Oral Histology

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Dentogingival Junction (Junctional epithelium):

The region where the oral epithelium meets the surface of the tooth is a unique junction of considerable importance because it represents a potential weakness in the epithelium of the oral cavity. The bacteria that present on the tooth surface produce toxin that cause inflammation if they enter the mucosal tissue; so the junction between the epithelium and the enamel or cementum is the principle seal between the oral cavity and the underlying tissue.

Gingival sulcus: Its an invagination between the gingiva and tooth surface. The gingiva encompassing the sulcus is the free or marginal gingival. Gingival sulcus extend vertically from the free gingival margin to the dentogingival junction(D.G.J), normally has a depth of 0.5- 3 mm, with an average of 1.8 mm. Any depth greater than 3 mm can be considered pathologic, and the sulcus is known as periodontal pocket.

The floor of the gingival sulcus and the epithelium cervical to it termed as junctional epithelium. The wall of the sulcus are lined by sulcular epithelium, which is nonkeratinized str. Sq. epith. thinner than the epith. Of the gingiva, it has no ridges, therefore it forms a smooth interface with lamina properia, its continuous with the gingival epith. from above and with junctional epith. from below.

Junctional epith. or attachment epith. or D.G.J., normally it extend from the bottom of gingival sulcus towards the C.E.J. It has very low resistance to the mechanical forces of mastication and to the

bacterial toxin produced by dental plaque and calculus, however the **gingiva can maintain this junction intact through the followings**:-

1. By the epith. of the gingiva:-when the epith. is injured(due to some reasons), the turnover of the epith.cells and their ability to migrate from the basal layer to higher levels will repair the injured part of the wound.
2. By the lamina properia:- when the C.T. is injured the fibroblasts can form the collagen fibers and ground substance that can repair the wound.
3. By the defense mechanism of the body that can resist the bacterial toxin.

Development of Junctional (attachment) epith. :

Primary E. cuticle: When the ameloblasts finish formation of enamel matrix, they leave a thin membrane on the surface of E. , the primary E. cuticle. After that epith. E. organ is reduced to a few layers of flat cuboidal cells called reduce E. epith.(REE) ,which covers the entire enamel surface extending to the CEJ and remains attached to the primary E. cuticle. The primary E. cuticle is soon removed by mastication because it's a very thin membrane, its remnant after eruption of the tooth is called Nasmyth's membrane.

The epith. that covers the tip of the crown degenerate in its center, and the crown emerges through this perforation into oral cavity. The R.E.E. remain organically attached to the part of E. that has not yet erupted, and once the tip of crown erupt the R.E E. is called primary attachment epith. At the margin of the gingiva the attachment epith. is continuous with oral epith. As the tooth erupt, a shallow groove the gingival sulcus, develop between gingiva and tooth surface and extend around its circumference.

Histological feature of Dentogingival Junction :

Junctional epith.(J. E.) is a unique nonkeratinized oral epith. thus the ultrastructural characteristics of J.E. cells are constant through the epith. and differ from these of other oral epith. cells The number of rough endoplasmic reticulum , Golgi complex and amount of cytoplasm are higher than that in oral epith. Conversely, fewer tonofilaments and desmosomal junction are present in J.E.cells. Also the rate of cell division is high, and those cells produce more to within 2-3 cell layers of the tooth surface (where the cells are attached to tooth cells) and then join a main migratory route in coronal direction, paralleling the tooth surface , to be desquamated into gingival sulcus.

Morphologically, the J.E. consists of flattened cells aligned parallel to the tooth surface and tapering from 3-4 layers in thickness apically to 15-30 layers coronally. The epith. has a smooth C.T. (lamina properia) interface where a basal lamina has associated hemidesmosomes and is similar to that which attaches epith. to C.T. elsewhere in oral mucosa. Between the plasma membrane of J.E. cells and the enamel (sometimes cementum) surface a basal lamina structure with similar morphology is present , associated with hemidesmosomes on the membranes of epith. cells. So the J.E. under electron microscope showing two basal lamina:

1- **Internal basal lamina**: which attached the J.E. to the tooth surface.

2- **External basal lamina**: which attached the J.E. to the lamina properia.

The C.T. component of D.G.J. shows an inflammatory infiltration particularly neutrophil leukocytes and mononuclear leukocyte cells. Which continually migrate into J.E. and pass between epith. cells to appear in G.S. and then in oral fluid.

One of the remarkable properties of J.E. is that it readily regenerates from the adjacent oral sulcular or oral epith. if its damaged or surgically excised.

Length of the Junctional epithelium:

- Length varies according to stage of eruption
- Tooth first erupts – most of enamel covered by JE
- Tooth reaches occlusal plane – ¼ enamel surface covered
- Eventually JE lies close to CE junction
- Older patients with root exposure (passive eruption or disease) JE proliferates apically - firm attachment with cementum.

Important features of JE:

- Has attachment role and protective role
- Cells of JE *immediately adjacent* to tooth attach to tooth by hemidesmosomes & basal lamina and this Combination is known as the epithelial attachment.
- Basal lamina in contact with tooth: Internal Basal lamina
- Basal lamina in contact with lamina propria: External Basal Lamina
- JE is permeable & tissue fluid and cells pass into Gingival Crevicular Fluid (GCF) and permeability allows GCF and defence cells to pass across to protect underlying tissues from disease processes (periodontal disease)
- Helps maintain integrity of tooth / periodontium structure.

The shift of dentogingival junction:

The position of the gingiva on the surface of the tooth always change with time, when the tip of the enamel first erupts through the mucous membrane of the oral cavity, the epith. almost cover the whole crown. The tooth eruption is relatively fast until the tooth reaches the plane of

occlusion. This cause the attachment epith. to separate gradually from the enamel surface, at this stage the primary attachment epith. replaced by secondary attachment epith. which is derived from gingival (oral) epith. While the crown emerges into oral cavity to reaches the plane of occlusion, one third to the one fourth of the enamel is still covered by gingival.

Actual movement of the teeth towards occlusal plane is termed *active eruption*, while the gradual exposure of the crown by separation of attachment epith. from enamel surface is termed *passive eruption*, and this can be described in four stages, first and second stages may be physiologic. Many consider the third and fourth stages as normal also, but there is a strong possibility that they are pathologic.

First stage: This stage normally persist in the primary teeth almost up to 1 year of age before shedding and , in permanent teeth, usually to the age of 20-30 years. In this stage the bottom of gingival sulcus or the coronal end of the attachment epith. is on the enamel, while the apical end of the primary attachment epith. stays at the C.E.J. In this stage the clinical crown (mean that part of the crown which is exposed in the oral cavity) is less than the anatomical crown (mean that part of the crown which is covered by the enamel) .

Second stage: This stage may persist to the age of 40 years or later. In this stage the bottom of the gingival sulcus or the coronal end of attachment epith. is still on the enamel and the apical end of the attachment epith. has been shifted to the cementum. The clinical crown is also less than the anatomical crown.

Third stage: In this stage the bottom of the gingival sulcus is on the CEJ and the apical end of the attachment epith. is on the cementum. This stage is transitory because the epith. shifts gradually along the tooth surface and

the attach. Epith. dose not remain at the linear C.E.J. for along time. In this stage the clinical crown is equal to the anatomical crown.

Fourth stage: In this stage the entire attach. Epith. is present on the cementum, mean both the coronal and apical ends of attach. Epith. on the cementum. In this stage part of the cementum of the root is uncovered and is exposed to the oral cavity. The clinical crown is greater than the anatomical crown.

Functions of JE:

1-Has attachment role and protective role

2-Permeability allows Gingival Crevicular Fluid (GCF and defence cells to pass across to protect underlying tissues from disease processes (periodonal disease)

3-Helps maintain integrity of tooth / periodontium structure.