Cervical Cytology and Colposcopy

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Colposcopy was first described by Hinselmann of Hamburg in 1925. The colposcope is a binocular microscope of low power (10× to 25×) which contains a light source and is mounted on a stand to permit its use in the study of the surface of the uterine cervix. Using the colposcope, the physician can identify and evaluate cervical epithelial abnormalities.

Cytology, as a means of diagnosing cervical cancer, was introduced to clinical medicine by Doctors Papanicolaou and Traut of New York in 1943. With improvements in technique and specificity, cervical cytology has become the most practical and effective means of screening for preinvasive and early invasive cancer of the uterine cervix.

In the past, colposcopy and cytology have been considered to be competitive diagnostic techniques. Now, they are being used in a complementary manner to improve diagnostic accuracy, determine therapy, and evaluate results. Their combined use has significantly decreased the need for cold knife conization of the cervix, thereby reducing morbidity and costs.

As most cervical neoplasia develops about the squamocolumnar junction of the cervix, the following discussion will include a review of the biological activity of the area, brief mention of the cytologic sampling technique, the evolution of colposcopic patterns, and the presentation of a schema for the combined use of cervical cytology and colposcopy in the diagnosis and management of cervical neoplasia.

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Transformation Zone

During childhood and the reproductive years the squamocolumnar junction of the uterine cervix is usually located on the vaginal portio. Changes in vaginal pH, trauma, and other local environmental factors cause the multipotential reserve cells underlying the columnar epithelium to undergo squamous metaplasia and the basal cells of the squamous epithelium to proliferate in order to replace the more fragile columnar epithelium with a more resistant squamous epithelium. As these processes are continuous, the squamocolumnar junction tends to retreat within the distal endocervical canal. Therefore, the majority of premenopausal women will have the squamocolumnar junction of their cervix located on the vaginal portio while postmenopausal women are more likely to have the squamocolumnar junction of their cervix located within the distal endocervical canal where it is less accessible to direct visual examination.

The squamocolumnar junction and the surrounding areas of active squamous metaplasia combine to make up the transformation zone. Typical squamous metaplasia implies that the process is orderly and predictable, resulting in the production of normal squamous epithelium. Occasionally, atypical squamous metaplasia takes place. Some of the resultant atypical epithelium resists further change and persists as such or is replaced at a later date by normal squamous epithelium. That which is less resistant to change may progress, in an orderly sequence, through the various stages of dysplasia to carcinoma in situ and even to invasive carcinoma of the cervix. At this time there is no practical means of determining which atypical lesion will regress, persist, or progress to ad-

vanced neoplasia. Therefore, the identification of any degree of cervical neoplasia requires investigation and eradication if its course is to be interrupted. Fortunately, cervical intraepithelial neoplasia (CIN) develops over a long enough period of time to permit its detection, documentation, and eradication. The complete removal of the lesion prevents its progression to invasive carcinoma. New recurrences appear to repeat the developmental sequence from the beginning, rather than initiating it at a more advanced stage.

Cervical Cytology

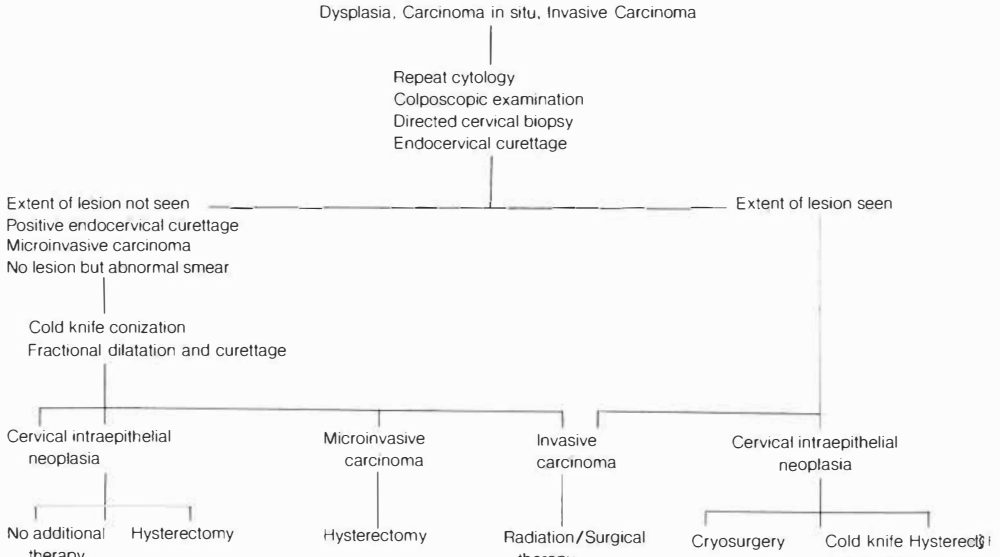
Care should be exercised in obtaining the best possible specimen for cervical cytology. The endocervical canal should be aspirated in order to obtain an endocervical specimen; then a thorough abrasive scraping of the entire transformation zone should be performed using a plastic spatula shaped to conform to the external cervical os. Immediate smear preparation and fixation reduce artifacts. After appropriate staining, it is possible for the cytopathologist to evaluate the smear and classify the findings, using cytologic terminology, as normal, atypical, dysplastic (mild, moderate or severe), carcinoma in situ, microinvasive, or invasive carcinoma. The diagnosis can be highly accurate and lesion specific. Often cervical and vaginal infections can be diagnosed by cytologic examination which, if recognized, should be reported to the clinician. All patients with evidence of cervical neoplasia on cytologic screening are candidates for colposcopy.

Colposcopy

The colposcope is used to visualize the portio and identify lesions recognizable because of alterations in vasculature, surface contour, color and opacity. Research has shown that most cervical neoplasia is unifocal in origin and that lesions which exhibit these alterations are the same ones that are responsible for the abnormal cytologic smears.

During the process of normal squamous metaplasia the vascular bundles which serve the columnar epithelium usually recede and form a flattened vascular layer underlying the new mature squamous epithelium. In the case

TABLE
Cervical Cytology



Frequent follow-up examinations are indicated after therapy for cervical neoplasia.

of cervical neoplasia, these vascular bundles persist among the clones of neoplastic cells. The evolution of colposcopic patterns is the result of layers of nuclear dense neoplastic cells covering up or distorting the vasculature to the surface epithelium. If neoplastic cells form layers across the top of the vascular bundles, the surface epithelium loses its pinkish color; if this epithelium is treated with 3% acetic acid, its metaplastic cells take on a white appearance. This colposcopic picture is referred to as white epithelium. On occasion, the neoplastic cells will form cuffs about the vascular bundles, and the tips of the vessels within the bundles will undergo dilatation. The resultant colposcopic picture is one of stippling or punctation. As these vascular bundles are connected by smaller vessels so as to form vascular baskets, and as neoplastic cells crowd within and about all these vessels, the dilated tips of the vascular bundles and the interconnecting vessels may both be visible giving the colposcopic picture of a mosaic. White epithelium, punctation, or the mosaic pattern may be seen singly or in combination, and to a lesser or greater extent. Experience enables the colposcopist to grade these findings into CIN I (minimal or mild dysplasia), CIN II (moderate dysplasia), or CIN III (severe dysplasia or carcinoma in situ). All lesions should be mapped in the patient's chart and biopsied. Endocervical canal curettage is recommended. To avoid inappropriate therapy, no patient should be treated solely on the basis of cytologic and/or colposcopic findings. It is essential to know the limits of all lesions and to have histologic documentation of each.

Correlation of Data

Cytologic, colposcopic, and histologic diagnosis must be in agreement in order to proceed with therapy. It must be remembered that although the volume of tissue obtained by cervical biopsy is larger than that obtained by cytologic sampling, the latter has the capability of sampling a more extensive area of the cervix. As cytologic and histologic diagnoses are lesion specific, receipt of a more advanced diagnosis of cervical neoplasia on cytologic examination than on histologic examination could mean that the most advanced lesion was not recognized colposcopically and therefore escaped biopsy. Should this occur a repeat colposcopic examination with directed biopsy or cold knife conization of cervix should be performed.

Using the schema in the Table, it is possible to combine the use of cervical cytology and colposcopy to identify histologically the most advanced cervical lesion in approximately 90% of cases. Conization of the cervix is still required when no cervical abnormalities consistent with the cytologic abnormality are found, the extent of the lesion cannot be ascertained, endocervical canal curettings are positive for neoplasia, or microinvasive cancer of the cervix is diagnosed. Failure to perform a cold knife conization and fractional dilatation and curettage in such cases may result in failure to detect the most advanced stage of cervical neoplasia or to appreciate the extent of disease. This has been a cause for inappropriate therapy and subsequent recurrence of cervical intraepithelial neoplasia and carcinoma.

REFERENCES

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