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# Recent advances in the material aspects of veneers.

Suresh Mitthra., *M.D.S., Reader*
S.Elanthendral., *B.D.S., Undergraduate student*
Balasubramaniam Anuradha, *M.D.S, Reader*
Venkatachalam Prakash, *M.D.S, Professor*
Department and institution:

*Department of Conservative Dentistry and Endodontics,*
*SreeBalaji Dental College and Hospital,*
*Bharath Institute of Higher Education and Research,*
*Narayanapuram,Pallikaranai,Chennai – 600100,*
*Tamilnadu,India.*
*S.Elanthendral,B.D.S.,Undergraduate Student*
*Address:*
*Department of Conservative Dentistry and Endodontics,*
*SreeBalaji Dental College and Hospital,*
*Bharath Institute of Higher Education and Research,*
*Narayanapuram,Pallikaranai, Chennai – 600100*
*Tamilnadu,India.*
*Phone number : 8190996644*
*E-mail :elenthendral.saravanan@gmail.com*
*E-mail address of the authors:*

1.Suresh Mitthra *: malu.dr2008@yahoo.com*
2.S.Elanthendral *: elenthendral.saravanan@gmail.com*
3.BalasubramaniamAnuradha: *anuradha_ind@yahoo.com*
4.VenkatachalamPrakash: *drprakashmds@gmail.com*

***Abstract : A Veneer is a layer of tooth colored material that is applied to a tooth to restore localized or generalized defects and intrinsic discolorations. Veneers are made from materials like chairside composite, processed composite, porcelain, ceramic, preformed acrylic laminates and glass ceramic veneers. The evolution of materials, ceramics and adhesive system helps in improving the aesthetics and self-esteem of the patients. The current article is a review that illustrates the recent advancements in material aspect and clinical techniques of dental veneers.***

***Keywords:- Laminate Veneers, porcelain,ceramic, Aesthetics.***

## 1. INTRODUCTION:

Restorative cosmetic dentistry is done as conservatively as possible. The use of adhesive technologies makes it more possible to preserve the healthy tooth structure. With the advent of

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indirect restorations, clinicians can choose a material and technique that is more conservative and satisfies the patients aesthetics, structural and biological needs and also fulfills the mechanical requirements to provide clinical durability[(1).] A veneer is athin sheet of material placed on the facial surface of anterior teeth, for aesthetic purposes and protection. It is a thin layer of restorative material that replaces the enamel. Veneers are the material of choice for a conservative and esthetic approach as they give the patient a perfect smile. Recent advancements like thick monochromatic veneers, stacked or feldspathic veneers with reinforced leucite, lithium disilicate veneers, lumineers and porcelain veneer are ultra thin and also offer maximum strength with excellent aesthetics[(2)].

RECENT ADVANCES IN MATERIAL ASPECT OF VENEERS

1. Thick monochromatic teeth veneers
2. Stacked or feldspathic teeth veneers with reinforced leucite
3. Componeers
4. E – max veneers
5. Zirconia veneers
6. Lumineers
7. Da Vinci veneers
8. MAC veneer
9. Durathin
10. Vivaneers

**STACKED/FELDSPATHIC TEETH VENEERS**

Feldspars are composed of silicon dioxide (60-64%) and aluminium dioxide (20-23%) mainly. These alumino-silicates occur naturally and contain various amounts of potassium and sodium which are modified in different ways to create glass that is used in dental restorations.

This material provides high aesthetic value and high translucency, closely resembling the natural teeth[(3)]. They lack strength due to their low flexural strength ( 60-70 MPa). Due to high glass contents and absence of core material they are more susceptible to fracture under mechanical stress. Hencethe ceramic laminate veneers fabricated from feldspathic porcelain obtain their strength from the strong bond created with the substrate enamel. The thickness of the veneer is less than 0.5mm with or without preparation in the enamel.

Feldspathic veneers are fabricated using a layering technique. The drawback is that it requires more investing time and effort to obtain a good clinical fit of the restoration. The process of duplicating the working model with a brittle refractory material and the removal of that material after the firing process is a most sensitive procedure. To avoid these problems in fabrication, now machinablechairside CAD/CAM feldspathic ceramics are used. These CAD/CAM prefabricated blocks have good mechanical strength.

A machinable feldspathic porcelain, Vita Mark II introduced in 1991 for the CEREC I (Chairside Economical Restoration of Esthetic Ceramics) system has good strength and finer grain size which contains $SiO_2$ (60-64%) and $Al_2O_3$(20-23%). Etching is done with hydrofluoric

acid to create micromechanical retention. Advantages of this material includes: reproducibility of natural tooth colour, less laboratory cost, better mechanical retention, less tooth preparation and excellent bonding characteristics. The strength of these materials is increased by the addition of filler particles like lithium disilicate and leucite. These reinforced ceramics are indicated for fabrication because of their optical property and acid sensitivity. Due to the low refractive index of crystals even in high crystalline content the materials are translucent. The flexural strength of Lithium disilicate reinforced ceramic is 320-450MPa and Leucite reinforced ceramic is 160-300 MPa[(4)].

**COMPONEERS :**

It employs a direct veneering technique. These are polymerized, prefabricated, enamel shaded composite laminates and that combine the properties of both direct and indirect veneers. There is conservative removal of tooth structure – 0.3mm cervically and 0.6-1mm incisally. A natural layering concept is followed and developed to allow combination of all enamel and dentin shades. This concept is based on a two layered incremental technique that mimics the anatomy of natural tooth[(5)]

**Indicatons:**

- Tooth fracture
- Malformation
- Midline diastema
- Wasting diseases of tooth
- Aesthetic correction
- Discolouration

2. **Contraindications:**
   - Bruxism
   - Active caries
3. **Advantages:**
   - No lab work is required
   - One sitting
   - Superior esthetics
   - Economical[(6)]

**E-MAX VENEERS**:

Lithium disilicates ($2SiO_2$) were first introduced in 1988, as a heat pressed core material and marketed as IPS$^{TM}$ Empress 2. This contains approximately 70% crystalline lithium disilicate filler. Due to the use of pressure casting procedure, the material showed less defects and uniform crystal distribution. Reformulation and refinement of the production process of IPS Empress 2 gave rise to the production of a new ceramic veneer, which was released in 2006 in the name of IPS$^{TM}$ e-max press whichled to the discontinuation of Empress 2 in 2009. IPS$^{TM}$ e-max is lithium disilicate glass ceramic prepared for CAD/CAM use. This material is available in "blue state" and is composed of lithium metasilicate ($LiSiO_3$) which is easier to milland has high edge stability. After the completion of milling process the material is heat treated and glazed in

one step thus forming the final lithium disilicate restoration. The partially crystallized blocks used for milling is composed of 40% lithium metasilicate crystals, 0.2-1.0 µm in size,platelet shaped and set in a glassy phase along with lithium disilicate nuclei. The material is considered to be fully crystallized after being tempered at 850ºC for 20- 25 minutes under vacuum. In partially crystallised form, the material has a flexural strength- 130MPa, fracture toughness- 0.91025 MPa and vickers hardness - 5400 VHN. After tempering the restoration it shows a 0.2% linear shrinkage thus causing gaps in the margins of the restorations. In fully crystallized form, the flexural strength of the material is 262-360 MPa and fracture toughness of 2.0-2.5 MPa. This material is available in standard shades and it also includes a line of bleach shades. It is indicated as a veneering material for inlays and onlays, three unit fixed partial denture and partial/ full / monolithic crowns[(7)].

**ZIRCONIA VENEERS:** It is a polycrystalline material made from zirconium dioxide that contains no glass. Crack propagation is difficult as all the atoms are packed into regular crystalline arrays, thereby the toughness and strength is increased. It has three forms – at melting point 2680ºC the cubic structure exists and gets transformed into tetragonal phase, below 2370ºC it transforms from tetragonal to monoclinic phase, below 1170ºC there is a volume expansion of 3%-5% which causes high internal stresses. Yttrium oxide is added to reduce the volume expansion and also to stabilize the zirconia in tetragonal phase at room temperature. This partially stabilized zirconia possess high flexural strength and fracture toughness. Under tensile stress, tetragonal phase transforms to a monoclinic phase with 3–5 % of localized expansion and this creates compressive strength at the crack tip that counteracts the tensile stresses. This phenomenon is referred to as transformation toughening. Yttrium oxide partially stabilized zirconia (Y-TZP) has excellent mechanical properties, high mechanical strength and increased fracture toughness. The fracture toughness of a material is 900 MPa and Vickers hardness number is 1200 Using CAD/CAM technique, Y-TZP can be manufactured in two methods. In first method, the restoration can be milled from a homogenous ceramic soft green body blank of zirconia which has a linear shrinkage of 20-25 % during sintering. Hence it is milled in a enlarged framework. In the second method the restoration can be fabricated from fully sintered prefabricated blank to the final dimensions but this method compromises the strength[(8).]

4. **Advantages:**

- High strength
- Durability
- Longevity
- Biocompatibility
- Single visit procedure

5. **Disadvantages:**

- Color is hard to match because of its opaque appearance
- Potential wear on other teeth – Hardness of the material causes wear and tear of opposing teeth.

**LUMINEERS:**

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It was introduced by Dr. Mat Carty in 1990 and manufactured by the Den Mat Corporation. It is considered to be one of the best no preparation veneers. Lumineer is a exceptionally thin shell like structure, custom - made for the patients and placed on the tooth structure with a permanent bonding agent. This is the most conservative procedure and only a maximum of 0.3mm of tooth structure is removed if required. It can maintain its durability due to high strength. Lumineers are made from patented cerinate porcelain.

Indications:

- Mal-aligned teeth
- Closure of interdental spacing.
- Restoration of fractured teeth
- Discolouration
- Stained teeth
- Mild crowding

Advantages:

- Minimally invasive technique as no tooth preparation is required and bonded directly to the tooth
- Superior aesthetics
- Long lasting
- No anaesthesia is required

- Reversible procedure as there is no preparation of teeth
- It is used to create instant orthodontics .Lumineers are a great substitute for orthodontic treatment as they change shape and alignment of teeth.
- Placed over worn out teeth to prevent further wear and increase strength.
- Placed over old crowns and bridges to rejuvenate the smile[(9)].

**DA VINCI VENEERS:**

It was introduced by Dr. Joel. D. Gould in 2008 at California. They are ultrathin shells (0.2-0.3 mm) of tooth colored ceramic that resist staining mimicking the natural appearance of tooth. They require little or no anaesthesia with minimum amount - (0.5mm) of tooth preparation. Indicated for crowding, discolouration, interdental spacing and fractured teeth. The longevity is good due to a high bond strength [(10)].

**MAC VENEER** :

MAC (Micro advanced cosmetic division) veneer .It was introduced by Micro Dental Laboratory at Dublin in 2005. They are pressed ceramic veneers with 16 hues to attain a natural colour and are contoured throughout to appearmore translucent. They are stronger, thicker (0.8-1 mm)and fit more tightly around the teeth. These veneers are long lasting, stain resistant,non abrasive with high durability[(11)].

**DURATHIN VENEERS:**

Durathin veneers are custom made from cerinate porcelain material that adheres directly to front surface of the tooth without grinding. The new durathin veneers was developed by Dr. Dennis Wells and dental lab technician Mark Willes[12]. It is as thin as a fingernail 0.3mm whereas other traditional veneers have0.5mm thickness. It is best suitable for patients who already have existing veneers that requires replacement. The advantages of durathinveneers include superior aesthetics, clinical longevity for about 5-10 years, painless procedure, no anaesthesia is required and with minimal removal of tooth structure [2].

## 6. CONCLUSION:

The recent advances in dentistry gave rise to an excellent alternative foe conservative approach for the teeth. It hassuperior aesthetics mimicking the natural teeth. It is a minimally invasive procedure and hence well accepted by the patients. The recent advancements shows good aesthetics , high strength and durability, very less or no preparation of toothstructure.

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