

**Al Rasheed College of Dentistry  
Oral Histology**

**Dr. Omar Faridh Fawzi  
Lecture 15**

**DentoGingival Junction(DGJ)**

**Gingival sulcus**

It's the space between the inner aspect of gingiva and the tooth surface. It is a continuous space present all around the tooth. The sulcus extends from the free gingival margin to the Dentogingival junction. In health its depth is at the approximate level of the free gingival groove on the outer surface of the gingiva. The sulcular epithelium is non keratinized in humans. It lacks epithelial ridges and so forms a smooth interface with the lamina propria. It is thinner than the oral epithelium of the gingiva.

The sulcular epithelium is continuous with the oral epithelium of free gingival from above and the attachment epithelium from below. These three epithelia have a continuous and coextensive basal lamina.

Under normal conditions it 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 depth of the sulcus is variable.

**DentoGingival junction(D.G.J.):**

It is the junction between the gingiva and the tooth. The epithelium of the gingiva which gets attached to the tooth is called junctional or attachment epithelium. The union between this epithelium and tooth is referred to as epithelial attachment.

The junctional epithelium resembles reduced enamel epithelium in its structure in that they have a basal layer and few layers of flattened cells. The junctional epithelium is a non-keratinizing epithelium and it extends up to **2 mm** on the surface of the tooth. It has the highest turnover rate of **5-6 days**; therefore, it regenerates readily. The junctional epithelium is highly permeable and it has large intercellular spaces, so that neutrophils have an easy passage in and out of the epithelium. It also permits the easy **flow of crevicular (gingival) fluid**.

Junctional epith. or epithelial attachment normally it extends from the bottom of gingival sulcus towards the C.E.J. It has very low resistance to

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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 propria: 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 DentoGingival junction:**

When the ameloblasts finish formation of enamel matrix, they leave a thin membrane on the surface of E., the primary E. cuticle. After that E. organ is reduced to a few layers of flat cuboidal cells called reduce E. epith. (R.E.E.), which covers the entire enamel surface extending to the C.E.J. 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 attached epith. At the margin of the gingiva the attached 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 D.G.J.:**

Its a unique non-keratinized 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

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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.

Morphologically, the D.G.J. 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 lamina propria interface where a basal lamina has associated hemi-desmosomes 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 surface (or cementum) a basal lamina structure with similar morphology is present, associated with hemi-desmosomes 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 (Enamel or cementum).
2. **External basal lamina:** which attached the J.E. to the lamina propria.

The C.T. component of D.G.J. shows an inflammatory infiltration particularly neutrophil cell. 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 J.E.:**

- Length varies according to stage of eruption
- Tooth first erupts - most of enamel covered by JE
- Tooth reaches occlusal plane -  $\frac{1}{4}$  enamel surface covered
- Eventually JE lies close to CEJ
- Older patients with root exposure (passive eruption or disease) JE proliferates apically - firm attachment with cementum.

### **Functions of D.G.J.:**

1. Has attachment role and protective role
2. JE is permeable & tissue fluid and cells pass into Gingival Crevicular

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Fluid (GCF) and permeability allows GCF and defense cells to pass across to protect underlying tissues from disease processes (periodontal disease)

3. Helps maintain integrity of tooth/ periodontium structure.
4. Lamina propria of gingiva - good vasculature and source of nutrient to JE and source of GCF
5. Turnover of JE is rapid. Epithelial cells migrate coronally & shed into oral cavity via gingival crevice. Rate of turnover dependent on demands placed on tissue. Directly related to degree of inflammation.

### **The shifting of D.G.J.:**

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 gingiva.

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 persists 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 attachment epith. stays at the C.E.J. In this stage the clinical crown (mean

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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).

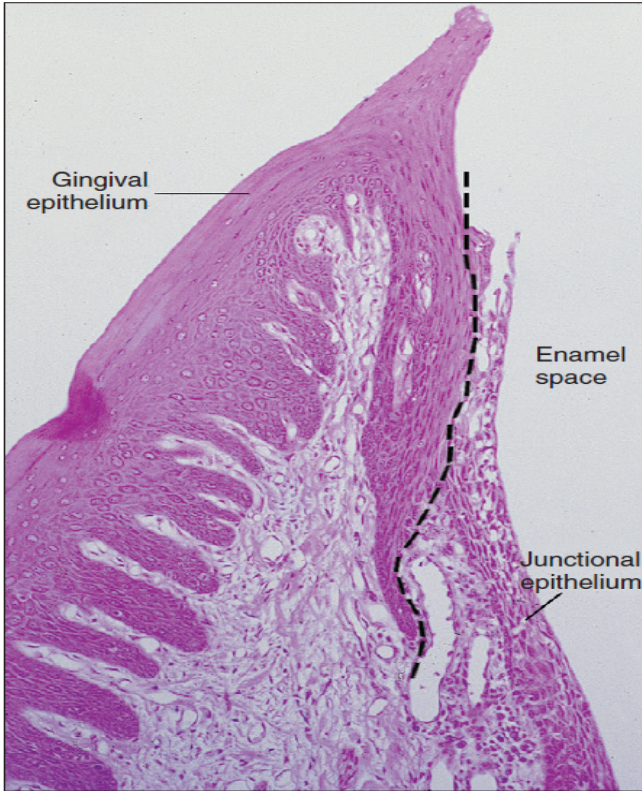
**Second stage:** This stage may persist to the age of **40 years or later**. In this stage the bottom of the gingival sulcus of attachment epith. is still on the enamel and the apical end of the attachment epith. has been shifted to the cementum. The clinical crown is also less than the anatomical crown.

**Third stage:** In this stage the bottom of the gingival sulcus is on the C.E.J. 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 attachment epith. does not remain at the linear C.E.J. for a long time. In this stage the clinical crown is equal to the anatomical crown.

**Fourth stage:** In this stage the entire attachment epith. is present on the cementum, mean both the coronal and apical ends of attachment 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.

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Formation of the dentogingival junction from the oral and dental epithelia.  
The dashed line separates junctional epithelium from oral epithelium