

بسم الله الرحمن الرحيم





شبكة المعلومات الجامعية التوثيق الالكتروني والميكرو فيلم



جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأقراص المدمجة قد أعدت دون أية تغيرات



يجب أن

تحفظ هذه الأقراص المدمجة بعيدا عن الغبار





بعض الوثائق الأصلية تالفة





بالرسالة صفحات
لم ترد بالأصل



INTRODUCTION

In response to an increasing patient's demand for minimally invasive, more esthetic and durable dental restorations, the use of ceramic laminate veneers over the last decades has become a widespread approach to restore fractured, malaligned, and malformed teeth. Moreover, the clinical indications of these restorations have been progressively increased due to the development of ceramic materials that have been recently introduced in the market together with efficient bonding to enamel and dentin using adhesive materials and techniques.^[1]

Although ceramic laminate veneers assist clinicians in achieving patient satisfaction, because of their excellent optical properties and biocompatibility, these restorations are bonded glass ceramic material which makes their removal very challenging.^[2]

In cases of removing the veneers a short time after cementation due to improper seating during cementation, veneer fracture and shade mismatching either due to improper selection of veneer cement or improper shade selection of ceramic veneer, preserving the integrity of the laminate veneer becomes critical to avoid their remanufacturing. Using conventional removal techniques as grinding the restoration using abrasive stones or mechanical crown removers is painful to the patient and carries a risk of bypassing the restoration, and

damaging underlying tooth structure because of the lack of color contrast between tooth, adhesive resin interface, and the restoration.

To overcome these difficulties, the use of lasers was recently introduced as a more comfortable and more conservative restoration removal technique.

Erbium lasers has been used as an alternative for debonding ceramic restorations from natural tooth surfaces. Erbium lasers including Er:YAG laser have an emission wavelength of 2940 nm which correlates with the absorption peak of water, residual monomers and bonding cements containing water. Therefore, it is considered safe to ablate dental hard tissues.^[3]

Er:YAG laser energy is transmitted through the ceramic surface. The resin cement absorbs the transmitted energy, whose amount depends on the ceramic type, thickness, and composition. When enough amount of cement is ablated through the ceramic, the restoration slides off the tooth surface in one piece. The ablation mechanism involved is explosive vaporization followed by a hydrodynamic ejection.^[4]

REVIEW OF LITERATURE

One of the patients' greatest desires when seeking dental treatment is the aesthetic transformation of their smiles to include healthy and harmonious dentition. Therefore, conservative treatments that are able to modify the size, shape, and color of the teeth should always be the first treatment option.^[5]

Contrary to what many clinicians think, the concept of ceramic laminate veneers without tooth surface wear is not new. Historically, during the 1930s, a California dentist Charles Leland Pincus worked in the US film industry; he had the difficult task of aesthetically improving the smiles of stars. Pincus used thin ceramic laminate veneers with an adhesive aid for the temporary fixation of full dentures. However, due to a lack of appropriate cement, the procedure lasted only a few hours.^[6]

During the 1980s, following the development of techniques for adhesive cementation, ultrathin ceramic laminates were relaunched. However, at that time, the practice did not spread as quickly as expected, mainly due to professionals' fears regarding the strength of the very thin porcelain veneers in resisting masticatory forces.^[7]

Due to increasing aesthetic demand and the possibility of bonding ceramic laminate to the tooth structure (particularly

enamel), a new concept was introduced: minimally invasive restorative dentistry, which causes less damage to dental structures.^[8] Since its introduction, porcelain laminate veneer has proven to be a durable and esthetic modality of treatment. Using adhesive materials and techniques, a strong bond can be achieved between laminate veneer and tooth structure.^[9]

Morimoto et al in 2016,^[10] carried out a systematic review to assess the survival rate of feldspathic porcelain and glass ceramic laminate veneers. It was concluded that laminate veneers have high survival rate of 89% after a follow-up of 9 years.

Porcelain laminate veneers can be used as a solution to esthetic problems, involving morphologic modifications as in relation to tooth shape, contour, size, color, volume, and positioning. Besides, veneers may be indicated for treating loss of tooth structure due to disease or trauma.^[11]

The contraindications must be recognized as well. The placement of veneers is contraindicated when there is reduced interocclusal distance; deep vertical overlap anteriorly, severe bruxism or parafunctional habits, severely malpositioned teeth, and teeth with extensive existing restorations.^[12]

Additionally, the long term success of porcelain laminate veneer is dependent on many factors such as composition of tooth surface, preparation depth, type and thickness of ceramic,

favorable occlusal relationships, and the ability of the porcelain to be etched and adhesively bonded to resin cements.^[13]

Veneer preparation

Preparation for ceramic laminate veneers should be made meticulously to maintain the preparation completely in enamel.^[14]

It is reported that preparation in enamel assists in maintaining an optimal bond with the porcelain laminate veneers and decreasing the stresses in the porcelain. Regarding preparation depth, the enamel reduction, depending on location usually 0.3–0.7 mm is necessary to remove the aprismatic and hypermineralized enamel, which can be resistant to acid etching.^[15]

Therefore, preparation technique became more important for the longevity of the porcelain veneers because high failure rates of such restorations have been attributed to the large exposed dentine surfaces.^[14]

Although improved new adhesives were developed, the bond strength of porcelain to enamel is still superior when compared to the bond strength of porcelain to dentine. Problems associated with bonding to dentine are more difficult to resolve than those associated with bonding to enamel because of the characteristics of the dentine substrates, including lower inorganic content, tubular structure with

variations in this structure, and the presence of intratubular fluid movement. ^[16]

Blunck et al in 2020, ^[17] carried out a study to investigate the influence of different preparation designs on fracture resistance of ceramic laminate veneers after thermomechanical loading. He concluded that fracture risk for veneers with preparations in dentin was statistically higher than that of veneers luted in enamel.

Additionally, marginal staining is a common complication of porcelain laminate veneers, often appearing some years after placement of veneers in cervical areas, where dentin is most likely to have been exposed during preparation. ^[16]

Different designs of laminate veneer

Preparation design itself continues to be one of the most controversial aspects of the veneer. Generally, 4 types of preparation designs have been proposed: the window preparation which is limited to the labial tooth surface, the feather incisal edge preparation in which the preparation is extended to the incisal margin but without a definite finish line, the butt joint incisal design in which the incisal edge of the tooth is prepared bucco-palatally and the length of the incisal tooth is reduced about 1-1.5 mm, and the overlapped incisal edge preparation, in which a palatal chamfer is prepared. Most preparation designs

require a uniform tooth reduction to provide enough space for the restoration. ^[18]

Window preparations have been reported to have fracture resistance values similar to that of unprepared teeth. This preparation design may be considered an option in case where strength is the primary goal as the margin design is characterized by high values of elasticity to better resist high dynamic stresses. ^[19]

In most indirect fabricated porcelain laminate veneer either a butt joint incisal design or an overlapped incisal edge preparation is used. ^[20]

Albanesi et al in 2016, ^[21] made a systematic review to evaluate the survival rates of preparation designs for ceramic laminate veneers with and without incisal coverage. Studies included were studies related to ceramic veneers and prospective or retrospective studies carried out in humans. Eight studies out of 1145 articles were initially identified. The survival rate for ceramic laminate veneers with incisal coverage was 88% and 91% for those without incisal coverage. It was concluded that irrespective of the preparation designs, with or without incisal coverage, ceramic veneers showed high survival rates.

Materials

To improve aesthetics in anterior teeth by means of laminate veneers, two types of materials are used for their translucency and possibility to be used in small thickness: sintered feldspathic porcelain and pressed glass ceramic, which can also be milled using a computer aided manufacturing technique.^[22]

Ceramics can vary from being very translucent to very opaque. Generally, the glassier the microstructure the more translucent the ceramic will appear while the more crystalline structure, the more opaque the ceramic will be. Other contributory factors to translucency include particle size, particle density, refractive index, and porosity.^[23]

Feldspathic porcelain

Feldspathic porcelain was the key material for creating porcelain teeth. This material provides superior esthetics and demonstrates high translucency, just like natural teeth. Skilled technicians in porcelain layering and veneering later would stack this powder and liquid material onto a core composed of metal, alumina, or zirconia to create esthetic restorations.^[24]

By using layering and firing process, ceramists began developing veneers that could be made as optically close to natural teeth as possible. When feldspathic veneers were first introduced, they presented 0.5 mm of thickness and tapered

down to practically nothing at the margins. Refractory dies and platinum foil techniques were used to fabricate feldspathic porcelain veneers.^[24]

A major concern with feldspathic porcelain veneers was their strength, which was approximately 70 MPa to 90 MPa. Moreover, when the veneers were placed without preparation, periodontal problems could occur as a result of overcontoured teeth with unnatural emergence profiles. After much research, it was determined that feldspathic veneers would last long term, especially when bonded to enamel. Therefore, to preserve the health of the gingival tissues and prevent overcontouring, a slight 0.5-mm reduction of tooth surface was recommended. Because the feldspathic veneers were typically 0.5 mm, the lost tooth structure was replaced and the original emergence profile was restored. To solve the perceived issues regarding strength, glass based ceramics were introduced.^[25]

Glass based ceramics

Interest in nonmetallic and biocompatible restorative materials increased following the introduction of the feldspathic porcelain crown in 1903 by Land.^[26] Increased strength in glassy ceramics is obtained by adding appropriate fillers that are uniformly dispersed through the glass, such as aluminum, zirconia, leucite, and lithium di silicate.^[27]

Glass ceramics can be ideally used as dental restorative materials. Their mechanical and physical properties have improved, including increased fracture resistance, improved thermal shock resistance and resistance to erosion. Improvement in properties depends on the interaction of the crystal particles and glassy matrix as well as on the size and amount of crystals. These crystals may be opaque or translucent depending on the chemical composition and percent crystallinity.^[23]

Their flexural strength depends on the shape and volume of these crystals. The material can be translucent, even with the high crystalline content as a result of the relatively low refractive index of the crystals. The manufacturer recommends the use of glass ceramics for anterior or posterior crowns, implants crowns, inlays, onlays, and laminate veneers.^[27]

Leucite

The first fillers to be used in glass ceramics contained particles of a crystalline mineral called “leucite” added to the ceramic, so that the leucite comprised about 50%–55% of the material. Leucite is a crystalline mineral having an index of refraction similar to that of the feldspathic glass. Commercial dental ceramics containing leucite as a strengthener include IPS Empress (Ivoclar Vivadent Schaan Liechtenstein) with flexural strength 73-182 MPa. The leucite strengthened porcelains are