

# *The Gold Standard in Adhesive Esthetic Dentistry: Ceramic Veneers from 1930 to NOW*

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## **ABSTRACT**

*The two revolutions that have changed the face of Dentistry in the past few decades is Bonding and Dental Implants. The increasing desire for our clients to look better and have more confidence is making them choose elective treatment in order to achieve better and more pleasing smiles.*

*Teeth are perhaps the biggest contrast on the human body and any striking disharmony is quite obvious.*

*Ceramic veneers have become a very popular choice for the patient as well as the dentist to provide the clients with dynamic harmony in their smiles.*

*In this presentation an attempt is made to briefly look at the past and to have a detailed perspective about different methods to fabricate ceramic veneers.*

*Detailed case presentations will highlight the gold standard in fabrication of veneers which integrate with the soft and hard oral tissues harmonizing with the personality and character of an individual.*

## **KEYWORDS**

Veneers, Creation-Willi Geller Ceramic, Bonding.

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## **INTRODUCTION**

The use of veneers in dentistry is not a new concept. In the early 1930's, the appearance of picture perfect teeth on the screen was due to Dr. Charles Pincus<sup>1</sup> pioneering work with porcelain laminates. He was founder and first president of the American Academy of Aesthetic Dentistry. He published numerous articles and was a contributor to Dr. Ronald Goldstein's book on aesthetic dentistry.

At that time, they fell off in a very short time as they were held on by denture adhesive. They were, however, useful for temporarily changing the smile of the Hollywood stars were working in front of the camera or making personal appearances. Since they were basically experimental, patients were instructed not to eat when wearing them. Later on, acrylic was adopted. He fabricated these veneers by baking a thin layer of porcelain onto platinum foil.

The roots of modern concepts of veneering began over half a century ago. In 1955, Bounocore spoke of bonding.<sup>2</sup> In the 1960s Bowen and others developed composite resin restorations. In 1972, Dr. Alain Rochette published a paper describing acid etch bonding of porcelain to enamel.<sup>3</sup> The porcelain itself was not etched, but was pre-treated with a coupling agent to promote chemical adhesion of an unfilled resin luting agent.

However nothing more was heard of this technique for a decade as the interest of the dental profession was focused on improving the composite resin materials used for direct application to the etched enamel.

Research started in 1982 by Simonsen and Calamia<sup>4</sup> revealed that porcelain could be etched with hydrofluoric acid, and bond strengths could be achieved between composite resins and porcelain that were predicted to be able to hold porcelain veneers on to the surface of a tooth permanently. This was confirmed by Calamia<sup>5</sup> in an article describing a technique for fabrication, and placement of Etched Bonded Porcelain Veneers using a refractory model technique and Horn<sup>6</sup> describing a platinum foil technique for veneer fabrication. Additional articles have proven the long-term reliability of this technique.<sup>7-15</sup>

Porcelain veneers are more durable and less likely to stain than veneers made of composite.<sup>16</sup>

## **BENEFITS OF VENEERS**

**Minimally invasive procedure:** Ceramic veneers in the right indication can change the appearance of the teeth and the smile with minimal or almost no alteration of natural tooth tissues. Veneers can be thinned down to 0.2mm and this makes it possible to preserve natural tooth structure where as the traditional crowns required quite aggressive tooth reduction.<sup>17</sup>

**Excellent Biological Response:** Ceramic as a material is known to have the best biological response around it. It is a crystalline glass and has minimal or no tendency to get scratched or have surface alterations over the years, thereby keeping the colour and tissue integrity over the years.<sup>18,19</sup>

**An increase in crevicular fluid:** It is known to stimulate the gingival tissue and improve circulation around well fitting margins. This leads to an increase in crevicular fluid, which in turn leads to less plaque retention.<sup>20</sup>

**Natural fluorescence:** Under exposure to ultraviolet, natural teeth emit a light blue fluorescence which also enhances the whiteness and brightness of teeth in daylight. Different chemical activators are added in commercial dental ceramics to present the fluorescence which can act as natural teeth in color and intensity under exposure of sunlight or artificial ultraviolet illumination. Over the years ceramics have been developed for them to have natural fluorescence to mimic the optical properties of the Dentine. If this is not present in a restorative material then the restorations can look lifeless in certain light conditions.<sup>21</sup>

#### INDICATIONS

- Diastemas closure
- Tetracycline discoloration
- Crowded teeth
- Fractured teeth
- Gummy smile
- To change the shape of the teeth e.g: Microdontia

#### CONTRAINDICATIONS

- Deep bite
- Less than 50% of the bonding surface is enamel
- Patients with known history of parafunction and having damaged similar restorations in the past
- Highly Flourosed teeth

#### DIFFERENT SYSTEMS

##### Cast glass-ceramic (Dicor)

The Dicor® crown system uses the lost wax system to produce a glass casting of the restoration. Were first introduced for all-ceramic crowns. The material exhibits interesting physical and chemical properties, but the high fabrication costs and restricted esthetics have limited further development of this system.



##### Pressed Ceramic (Empress, Impulse, Creation etc.)

Offers two elaboration modalities:

The reinforced pressed porcelain is used to fabricate either an entire restoration or only a core. This latter option allows esthetic improvements and characterization by additional ceramic firing. Esthetic characterization, however, remains very limited compared to the full-thickness layering that can be applied with the refractory die technique.

##### Slip casting (In-Ceram Spinell)

Can generate restorations with higher intrinsic strength compared to other systems. The basic method was originally marketed for full crowns and later adapted to veneers with the use of spinel instead of alumina. Due to the high crystalline content of this material, traditional hydrofluoric acid etching is not effective. Resin bonding to In-Ceram alumina, for instance, requires tribochemical silica coating or use of a special resin monomer.

##### Machined ceramic (Cerec)

Even though originally designed for chairside use, have become popular laboratory use also. Veneers made from machined ceramic suffer from shade uniformity and rather simplistic anatomy, unless additional porcelain firings are carried out.

##### Refractory die technique

Ceramic fired over refractory die is the oldest and the most widespread method for fabricating a porcelain object. The main advantages of this technique are:

- No special equipment required
- Extremely sophisticated effects of color and translucency can be obtained through a full-thickness layering technique
- Traditional feldspathic porcelains can be used when combined with hydrofluoric acid etching and silanization, they show extremely reliable bonding to resins
- Marginal closure from 20 to 40  $\mu\text{m}$ <sup>22</sup>

##### CASE 1 Courtesy of Dr. Rabih Abi Nader

This is a case where the patient was unhappy with the shape and colour of her teeth. (Fig 1)

After critical evaluation it was planned that 4 veneers for teeth 22, 21, 11 and 12 should be a good treatment option. The midline was also corrected to be more in line with the midline of the face. (Fig 2)



Refractory Die technique was used with gingival model (Willi Geller model) with accurate gingival contours and artificial alveoli conforming to the original shape of the dies. The major advantage of this soft tissue cast is that stone dies and refractory dies can be inserted and interchanged, due to the identical design of their root portions, which have the same antirotation grooves. **(Fig 3)**

The ceramic build-up was made with the application of dentin powders using the base shade dentin and several shades with higher chroma in the cervical area and higher value in the incisal area. (Creation Ceamic)

**CASE 2 Courtesy of Dr. Jaco Smith**

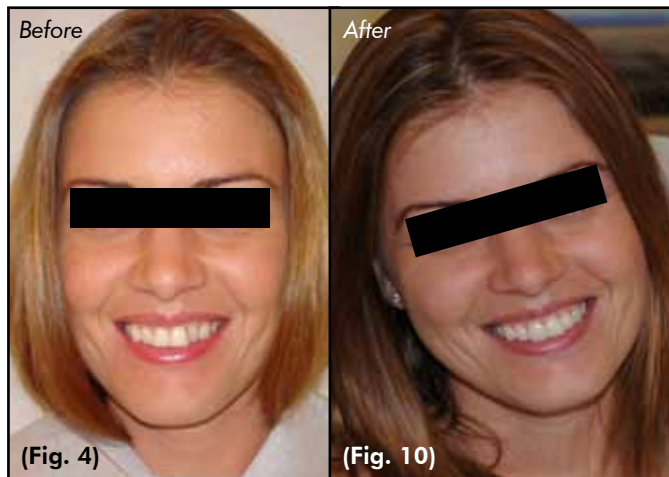
28 years old female patient complaining about her front teeth. **(Fig 4)**

All four upper anteriors had old composite fillings and there was crowding **(Fig 5)**. Looking at her face the actual shape of the teeth were not in harmony with her face. There was a defianate negative space between her



teeth and her lips which was in the acceptable range, but it was decided to increase the length of the central incisors by approximately 1mm. A more oval shape of her teeth was better suited to her face and lips. **(Fig 6,7)**

Four porcelain veneers were cemented on central and lateral incisors. **(Fig 8-10)**



**CASE 3 Courtesy of Dr. Ajay Juneja**

26 years old male patient complaining about his teeth having diastems and desiring a lighter shade. (Fig 11,12) The lateral incisors were narrow and rounded, having

a rather feminine appearance. It was decided to do four veneers on teeth 22,21,11 and 12 to eliminate the diastema and to make the smile more masculine by making the laterals slightly broader. (Fig 13-15)



**CASE 4 Courtesy of Dr. Ajay Juneja**

A 34 year old healthy female came to the dentist's office with aesthetic concerns and wanted to have a more confident smile (Fig 16). The case was referred to the lab for preoperative evaluation. The patient had concerns about the esthetics of her front teeth which had received treatment earlier.

**Diagnosis:**

Taking into consideration the patient's expectations and also clinical examination the following diagnosis was made:





(Fig. 18)



(Fig. 19)



(Fig. 20)



(Fig. 21)

The patient had four composite anterior veneers done which lacked form, shade and texture. (Fig. 17)

1. There was history of these getting discolored very rapidly and she was having to get them cleaned time and again
2. There was some sensitivity to cold on tooth no. 22 which had a restoration extending interproximally

**Treatment Provided:**

- All relevant photographs were taken
- After receiving study models a wax up was done for 11,12,21,22



(Fig. 22)

- Patient was called to the lab to review wax up and was shown the same for her approval
- Shade selection was done in the laboratory at this stage
- Preparation guides were made to assist the clinician in ideal tooth reduction for the case (Fig. 18)

The Laboratory work was then sent to the Dentist for cementation.

The veneers were cemented following a standard protocol of Bonding and were polished thereafter. The patient made a follow up appointment at the laboratory where the final pictures were made. (Fig 19-23)

**DISCUSSION**

Ceramic veneers which are fabricated using a layering technique with all protocols being followed during the course of treatment offer patients a very natural and esthetic result. We are able to achieve a better marginal closing with veneers made with refractory die technique.

Feldspathic ceramic remains the best material to attain natural looking shade when compared to any other ceramic.

Medium to long-term clinical investigations have demonstrated excellent maintenance of esthetics, high patient satisfaction and absence of adverse effects on gingival health.

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