

Clinical Outcomes of Premolars Restored with Ceramic Vonlay Restorations versus Onlay Using Modified USPHS Criteria (Randomized Clinical Trial)

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Abstract

Statement of the problem: For restoring maxillary premolars, onlay restorations are used to restore large areas of decay, but they cannot restore facial surface defects. Vonlay restorations, on the other hand, exhibit the benefits of onlays and veneers, resulting in a highly attractive and effective restoration.

Aim: Evaluate the clinical performance of premolars restored with ceramic vonlays versus onlays using modified USPHS criteria regarding fracture, marginal integrity, and marginal discoloration.

Methodology: 26 partial coverage restorations for vital premolar teeth were constructed from pressable lithium disilicate ceramic material. According to the preparation designs, premolar teeth were divided into two groups. Group 1: (complete onlay preparation design) and Group 2: (vonlay preparation design). It was cemented with dual cure-adhesive resin cement. Immediately following cementation, fracture, marginal integrity, and marginal discoloration were evaluated using modified USPHS restoration clinical assessment guidelines. After three, six, nine, and twelve months, respectively, these measurements were repeated.

Results: The clinical performance of maxillary premolars regarding (fracture, marginal integrity and marginal discoloration) over one year, there was no statistically significant difference between the two groups.

Conclusions: Maxillary premolars restored with both complete onlay and vonlay designs using pressable lithium disilicate ceramic material demonstrated successful clinical performance in terms of fracture resistance, marginal integrity, and marginal discoloration over a one-year period.

Keywords: clinical outcomes, premolars, ceramic, vonlay restorations, onlay, modified USPHS criteria.

INTRODUCTION

Maximum conservation of sound dental structure and preservation of the restored teeth vitality are essential for the survival of teeth and restorations, particularly in cases where caries removal, cavity preparation, wear and/or trauma were the cause of significant dental structure loss⁽¹⁾. Loss of tooth structure can lead to diminished fracture resistance, decreased tooth stability, and deflection of weakened cusps⁽²⁾.

The basis of modern dentistry is tissue preservation. Understanding the significance of tissue preservation and advancing biomaterials have enabled the development of treatment alternatives that increasingly meet the biological, biomechanical, and aesthetic goals of so-called "minimal invasive" dentistry. Over the past two decades, patients have sought out treatments that are more effective and less invasive. The current state of our knowledge enables us to propose minimally invasive bonded partial restorations that meet the major requirements of modern dentistry, either to overcome the limitations of direct

restorations or, alternatively, to offer the patient an alternative to full coverage restorations, which are considered to be more damaging to the dental organ, thanks to new techniques and materials⁽³⁾.

Due to increased demands for conservative treatment, the necessity for ceramic partial crowns increases. In addition to conventional cusp capping, alternative simplified designs have been proposed in certain cases, including fractured teeth and teeth with extensive caries⁽⁴⁾.

Onlays are used to restore extensive carious cavities and to replace existing restorations, whether they are poor amalgam fillings, old cast-gold onlays, or those made of another material. Onlays require a high level of practitioner skill, a rigorous and difficult preparation and bonding, and their indications remain poorly known⁽³⁾.

Onlays aim to restore the lost occlusal tooth substance in the posterior region. But, when defects also involve buccal or cervical regions, options include either a full-coverage preparation or adding a cervical Class V resin filling to occlusal restorations. Whereas full-coverage preparation requires 63%–72% removal of coronal tooth structures and class V restorations reported with limited survival and impaired esthetics in the worn dentition^(5,6).

As a result, vonlays which are a minimally invasive alternative to full-coverage restorations that cover the occlusal, labial, and proximal portions of the tooth have developed as a less invasive and extremely esthetic restoration. In posterior teeth, particularly premolar regions where there is typically enough enamel for bonding, and due to the visible portion of maxillary premolars may extent from 92% to 97% when smiling, this combination of an onlay and an extended buccal veneer restoration is used to fulfill the highest esthetic demands for patients nowadays^(7,8).

Consequently, this study aimed to compare the clinical performance of premolars restored using ceramic vonlays versus onlays in terms of fracture, marginal integrity and marginal discolorations.

MATERIAL AND METHODS

Sample size calculation

Sample size calculation was performed using G*Power Version 3.1.9.2. This power analysis used fracture criteria (Alpha, Bravo) as the primary outcome. The effect size $w_1 = 1$ was calculated based upon the results of Santos MJMC et al (2016). Since no prior randomized clinical studies comparing the two groups have been performed, the effect size $w_2 = 0.8$ was calculated based upon the estimation that fracture criteria will be (Alpha= 0.9 and Bravo= 0.1). Using alpha (α) level of (5%) and Beta (β) level of (20%) i.e., power = 80%; the minimum estimated sample size was a total of 22 restorations. The sample size will be increases to a total of 26 restorations (13 restorations per group) to compensate for a dropout rate of 25%.

Research ethics approval

This study and the template informed consent form reviewed by the Ethics Committee of Scientific Research - Faculty of Dentistry – Cairo University and approved in September 2019. Approval code (19-9-13)

Study design

This study was performed in Fixed Prosthodontics Department clinics of Faculty of Dentistry, Cairo University, Cairo, Egypt. A total of 26 onlay and vonlay restorations were included in the study and completed by one operator (the researcher) who followed a meticulous clinical procedure and the restorations were fabricated by one experienced dental technician.

Patients' selection

A total of 26 onlay and vonlay indirect intra-coronal restorations indicated for intra-coronal reconstruction in maxillary premolar teeth were inserted in patients with the chief complaint of improving chewing efficiency and appearance. They were able and motivated to follow proper oral hygiene.

The inclusion criteria: patients between the ages of 25 and 45 years old, psychologically and physically capable of tolerating standard dental procedures, no current periodontal or pulp diseases, and patients with maxillary premolar teeth had large carious lesions, large old filling restorations, occlusal defect, or spacing in maxillary premolar area.

The exclusion criteria: the patient had periodontal disease that was aggressive and resistant, patients with poor oral hygiene, high caries risk, uncooperative patients, patients had abnormal occlusal habits, signs of bruxism or clenching, and lack of opposing dentition in the area of interest.

Randomization and Allocation concealment

To exclude the possibility of bias, the participants were randomized into 2 groups with a 1:1 allocation ratio. At least two restorations (one of each preparation design) were placed in each patient. To ensure allocation concealment, folded paper enclosed in opaque, sealed envelopes were released to participants in second visit containing a number from 1 to 2 denoting preparation design (onlay or vonlay) and a number 4 or 5 representing the premolar tooth where the restoration will be fitted. The patient chose at random the onlay design for the initial tooth, and then received the alternative vonlay design for the succeeding tooth.

Blinding

This clinical trial was double-blinded: participants and the statistician were blinded however due to the nature of the treatment approach; the operator and the outcome examiners could not be blinded.

Prosthetic steps:

Diagnostic phase:

Intra-oral examination, photographs, periapical x-rays, full mouth scaling and polishing, and shade selection were carried out before treatment procedures.

Tooth preparation phase:

After diagnosis and suitable case selection, the cases were divided into two groups (13 cases each): Onlay design group (control group) and Vonlay design group (intervention group).

The only difference between the two groups was the facial extension of preparation in vonlay design group to cover the buccal surface. Figure (1)

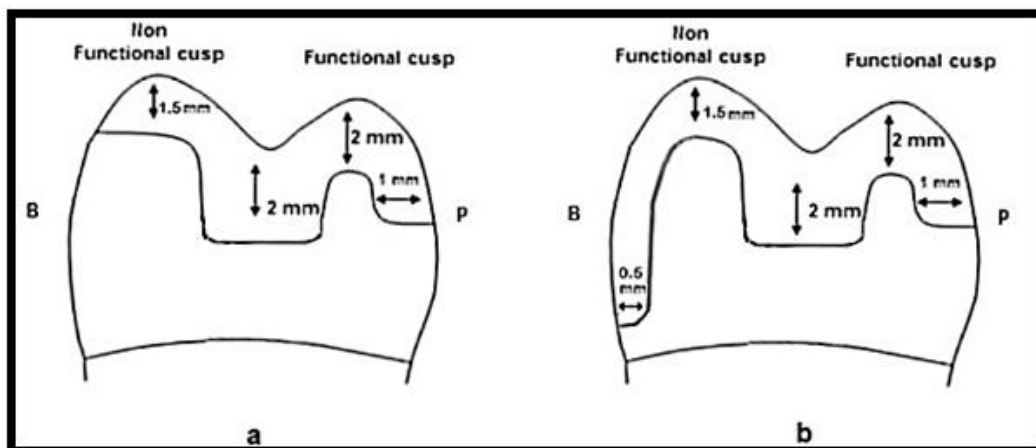


Figure (1): Schematic diagram: a) onlay preparation dimensions, b) vonlay preparation dimensions

The preparations were performed using inlay/onlay preparation kit (ökodont GmbH & Co. KG, Germany) and ceramic veneer kit (Komet, Germany).

Two silicon indices were made before tooth preparation. One was used later for temporary restoration fabrication and the other was vertically cut buccolingually to assess the amount of preparation.

To standardize the amount of preparation and assure uniform thickness of the restorative materials, orientation grooves were created using depth-marker burs (microcopy, USA) with known length (1.5 mm and 2 mm) and then the preparations were verified with the silicon index.

For onlay group (control group), following ceramic MOD inlay restoration preparation criteria, the occlusal reduction was prepared by reducing 1.5 mm of non-functional cusp and 2 mm of the functional cusp. The buccal cusp in onlay group prepared by butt joint occlusal reduction of 1.5 mm that follows the morphology of the cusp with an inclined plane and not be a full flat-top reduction. The palatal margin was in the form of a rounded shoulder with a depth of 1 mm and placed 1 mm away from the tip of the palatal cusp. The occlusal box depth was established between 1.5 to 2.0 mm extended from central

groove to the pulpal floor, 1mm depth from the pulpal floor to the gingival seat, the internal line angles were rounded, and the divergence angle of the cavity walls was approximately 12° to 20° , with no bevel. The isthmus portion measuring was $\frac{1}{3}$ the bucco-lingual width^(9,10,11)Figure (2).

For vonlay group (intervention group), The same as control group then preparation was extended to the buccal surface 0.5 mm supragingival ending with a chamfer finish line of 0.5 mm depth. then rounding of all line angles and the margins was done^(12,13)Figure (3a,b).

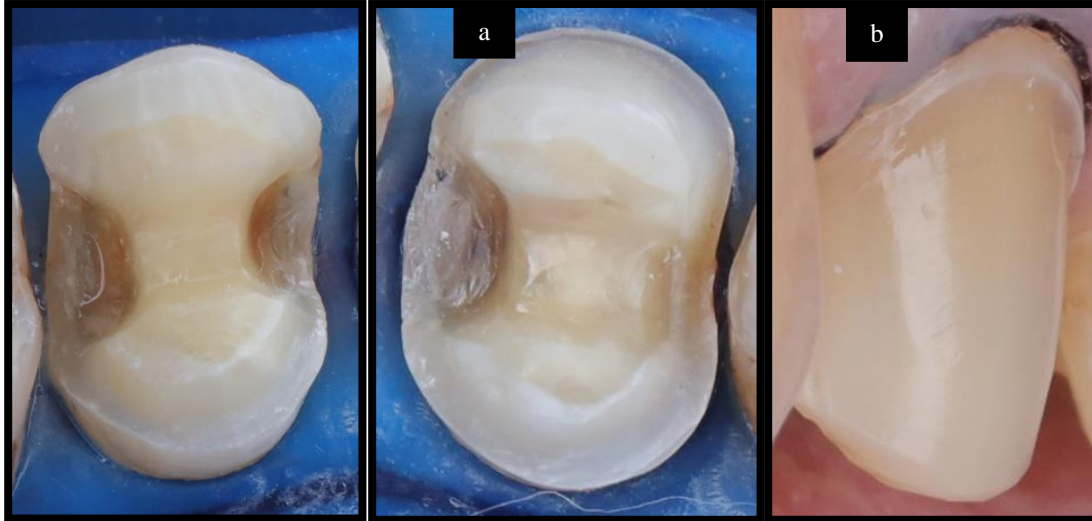


Figure (2): Prepared tooth to receive an onlay **Figure (3):** Prepared tooth to receive vonlay(a,b)

Polyvinyl siloxane (PVS) addition silicon impression material(ZhermackSpA, Italy) was used to make the final impression in two steps impression technique.

Temporary self-curing composite resin material (Charm Temp Crown, Dentkist,Korea) was used to fabricate the provisional restoration utilizing the previously made silicon putty index.

The final impressions were poured using type IV stone (Elite,Zhermack,Italy) following the manufacturer instructions to fabricate the master cast.

Medit extra-oral scanner (MeditIdentica Hybrid 3D scanner, On dent, Turkey) was used for the process of scanning the master cast. Then the resin pattern design was created using exocadsoftwareFigure(4)which was used to mill PMMA try in onlay and vonlayrestorations by using 5-axis milling machine (Shera eco mill 5x, Germany).

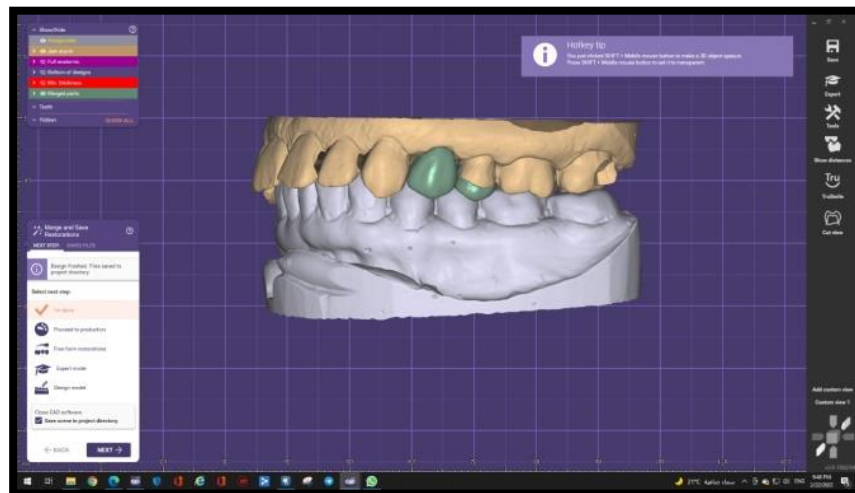


Figure (4): Restoration proposal (buccal view)

Try in by the resin restoration:

The resin restoration try-in (CAD/CAM PMMA) was checked initially for seating, occlusion, and marginal fit on the master cast then intra-orally for contacts, seating, marginal fit, retention, stability, shape, contour, and occlusion⁽¹⁴⁾.

Fabrication of the final restoration using pressing technique:

Lithium disilicate-pressable (e.max) ceramic were available in the form of ingots to fabricate restoration shape by pressing technology.

Upon completion of the press cycle the investment ring was retrieved immediately, cooling to room temperature, divesting, removing of reaction layer, finishing, and finally the final restorations were glazed using a fluorescent glazing paste^(15,16,17).

Checking and verification of the final restoration on the patient's mouth:

Removing the provisional restoration by the aid of a manual excavator and the abutment teeth were cleaned from any temporary cement remnants followed by washing and gently air-dried, then checking of the final restorations including the seating, marginal integrity, retention, stability, and the contacts were performed.

Radiographic checking of the final restorations was done to ensure marginal fitting by using periapical radiographs.

Cementation of the final restoration

The internal surfaces of e-max onlays and vonlays restorations were etched with 9.5% hydrofluoric acid (BISCO-USA) for 20 seconds, washed and air dried. And the silane coupling agent (BISCO-USA) was applied for 60s and dried^(18,19).

After rubber dam isolation, the cavity margins of the exposed enamel were treated with a 37% phosphoric acid gel (Ivoclar Vivadent, Schaann, Liechtenstein) for 20 seconds, followed by 20 seconds of water spray cleaning and gentle air drying⁽¹⁾.

In accordance with the manufacturer's recommendations, an adhesive bonding agent (All bond universal, Bisco, USA) and dual-cure adhesive resin cement (Duo-link, Bisco, USA) were applied and then light cured for 60 seconds.

Excess cement was removed completely with care using a sharp explorer and a dental floss⁽¹⁾. After removal of the rubber dam, any occlusal interference was evaluated using articulating paper. Figure (5)

Postoperative instructions and care

The patients were instructed to maintain proper oral hygiene and follow the correct technique for regular flossing and brushing, using fluoridated, non-abrasive toothpaste and a soft brush.



Figure (5): Lateral view: Onlay and Vonlay restorations after the final cementation

White arrow is vonlay and yellow arrow is onlay

Follow up sessions and continuous assessment using Modified USPHS criteria for data collection

The clinical outcomes of Onlay and Vonlay restorations were assessed by two independent outcome assessors according to the modified United States Public Health Service (USPHS) criteria in terms of fracture, marginal integrity, marginal discoloration (Table 1); at baseline, 3, 6, 9, and 12 months post-cementation. Onlay and Vonlay restorations were visually inspected with mirror, probe and dental floss; any fracture or ditching was detected, as well, any discoloration or stains at the margins of the restoration were recorded and photographed.

Table (1): USPHS criteria for outcomes' evaluation

	Outcome	Measuring unit/ Criteria
Primary 1ry	Fracture	Alpha: No evidence of fracture
		Bravo: Evidence of fracture
Secondary 2ry	Marginal integrity	Alpha: No visible evidence of ditching along the margin.
		Bravo: Visible evidence of ditching along the margin not extending to the DE junction.
		Charlie: Dentin or base is exposed along the margin.
		Delta: Restoration is mobile, fractured or missing.
	Marginal discoloration	Alpha: No discoloration on the margin between the restoration and the tooth structure.
		Bravo: Discoloration on the margin between the restoration and the tooth structure.
		Charlie: Discoloration penetrating along the margin of the restorative material in a pulpal direction.

During data collection, all patients attended throughout follow up periods in the control group (onlay group) and the intervention group (vonlay group).

Statistical methods

All of the collected data were checked, revised, tabulated and input into the computer. The statistical analysis was performed with SPSS 20® (Statistical Package for Social Science, IBM, USA), Graph Pad Prism® (Graph Pad Technologies, USA), and Microsoft Excel 2016 (Microsoft Co-operation, USA).

All qualitative data (clinical outcomes regarding fracture, marginal integrity and marginal discoloration) were presented as frequency & percentages. All the comparisons were performed using The Chi square test.

RESULTS

The results of Comparison between control & intervention groups were performed and revealed that both groups showed non-significant difference regarding fracture, marginal integrity, and marginal discoloration of restorations.

For fracture and marginal integrity outcomes, both onlay and vonlay groups presented the same Alpha scores (100%) and Bravo scores (0%) during all follow-up visits; as the restorations and the margins of all restorations in the two groups remained intact. at baseline, 3 months, 6 months, 9 months and after 12 months.

For marginal discoloration outcome as shown in table (2) and figure (6):

At baseline(Immediately post cementation) and after 3 months; all restorations in the two groups showed (Alpha) score.

After 6 months; 84.6% of Onlay restorations group showed (Alpha) score and 15.4% showed (Bravo) score. In Vonlay restoration group; all restorations showed (Alpha) score. (P-value = 0.14) There was statistically non-significant difference between the two groups.

After 9 months; 92.3% of Onlay restorations group demonstrated (Alpha) score whereas 7.7% showed (Bravo) score. In Vonlay restorations group; 92.3% of restorations showed (Alpha) score while 7.7% showed (Bravo) score. There was statistically non-significant difference between the two groups(P-value = 1.000).

After 12 months; 76.9% of Onlay restorations group showed (Alpha) score while 23.1% showed (Bravo) score. In Vonlay restorations group; 92.3% of restorations demonstrated (Alpha) score while 7.7% showed (Bravo) score. There was statistically non-significant difference between the two groups (P-value = 0.27).

Vonlay group was better than onlay group with statistically non-significant difference between two groups during 2nd and 4th follow up visits. Each group received alpha as the highest score during all intervals.

Table (2): Comparison between control & intervention groups regarding Alpha (A), Bravo (B) & Charlie (C) in marginal discoloration:

Marginal discoloration		Alpha (A)		Bravo (B)		Charlie (C)	
		N	%	N	%	N	%
Baseline - Immediately post-cementation	Control	13	100	0	0	0	0
	Intervention	13	100	0	0	0	0
	P value	1.0000		-----		-----	
1st follow-up after 3 months	Control	13	100	0	0	0	0
	Intervention	13	100	0	0	0	0
	P value	1.0000		-----		-----	
2nd follow-up after 6 months	Control	11	84.6	2	15.4	0	0
	Intervention	13	100	0	0	0	0
	P value	0.14		0.14		-----	
3rd follow-up after 9 months	Control	12	92.3	1	7.7	0	0
	Intervention	12	92.3	1	7.7	0	0
	P value	1.0000		1.000		-----	
4th follow-up after 12 months	Control	10	76.9	3	23.1	0	0
	Intervention	12	92.3	1	7.7	0	0
	P value	0.27		0.27		-----	

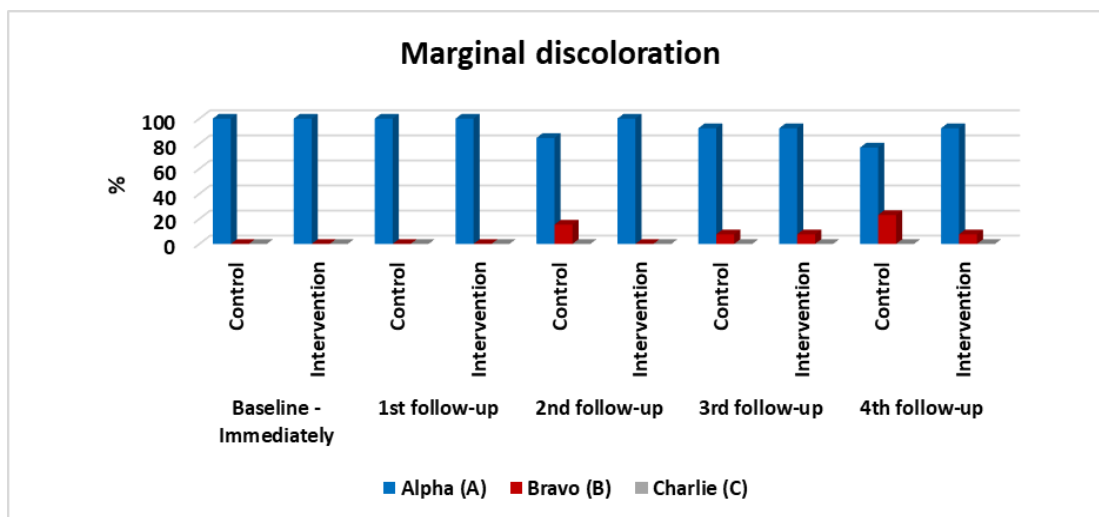


Figure (6): Comparison between control & intervention groups regarding Alpha (A), Bravo (B) & Charlie (C) in marginal discoloration

DISCUSSION

In the present study, we evaluated the clinical performances of maxillary premolars restored with two different designs (onlay restorations as the control group and vonlay restorations as the intervention group) regarding fracture, marginal integrity, and marginal discoloration with the use of e-max press material, using modified USPHS criteria over a 12-month period.

The success and durability of dental restorations are dependent on their fracture strength and it was recorded that a material fracture of the restorative material is the most common reason for the loss of partial coverage restorations constructed from all-ceramic. Moreover, the most frequently detected type of deterioration was linked to loss of marginal integrity and marginal discoloration⁽²⁰⁾.

The selection of the appropriate cavity design and indirect restoration to repair maxillary premolars was difficult due to esthetic, biomechanical, and anatomical considerations. As a result of unfavorable anatomical configuration, large mesio-occluso-distal deficiencies in maxillary premolars have a high risk of fracture as MOD preparations were observed to weaken the abutment teeth by around 59%⁽²¹⁾. It was reported that 92%–97% of the maxillary premolars are visible during a smile, so the restoration of these teeth must meet the utmost esthetic standards⁽⁸⁾.

Preclinical and clinical data on premolar restorations are insufficient, focusing primarily on overlay or occlusal onlays that do not cover the labial aspect or on labial veneers that do not cover the occlusal surface.

Onlay restorations provide superior esthetics and reduce tooth tissue loss, making them an excellent treatment option for posterior teeth with extensive caries-caused cavities. In addition, because onlays cover one tooth cusp or more, they give a beneficial distribution of stress, hence lowering the fracture possibility of tooth and restoration⁽⁴⁾.

Vonlay is a combination of an onlay with an extended veneer to cover the buccal surface used in premolar tooth areas where bonding to enamel is preferred. The vonlay is a good example of minimally invasive and esthetically pleasing restorations for patients exhibiting large cavities, decay extending cervically, or occlusal problems in premolar or even molar teeth⁽⁷⁾.

The selection of heat-pressed lithium disilicate was based on the material's superior properties compared to other highly esthetic materials, such as feldspathic porcelains or leucite-reinforced glass ceramics, making it the gold standard among glass ceramic materials. E.Max Press demonstrated superior marginal and internal fit compared to E.MaxCAD^(22,23,24,25) as a result of lowering sintering shrinkage through ceramic firing. The greatest advantage of lithium disilicate ceramic is that it can be manufactured for minimally invasive or even non-invasive therapy with thin or ultrathin (less than 0.5 mm) thickness keeping appropriate mechanical characteristics and marginal integrity with exceptionally esthetic results^(22,26).

The modified USPHS criteria have provided a practical and reasonable approach to the evaluation of the restoration's clinical performance; they are also widely used for the long-term evaluation of restorations; they are considered effective for comparison purposes at different observation periods; and they offer now a universally accepted systematic approach^(27,28).

According to reports, adhesive cementation is a crucial aspect in increasing the mechanical stability of glass-ceramic restorations. In a clinical split-mouth research, survival rates for adhesive resin cements (95.6%–87.8%) were significantly greater than for self-adhesive cements (75.6%) after 18 months of service⁽²⁹⁾.

Correct cavity preparation is necessary for the success of onlays and also other bonded partial crowns, and is therefore recognised as one of the most crucial aspects affecting the longevity and durability or long-term survival rate of ceramic onlay restorations⁽³⁰⁾.

To ensure standardization of our preparation, the same operator performed all teeth preparations. Using a depth cut of known length to create grooves of specified depth. Using a graduated periodontal probe and silicon index, the cavity's depth was measured and examined, as well as the cavity walls' width and height to ensure proper thicknesses of the preparation.

The buccal preparation of vonlay restorations ended with a chamfer finish-line which was positioned 0.5 millimetres supra-gingival because it was determined for ceramic crowns that the internal adaptation with a chamfer finish line is superior to that with a shoulder⁽³¹⁾.

A highly accurate scanner was chosen to record all the details needed for the following designing step. The restorations were designed using Exocad software, which allows for simple and accurate restoration design and consequently accurate fit of restoration to the prepared abutment. This was in conjunction with 5-axis milling machine to produce a precise fit between the restoration and the preparation^(32,33).

Also, it was found that using CAD/CAM technique to design the resin pattern considered a reliable approach in production within a clinically acceptable range regarding internal fit. This approach was utilised to limit human error and control all factors in order to reduce margin inaccuracies⁽³⁴⁾.

The try-in was machined from blocks of Poly-methyl methacrylate (PMMA), which has various advantages including excellent mechanical qualities, good marginal adaptability, greater patient comfort. Then, PMMA was invested for the manufacturing of IPS e-max press onlays or vonlays⁽³⁵⁾.

For fracture results, no fracture was observed during the one-year follow-up with no statistically significant difference in our study between both designs (Onlay and Vonlay). All the teeth treated with lithium disilicate onlay and vonlay restorations were given an Alpha score. Both were demonstrated to tolerate masticatory forces and are hence clinically acceptable.

This may be explained by the study's optimal preparation design and appropriate ceramic restorations thickness with excellent mechanical properties.

Our study results were in agreement with the results of in-vitro study by **Elsayed et al., 2020**⁽¹³⁾ and in-vivo studies **Chen et al., 2021**⁽³⁶⁾, **Edelhoff et al., 2019**⁽³⁷⁾ and **Luciano et al. in 2020**⁽³⁸⁾ studies that used lithium disilicate ceramic as partial coverage indirect restorations in posterior region including premolars.

The preparation was designed to allow the use of 2-mm-thick lithium disilicate ceramic material in the stress-bearing areas (functional cusp and central fossa), which is essential to resist flexure under loading and endure masticatory forces⁽¹¹⁾, while **Guess et al., 2013**⁽³⁹⁾ reported that onlays prepared with lesser thicknesses of ceramic (1 mm and 0.5 mm) demonstrated higher failure loads.

Furthermore, the anatomical design which was followed in our study maintains the most occlusal thickness in the center of the restorations. This was consistent with the findings of in vitro studies^(40,41). On the other hand, some in-vitro studies^(4,42) considered flat preparation exhibited fracture resistance higher than the anatomical preparation and attributed that to the flat preparation design has less stress concentration than anatomical preparation.

Our findings for vonlay design were in accordance with in-vitro studies by **Elsayed et al., 2020**⁽¹³⁾ and **Gierthmuehlen et al., 2022**⁽⁴³⁾ in which the examined monolithic lithium disilicate vonlays were found to exceed physiological masticatory forces and clinically accepted.

For marginal integrity results, both onlay and vonlay restorations showed excellent marginal integrity and received Alpha scores throughout follow-up period over one year with statistically non-significant difference.

The clinically accepted results of our study might be attributable to the following: optimal preparation design, impression was accurate with proper material and technique, scanning the master cast rather than the impression, using a scanner with blue light technology, software design, milling PMMA resin pattern by means of CAD/CAM, the type and shape of milling instruments, and the type of material and its behavior (pressable lithium disilicate).

Our results were in accordance with the findings of **Chen et al., 2021**⁽³⁶⁾, in nine cases of vonlay (buccal-occlusal onlays) restored by lithium disilicate glass-ceramic, grade A (alpha score) was observed.

While our results contradicted those of a clinical evaluation for ceramic onlays conducted by **Archibald et al., in 2018**⁽¹⁾ which revealed that regarding marginal adaptation few restorations (32.4%) received an Alfa score, two restorations received Charlie or Delta scores. This inconsistency may be attributable to the variation in observation periods.

For marginal discoloration results, the majority of vonlay and onlay restorations received alpha scores, there was no statistically significant difference between the two groups, the restorations received alpha and bravo scores. **Petridis et al., 2012**⁽⁴⁴⁾ reported the normal protocol of scaling and polishing to eliminate these marginal discolorations which was followed in our study. Even though they improved at the subsequent follow-up session, they recurred at the 12-month follow-up, which might be explained by the patients did not follow the recommended oral hygiene protocol and this was in agreement with clinical study by **Salem et al., 2022**⁽⁴⁵⁾. This outcome was similar with **Nassar et al., 2019**⁽⁴⁶⁾ where (IPS e.max CAD) partial coverage restorations showed a non-significant decline in Alpha scores to 95.65% after six months and to 87% after 12 months.

Other clinical studies^(9,39) observed marginal discoloration of e.max PCRs (partial coverage restorations) as the most common clinical sign occurring in 37.5% of PCRs after 7 years in.

Rauch et al., 2018⁽⁴⁷⁾ in a clinical trial to evaluate the clinical survival of monolithic lithium disilicate crowns observed that discoloration was visible related to the adhesive gap when self-adhesive resin cements were used.

While it has been observed that adhesive cementation reduces marginal microleakage, resin luting agents could be more susceptible to water absorption and discoloration than other types of cement⁽⁴⁴⁾.

CONCLUSIONS

Within the limitations of this study, the following could be concluded:

1. Both lithium disilicate (e-max press) onlay and vonlay restorations are reliable treatment options with high successful clinical performance in term of fracture, marginal integrity and marginal discoloration for restoring defects in maxillary premolar dentition over a period of one year.
2. Vonlay restorations can effectively repair weakened tooth structure without considerable removal of healthy dental tissue.

RECOMMENDATIONS

1. Further randomized, long-term clinical studies are required to evaluate vonlay design with different ceramic materials and different thicknesses not covered in this study to allow maximum conservatism.
2. Whenever the clinical situation permits (cervical caries or labial defect), the preparation for vonlay restorations is recommended.

CLINICAL IMPLICATIONS

It is advisable for the clinician to use conservative preparation of lithium disilicate vonlay restorations to meet esthetic demands of the patient in premolar dentition.

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