

Esthetic operative Dentistry

Lect.2
4th stage

٢٠١٩-٢٠١٨



Sterilization and Infection Control in dentistry
Aesthetic Restorative Dentistry.
Principles of aesthetic dentistry.
Smile design and golden proportions.

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دكتوراه اختصاص في طب الاسنان التجميلي و الترميمي



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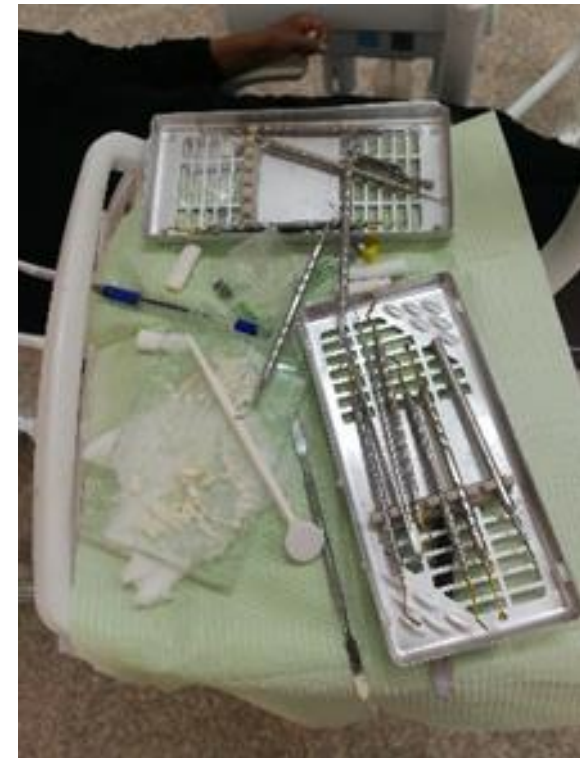
Sterilization and Infection Control in dentistry:

Practical infection control in the operatory dentistry is a multi-step process. Protocol should be updated to include:

- 1- Good identification of high-risk patient populations.
- 2- Good barrier technique, aseptic technique.
- 3- Good surface disinfection.
- 4- Good instrument sterilization.
- 5- Good equipment disinfection and sterilization



- ❑ Dental chair units contain integrated systems that provide the instruments and services for a wide range of dental procedures.
- ❑ Dental chair units use water to cool and irrigate Dental Chair Unit (D.C.U) -supplied instruments and tooth surfaces during dental treatment.
- ❑ Water is supplied to these instruments by a network of interconnected narrow-bore (2–3 mm) plastic tubes called dental unit waterlines.



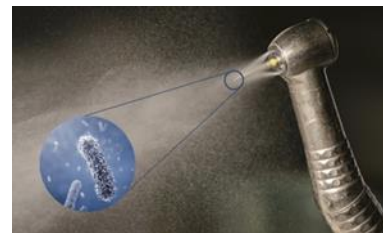
Automated (D.U.W) treatment procedures that are effective at controlling biofilm in the long-term and require minimal human intervention, are safe for patients and staff, and which do not cause deterioration of (D.C.U) components following prolonged use.



A few studies have reported adverse effects associated with the application of (D.U.W) treatment agents,

A number of recent studies reported that some (D.U.W) treatment agents (e.g. 3-ppm sodium hypochlorite; a 1:10 dilution of Listerine mouthrinse; bio 2000,

- 0.12% chlorhexidine gluconate- and 12% ethyl alcohol-containing product,
- 0.224% BioClear, a citric acid containing product)
- All may adversely affect bonding of composite material to both enamel and dentine.



Aesthetic Restorative Dentistry.

Closed sandwich technique



Figure 1 shows the preoperative view of a wedge-shaped carious cervical lesion on the mandibular right second premolar.

Figure 2 The initial caries control procedure provided removal of the infected dentin and placement of a resin-modified glass ionomer to provide a seal of the lesion while remineralizing the affected dentin.

Figure 3 A chamfer was placed along the occlusal margin.

Aesthetic Restorative Dentistry. Closed sandwich technique

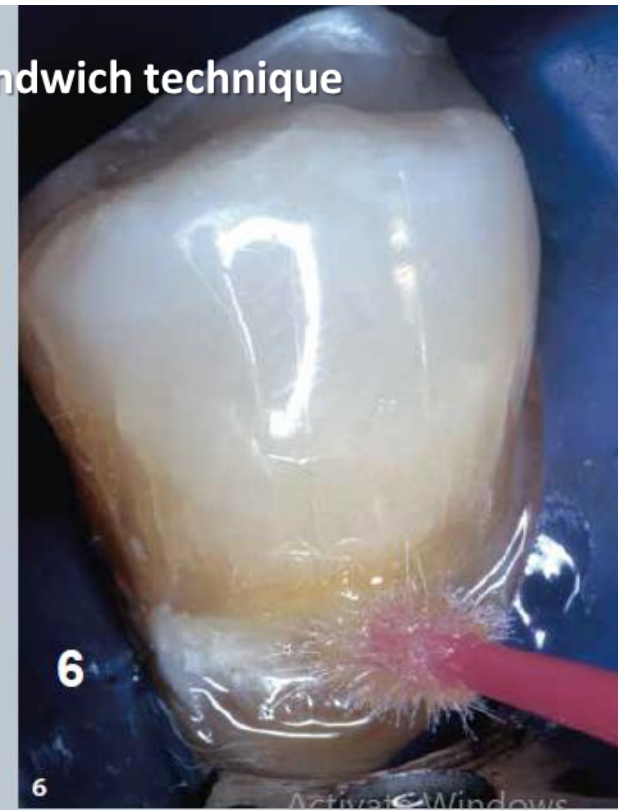
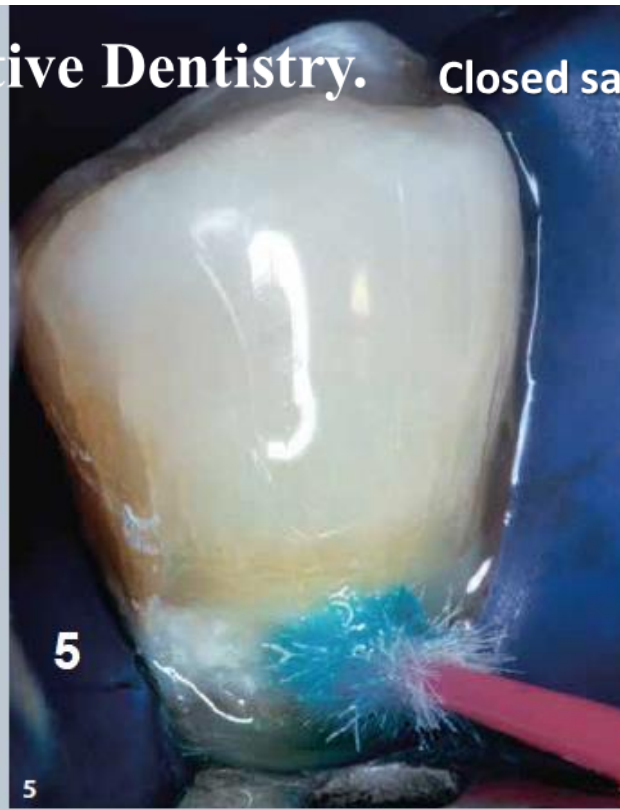


Figure 4: A 0.5-mm scalloped bevel was placed in enamel to interrupt the straight line of the chamfer and to reduce the potential for microleakage

Figure 5: The preparation was cleaned with a premixed slurry of pumice and 2% chlorhexidine (Consepsis).

Figure 6: The preparation was rinsed and lightly air dried. A two-component self-etching system was used. The self-etching primer was applied to the preparation and allowed to set for 20 seconds and dried gently for 5 seconds.

Aesthetic Restorative Dentistry.

Closed sandwich technique



Figures 7 and 8: The bonding agent was applied to the enamel and dentin surfaces and light cured for 10 seconds.

Figure 9: The initial enamel layer of any composite resin as A4-shaded was applied to the occlusal half of the preparation with a long-bladed composite instrument.

Aesthetic Restorative Dentistry.

Closed sandwich technique

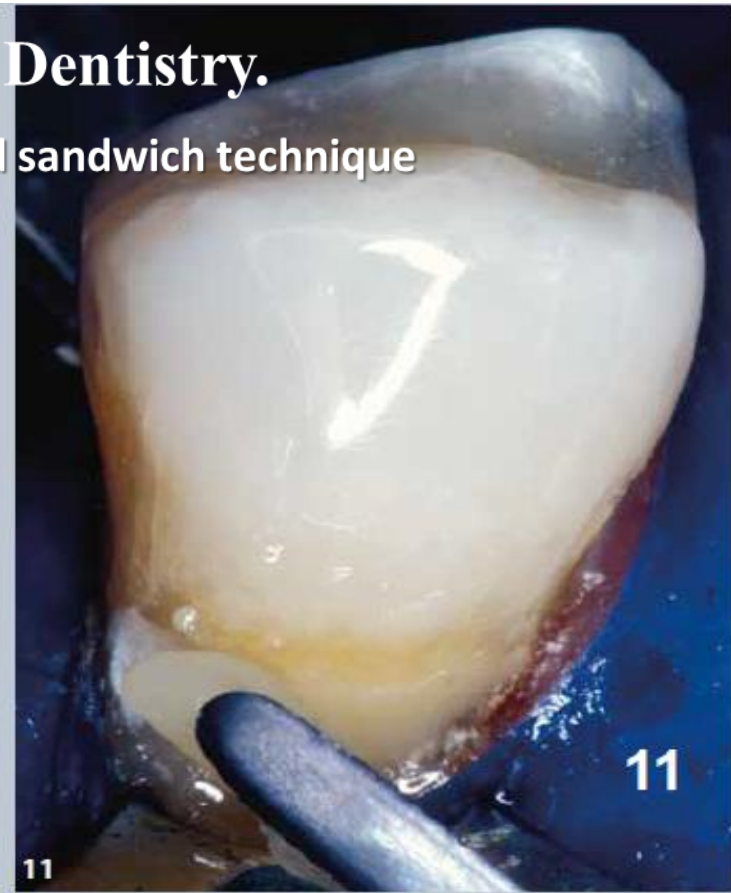
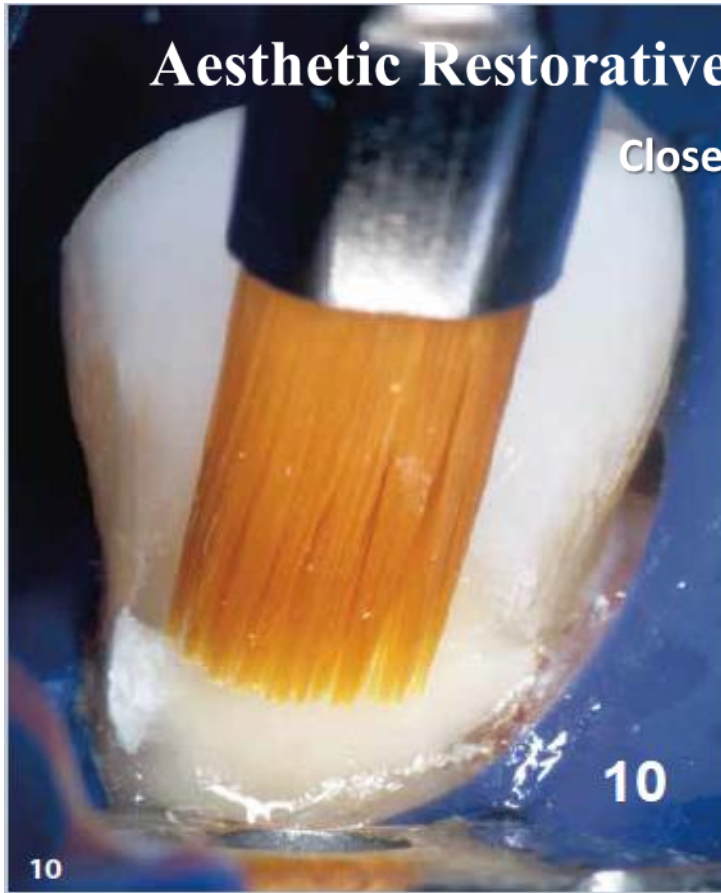
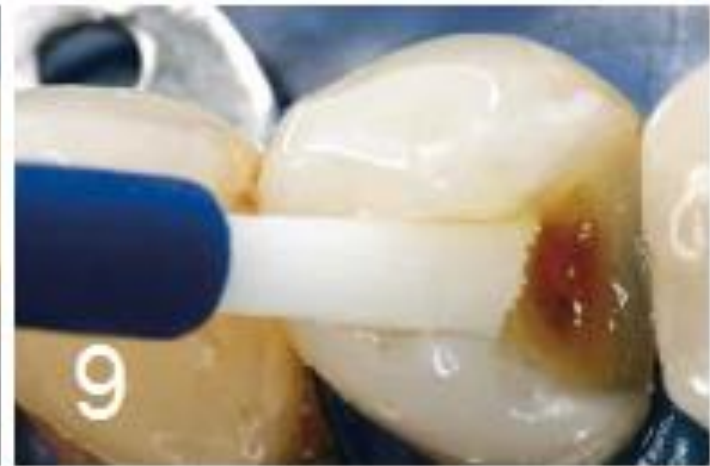
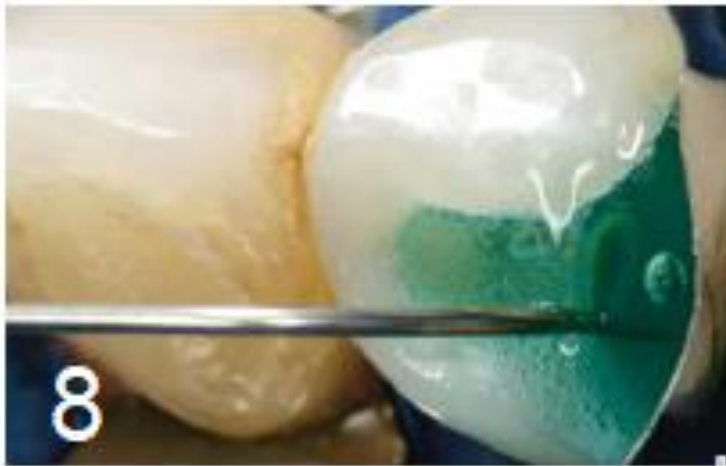


Figure 10: contoured, and smoothed with a #2 sable brush.

Figure 11: A second opacious increment was placed in the gingival half of the preparation, smoothed with a #2 sable brush, and light cured.



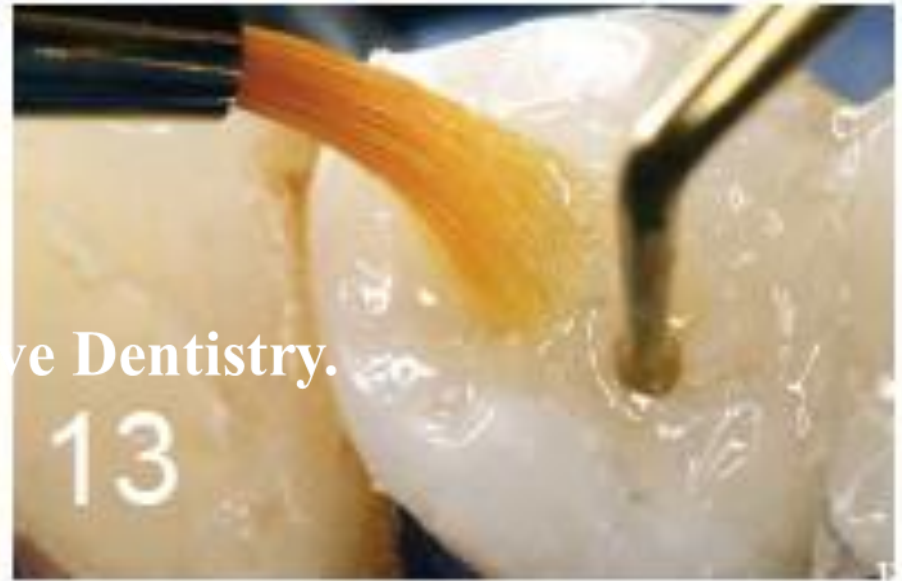
(Fig 8): After the preparation was cleaned with 2% chlorhexidine (Consepsis), the preparation was etched for 15 seconds with 32% phosphoric acid, rinsed with water for 5 seconds, and lightly air dried.

(Figs 9 to 11): An adhesive (All-Bond 3, Bisco) was applied, air thinned, and light cured for 40 seconds.



Aesthetic Restorative Dentistry.

Aesthetic Restorative Dentistry.



(Fig 12): The composite resin cement was injected into the preparation.

(Fig 13): The inlay was positioned and held firmly in place using a ball-tipped instrument. The excess resin cement was removed with a sable brush, leaving only a residual amount at the margin to compensate for polymerization shrinkage, and light cured for 40 seconds.



(Fig 14): The residual cement was removed with a scalpel blade (#12 BD Bard-Parker), and a thin application of glycerin was applied to all the margins to prevent the formation of an oxygen inhibition layer on the composite resin cement.

(Fig 15): The restoration was polymerized from all aspects buccal, occlusal, lingual, and proximal surfaces each for 40 seconds. Final polishing at the restorative interface was achieved with prepolishing and high-shine polishing points.



(Fig 16): The postrestorative occlusal view illustrates an optimal and durable interfacial adhesion between the tooth and ceramic biomaterial that can be attained from utilizing a thorough adhesive protocol

Ceramic materials:

- 1-Derived from the Greek word keramos, was the ancient art of fabricating pottery.
- 2-This word may have originated from a **Sanskrit term meaning burnt earth** because the main constituents were clays excavated from the earth, which were heated to form pottery.
- 3-Traditional ceramics uses clay as one of its primary components, in combination with other metal oxides including feldspar ($\text{K}_2\text{O Al}_2\text{O}_3 6\text{SiO}_2$), alumina (Al_2O_3), potash (K_2O), and soda (Na_2O).



4 -Cultures Archaeologists have uncovered human-made ceramics that date back to at least 24,000 BC.

5-These ceramics were found in what was formerly Czechoslovakia and were in the form of animal and human figurines.

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7-These ceramics were found in what was formerly Czechoslovakia and were in the form of animal and human figurines.

8-The first use of functional pottery vessels is thought to be in 9,000 BC. These vessels were most likely used to hold and store grain and other foods



Ceramic materials:

9- Ceramic objects are still fabricated by pulverizing these raw materials into fine particles and powders and adding water to help keep the particles together during sculpting and shaping.

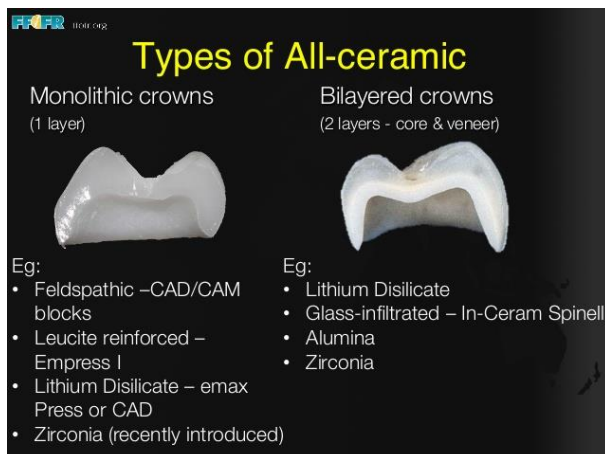
10-These traditional ceramics include stoneware (tile), earthenware (pottery), porcelain (tableware and china), electrical insulators, bricks, and sanitary ware (sinks and toilets).



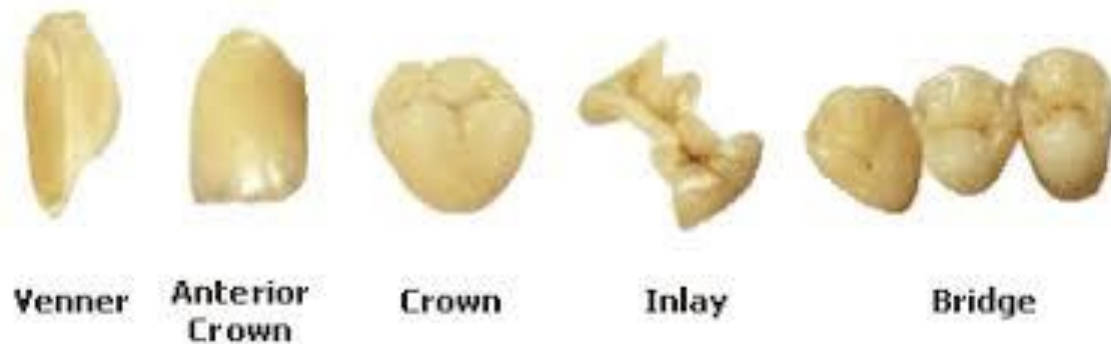
11-Dental ceramics are chemical mixtures of nonmetallic and metallic elements that allow ionic and covalent bonding to form periodic crystalline structures.

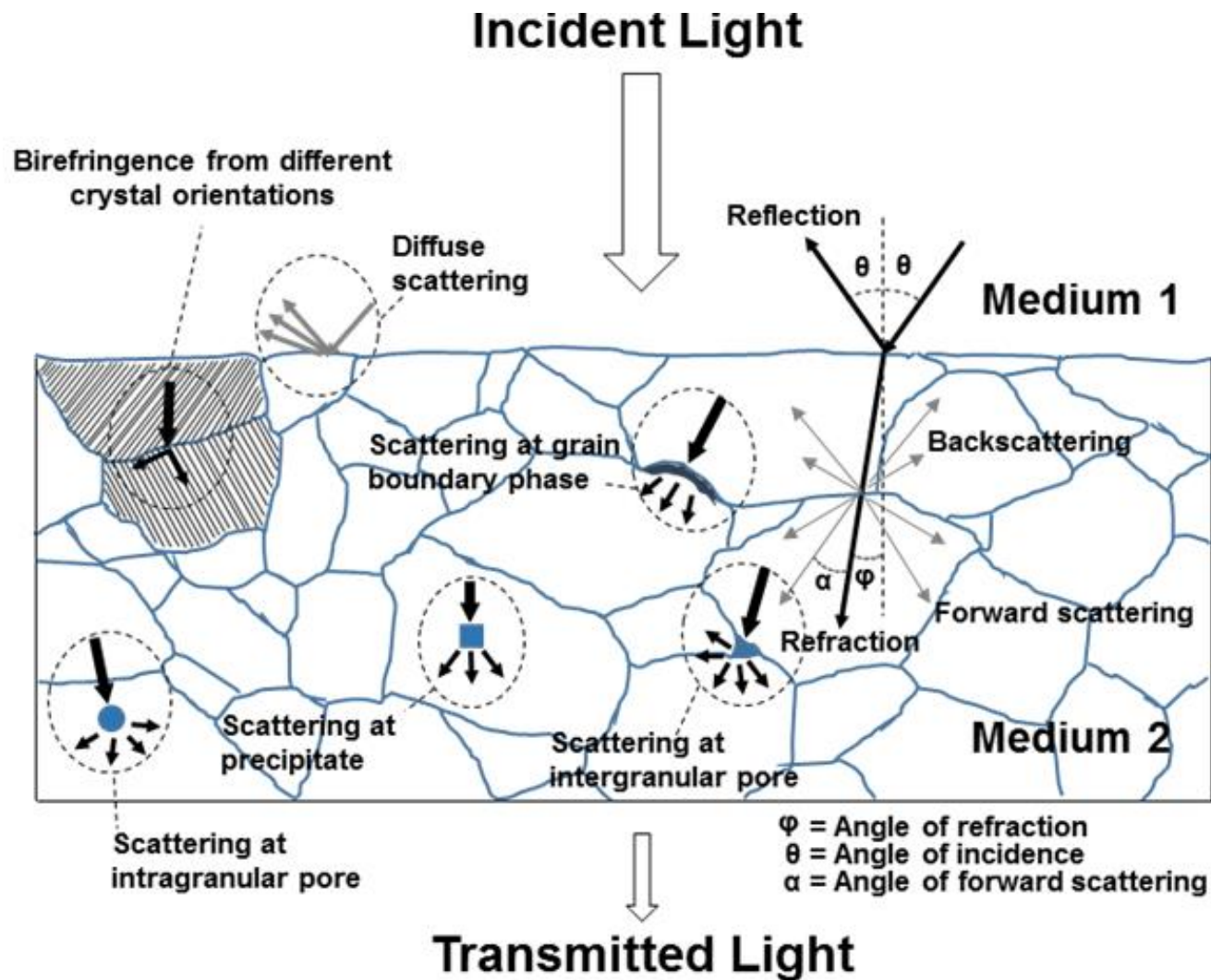
12-The major difference between the porcelain used in dental ceramics and other traditional ceramics is the proportion of the main ingredients. Dental ceramics are composed mainly of **feldspar**, while traditional ceramics are composed mainly of **clay**.

13-The coloring agents **metallic oxides** include **iron oxide** for brown shading, **copper oxide** for green shading, and **titanium oxide** for yellow shading, **manganese oxide** for purple shading, **cobalt oxide** for blue shading, and **tin oxide** for opaquing, and the **rare earth elements** can be added in small quantities to provide fluorescence.



- ☐ Dental porcelain is comprised of **approximately 15% quartz powder**.
- ☐ The quartz powder is infusible at the firing temperature of porcelain and is surrounded by fusible ingredients.
- ☐ And this crystalline layer of quartz that contributes to the dispersed phase.
- ☐ And is surrounded by a continuous amorphous phase.





Interaction light with materials and their microstructures

This crystalline layer is responsible for the translucent optical properties of porcelain and limits shrinkage during firing.

- ❑ Kaolin is a natural form of clay obtained from riverbeds, and the clay is washed, dried, and screened into a pure, fine powder.
- ❑ In dental porcelains, kaolin is used in small concentrations (ie, 4%) as a particle binder, and the kaolin coats the non-fusible particles and becomes sticky, holding the wet porcelain particles together, and this allows the technician to control the form of the restoration by manipulating the powder-liquid mass.



The porcelain restorations tooth colored, small quantities of coloring agents are added to porcelain powders.

The coloring agents metallic oxides include:

Iron oxide for brown shading.

Copper oxide for green shading.

Titanium oxide for yellow shading.

Manganese oxide for purple shading.

Cobalt oxide for blue shading.

Tin oxide for opaquing.

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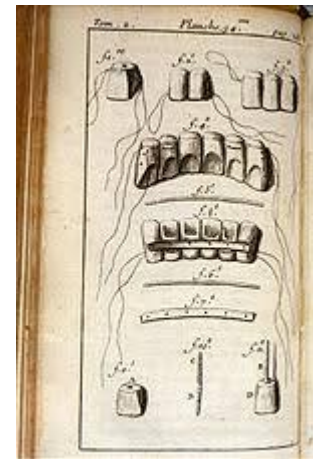
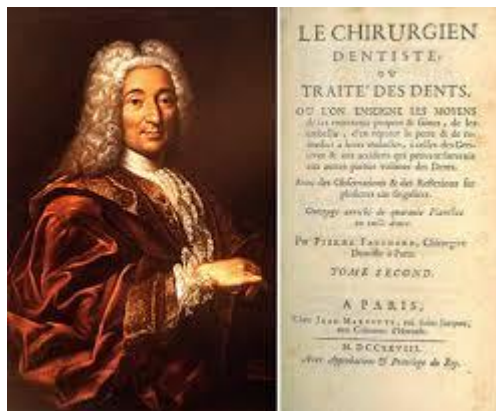


Principles of aesthetic dentistry:

Smile, a person's ability to express a range of **emotions with the structure and movement of the teeth and lips**, can often determine how well a person can **function in society**.

Earliest civilizations; both the Phoenicians (app 800 BC) and Etruscians (app 900 BC).
Pierre Fauchard (1678– 1761) of France, the leader of the movement esthetic practices.

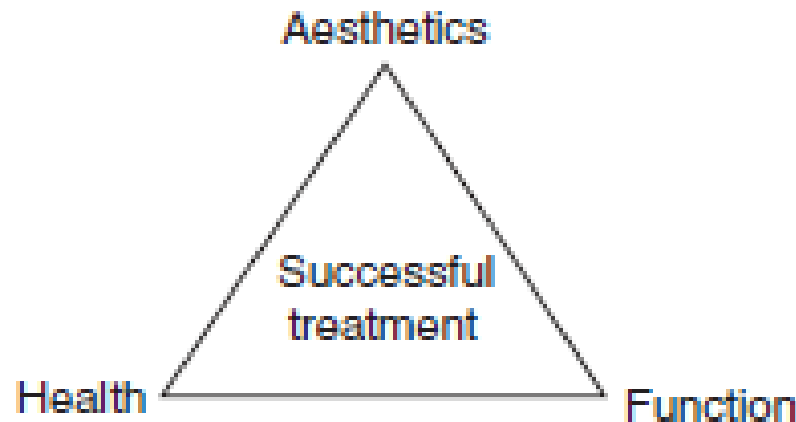
The goal of an esthetic makeover is to **develop a peaceful and stable masticatory system**, where the **teeth, tissues, muscles, skeletal structures and joints all function in harmony**



The success of a restoration depends on sound mechanical, biological and esthetic principles.

Irfan Ahmad has suggested the HFA triad. According to this, careful dental treatment must be directed to fulfil the **Health, Function and Aesthetics** for the patient. It is important to undertake the treatment in the sequence where health is first, followed by function and last esthetics.

Health can be achieved without function and esthetics.



Facial composition

Facial beauty is based on standard esthetic principles that involve proper alignment, symmetry and proportion of face.

There are two facial features which do play a major role in the smile design:

1. The inter pupillary line should be perpendicular to the midline of the face and parallel to the occlusal plane.
2. 2. Lips.

The correction of the facial composition, before we venture into the correction of the dental composition.

Horizontal and vertical dimensions for an ideal face are as follows:

1. Horizontal:

- The width of the face should be the width of five “eyes”.
- The distance between the eyebrow and chin should be equal to the width of the face [Figure 1].

2. Vertical:

- The facial height is divided into three equal parts from the forehead to the eyebrow line, from the eyebrow line to the base of the nose and from the base of the nose to the base of the chin.
- The full face is divided into two parts, eyes being the midline.
- The lower part of the face from the base of the nose to the chin is divided into two parts, the upper lip forms one-third of it and the lower lip and the chin two-thirds of it

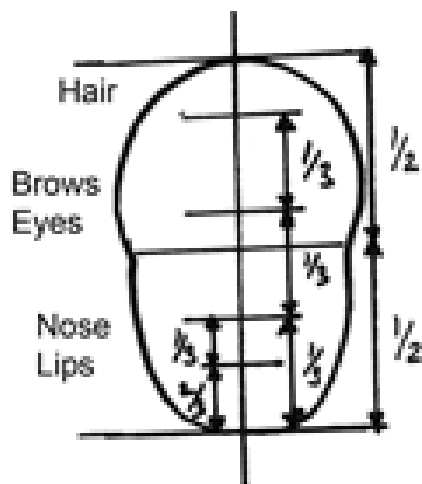


Figure 1: Horizontal dimensions of face.

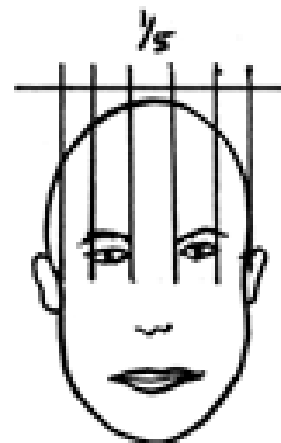


Figure 2: Vertical dimensions of face

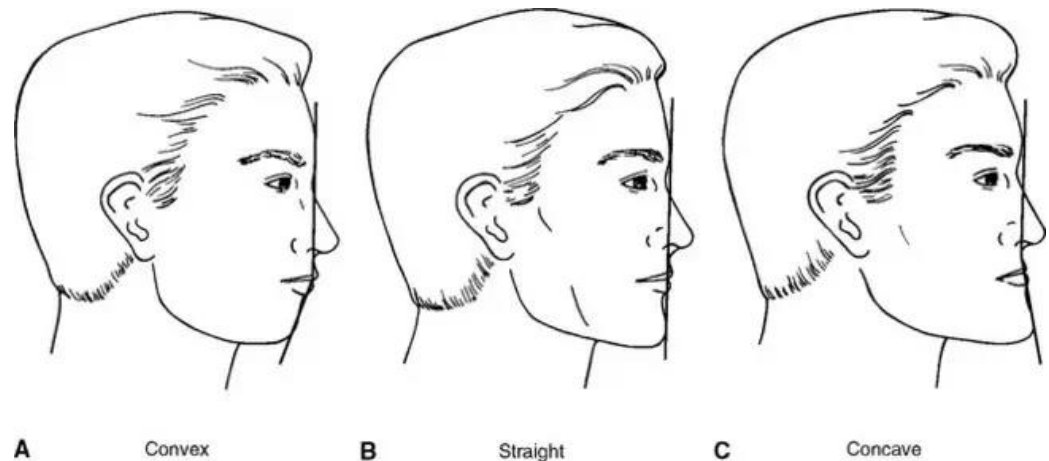
The basic shape of the face when viewed from the frontal aspect can be one of the following:

1. Square.
2. Tapering.
- 3 Square tapering.
4. Ovoid.



The lateral profile of an individual can be any one of the following:

1. Straight.
2. Convex.
3. Concave.



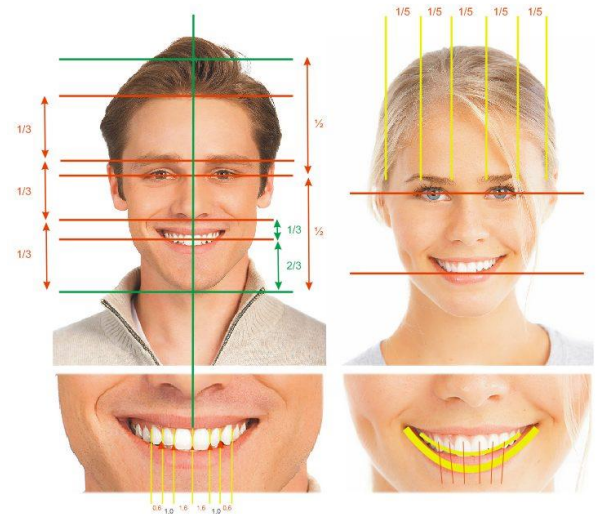
Vital elements of smile designing (dental composition)

The vital elements of smile designing include the following:

1. Tooth components:

- a) **Dental midline:** The midline refers to the vertical contact interface between two maxillary centrals. It should be perpendicular to the incisal plane and parallel to the midline of the face.
- b) **Incisal lengths (incisal edge positions):** Maxillary incisal edge position is serves as a reference point to decide the proper tooth proportion and gingival levels.
- c) **The parameters** used to help establish the maxillary incisal edge position are:

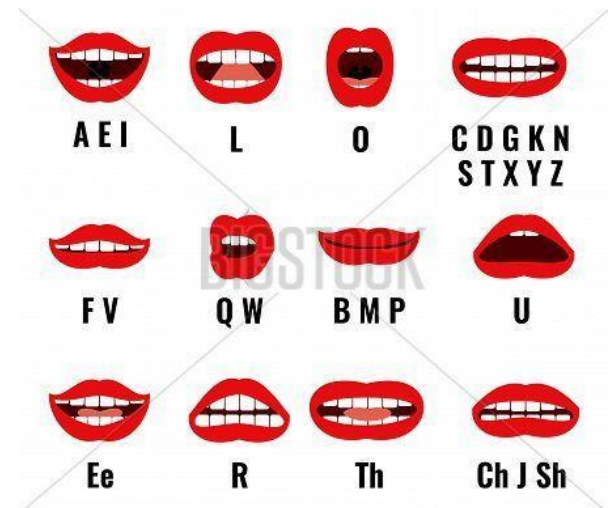
1. Degree of tooth display: When the mouth is relaxed and slightly open, 3.5 mm of the incisal third of the maxillary central incisor should be visible in a young individual.



2. Phonetics: In order to determine proper lip, tongue and incisal support and tooth position, it is necessary that the patient sits either erect or stands during the phonetic exercises.

The various phonetics used are as follows:

- **M sound:** The lips return to their normal rest position, allowing evaluation of the amount of the tooth display in rest position.
- **E sound:** The maxillary incisal edge position should be positioned halfway between the upper and lower lip during the “E” sound.
- **F and V sounds:** Produced by the interaction of the maxillary incisal edge with the inner edge of the lower lips, fricative sounds help to determine the labiolingual position and length of the maxillary teeth.
- **S sound:** During pronunciation, the mandibular central incisors are positioned 1 mm behind and 1 mm below the maxillary incisal edge.



3. Patient input:

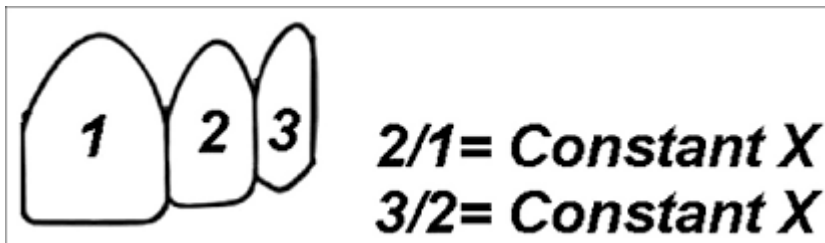
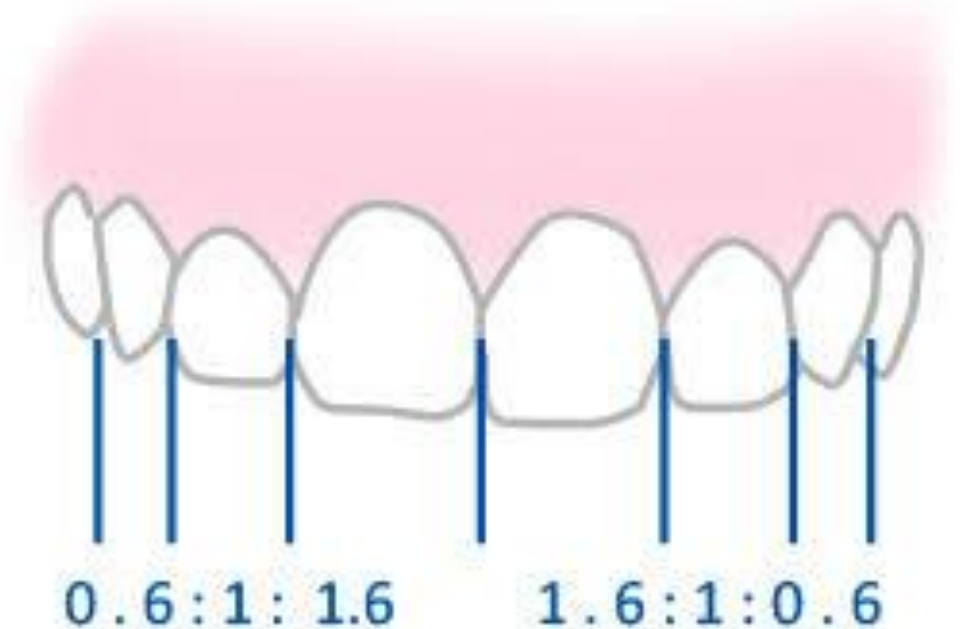
Intraoral cosmetic preview and provisional restorations help to confirm proper placement of the final incisal edge position.

Tooth dimensions:

- ☐ Correct dental proportion is related to facial morphology and is essential in creating an esthetically pleasing smile.
- ☐ Central dominance dictates that the centrals must be the dominant teeth in the smile.
- ☐ Central must display pleasing proportions.
- ☐ Centrals are the key to the smile.
- ☐ Various guidelines for establishing correct proportions in an esthetically pleasing smile are:



- 1. Golden proportion (Lombardi):** When viewed from the facial, the width of each anterior tooth is 60% of the width of the adjacent tooth (mathematical ratio being 1.6:1:0.6) [Figure 3]. It is difficult to apply as patients have different arch form, lip anatomy and facial proportions.



d) Zenith points: are the most apical position of the cervical tooth margin where the gingiva is most scalloped. It is located slightly distal to the vertical line drawn down the center of the tooth. **The lateral is an exception as its zenith point may be centrally located.** Establishing the proper location of zenith points is a critical step in alteration of mesial and distal dimensions.

- Closure of diastema:

Move the zenith points to provide the illusion of bodily movement and reduce exaggerated triangular form, correction of tooth angulation.

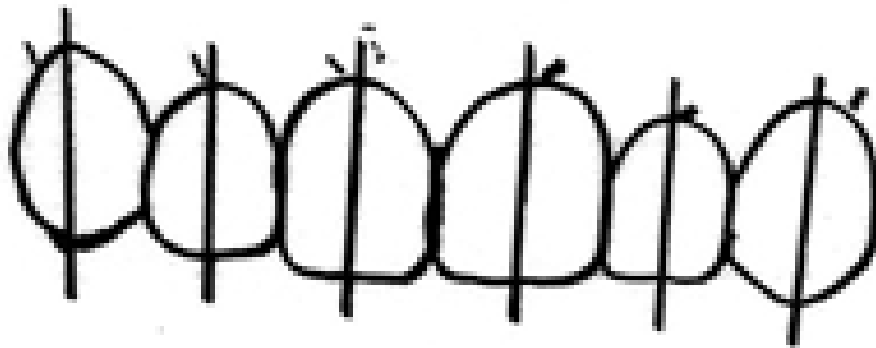
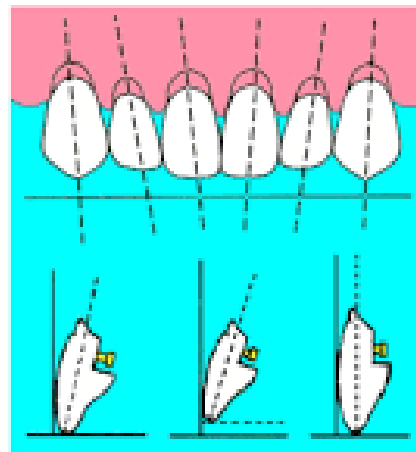


Figure 5: Zenith points and its relation to midline.

e) Axial inclinations: Compares the vertical alignment of maxillary teeth, visible in the smile line, to central vertical midline. From the central to the canine, there should be natural, progressive increase in the mesial inclination of each subsequent anterior tooth. It should be least noticeable with the centrals and more pronounced with the laterals and slightly more so with the canines.

The guide for labiolingual inclination is as follows:

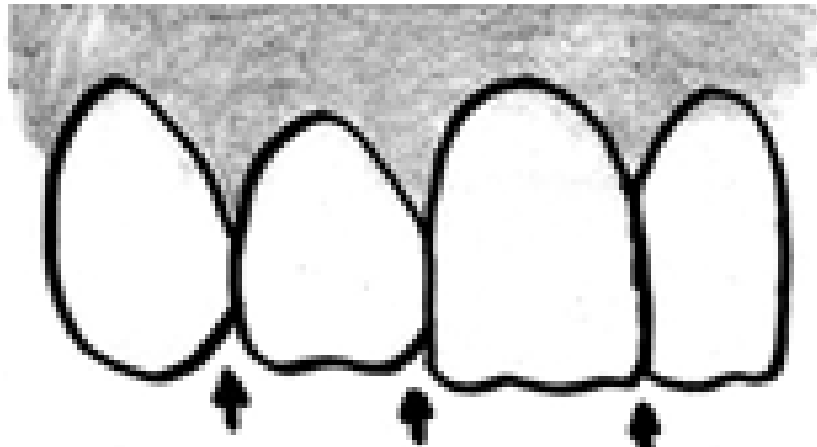
1. Maxillary central incisor – positioned vertically or slightly labial.
2. Maxillary lateral incisor – cervical is tucked in, incisal edge inclined slightly labially.
3. Maxillary canine – cervical area positioned labially, cusp tip lingually angulated.



Axial Inclination of Maxillary Anteriors
in the "Basic" Arrangement.

g) Incisal embrasure:

- ☐ progressive increase in size or depth from the central to the canine.
- ☐ the contact point moves apically as we proceed from central to canine.
- ☐ The contact points in their apical progression should mimic the smile line.



Figures 8: Incisal embrasure – increase in size and depth from central to canine.

Failure to provide adequate depth and variation to the incisal embrasure will:

1. Make the teeth appear too uniform.
2. Make the contact areas too long and impart to the dentition a box like appearance.

i) Symmetry and balance:

- ☐ Symmetry is the harmonious arrangement of several elements with respect to each other.
- ☐ Symmetrical length and width is most crucial for the centrals.
- ☐ It becomes less absolute as we move further away from the midline.
- Static symmetry: Mirror image, maxillary central incisors.
- Dynamic symmetry: Two objects very similar but not identical.



Balance: is observed as the eyes move distally from the midline, so that both the right and left sides of the smile are well balanced.

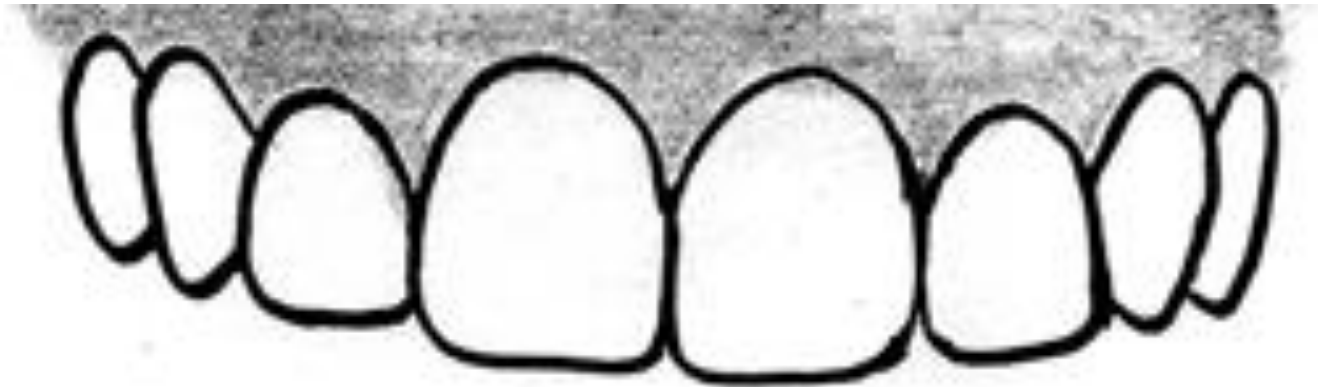
2. Soft tissue components:

a) Gingival health: The gingiva acts as the frame for the teeth; thus, the final esthetic success of the case is greatly affected by the gingival health. Healthy gingiva is usually:

1. Pale pink in color, stippled, firm and it should exhibit a matte surface.
2. Located facially (3 mm) above the alveolar crestal bone.
3. Located interdentally (5 mm) above the intercrestal bone papilla should be pointed and should fill the gingival embrasure right up to the contact area.



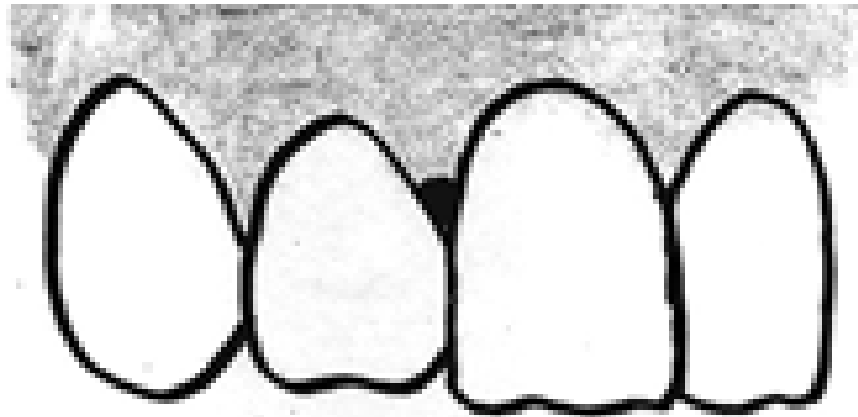
b) Gingival levels and harmony: Establishing the correct gingival levels for each individual tooth is the key in the creation of harmonious smile. The gingival margin of the lateral incisor is 0.5–2.0 mm below that of the central incisors. The least desirable gingival placement over the laterals is for it to be apical to that of the centrals and or the canines.



Figures 9: Ideal gingival level centrals and canines same level and laterals cervical to them,

c) Interdental embrasure (Cervical embrasure):

- ☐ The darkness of the oral cavity should not be visible in the interproximal triangle between the gingiva and the contact area.
- ☐ If the most apical point of the restoration is (5 mm) or less from the crest of the bone, then black triangles will be avoided.



Figures 10: Interdental embrasure – showing black triangle

d) Smile line:

- ❑ Refers to an imaginary line along the incisal edges of the maxillary anterior teeth which should mimic the curvature of the superior border of the lower lip while smiling.
- ❑ Centrals should appear slightly longer or, at least, not any shorter than the canines along the incisal plane.

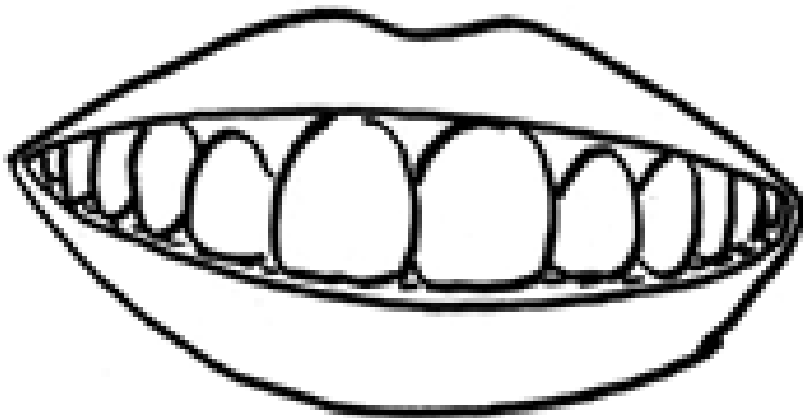
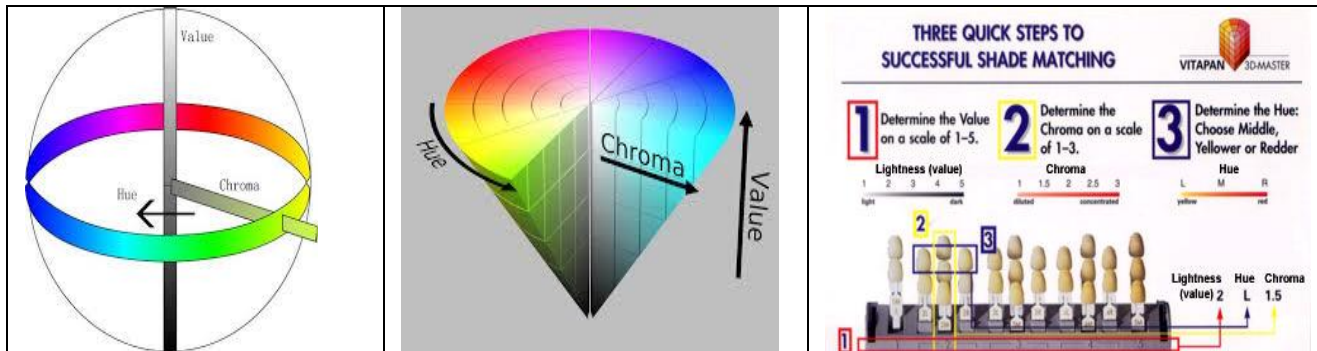


Figure 11: Smile line that follows the superior border of the lower lip.



Reverse smile line or inverse smile line occurs when the centrals appear shorter than the canines along the incisal plane. Lip line should not be confused with the smile line. Lip line refers to the position of the inferior border of the upper lip during smile formation and thereby determines the display of tooth or gingiva at this hard and soft tissue interface.

Finally, the individual tooth morphology has to mimic nature, also, the appropriate shade selection has to be done to bring out all the hard work of our smile design. Shade selection must be customized for each individual. It should be natural and polychromatic. The body of the tooth can be fairly uniform in color but the gingival third should be noticeably richer in chroma. The chroma should also increase from central to the canine, canine having a higher chroma.



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