ABSTRACT

The no prep technique to ceramic veneer have some advantages, one of the most important is the preservation of tooth structure. **Purpose:** Evaluate fracture resistance in bovine teeth, of ceramic veneer in different thickness (0.3 to 1.0mm). **Methods:** 60 teeth were selected for this study. Forty fifth ceramic veneer were made for each tooth, varying the thickness in: G1 – 0.7mm; G2 – 0.5mm; G3 – 0.3mm and G4 – 1.0mm (control group). Flexural strength test was carried out after 24h of luting. The results were analysed by ANOVA and HSD of Tukey. **Results:** the results showed that was no statistic difference between the groups (G1 - 297.2200; G2 - 294.5467; G3 - 291.9380 and G4 -290.0733). **Conclusion:** The ceramic veneer thickness didn't have influence in the final flexural strength.

**KEYWORDS:** Ceramic. Dental Veneers. Esthetics.

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INTRODUCTION

Ceramic veneer is an alternative to aesthetic dental treatment.1-6 The clinical success of this treatment its possible due of adhesion procedures accomplished in tooth structure and ceramic, including etching, adhesive and silane application.7-11

The adhesive technique allows conservative prep following the Dentistry trend.12-14 The prep accomplished to ceramic veneer can be restricted to enamel or no prep,15-18 representing one fourth to half of ceramic total crown prep.19

The no prep technique to ceramic veneer it’s usually sought by the patients. There are some advantages about the no prep technique as: less anxious; tooth structure preservation; no anesthesia needs and according to the literature, it is a reversible treatment.20,21 On the other hand, there are some disadvantages as: possibility of over configuration; the necessity to involve more teeth; limited translucence; margins prep not visible to technician and occlusion changes.20,21

There are some cases report showing no prep to ceramic veneer treatment, varying the ceramic thickness in 0.3 to 0.7mm.22-24 However, the literature relate that the main cause of ceramic veneer failure is by mechanical reason,25 like ceramic fracture.6,26 Still, the scientific embasement about ultra-thin ceramic veneer needs more grounding.

For this reason, the purpose of this study was evaluated the fracture strength of different thickness of lithium disilicate ceramic in bovine teeth.
METHODS

The ceramic selected for this study was lithium disilicate - IPS e.max Press (Ivoclar Vivadent, Schaan, Liechtenstein). Sixty bovine incisors with similar dimensions were used, the teeth were randomly distributed in 4 groups (n=15): G1 - ceramic veneer with 0.7mm thickness; G2 - ceramic veneer with 0.5mm thickness; G3 - ceramic veneer with 0.3mm thickness and G4 - ceramic veneer with 1mm thickness. Each tooth was included in acrylic resin to facilitate handling. The teeth were stored 24h in distilled water at 37°C.

Standardized ceramic veneer was fabricated with IPS e.max Press (Ivoclar, Vivadent) following the thickness of each experimental groups. The ceramic veneer polishing was carried by abrasive rubber (MasterCeram, Eurodental, Brasil).

The ceramic veneer thickness was measured with a digital pachymeter (Mitutoyo Corporation, Tokyo, Japan) in three points with a precision of 0.01mm.

After all, the inner surface of the ceramic was etched with 10% hydrofluoric acid (Dentsply) for 20s, removed with air/water spray for 1min, followed by fosforic acid 37% (Condac, FGM, Brazil) for 1min. The surface was air dry with air spray during 30s, followed by silane application (Monobond Plus, Ivoclar Vivadent). The teeth surface was treated with fosforic acid 37% for 30s, followed by 60s of air/water spray and dry. Both surfaces, inner of ceramic veneer and teeth surface received an adhesive coat (Tetric N Bond, Ivoclar Vivadent), before light cure, the luting cement was applied in the ceramic veneer (Variolin II, Ivoclar Vivadent). The restorations luted using digital pressure, the excess was removed and photocopolymerized (Olsen) 60s in labial and lingual surfaces. The margins were polished with abrasive rubber (Astropol, Ivoclar Vivadent). The specimens were stored in artificial saliva at 36°C during 48h after test.

The specimens were accomplished in an Instron universal testing machine (4444, Instron, USA). The load was applied perpendicular at lingual surface 2mm from the incisor edge. A stainless steel point was applied with 1mm/min crosshead speed, according to ISO recommendation (ISO/TS 11405/2003), until fracture. The fracture load was measured in Newton (N).

The fracture specimens were analyzed visually and with photography (Nikon D60 an 105mm macro lens, at 15 cm distance; f32 and vel 1s). Both way was analyzed using a transluminator (Microlux, Addent).


The data were analyzed statistically by using SPSS 12 (SPSS Inc., Chicago, IL, USA). ANOVA was applied to analyze the normal distribution of groups. The Tukey HSD test was used to verify which groups had differences between them. The significance level was fixed in \( p<0.05 \).

RESULTS

The groups presented normal distribution therefore the means could be compared by ANOVA one way (\( \alpha=0.05 \)). The multiple comparison test HSD Tukey was used to verify differences between the means.

The tables show the fracture resistance values of experimental groups.

The was no statistical difference between experimental groups G1 – 0.7mm; G2 – 0.5mm; G3 – 0.3mm and G4 – control. The ceramic veneer thickness had not influenced the fracture resistance of this study. Table 3 shows the fracture classification in each group. There was no difference in the fracture patterns found in the experimental groups.

DISCUSSION

The interesting in aesthetic treatment with contact lens had increased. This leads the need for a better compression about the relation teeth/restoration in thin thickness to obtain more scientific datas.39

The present study used a methodology to evaluate fracture strength that is already widespread in literature.30–35 The strength was applied in the buccal face to evaluate the strength in Newtons in the palate face.30 The data obtained with this methodology vary according to the type of substrate used, human or bovine teeth.33–357 Once the methodology used in this study evaluate the ceramic veneer bonded to bovine teeth it is not possible to compare the results with others paper, once there is no longer paper using bovine teeth.

In the present study the results of fracture strength showed no significant difference between the experimental groups, that means, that the thickness of the ceramic veneer 'contact lens' do not influence the fracture strength.
The high bonding to human enamel allows the great longevity to ceramic veneer.\textsuperscript{38,41} As no prep was performed on the bovine teeth place the ceramic veneer, there was no prior loss in the integrity of the teeth.\textsuperscript{42} That means, the teeth remained intact, not influencing the results of fracture resistance due to the possible loss of dental structure (enamel).

Ceramic bonding to dental substrate is important to have clinical longevity.\textsuperscript{43,44} Its know that the ceramic thickness associated to the thin layer of luting agent are the best combination to avoid failures during the restoration clinical performance.\textsuperscript{45} In this study an expert dental clinician was selected to do all the ceramic luting, fact that contributes to obtain suitable clinic results.\textsuperscript{46} All luting was performed manually, without any device to approach the clinical situation. Regarding the ceramic veneer, they were made using all the buccal face size of the bovine teeth, following the anatomic convexity. Naturally, the force distribution on the convex surface its more complicated than in a flat surface. Previous studies have shown that the increase of ceramic thickness raises the values of fracture strength.\textsuperscript{38,47} Fact that can be explained by the different thickness applied in these studies. In the present paper the method used thickness with little difference between them: 0.7 to 0.3mm. All facts argued above can explain the divergence in the obtained results. It can also attribute the fact that the restoration in the buccal face was bigger, influencing the resistance values, that means, the greater the area of the tooth covered by the ceramic, the greater the need for a material with a superior flexural strength.\textsuperscript{25}

Ultimately, its well known that the aesthetic and the patient satisfaction are real and important daily basis in clinic.\textsuperscript{48} The clinical procedures, like teeth prep or no prep, luting, finishing and polishing, are key factors to succeed in ceramic restoration.\textsuperscript{49} Worth noting that the treatment in different area and the correct case planning are important for successful treatment. Nowadays there is a big trend towards the ceramic ‘contact lens’. However, there are others minimally invasive restorative techniques like composite resin.\textsuperscript{50} Its important that the clinician be aware about the advantages and disadvantages about the techniques to apply the suitable for each case.\textsuperscript{51} Burke (2009),\textsuperscript{52} approach a test that he called ‘daughter test’. This test is the question that leads the clinician if he really would indicate the ceramic veneers, with prep or no prep, in his most loved ones. If the answer is positive, proceed with treatment.

It is worth mentioning that clinical follow-up and further studies are essential to assist in the understanding of the tooth/restoration complex, when using ultrathin ceramic veneer without wearing out the dental structure.
CONCLUSION

It can be concluded that the thickness of the tested ceramic (0.7 mm; 0.5 mm; and 0.3 mm) didn’t influence the fracture resistance of restoration, as well as did not influence the fracture pattern found in restored bovine teeth.

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