

ORAL EXFOLIATIVE CYTOLOGY-A REVIEW

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ABSTRACT: Oral exfoliative cytology is method for diagnosing various diseases such as oral candidiasis, bacterial and viral infections including COVID-19. It is also useful in diagnosing precancerous lesions and cancerous lesions such as oral squamous cell carcinoma. Oral exfoliative cytology depends on bio-chemical, morphological changes and molecular analysis of cells that scraped off from the oral cavity. Various development has been implemented in recent times for early detection of oral cancer.

Keywords: Oral cytology, Cyto brush, Quantitative analysis.

INTRODUCTION:

Oral exfoliative cytology is a simple non-invasive procedure that involves in collecting of surface cells of a lesion. Papanicolaou and Traut (1941) first demonstrated the validity of cytology for diagnosing the neoplasm of uterine cervix. Oral cytology soon came to be used for diagnosing of disease of oral cavity but little success (sandler 1963) The surface cells are obtained by scraping with the help of stiff brush (may not reach the basal cells) and the use of "Cytobrush" which gently excavates down to some of the basal cells^[1]. After the cells have been collected, fixed and stained the morphology of surface epithelial cells is observed under microscope (Langlois et al 1993). Although it play an indispensable role in diagnosing fungal, viral and bacterial infections. It is one step ahead to biopsy which is invasive and cannot be performed on all mucosal lesion. It is also analyze the changes in oral epithelium in burning mouth syndrome including nuclear and cytoplasmic ratio.

CONVENTIONAL METHOD OF COLLECTING SAMPLE:

Before collecting the sample the patients are asked to rinse the mouth thoroughly to reduce the influence of debris. The cells were exfoliated manually from the oral cavity of the patient using cytobrush in normal saline. The collected sample is transported in ice. Cell counting was done after RBC lysis protocol. The unstained harvested cell pellet was employed for the spectral acquisition following which the pellet was made onto glass slide, fixed and subjected to pap staining^[2]

ANALYSIS OF ORAL CARCINOMA:

Cytology specimen can be studied using quantitative cytomorphology, nuclear DNA content analysis, immunocytochemical tumor marker identification and molecular analysis.^[1] Quantitative analysis depends on the dysplastic cell which shows variation in size and shape, nucleus and cytoplasmic ratio and pleomorphic features. Nuclear DNA analysis shows that the cancerous cell does not show diploid DNA profile. Immunocytochemical tumour marker identification shows mutation of tumor suppressor gene p53, a marker of genomic instability associated with cell cycle, is one of the most frequent genomic changes in OSCC supra basal p53 immunopositivity is strongly associated with high grade dysplasia and risk of malignant transformation and can be detected also in malignant cell obtained using exfoliative cytology.^[3] The nuclear expression of Ki67, a cell proliferation marker, may provide useful information to evaluate the grading of oral epithelial dysplasia and risk of evolution into oral squamous cell carcinoma.^{[4][5][6]} The most commonly used marker in molecular analysis are epigenetic alterations (promotor hypermethylation)^[7]. Loss of heterogeneity^{[8][9]} and microsatellite instability^{[7][10][11]}.

INTERPRETATION OF CYTOLOGY REPORT

Class I - Normal

Class II - atypical

Class III - indeterminate

Class IV - suggestive of cancer

Class V - positive of cancer. (Shafer's oral pathology 8th edition)

ANALYSIS OF FUNGAL INFECTION:

Fungal is the major cause of morbidity and mortality in immunocompromised patient^[12]. oral candidiasis is the most common opportunistic infection with the impaired immunity^{[13][14]}. Candidal infection the oral mucosa is important in

differentiating from malignancy incision biopsy is highly reliable but invasive^[12]. Oral exfoliative cytology was performed in the group of 53 patient with various mucosal disease the surface cell was obtained by cytobrush and the sample was subjected to cyto-morphometric analysis ,DNA extraction, culture and identification of *Candida albicans* ,LAMP reaction. The combination of exfoliative cytology and LAMP is highly successful in diagnostic system then DNA extraction and PAS staining because it is less time for diagnosis and does not requires costly apparatus^[15].

ANALYSIS OF BURNING MOUTH SYNDROME:

Burning mouth syndrome is the clinical condition is characterized by sensation of episodic pain in the healthy oral mucosa^[16]. In this study 20 adult BMS patients [experimental group] and 20 healthy individual [control group] were participated, sample were collected from both the group by exfoliative cytology and the result shows significant increase in NA [nuclear area] and reduction in CA[cytoplasmic area] for experimental group. The NA/CA ratio was higher in experimental group than in the control group^[17].

ANALYSIS OF PARTICLES RELEASED FROM IMPLANTS AND METALLIC PIERCING:

A study comprised of 30 patients carrying titanium dental implants who had neither had a metallic prosthesis or metal restoration neighbouring tooth the sample included patient with or without peri-implantitis cytological sample of peri-implant area was collected. Cytological analysis was performed using light microscope, titanium concentration was determined using inductively coupled plasma mass spectrophotometry which shows metal like particle where absorbed inside and outside the epithelial cell and macrophages in cytological smear of peri-implant mucosa of both patient with or without peri-implantitis. Titanium conc. Was more in peri-implantitis group than group without peri-implantitis. Exfoliative cytology simple technique to detect metal particles in cell exfoliated in peri-implant mucosa.^[18]

The population comprised 16 patient who have done lip/tongue piercing where undergoing exfoliative cytology. The smear obtained was evaluated by SEM [scanning electro-microscopic] and their chemical composition of the metal was analysed by EDS [energy/dispersive x-ray spectroscopy]. Cytological study shows varying in the shape and size of the cells. Chemical characterization of the particle in the collected cytological smear are aluminium 66.6%, tungsten 5.5% and molybdenum 2.7%.^[19].

ANALYSIS OF VIRAL INFECTION:

One of the most recent viral infection COVID-19 a pandemic disease which has morbidity and mortality rate. The screening of the COVID-19 depends on the Angiotensin-converting enzyme II (ACE-2) receptor has been identified as the attachment domain for the spike receptor of the COVID-19 virus^[20]. Once infections enters the host cells virus replication and shedding lead to relevant clinical manifestation attachment of spike receptor also caused depletion of ACE-2 receptor which further leads to various morbidity^[21]. This changes in ACE receptor leads to the detection of COVID-19 infection ACE receptor has been identified in oral stratified squamous epithelial in normal oral mucosa^[22]. Exfoliative cytology helps in retrieving the supra-basilar and basilar cell this helps in retrieve the COVID19 positive epithelial cells from the infected patient. The positive cells can be used in early detection of ACE inhibitors using simple immune histochemistry.

CONCLUSION:

Oral exfoliative cytology is the less time consuming, economical and easily performed for identifying vast group of diseases and infections. It is also helpful in screening large population in a shorter period of time. It provides detail study of surface cells and their morphological changes for diagnosing diseases. Recent advances has been implemented for identifying diseases at an early state and preventing further complication and providing better health.

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