

Esthetic Clinical Performance of Lithium Disilicate Restorations According to FDI Criteria In The Last 10 Years: Review

Vanessa Bernasconi Stange*, G Jorquera and JP Sánchez

Dentist of Universidad de los Andes, Santa Brígida 421 Depto 72, Las Condes, Santiago, Chile

Review Article

Received: 15/12/2017

Accepted: 18/01/2018

Published: 25/01/2018

*For Correspondence

Vanessa Bernasconi Stange, Dentist of Universidad de los Andes, Santa Brígida 421 Depto 72, Las Condes, Santiago, Chile, Tel: +56999985872.

E-mail: vbernasconi@miauandes.cl

Keywords: Lithium disilicate, Lithium metasilicate, Glass-ceramic, Dental porcelain, Improvement, Dental treatment, Clinical performance, Survival rate, Monolithic

ABSTRACT

Aim: Describe the available information of Esthetic Clinical Performance of Lithium Disilicate restorations according to FDI criteria in the last 10 years.

Method: The information research was made on Pubmed, Ebsco, Trip Database and Scopus. Homologation of existent evaluation of the esthetic criteria to the FDI evaluation guidelines.

Results: A total of 430 studies were found, however only 17 fulfilled the inclusion and exclusion criteria established in this review.

Conclusion: The literature review shows an excellent esthetic clinical performance of Lithium Disilicate as a restorative material. In fact, Lithium Disilicate esthetic clinical performance in single crowns and three-unit bridges overcome the classical fused to metal porcelain restorations, current gold standard. Nevertheless, new studies with better design and methodology are needed for a proper esthetic clinical performance evaluation of Lithium Disilicate as a restorative materials.

INTRODUCTION

The increase in esthetic dental treatments in the last decade lead to a buzzing development and research in more esthetic and also more resistant restorative materials. The first example of restoration mimesis in oral cavity arises with metal porcelain restoration. For a long time, this combination was considered the gold standard as prosthetic material ^[1].

In 1998 Lithium Disilicate was introduced in the market. Nowadays Lithium Disilicate as a dental restorative material presents high resistance and good esthetic properties in all confection techniques ^[2,3]. Furthermore, this material exhibits a survival rate of 95% between 3 to 5 years which imply this porcelain is a good alternative for dental treatment ^[4,5].

The manufacture options for Lithium Disilicate restorations are pressed or machined (CAD/CAM) ^[4,6]. It can be used as inlays, onlays, tabletops, anterior or posterior single crowns, implant restorations, three unit bridges or cemented structures over zirconium oxide frameworks ^[2,6,7].

Are esthetic properties of Lithium Disilicate restorations really effective? Is Mimesis with the oral cavity accurately achieved? The aim of this study is to describe the available information of the esthetic clinical performance of Lithium Disilicate restorations according to FDI criteria in the last 10 years.

METHOD

The information research was made on Pubmed, Ebsco, Trip Database and Scopus. The keywords were E. max, Lithium Disilicates, Lithium metasilicate, Glass-ceramic, Dental porcelain, Evolution, Improvement, Dental treatment, Outcome, Clinical performance, Survival rate y Monolithic.

The full-text articles, issued between the years 2006 and 2016, without language restriction, systematic review, two or more years prospective and retrospective clinical studies about treatment with Lithium Disilicate over natural tooth were included in this review.

All the *in vitro*, on animals, clinical trial, primary studies, pilot studies, expert opinion, and articles that do not concur with the aim of this review were excluded.

Table 1. Nomenclature: Retrospective (R), Underdetermined (U), Prospective (P), Randomizer clinical studies (RCS), Systematic review (SR), Single crown (C), Three unit bridge (TUB), Parcial (P), Empress iii (E II), CAD/CAM (IC), Press (IP).

Author	Guess	Alhekeir	Fabbri	Valenti	Suputta-mongkol	Reich	Etman	Gehrt	Reich	Esquivel upshaw	Simeone	Toman	Valenti	Taskonak	Usquivel-upshaw	Makarouna
Year	2009	2012	2014	2009	2009	2010	2010	2012	2012	2013	2015	2015	2015	2005	2008	2011
Study type	P	P	U	R	U	P	P	P	P	RCS	R	P	R	U	U	RCS
Year of study	5	7	3	9	2	2	3	9	4	2	11	9	10	2	4	6
Restorations type	P	P	P	C	C	C	C	C	C	C	C	C	C	C	TUB	TUB
Fabrication	IP	IC	IP	EII	U	IC	IP	IP	IC	IP/EII	IP/EII	EII	U	EII	IP	EII
Number of restorations	80	80	428380	263	30	39	90	104	41	37	275	121	110	2020	30	18 - 19

Table 2. Partial restoration clinical performance by period, author and esthetic criteria, percentages values.

Author	Criteria	Months	Guess et al.			Guess et al.			Alhekeir et al.		
			Level	CAD	Press	CAD	Press	CAD	Press		
Surface luster		24-60	01-Feb	17.4							
			3	74%			79.20%				
			4		8.60%		20.80%				
		60-120	01-Feb	16.70%	8.30%						
Staining: (a) surface and (b) margin		0-24	3	75%	79.20%						
			4	8.30%	12.50%						
			4					58.60%			
		24-60	01-Feb	47.80%		62.50%					
Color match and translucency		60-120	3	45.80%	45.80%						
			3	54.20%	54.20%						
			01-Feb	39.10%		8.30%					
		24-60	01-Feb	60.90%		91.70%					
Esthetic anatomical form		60-120	3	37.5	12.50%						
			3	62.5	87.50%						
			01-Feb	56.50%		79.20%					
		24-60	01-Feb	43.50%		20.80%					
Esthetic anatomical form		60-120	01-Feb	66.70%	83.30%						
			3	33.30%	16.70%						
			3								

The entire sample of articles was analysed and evaluated by one operator according to relevance. The information recollected was homologated with the World Dental Federation (FDI) evaluation criteria ^[8] with the final purpose of obtaining a single description and performance scale of the aesthetic parameters.

The risk of bias was evaluated with “The Cochrane Risk of Bias Tool“ guideline ^[8-11], developing three categories: low, medium and high risk.

The ethical aspects of the selected articles were evaluated according to the explicit description of informed consent, ethics committee approval, and a declaration of conflict of interest.

RESULTS

The electronic search with the filters obtained 430 studies. The preliminary selection was made for the title and duplicate articles were discarded. Seventeen studies fulfilled the inclusion and exclusion criteria.

Table 1 shows the full analysis of articles information. They were classified by type of restoration, methods and fabrication material, and the number of restorations analyzed in each study.

The percentage results according to the criteria and level of the FDI guideline were described for all types of restoration. They were divided in a three-time period (0-24 months, 24-60 months and 60-120 months).

The articles correspondent to Valenti et al. ^[12] and Sulaiman et al. ^[5] did not satisfy two of the ethic criteria. All the studies have a high risk of bias because of the omission in the methodological design by the authors.

DISCUSSION

Partial Restoration

The Lithium Disilicate partial restorations were analyzed on three articles. The existent evidence alude only four FDI esthetic criteria.

Alhekeir et al. ^[11] observed in the first 2 years, light marginal staining that meant poor performance of 58.6% restorations. However, Guess et al. ^[9] noted an easy removal of the pigmentation after polished. Including until the 120 months period, 45.8% of the restorations did not present any alteration ^[10-12].

Guess et al. ^[10] found the restoration surface luster had the poorest performance. Reaching insufficient results in 20.8-29.4% of the partial restorations, which presented not polishable rough surfaces (**Table 2**) ^[10,11].

The color match and translucency and also the aesthetic anatomical form had a fluctuating performance between sufficient to excellent. Definitely, color was the best-qualified criteria for the CAD-CAM restoration and the esthetic form was mostly preserved to the ideal for the PRESS restoration. The form obtains a 75% of good to excellent reviews ^[10,11].

Single Crown

Till the date, Lithium Disilicate single crowns have been considerably more studied than the others type of restoration. Nevertheless, the available information is not uniform and a lot of different esthetic criteria are used.

According to Valenti et al. ^[12] surface luster in 1.85% of restorations present opaque, porous or rough surface easy to perceive ^[1,13]. Those results markedly differ from Toman and Fabbri studies. Who observed a luster comparable with enamel or lightly opaque in 90.9% of the restoration among five to ten years ^[1,5,13-23]. The analysis made by Reich et al. ^[13] even exceed the clinical performance previously described and conclude that the total of the restorations reaches a good to excellent score between two to five years ^[14,15].

Esquivel et al. confirm a greater performance of surface luster in metal-porcelain restoration than the Lithium Disilicate restorations because a uniform dissolution process which causes a homogeneous loss volume in time without porous surface manifestation ^[16].

The margin staining reaches a 92.7% of restoration with easy removal stains and no need for mayor intervention for elimination ^[16]. Therefore the clinical performance of all period ranges between good and excellent.

Color match and translucency were found as an unacceptable alteration in 1.7% of the restorations evaluated for Fabbri et al. ^[20]. However, all the other authors described an excellent performance of 90.6%, 83.8% and 87.9% according to the ascending order of time periods studied ^[1,5,13-16,21]. Esquivel describes this aspect of Lithium Disilicate as comparable to the clinical performance of metal porcelain restorations ^[2,16].

Esthetic anatomical form by the study of Esquivel-Upshaw et al. accomplishes a superior performance at the three-year range than metal porcelain restorations reaching 80-90% of good behavior ^[5,16] (**Figure 1**).

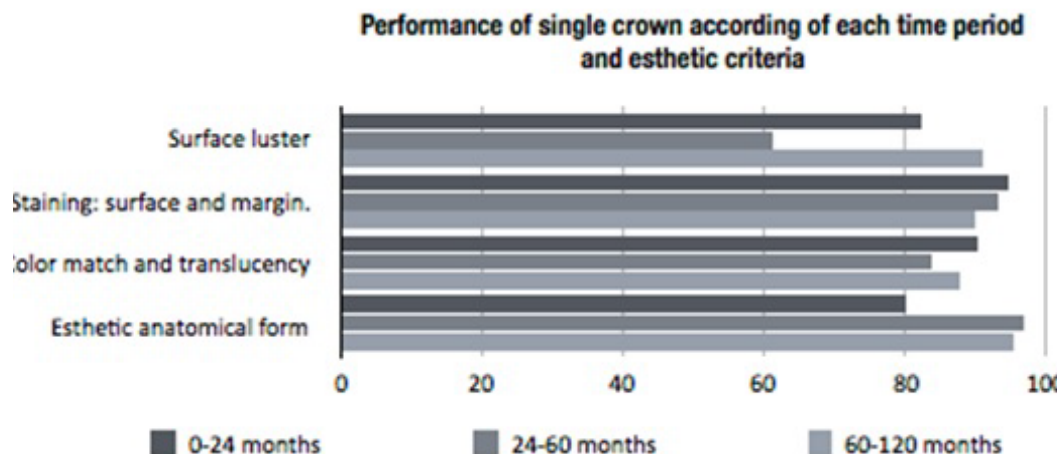


Figure 1. Esthetic criteria performance of single crown restorations.

Three Unit Bridge

Three-unit bridge corresponds to only 7% of the studied restorations and no more than three author elaborated articles about this kind of preparation.

The surface luster and esthetic anatomical form had a decline in the clinical performance in time. The manifestations of rough surfaces or shape alterations were evidenced before 60 months ^[16,17].

Color match and translucency have evaluation records through all the period in this research. Diverse results were found in this regard for three units Lithium Disilicate bridges. Makarouna et al. described no variation of color in any preparation, however Taskonak et al. state that only 60% of the restoration were exempt from color alteration ^[17,18].

The 7.1% of restorations need a major intervention in order to improve the stained margin, which concludes a poor clinical performance of the material ^[18].

All the esthetic properties of Lithium Disilicate are better than metal porcelain restorations according to the study of Raigrodski et al. ^[19].

CONCLUSION

The literature review evidence an excellent esthetic clinical performance of Lithium Disilicate as a restorative material. Different authors analyzed partial restorations, single crown and three-unit bridges. Nevertheless, single crown esthetic clinical performance articles were a lot more abundant than the other studied restorations.

The surface luster of partial restorations is the most affected criteria cause of the porosities development in time. Single crowns show their most deficient area in color alteration, the chromatic difference was found as an unacceptable performance in 1.7% of restorations, which represents a small percentage of the total. Nevertheless, Lithium Disilicate accomplishes a superior clinical performance than metal porcelain restoration (Gold Standard) both in single crown preparation and three-unit bridges.

However, new studies are necessary to evaluate the aesthetic performance of Lithium Disilicate as a restorative material. Particularly important is that new studies follow the FDI guidelines so the results can be compared and analyzed with other similar studies and a superior level of evidence is achieved.

REFERENCES

1. Valenti M and Valenti A. Retrospective survival analysis of 110 Lithium Disilicate crowns with feather-edge marginal preparation. *Int J Esthet Dent.* 2015;10:246-257.
2. <http://www.ivoclarvivadent.es/es-es/productos/ceramica-sin-metal/ips-emax-system-tecnico-dental/ips-emax-press>
3. <http://www.ivoclarvivadent.in/en-in/media/media/ips-emax-clinical-guide>
4. Sulaiman TA, et al. Survival rate of Lithium Disilicate restorations at 4 years: A retrospective study. *J Prosthet Dent.* 2015;114:364-346.
5. Toman M and Toksavul S. Clinical evaluation of 121 Lithium Disilicate all-ceramic crowns up to 9 years. *Quintessence Int.* 2015;46:189-197.
6. <http://www.ivoclarvivadent.es/p/todos/cad/cad/ips-emax-cad/ips-emax-cad-mt>

7. Hickel R, et al. FDI World Dental Federation - clinical criteria for the evaluation of direct and indirect restorations. Update and clinical examples. *J Adhes Dent.* 2010;12:259-272.
8. <http://methods.cochrane.org/bias/assessing-risk-bias-included-studies>
9. Guess PC, et al. All-ceramic partial coverage restorations—midterm results of a 5-year prospective clinical splitmouth study. *J Dent.* 2009;37:627-637.
10. Guess PC, et al. Prospective clinical split-mouth study of pressed and CAD/CAM all-ceramic partial-coverage restorations: 7-year results. *Int J Prosthodont.* 2013;26:21-25.
11. Alhekeir DF, et al. Porcelain laminate veneers: Clinical survey for evaluation of failure. *Saudi Dent J.* 2014; 26:63-67.
12. Valenti M and Valenti A. Retrospective survival analysis of 261 Lithium Disilicate crowns in a private general practice. *Quintessence Int.* 2009;40:573-579.
13. Reich S and Schierz O. Chair-side generated posterior Lithium Disilicate crowns after 4 years. *Clin Oral Investig.* 2013;17:1765-1772.
14. Etman MK and Woolford MJ. Three-year clinical evaluation of two ceramic crown systems: A preliminary study. *J Prosthet Dent.* 2010;103:80-90.
15. Esquivel-Upshaw J, et al. Randomized, controlled clinical trial of bilayer ceramic and metal-ceramic crown performance. *J Prosthodont.* 2013;22:166-173.
16. Esquivel-Upshaw JF, et al. Four-year clinical performance of a lithium Disilicate-based core ceramic for posterior fixed partial dentures. *Int J Prosthodont.* 2008;21:155-160.
17. Makarouna M, et al. Six-year clinical performance of Lithium Disilicate fixed partial dentures. *Int J Prosthodont.* 2011;24:204-206.
18. Raigrodski AJ and Chiche GJ. The safety and efficacy of anterior ceramic fixed partial dentures: A review of the literature. *J Prosthet Dent.* 2001;86:520-525.
19. Reich S, et al. A preliminary study on the short-term efficacy of chairside computer-aided design/computer-assisted manufacturing- generated posterior Lithium Disilicate crowns. *Int J Prosthodont.* 2010;23:21-46.
20. Fabbri G, et al. Clinical evaluation of 860 anterior and posterior Lithium Disilicate restorations: retrospective study with a mean follow-up of 3 years and a maximum observational period of 6 years. *Int J Periodontics Restorative Dent.* 2014;34:165-177.
21. Simeone P and Gracis S. Eleven-year retrospective survival study of 275 veneered Lithium Disilicate single crowns. *Int J Periodontics Restorative Dent.* 2015;35:685-694.
22. Taskonak B and Sertgöz A. Two-year clinical evaluation of lithium-Disilicate-based all-ceramic crowns and fixed partial dentures. *Dent Mater.* 2006;22:1008-1013.
23. Gehrt M, et al. Clinical results of Lithium-Disilicate crowns after up to 9 years of service. *Clin Oral Investig.* 2013;17:275-284.