



Perfecting Smiles with Pink and White

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Abstract

The success of a complete denture prosthesis is heavily influenced by its esthetics. The esthetic appearance of dentures is critical for patient satisfaction as it directly affects their self-confidence and quality of life. The principles and ratios of dental esthetics are crucial in improving denture esthetics, including the selection of teeth shape, size, color, position, and the material used for the denture base. This review paper covers the theories and techniques behind the factors that govern the pink-and-white esthetics of a denture and essential considerations in creating an individualized esthetic appearance for patients.

Keywords: Esthetics, Complete denture, characterization, teeth selection

Introduction

Looking beautiful is something that all human beings strive for, regardless of age or the odds they face. As people get older, they may find it more difficult to maintain their youthful looks, but this doesn't stop them from trying. "Esthetics" is derived from the Greek word "aisthetikos", which means perceptive. This term was coined in 1750 as the science of sensuous knowledge which gave beauty. For centuries, authors and poets have written in awe of the beauty of teeth and how they can enhance one's facial features. From ancient Greek literature to modern-day texts, teeth have been used as a symbol of physical beauty, strength, and health. Esthetics is the balancing of artificial with natural. A successful design requires beauty, naturalness, and individuality - the three virtues of esthetics.

Patients who have lost their teeth encounter compromised mastication and pronunciation and the emotional mutilation of losing their natural physical appearance. Thus, the purpose of a complete denture incorporates helping the patient to recover self-

confidence. This needs knowledge and understanding of both the physical and biological aspects. Esthetics in complete dentures is more challenging to accomplish, as there are no remaining teeth for reference. A complete denture grants the patient to resume normalcy and social well-being.

Pink esthetics in complete denture corresponds to the esthetic concern of the denture base which reinstates the natural color and contour of the gingiva. This can be integrated by selecting the denture base material, creating scalloped margins, stippling, and gingival staining. White esthetics corresponds to the selection of teeth form, shade, and size of teeth which are positioned according to teeth setting concepts and principles. This plays a substantial role in fabricating a functional and aesthetically pleasing denture.

Esthetic Principles

The term "esthetic" or "unesthetic" is used to describe something that is either pleasant or unpleasant to the viewer. This perception is based on a combination of

physiological and psychological processes that have been studied and developed over time.

Leonardo-da-Vinci said, “Human beings represent the sensitive vector that gives life to essential beauty.” This means esthetics is a phenomenon of intellect. The process of perception is an organization of sensory data which are passed to the intellect where an answer is developed in combination with the results of previous experiences or beliefs that are unconsciously interpreted. This is what is known as a **percept**.

An understanding of these perceptual principles can eliminate mistakes in the realm of esthetics. The two types of sins in the arena of denture esthetics are :

1. The sin against the principle of visual perception.
2. The sin against the principle of reality.

These principles should be used with all the delicacy and insight required in the application of any natural law. ⁽¹⁾

A highly detailed and histologically-informed approach is necessary for achieving optimal dental esthetics. The principles of perception can be considered the building blocks of dental tissue aesthetics. As one becomes more familiar with these principles, one becomes more skilled in their application. With practice, dental professionals can visualize the shape and characteristics of tooth arrangement before even beginning to work with wax. The final step is a thorough examination during the try-in stage to identify any minor perceptual conflicts, which can become easier with training to develop a discerning eye.

Structural Esthetic Components

That includes facial components, dentolabial considerations, dental considerations, and tooth considerations that include tooth form, tooth shape, and tooth dimension. Phonetics along with the gingival health of the patient.

Facial components:

Frontal view – Allows appropriate identification of reference guides that are crucial in esthetic treatment planning.

-Basic shape of the face: square, tapering, square tapering, or ovoid.

-Interpupillary line passes through the center of the eyes and is perpendicular to the midline of the face. The midline line is an essential vertical reference line. It is marked out by joining the glabella, the tip of the nose, the philtrum, and the tip of the chin. The philtrum of the lip is one of the most precise anatomical parameters.

Lateral view - the patient’s head is kept upright with the eyes staring towards the horizon. This position makes the Frankfort plane to an angle of 8 degrees with the horizontal plane and is termed the esthetic plane.

Dentolabial Considerations: [Frontal view]⁽²⁾

- Ideal incisal curve when examined is a convex curve that follows the natural concavity of the lower lip during smiling and is referred to as the **Incisal arc**.
- Position of the incisal edges in the anteroposterior direction gives the **Incisal profile**, which is located within the limitations of the inner border of the lower lip.
- **Smile Line** - An imaginary line drawn along the incisal edges of the maxillary anterior teeth and display of teeth and gingiva concerning the upper lip, further divided into low, average, and high smile lines (Tjan and Dong)⁽³⁾

Dental Considerations: 3 key components of a color: hue, chroma, and value.

Hue: Characteristics of a color that give it its identity and differentiate it from other colors.

Chroma: Is the proportion of black and white in a hue on a scale going from black to white.

Value: lightness or darkness of a color. ⁽⁴⁾

Axial inclination: Assess the vertical alignment of maxillary teeth (visible in the smile line) to the central vertical midline. It can also refer to the degree of tipping in any plane of reference.

Tooth dimension: Accurate dental proportion is associated with facial morphology and is crucial in creating an esthetically pleasing smile. The width-to-length ratio of the centrals ought to be nearly 4:5 (0.8–1.0); a range for their width of 75–80% of their length is most suitable. Various guiding principles for establishing correct proportions in an esthetically pleasing smile are Golden proportion (Lombardi),

Recurring esthetic dental (RED) proportions (Ward), M proportions (Methot), and Chu’s esthetic gauges.

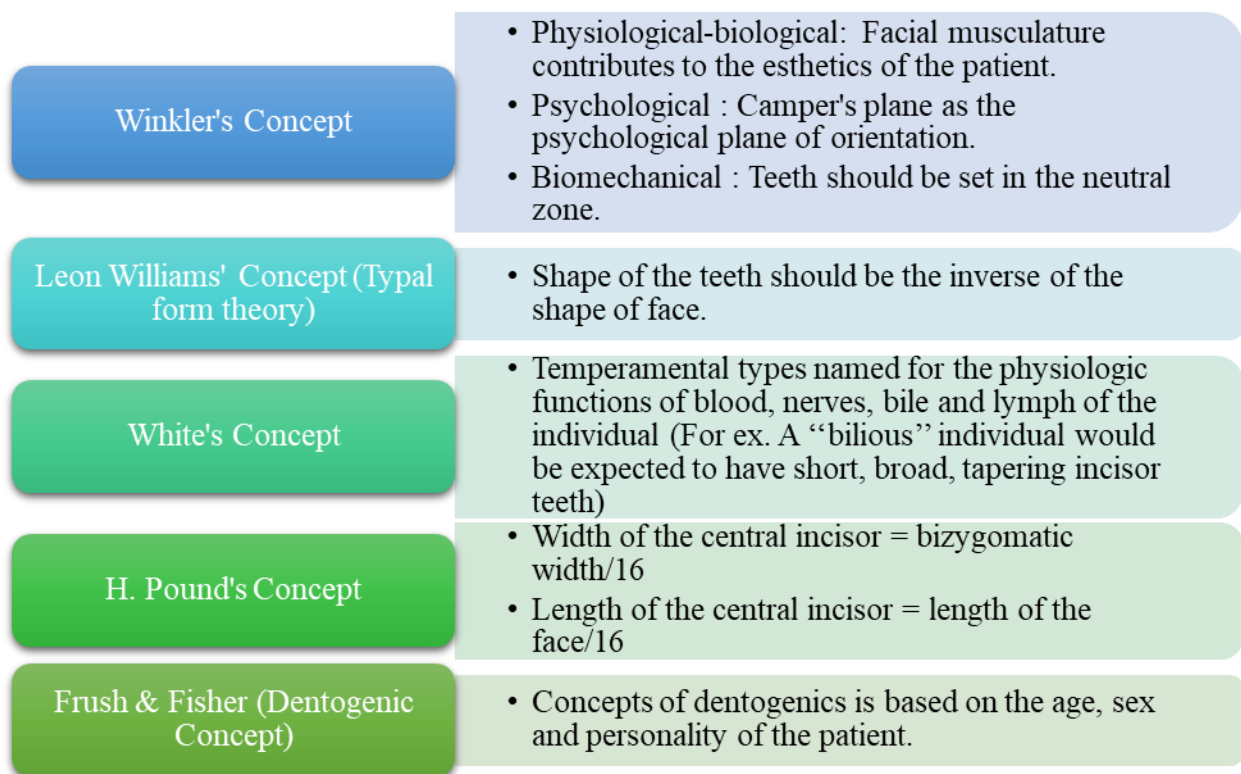
Phonetics: Phonetics is a function that is created by the association between the teeth, lips, and tongue, and it can be considerably compromised by deficient restorations. Pronunciation of the sound of m, e, f/v, and s can be a valued support in recognizing some of the functional and esthetic restrictions to be observed when creating the prosthetic treatment plan. ⁽⁵⁾ They can give useful signs for determining both suitable tooth position and length, as well as for deciding an appropriate vertical dimension of occlusion. ⁽⁶⁾

Gingival health: The gingiva works as the scaffold for the teeth; thus the final esthetic success of the patient is greatly influenced by the gingival health.

Anatomic And Physiologic Factors

Lips must be supported correctly by the complete denture to restore the normal tone of the orbicularis muscle. Any insufficient or unnecessary support given to the lips may alter the philtrum, along with the nasolabial and mento labial fold. Therefore, supporting the muscles of the face with the complete denture adequately is essential for a good esthetic outcome for the complete denture. The extensions of the denture flanges should be adequate. Overextension of these borders gives an unesthetic appearance ⁽⁴⁾

Concepts Of Tooth Selection



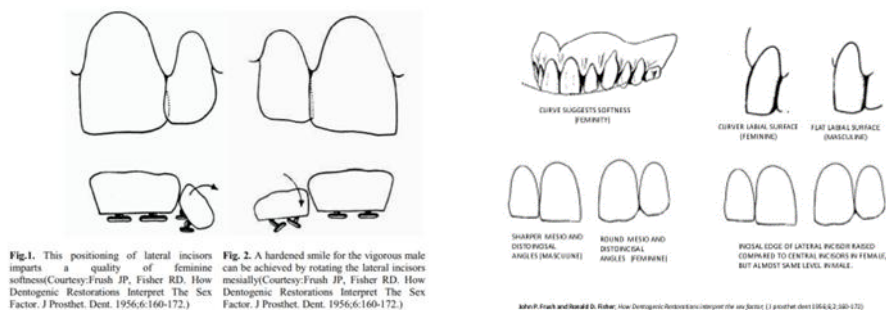
The Dentogenic Concept

The dentogenic concept is an aesthetic philosophy. It considers gender, age, and personality to restore the patient’s dignity and unique individuality that has been missing in far too many prostheses. The dentogenic concept, when practically applied, provides a more natural harmonious prosthesis, which not only is sought after by patients but also is the quality of care they deserve. ⁽⁷⁾

The Sex Factor:⁽⁸⁾

“A woman is a woman from her fingertips to her smile and a man from his fists to his grins.”⁽⁹⁾

CHARACTERISTICS EXPRESSED	
FEMININE	MASCULINE
<i>Interpretation of sex</i>	
Roundness, smoothness, and softness	Cuboidal, hard, muscular, vigorous appearance
<i>Sex interpretation by tooth positioning</i>	
<ul style="list-style-type: none"> In females, Incisal edges of the maxillary anterior follow the curvature of the lower lip. Distal surfaces of the centrals are usually rotated in a posterior direction. Lateral incisor’s mesial surface is frequently seen in an anterior relation to the distolabial surface of the central incisor. Distal surface is rotated posteriorly to give softness to the smile. Distal surfaces of the Canines are rotated in a posterior direction, and the mesial third of the labial surface is exposed when viewed from the front. 	<ul style="list-style-type: none"> In males, the maxillary central incisors and the canine are on a plane corresponding to the lip whereas laterals are above the plane. Labial surfaces of the central are usually not rotated. Mesial surface of lateral incisor is hidden behind the distal surface of the central incisor. Distal surface is rotated somewhat in a posterior direction giving hardness to the smile. Rotated less in the posterior direction, the mesial 2/3rd of the labial surface is exposed.



The Personality Factor⁽¹⁰⁾

Interpretation of personality factors depends on our handling of tooth shapes (molds), tooth position, tooth colors, and the matrix (visible denture base).⁽⁹⁾

Personality and mold consideration- Wilhelm Zech gave us his notions of the molds in the personality spectrum as in vigorous, medium and delicate categories.

The use of personality factor -Comprehensive use of patients' personalities becomes practical only if we limit the extremes of vigorous and delicate. Something instead of the 'Trial and Error' method of repeated try-ins seems to be a very desirable goal.

Personality spectrum is a spectrum, which has vertical rainbow hues extending from red to violet (color-band).

The three divisions of the personality spectrum are

1.	Delicate type (green to violet band)	5%	fragile, fraile, the opposite of robust
2.	Medium type (orange to yellow band) -	80%	normal, moderately robust, healthy and of intelligent appearance
3.	The vigorous type (red to purple) -	15%	the opposite of delicate, hard and aggressive in appearance, the extreme male animal

Most of the vigorous patients are men, and most of the delicate patients are women.

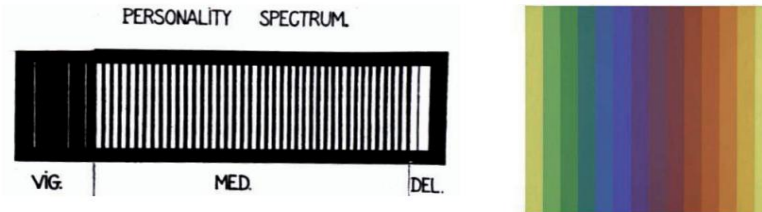


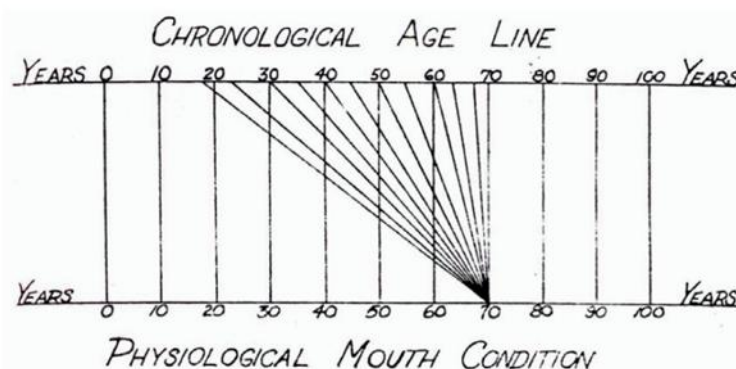
Fig. 3. Personality spectrum

The Age Factor:⁽¹¹⁾

In each individual, age changes take place throughout the entire body, and the teeth are no exception.

Management of the age factor

Young says, "It is less easy for dentists to accept the fact that denture patients desire a brand of denture esthetics closely paralleling the ideal esthetic values of the third decade of life".⁽⁹⁾



Age in the artificial tooth - As the body of the female loses its curves, the teeth lose their curves. The teeth of the male become squarer in form to complement added weight and squareness of the body.

Color selection - Lighter shades for young individuals and darker for older ones.

Mold refinement - Teeth abrade with age. Central and lateral incisors abrade in a straight line and cuspids abrade in a curve. Erosion is seen on the gingival third and the necks of teeth, conveying the impression of vigor and progressive age.

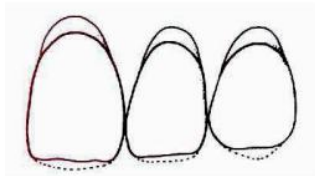


Fig. 6. Dotted line shows the original appearance of the incisal edges of artificial teeth; solid line shows the incisal wear to be incorporated for a particular patient (Courtesy: Frush JP, Fisher RD. The Age Factor in Dentogenics. J Prosthet Dent. 1957;7:5-13.)

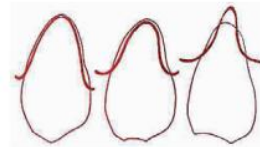


Fig. 7. The changing cuspid with age. Left youth center middle age right advanced age (Courtesy: Frush JP, Fisher RD. The Age Factor in Dentogenics. J Prosthet Dent. 1957;7:5-13.)

Diastema – It is present even more often in the mouth of adults in advancing years, because of the drifting of teeth resulting from premature loss of permanent teeth.

Age in the matrix - Periodontal changes that may occur with age are gingival inflammation, edema with loss of stippling, and recession due to loss of attachment. These changes can be replicated in complete dentures and will help to enhance the esthetics.

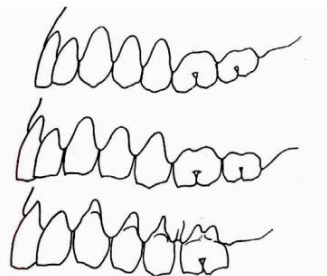


Fig. 8. The interdental papillae above, of youth; Center, of middle age; below, of advanced age (Courtesy: Vig RG, Brundo GC. The kinetics of anterior tooth display. J Prosthet Dent 1978;39(5):502-504.)

Characterization of anterior segment	
Sex, Age & Personality (SAP)- Frush and Fisher	Sexual type, aggressivity & Personality(SAP) Rufenacht

Selection Of Tooth Shade

The shade of denture teeth can be established by studying the personality, skin complexion, age, pre-

extraction records, existing dentures, and patient preference. The personality can be identified as strong, average, and soft. For ex. A person with a

strong personality is full of energy, dynamic, and vivacious.

Selecting The Size Of The Tooth

Size of face	<ul style="list-style-type: none"> • Width of the anterior teeth=1/16 of bizygomatic width • Width of maxillary anteriors=1/3rd of bizygomatic width
Size of the maxillary arch	<ul style="list-style-type: none"> • Measured from the crest of the incisive papilla to the hamular notches and from one hamular notch to the opposite side. The combined length of the triangle in millimeters is used for selecting teeth.
Inner canthal distance	<ul style="list-style-type: none"> • It is the distance between the medial angles of the palpebral fissure. • The inner canthal distance > combined width of maxillary central incisors [width of a single central incisor = inner canthal distance x 0.618/2]
Nasal width	<ul style="list-style-type: none"> • Parallel lines, when extended from the lateral surface of the ala of the nose onto the labial surface of the upper occlusal rim gives combined width of upper anterior teeth.
Lip	<ul style="list-style-type: none"> • Labial surface of the maxillary anterior teeth supports the relaxed lip and the incisal edge extends slightly inferior or below the lip margin
Vertical distance between the ridges	<ul style="list-style-type: none"> • The length of the teeth is determined by the vertical distance between the ridges. Use of longer teeth is advisable as the exposure of the denture base can be reduced

MATHEMATICAL CONCEPTS OF TEETH ARRANGEMENT

Golden proportion: Levin (1978) first documented the application of golden proportion to dental esthetics. He described that esthetically pleasing dentition and smile can be attained with proportions. The golden proportion also offers good guidance in aligning the height of the incisors although it applies only to about 75% of the population.⁽¹²⁾

Repeated ratio: This is put forward by Lombardi which states the use of a “continuous proportion or repeated ratio” in establishing the width of the central and lateral incisors and continues the placement of the remaining.

Recurrent esthetics dental (RED) proportion: This is a combination of the Golden proportion (by Levin) and Repeated ratio (by Lombardi). The RED proportion determines that, when viewed from the frontal aspect, a constant proportion of the width of

the tooth is maintained on moving distally. Instead of accepting a proportion that already exists, the dentist can create his or her RED proportion for a particular patient and situation.⁽¹³⁾

Pink Esthetics

The Gingiva forms a share of the soft tissue lining of the mouth that encircles the teeth and provides a seal around them. Its main function is to resist the friction of food when passing over them. Healthy gingiva is present as pink/coral pink or with various pigments. Pink esthetics in complete denture deals with the imitation of these gingival contours and the several aspects of gingiva such as stippling, staining, pigmentation, etc.⁽¹⁴⁾

Festooning:

It is done by carving the denture base after wax up to create natural tissue contours in the denture. The marginal gingiva, papillae, and alveolar mucosa are

smooth, whereas the band of attached gingiva in between has a stippled (or orange-peel) appearance. The alternating elongated prominences conforming to the root contours give a festooned appearance to the gingival contours.

Objectives and Requirements of Waxing-up:

Wax-up must not only have a natural and beautiful appearance but must also assist in the stability and retention of the denture. Over-contouring of the labial flanges should be avoided as it results in loss of seal. The buccal and lingual flanges should also be in harmony with the other oral structures.

Common Errors during Wax-up		
<i>Gingival portion</i>	Over contouring	-Not esthetically pleasing. -Difficult to clean and maintain oral hygiene
<i>Interdental papilla</i>	1) Small or non-existent 2) Large	-Result as a trap for food -Resemble an inflamed tissue
<i>Palatal region</i>	Uneven thickness	-Causes discomfort to the patient

Characterization Of Complete Denture

“Denture characterization is defined as a modification of the color and form of the denture base and teeth in order to produce a more lifelike appearance.”⁽¹⁶⁾ ⁽¹⁷⁾Denture characterization includes:

1. Characterization by selection, arrangement, and modification of artificial teeth:

The teeth can be customized to match the patient's age, sex, and personality to provide subjective unity. Fisher said that gender, personality, and age can be utilized as guiding principles for teeth selection, arrangement, and characterization to enrich the natural appearance of the individual.

2. Characterization of the denture bases:

Pigmentation: Pound (1951) included the racial and individual color individualities of the gingiva in the artificial denture. Kemnitzer used a mixture of blue and brown stains to reproduce the melanotic pigmentation of the gingiva.

Tinting the Denture Base: Commonly, auto-polymerizing or heat-curing resins of various colors or shades are coated on the denture base or are transferred onto the mold during denture construction to obtain a tinted dentu(18) The most widely used tints today are the numerous pigments, which are placed within the original mold chamber, so they do not affect contours. Supplementary shades besides the standard Kayon Tints can be mixed from earth color pigments which permits the dentist to match virtually any color of gingival tissue. The most frequently used tints are the Kayon dental stains or tinting resins. One Kayon Kit contains five shades.

Stippling

Lynn C. Dirksen defined stippling as a technique that provides an economical means of attaining more natural-looking buccal and labial contours for complete dentures. *Suresh Nayar and Nicholas W. Craik* quantified that gingival stippling is a characteristic of the healthy attached gingiva. Replicating gingival texture and contours promotes the natural appearance of labial flanges in complete dentures by emitting an irregular reflection of light. ⁽¹⁵⁾The various techniques involved to create stippling are:

TOOTHBRUSH TECHNIQUE

Press the bristles of the toothbrush against the waxed up denture surface before investment.

This produces indentations in the wax, which is then lightly flamed so as to make it less pronounced and form dimples.

Limitation:

- Investment material may get trapped, making it difficult to clean.
- Difficulty in polishing to the depth of dimples.

OFFSET BUR TECHNIQUE

A bur(size Nos. 4 to 8) with an offset bending of the shank is used, placing it in a handpiece, and wiping the bur over the denture in a circular motion to create stippling.

Limitation:

- Difficult to control the depth of the bur cuts.
- The dimples are usually linear in shape, rather than rounded.
- The bur tends to scratch the surface of the denture base making it difficult to polish
- Produces an esthetic result, but short-lived.

BLOW WAX TECHNIQUE

The denture base is contoured in the usual manner which will simulate the root eminences.

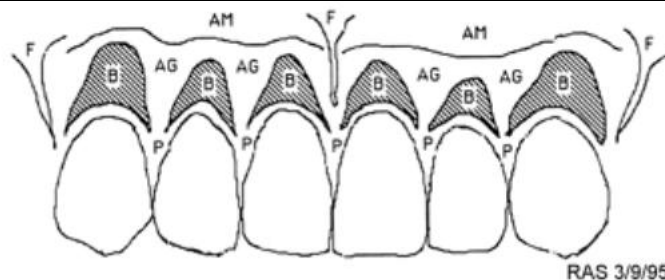
Gingival margin is accurately placed and excess wax is removed from the teeth.

The wax is smoothed, and it is polished to avoid defects

Limitation:

- Care should be taken to cover the entire tooth surface, including the gingival crevice and the surface

<u>Tinting chart of denture tissues</u>		
<u>AREA TO BE TINTED</u>		<u>SHADE SELECTED</u>
AG	Attached Gingiva	Light reddish pink Shade
AM	Alveolar Mucosa	Reddish pink Shade
B	Blanched areas over roots	Pale pink Shade
F	Frenum Attachments	Red stain Shade
P	Papillae	Light reddish pink Shade



Soft tissue shade guide: Used to choose the color of the denture base material which closely resembles the patient. It is done during the selection of artificial teeth. It can also be used to record other features such as the blotches of melanin

Light-cured gum shading: It comprises of micro-filled composite resin, can be applied in multi-layered technique, and can deliver unlimited likelihoods for gingival reproduction

Conclusion

The creation of beauty through artistic and subjective design elements is the foundation of aesthetics. Addressing and resolving aesthetic concerns necessitates an orderly and methodical strategy. As aesthetics are based on individual opinions, there are no set standards that can be universally applied, and each patient may require a unique approach. However, by incorporating the patient's qualities into the dentures, we can produce dentures that are natural and vibrant. Our objective as dental professionals is to create an appealing smile by incorporating various aesthetic components.

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