

To Assess Nuclear and Cellular Perimeter Ratio in Normal Mucosa, Epithelial Dysplasia and Oral Squamous Cell Carcinoma

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ABSTRACT

Introduction: Early detection of OSCC is necessary in bringing down the high morbidity and mortality rate which are associated with it. Study aimed to assess nuclear and cellular perimeter ratio in normal mucosa and to determine the correlation in the nuclear cellular perimeter ratio between normal mucosa, dysplasia and various grades of OSCC.

Material and Methods: The present study was conducted in the Department of Oral Pathology and Microbiology, Sharad Pawar Dental College Sawangi (Meghe) Wardha. Approval from Institutional Ethical Committee was taken. The cases of histopathologically diagnosed OSCC were retrieved from the archives of department of oral pathology and were studied for nuclear perimeter and cellular perimeter using morphometric analysis in patients with normal oral mucosa, oral epithelial dysplasia and Oral squamous cell carcinoma.

Results: The mean nuclear perimeter to cellular perimeter ratio of normal mucosa, dysplastic epithelium, well differentiated, moderately differentiated and poorly differentiated cases were taken down and the value showed progressive rise along the increasing grades of OSCC, the highest being in poorly differentiated squamous cell carcinoma.

Conclusion: The study concluded that there was a progressive rise in nuclear cellular perimeter ratio with the increasing grades of OSCC and this could be of use in determining the prognosis.

Keywords: Nuclear and Cellular Perimeter Ratio, Mucosa, Epithelial Dysplasia, Oral Squamous Cell, Carcinoma

INTRODUCTION

Oral squamous cell carcinoma (OSCC) is the 6th the most common type of malignancy of the oral cavity. Carcinogenesis is herald by numerous cellular and extracellular changes. Early detection of OSCC is imperative in bringing down the high morbidity and mortality rate associated with it.¹ In consideration with the cellular changes, difference in opinion still exists among pathologists in terms of histopathological evaluation. Dysplasia includes cytological and architectural changes. The cells exhibit considerable pleomorphism and hyperchromatism. The nuclear cytoplasmic ratio is increased in premalignant lesions and is one of the features of cellular atypia. Thus, computer-assisted morphometry can be used to quantify various changes in OSCC.²

Study aimed to assess nuclear and cellular perimeter ratio in normal mucosa, to assess nuclear and cellular perimeter ratio in dysplasia, to assess nuclear and cellular perimeter ratio in Oral Squamous Cell Carcinoma and to determine the correlation in the nuclear cellular perimeter ratio between normal mucosa, dysplasia and various grades of OSCC.

MATERIAL AND METHODS

The present study was carried out in Department of Oral Pathology and Microbiology, Sharad Pawar Dental College

Sawangi (Meghe) Wardha. Approval from Institutional Ethical Committee was taken. The cases of histopathologically diagnosed OSCC were retrieved from the archives of department of oral pathology and were studied for nuclear perimeter and cellular perimeter using morphometric analysis in patients with normal oral mucosa, oral epithelial dysplasia and Oral squamous cell carcinoma. 4 µm tissue sections were cut using microtome from formalin fixed paraffin embedded blocks. The sections were stained with H and E. The stained sections were then observed under microscope. The sections were subjected to morphometric analysis on a research microscope under 40X. For each section the selected field included representative area avoiding areas of basal cell hyperplasia and overlapping cells. The images were stored in the computer. The Cell Perimeter and Nuclear perimeter were measured in microns. 10 largest cells with clear outline were selected from each field.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the statistical analysis. The mean value was calculated and comparison was then made accordingly.

RESULTS

The mean nuclear perimeter to cellular perimeter ratio of normal mucosa, dysplastic epithelium, well differentiated, moderately differentiated and poorly differentiated cases were taken down and the value showed progressive rise along the increasing grades of OSCC, the highest being in poorly differentiated squamous cell carcinoma.

DISCUSSION

Oral squamous cell carcinoma (OSCC) is the 6th most common cancer of the Indian population and is known for its unpredictable course. Presently, clinical staging and histological grading are the most common methods used to diagnose OSCC. Computer aided histo-morphometric techniques help to note important features that might have been overlooked during staining procedures.³⁻⁵ A study by Natarajan et al has employed the

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Criteria	Grade	Cellular Perimeter (μ)
Mean Cellular Perimeter	Normal mucosa	25
	Severe Dysplasia	23
	Well Differentiated	24
	Moderately Differentiated	24
	Poorly Differentiated	24
Criteria	Grade	Nuclear Perimeter (μ)
Mean Nuclear Perimeter	Normal mucosa	13
	Severe Dysplasia	14
	Well Differentiated	18
	Moderately Differentiated	19
	Poorly Differentiated	20
Grade	Nuclear Perimeter/ Cellular Perimeter	
Normal Mucosa	0.52	
Severe Dysplasia	0.60	
Well Differentiated	0.75	
Moderately Differentiated	0.79	
Poorly Differentiated	0.83	

technique of nuclear morphometry in OSCC and has stated that morphometric analysis can be effectively used to assess nuclear features preoperatively and enable early detection of cellular changes efficiently.¹ A study was carried out by T Smitha et al. applying morphometric analysis in oral leukoplakia and well-differentiated oral squamous cell carcinoma.² The results revealed that the values of nuclear perimeter and area, along with cellular perimeter and area, gradually increased as they moved from the normal buccal mucosa to leukoplakia, reaching the highest value in OSCC. During Transformation of normal tissue to malignancy cellular changes occur at the molecular level before they are seen under the microscope and much before clinical changes become evident. On one hand the cellular morphology reflects biologic behavior of tissue and host and on the other hand reflects the genetic and molecular biology of cells themselves. The morphologic change of increased cellular activity is characterised by hyperchromatism, enlarged and prominent nucleoli and increased mitosis. The amount of cytoplasm the cell makes decreases relative to the amount of nucleoplasm. As a result the nuclear to cellular perimeter ratio increases at times to an extreme degree. Our results were significant for the histomorphometric parameter size. The ratio of nuclear to cellular perimeter increased gradually from normal mucosa to dysplasia and to OSCC. The histomorphometric parameter was thus useful in differentiating between dysplasia and malignant conditions. Nuclear pleomorphism and hyperchromatism is a distinctive feature of malignancy. Artifacts may result from poor cellular fixation, trauma, degeneration, cautery or hormonal changes and other degenerative features. Tangential cut sections might lead to elongated nuclear shape. By itself, changes in nuclear shape, if not extreme, are not sufficient for diagnosis in most tumors.⁶⁻⁹

CONCLUSION

Numerous cellular and extracellular changes occur during

carcinogenesis. Various morphometrical analysis of nuclear and cellular changes in OSCC along with the interpretation of stromal changes in collagen fibers function are simple and reliable methods for clinical and histological evaluation of OSCC, and thus in an effective treatment planning according to the needs of the patient.

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