laminate veneer restorative materials. The influence of the preparation design was also considered. The selected materials offer different characteristics based on their structural natures and compositions. Therefore, comparing the performance of these materials in situations mimicking that of the normal intraoral environment is of great importance and would guide the practicing dentist to select the most clinically beneficial material.

General comment:

- The whole article should be linguistically revised. Rephrasing of some sentences is highly recommended.

Title:

- After going through this article, I do suggest some changes to the study title ***“Fracture Resistance of Teeth Restored with Hybrid and Glass-based Ceramic Veneers”***. The new title, according to my vision, would be beneficial for the work and for properly leading the readers.

Abstract:

- The aim of the study should be restructured according to the new title. The conclusion should also be redrawn according to the new aim.

Introduction:

- Should be revised and modified wherever possible according to the suggested aim. Highlights on the actually utilized composite material (as shown at the beginning of the abstract section) should be considered. Referring to previous literature (if any) that showed support/conflict of using these materials would be helpful. The aim should be modified too.

Materials and methods:

- A table showing the detailed description, composition and manufacturer of the used materials must be added. This will help the reader to easily discover the differences between both categories of the restorative materials.
- Testing procedure: The recorded test results were greatly influenced by the bulk of tooth structure. Referring to the testing mechanism, the site of load application would flex the tooth at the cervical third. In the tooth crown the cervical third is having the most bulk of the tooth structure and accordingly shows minimal flexing. Most of the applied force would affect the cervical constriction (at the cervical line) causing fracture of the tooth itself. It is so important for the authors to mention when they exactly recorded the fracture load (must be at the first-heard cracking/clicking sound) simply because if the fracture starts within the tooth at the cervical line, continuous loading could lead to fracture or debonding of the veneer leading to false results.

Therefore, the influence of tooth flexing on the bonded restoration was; accordingly, too minimal to induce fracture unless defective cementation was there to initiate cracking (this can explain the high values of the SD and the insignificant differences between the recorded results). Therefore, in my opinion, the performed test was evaluating the fracture resistance of the restored teeth rather than the fracture resistance of the restorations themselves. To test the fracture resistance of the veneering materials, 3-point flexure test is recommended to test bar specimens obtained from the restored teeth.

Results:

- Duplicate presentation of the results (Tables and graphs) is not recommended.

Discussion and Conclusion:

- Should be adjusted according to the aforementioned suggestions.

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

Partly

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Restorative Dentistry & Dental materials

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

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