REVIEW OF LITERATURE
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COLPOSCOPY

It is a unique method of diagnosing and observing any cervical or vaginal lesion in vivo.

In 1925, Hans Hinselmann, Director of Gynaecological Clinic of University of Hamburg, invented optical device that permitted him to examine the surface of uterine cervix under great magnification. The instrument consists of a binocular magnification with sharply focussed light which could detect the earliest cancer of the uterine cervix. For his first experiment, Hinselmann used a binocular magnifying lens placing on a pile of books at the level of patients' vagina. He had constructed the device himself to improve his ability to inspect vulva, vagina and cervical partio. After lengthy trials with Leitz dissecting lenses, he succeeded in fixing the binocular lenses together with a central illumination source onto a movable stand.

From the beginning, Hinselmann was optimistic about the success of his method. He soon formulated the concept that every woman who has had a child should be subjected to colposcopy every one or two years in order to be sure that she was safe from cervical cancer. It was his feeling that formal training was necessary for an individual to do competent colposcopy.
Prior observations of superficial epithelial atypia by Von Franque, Shauenstein, Pronai, Rosthorn, Schottlander and Rubin provided the stimulus that led to Hinselmann's invention and an equally important part was played by technicians at Leitz and Zeiss, and at Moeller and Kern in resolving the complex problems that the idea presented. With the aid of his new exploratory method named colposcopy, Hinselmann described and systematized a number of cervical lesion that had been previously unknown. The great merit of his achievement is not simply the diagnostic instrument itself but the clear understanding of cervical pathology that has resulted from its use. Performance of repeat biopsied and the correlation of histologic slides with colposcopic views permitted Hinselmann to develop a concept of the origin of cervical carcinoma that is still fundamental in the early diagnosis of this disorder (along with Papanicolaou's cytological examination).

Colposcopy was seen being widely practised in Germany, where extensive series of examination were reported and tabulated by Mestwerdt (1939), Hampt (1941), Triete (1942), Ganse (1942) and Limberg (1952). This occurred inspite of the fact that Schillers introduced his Lugol's staining test in 1927, which at first compared with colposcopy and regarded its early adoption. Through the work of Anderes (1936) and
Hespi (1938), Colposcopy was popularised in Switzerland, where such well known practitioners as Glatthaar and de Watteville also described their experience in later years.

The procedure was introduced into Italy by Cattaneo's translation of Hinselmann's Introduction to Colposcopy in 1940, and in Austria by Antione (1949) who tried to improve upon the technique by devising colposcopy.

Palmer made the virtues of colposcopy well known in France in 1950, and its position was strengthened when Frank-Brentano and de Watteville accorded it a pre-eminent position in their discussion of 'Early diagnosis of cervical cancer' in 1952. Since that time important treatises have been written by Bret and Coupez (1960) in France and by Masciotta (1954) and Mossetti and Russo (1962) in Italy, and there have been notable atlases produced in Germany by Mestwerdt (1953), and Cramer (1956). Although significant papers appeared in England, notably the discussion by Youseff (1957), use of the method is still not widespread in that country. Adoption of colposcopy on a general basis in Australia was aided by the reports of Coppins (1959), Browne (1960), Garret (1961) and Cope (1961).

Colposcopy was described relatively early in Spain by Martinez de la Riva in 1944, Alba in 1947, and
Varela in 1957, but its widespread use did not begin until the 1960's following the reports of Gonzalez-Merlo, Rodriguez-Soriano, and Mateu-Aragones and Dexeus.

All in all, the technique actually gained popularity more quickly in Latin America, where particularly important papers included those of Jurgens (1933), Jacob (1939), Goulart de Andrade (1940), Cruz (1941), Reiper (1941), Gori and Bayona (1943) and Rocha (1946).

In United States, however, colposcopy encountered firm resistance, at least in part because it was considered to be a technique that competed with cytology. Scheffey (1955) was one of the first American authors to present his experience with the method; other were Lang and Rakoff (1956), Schmitt (1957) Trace (1959), Olson and Nicholas (1960), Graham (1963) and Dampool (1962). Coppleson and Reid suggested that in addition to the great popularity of cytology and the lack of enthusiasm with which colposcopy was received by leading Gynaecologists, to explain the limited used of colposcopy in the United States one must point to the small number of publications in English and the restricted anatomic and pathologic training of the American Gynaecologist, to whom the complex nomenclature of the traditional colposcopists has been difficult to assimilate.
Hinselmann in 1938, recommended the use of 2% acetic acid, principally because of its albumin precipitating effect on the cervical mucus, which often distorts the examination. There is a corresponding improvement in the clarity of the colposcopic image to the point that many lesions are revealed by this reagent. Difference in cellular density, thickness and keratinization of the mucosa, breaks in the epithelium and even columnar papillae can be clearly seen after acetic acid has been applied. According to Game however, the vascular bed becomes less evident, perhaps due to arteriolar vasospasm.

Various techniques have been proposed to obtain better visualization of the cervical blood vessels. Hinselmann recommended a fluorescent lamp, but this had little or no acceptance. Kruger used ethyl chloride to differentiate typical vessels (which contract upon application of chemical), from the atypical ones of carcinoma (which do not).

Majewski painted the cervix with 1:1000 solution of epinephrine or nor epinephrine and claimed that in 30 seconds the vascular network, especially the capillaries became more evident. Manter favoured this method as with Mateu-Aragones (1947) emphasised that a green filter over the lens provides the best visualization of the vascular bed of the cervix.
Madej (1951) proposed substitution of 5% lactic acid for the acetic acid but there seems to be no advantage to this, except that it may make easier to recognise instances of re-epithelialization. An aqueous solution of metacresyl sulphone methane acid (50% Negatol) may be used for the same purpose.

Lo Wan-Hua has proposed in vivo staining method to be applied after the acetic acid solution. It consists of painting with haemotoxylin solution for 1 to 2 minutes and then 0.5% hydrochloric acid for 1 minute. A positive test implying malignancy, consists of a deep blue stain of any part of the cervix. A light blue colour is read as negative. Lo-Wan-Hua claims a 94% accuracy in early diagnosis of cervical cancer.

Gonzalez-Merlo has emphasised the lack of specificity of Schiller's test, and an experienced colposcopist derives little benefit from it. However, it was thought to be useful adjunct in the differentiation of some atypical images which look like superficially such as from ground structure and vaginitis. Application of Lugol's iodine also makes possible to define the exact limits of a lesion and to study its degree as well as the extent of regularity of the epithelium.
The twentieth century might well be called the age of photography. The usefulness of colpophotographs in discussions of colposcopic problems has become obvious. All current colposcopic presentations rely on such objective material including those of Bauer, Bauer and Seidl, Balten, Cartier, Coppleson, Pixley and Reid, Couper, Carrera and Dexeus, Cramer and Ohley, Fernandes, Ganse Hinselmann and Schitt, Johannison et al.

In 1956, a refinement in the photographic techniques was done by Koller, Kolstad and Stafl, Lane, Lust Menken, Navratil, Rieper and Fonesca, Von Scheidt, Schmitt and Seidl. Photography is now possible without electronic flash by using the combination of a bright halogen light and highly sensitive film. Early results are encouraging although, not entirely satisfactory.

Stereocolpophotography consists, in principle of filming an object simultaneously with two cameras that are separated by a distance of about equal to the spaces between one's eye.

The first successful stereoscopic photography was produced in 1954, with accessories attached to a Kern colpophroscope (Lotmar and Wespi). Stereocameras for colposcopy have been manufactured by Leisgang (Berlin) and by Zeiss (Oberkochen). They made possible the development of series of slides in the women's clinic at Hamburg-
Barmbek (Mestwerdt and Gunther 1958) and Berlin-Moabit (Lax and Zimblars) and more recently the series compiled by St. Seidl at Hamburg all obtained by Leisgang colposcopes. These collections are eminently suitable for independant study. Enlarging these in a view master or stereo viewer offers an impressive stereoscopic effect. This technique was used by Scott to produce the (Stereo-colposcopic Atlas of the uterine cervix, 1957).

Gusten Mesterwerdt in (1949), in his 'Atlas on Colposcopy', described the colposcopic findings of the cervix under different physiological and pathological conditions. He also studied the importance of early detection of cancer cervix.

Sugihara (1958), demonstrated by means of different models, a case of invasive cancer and another of normal cervix considering the limitations of colposcopy, as it is possible to study only the superficial vascular pattern, and when the transparency of the vessels is decreased by hyperkeratosis, necrotic tissue or thick mucus, the vessels becomes invisible.

In 1966, Jahannison, Kolstad and Sodenberg correlated the cytologic and histologic pattern of dysplasia, CIS and early invasive carcinoma by the help of colposcopy.
Coppeloson and Reid (1966), did a colposcopic study of the cervix and studied the various changes brought about during pregnancy. The majority of descriptions follow the criteria espoused by Epperson et al (1968) who characterise the cervical histopathology through the study of its three basic elements, epithelium, stroma and glands.

In 1973, Stafl and Mattingly gave a detailed account of colposcopic diagnosis of neoplasia. They have shown that the atypical vessels frequently represent the first colposcopic feature of invasion, and also suggested that certain colposcopic findings may indicate biological cancers before histological criteria and present to substantiate such a diagnosis.

In 1975, Richarts gave a comprehensive terminology for the premalignant lesions of cervix. He considered dysplasia and carcinoma-in-situ under a term cervical intra epithelial neoplasia.

Koss (1978), Graded CIN in following grades:

Grade I -- Mild dysplasia
Grade II -- Moderate dysplasia
Grade III -- Severe dysplasia and carcinoma-in-situ.

In 1979, Sughimora published a paper on colposcopic findings in invasive carcinoma of the uterine cervix.
They studied the atypical transformation zone analytically with regards to whiteness, surface contour, clarity and levels of margin.

Silman, Boyce and Frutcher (1981) studied the significance of atypical vessels and new vascularization in cases of cervical neoplasia.

In 1982, El Rubinsten described the colposcopic pattern of cervicitis, dysplasia and preinvasive cancer of cervix and classified them as benign, atypical and unspecific.

In 1983, Kolstad gave a detailed account of vascular changes in CIN and invasive carcinoma. He described the two most common patterns of CIN called punctations and mosaic and they may be compared to hairpin and network capillaries. Cervical colposcopy is limited in its ability to diagnose carcinomas that develop high in the cervical canal. It has not yet been determined whether these lesions actually aim at the site as often as they seem to or whether they represent dysplastic patterns that have been mislabelled. It is also difficult to carry out in the presence of haemorrhagic oedema and necrosis.

Colposcopic diagnosis of cervical carcinoma becomes more difficult postmenopausally. The squamocolumnar junction retracts inwardly and with draws from view up into the cervical cancer.
Colposcopic patterns have traditionally been grouped into two classes, typical and atypical, which was proposed by Gonzalez-Merlo, Calve de Mora and others, this classification attempts the definitive separation of totally benign findings from those which imply the existence of histological disorders more or less related to cancer. But this method had a few drawbacks.

Mestwerdt (1960) proposed a division into physiologic, inflammatory and malignant states. For purpose of prognosis, a classification of benign, doubtful and malignant was also proposed.

At the first World Congress of Colposcopy and cervical and uterine pathology at Mardel Plata (November, 1972) it was proposed that colposcopic findings be classified into three groups:

(a) Normal or typical appearances (original mucosa, ectopy, zone of re-epithelialization, and atrophic mucosa).
(b) Pathologic images not related to malignancy (vaginitis, polyps, endometriosis, condyloma, sequelae of coagulation etc).
(c) Pathologic images compatible with malignancy (leukoplakia, ground structure, mosaic, erosion, zone of atypical transformation, atypical vascularization, uncharacteristic iodine negative zone carcinoma).
In German speaking circles, Hinselmann's original nomenclature has recently been in wide use. It is purely descriptive in form and is not intended to be related to cytologic or histologic characteristics. This system would have sufficed had it not been for the international spread of colposcopy, and the series of discoveries that accompanied its dissemination.

Another proposal for classification was developed during the second World Congress on Cervical Pathology held in Graz in 1975. This was discussed and modified by a task force on colposcopic nomenclature during the third session at Wiesbaden in 1976.

Three types of colposcopic patterns are now distinguished:

1. Normal findings (85 percent of all cases)
   (a) Squamous epithelium
   (b) Columnar epithelium
   (c) Transformation zone

2. Variations from normal
   (a) Inflammation
   (b) Polyp, cyst, papilloma, condyloma and other benign lesions
   (c) Erosion
   (d) Atrophic change
3. Abnormal findings:
(a) Leucoplakia
(b) Punctations
(c) Mosaic
(d) Acetic positive (white) epithelium
(e) Iodine negative area
(f) Combination forms
(g) Atypical transformation zone
(h) Changes suggestive of carcinoma

Although an internationally uniform system for designating colposcopic findings has been achieved thus is not complete compliance with it. Some authors add a fourth group to include findings that are indescribable.

Comparison of Old and New nomenclatures

<table>
<thead>
<tr>
<th>Old</th>
<th>New</th>
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<tr>
<td>Original mucosa</td>
<td>Squamous epithelium</td>
</tr>
<tr>
<td>(a) Primary</td>
<td>(a) Mature</td>
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<tr>
<td>(b) Secondary</td>
<td>(b) Immature</td>
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<tr>
<td></td>
<td>(c) Atrophic</td>
</tr>
<tr>
<td>Ectopy</td>
<td>Columnar epithelium</td>
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<tr>
<td>Transformation zone</td>
<td>Transformation zone</td>
</tr>
<tr>
<td>(a) Fresh</td>
<td></td>
</tr>
<tr>
<td>(b) Old, vascular</td>
<td></td>
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<tr>
<td>Atypical epithelium</td>
<td>Atypical epithelium</td>
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</table>
Ground structure
(a) Fine
(b) Coarse
(c) Mosaic
Leucoplakia
(a) Fine
(b) Coarse
Atypical vessels
Surface alterations
True erosion
Mosaic
Keratosis
Atypical vessels
Surface alterations
Epithelial defects, ulcer

Colposcopy has played much greater role than cytology in screening the very early stages of cervical intraepithelial neoplasia. The practical problem involving cytologic methods are based on the work of Papanicolaou who in collaboration with Stokard (1917) reported the cyclical changes seen in the cells exfoliated from vaginal epithelium.

If routine cytological examination of a smear shows abnormality short of invasive cancer, colposcopic examination, along with a directed biopsy of cervix is the procedure of choice (Roseman et al 1980).

A combined use of cytology and colposcopy improves the rate of detection of serious abnormalities of the cervix and makes conization unnecessary in all, but in a few cases (Roachowiasg 1978).
<table>
<thead>
<tr>
<th>Study</th>
<th>Cytopathy</th>
<th>Colposcopy</th>
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<th>Target biopsy and surgical specimen</th>
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The false negative rates reported by various authors have been

<table>
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<th>Authors</th>
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False positive rates

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</table>

Colposcopy helps to recognize false positive cytology and avoids unnecessary cervical conization (Feldman et al, 1976) 2.3% of histologically verified precancerous cervix had unsuspected colposcopy (Bereliter et al 1975).

The general tendency for medical practice to refine diagnostic approaches, however, gave colposcopy new impetus. During the past few years, renewed initiatives from the United States and France, utilizing improved
techniques, have shown colposcopy to be more and more indispensible to the Gynaecologist. This applied especially to its capacity to aid in differential diagnosis, as well as to the many other attributes that have been recognised over the half century of its use. Above all else, colposcopy has been shown to be reliable in identifying benign conditions. Thus it plays an increasing role in averting unnecessary use of hot cryo or cryotherapy of the cervix. It has recently been shown that even in elderly women, cancer prophylaxis may be useful. At any rate, there is no longer any question of cytology competing with colposcopy. Quite the contrary, the procedures complement each other ideally. The inherent limitation of cytology are counter balanced some what by colposcopy.

The present study is undertaken to demonstrate the complementary roles of cytology and colposcopy in the early detection of cancer cervix.