Effect of Surface Treatment of Lithium Disilicate on Shear-Bond Strength of Resin Cements

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Poster # 120

INTRODUCTION

Due to patient's increasing esthetic demands and clinical success, the use of all-ceramic restorations is expanding. A retrospective study has shown an estimated clinical survival rate of 93.5% after 10 years and 78.5% after 20 years for all-ceramic restorations. The implementation of adhesive cementation procedure is one of the key factors for long term clinical success of these restorations.

The bonding between glass ceramics and resin cements is achieved by hydrofluoric acid (HF) etching of intaglio surface followed by silanization. The use of HF forms micro-retentive etched pattern on ceramic surface. HF is commercially available in various concentrations and limited literature is available to evaluate its effect on bond strength as a function of HF concentration. In addition, HF is extremely corrosive and can cause severe trauma to soft tissues after exposure. Furthermore, the lesion severity is directly related to exposure time and HF concentration.

Silanization results in strong chemical bond between silicon dioxide surface of glass ceramics and resin cement matrix during polymerization. In order to minimize dental inventory, dental manufactures have introduced so called "Universal Adhesives" that include silane as an ingredient. However, limited studies are available to validate silanization ability of universal adhesives.

Therefore, the concerns of use of HF and a separate product for silanization has been addressed with the introduction of self-etch ceramic primer (Monobond® Etch and Prime). It contains ammonium polyfluoride for etching glass ceramic and trimethoxypropyl methacrylate for silanization in one single step, thus eliminating the use of HF and minimizing dental inventory.

OBJECTIVE

The objective of the study was to measure the effect of different surface treatments of lithium disilicate on the shear bond strength with resin cements.

MATERIALS AND METHODS

Materials:

IPS e.max CAD (HT/A2)
Ivoclar Vivadent Inc.
Lot# T33955

IPS Ceramic Etching Gel
Ivoclar Vivadent Inc.
Lot # 44469

CERAM-ETCH (HF: 9.5%)
Gresco Products, INC.
Lot # 5D119

Monobond Plus
Ivoclar Vivadent Inc.
Lot # T45804

Monobond Etch & Prime
Ivoclar Vivadent Inc.
Lot # TM1111

Scotchbond Universal
3M ESPE
Lot # 566304

RelyX™ Ultimate (Translucent)
3M ESPE
Lot # 568212

Bluephase G2
Ivoclar Vivadent Inc.

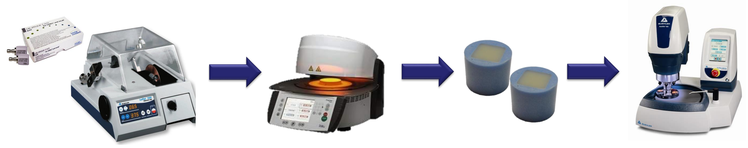
Multilink Automix (Transparent)
Ivoclar Vivadent Inc.
Lot # T30892

MATERIALS AND METHODS, Cont.

Groups	Surface Finish	Surface Treatment	Resin Cement
1	**NO TREATMENT:** Polished	Monobond® Plus	Multilink® Automix (Transparent)
2	**MICRO-ETCHED:** Al_2O_3 (50µm)/2bar/Distance-10mm		
3	**ACID ETCHED 4.5%:** HF {4.5%/20s}		
4	**ACID ETCHED 9.5%:** HF {9.5% (Non-buffered)/20s}		
5	**SELF-ETCH PRIMER** (Monobond® Etch & Prime)		
6	**ACID ETCHED 4.5%**: HF {4.5%/20s}	ScotchbondTM Universal	RelyXTM Ultimate (Translucent)

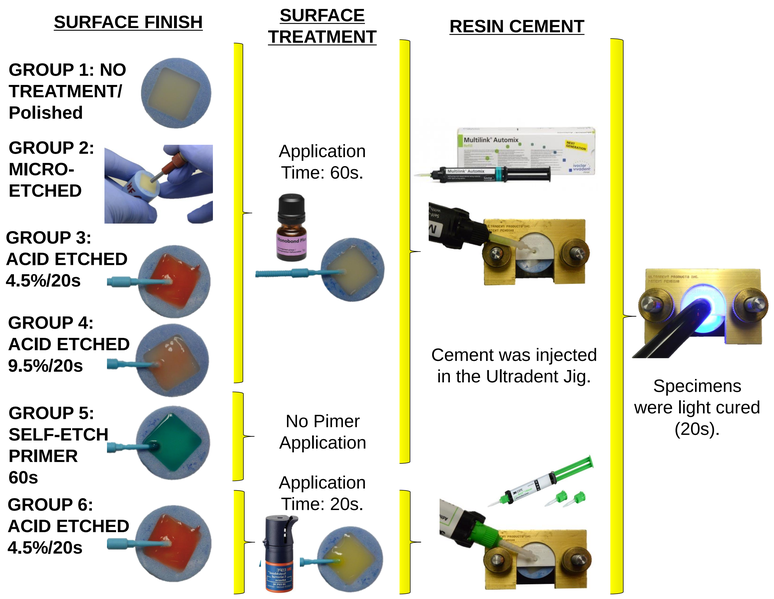
Experimental Method:

A) Specimens preparation (n=10):

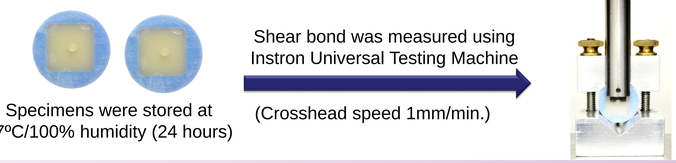


Sectioned | Crystallized | Mounted | Polished [400 SiC except Group-1 (1200 grit)]

B) Surface treatment of prepared specimens:



C) Shear bond strength measurement:



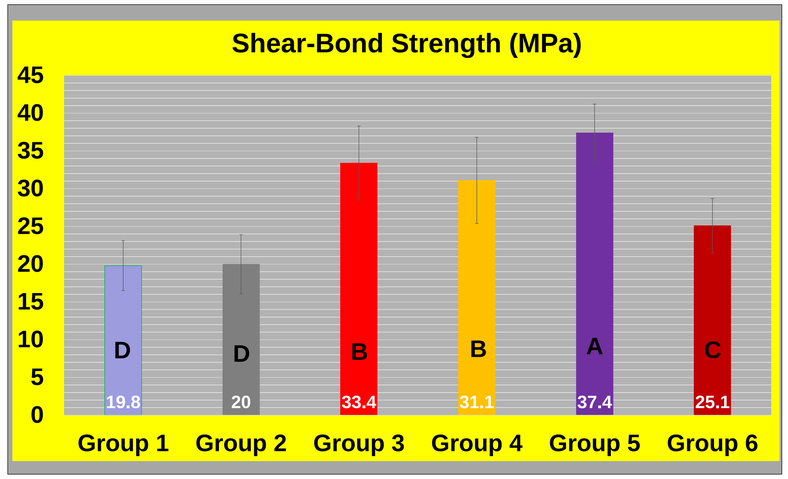
Specimens were stored at 37ºC/100% humidity (24 hours)

Shear bond was measured using Instron Universal Testing Machine

(Crosshead speed 1mm/min.)

RESULTS

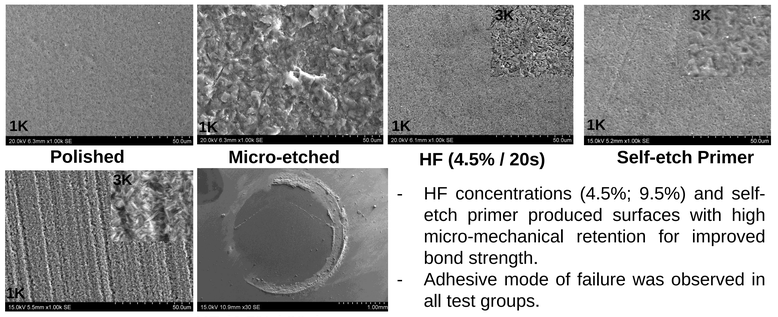
Data was analyzed by One-way Analysis of Variance (ANOVA) and Tukey's HSD post-hoc test (α=0.05).



*Groups showing different superscripts were significantly different (α=0.05).

DISCUSSION

Representative SEMs:



- HF concentrations (4.5%; 9.5%) and self-etch primer produced surfaces with high micro-mechanical retention for improved bond strength.
- Adhesive mode of failure was observed in all test groups.

CONCLUSION

Within the limitation of the study, self-etching glass ceramic primer showed significantly higher bond strengths compared to other tested experimental groups. The micro-etching of the lithium disilicate showed lowest bond strength followed by the use of universal bonding agent.

REFERENCES

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