Esthetic Clinical Performance of Lithium Disilicate Restorations According to FDI Criteria In The Last 10 Years: Review
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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, Improvement, Dental treatment, Outcome, Clinical performance, Survival rate, 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), Undertermined (U), Prospective (P), Randomizer clinical studies (RCS), Systematic review (SR), Single crown (C), Three unit bridge (TUB), Parcial (P), Empress II (E II), CAD/CAM (IC), Press (IP).

<table>
<thead>
<tr>
<th>Author</th>
<th>Guess</th>
<th>Guess</th>
<th>Alhekeir</th>
<th>Fabbri</th>
<th>Valenti</th>
<th>Suputtamongkol</th>
<th>Reich</th>
<th>Etman</th>
<th>Gehrt</th>
<th>Reich</th>
<th>Esquivel upshaw</th>
<th>Simeoone</th>
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<td>121</td>
<td>110</td>
<td>20 20</td>
<td>30</td>
<td>18 19</td>
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</tbody>
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Table 2. Partial restoration clinical performance by period, author and esthetic criteria, percentages values.

<table>
<thead>
<tr>
<th>Author</th>
<th>Guess et al.</th>
<th>Guess et al.</th>
<th>Alhekeir et al.</th>
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<tr>
<td>Criteria</td>
<td>Months</td>
<td>Level</td>
<td>CAD</td>
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<tr>
<td>Surface luster</td>
<td>24-60</td>
<td>01-Feb</td>
<td>17.4</td>
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<td></td>
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<td>4</td>
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<tr>
<td></td>
<td>60-120</td>
<td>01-Feb</td>
<td>16.70%</td>
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<tr>
<td></td>
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<td>4</td>
<td></td>
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<tr>
<td>Staining: (a) surface and (b) margin</td>
<td>0-24</td>
<td>4</td>
<td>58.60%</td>
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<td></td>
<td>24-60</td>
<td>01-Feb</td>
<td>47.80%</td>
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<td>3</td>
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<td></td>
<td>60-120</td>
<td>01-Feb</td>
<td>45.80%</td>
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<tr>
<td>Color match and translucency</td>
<td>24-60</td>
<td>01-Feb</td>
<td>39.10%</td>
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<td>3</td>
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<td></td>
<td>60-120</td>
<td>01-Feb</td>
<td>37.5</td>
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<tr>
<td>Esthetic anatomical form</td>
<td>24-60</td>
<td>01-Feb</td>
<td>66.70%</td>
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<td></td>
<td>60-120</td>
<td>01-Feb</td>
<td>66.70%</td>
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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


