

GINGIVAL EXAMINATION -GINGIVA IN HEALTH(clinical)



**DEPARTMENT OF PERIODONTOLOGY
KARPAGA VINAYAGA INSTITUTE OF
DENTAL SCIENCES**

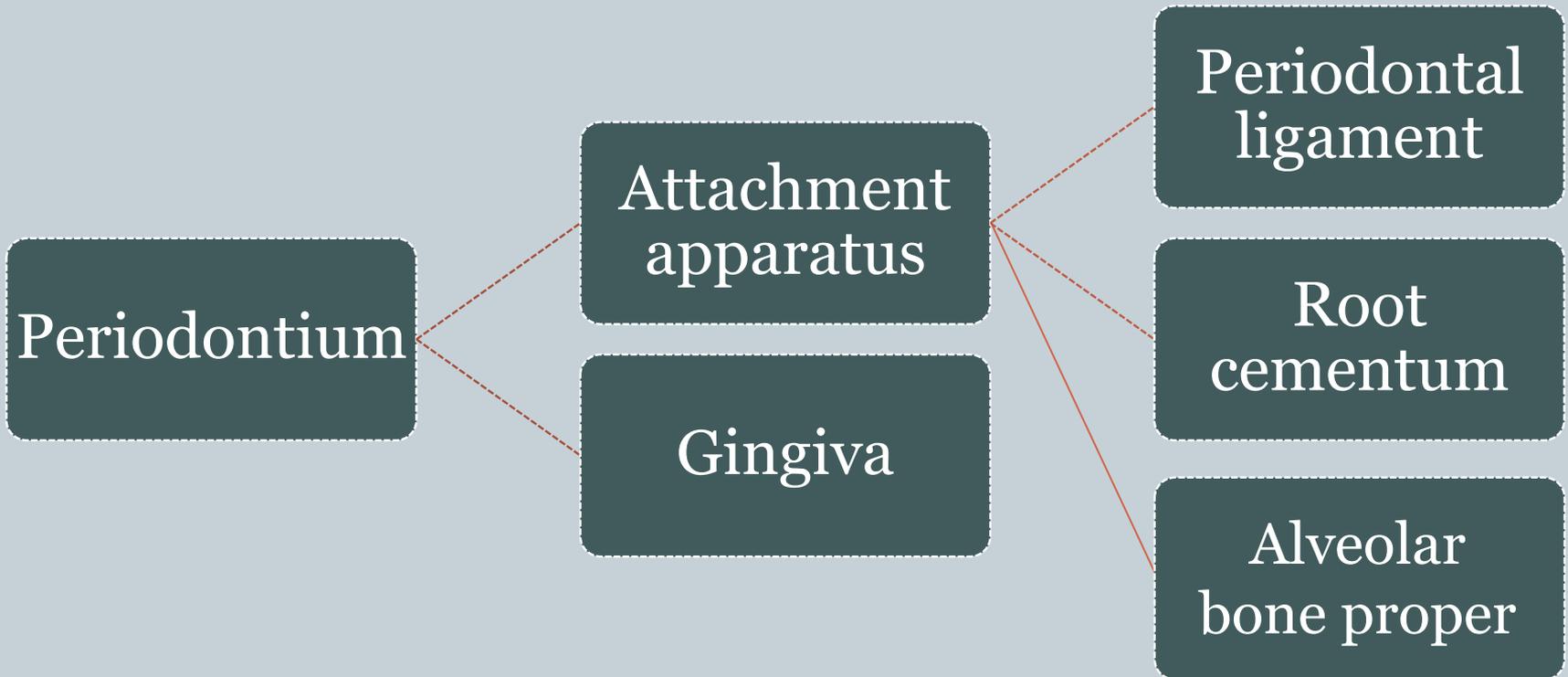
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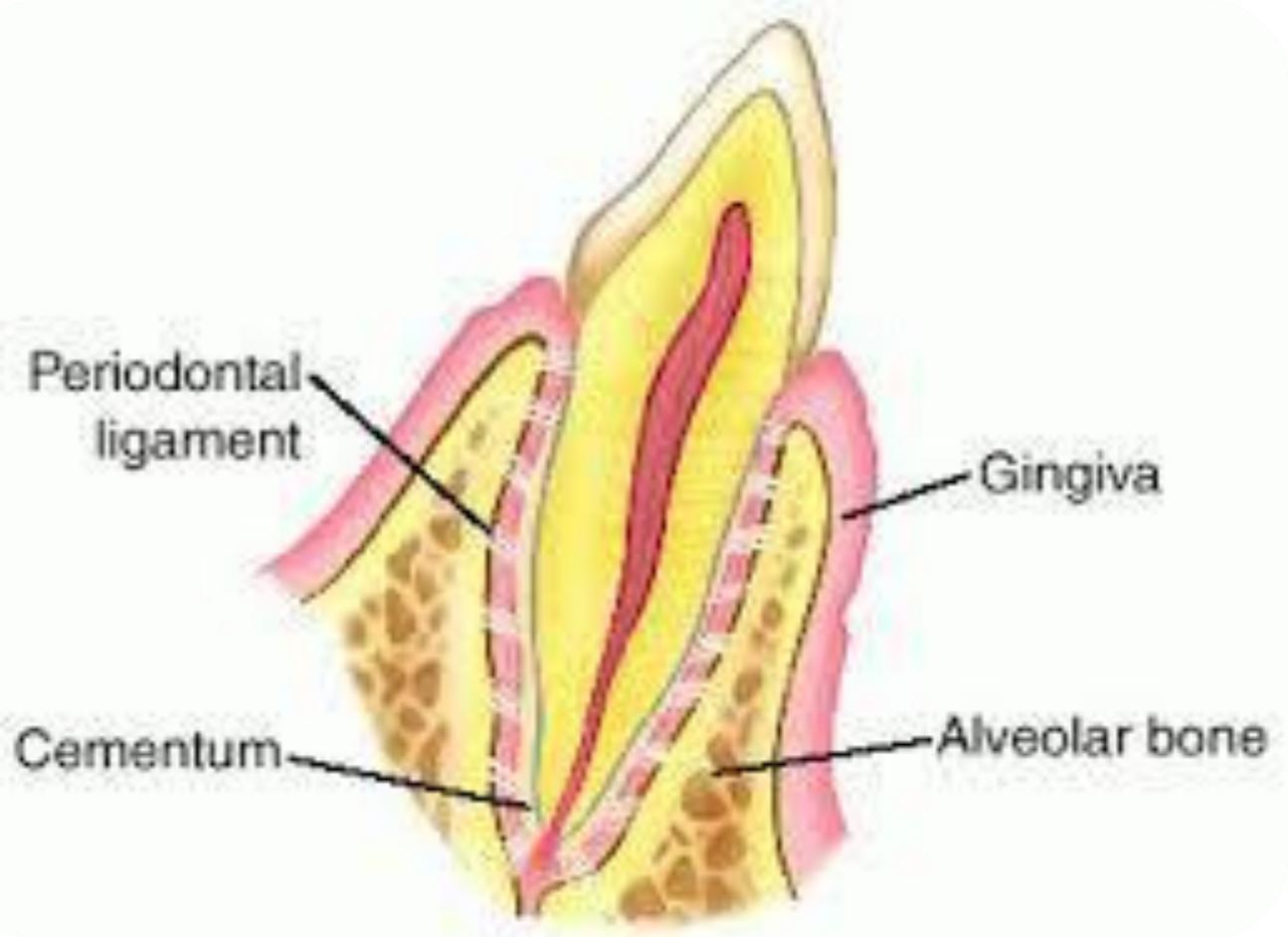


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PERIODONTIUM





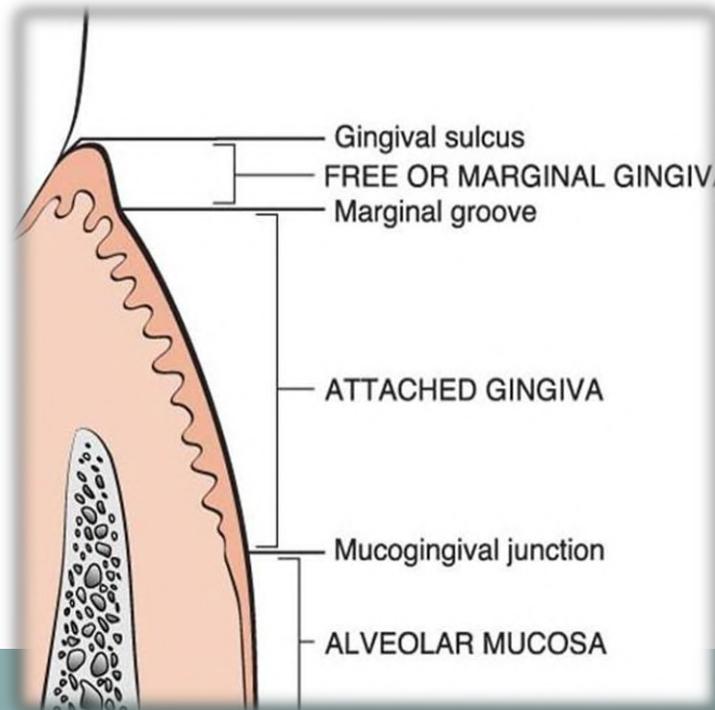
GINGIVA

- Carranza defines gingiva as ‘ the part of oral mucosa that covers the alveolar processes of the jaws and surrounds the neck of the teeth.’



Fig. 8

- Lindhe states that ‘gingiva is that part of masticatory mucosa which covers the alveolar process and surrounds the cervical portion of the teeth.’
- Elley describes it in even more simpler terms as ‘that part of oral mucosa which surrounds the tooth and covers the alveolar ridge.’



FUNCTIONS OF GINGIVA



- It is the part of the oral mucosa which surrounds the tooth and covers the alveolar ridge.
- It is a part of the tooth supporting structures.
- Gingival sulcus, a part of the gingiva protects the underlying tissues of the tooth attachment from the oral environment.

MACROSCOPIC ANATOMY

Gingiva is anatomically divided into three parts as



Marginal
gingiva



Attached
gingiva



Interdental
papilla

Interdental
gingiva

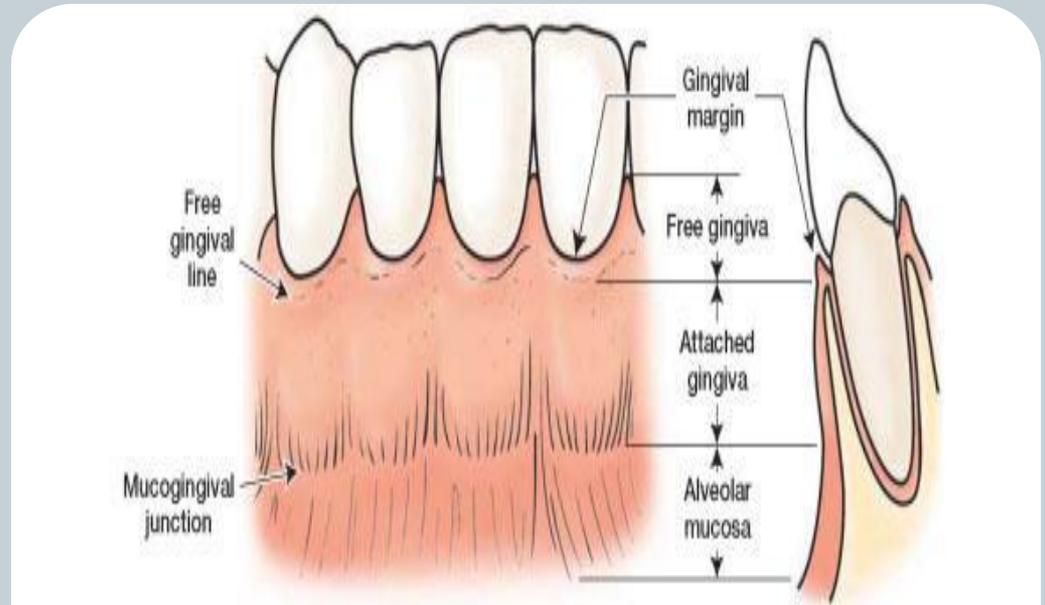
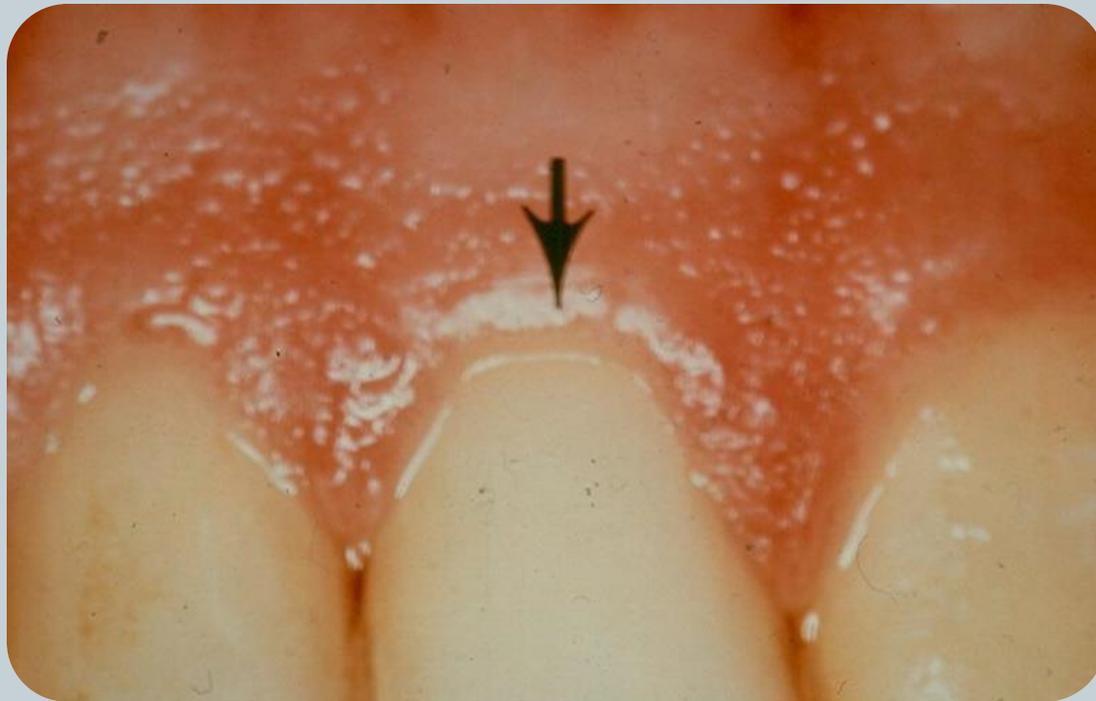


Figure 1.5. Boundaries of the Gingiva. Illustration showing the boundaries and anatomical areas of the gingiva.

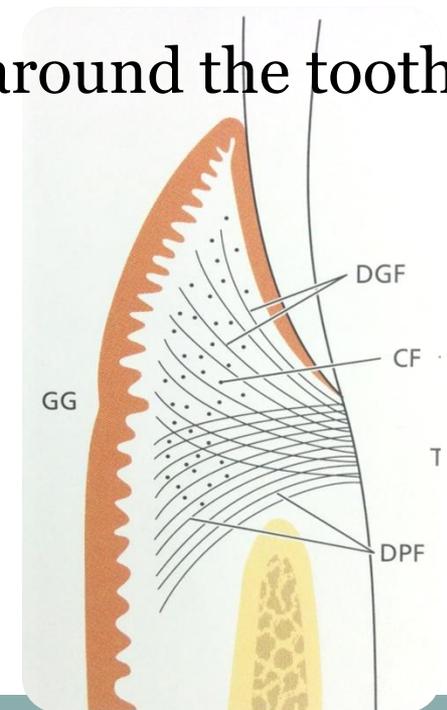
MARGINAL GINGIVA



- Also known as the unattached or free gingiva. It forms the terminal edge or border of the gingiva surrounding the teeth in collar like fashion.



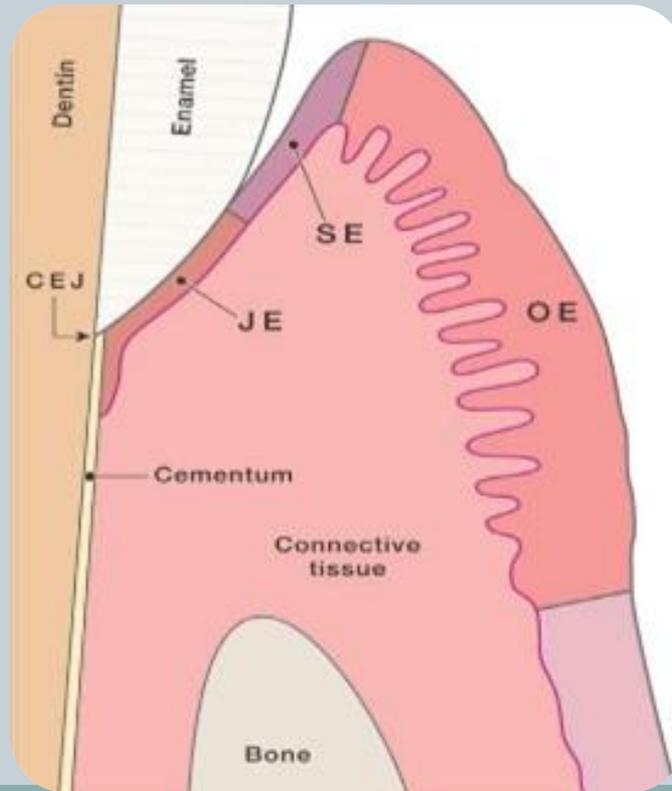
- Usually about 1- 2 mm wide, has a dull surface and firm consistency.
- It can be separated from the tooth surface with a periodontal probe because the underlying connective tissue is not attached to the periosteum.
- Therefore a crevice or a sulcus is found around the tooth which is about 0 – 2 mm deep.
- This aids in the cleansing action.



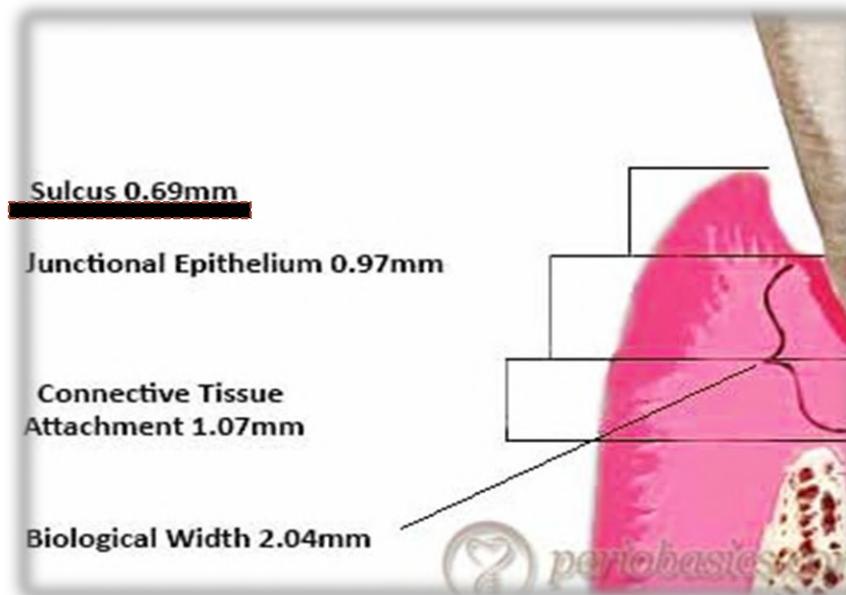
Gingival Sulcus



- It is the shallow crevice or space that is bounded by the tooth on one side and the epithelium lining the free margin of the gingiva on the other side.



- It is V shaped and barely permits the entry of a periodontal probe.
- Under ideal conditions, the depth of the gingival sulcus is 0 mm or close to 0 mm ([Gottlieb B, Orban B; 1933](#)) .



- In a clinically healthy gingiva, there is infact no “gingival pocket” or “gingival crevice” present, but the gingiva is in close contact with the enamel surface ([Gottlieb B, Orban B; 1933](#)).The gingival crevice is artificially opened by the insertion of a periodontal probe approximately to the level of the CEJ.

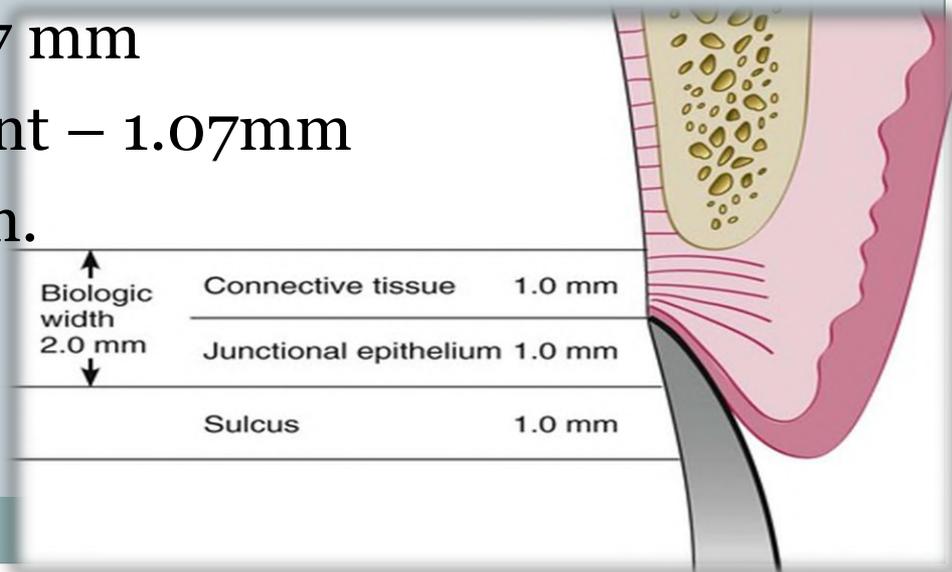
- Clinically the so called probing depth of a normal gingival sulcus in humans is 2 to 3 mm.

- In histological section , the depth is 1.8 mm with variation from 0 to 6 mm ([Orban B, Kohler J; 1924](#))

Biologic width



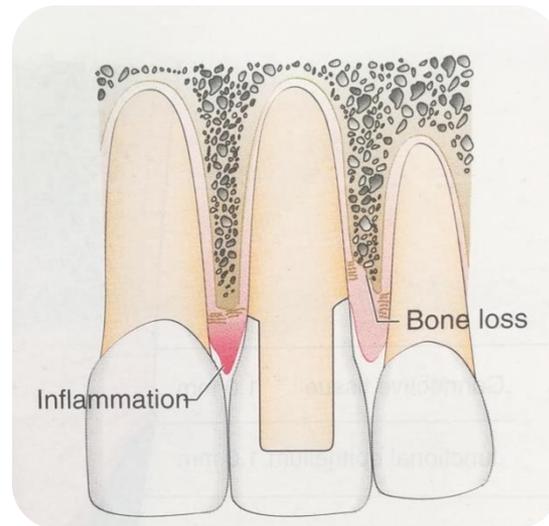
- It is the dimensional width of the dentogingival junction and is described by Sicher in 1959.
- *Gargiulo and colleagues (1961)* studied the anatomy of the dentogingival junction and quantified the average as a constant 2.04 mm
 - epithelial attachment - 0.97 mm
 - connective tissue attachment – 1.07mm
 - with a sulcus depth of 0.69mm.



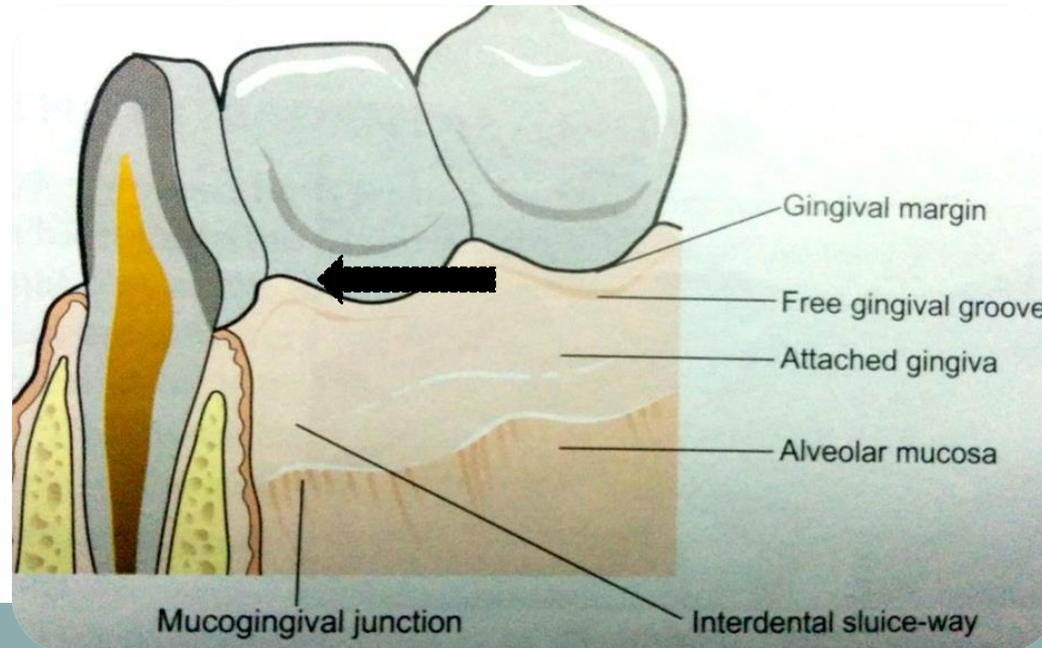
Significance of biologic width :

If the biologic width is violated during any restorative procedure, two different responses is observed in the surrounding gingival tissues

- Bone loss of unpredictable nature to recreate the room for tissue reattachment.
- Gingival inflammation develops and persists.



- In the border area between the free and attached gingiva, the epithelium often lacks support from underlying oriented collagen fibre bundles producing a linear depression on the external surface of the gingiva called, the *free gingival groove*.
- This demarcation was found only in about 50% of the cases according to a study done by [Ainamo A, Loe H](#) in the year 1966.



ATTACHED GINGIVA



- Also known as the functional mucosa. This extends from the free gingival groove to the mucogingival junction.



- It is firm, resilient and tightly bound to the underlying periosteum of alveolar bone.
- At the mucogingival junction the mucoperiosteum splits so that the alveolar mucosa is separated from periosteum by a loose, highly vascular, connective tissue.



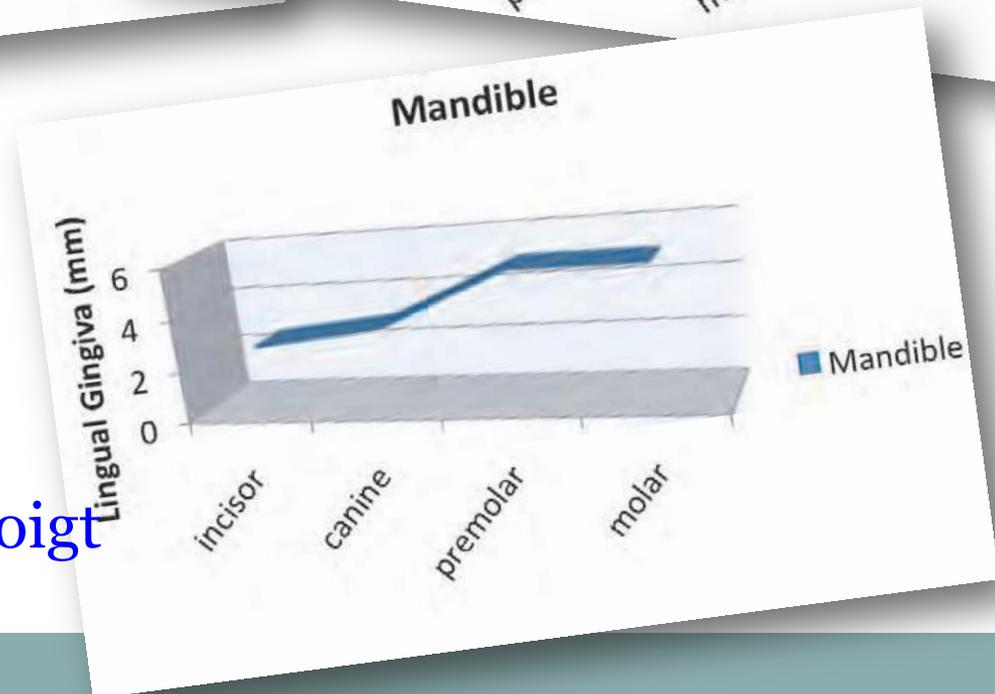
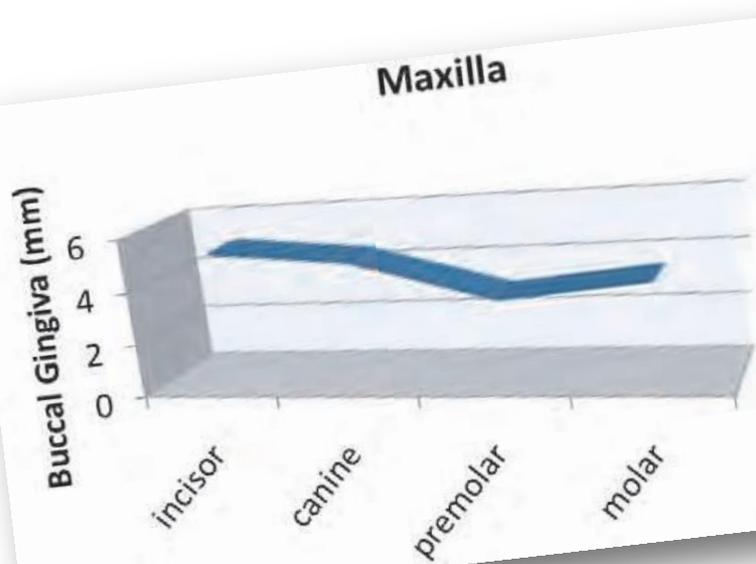
Width of the attached gingiva ; It is the distance between the mucogingival junction and the projection on the external surface of the bottom of the gingival sulcus or the periodontal pocket.

This differs in different areas of the mouth([Bowers GM; 1963](#)).

- Incisor region - (3.5 -4.5 mm in maxilla)
-(3.3 – 3.9mm in mandible)
 - Posterior region -(1.9mm in maxillary first premolars)
-(1.8mm in mandibular first premolars)
- ([Ainamo A,Loe H; 1966](#))

This differs from *width of keratinized gingiva* which also includes the marginal gingiva.

According to
Bowers 1963



According to Voigt
1978

Methods of assessing width of attached gingiva



Visual method

Functional method

Visual method with
histochemical
staining method (
lugol's / schiller's
solution)

Roll test

Tension
test

Width of attached gingiva = Width of keratinized gingiva – Sulcus depth



Visual method

“Iodine” Test

The mucosa takes on a brown color because of its glycogen content.

The glycogen-free keratinized tissue remains unstained.

Schiller or Lugol Solution

Contain iodine and potassium

Contain iodine and potassium
Contain iodine and potassium

unstained
unstained



Visual method iodine staining

Tension test: Stretch the lip or cheek outward and upward for the upper and downward for lower and also moved sideward.

If the marginal/ the interdental pappila moves away from the tooth surface, test is said to be positive and indicates a minimal width of attached gingiva.

Roll test : A Periodontal probe is used to push the movable mucosa over the tooth surface, the attached gingiva is immovable as it is firmly attached to the underlying periosteum and offers resistance whereas the alveolar mucosa is mobile, it will roll up ahead of the blunt instrument. By this we can locate the mucogingival junction.

Significance of width of attached gingiva



- Supports the marginal gingiva.
- To protect the periodontium from injury caused by friction forces encountered during mastication.
- To dissipate the pull on the gingival margin created by the muscles of adjacent alveolar mucosa. ([Friedman 1957](#); [Oschsenbein 1960](#))
- Reduces the subgingival plaque formation by providing firm attachment. ([Friedman 1962](#))
- Maintain proper oral hygiene. ([Carranza & Carraro 1970](#))

Controversies on width of attached gingiva

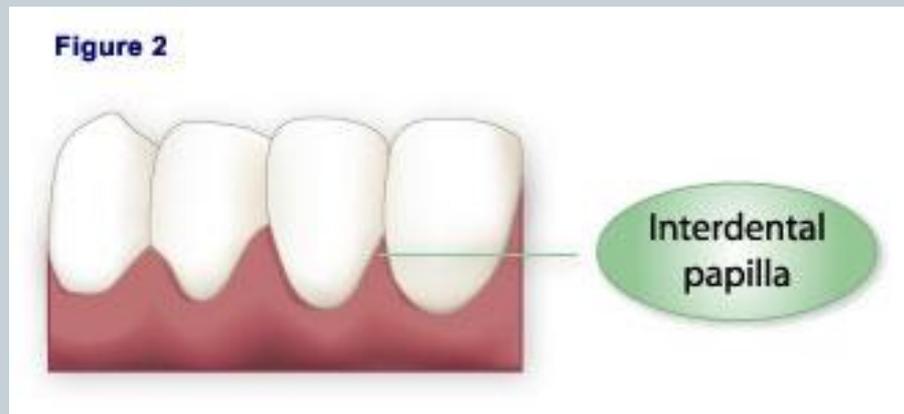


- According to a study done by [Bowers](#) in 1963; [Grevers, 1977](#); [Miyasato et al, 1977](#) suggests that < 1mm of gingiva may be sufficient.
- [Corn](#) in the year 1962 claimed that apico- coronal height of keratinized tissue ought to exceed 3mm .
- Whereas the third category of authors, [Friedman, 1962](#); [De troy & Bernimoulin, 1980](#) had a more biologic approach and stated that an adequate amount of gingiva is any dimension that
 - > is compatible with gingival health
 - > prevents retraction of the gingival margin during movements of the alveolar mucosa.
- [Lang and Loe](#) in 1972 suggested that 2mm of gingiva is an adequate width for maintaining gingival health.

INTERDENTAL GINGIVA

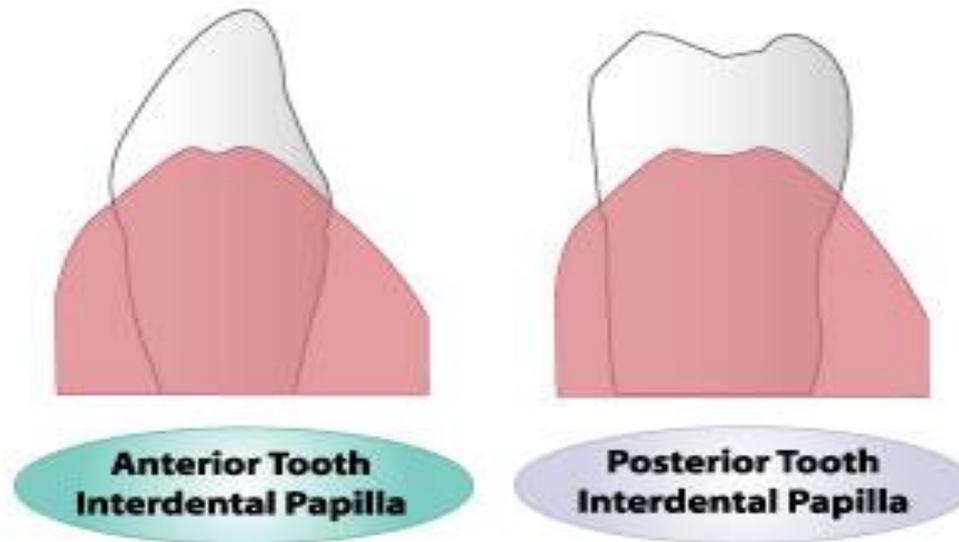


- It occupies the gingival embrasure, which is the interproximal space beneath the area of tooth contact.
- The shape is determined by the contact relationships between the teeth, the width of the approximal tooth surfaces, and the course of the CEJ.



- In the anterior regions of dentition, the interdental papilla is of pyramidal form, papilla is located immediately beneath the contact point.

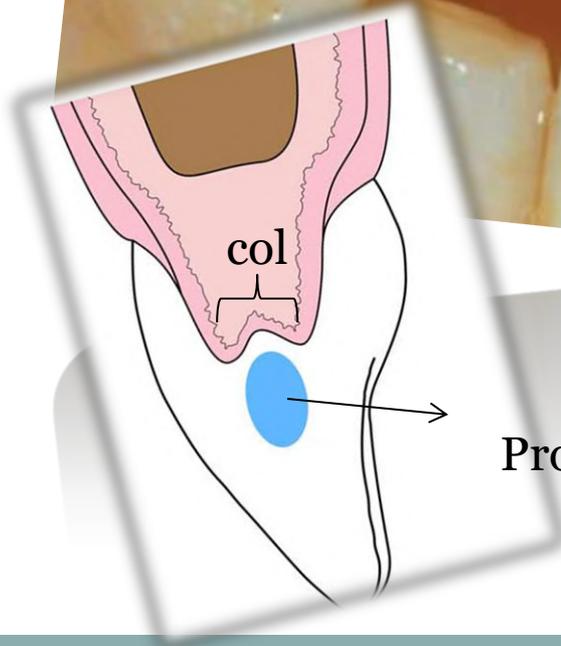
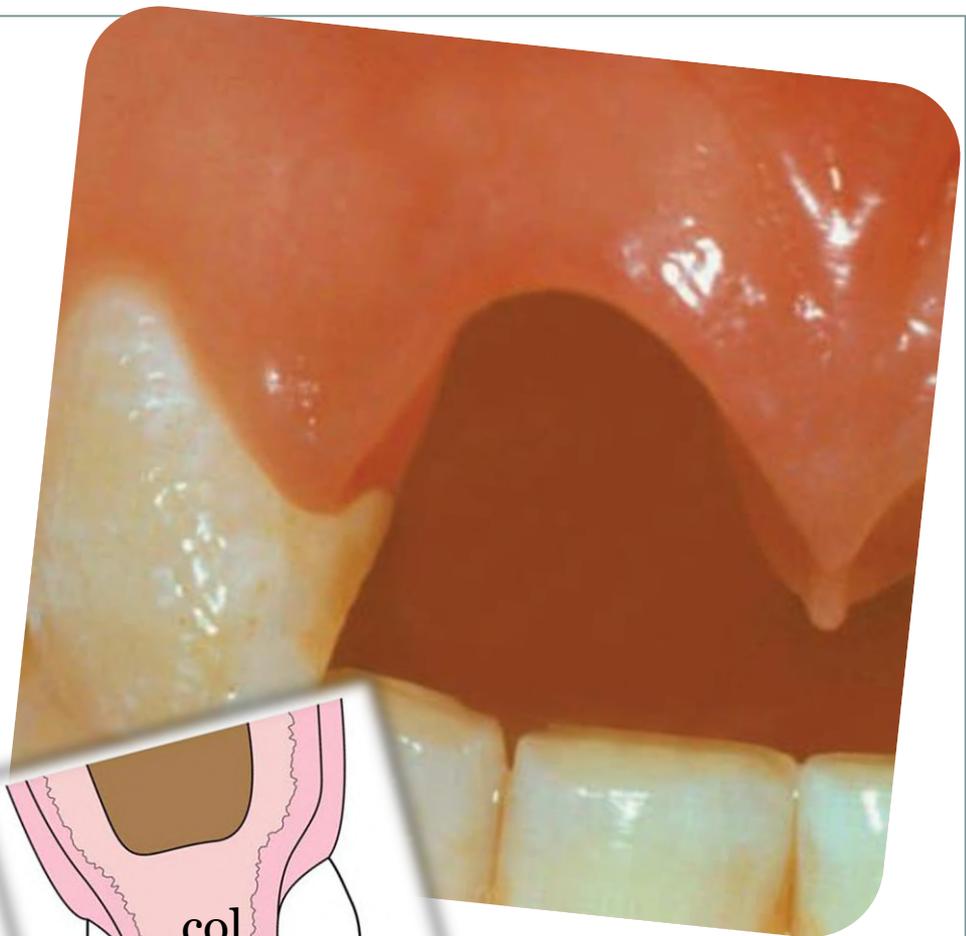
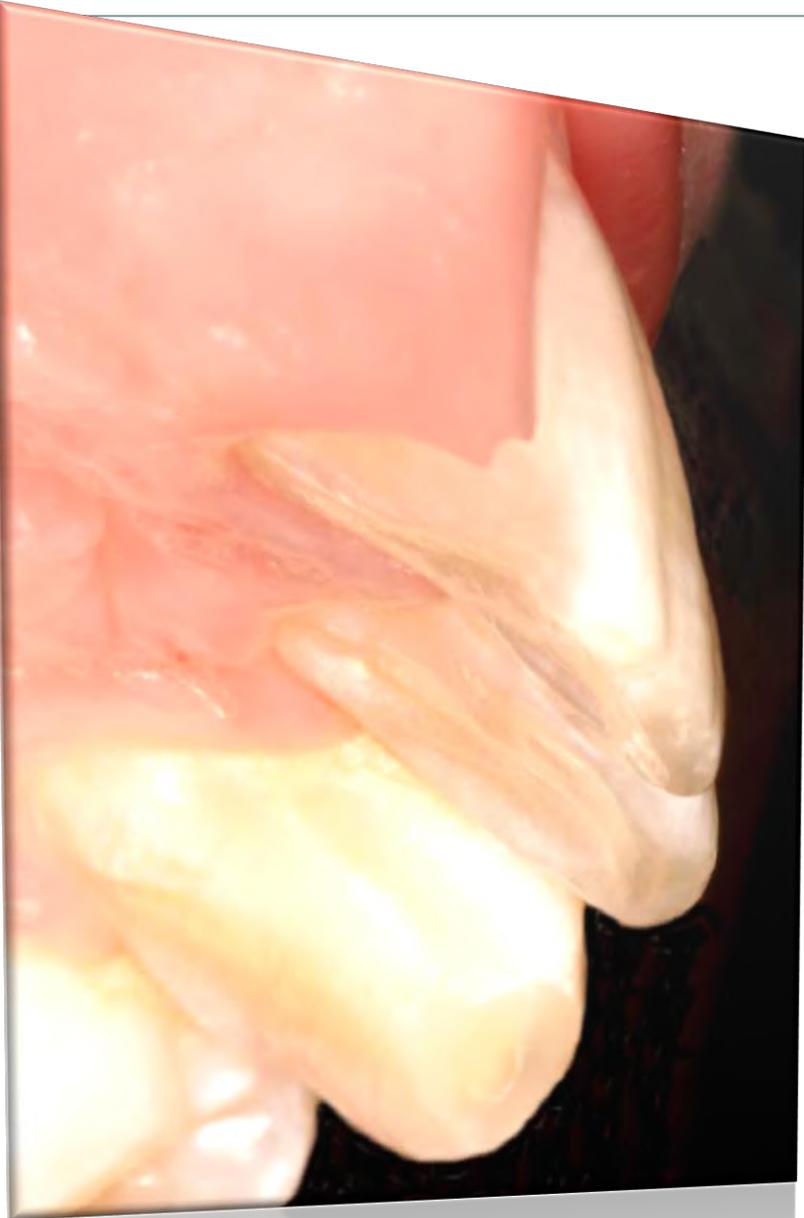
Figure 3



- While in the molar regions, the papillae are flatter in the bucco-lingual direction, having a 'col' shape presenting a valley like depression and conforms to the shape of the interproximal contact.

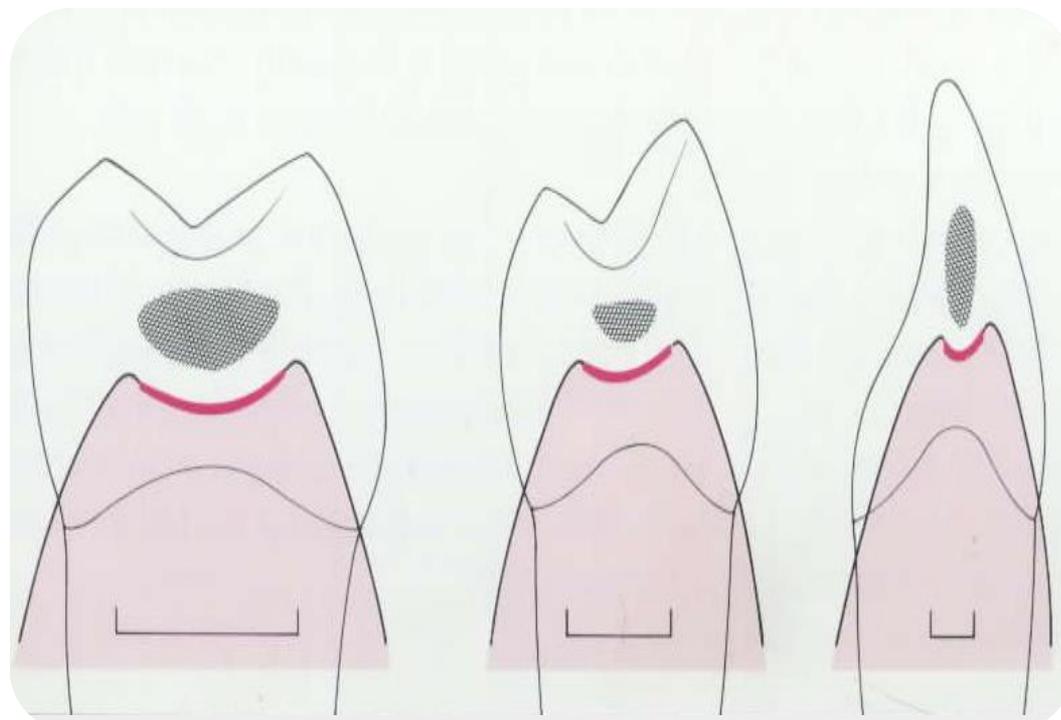


- If a diastema is present or in case of recession, the gingiva is firmly bound over the interdental bone and forms a smooth, rounded surface without interdental papilla.
- The lateral borders and tips are formed by the marginal gingiva and the intervening portion consists of the attached gingiva.

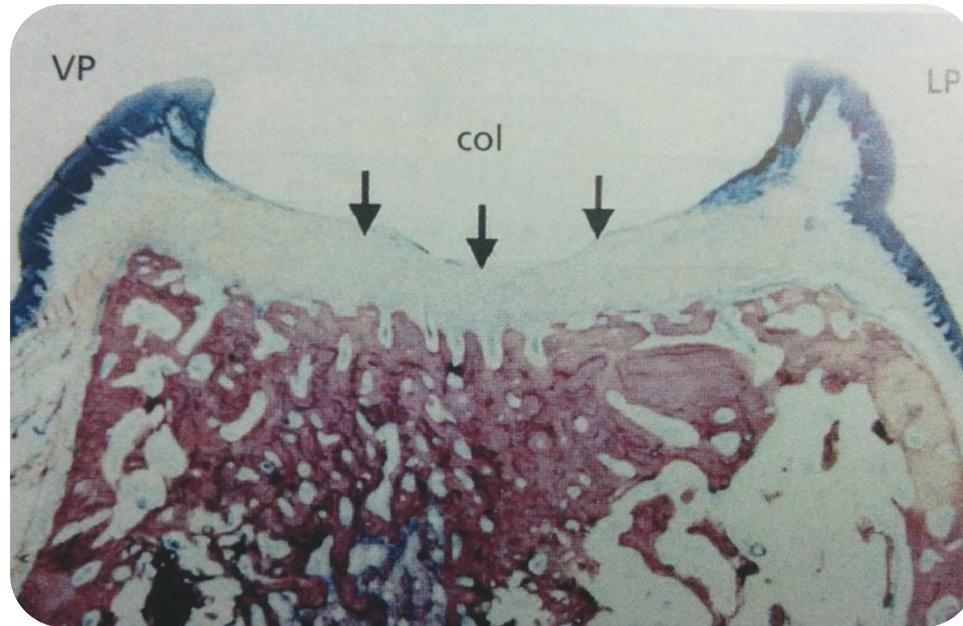


Proximal contact
area

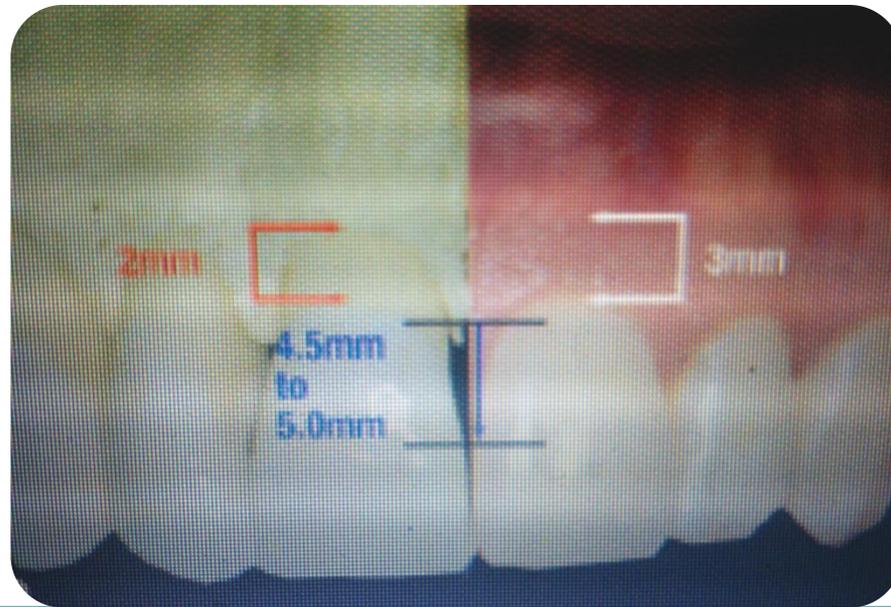
Tooth position and tooth morphology especially the width of the crown, will determine expanse of the interdental contact area, which in turn accounts for the breadth and depth of the col.



- Col epithelium is non keratinized
- It acts as barrier just like the junctional epithelium.
- It is a site for bacterial stagnation. Hence it is more prone to loss of attachment leading to pocket formation and /or loss of the dental pappila.



- Interproximally although the biologic width is similar to that of facial surface ([Gargiulo & colleagues, 1961](#)) the dentogingival complexes are not.
- [Kois, 1994](#) & [Spear, 1999](#) pointed out that the dentogingival complex is 3 mm facially and 4.5 to 5.5mm interproximally.
- [Spear](#) suggested that additional 1.5 – 2.5mm of interproximal gingival tissue height requires the presence of adjacent teeth for maintenance of interproximal gingival volume.



- The relationship between contact point, osseous crest and total dentogingival complex is one of the prime considerations a clinician must take care of during any restorative or corrective procedures.





CLINICAL PRESENTATION OF HEALTHY GINGIVA

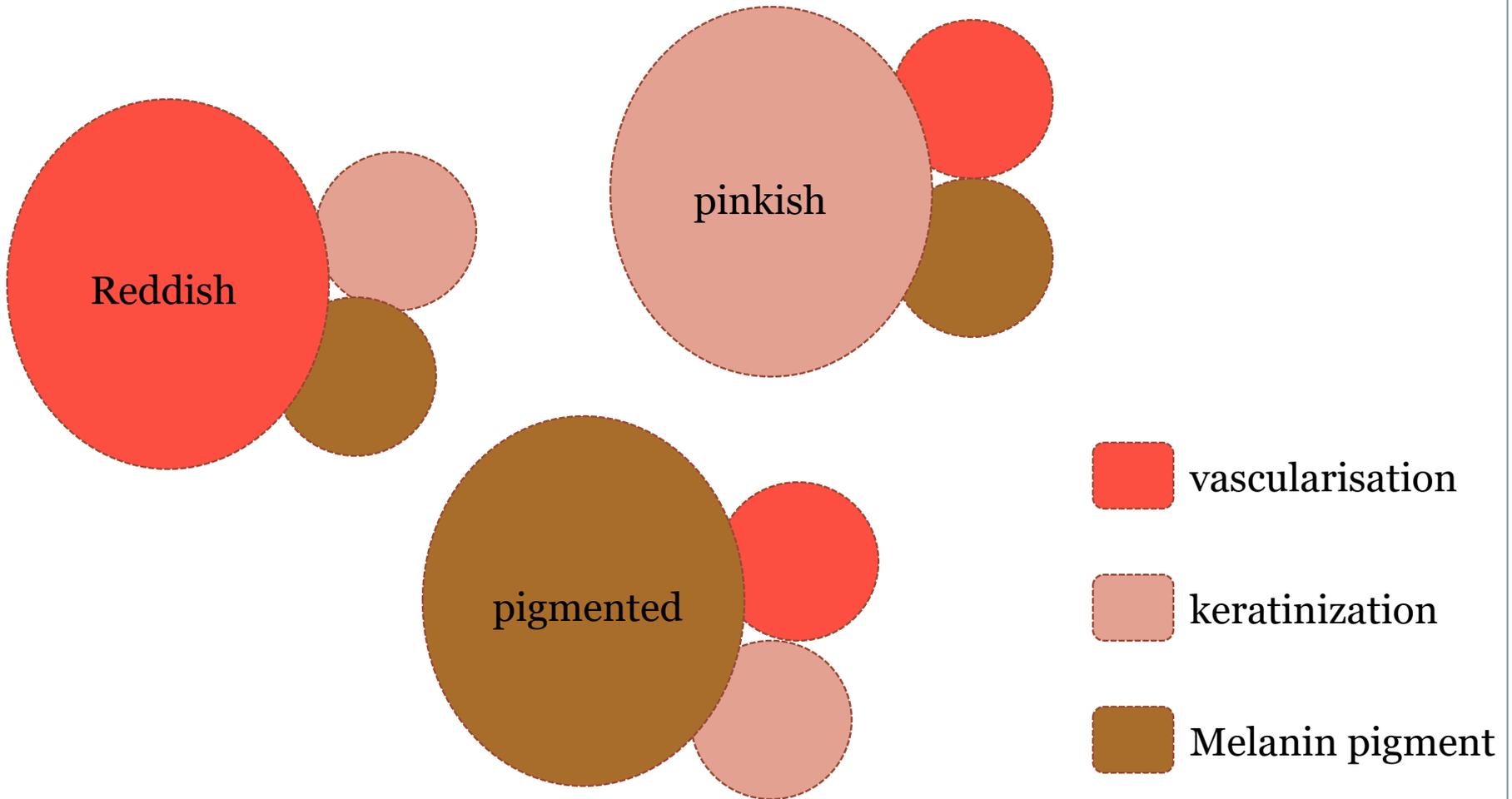
COLOR



- Generally described as coral pink. The color is produced by the vascular supply, thickness and degree of keratinization of gingival epithelium and the presence of melanin pigment in the gingiva.



Color cycle



- Attached gingiva is demarcated from the adjacent alveolar mucosa by a mucogingival line.
- Alveolar mucosa is red, smooth and shiny rather than pink and stippled

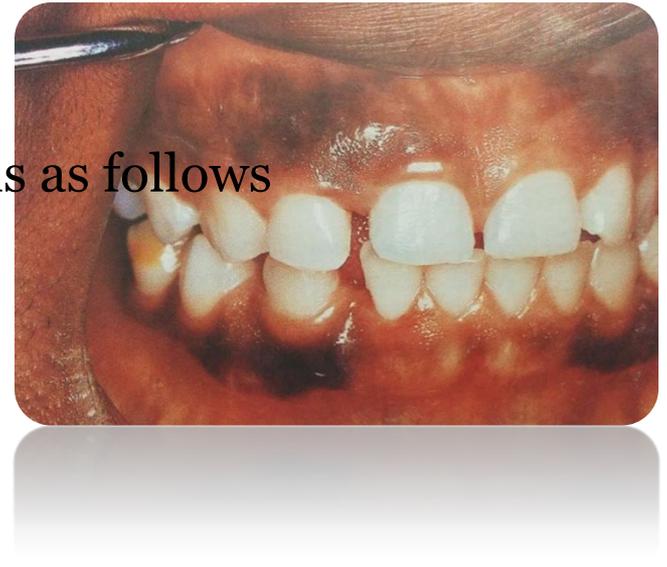


Physiologic pigmentation : Melanin, a non-hemoglobin derived brown pigment, is responsible for the normal pigmentation of skin, gingiva and remainder of oral mucous membrane.

- Prominent in black individuals.

According to [Dummett, 1946](#), the distribution is as follows

- Gingiva - 60%
- Hard palate - 61%
- Mucous membrane - 22%
- Tongue - 15%



Gingival pigmentation occurs as diffuse, deep purplish discoloration or as irregularly shaped brown and light brown patches.

Dummett oral pigmentation index(DOPI)

0 = Pink tissue (no clinical pigmentation)

1 = Mild light brown (mild clinical pigmentation)

2 = Medium brown / Mixed pink / Brown tissue (moderate clinical pigmentation)

3 = Deep brown or blue/ black tissue (heavy clinical pigmentation)



SIZE



- The size of the gingiva corresponds with the sum total of the bulk of cellular and intercellular elements and their vascular supply.
- Alteration in size is a common feature of gingival disease.
- This is assessed by measuring the distance from the margin of the gingiva to the base of the sulcus.

CONTOUR



It varies considerably and depends on

shape of the teeth

alignment in the arch

the location and size of the area of proximal contact

Dimensions of the facial and lingual gingival embrasures.



- Due to the presence of the interdental pappila, the free gingival margin follows a more/ less accentuated , or scalloped course through the dentition.
- It forms a straight line along the teeth with a relatively flat surfaces.



- The normal arcuate contour is accentuated in teeth with pronounced mesio-distal convexity - canines or teeth in labial version, and the gingiva is located farther apically.
- On teeth in lingual version, the gingiva is horizontal and thickened.

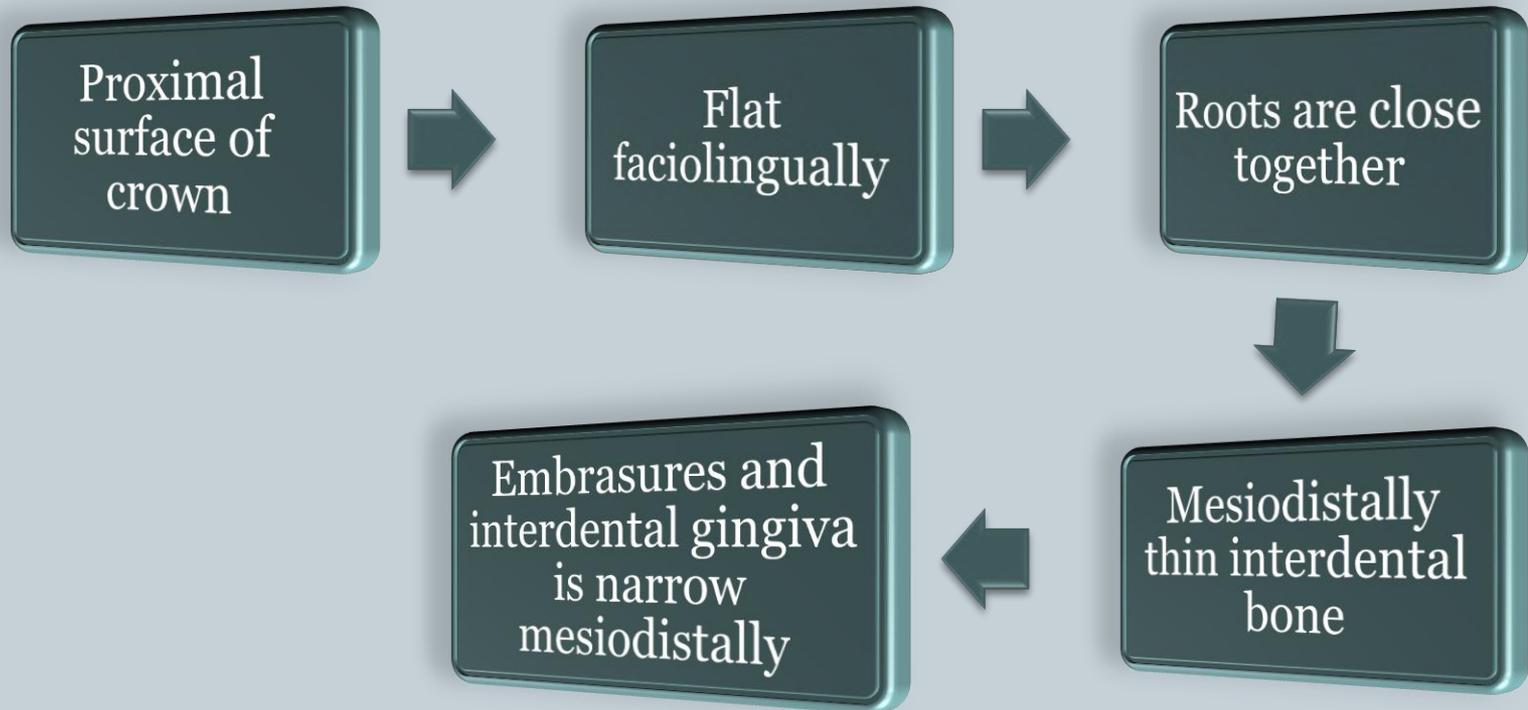


SHAPE



This is governed by

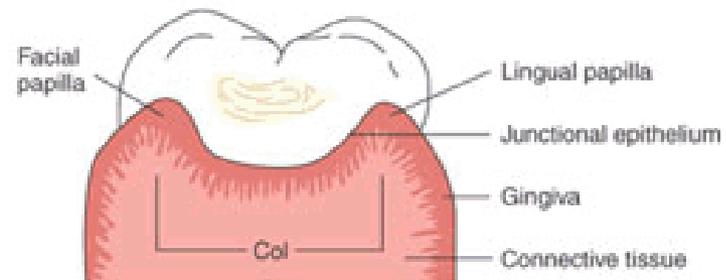
- Contour of the proximal tooth surfaces
- Location and shape of gingival embrasures



- Conversely , with proximal surfaces that flare away, the mesiodistal diameter of the interdental gingiva is broad.
- Thus, the interdental pappila is pyramidal in form in the anterior and more flattened in the molar region.
- Height of interdental gingiva varies with the location of the proximal contact.



(a)



(b)

CONSISTENCY



- The gingiva is firm and resilient and, with the exception of the free margin, tightly bound to the underlying bone.
- The collagenous nature of the lamina propria and its contiguity with the mucoperiosteum of the alveolar bone determine the firmness of attached gingiva.
- The gingival fibres contribute to the firmness of the gingival margin.

This is assessed by palpating with the side of the probe over the gingiva.

Healthy

Tactile

- Knife edged margins with surrounding tissues *Firm and resilient*.
- Gingiva fits snugly against the tooth.

Visual

Orange peel (fine/ coarse grained) appearance.

Diseased

Tactile

- Rounded gingival margins and adjacent tissue are somewhat enlarged and puffy.
- Gingiva doesn't fit tightly against the tooth.

Visual

Smooth velvet appearance.

GINGIVAL BIOTYPE



Categorized by **Ochsenbein and Ross (1969 and 1973)**

- Thin and scalloped (15%)



- Thick and flat (85%)



Biotypes



Thin and scalloped

- Delicate thin periodontium
- Highly scalloped gingival tissue & osseous contour
- Underlying dehiscences/fenestration
- Minimum zones of keratinized gingiva
- Small incisal contact area
- Triangular anatomic crowns.

Thick and flat

- Thick heavy periodontium
- Flat gingival contour
- Thick flat osseous contour
- Wide area of keratinized gingiva
- Broad apical contact areas
- Square anatomic crowns

The gingival thickness can be assessed by

- Direct method
- Probe transparency ([De Rouck et al, 2009](#))
- Transgingival probing method ([Claffey and Shanley](#))
- Ultrasonic devices ([Kydd et al , 1971](#))
- Cone Beam Computed Tomography (CBCT) scans([Fu et al,2010](#))



Significance of biotypes



- In patients with thin biotypes the frequency of gingival recession is high.
- Thick biotypes show greater dimensional stability during remodeling compared to thin biotypes.
- In thin biotypes, where the lamina bone is scarce or absent, the cortical bone is subjected to rapid resorption.
- Thick gingival tissues ease manipulation, maintain vascularity and promote wound healing during and after surgery.
- Thick gingival tissues are more resistant to mucosal recession or mechanical irritation and are capable of creating a barricade to conceal restorative margins.

SURFACE TEXTURE



- It is a form of adaptive specialization or reinforcement for function.
- It is similar to an orange peel and is referred to as being stippled.
- Best viewed by drying the gingiva.
- Attached gingiva and central portion of the interdental papilla is usually stippled, marginal gingiva is not.



- The pattern and extent of stippling vary among individuals and different areas of the same mouth (Greene AH, 1962), its most prominent on the facial aspect.
- It is absent in infancy, appears at about 5 years of age, increases until adulthood and disappears in old age.
- Feature of healthy gingiva, absence or reduction is a common sign of gingival disease.
- The papillary layer of the connective tissue projects into the epithelium creating elevations and depressions over the surface of the gingiva giving it a stippled appearance.

POSITION



- Refers to the level at which the gingival margin is attached to the tooth.
- During eruption, the margin and sulcus are at the tip of the crown; as it progresses , they are seen closer to the root.
- ***Continuous tooth eruption***; states that eruption does not cease when teeth meet their functional antagonists but continues throughout life.

Active eruption

Passive eruption

- Active eruption is the movement of the teeth in the direction of the occlusal plane.
- Passive eruption is the exposure of the teeth by apical migration of the gingiva. It is considered as a pathologic process.
- **Gottlieb and Orban, 1933** believed that active and passive eruption proceed together , active eruption keeps pace with tooth wear, preserving the vertical dimension of the dentition.

Passive eruption

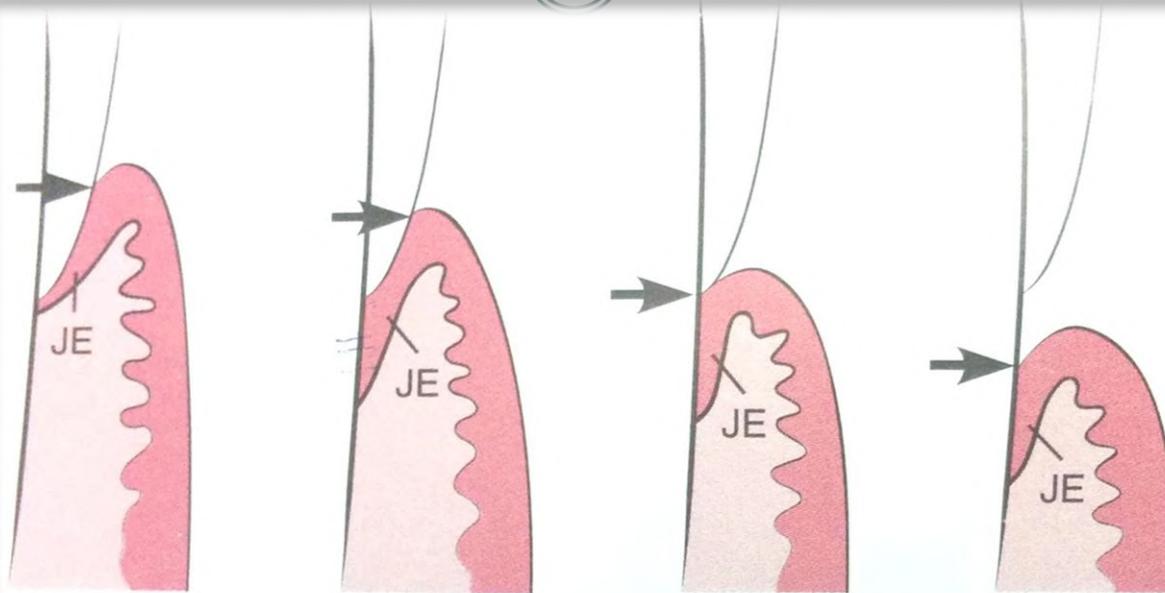


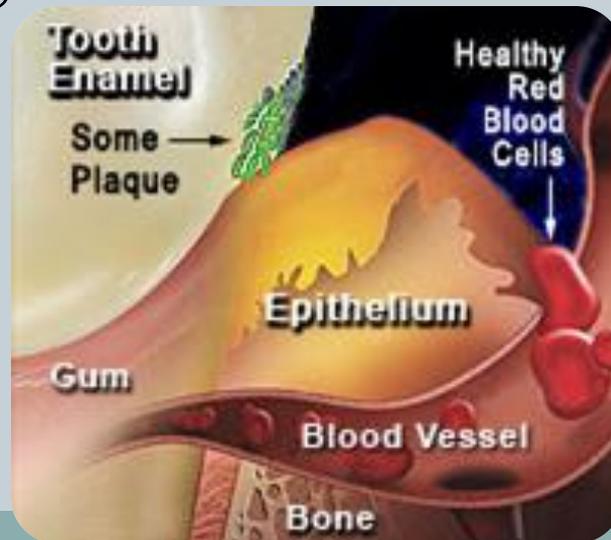
Figure 4-30 Diagrammatic representation of the four steps in passive eruption according to Gottlieb and Orban.⁴⁹ 1, Base of the gingival sulcus (*arrow*) and the junctional epithelium (*JE*) are on the enamel. 2, Base of the gingival sulcus (*arrow*) is on the enamel, and part of the junctional epithelium is on the root. 3, Base of the gingival sulcus (*arrow*) is at the cemento-enamel line, and the entire junctional epithelium is on the root. 4, Base of the gingival sulcus (*arrow*) and the junctional epithelium are on the root.

Healthy Gingiva



Kiane and Lindhe classified healthy gingiva into

- Super healthy or '*Pristine*' state, which histologically has little or no inflammatory infiltrate.
- 'Clinically healthy' gingiva, which looks similar clinically, but histologically, has features of an inflammatory infiltrate.



Aging and Gingiva



- There is thinning and decreased keratinization of the gingival epithelium.
- Absence of stippling due to flattening of the rete pegs.
- Increase in the width of attached gingiva owing to the passive eruption in order to maintain occlusal contact that has resulted from attrition.

CONCLUSION



Healthy gingiva is coral pink with or without pigmentation, firm and resilient , scalloped to conform to the contour of the teeth.

Knowledge of the normal morphology of the gingiva is a prerequisite for any understanding of the pathological changes ,arrive at a diagnosis and to provide a beneficial treatment plan for the patient.

REFERENCES



1. B.M.Elley , M.Soory, J.D. Manson; Periodontics, 6th edition , Elseveir publications,2010.
2. Ainamo A, Loe. H ; Anatomical charecteristics of gingiva : a clinical & microscopic study of the free & attached gingiva, J Periodontal 37:5,1966.
3. Gottlieb B, Orban B; Active & passive continous eruption of teeth, J Dent Res 13:214, 1933.
4. Bowers GM : A study of the width of the attached gingiva, J Periodontal 34:210,1963.
5. Dummett CO et al: physiologic pigmentationof the oral and cutaneous tissues in the negro, J Dent Res 25:421,1946.
6. Greene AH: A study of the characterestics of stippling and its relation to gingival health, J Periodontal 33:176, 1962.
7. Gottlieb B, Orban B: Active and passive continous eruption of teeth, J Dent Res 13:214,1933.
8. Newman, Takei, Klokkevold, Carranza; Clinical Periodontlogy, 10th edition, Elseveir publications, 2010
9. Jan lindhe, Niklaus P.Lang, Clinical Periodontology and Implant Dentistry,6th edition, Wiley publications, 2015.
10. Louis F Rose, Brian L Mealey; Periodontics, Elseveir publications, 2004.
11. H.F. Wolf, T.M. Hassel; Color atlas of Periodontology, Thieme Inc.
12. Cohen ; Atlas of cosmetic and reconstructive periodontal surgery.

THANK YOU