



## “Histopathological Aspect of Oral Epithelial Dysplasia – Third Dimension” A Preliminary Report

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### Abstract

In standard medical terminology, dysplasia means an abnormality of development, while in histomorphology, it expresses cellular and structural changes in the epithelium.

It is a histopathological finding seen in potentially malignant disorders. There are plethora of histopathological 2D images available in literature of epithelial dysplasia but 3D images of the same have not been published so far. Therefore, this article is a preliminary attempt of the same which author has designed herself using various 3D animation softwares.

**Keywords:** Oral Epithelial Dysplasia; Third Dimension; Histopathology; Potentially Malignant Disorders

### Introduction

Dysplasia is a Greek word which means: dys= abnormal, plasia= formation (pathology referring to an abnormality of development). When architectural disturbance is accompanied by cytological atypia (variation in size and shape of keratinocytes), a term dysplasia is applied [1].

WHO in year 2003 classified Oral Epithelial Dysplasia as Mild, moderate, severe, carcinoma in situ, according to the presence and severity of cellular atypia and the architectural features. This was published in the new book by WHO titled “classification of tumors of the head and neck” [2]. The dysplastic changes are as follows:

#### Architectural characteristics

1. Irregular epithelial stratification
2. Loss of polarity of basal cells
3. Drop-shaped rete ridge
4. Increased number of mitotic figures
5. Abnormally superficial mitoses
6. Keratin pearls within rete pegs

#### Cellular characteristics

1. Anisonucleosis
2. Nuclear pleomorphism
3. Anisocytosis
4. Cellular pleomorphism
5. Increased nuclear-cytoplasmic ratio
6. Dyskeratosis
7. Atypical mitotic figures
8. Increased number and size of nucleoli [2]

There are high quality histopathological images available online but 3d images of the same haven't been made so far. Teaching of oral histopathology has always been through two dimensional (2D) static images, which, in this era of technology, can't be correlated with the three-dimensional (3D) terms mentioned in the text books. Thus, understanding would be better if along with 2D images, 3D images and 3D animated videos are also made available to explain the step by step process of pathogenesis in a life like manner [3].

There is plethora of articles on histopathology of oral epithelial dysplasia but all have 2 dimensions images. 3d images of histopathological aspect of oral epithelial dysplasia have not been explored yet [4-6]. Therefore, in this article presents preliminary 3d images of histopathological features of epithelial dysplasia which has been designed by author herself using various 3d animation software.

#### Methodology

Preliminary 3D images and videos on histopathological aspect of oral epithelial dysplasia which is most commonly seen in oral leukoplakia was designed by author using 3Dmax (Autodesk Media and Entertainment) and Adobe premiere pro 5.5 software which is a video editing software (Adobe Systems) as follows:

Basic epithelial cells of oral mucosa in 3d as follows (Figure 1-3).

**Hyperkeratosis:** Many oral precancers show excess surface keratin (hyperkeratosis, hyper parakeratosis, hyper orthokeratosis). In 3d it can be seen as multiple sheets of keratin layer on the epithelial surface (Figure 4).

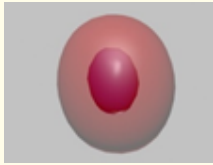


Figure 1: Spinous cell.



Figure 2: Basal cell.

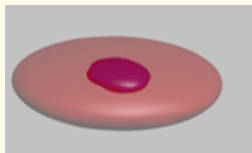


Figure 3: Corneum cell.

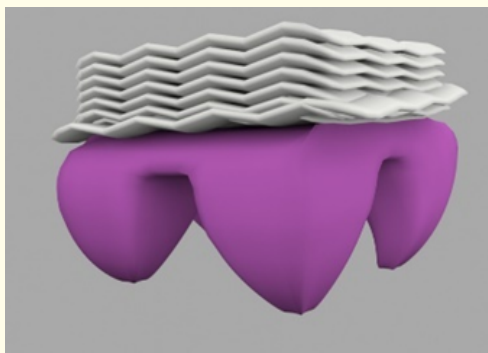


Figure 4: Hyperkeratosis.

**Irregular epithelial stratification:** An alarming morphological alteration of dysplastic epithelium is loss of stratification due to an apparent inability to properly differentiate and mature from basal cells to prickle cells to flattened keratinocytes. In 3d it can be seen as disturbed Layer wise arrangement of cell.

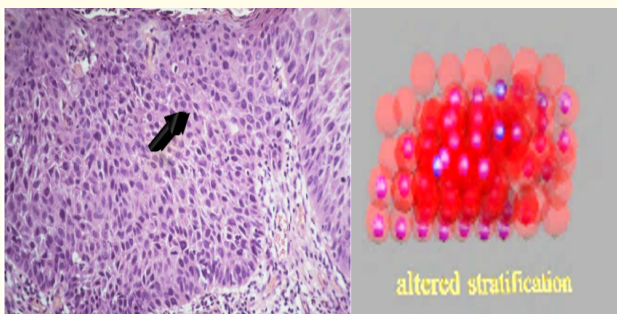


Figure 5: Altered of stratification.

**Basal cell hyperplasia:** It is seen as multiple layer of basal cell layer instead of one.

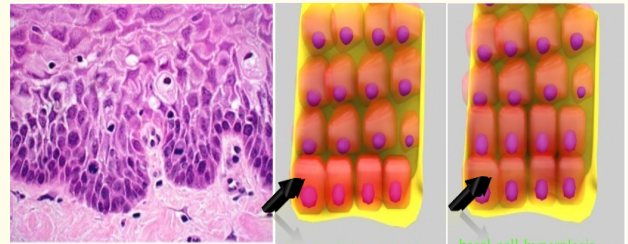


Figure 6: Basal cell hyperplasia.

**Loss of polarity of basal cells:** When basal cells are not arranged perpendicular to basement membrane.



Figure 7: (a) Loss of polarity of basal cells- in 2D, B and C in 3D.

**Drop-shaped rete ridge:** Rete processes with a bulbous enlargement of the lowermost region (drop-shaped rete processes). In 3d it can be seen as drops of rete pegs hanging from epithelium towards connective tissue.

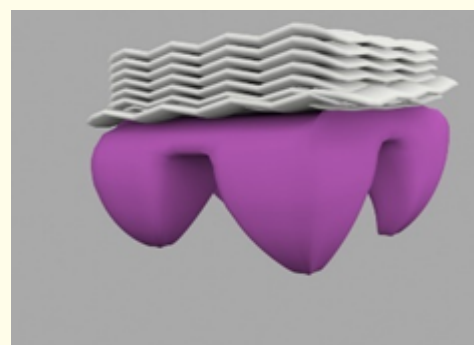
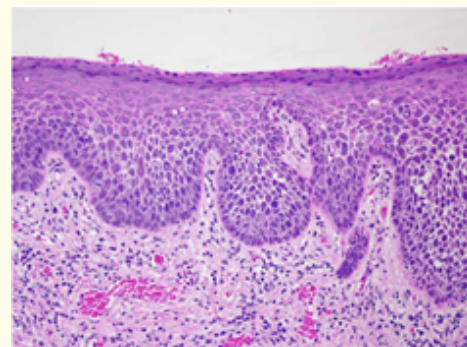
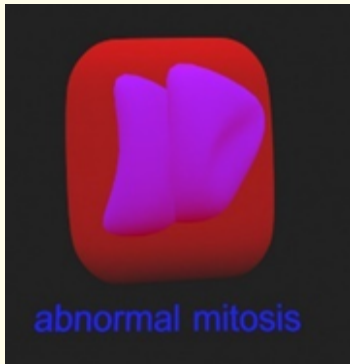


Figure 8: Drop shaped rete pegs.

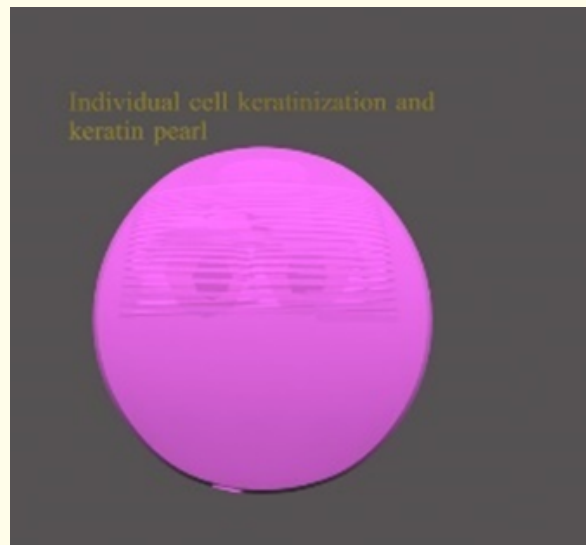
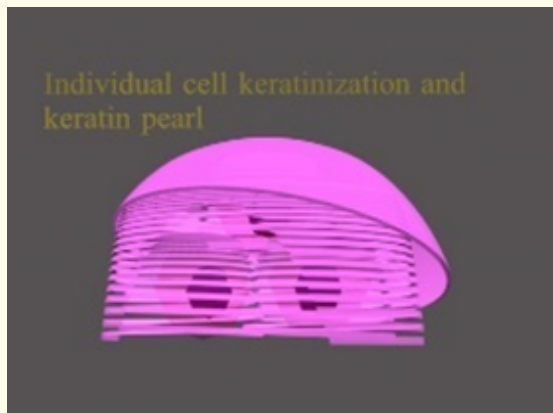
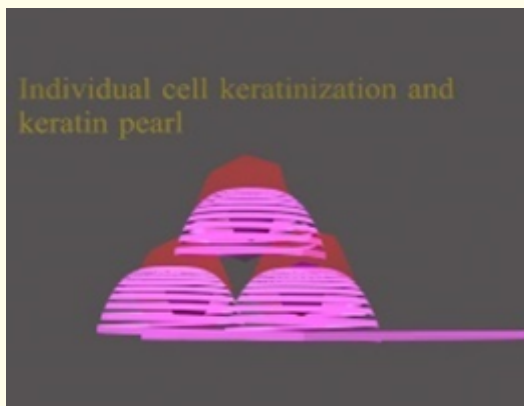
**Increased number of mitotic figures:** (Abnormal mitoses), Enlarged, tripolar or star-shaped mitotic figures however, are much more indicative of precancerous changes. In 3d it can be seen as multiple lobes arising from nuclear surface.

Abnormal mitosis may also be defined as mitotic figures found in unusual locations above the basal cell layer.



**Figure 9:** Mitotic figure.

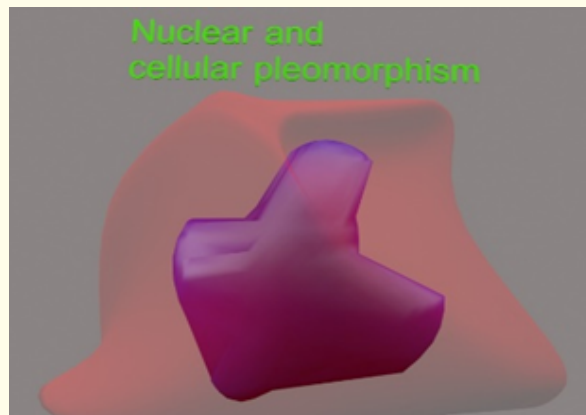
**Keratin pearls within rete pegs:** Dyskeratosis may be represented by individually keratinized cells or by tight concentric rings of flattened keratinocytes (epithelial pearls).



**Figure 10:** Individual cell keratinization and keratin pearl formation.

**Cellular pleomorphism:** A key alteration of dysplastic epithelial cells is variation in the shape of the cells and nuclei (Figure 11).

**Increased nuclear-cytoplasmic ratio:** Nuclear-cytoplasmic ratio, is the relative size of the nucleus to the cytoplasm. It is commonly abbreviated NC ratio. Nucleus is enlarged in size than normal (Figure 11).



**Figure 11:** Cellular pleomorphism and increased nuclear cytoplasmic ratio.

**Dyskeratosis:** Premature production of keratin below the surface layer is another important alteration, but it is much more commonly seen in oral carcinomas than in oral premalignancies.

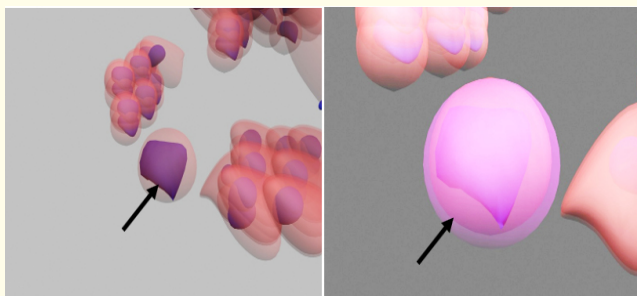


Figure 12: Individual cell keratinization.

**Hyperchromatism:** Darkly stained nuclei is referred as hyperchromatism

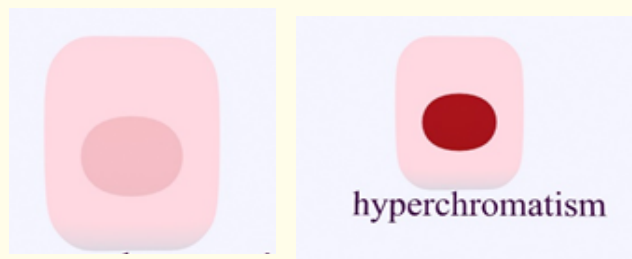
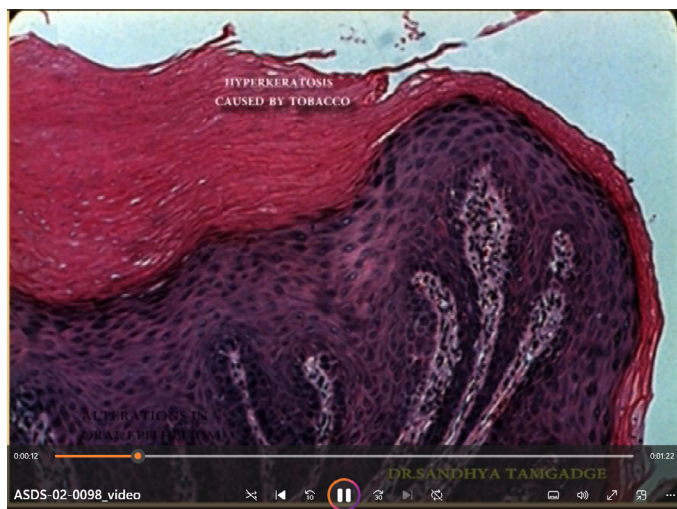


Figure 13: Normal and hyperchromatism.

The 3D animation video of oral leukoplakia with dysplastic features are as follows -



Video

### Conclusion

3d images and 3d animation videos would be made available on histopathological aspect of all the oral lesions for academic and patient education purpose [4]. This could be a best adjunct to existing teaching methods in oral pathology and patient education.

### Conflict of Interest

None

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