One Year Clinical Evaluation of E.Max Laminate Veneers with and without Using Galla Chinensis as Natural Cross Linking and Remineralizing Agent Before Bonding to Teeth with Amelogenesis Imperfecta

Mohammed Gamal Fahmy*, Dr. Jylan Fouad El-Guindy**, Dr. Amina Zaki*** and Dr. Heba Hamza****

INTRODUCTION:

Esthetic or cosmetic dentistry branch has become a main interest in dental practice for several years. Recently, restorative dental materials was not only to restore lost of dental tissues due to caries or trauma, but also to correct the shape and color of teeth for social acceptance. ¹

Ceramic laminate veneers were manufactured from different ceramic materials with specific properties. Feldspathic ceramics were the most ceramic used which have less flexural strength; however, it could be used in multiple layers and different thicknesses. The lithium disilicate was introduced made with greater flexural strength, either machined or pressed with veneering porcelain. These materials could be successfully used and showed successful results for ceramic laminate veneers. ²

Long-term success of ceramic laminate veneers could be influenced by several factors, such as type and depth of preparation, type and thickness of the porcelain, type (enamel or dentin) and surface area of the adhesion surface, type of the resin cement and dental adhesive, tooth morphology, as well as functional and parafunctional activities.³

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* Master degree at Fixed Prosthodontics
** Professor of Fixed Prosthodontics Cairo University
*** Professor of conservative Cairo University
**** Professor of Fixed Prosthodontics Cairo University
Bonding to enamel surface shows reliable adhesion with mean bond strengths up to 40MPa with phosphoric acid etching followed by adhesive application. Also, etching the fitting surface of glass ceramic veneers with hydrofluoric acid followed by application of silane coupling agent and in conjunction with resin cements delivers bonding strength values similar to or higher than to enamel. 4

Development of bonding technology of resin cement in the dental field increased the success of bonded ceramic laminate veneers. Resin cements were generally used for the bonding of all ceramic restorations since they provide adequate esthetics, low solubility in oral environment, high bond strength to tooth structures superior mechanical properties and support for ceramics. Resin cements were produced by several manufacturers and in various polymerization modes and shade.

Aim of study:

The aim of this study was to evaluate E.Max Laminate Veneers with and without Using Galla Chinensis as natural cross linking and remineralizing agent Before bonding to teeth with Amelogenesis Imperfecta.

MATERIALS:

Preparation of Galla chinensis extract:

One kilogram of Galla Chinensis extract* was dried in an oven at 60°C for three days, finely powdered, and added to 600 mL of distilled water. The mixture was stirred for 10 h at 65°C and then filtered. The filtrate was re-extracted with distilled water under the same conditions. Then the product was dissolved in 500 mL of ethanol (100%). After filtration and evaporation of the ethanol, the remaining extract was lyophilized to render powder of GCE. Finally, forty grams of the extract were weighed on a digital sensitive balance and dissolved in one liter distilled deionized water with pH adjusted 5.5. (Zhang et al. 2009).

Statistical methods:

Data were analyzed using IBM SPSS advanced statistics (Statistical Package for Social Sciences), version 21 (SPSS Inc, Chicago, IL). Categorical data were described as numbers and percentages. Comparisons between categorical variables will be performed using the chi square test or fisher exact test appropriate. A p-value less than or equal to 0.05 was considered statistically significant. All tests were two-tailed.

Methodology

Study design:

This study was performed in Fixed Prosthodontics Department clinics of Faculty of Dentistry, Cairo University, Cairo, Egypt. A total of 24 ceramic laminate veneers were included in the study and completed by one operator (the researcher) who followed a meticulous clinical procedure and the ceramic laminate veneers were fabricated by one experienced dental technician. The operator followed the five phases of laminate veneers fabrication: diagnosis, preparation design, provisionalization, construction of the material and bonding. Two groups (24 laminate veneers in 2 patients) included in the study.

Exclusion criteria were:

1. Patients in the growth stage with partially erupted teeth.
2. Patient with fractured teeth of more than 50% enamel loss.
3. Patients with poor oral hygiene and motivation.
4. Pregnant women.
5. Patient with post and core endodontically treated teeth.
6. Psychic problems or unrealistic expectations.
7. Lack of opposite occluding dentition in the area intended for restoration.
Allocation concealment mechanism:
The participants were given folded cards (A or B) placed in sealed opaque envelops.

Implementation:
The candidate under supervision was responsible of all procedure as patient selection, preparation, shade selection, try in and bonding.

Randomization:
The Preparations of laminate veneers followed by the final impression step and temporarization were done for both patients before selecting which one of them will be the control or the intervention groups to prevent any bias.

In the Bonding visit, each patient was asked to select one of two sealed envelopes containing either group I card or group II card.

Informed consent:
An informed patient consent was obtained from both patients who participated in the study under the supervision of ethics committee of Faculty of Dentistry, Cairo University.

The two patients were divided into 2 groups (1 patient in each):

Group (1): control group: Conventional Bonding.

Included 1 patient received 12 e.max CAD laminate veneers on the upper and lower six anteriors with butt joint preparation design.

Group (2): intervention group: Application of Galla chinensis before bonding.

Included 1 patient received 12 laminate veneers of e.max CAD laminate

I. Diagnostic phase:
1. Intra oral examination
2. Photographs
3. Diagnostic casts
4. Diagnostic wax up
5. Shade selection
6. Scaling and polishing

Sample grouping:
A total of 24 ceramic laminate veneers were divided into two main groups \((n=12\text{ each})\) according to the technique used for final bonding, they were showed in.

Group (I): e.max CAD laminate veneers bonded conventionally without using of Galla chinensis

Group (II): e.max CAD laminate veneers bonded using Galla chinensis

II. Tooth preparation Phase:
Silicon matrix index construction
Labial preparation
Incisal preparation
Proximal preparation
Cervical finish line
Finishing the preparation

III- Final Impression Phase

IV- Temporarization Phase

V- Fabrication Phase

VI- Bonding Phase
Scanning master cast
Designing
CAD/CAM wax veneers construction

1. Milling process:
The patients were instructed:
1. To perform brushing and flossing regularly, using non-abrasive fluoridated tooth paste.
2. To avoid the excessive stresses.
3. To avoid biting on fingernails.
4. To avoid biting ice on anterior teeth.
5. To avoid eating seeds.

Follow up sessions:
Follow up sessions were done every two months for each patient using dental probe and operator eye vision to evaluate marginal adaptation postoperative sensitivity by asking patient. Follow up and scoring system was done according to USPHS grades (United States Public Health Service)

Results:
The mean and standard deviation values were calculated for each group in each test. Data were explored for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests, data showed non-parametric (not normal) distribution.

The significance level was set at \( P \leq 0.05 \). Statistical analysis was performed with IBM® SPSS® Statistics Version 20 for Windows.

1. Marginal adaptation:
Descriptive statistical analysis presented in table (6) figure (43) revealed the following: According to USPHS criteria in marginal adaptation evaluation:
- Alpha: Smooth margin
- Bravo: All margins closed, or possess minor voids or defects (enamel exposed)
- Charlie: Obvious crevice at margin, dentin or base exposed

2. Survival rate (Retained or De-bonding):
Descriptive statistical analysis presented in table (6) figure (49) revealed the following: According to USPHS criteria in marginal adaptation evaluation:
- Alpha: Retained
- Bravo: De-bonding

A. Group I (Conventional without using Galla chinensis):
There was no statistically significant difference between (Base line), (After 2 months), (After 4 months), (After 6 months), (After 8 months), (After 10 months) and (After 12 months) where \( p=1 \).
Alpha grade was recorded for all the veneers at all the intervals of evaluation.

B. Group II (Using Galla chinensis):
There was no statistically significant difference between (Base line), (After 2 months), (After 4 months), (After 6 months), (After 8 months), (After 10 months) and (After 12 months) where \( p=1 \).
Alpha grade was recorded for all the veneers at all the intervals of evaluation.

Relation between both groups:
There was no statistically significant difference between (Group I) and (Group II) where \( p=1 \) as both groups showed (100%) Alpha in all time periods.
12 months) where \( p = 1 \).

Alpha grade was recorded for all the veneers at all the intervals of evaluation.

- Relation between both groups:

There was no statistically significant difference between (Group I) and (Group II) where \( p = 1 \) as both groups showed (100%) Alpha in all time periods.

3. Postoperative sensitivity:

Descriptive statistical analysis presented in table (8) figure (47) revealed the following:

According to USPHS criteria in marginal adaptation evaluation:

- Alpha: No symptoms
- Bravo: Slight sensitivity
- Charlie: Moderate sensitivity

A. Group I (Conventional without using Galla):

There was no statistically significant difference between (Base line), (After 2 months), (After 4 months), (After 6 months), (After 8 months), (After 10 months) and (After 12 months) where \( p = 1 \).

Alpha grade was recorded for all the veneers at all the intervals of evaluation.

B. Group II (Using Galla chinensis):

There was no statistically significant difference between (Base line months e), (After 2 months), (After 4 months), (After 6 months), (After 8 months), (After 10 months) and (After 12 months) where \( p = 1 \).

Alpha grade was recorded for all the veneers at all the intervals of evaluation

- Relation between both groups:

There was no statistically significant difference between (Group I) and (Group II) where \( p = 1 \) as both groups showed (100%) Alpha in all time periods.

**DISCUSSION:**

Ceramic laminate veneers are considered as a conservative modality that provides excellent potential for esthetic enhancement. Veneer preparation preserve sound tooth structure which is the gold slandered of veneer preparation. 53

Clinically successful dental restoration, four distinct properties should be existing: marginal adaptation, biocompatibility, esthetics and mechanical strength.16

Overall, understanding the clinical performance and causes of failure modes of ceramic laminate veneers was absolutely necessary before results of in vitro studies to be considered clinically valid.54 55 12 Kelly et al in 1995 54 stated that the specimens used for testing dental ceramics in the lab sometimes differ significantly in both size and structure from the restorations they represent clinically. Clinical studies are needed for evaluating the performance of restorative materials because certain intraoral conditions could not be reproduced in the laboratory. These conditions include the application of multiple, intermittent, cyclic forces while chewing, grinding, and clenching, constant exposure to a moist, bacteria-rich environment, ingestion of hot or cold liquids and acids and heavy tooth brushing. In-vivo evaluation has clear basis for establishing criteria for acceptable veneers. Also Fradeani et al in 2005 56 stated that in vitro studies did not have the same value as in vivo studies, as there were few studies of the clinical performance of porcelain veneers were available to date whereas, several papers dealing with in-vitro studies of the system have been published.

In the present study all teeth included were maxillary and mandibular anterior teeth. It was restricted to non-curious, unrestored teeth which prevented the size and sites of disease or restorations from influencing the preparations carried out.

Anterior teeth were chosen as they are the most commonly restored teeth with ceramic laminate veneers. This is due to their presence
in the esthetic zone, the most visible teeth in dental arch and to standardize bonding area and forces of all restorations. In addition to the traditional free hand method, longitudinal or horizontal depth orientation grooves and the use of small round burs to produce dimples as depth guides have been suggested. However, there is no published data that compares how effective these techniques are at producing the 'ideal' veneer preparation. In this study three techniques were compared using the technique of co-ordinate metrology.

Method: A single operator using the above three techniques prepared 84 extracted teeth. Impressions of the prepared and unprepared teeth were scanned using a co-ordinate measuring machine (CMM). Conventional and current popular practice for conservative laminate veneers preparation is to remove 0.5 mm of tooth structure to create room for the placement of 0.5 mm of porcelain. It has been suggested that a maximum of 0.5 mm thickness to be done at cervical region of labial veneer preparation.

In order to standardize our preparation design three wheel depth cutter was used to have minimum depth cutting. Then, silicon index was performed for checking final preparation depth and design. This procedure ensured uniform reduction and preserved tooth structure.

Summary:
Ceramic laminate veneers show a successful esthetic and functional long-term service for their perfect color match, marginal integrity and mechanical properties. The minimum-thickness, ceramic laminate veneers are a conservative and esthetic alternative to re-establish the form, shape and color of anterior teeth. Mechanical behavior and marginal integrity are the major factors that affect the long-term prognosis of any restorations.

This clinical study was done to evaluate the marginal integrity and post-operative sensitivity for e.max CAD veneers bonded with or without using Galla chinensis before bond application.

Twenty four ceramic laminate veneers were fabricated for anterior teeth. The patients were divided into two groups according to the bonding technique Group A (control group) e.max CAD laminate veneers bonded with conventional technique. Group B (intervention group) e.max CAD laminate veneers bonded after application of Galla chinensis. Standardized preparation with butt joint design and chamfer finish line located supra gingival were performed for all the teeth.

The fabrication of the veneers was performed using CAD/CAM (Vhf S1) machine, with software (Exocad). The veneers surfaces were treated and silanated according to the manufacture instruction of each ceramic and enamel surfaces were etched where total etch adhesive protocol was obeyed using BISCO.

Survival rate in terms of (marginal adaptation and post-operative sensitivity) for both groups were evaluated according to united states public health services (USPHS) criteria.

CONCLUSION:
Within limitations of this clinical study, the following conclusions could be drawn as follows:

- E-max CAD laminate veneers bonded with both techniques Conventional Bonding technique or after application of Galla chinensis before bonding revealed high successful survival rate in terms of marginal adaptation, post-operative sensitivity and retention of veneers. Thus they can be recommended for bonding of e.max CAD ceramic veneers. The choice depends for clinicien’s preference.
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