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# COLPOSCOPY: A SOLATIUM FOR MALIGNANT LESIONS OF ORAL CAVITY AND ITS BIOPSY- A REVIEW

Dental Science

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## ABSTRACT

In spite of the many revolutionary changes occurring in the field of medical sciences, especially in the field of diagnosis and treatment of oral cancer, it became cumbersome for a medical or dental fraternity to increase the survival rate of an oral cancer patient. This may be due to the hindrance in understanding the exact nature and severity of any pathological lesion and to look into its deeper dysplastic changes occurring at cellular level. Due to this still the histopathological diagnosis remains as a gold standard investigation in diagnosis of malignant lesions and choosing the site of tissue as a heart of the biopsy. Thus the present article is a review of colposcopy, a diagnostic microscopic procedure used in choosing the accurate site for oral biopsy and to look into tissue for its dysplastic changes.

## KEYWORDS

Colposcopy, Gynecological procedure, Oral biopsy, Vascular patterns, Surface irregularities of oral mucosa.

**Introduction:**

Oral cancer is the most common cancer occurring in males and females at a ratio of 3:1 [1] among which oral squamous cell carcinoma [OSCC] is the most predominant variant accounting for more than 90% of all the oral cancers [2]. Most of these lesions can be diagnosed clinically just looking at their invasive nature [Figure 1] or when the patient experiences severe pain, functional limitation, or regional lymphadenopathy but most of the times it would have already developed advanced disease [3] with regional metastasis compromising prognosis and survival rates. Hence, early diagnosis of oral cancer is of paramount importance where procedures like toludine blue staining, exfoliative cytology, etc,. were been used as supplemental aids to clinical examination [4]. Eventhough the histopathologic examination of the lesion is very necessary to establish a definite diagnosis then the site of biopsy becomes a subjective choice as it sometimes raises doubts about its representativeness [5]. So far, no simple and reliable method is available for selecting the most appropriate area for biopsy [6]. This urge has laid to choose and implement a procedure called colposcopy commonly implemented in gynecological procedures for screening cervical cancer, in oral cancer for selecting biopsy site [7].

**History:**

In the actual terms of literature, the word colposcopy is derived from two words "colpo" meaning "Vagina" and "scope" meaning "to look into the vagina". It uses a specialized microscope called as colposcope, to look into the vagina and then to focus at cervix throwing light thereby magnifying the area to be chosen for the biopsy based on microscopic abnormalities identified from the normal [8]. Colposcopy was introduced by Hans Hinselmann in the year 1925 in Germany who theorized that it might be possible to detect cervical cancer at an early stage by properly illuminating and magnifying the cervix. Although the technique was widely accepted in Europe, it did not gain any popularity in the U.S. or the United Kingdom primarily because of a cumbersome terminology that was difficult to translate into English [9].

In 1928 Shiller introduced the concept of placing iodine on the cervix to identify non-glycogen-containing areas for biopsy. This became popular in the U.S. and further delayed the acceptance of the colposcope. In 1941 Papanicolaou and Traut published their report on the use of vaginal pool cytology for detecting cervical cancer. Later in 1949 Ayre developed the concept of using wooden cervical spatula to obtain abrasive cervical smears rather than exfoliative cytological samples, which improved the detection of cervical neoplasia. Thus, Pap smear became the most accepted method of screening for cervical neoplasia and the colposcopy as the appropriate clinical diagnostic technique for evaluation of this abnormal Pap smear [10].

**Indications for Colposcopy:** To visualize, evaluate and chosen the biopsy site based on the microscopic vascular changes of the involved pathological tissue suspected with

1. Atypical Squamous Cells
2. Low Grade Squamous Intraepithelial Lesion and High Grade Squamous Intraepithelial Lesion
3. Atypical Glandular Cells,
4. Cervical polyp, suspicious lesions of genital tract
5. Sexual abuse a specialized colposcope equipped with a camera is used in examining and collecting evidence for victims of rape and sexual assault [5].

**Advantages:**

The concept of Colposcopy has brought a revolutionary changes in the world of biopsy due to its:

1. Precision
2. Versatility
3. Ease of use
4. Non-invasive technique
5. Avoids false negative results [11]

**Disadvantages:** The technique sensitive issues yielding to some of its drawbacks are:

1. Bleeding from site of biopsy
2. Infection at the site of biopsy
3. Technical errors such as magnification errors, focal length errors or working distance errors, etc.
4. Cost of the equipment
5. Failure to identify the lesion[12]

**What is a Colposcope?**

A colposcope is a low-power, stereoscopic, binocular, field microscope with a powerful variable intensity light source that illuminates the area being examined [10]. The head of the colposcope, also called the 'optics carrier', contains:

1. The objective lens located at the end of the head positioned nearest to the patient being examined,
2. Two ocular lenses or eyepieces used by the colposcopist to view the cervix or oral cavity
3. A light source Green and/or blue filters to be interposed between the light source and the objective lens
4. A knob to introduce the filter,
5. A knob to change the magnification of the objective lens, if the colposcope has multiple magnification facility and a fine focusing handle.[13]

The filter is used to remove red light, to facilitate the visualization of blood vessels by making them appear dark. Using a knob, the head of the colposcope can be tilted up and down to facilitate examination of the oral cavity [10]. The distance between the two ocular lenses can be adjusted to suit the inter-pupillary distance of the provider, to achieve stereoscopic vision. Each ocular lens has dioptre scales engraved on it to facilitate visual correction of individual colposcopists [14]. The height of the head from the floor can be adjusted by using the height

adjustment knob, so that colposcopy can be carried out with the colposcopist comfortably seated, without strain to the back. [Figure 2]

The colposcopy is characterized by an important factor called as magnification whose working level ranges from 6x to 15x where most of the simple colposcopes works with a single fixed magnification level such as 6x, 9x, 10x, 12x or 15x and the modern colposcopes has permit adjustable magnification ranging from 6x to 40x whereas some sophisticated and expensive equipment had electrical zoom capability to alter the magnification. However the lower magnification yields a wider view and greater depth of field for examination whereas more magnification is not necessarily better as the field of view becomes smaller it diminishes the depth of focus and thereby increasing the illumination required. However, higher magnifications may reveal finer features such as abnormal blood vessels [11].

The colposcopes has light bulbs located in easily accessible area to facilitate changing them whenever necessary but some colposcopes has bulbs mounted in the head of the instrument; in others, these are mounted elsewhere and the light is delivered via a fiber-optic cable to the head of the colposcope. The latter arrangement can use brighter bulbs, but less overall illumination may result if the cables are bent or twisted. A colposcope may be fitted with halogen, xenon, tungsten or incandescent bulbs but the halogen bulbs are usually preferred, as they produce strong white light. The intensity of the light source may be adjusted with a knob [10].

Before focusing the colposcope and working with it, the focal length or working distance between objective lens and patient should be adjusted adequately which is accomplished by positioning the instrument properly at the right working distance. The ideal focal length to work with it ranges from 250 to 300mm where if it is too short causes difficulty in using biopsy instruments while visualizing the target area and if it is too long causes hard for the colposcopist to reach their arm to the patient. These can be adjusted by using fine focus adjustments such as changing the power of the objective lenses altering the magnification and working distance [14]. [Figure 3]

These colposcopes are quiet heavy available in different forms such as mounted form on to floor pedestals with wheels, suspended form from a fixed ceiling mount or as a fixed one to the examination table or to a wall, sometimes with a floating arm to allow for easier adjustment of position. Generally mounted floor pedestal forms are preferred in developing countries as they are easier to handle and can be moved within or between clinics. Even we can have colposcopes added with accessories such as a monocular teaching side tube, photographic camera and CCD video camera but they substantially increases the cost of the equipment. These accessories are added using a beam splitter which splits the light beam in half and sends the same image to the viewing port and to the accessory port [15].

**Procedure:**

It usually takes only 20 to 30 minutes for the doctor to complete a colposcopy aided biopsy. The oral cavity is initially gently swabbed with a 3-5% vinegar or acetic acid to remove the mucus that covers the surface and then to high lighten the abnormal areas of acetowhiteness correlating with higher nuclear density. Then the colposcope is focused at the oral cavity, examined for abnormal areas, if necessary photographs are taken and finally if any area looks abnormal, a small sample of the tissue is removed using small biopsy tool [16]. If no lesions are visible, a Schillers or Lugols iodine solution may be applied to the oral cavity to help in high lightening areas of abnormality. [Figure 4]

Then these areas are thoroughly examined using colposcopy and the areas showing extensive cell changes or abnormal vascular pattern are selected for biopsy [Figure 5]. Now once the biopsy site is selected a grid is placed against it and marked with green pen [Figure 6]. But this can be done only when an adequate colposcopic examination is attained where complete extension of the lesion including its critical zone of transformation are visualized properly [17]. Once the site of biopsy is chosen, an adequate amount of tissue or sample is collected using a long biopsy instrument, such as a punch forceps or spiral CX brush [Figure 7] under topical anesthetics such as lidocaine or a nerve block to decrease patient discomfort, particularly if many biopsy samples are taken.

Then the bleeding after the procedure is controlled by applying either Monsel's solution or silver nitrate with large cotton swabs. This solution of Monsel's looks like mustard and turns black when exposed to blood interfering with interpretation of biopsy specimen, so these substances should not be applied until all biopsies have been taken [18]. To increase the diagnostic accuracy of colposcopy, multiple biopsies of two or more sites are recommended.

**Interpretation:**

The studies carried out by Shambulingappa pallagatti et al. [19] in 2011 and Dr. Abhishek singh nayyar [20] et al. in 2012 has concluded that 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 characterized by: abnormal vascular pattern, irregular contour with a loss of the surface epithelium, and color tone change. Hence colposcopy directed biopsies avoids false-negative results thus allowing treatment to be administered without delay.

**1. Color tone changes:** The color tone may change as a result of the increasing vascularity, surface epithelial necrosis, and in some cases production of keratin which may vary from yellow to orange appearance rather than the expected pink color of the intact squamous epithelium in pathologies.

**2. Margins and color:** Following the application of 3-5% acetic acid to mucosal epithelium, depending upon the onset of color and degree of whiteness obtained, its rapidity and duration of acetone whitening the sharpness of the lesion borders were observed. The high-grade lesions demonstrate a more persistent duller shade of white, whereas low-grade lesions are translucent or bright white and fade quickly.

Similarly, 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 considered to be typically high grade.

**3. Vascular pattern:**

**Normal oral mucosa:** It has two basic types of capillary networks when seen with the colposcopy and they are network capillaries [Figure 8] and hairpin capillaries [Figure 9].

**Abnormal epithelium:** Its vascular pattern include varied forms like punctuation, mosaicism and atypical vessels [20, 21].

**a.)** Punctuation: In areas of dysplasia and carcinoma in situ of the uterine cervix or oral mucosa, a specific vascular pattern called as punctuation is common characterized by dilated, often twisted, irregular, hairpin-type of vessels or capillaries terminating on the surface of mucosa, appearing from the end as a collection of dots and are thus referred to as punctuation [Figure 10]

**b.)** Mosaic: Another pattern of the vessels in dysplasia is called mosaic where the terminal capillaries surrounding roughly circular or polygonal blocks of acetowhite epithelium are crowded together forming a basket giving an appearance mimicking a mosaic tile. Like punctuation vessels, true mosaic vessels are usually seen in sharply demarcated areas [Figure 11] [18].

These punctate and mosaic patterns are graded on the basis of vessel caliber, intercapillary distance and the uniformity of these where the normal intercapillary distance is 50-200 μm which increases with the degree of dysplasia so that the maximum distances may exceed 700 μm. A fine punctuation and mosaicism which are created by narrow vessels and uniform intercapillary distances typify low-grade lesions. A coarse pattern resulting from a wider and more variable vessel diameter and spacing indicates higher grade abnormalities. The mosaic tiles with central punctuation indicate carcinoma in situ [16].

A colposcopic finding of loss of previous intact mosaic and punctuate patterns due to the production of abnormal, predominant and irregular waste thread like vessels is an early warning sign of squamous micro invasion or cancer. Thus dilation and proliferation of the resulting punctate and mosaic patterns increases with the degree of neoplastic change. So, when it is difficult to describe the pattern of the vessels, the term atypical vessels is used which describes the terminal vessels that are irregular in their size, shape, coarse and arrangement indicating neoplasia [Figure 12]. With this increased growth of neoplastic tissue

there is an increased demand for the oxygen and nutrition initiating more angiogenesis and local tissue production of VEGF, PDGF, EGF, and other cytokines, resulting in the proliferation of blood vessels and neovascularization [22].

**4. Irregular surface:**
With the growth of the tumor many abnormal surface patterns are observed such as ulceration of the surface epithelium due to the loss of intercellular cohesiveness secondary to the loss of desmosomes and irregular contour because of a papillary characteristic of the lesion.

Finally after a complete examination of the oral mucosa the colposcopist determines the areas with the highest degree of visible abnormality followed by the biopsy from where specimens measuring around 6mm punch were taken and sent for histo-pathological examination [23]. [Figure if needed]

**Conclusion:**
The selection of more representative sites of oral mucosa for biopsy is a key to success in histopathological diagnosis of any oral mucosal lesion than routine clinical examination alone, hence colposcopy also called as direct microscopy can be definitely used to achieve this successfully but its regular implementation in oral biopsy is often needed.

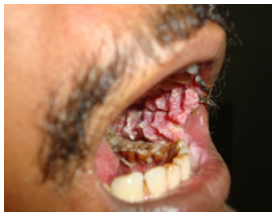

**Figure 1: Cancerous lesion with induration**

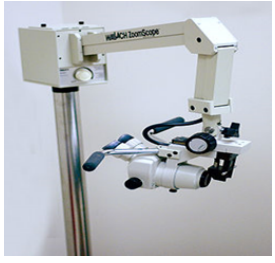

**Figure 2: Colposcopy**

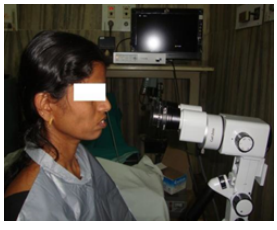

**Figure 3: Examination of the patient**

**Figure 4: Punch biopsy forceps**

**Figure 5: Abnormal tissue demarcated from normal mucosa**

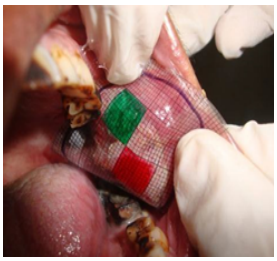

**Figure 6: Area of the biopsy site**

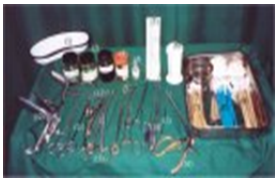

**Figure 7: Colposcopy kit**

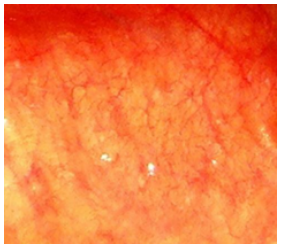

**Figure 8: Network capillaries**

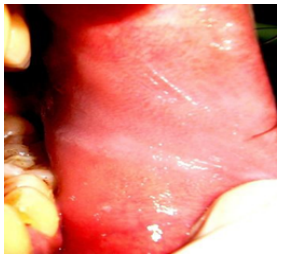

**Figure 9: Hairpin capillaries**

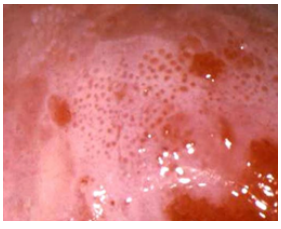

**Figure 10: Punctuation capillaries**

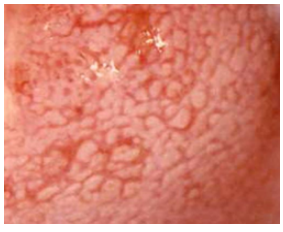

**Figure 11: Mosaic pattern of vessels**

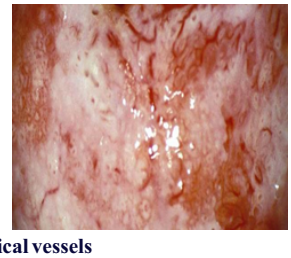

**Figure 12: Atypical vessels**

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