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A Detailed Overview on Veneers – Diagnostic and Clinical Considerations

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ABSTRACT

Cosmetic dentistry is comprehensive oral care that combines both art and science to optimally improve dental health, aesthetics and function. Its objective is to provide maximum improvements in aesthetics with the minimum trauma to the dentition. Veneer is a thin layer of tooth colored material applied to the tooth to restore localized or generalized defects and intrinsic discoloration. The evolution of material sciences, ceramics, and adhesive system permits improvements of the aesthetic smile design of patients. The current manuscript is a review that highlights the diagnostic considerations; repair and maintenance; and recent advances in veneers.

Keywords: Aesthetic dentistry; smile design; repair of veneers; lumineers.

1. INTRODUCTION

The term “esthetics” is borrowed from the Greek word “aesthesia” meaning sensation or sensibility. It can be defined as belonging to the appreciation of the beautiful. Pilkington in 1936 defined dental esthetics as the science of copying or harmonizing our work with that of nature, making our art inconspicuous. The word “cosmetic” means “kosmos” or adornment in Greek.

The success of a restoration depends on sound mechanical, biological and esthetic principles. An ideal restoration must satisfy these requirements. Irfan Ahmad has suggested the HFA triad, according to this, dental treatment must be directed to fulfill the Health, Function and Aesthetics for the patient [1]. Various techniques for esthetic rehabilitation treatment include a combination of: preoperative and postoperative clinical photographs of patients, diagnostic models with wax ups, composite resin mock-ups on the patient and computer-imaging simulations.

Veneer is a layer of tooth colored material that is applied to a tooth to restore localized or generalized defects and intrinsic discoloration. Veneers are made up of chair-side composite, processed composite, porcelain and compressed ceramic materials. The process of applying a thin veneer of preformed porcelain, composite resin or plastic material to a tooth is called laminating. Laminates can successfully transform smiles painlessly, conservatively and quickly with long lasting results.[2]

The objective of Cosmetic Dentistry is to provide maximum improvements in aesthetics with minimum trauma to the dentition. Rendering or restoration of the smile is one of the most appreciated treatments provided by the dentist. Correction of discoloured, malformed or crooked teeth can produce dramatic changes in appearance, which often results in improved confidence, personality and social life. Veneer is considered one of the most conservative operative treatment procedures because the tooth preparation involves the removal of less than half the thickness of the enamel, leaving the remaining portion intact before veneer placement [3]. Many clinical studies have concluded that bonded laminate veneer restorations delivered good results over a period of 10 years

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and more [4]. The modern improvement of composite cements, adhesive systems and simplified cementation procedures enable the promotion of using veneers among the dentists [5,6].

2. CLASSIFICATION OF VENEERS

- I. Based on method of fabrication:
 - i. Direct technique
 - ii. Indirect technique
- II. Based on extent of coverage:
 - i. Partial veneers- for localized defects or areas of intrinsic discolouration that involve only a portion of the clinical crown.
 - ii. Full veneers – when majority of the facial surface or whole crown of the tooth is discoloured or restoration of generalized defects.
- III. Based on tooth preparation – full veneer:
 - i. Full veneer with incisal lapping.
 - ii. Full veneer with window preparation.
- IV. Based upon the materials & techniques used:
 - i. Directly fabricated composite resin veneers.
 - a) Direct partial veneers
 - b) Direct full veneers
 - ii. Indirectly fabricated veneers
 - a) Etched porcelain veneers
 - b) Processed composite veneers
 - c) Castable ceramic veneers
 - iii. Veneers for metal restorations.
- V. Based on the preparation designs
 - i. Window preparation: the incisal edge of the tooth is preserved.
 - ii. Feather preparation: the incisal edge of the tooth is prepared bucco- palatally, but the incisal length is not reduced.
 - iii. Bevel preparation: the incisal edge of the tooth is prepared bucco-palatally and the length of the incisal edge is reduced slightly by 0.5-1 mm.
 - iv. Incisal overlap preparation: the incisal edge of the tooth is prepared bucco-palatally and the length is reduced (about 2 mm), so the veneer is extended to the palatal aspect of the tooth [7].

2.1 Indications

1. Teeth with intrinsic / extrinsic discoloration- single/multiple-
Extrinsic – Plaque, chromogenic bacteria, chlorhexidine mouthrinse, beverages (tea,coffee, red wine), iron supplements.
Intrinsic – tetracycline stains, fluorosis, haematological diseases, devitalization, smoking, caries and dental restorative materials.
2. Enamel defects- gross enamel hypoplasia of the anterior teeth, amelogenesis imperfecta.
3. Presence of diastema.

4. Teeth with abnormal shape and form.
5. Improper surface texture.
6. Mal-aligned teeth- For developing the esthetic illusion of straight teeth where orthodontic treatment is not sought or indicated.
7. Malocclusion- The configuration of lingual surface of anterior teeth can be changed to develop incisal guidance or centric contacts in malocclusion or periodontally compromised teeth.
8. Multiple carious lesions and decalcifications.
9. Attrition / abrasion / erosion.
10. Stained or defective restorations that appear unesthetic on labial surfaces of teeth.
11. Trauma / fracture of multiple anterior teeth.
12. Aging - For discoloured teeth or attrited teeth due to aging, improvement can be done by bleaching or bleaching with subsequent veneering.
13. Wear patterns- Porcelain laminates are useful in teeth with slow progressive wear patterns. If sufficient enamel remains and the desired increased in length is not excessive, porcelain veneers can be bonded to the remaining tooth structure to change shape, color or function.
14. Agenesis of lateral incisor.

2.2 Contra- Indications

- Teeth having insufficient enamel.
- Young permanent teeth.
- Teeth exhibiting severe occlusal wear patterns, due to para-functional habits.
- Severe periodontal involvement with severe crowding.
- Poor oral hygiene.
- Inability to etch the enamel in excessively fluoridated teeth.
- Patients with high caries rate.

2.3 Ideal Requirements of a Veneer

1. Biological compatibility, especially with gingival tissues and periodontium.
2. Chemical durability of both the veneer material and its bond to enamel.
3. To be wear resistant.
4. Good aesthetics, which depends on: color of veneer, Translucency, Color of the luting agent, Resistance to both staining and discoloration.
5. Replicate tooth contour, with a minimum thickness (not thicker than 0.5mm)
6. Smooth surface and margins, capable of retaining high lustre.
7. To be able to mask all sorts of discoloration without the need of an excessive increase in thickness.
8. To be able to copy well, natural colours of tooth both at cervical and at its middle portion and incisal.
9. To be easy to prepare.
10. When in service, to resist fracture and be easily repaired or substituted when fracture occurs.
11. To be of a low cost.

2.4 Diagnostic Considerations

2.4.1 Assessment of the face

It is important to assess the shape of the face, skin color, symmetry, maxillary and mandibular lip lines. Patients with a narrow face may desire veneers with long and narrow teeth to emphasize the facial shape or round and short teeth to soften the narrowness of the face. Veneers appear brighter and high in value – dark skin and appear yellow and low in value as the skin tone becomes lighter.

2.4.2 Assessment of the smile

It is important to assess the shape, form, color of the teeth. The clinician should note the maxillary incisal edge position in relation to the lower lip, the amount of gingival display during smiling and

speaking and the overall quality of the smile. In an ideal tooth arrangement, the smile line should coincide or follow the curvature of the lower lip while smiling.

The space that includes the teeth and tissues (inferior border of the upper lip, superior border of the lower lip) that is revealed when smiling is called the smile zone. Smile zones can be classified into the following types namely - straight, curved, ellipse, bow, rectangular and inverted. This is helpful in assessment of the smile. [6]

2.4.3 Photographs

The pre-operative photographs document the pre-operative condition and aid the technician for the veneer fabrication. This should include - a full face smile, retracted frontal view with the shade tab held beneath the incisal edges of the maxillary incisors, a close-up view of the teeth to be veneered and a post-preparation view with the shade tab.

2.4.4 Computer imaging and diagnostic mock Ups

Computer imaging of the patient's smile and making the desired changes on the screen – provides the patient and the dentist a realistic preview of the expected result. Preparation and waxing on the diagnostic cast is necessary when veneers are required to lengthen teeth, close spaces or correct mal-aligned teeth.

Technique for tooth preparation for porcelain veneer fabrication:-

Incisal edge preparation-Three preparation designs have been suggested regarding the incisal edge preparation of ceramic laminate veneers:

- the window or inter-enamel preparation,
- the incisal bevel 0.5-1 mm
- the overlapped incisal edge 2-4 mm preparation.

The window or inter-enamel preparation is used for minimal teeth preparation – removal of stains or discoloration with no need for crown length correction. In this technique, the main preparation is on the labial or facial tooth surface and the incisal portion just prepared from facial surface and no preparation at all done at both incisal edge and palatal surface. The depth is equivalent to half the thickness of facial enamel (0.5 – 0.75 mm - mid facially; 0.2 – 0.5 mm = gingivally). The disadvantages manifested are decreased retention and weakened incisal portion of the ceramic laminate veneers.

For the incisal bevel preparation technique the outline form includes the entire facial surface, extending 0.5 – 1mm cervical to the mark at the gingival tissue level. The study of Castelnovo et.al,[8] revealed that the incisal bevel of 0.5-2 mm will result in nearly a butt joint and the palatal reduction of the incisal edge will result in a chamfer finishing line. This leads to more strength of veneer and decreases the risk of broken thin shell of non-supported veneers ledges, the incisal bevel will strongly achieve that purpose especially in the case of multiple ceramic laminate veneers. Half of the enamel thickness should be removed: 0.75mm- incisally; 0.5mm - mid facially; 0.3 mm - gingivally on the facial surface.

Regarding the third preparation technique, the edge lapped or the overlapped incisal edge 2-4 mm preparation, a study by Akoglu et.al, [9] assessed the failure mode and the load of fracture of ceramic laminate veneers where the preparation are done and finished at either enamel or dentin. It revealed that the lower fracture load was achieved when 4mm incisal reduction entirely done on dentin surface than those of only 2 mm dentin reduction. It also concluded that the fracture resistance was nearly similar with no statistical significant difference for both veneers of less than 2 mm preparation at the incisal edge area and for intact teeth with no incisal edge preparation (the window type). Dentist should be able to choose the proper preparation technique either incisal edge bevelling (0.5-1 mm) or complete over-lapped technique (2-4 mm) according to situation of the case to achieve long lasting

veneers. Higher accuracy results were obtained when palatal surface and incisal edge preparation were guided by silicone putty index than with depth gauge bur.

2.5 Preparation of Labial Surface

Since this surface resembles the most esthetic portion of ceramic laminate veneers, obtaining the accurate preparation depth can be achieved via several methods. Depth cutter burs are very useful to make grooves or cuts that control preparation depth. The depth for minimal invasive approach is 0.5 mm. The standard reduction is 0.3 mm on the gingival third, 0.5mm on the middle third, 0.7 mm on the incisal third of the labial surface and 1.5 - 2 mm on the incisal edge. The silicon putty index after wax up is also helpful. Free-hand technique is not recommended for beginners to avoid the risk of overcutting or unequal reduction levels of labial tooth surface.

2.6 Preparation of Interproximal Surface

There is no restriction regarding the interproximal tooth preparation for ceramic veneers. Few authors recommended no-preparation especially with window type when a minor tooth discoloration confined to facial surface with no interproximal extensions. Others advised a conservative interproximal preparation with no contact area opening, if discoloration extended at proximal area. In diastema closure, slight opening of the interproximal contacts is recommended. In some situation when preparing multiple teeth with tight contact a slice preparation or breakage of contact will be advisable in order to free way the contacts and enhance contour adjustments.

2.7 Palatal Extensions

- Short wrapping – The veneer extends only to the facial margin of the tooth
- Medium wrapping – The veneer extends into the bulk of the mesial or distal marginal ridge by penetrating 50% of the interdental area
- Long wrapping – The veneer encircles the entire interdental area

The margins should not be placed on the concavity but rather should be placed above the concavity or below on the smooth convex area of the cingulum.

2.8 Cervical Margin Preparation

In porcelain laminate veneers cervical margin is one of the critical areas from esthetic and biological point of view. Finish line may be at one of these three locations; supra-gingival, equi-gingival and sub-gingival. The Supra-gingival finish line is more hygienic and biological for gingival tissues but less esthetic. Chamfer finish line is more accepted and will be more beneficial for technician to determine where to build and construct the porcelain laminate veneers. The sub-gingival finish line is more esthetic but less biocompatible for the gingival tissues. This type can be used efficiently in case of severely discoloured teeth like tetracycline stains to mask the undesirable discoloration at the cervical margins. Cervical margins are a challenge for luting cement as fluids secreted from gingival crevice impair a good seal between the fitting surface of laminate veneer and the tooth structure. Many studies have concluded that if the tooth preparation was more conservative and confined to enamel, the bond strength between recent resin cements and enamel will be better than with dentin [7].

Window preparation is

- Preferred in Direct Composite Veneers.
- Preserves lingual and incisal surfaces
- Preservation of functional surfaces
- Reduces wear of opposing tooth

Incisal lapping design is preferred for

- Lengthening of tooth
- Incisal defect
- Facilitates seating of veneer

3. TECHNIQUE FOR DIRECT PARTIAL VENEER

- Outline the extent of defect.
- The Existing composite resin or decay is removed.
- A Coarse elliptical/round diamond bur used to remove 0.5-0.75mm of the defective enamel.
- Chamfer finish line for definite cavity margin.
- Sub-gingival extension- if the defect is subgingival
- Tooth is then etched with 37% phosphoric acid and dentin bonding agent is applied. Microfilled or more opaque composite is placed depending on the extent of the defect.

4. TECHNIQUE FOR DIRECT FULL VENEER

- Anesthetization and tooth isolation.
- Shades of composite are tried on.
- Half the depth of enamel-0.5-0.75mm mid facially and 0.2-0.5mm along gingival margin is reduced.
- Tooth is roughened and a definite chamfer finish line from papilla tip towards the incisal edge on both the mesial and distal proximal surfaces.
- Incisal edge included, reduce atleast 1mm.
- Margins should be at the crest of the gingiva.
- Shade selection and isolation.
- Contoured anatomical matrix is placed and wedged loosely.
- Tooth is then etched with 37% phosphoric acid and the dentin bonding agent is applied. Composite is placed and cured and shaped with a composite roller in case of discoloured teeth, opaques are used to mask the defects [10].

4.1 Indirect Composite Veneers

4.1.1 Advantages

- Better control of facial contours.
- Easily repaired.
- Children and adolescents as interim restorations.
- Lower cost.

4.1.2 Disadvantages

- Limited bonding.
- Surface conditioning or sand blasting required.

4.1.3 First appointment

- Window preparation recommended due to limited bond strength.
- Incisal lapping - if incisal defect is present.
- It an intra-enamel preparation.
- Elastomeric impressions are taken.
- No temporization.

4.1.4 Second appointment

- Evaluate fit of veneer.
- Tooth side of veneer (pre-etched) is primed.
- Tooth etched with 37% phosphoric acid then rinsed and dried. Adhesive resin is applied but not cured.
- Adhesive dual cure resin cement is applied.
- Veneer placed on to the tooth and excess cement removed.

- Check for fit with no.2 explorer.
- Light cured for 40-60seconds facially & lingually. [10]

5. PORCELAIN VENEER

5.1 Advantages

- Esthetic stability
- High Bond Strength
- Resistance to abrasion
- Inherent Porcelain Strength (Stronger and durable)
- Resistance to fluid absorption
- Stain resistant
- Gingival tissue tolerates porcelain well
- For a porcelain veneer colour can be selected such that it makes dark teeth appear whiter.

5.2 Disadvantages

- The process is irreversible
- More expensive than composite veneers
- Not suitable for patients with clenching or grinding habits
- Not repairable should they chip or crack
- Tooth become more sensitive to hot and cold foods and beverages
- They can dislodge or fall off
- Technique sensitive

5.3 Indications

- Discoloration
- Enamel defect
- Diastema
- Mal-positioned teeth
- Malocclusion
- Poor restoration
- Ageing
- Wear patterns
- Agenesis of lateral incisors.

5.4 Contraindications of Porcelain veneers

- Crowded or mal-aligned teeth
- Teeth with inadequate enamel present
- Patient with habitual clenching and grinding
- Non-ideal occlusion
- Periodontal disease
- Inability to etch enamel effectively; deciduous and highly fluoridated teeth may not etch effectively due to the presence of hydroxyl fluoroapatite crystal structure.
- Patients with high caries index.
- Endodontically treated teeth; a full crown would hold the integrity of the non vital teeth than a veneer.
- Teeth with gingival recession
- Teeth with extensive restorations and small triangular teeth.

- Unstable occlusion; pronounced overbite, edge to edge occlusion, pronounced over jet, severely crowded teeth and cases which have to undergo another type of treatment (endodontic, restorative, periodontic and orthodontic).
- Reduced inter occlusal distance and deep overlap (higher tensile and shear stress).

5.5 Currently Used Porcelain Material

5.5.1 Based on the lab procedures used to fabricate these laminate veneers

1. Sintered feldspathic porcelain. Using platinum foil.
2. Pressable ceramic by injection (feldspath + leucite).
3. CAD/CAM technique (feldspath reinforced with leucite or lithium block).

5.5.2 Based on translucency and opacity

1. Amorphous glassy microstructure (non crystalline) appears translucent (SiO_2 , quartz with small amount of alumina, feldspath). This type has low flexural strength.
2. The crystalline microstructure appears opaque (ZrO_2 , Al_2O_3). This type has high flexural strength [10].

5.6 Procera Veneer (CAD_CAM)

- Thin all ceramic shell used to cover chipped, cracked or crooked teeth.
- Computer programmed oversized dies
- Highly sintered high purity alumina.
- Its brilliant, luminous quality just mimics natural teeth.
- Simple to use
- Excellent esthetics [11]

5.7 Clinical Technique for Placement of Indirect Veneer

- Shade selection is done.
- Tooth preparation is done with a medium grit flame or chamfer diamond bur (facial reduction – 0.25 to 0.50 mm & incisal reduction – 1 to 1.5 mm).
- A full arch impression of the prepared teeth is made with vinyl polysiloxane.
- Make an opposing arch impression with irreversible hydrocolloid.
- A provisional restoration is placed.
- The stone models are poured. Veneers can be made on the stone model using separating medium or on a flexible model.
- After the stone is fully set, make an irreversible hydrocolloid impression of the model.
- Inject addition silicone (medium to heavy viscosity) into the alginate impression and form a flexible model.
- On the flexible model, fabricate the composite resin veneer similar to the direct intraoral application technique (apply layers of dentin, body and incisal shades and cure each layer for 40 sec).
- Remove the veneer from the flexible model.
- Contour and polish veneers using 12 – 30 fluted finishing carbide burs in a high speed handpiece and polishing wheels.
- Place the veneers on the original stone model to check the fit and the margins.
- Heat treat the veneers in boiling water or in a heat device such as a Coltene unit for 10 min to achieve the benefits of heat curing.
- Acid etch the lingual side of the veneers with 10% hydrofluoric acid gel for 30 sec or lightly sandblast with an air abrasion unit and rinse thoroughly.
- Isolation is done, clean the teeth and etch with 37% phosphoric acid for 15 seconds and rinse thoroughly.

- Using a brush, apply silane coupling agent to the internal surface of the veneer and air dry.
- A thin layer of bonding agent is applied on the etched surface of the tooth and as well as on the internal surface of the veneer.
- Apply a thin layer of dual cure luting composite resin on the inner surface of the veneer and place it on the prepared teeth.
- Remove the excess material with a brush dipped in bonding agent and light cure for 40 sec.
- Remove the excess cured resin luting agent with # 12 surgical blade or scaler.
- Finish the margins with 12- 30 fluted carbide finishing bur; fine diamonds, rubber polishing cusps or finishing discs [7].

6. FINISHING THE PREPERATION

1. The final step in the preparation is the production of a smooth enamel surface, achieved with fine diamond bur carried across the enamel with a light sweeping motion, followed by polishing with small diameter, waterproof, flexible discs.
2. The discs are also used to round off sharp angles left in the preparation.

7. PROVISIONAL RESTORATION

Before the final impression of the prepared tooth, fabricate a preliminary provisional restoration using a bis-acryl provisional material. It will give the chance to evaluate the thickness, the shade, and the alignment which can be modified before the final impression. It could be done by a silicone impression of the waxed-up model, filled by acrylic and inserted in the mouth till setting. A metallic tray (rim lock) is used to avoid any distortion or separation of the impression material. Vinylpolysiloxane is the material of choice. The wash technique or double mix technique can be used.

8 TRY-IN

- Remove the provisional restoration, clean, isolate and dry. Moisten the veneers, place them on the teeth, and check up the fit and the shade. Try-in paste is used to adjust the shade (water soluble).
- 37% phosphoric acid is used for 30 sec to clean the veneers if they are etched in the lab.
- Rinse and dry.

8.1 Ceramic Composition and Surface Treatment Protocols

- Feldspathic - 9.5% hydrofluoric acid for 2 to 2.5 min; 1 min washing; silane application.
- Leucite-reinforced- 9.5% hydrofluoric acid for 60 s; 1 min washing; silane application.
- Lithium disilicate-reinforced -9.5% hydrofluoric acid for 20 s; 1 min washing; silane application

Silane coupling agent:

These agents are capable of chemically bonding to silica in both the porcelain laminate veneer & composite resin matrix. Eg., Gamma aminopropyl tri-ethoxysilane, Vinyl tri-ethoxysilane & Methyl acryloxy propyl trimethoxysilane are the silane coupling agents used.

8.2 Isolation

- Rubber dam
- Retraction cord
- Cotton roll

9. CEMENTATION

- Apply silane to the etched teeth for 60 sec and air dry.
- The teeth are well cleaned, dried and isolated.

- Hydrofluoric acid (9%) etched –internal surface of veneer for 10 to 20 sec, rinse and dry.
- Phosphoric acid (35-37%) etched on tooth.
- Apply enamel/dentin bonding and light cure the adhesive.
- Apply dual cure composite resin on the veneer and place it in an inciso-gingival direction.
- Hold the veneer and check its proper seating, remove any additional excess using adhesive coated brush.
- Curing starts in the gingival area for 10 sec, then continue around, the whole face for 60 sec [7].

9.1 Maintenance of Veneers

- Devices such as ultrasonic cleaner and air- abrasive polisher must be avoided.
- Surface stains on porcelain veneers can be removed with Al_2O_3 or diamond polishing paste on a felt wheel or a rubber cup.
- Proximal stains can be removed with composite proximal polishing strips.
- When scaling is performed around veneers care must be taken not to chip off the margins.
- If topical fluoride application is required by the patient it should have neutral pH- stannous fluoride, acidulated phosphate fluoride should not be used.

9.2 Instructions for the Patient

1. Patient should be advised that foods & liquids with a high potential for staining such as tea and coffee, increase the potential for marginal staining.
2. Patient must also be aware of the potential of porcelain to fracture.
3. Activities like ice-chewing and finger nail biting should be avoided.
4. Patients with parafunctional habits or in cases when porcelain veneer oppose the natural teeth – a protective appliance or occlusal guard is fabricated and worn by the patient to protect both the veneers and the opposing teeth.[12]
5. Patient should be recalled after 6 months for clinical evaluation. Kihn & Barnes recall method, which was also modified from Ryge criteria are used to evaluate the restoration [13]

9.3 Repair of Veneers

9.3.1 Repair of direct/indirect composite veneers

Direct laminate veneer restorations have been developed for advanced esthetic problems of anterior teeth.[14,15] Tooth discolorations, rotated teeth, coronal fractures, congenital or acquired malformations, diastemas, discolored restorations, palatally positioned teeth, absence of lateral incisors, abrasions and erosions are the main indications for direct laminate veneer restorations.[15,16]

Small chipped areas can be corrected by re-contouring and polishing. When a sizable area is broken - The area is cleaned and shade selection is done. The operator roughens the damaged surface of the veneer with a coarse round ended diamond instrument to form a chamfered cavosurface margin. Roughening can also be done by sandblasting.[17] For additional retention- undercut or mechanical

locks are placed in the remaining composite with a small $\frac{1}{4}$ round bur. A 45° bevel (2mm in width) is placed at the junction of the remaining composite and fractured portion. Acid etchant is applied and rinsed. Bonding agent is applied on the remaining composite and exposed tooth surface and cured. Composite is then added, cured, finished and polished.

9.3.2 Repair of porcelain veneers

PLVs have become the aesthetic alternative to ceramic crowns and the traditional porcelain-fused-to-metal [18].These restorations exhibit reduced plaque build-up and its easy removal due to their smoothly glazed surface [19]. The union of etched enamel and porcelain, combined with the bonding

composite resin-luting agent with a silane coupling agent provides a long lasting restoration [20]. The patient's acceptance of the porcelain laminate veneer technique now-a-days seems to be high. Goldstein and Lancaster [21] in their study showed that patients would readily accept shorter restoration life expectancy (five to eight years) if enamel could be saved by not reducing the tooth for a full crown. Due to the delicate nature of porcelain veneers, a possible post-operative complication is cracking. If the veneer is been well bonded to the underlying enamel and is not an aesthetic concern, the patient should be informed and the veneer should be left in place [22].

When the patient presented with a fracture of the mesio-incisal portion of porcelain veneer, isolation is done with an oral retractor. Initial shade selection is done. A quick mock-up of the repair with the selected resin composite can verify the shade selection. A 2mm wide bevel is placed on the porcelain surrounding the fracture [23]. To protect the adjacent soft tissue and the restoration surface- Etch Arrest – sodium bicarbonate gel is applied. 10% of hydrofluoric acid gel is applied for 1 min. To prevent the potentially harmful acid splatter and to neutralize the effect of HF acid- Etch Arrest is again applied. Next the porcelain surface is rinsed and dried. The silane primer is applied and allowed to dry for 60 sec. This silane treatment of the exposed silica surface results in the formation of siloxane bond with the methacrylate groups of the composite. Bonding agent is applied and cured. The resin composite is applied to the fractured site, cured, finished and polished. Large fractures are treated by replacing the entire porcelain veneer.

9.4 Recent Advances in Veneers

9.4.1 Porcelain veneer with Inman aligner

The Inman aligner was invented by Dr. Don Inman in 2001 at the Inman Orthodontic Laboratory at Kent in U.K. Indicated in patients with severe anterior crowding, where extensive tooth preparation is required for porcelain veneers. The aligner worn for 4 -12 weeks, prevents excessive tooth reduction by pre-alignment of teeth. Minimum tooth preparation is done and porcelain veneers are fabricated.

9.4.2 MAC veneer

The MAC (Micro Advanced Cosmetic division) veneer was introduced by the Micro Dental laboratory at Dublin in 2005. They are made from pressed ceramic. When compared to porcelain veneers, they are stronger, thicker (0.8-1mm), fit more tightly and securely over teeth. These custom-made veneers are long lasting, stain resistant and not easily dislodged.

9.4.3 Da vinci veneers

They were introduced by Dr. Joel. D. Gould in 2008 at the Da Vinci laboratory at California. They are ultrathin shells of tooth coloured ceramic that are resistant to permanent staining. [13] The thickness is 0.2 – 0.3 mm. They require no anesthesia with minimum or no tooth preparation. The teeth are lightly buffed to removed 0.5 mm thickness of enamel, an impression is made and sent to the lab. No temporization is required. Depending on the colour of the luting cement the shade of the veneer can be adjusted.

9.4.4 Lumineers

They were introduced by Dr. Mat Carty in 1990 and manufactured by the Den Mat corporation. They are the most popular no preparation veneers. This exceptionally thin veneer (0.3 – 0.5 mm) can maintain its durability due to the high strength – Cerinate porcelain is a translucent leucite based feldspathic porcelain, available as stackable or pressable porcelain. A study conducted by Strassler et al [24] evaluated the colour stability, marginal integrity, discoloration and secondary caries for 10 years revealed that 94% out of 167 Cerinate Lumineers placed with ultrabond were successful. The difference between Lumineers and standard porcelain veneers is that Lumineers are made from a special patented cerinate porcelain that is very strong but much thinner than traditional laboratory-fabricated veneers. Their thickness is comparable to contact lenses.

9.4.4.1 Advantages

- Minimal or no preparation required. The Patients can receive their veneers quickly, usually within two weeks from the date that the impressions are made.
- Lumineers will bond directly to the tooth, making the bond very strong. They are also long-lasting- up to twenty years or longer.
- Excellent esthetics
- A painless procedure
- Sensitivity free
- Lumineers are a reversible procedure as no cutting is often made.
- The Lumineers have similar costs as the porcelain veneers.

The Lumineers can only be placed on teeth that are in good structural condition. The teeth must be free of decay. The existing fillings must also be in good condition, along with the surrounding gingiva in the area where the Lumineers will be placed. The patient must have good oral hygiene, with no receding gingiva or signs of gingival disease.

9.4.4.2 Indications

- Chipped or cracked teeth
- Stained or discolored teeth
- Spaced teeth
- Teeth with improper crown morphology
- Slightly crowded teeth
- Worn teeth
- Small teeth.

The No-Prep Technique; allows LUMINEERS to be placed over the existing teeth without the removal of any form of tooth structure. Therefore, anesthesia and temporaries are also not required

9.4.5 E-max veneers

Introduced by Microstar Corporation to the U.S. market in September 1998.[25] Available either as ingots for pressing or as blocks that can be milled by CAD/CAM milling machines. Made from IPS Empress 2 ceramic – lithium disilicate veneers. Mostly commonly used for crowns and bridges. Indicated for veneers when combined with adjacent IPS e max bridges or crowns.They are very thin (0.3 mm), can be used to increase the vertical dimension of the concerned teeth. They have high bond strength, most popular for the last 15 years and are cemented with dual cure resin cement.

9.4.6 Componeer

These represent polymerised pre-fabricated nano-hybrid-composite enamel-shells, which combine the advantages of direct composite restoration with the advantages of prefabricated veneers. Pre-shaped componeer veneer are available in different sizes and shapes for single tooth reconstruction as well as complete reconstruction in the anterior region. There is less removal of healthy tooth structure – 0.3mm max.

9.4.6.1 Advantages

- Easy and efficient to use.
- Only one session required.
- Quality restoration with be better esthetic results.
- No lab work
- Optimum customization(choice of colour, shape and structure)
- Economical

9.4.7 Gingival veneer

It is worn in the labial aspect of the dental arch, which aims to restore the mucogingival contour and esthetics in areas where periodontal tissues are deficient. The gingival veneers were introduced by Emslie in 1955 and were used to mask the unesthetic appearance of gingival recession in a patient who underwent a gingivectomy

9.4.7.1 Indications

- Inter dental “ black triangles”, leading to poor esthetics
- Food impaction in inter dental spaces.
- Lack of saliva control
- Impaired speech
- Root dentine sensitivity

9.4.7.2 Contraindications

- Poor oral hygiene
- Limited manual dexterity
- High caries activity/risk
- Incomplete periodontal therapy
- Allergy to fabrication materials

Materials like Porcelains, pink auto cure and heat-cured acrylics, composite resins and thermoplastic acrylics, as well as silicone-based soft materials are used to fabricate gingival veneers [26].

10. CONCLUSION

A beautiful smile is like a green light at an intersection. The ultimate goal of veneers is to enhance the aesthetics with a beautiful smile. Veneers are a useful adjunct to the armamentarium of the dentist for management of aesthetic problems in both young and elderly patients. Care needs to be taken during tooth preparation and the luting phase to ensure maximum results. With the combined advancements in acid-etch, resin bonding techniques and material properties, veneers have become a more conservative and a highly aesthetic alternative to full coverage restorations.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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