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COLPOSCOPY : AN INNOVATIVE DIAGNOSTIC TECHNIQUE FOR ORAL LESIONS

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ABSTRACT

Cancer is one of the leading cause of deaths in public health and is particularly common in developing countries. The influence of smoking, chewing tobacco and alcohol has usually been considered a relevant confounding factor for oral cancer. Oral cancer is generally preceded by some potentially malignant disorders such as leukoplakia, lichen planus, oral submucous fibrosis etc. However, even with meticulous follow up, early malignant changes are still overlooked. As the emphasis shifts from damage mitigation to disease prevention, the need for sensitive and accurate detection and diagnostic tools become more important. Many novel and emergent optical diagnostic modalities for the oral cavity are available with a variety of desirable attributes including non-invasiveness, absence of ionising radiation, patient friendliness, repeatability and high resolution surface. One such diagnostic aid is Colposcopy. Because of the rapid pace of innovation in this field, the cost and ease of use of such modalities is improving rapidly. Hence, early diagnosis is of paramount importance facilitating large scale screening for high risk population. The future is promising for further development and evolution of oral cancer diagnostic aids to enhance the quality of patient care there by reducing the mortality and morbidity.

KEYWORDS : Colposcopy, Potentially Malignant Disorders, Diagnostic aids

INTRODUCTION

Oral cancer is commonly diagnosed when it becomes symptomatic and by this stage approximately two-thirds of patients would already have developed advanced disease with regional metastasis. This further leads to a consequently diminished prognosis. The early detection of pre-malignant lesions of the oral cavity allows for treatment that is sufficiently early to prevent their progression to an invasive carcinoma. Clinical examination often leads to uncertain diagnosis and thus the final diagnosis of dysplastic or premalignant lesions of the oral mucosa cannot be based solely on clinical manifestations. With the aim of improving clinical examination and facilitating the identification of initial carcinomas,[1] biopsy with histo-pathological examination is considered the gold standard in the diagnosis of oral cancer and precancerous lesions and conditions. Selection of the biopsy site is the most important criteria to arrive at a correct diagnosis.[2] As the biopsy site is a subjective choice, it is possible that the biopsy specimens have been taken from non-representative sites of the lesion or before morphological changes were identified.[3] At present, though there are simple chair-side investigations including staining with toluidine blue and exfoliative cytology to aid the diagnosis of such changes, there is high risk of false positives.[4] Therefore, the technique for non-invasive detection of dysplastic changes or assisting the clinician in choosing the appropriate biopsy site can save patients from multiple biopsies and allow a broader range of diagnosis which can aid early detection of oral cancer.[5] Colposcopy is one such diagnostic modality which offers advantage in choosing more representative sites for biopsy than routine clinical examination.[4]

DISCUSSION:

Colposcopy provides accurate early care with improved appearance. The need for a non-invasive technique for the early detection of cancers has long been recognized.[1] Colposcopes can see what a healthy naked eye cannot see.[7] The surface pattern, clarity of demarcation, colour and opacity can be more easily determined by direct oral microscopy than by routine clinical examination. This aid in the earliest detection of premalignant lesions and conditions such as leukoplakia, lichen planus, lichenoid reaction and others.[1]The progression from dysplasia to carcinoma cannot be determined based on clinical findings. Similarly, such mucosal progression cannot be detected, because areas of suspected mucosal change may contain foci of dysplasia in varying degrees, reversible or irreversible. Therefore, periodic follow-up is essential for precancerous lesions, such as heterogenous leukoplakia. It is hoped that colposcopy will be used to monitor mucosal lesions and detect signs of progression as it currently appears to be the only way to assess vascular changes in the oral mucosa.

COLPOSCOPY:

The word colposcopy is derived from the Greek word "kolpos" meaning "hollow,womband vagina" and "skopos" meaning "look at". The procedure was developed in 1925 by the German physician Hans Hinselmann with the help from Dr. Eduard Wirths.[6] It is a medical diagnostic procedure to examine an illuminated, magnified view of the cervix and the tissues of the vagina and vulva.[1] Various authors have tried to adapt gynaecologic methods of examination to the oral mucosa because of the similarities, the oral mucosa shows with the female genital mucosa. The main purpose of colposcopy is to detect intraepithelial and early neoplasia of the cervix, vagina and vulva. Most of the times, a colposcopic examination is indicated as an integral part of every gynaecologic examination in concert with cytological examination to further investigate a cytological abnormality on pap smears.[6]

A colposcope is typically defined as a stereoscopic binocular field microscope with a long focal length and powerful light source. The parts of a colposcope include a colposcope head, a height adjustment knob to adjust the height of the instrument, head inclination knob to adjust the angulation. Illumination is provided by a halogen lamp via a fiberoptic cable connected to a system of lenses. It can magnify the tissue from 4 to 40 folds. The colposcope head consists of a pair of diapter knobs, 45° angled lens, objective lens, three step magnification knob for low, medium and high power. Various light filters are available to highlight different aspects of the surface of the tissue. Colposcope uses a green or blue filter to facilitate the examination of vascular changes and colour tone because the unfiltered white or yellow light reduces the contrast between the terminal vessels and the surrounding tissue. The green filter removes red light thereby enhancing the vascular details by making blood vessels

appear dark. The focal length of the microscope is 200 mm, providing an optimal working distance. It provides 3-dimensional image of tissue surfaces examined.[7]

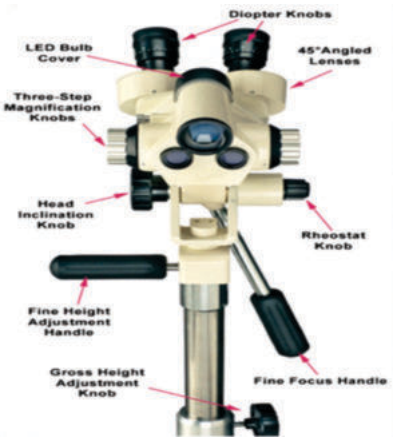

Figure 1: Colposcope

Examination Procedure:

The colposcopic examination is less time- consuming and does not require anaesthesia. This is generally a safe and painless procedure. Three percent of acetic acid is applied to the mucosa using cotton swab for about 30 seconds. The acetic acid coagulates the mucus, which is easily removed and hence washes away mucus and allows abnormal areas to be seen more easily with the colposcope. Acetic acid causes swelling of both squamous and columnar epithelium, reducing its transparency by producing a transient coagulation of nuclear proteins and perhaps by other mechanisms that are still unknown. The acetic acid does not affect the mature, glycogen-producing epithelium as the acid does not penetrate below the outer one-third of the epithelium. The cells in this region have a very small nuclei and a very large amount of glycogen. Dysplastic cells are most affected. They contain large nuclei with abnormally large amounts of chromatin. The areas that stain white after the acetic acid wash is called acetowhite lesions. The acetic acid effect develops in about 40-60 seconds and then fades over a similar time scale but, reappears on repeated application of acetic acid. The vascular patterns are clearly seen just when the acetowhitening begins to fade. Sometimes, normal areas can also stain white but, these areas have vague or faint borders. In contrast, significant abnormalities such as lichenoid reactions, lichen planus, leukoplakia and squamous cell carcinoma generally produce acetowhite areas with clear and well-defined margins. Areas of the tissue which turn white after the application of acetic acid or have an abnormal vascular pattern are often considered for biopsy.[1]

If no lesions are visible after acetic acid application, staining with a dilute iodine solution called Lugol's solution or Schiller's solution is used to further investigate the abnormalities. The normal squamous epithelium is rich in glycogen which will generally takes up iodine stain and turns a uniform brown colour but, precancerous and cancerous lesions do not.[1]

Criteria For Vascular Changes

The vascular changes described in the colposcopic literature can be used as the criteria for selecting biopsy sites in the oral cavity. The most frequently used and widely accepted index is Reid's index. Diverse blood vessel patterns can be observed on colposcopic examination which is best studied using a variety of magnifications and accentuating blue or green filters. The normal squamous epithelium of the oral mucosa is pink and smooth which demonstrates fine, regular vessels. This normal vascularity can be altered in various inflammatory, benign and malignant lesions and conditions Colposcopy findings suggestive of infiltration include vascular patterns, inter-capillary distance, surface patterns, colour tone, opacity and clarity of demarcation of mucosal lesions. Increased vascular distribution causes necrosis of superficial epithelium, and in some cases causes keratin production and color changes. With the application of 3-5% acetic acid, the high grade lesions demonstrate a more persistent duller shade of white and the low-grade lesions are translucent or bright white and fades quickly. Low-grade lesions have feathery margins and irregular borders whereas high-grade lesions have straighter, sharper outlines with well-defined borders. A lesion with an internal border that is a lesion within a lesion is typically high grade. These results are based on the vascular and tissue changes. The capillary changes that precede tumour growth associated with the pattern of tumour angiogenesis are different from the usual neo-vascularization taking place during repair and regeneration processes. At the cellular level, various molecules such as vascular endothelial growth factor, basic fibroblast growth factor and transforming growth factor alpha are involved. Direct optical visualization of these patterns is useful for the early detection of the underlying pathology and marking of biopsy sites.[7]

Blood Vascular Pattern:

The criteria for vascular changes described in colposcopic literature for the selection of biopsy site has been described as follows:

Normal:

In the normal mucosa, two basic types of capillary networks can be seen with the colposcopy procedure - Network capillaries and Hairpin capillaries.

Abnormal:

In the abnormal epithelium, three different types of capillary networks are included.

In areas of dysplasia and carcinoma in situ of the uterine cervix or oral mucosa, a specific vascular pattern, punctuation is commonly characterized by dilated, often twisted, irregular, hairpin-type vessels. These dilated capillaries that terminate on the surface appear from the ends as a collection of dots and are referred to as punctuation. Terminal capillaries surrounding roughly circular or polygonal blocks of aceto-white epithelium crowded together are called mosaic because their appearance is similar to a mosaic tile. These vessels form a basket around the blocks of abnormal epithelium. Atypical vessels are terminal vessels that are irregular in size and shape and coarse and such arrangement indicates neoplasia.[7]

Fine punctuation and mosaics produced by narrow vessels and uniform inter-capillary distances are typical of low-grade lesions. A coarse pattern that results from a wider, variable vessel diameter and spacing indicates higher grade anomalies. The mosaic tiles with central punctuation suggests carcinoma in situ. Fracturing of formerly intact mosaic and punctuate patterns with predominantly waste thread like vessels is an early colposcopic caution sign of squamous micro invasion or cancer. Thus, dilation and proliferation of punctuate and mosaic patterns increase with the degree of neoplastic change. As the neoplastic growth process proceeds, the need for oxygen and nutrition increases, angiogenesis occurs as a result of tumour and local tissue production of VEGF, PDGF, EGF and other cytokines, results in the proliferation of blood vessels and neo-vascularization. Atypical vessels may be looped, branched or reticular. Sharp turns, dilations and luminal narrowing also characterize these vessels. The surface epithelium is lost in these areas leading to irregular surface contour and friability. Common to all, these vascular patterns depict irregular vessel dilatation and inter-capillary distances greater than the normal

distance of 50-200 μm. With the increasing degree of dysplasia, the distance increases so that the maximum distances may exceed 700 μm.[7]

REID'S COLPOSCOPIC Index

Colposcopic Sign	Zero Point	One Point	Two Point
Margin	Condylomas Micro papillary areas Pale acetowhitening Satellite lesion and acetowhitening extending beyond the transformation zone	Regular lesions with smooth outlines	Rolled peeling edge Internal demarcation between areas of different appearances
Color	Shiny snow white Pale acetowhitening	Shiny grey	Dull oyster white
Vessels	Fine calibre vessels	Absent vessel	Definite punctuation and mosaicism
Iodine staining	Positive staining or Minor Iodine negativity	Partial iodine uptake	Negative staining

CONCLUSION:

The advantages of colposcopy compared with other methods are high resolution, good magnification, good illumination, good storage capacity, early detection of lesions, painless, non-invasive with an accuracy of 80 to 90%. The main disadvantages are complexity and cost and this need to be evaluated by further comparative studies.[7]

Colposcopy serves as a promising tool for early diagnosis of lesions and choosing the biopsy site owing to its high precision, versatility, ease of use and non-invasive technique. The use of colposcopy should be made in our routine practice, providing better patient care with early diagnosis.[7]

REFERENCES:

1. Pallagatti S,Sheikh S,Puri N, Gupta D,Singh B. Colposcopy: A new ray in the diagnosis of oral lesions. Indian J Dent Res 2011;22:810-5.
2. Nayyar, AbhishekSingh & Gayitri, HC & Bafna, Uttam & Ahmed, Siddique & Khan, Mubeen. (2012). Tumor angiogenesis: A potential marker of the ongoing process of malignant transformation in leukoplakia patients, removing the veil. Clinical Cancer Investigation Journal. 1. 127. 10.4103/2278-0513.102880.
3. Ohri N, Kapoor C, Mohemmed RP, Vaidya S. An update on intraoral application of colposcopy. J Oral Maxillofac Pathol 2014;18:403-10.
4. Nayyar AS, Khan M, Bafna UD, Siddique A, C H. Colposcopy: Gynecological vision in viewing oral lesions. Indian J Pathol Microbiol 2014;57:223-30.
5. Nayyar AS, Khan M, Bafna UD, Ahmed S, Chaluvaiah GH. Colposcopy in oral epithelial dysplasia: seeing the unseen, a pilot study [retracted in: J Cancer Res Ther. 2015 Oct-Dec;11(4):1049]. J Cancer Res Ther. 2014;10(3):563-570. doi:10.4103/0973-1482.137957.
6. Nayyar A,Khan M,Gupta P. Colposcopy in oral mucosa. International Journal of Pathology;2012;10(1):48-49.
7. Kumar A, Shankar YU, Prakash S, Radhika B, Fatima N. Colposcopy - a novel diagnostic technique for oral mucosal lesions. J Clin Diagn Res. 2014;8(10):ZE25-ZE28. doi:10.7860/JCDR/2014/10234.5038.
8. Issrani R,Ammanagi R,Keluskar V. Use of colposcopy for diagnosing oral mucosal lesions: An illusion or a realistic possibility?. Indian J Cancer 2015;52:370-4.
9. Costa, S., Panta, P. (2019). Colposcopy: A Direct Oral Microscopy for Oral Cancer and Precancer. In: Panta, P. (eds) Oral Cancer Detection. Springer, Cham. doi.org/10.1007/978-3-319-61255-3_10.
10. Ohri N, Kapoor C, Mohemmed RP, Vaidya S. An update on intraoral application of colposcopy. J Oral Maxillofac Pathol. 2014 Sep-Dec;18(3):403-10. doi: 10.4103/0973-029X.151328. PMID: 25948996; PMCID: PMC4409186.
11. Mahmoud, S. A. M., Latif, M. K. A., Dahmoush, H. M., & Hussein, E. A. (2020). Diagnostic accuracy of colposcopic examination in patients with oral dysplastic lesions. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology.
12. Gynther, G. W., Rozell, B., & Heimdahl, A. (2000). Direct oral microscopy and its value in diagnosing mucosal lesions. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology, 90(2), 164–170.
13. Ujwala N, Singh NA, Milind N, et al. Colposcopy in pre-malignant lesions and oral squamous cell carcinoma: linking threads of clinical, histopathological and colposcopic inferences. J Cancer Res Cell Ther. 2016;12:295.
14. Khan MJ, Werner CL, Darragh TM, et al. ASCCP colposcopy standards: role of colposcopy, benefits, potential harms, and terminology for colposcopic practice. J Low Genit Tract Dis. 2017;21:223-229.
15. Durdi GS, Sherigar BY, Dalal AM, Desai BR, Malur PR. Correlation of colposcopy using Reid colposcopic index with histopathology—a prospective study. J Turk Ger Gynecol Assoc. 2009;10:205.
16. Mahmoud SAM, Abdul-Latif MK, Dahmoush HM, Hussein EA. Methodology and raw data of the diagnostic accuracy of oral colposcopy. Mendeley Data. 2020.
17. Shojaei H, Yarandi F, Ghozati L, Yarandi N, Izadi-Mood N, Eftekhar Z. Acceptable predictive accuracy of histopathology results by colposcopy done by gynecology residents using Reid index. Arch Gynecol Obstet. 2013;287:345-349.
18. Liu D, Zhao X, Zeng X, Dan H, Chen Q. Non-invasive techniques for detection and diagnosis of oral potentially malignant disorders. Tohoku J Exp Med. 2016;238:165-177.
19. Principles and practices of Colposcopy – Patrick Walker 2nd ed. B.Shakuntala Baliga.(Page No-1).
20. Dresang LT. Colposcopy: An Evidence –Based Update. J Am Board Fam Med.2005;18:383-92.
21. Kolstad P,Terminology and definitions. In: Kolstad P, editor. Atlas of colposcopy. 3rd ed. London: Churchill Livingstone;1982. p.21-31.