



CASE REPORT

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Repair Protocol of Porcelain Laminate Veneers Through Reattachment of the Fractured Ceramic Piece: A Technical Report

Protocolo de reparo de laminados de porcelana através de recolocação da peça de cerâmica fraturada: um relato técnico

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ABSTRACT

This technical report has been developed to repair the ceramic laminate veneer without removing after fracture. The bonding between the tooth and the laminate veneer is very strict, thus removing the restoration is difficult. The disadvantages such as the loss of tissue from the tooth, the cost and time loss are eliminated with this technique. In this technical report, the cementation of porcelain to porcelain in the presence of the fractured piece is explained step by step.

KEYWORDS

Ceramic; Laminate veneers; Repair.

RESUMO

Este relato técnico foi desenvolvido para reparar o laminado cerâmico sem remoção após fratura. A união entre o dente e o laminado é muito rígida, remover a restauração é difícil. As desvantagens como a perda de tecido do dente, o custo e a perda de tempo são eliminadas com esta técnica. Neste relato técnico, a cimentação de porcelana em porcelana na presença da peça fraturada é explicada passo a passo.

PALAVRAS-CHAVE

Cerâmica; Laminados; Reparo.

INTRODUCTION

Ceramic laminate veneers have become an important restorative procedure for the treatment of especially anterior teeth because of their biocompatibility, satisfying expectations about esthetics and long-term success in the clinic [1]. Despite the long-term success of ceramic laminate veneers, when clinical follow-up studies were investigated, there are some mechanical failures (debonding, chipping and fracture) [2-4].

Clinicians have to know the mechanical properties of the materials, because of choosing

the correct materials and encountering lower rate of failure. Flexural strength and fracture toughness are important mechanical properties for fracture of glass-ceramic materials. Flexural strength measured the strength of the brittle materials and fracture toughness measured the fracture resistance of brittle materials [5-7]. When investigating suitable materials for laminate veneers, there are two materials mainly: feldspathic porcelain and lithium disilicate based ceramics [8, 9]. Flexural strength and fracture toughness of leucite reinforced ceramics are lower than lithium disilicate based ceramics [9,10].

Although the mechanical properties that mentioned above are good for lithium disilicate based ceramics, in some cases fractures can be observed. Several clinical and laboratory factors may also contribute to such failures alone or in combination. Clinical factors include improper occlusal adjustment, lack of ceramic polishing after occlusal adjustments and parafunctional habits. Laboratory processing steps are also related these mechanical failures [11] .

In this technical report, repairing protocol of lithium disilicate reinforced ceramic laminate veneer which has cohesive fractured piece is described. The fractured ceramic piece is bonded to lithium disilicate ceramic surface.

TECHNIQUE

A 35-year-old male patient was applied to the clinic with a fracture on the mesial incisal edge of lithium disilicate crown restoration in tooth number 11. The patient also brought the entire fractured piece. It was decided to cement the entire fractured piece to the restoration with adhesive system instead of replacing this restoration.

1. If there is a sharp pointed places in the fractured area in the ceramic surface

(Figure 1), smooth these places with diamond bur with low speed handpiece.

2. Check the presence of any contact at the level of the fracture line with the articulating paper (Bausch Articulating Paper, Dr. Jean Bausch GmbH & Co. KG) (Figure 2).

3. Apply 4% hydrofluoric acid (Porcelain Etchant, Bisco) for 1 min to fractured piece of the laminate veneer (Figure 3). Then wash for 1 min and dry with oil free compressed air.

4. Apply silane coupling agent (Monobond S, Ivoclar Vivadent) to fractured piece of laminate veneer and allowed to react 1 min (Figure 4).

5. Apply a thin layer of light curing bonding agent (Heliobond, Ivoclar Vivadent) to fractured piece of laminate veneer (Figure 5).

Remove any excess with compressed air.

6. Isolate the teeth with rubberdam (Roeko Dental Dam, Coltene). Also cover right upper lateral incisor and left upper central incisor with polytetrafluoroethylene tape (Figure 6).

7. Clean the fractured area in the tooth with polishing paste and brush.

8. Apply 4% hydrofluoric acid (Porcelain Etchant, Bisco) for 1 min to fractured area in the tooth (Figure 7). Then wash for 1 min and dry with oil free compressed air.

9. Apply silane coupling agent (Monobond S, Ivoclar Vivadent) to fractured area on the teeth and allowed to react 1 min (Figure 8).

10. Apply a thin layer of light curing bonding agent (Heliobond, Ivoclar Vivadent) to the entire surface area which needs to be repaired. Remove any excess with compressed air (Figure 9).

11. Apply resin cement (Variolink N LC, Ivoclar Vivadent) to fractured piece of laminate veneer inner surface (Figure 10).

12. After placement of the piece of laminate veneer, apply to light (Bluephase, Ivoclar Vivadent) labial surface of the laminate veneer for 40 s (Figure 11). The light have to be at least 800 mW/cm².

13. For oxygen inhibition layer, apply glycerine gel (Ivoclar Vivadent Liquid Strip Glycerin gel) to border of the fracture and during 40s apply the light from buccal, palatinal and marginal side.

14. After rinse the glycerine gel, remove excess cement with low speed handpiece and finishing burs under water.

15. Polish fractured line with silicone polishers (EVE Diapol Twist, Ernst Vetter GmbH) under water (Figure 12). If you need you can use interproximal polishing strip.

16. At the end, check the contacts in centric occlusion, lateral and protrusive movements of the jaw (Figure 13).



Figure 1 - Frontal view of porcelain laminate veneer fracture.

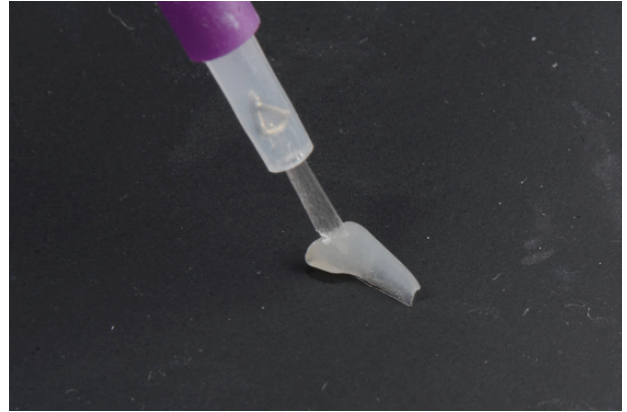


Figure 4 - Application of silane coupling agent and waiting for its reaction for 1 min.



Figure 2 - Occlusion control for presence of any premature contact at the level of the fracture line with articulating paper.



Figure 5 - Application of light curing bonding agent.



Figure 3 - Etching fractured piece of porcelain laminate veneer with 4% hydrofluoric acid for 1 min.



Figure 6 - Isolation with rubberdam and polytetrafluoroethylene tape.

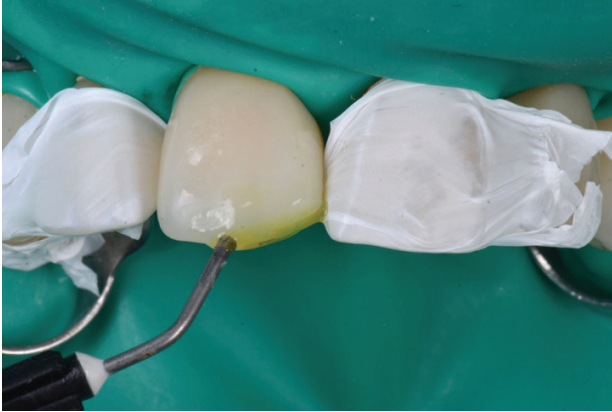


Figure 7 - Fractured ceramic area etching with 4% hydrofluoric acid for 1 min.



Figure 10 - Bonding the fractured piece of porcelain laminate veneer to ceramic area on the teeth.



Figure 8 - Application of silane coupling agent and waiting for its reaction for 1 min.

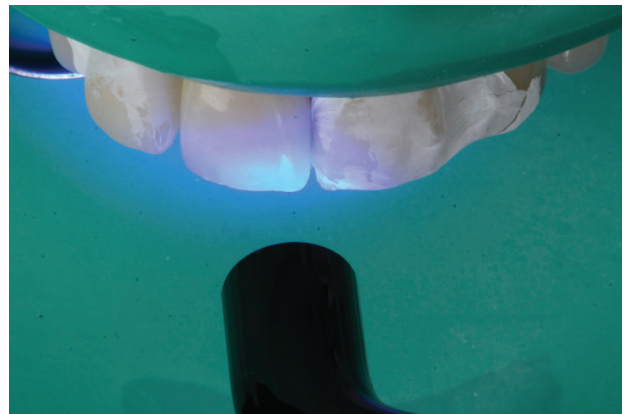


Figure 11 - Photo-polymerization of the light-cure adhesive resin cement.



Figure 9 - Application of light curing bonding agent.



Figure 12 - Finishing and polishing of the porcelain laminate veneer.



Figure 13 - Occlusion control during anterior movement.

DISCUSSION

Laminate veneers are restorations that can be safely used by patients for many years. In meta-analysis of Morimoto et al. [3], cumulative survival rate of feldspathic porcelain laminate veneers is 87% and cumulative survival rate of glass ceramic laminate veneers is 94%, the median of maximum follow-up times are 8 years and 7 years respectively. Although these restorations are successful clinically, some types of failures like debonding, chipping/ fracture, marginal or total discoloration, hypersensitivity, secondary caries, periodontal problems and endodontic problems are observed. It is thought that debonding failures will be more common than the other failures because of non retentive feature of laminate veneers. But chipping and fracture related failures are more common than the others. This situation is confirmed by long term clinical follow-up studies of Gürel et al. (debonding rate: 2%, chipping/fracture rate: 3%) [12], Beier et al. (debonding rate: 1%, chipping/fracture rate: 5%) [13], Freadeni et al. (debonding rate: 2%, chipping/fracture rate: 3%) [14], Gresnigt et al. (debonding rate: 1%, chipping/fracture rate: 4%) [15], Smales et al. (debonding rate: 2%, chipping/fracture rate: 5%) [16] and Rinke et al. (debonding rate: 2%, chipping/fracture rate: 3%) [17].

The procedures that can be performed in case of clinical failures were defined by Setcos et al. [18] under four different headings and then

these definitions were redefined by FDI criteria [19]. These are no treatment (monitoring), refurbishment, repair and replacement. Also treatment recommendations for chipped ceramic restorations are published by Heintze and Rousson [20]. Small chippings are grade 1 and can be treated with polishing. Moderate chippings are grade 2 and can be repaired with composite resin. Severe chippings are grade 3 and treatment option is replacement of entire restoration.

Repairing or replacing are choice for clinicians in small chipping/fracture failures of laminate veneers. The complete replacement of a restoration is both time consuming and expensive. Also tooth structure could be damaged during replacement or additional preparation. Unacceptable restorations can be replacing, but recently repairing has also been recommended as a current treatment option [21,22].

In the previous technique, fractured parts were repaired with composite restorations [22]. Discoloration and compatibility with porcelain surface are disadvantages of repairing with composite. The advantage of this technique is the repair of a lamina veneer with own piece. It seems extremely one-piece, because it is cemented with its own part (Figure 14-18).

In present case, which was repaired with its own part, no failure was observed during 3 years clinical follow-up.



Figure 14 - Intraoral frontal view of bonded porcelain laminate veneer.



Figure 15 - Palatal view of bonding area.



Figure 18 - Left lateral view of bonded porcelain laminate veneer.



Figure 16 - Right lateral view of bonded porcelain laminate veneer.



Figure 17 - Frontal view of bonded porcelain laminate veneer.

CONCLUSION

This technique allows to clinicians to repair the partial fractured laminate veneer without renewing the laminate veneer.

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