

Distinguished expert series

by S. Dexeus *et al.*

The role of colposcopy in modern gynecology

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Summary

The purpose of this review is to demonstrate that colposcopy, introduced in 1925 – which is, notably before the development of great technological advances in modern gynecology – continues to be a valid technique without essential innovations to the original method described at the beginning of the last century.

Colposcopy was developed in Germany during the rise of Nazism with the Second World War being an important barrier for the spread and diffusion of the technique. Colposcopy, however, continued to progress in a few countries such as Spain, Italy, Brazil, France and Switzerland.

When colposcopy was introduced in the United States during the 70s, its use was mostly restricted to specialists who were almost exclusively dedicated to cervical pathology and knowledgeable about cytopathology, anatomic pathology, and colposcopy and who were competent both in the diagnosis and treatment of cervical lesions. These circumstances were completely different from what happened in the majority of European countries where colposcopists were trained as gynecologists and their histocytological knowledge, which was focused on the lower genital tract, was somewhat more extensive than that acquired by specialists in gynecology.

There are two clearly different trends in relation to the use of colposcopy with characteristic geographic distribution: countries with an Anglo-Saxon influence in which colposcopy is performed *selectively*, and countries with a German medical inheritance in which colposcopy is carried out *routinely* during a standard general gynecological consultation. However, this difference is not restrictive and by no means can it be stated that colposcopy is systematically being used by all European or Latin American gynecologists for reasons related to training in the colposcopic technique.

In 1977, we introduced the concept of *dynamic* colposcopy with the aim of differentiating it from the descriptive immobility of the original classification of Hinselmann (1954) that had remained almost unchanged by his immediate followers. Briefly, the objective was to turn colposcopy into a diagnostic tool able to identify the pathological substrate corresponding to traditional colposcopic images. We established ten differential signs that allow us to classify an ATZ area as subsidiary or not to be biopsied. The classification system proposed in Rome (International Federation of Cervical Pathology and Colposcopy [IFCPC], 1990) supports our original concept because by identifying major or minor changes in the original images, a diagnosis of the severity of the lesion can be established.

With regard to specificity, the figures range between 48% and 10% with 96% for sensitivity. Obviously, a wide range of colposcopic specificity must be related to the expected efficacy of the method. When after biopsy of an atypical colposcopic image, only a low-grade lesion is detected, should this be considered a false positive colposcopic result? Although histopathologic findings are accepted as the “gold standard”... it is well known that a certain degree of subjectivity can be present. Inter- and intra-observer differences (when the same pathologist is reviewing the diagnosis after a certain time lapse) may be present.

It has been argued that microbiopsy under colposcopic control gives rise to a wide error range and that it cannot be considered representative of the lesion. It is likely that this situation may occur when colposcopy-guided biopsy is performed by inexperienced hands or when biopsy is limited to small and insufficient sampling. A very important colposcopic sign, such as complete visual inspection of the squamocolumnar junction is frequently missed. Any lesion with boundaries in the endocervix, cannot be simply assessed by means of microbiopsies from the ectocervix unless there is no doubt regarding the severity of the lesions. Microcolpohysteroscopy (MCH) may be of great value in these cases by showing the limits of endocervical involvement.

Conclusions: According to the evidence presented here, it can be concluded that “colposcopy is in good health” and that probably the popularity of this technique in the field of gynecology would increase if cytopathologists and gynecologists’ tasks were limited to their own fields rather than turning them into improvised specialists for their counterpart disciplines. The coordinating role of the gynecologist as a specialist for integral women’s health should continue to be defended and in this respect, colposcopy should be considered a routine technique in daily practice.

Introduction

It was not long ago that if we had been told that the human fetus could be photographed just like a patient or that very early ectopic pregnancies could be diagnosed by ultrasound examination, we would probably never have believed it. These and many other scientific progresses had been taking place during the past 30 years.

The purpose of this review is to demonstrate that colposcopy, introduced in 1925 – which is, notably before the development of great technological advances in modern gynecology – continues to be a valid technique without any essential innovation to the original method described at the beginning of the last century. We may even go further if we really want to preserve the essence of our specialty, and say that techniques with marked clinical characteristics such as colposcopy may well constitute a pillar of gynecology in the future. This will be characterized by a high technological level in association to which human factors and solidarity with patients should never be lacking.

Colposcopy in different countries

It is evident that there are diverse approaches to the use of colposcopy according to different settings. Colposcopy was developed in Germany during the rise of Nazism with the Second World War being an important barrier for the spread and diffusion of the technique. Colposcopy, however, continued to progress in a few countries such as Spain, Italy, Brazil, France, and Switzerland; in the case of the European countries it was because of a direct influence of German medicine, and in the case of Brazil it was due to the activity of gynecologists from an important colony of German immigrants who mainly settled in the south of the country.

Despite the fact that the technique has been introduced for more than 75 years and that it has practically not been modified since the original description by Hinselmann, its worldwide recognition and use has been quite irregular due to a number of circumstances. First of all, political reasons derived from the Second World War resulted in the disappearance of the leadership of German medicine that had had an important influence on European countries in the past. Moreover, the suspicion of Nazism in the years past determined that some German university clinics faded away from the international scientific scene. This was the case of Hamburg, the cradle of colposcopy.

When colposcopy was introduced in the United States during the 70s, its use was mostly restricted to specialists who were almost exclusively dedicated to cervical pathology and knowledgeable about cytopathology, anatomic pathology, and colposcopy and who were competent both in the diagnosis and treatment of cervical lesions. These circumstances were completely different from what happened in the majority of European countries where colposcopists were trained as gynecologists and their histocytological knowledge focused on the lower genital tract, was somewhat more extensive than that acquired by specialists in gynecology.

In our hospital, all 30 staff gynecologists have a colposcope in the office; however, when there is a case of abnormal or atypical cytological findings, the patient is referred for diagnostic confirmation and eventual treatment to the unit of lower genital tract diseases. This approach allows us to have available a highly specialized unit in diseases of the lower genital tract that, on the other hand may be attended by gynecologists who desire training in colposcopy.

It can be easily understood that a colposcopic examination may cost up to \$400 in the United States because cases of abnormal cytology are referred to specialists, whereas in our environment, colposcopic examination is being carried out by simple insertion of a speculum or palpation of the vagina and, therefore, an extra-cost to the gynecological consultation by itself is not justifiable.

Accordingly, there are two clearly different trends in relation to the use of colposcopy with characteristic geographic distributions: countries with an Anglo-Saxon influence in which colposcopy is performed *selectively*, and countries with a German medical inheritance in which colposcopy is carried out *routinely* during a standard general gynecological consultation. However, this difference is not restrictive and by no means can be stated that colposcopy is systematically being used by all European or Latin American gynecologists for reasons related to training in the colposcopic technique (see below).

Colposcopy training

In the Obstetrics and Gynecology programs of the different Faculties of Medicine in Spain, no more than 90 minutes are devoted to teaching all topics of the lower genital tract, and the notion of colposcopy acquired by the student is a limited knowledge about “an optic instrument that is useful in the early diagnosis of cervical cancer, mainly to obtain directed biopsies”.

During the years of fellowship, postgraduates will be able to learn pathophysiology of the lower genital tract, the usefulness of different diagnostic techniques, and various therapeutic modalities, including an

opportunity to perform local excisional treatments (in the same manner as cold conization was learned in the past), but very rarely will they be able to acquire adequate expertise as colposcopists.

When the degree of "diagnostic accuracy", i.e., the correlation of colposcopic findings with histopathological diagnosis, throughout the years of fellowship is compared, an improvement in results obtained for each consecutive year has not been observed. Thus it may be concluded that future specialists may acquire an acceptable level of knowledge of pathology of the lower genital tract, but it will mainly depend on the personal attitudes and resources of the training hospital. In summary, colposcopy training during fellowship is conditioned by:

- Lack of a structured and progressive training program in respect to extent of scientific knowledge.
- Lack of stimuli to be trained in-depth for colposcopic diagnosis.
- Adequacy of department facilities for colposcopy training.

However, it is likely that a scarcity of colposcopic knowledge would be mostly related to the lack of interest of gynecologists than to deficiencies in the training program of postgraduates. (In the Spanish program for subspecialists in oncological gynecology, 75% of the program is devoted to diagnosis, including colposcopy and surgery). The majority of colposcopists have been trained in courses, symposia, etc., i.e., teaching activity that is included in the concept of *continuing medical education*, which in a few states is properly organized and controlled. The system of credits and quality control of continuing medical education should be established by universities, academic or national scientific authorities and/or by supranational bodies.

The requirements for a Colposcopy Unit with medical care and teaching responsibilities have been perfectly defined [1]. Ideally, the most important targets are as follows:

- Homogeneity of the teaching programs.
- Common terminology based on criteria of the international classification system proposed in Rome, in 1990.
- Adoption of the concept of *dynamic colposcopy*. Complete specialists in lower genital tract disease, coming or not from subspecialists in oncological gynecology.
- Definition of minimum standards and control of quality of teaching in any aspect of continuing medical education.
- Routine use of the colposcope in gynecological daily practice.

Dynamic colposcopy

In 1977, we introduced the concept of *dynamic colposcopy* [2] with the aim of differentiating it from the descriptive immobility of the original classification by Hinselmann (1954) which had remained almost unchanged by his immediate followers. Briefly, the objective was to turn colposcopy into a diagnostic tool able to identify the pathological substrate corresponding to traditional colposcopic images. There is no difficulty in recognizing irregular punctation and mosaic patterns in a few minutes with the simple observation of high-quality pictures and images – however deciding whether or not to take a biopsy of an atypical transformation zone (ATZ) area exclusively on the basis of colposcopic signs, is not an easy task and requires adequate training. We established ten differential signs that allow us to classify whether an ATZ area should be biopsied. The classification system proposed in Rome (International Federation of Cervical Pathology and Colposcopy [IFCPC], 1990) supports our original concept because with means to identify major or minor changes in the original images, a diagnosis of the severity of the lesion can be established (Tables 1-3).

Because colposcopic "severity" should coincide with histopathological relevance of the lesion, an accurate definition of what "severity" means is of outmost importance.

With regard to specificity, figures range between 48% and 10% [3, 4] with 96% for sensitivity [4]. Obviously, a wide range of colposcopic specificity must be related to the expected efficiency of the method. When after biopsy of an atypical colposcopic image, only a low-grade lesion is detected, should this be considered a false positive colposcopic result? Although histopathologic findings are accepted as the "gold standard", it is well known that a certain degree of subjectivity can be present. Inter- and intra-observer differences (when the same pathologist is reviewing diagnoses after a certain time lapse) may be present.

It has been argued that microbiopsy under colposcopic control gives rise to a wide error range and that it cannot be considered representative of the lesion. It is likely that this situation may occur when colposcopy-guided biopsy is performed by inexperienced hands or when biopsy is limited to small and insufficient sam-

Table 1. — *Colposcopic terminology (IFCPC, Rome 1990)*

A) Normal colposcopic findings
Original squamous epithelium
Columnar epithelium
Normal transformation zone
B) Abnormal colposcopic findings
C) Suspicion of invasive carcinoma
D) Unsatisfactory colposcopy
SC junction not visible
Severe inflammation or atrophy
Cervix not visible
E) Miscellaneous findings
Micropapillary surface (no acetowhite changes)
Exophytic condyloma
Inflammation
Atrophy
Ulcer
Others

Table 2. — *Abnormal colposcopic findings*

– Acetowhite epithelium
– Flat or micropapillary or microconvoluted
– Punctation
– Mosaic
– Leukoplakia
– Iodine negative
– Atypical vessels
Within or outside the transformation zone
Minor or major changes

Table 3.

Colposcopic image	Minor changes	Major Changes
Acetowhite epithelium	clear	dense
Mosaic	fine	coarse
Punctation	fine	coarse
Leukoplakia	thin	thick
Atypical vessels	no	thick
Erosion	no	yes

pling. A very important colposcopic sign, such as complete visual inspection of the squamocolumnar junction is frequently missed. Any lesion with boundaries in the endocervix cannot be simply assessed by means of microbiopsies from the ectocervix unless there is no doubt regarding the severity of the lesions. Microcolposcopy (MCH) may be of great value in these cases showing the limits of endocervical involvement.

Relevant indications of colposcopy

1. *Early diagnosis of cervical carcinoma.* The simultaneous use of cytology and colposcopy for the secondary prevention of carcinoma of the uterine cervix was only applied at the beginning of the use of cytology as a screening method, and in few centers. In a previous publication [5], it was shown that the simultaneous use of cytology and colposcopy provided diagnostic efficiency rates near to 100% (Table 4). At the present time, however, the combined use of both techniques is unfeasible since cervical cancer screening programs are designed for populations at large, and colposcopy should be reserved as a second-line diagnostic tool for cases with abnormal cytological findings. Recent evidence from the literature and consensus meetings (Bethesda September 2001) recommended DNA-human papilloma virus (HPV) assay, not only as an aid in deciding the treatment of choice in cases of abnormal cytology, but also for designing new screening programs in which intervals between cytological screening may be extended in patients with negative DNA-HPV testing [6-8]. Some authors [9] have shown that HPV testing when used in combination with cytology does not offer better results than those obtained with second-line colposcopy thus questioning the validity of HPV assay in clinical practice [10, 11]. It may be possible that in the future, new strategies will allow us to substitute cytology totally or partially as a primary method for early diagnosis of cervical carcinoma, but until the actual efficiency of other methods is established, the value of cytology remains unaltered. This statement is not invalidated by the high rate of negative cytological results and false positives, and only force us to carry precautions to an extreme in the control of quality both at the cytology laboratory and at the sampling procedure.

2. *Cervical pathology.* It is well known that colposcopy has its principal indication in the diagnosis of cervical pathology. Recognition of highly specific colposcopic signs alerts an expert colposcopist to call in ques-

Table 4. — *Diagnosis of cancer of the cervix using cytology and colposcopy simultaneously*

First author, year	Correct diagnoses cytology, %	Correct diagnosis colposcopy, %	Correct diagnoses both techniques, %
Limburg, 1965	89.0	97.0	99.4
Navratil, 1964	87.0	79.1	98.8
Coppleson, 1967	93.0	92.0	98.0
Cope, 1969	90.0	95.0	95.0
Dexeus, 1972	91.0	94.1	98.9

Data in ref. no. 2.

tion the histopathological nature of a lesion that is under his/her vision, as well as to guide biopsy forceps to the most representative and indicative area of the process. Although definition of the different colposcopic signs is beyond the objective of this study, some representative images of low-grade and high-grade cervical lesions are here presented.

The colposcopic signs proposed in the classification used at our center [5] constitute a “decatalogue” (Table 5) that includes all signs proposed in the IFCPC classification (Rome, 1990) and some others. Keratinizing gland openings adopting a ring or a drop shape in association with absence of areas of metaplasia characteristic of normal transformation zones (Figure 5) is a very characteristic sign. In-depth knowledge of colposcopic signs allows us to establish a diagnosis of lesion “compatibility”, with directed biopsy as the final diagnostic step. In some cases, however, wide excision of the lesion is needed to establish an unequivocal diagnosis.

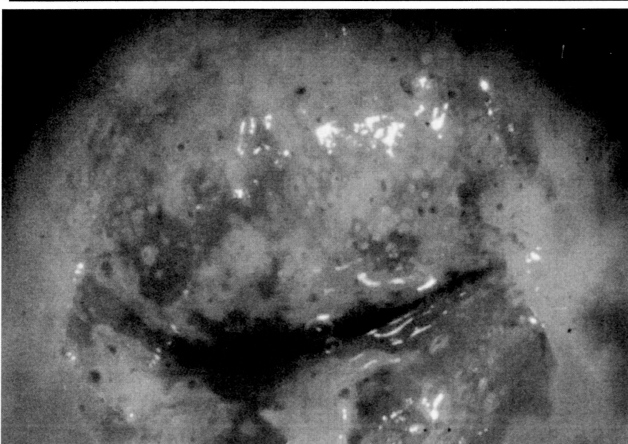
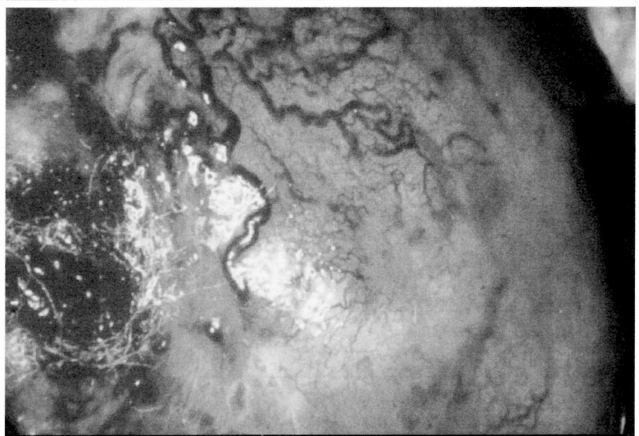
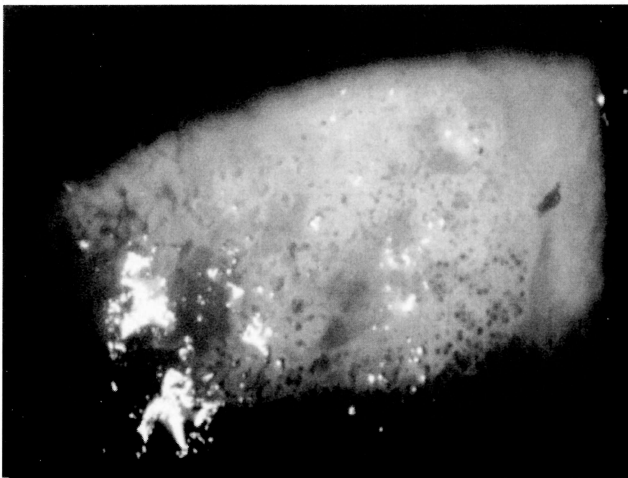
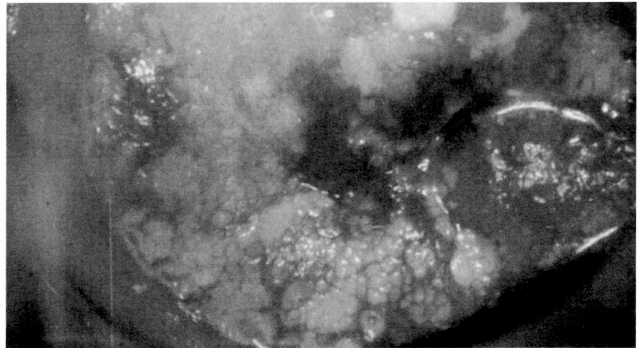
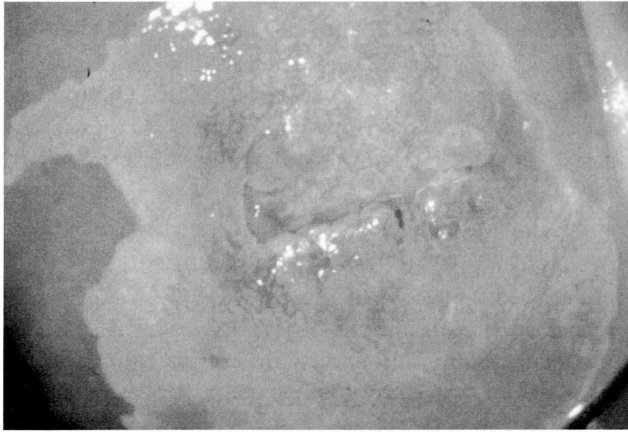


Figure 1. — Regular, whitish epithelial surface with flat mosaic. The colposcopic diagnosis is compatible with a low-grade lesion.

Figure 2. — Erosion, leukoplakia, and rough mosaic. Diagnosis: invasive carcinoma.

Figure 3. — Swollen points of punctuation: Diagnosis: colposcopic lesion compatible with microinvasive carcinoma.

Figure 4. — Atypical vessels. Diagnosis: colposcopic image compatible with carcinoma.

Figure 5. — Atypical transformation zone.

All these considerations support the concept of *dynamic* colposcopy which, in turn, is an indispensable tool in gynecological consultation.

3. Particular cases

– Low-grade squamous intraepithelial lesions, atypia squamous cells of undetermined origin, glandular atypia of undetermined origin, and cytological HPV. Although cytological diagnoses for each of these lesions are different, they are considered together given that colposcopy plays the same role in the algorithm for decisions regarding the management of these conditions (Table 6). In summary, definite colposcopy (i.e., where the limits of the columnar epithelium is clearly visible) usually plays a conclusive role in diagnosing a lesion. (In our experience, the percentage of positive cytological results for squamous cell/glandular atypia of undetermined origin and low-grade squamous intraepithelial lesions is 0.1% and 0.5%, respectively).

– High-grade squamous intraepithelial lesion. In this case, immediate colposcopy is the only valid approach, with diagnostic discrepancies occurring very rarely (in these circumstances, full study of the lower genital tract and the endocervix is mandatory).

– Inflammatory cytology. Colposcopy is highly desirable since inflammatory cytology may hinder a certain number of squamous intraepithelial lesions that may pass undiagnosed but which may be identified at colposcopy.

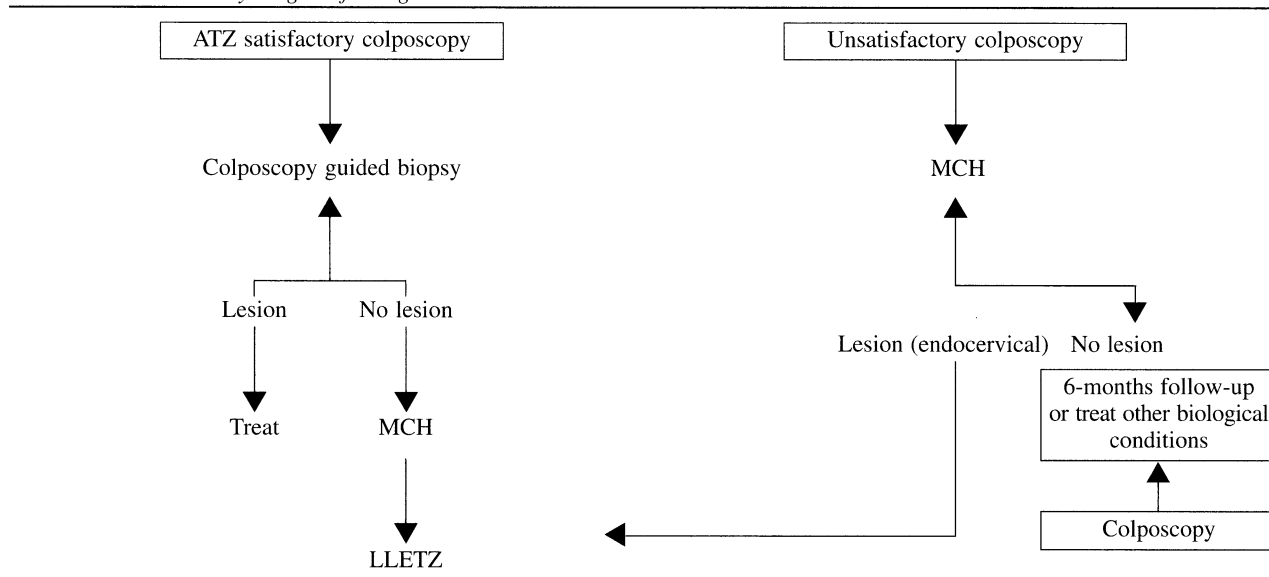
– Benign pathological conditions. Colposcopy is indispensable for the diagnosis and treatment of small cicatricial granulomas, polyps, tears, or trauma lesions. It is also very useful in the recognition of fistula openings, endometriosis nests, and as a diagnostic complement of congenital abnormalities of the lower genital tract. Colposcopic signs of infection (in many cases, asymptomatic) range from identification of characteristic findings of leukorrhea to pathognomonic colposcopic images (Figure 6).

4. Control of lesions and treatment. It is universally accepted that treatment of squamous intraepithelial lesions diagnosed during pregnancy can be delayed after delivery and that lesions can be controlled during

Table 5. — Colposcopic differences between highly significant and nonsignificant atypical transformation zones

Colposcopy	Nonsignificant ATZ	Highly significant ATZ
Acetic acid	nonvisible	visible
Limits	precise	imprecise
Perilesional reaction	absent	present
Site	usually near ectopy	rarely associated with ectopy
Epithelial trauma	no alteration	erosion, ulcerations
Visual density	stronger in periphery	stronger near JC junction
Vascularization	normal vessels	atypical vessels
Colposcopic images	only one type	superimposed, various types
Glandular openings	absent	present, often queratinized

Table 6. — Abnormal cytological findings



gestation. Colposcopic studies allow an accurate control of the growth of the lesion, particularly with images obtained by digital imaging colposcopy.

5. *Follow-up.* Colposcopy together with cytology is an excellent tool for the control of lesions that had been treated by means of excisional biopsy or laser (Figure 7).

6. *Topographic distribution of lesions.* Assessment of the topography of lesions (multifocal areas, size, etc.) is extremely important for correct staging and treatment in oncological gynecology (e.g., colposcopy may detect vaginal spread in a stage Ib lesion without apparent extension to the naked eye, and consequently, restaging and adequacy of treatment including extensive vaginal excision should be recommended). On the other hand, it should be remembered that the more extensive a squamous intraepithelial lesion is, the more possibilities there are for a high-grade lesion to be present.

7. *Colposcopy and menopause.* The degree of atrophy can be precisely assessed by means of colposcopy, and in patients reluctant to take hormone replacement therapy undergoing colposcopy, vaginal dryness potentially associated with other pathologies, such as recurrent bladder infection, dyspareunia, leukorrhea, etc., is susceptible to be treated by replacement therapy, which on the other hand will be much better accepted by the patient.

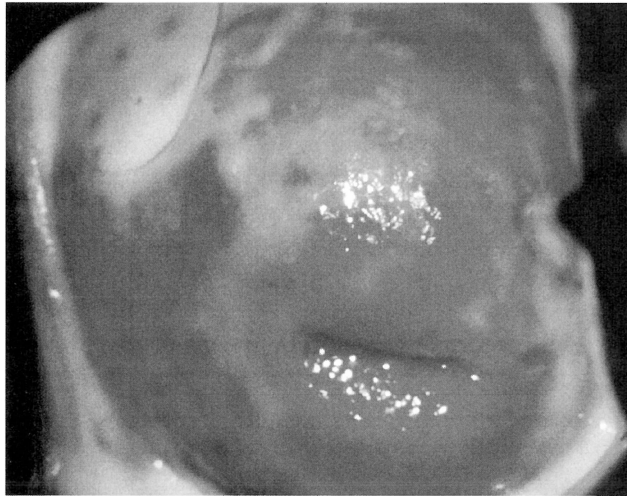
8. *Gynecological symptoms.* Patients presenting with gynecological symptoms especially bloody leukorrhea or metrorrhagia should undergo colposcopy. In these cases false negative cytological results may frequently occur due to insufficient sampling related to lack of visualization of the uterine cervix due to uterine hypertrophy or bloody discharge. Moreover, colposcopy should be immediately performed when there is any doubt regarding the normal macroscopic appearance of the cervix.

9. *Colposcopy-derived techniques.* Although colposcopy should be properly called “cervicoscopy” (study of cervical pathology is the major indication), vaginoscopy and vulvoscopy refer to the use of the colposcope for examining the vagina and the vulva, respectively. The technique is the same as that used for standard colposcopy, although a higher concentration of acetic acid (4%) is recommended for vulvoscopy. Vaginoscopy, however, is more difficult since a virtual cavity is inspected, but colposcopy should be always performed in case of radical surgical treatment of uterine neoplasms in order to detect local recurrences that are difficult to identify with the naked eye. All patients undergoing conservative treatment of squamous cell intraepithelial lesions should require an exhaustive control of the lower genital tract because of the possibility of multifocal or recurrent lesions (Figure 8). Vulvoscopy has similar indications with respect to patients with squamous intraepithelial lesions, although it is mainly recommended in case of vulvar intraepithelial neoplasia which is especially visible with the use of the colposcope (Figures 9 and 10).

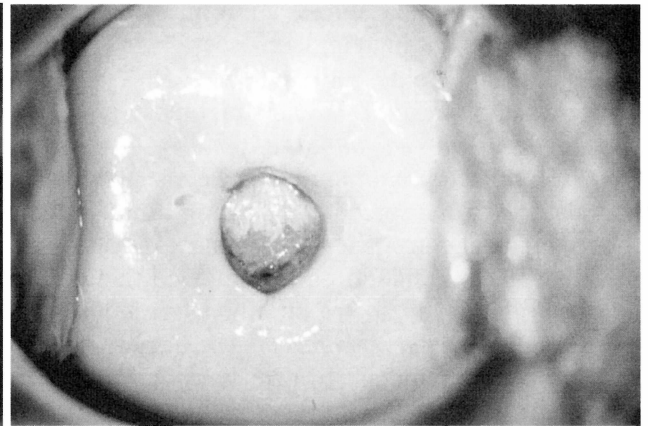
Microcolpohysteroscopy

This technique described by Hamou in 1980 [12-14], with its origins in the colpomicroscopy described by Antoine and Grunberg in 1949, has become a valuable addition to colposcopy. The system of lenses of the microcolpohysteroscope allows a panoramic or *in vivo* microscopic visual inspection of the cervix (60 x and 150 x magnifications for contact work). Supravital stains (Lugol's iodine for visualization of mature squamous cell epithelium and Waterman blue ink [pH 3.14] for the detection of dysplastic and metaplastic cells). Lesions in the ectocervix and in the cervical canal can be accurately assessed (Figures 11 and 12); biopsies can be directed according to severity of the lesions, with pre- and post-treatment biopsy correlations greater than 88% [15, 16]. An excellent design of the lesion can be accomplished thus contributing to the optimal target of conservative management. The percentage of residual lesions was 0.6% in patients undergoing MCH before conization as compared to 10% in the control group [17].

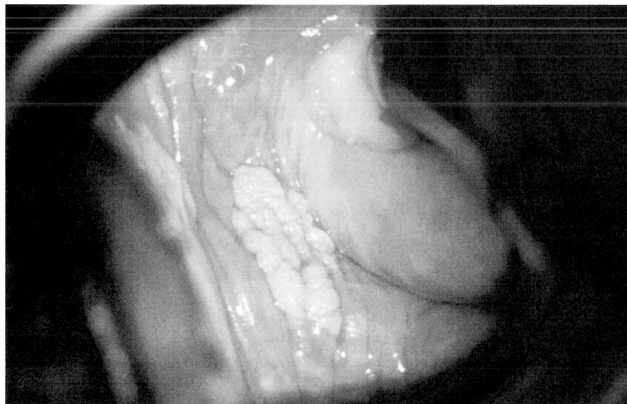
In the experience of our group (Ubeda A, personal communication), in a total of 291 hysteroscopies carried out because of abnormal cytological findings, the presence of histiocytes was the main indication for hysteroscopy (Table 7). In this series, 21 (17.6%) of 119 cytologies with histiocytes from the endometrial stroma showed pathological lesions, whereas pathological lesions were observed in 12 of the 17 cytologies with atypical glandular cells (carcinoma of the cervical canal in 2, adenocarcinoma of the endometrium in 2, and benign processes in 8). When hyperplastic endocervical cells or glandular hyperplasia of the endocervix was diagnosed by cytology, no case of malignancy was diagnosed by hysteroscopy, although there were normal findings in 64% of cases, hypotrophy in 11.2%, and endocervical atrophy in 10.1%. It should be noted that



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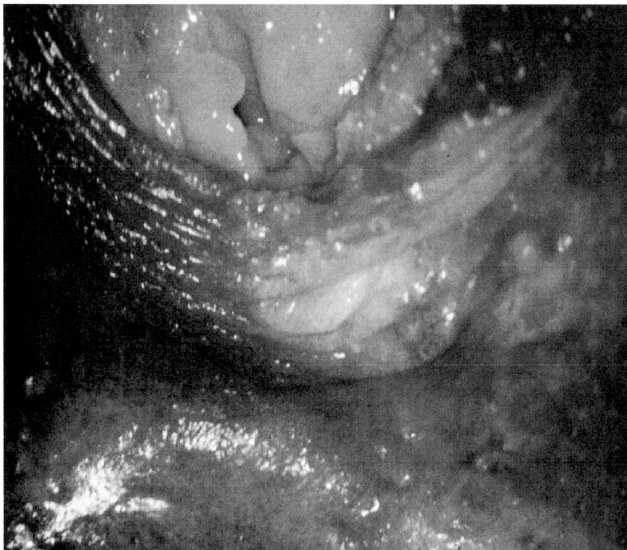
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Figure 6. — White discharge. Colpitis. *Trichomonas* infection.
 Figure 7. — Post laser image of the cervix.
 Figure 8. — Vaginoma.
 Figure 9. — Multifocal VIN.
 Figure 10. — VIN.

in cases of suspicion of endometrial adenocarcinoma, the percentage of concordance was 89.9% (6/8) despite the fact that cytology is not considered to be of value for the screening of this neoplasm.

Conclusions

According to the evidence presented, it can be concluded that “colposcopy is in good health” and that probably the popularity of this technique in the field of gynecology would increase if the tasks of cytopatho-

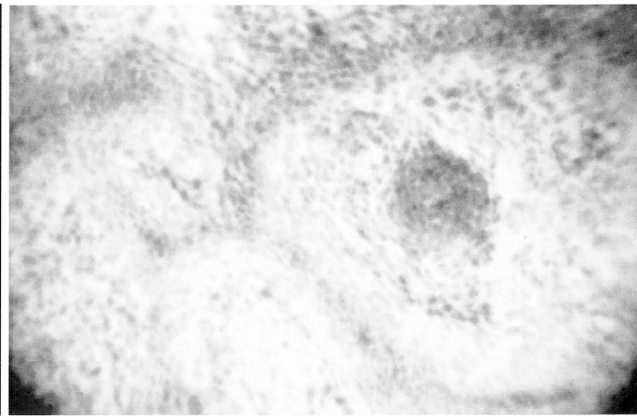
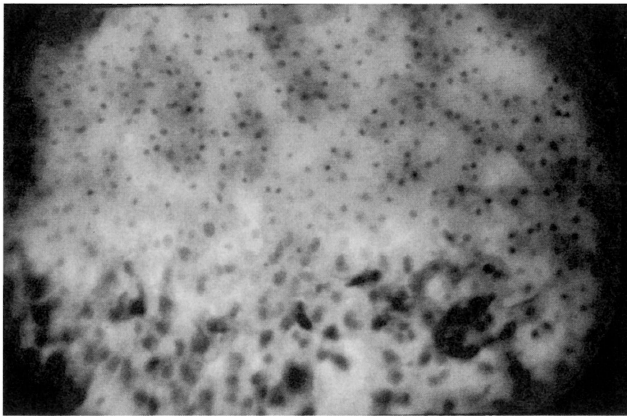


Figure 11. — Microcolpohisteroscopy. CIN lesion at the lower limit of the image.

Figure 12. — Microcolpohisteroscopy. Mosaic and punctuation.

Table 7. — Cytological findings that prompted hysterectomy

Cytology	Number cases	Percentage
Histocytes	119	40.9
Glandular cells with atypia	68	23.4
Hyperplastic endocervical cells	58	19.9
Glandular hyperplasia of the endocervix	31	10.6
Adenocarcinoma of endometrial origin	8	2.7
Fibroglandular polyps	5	1.7
Adenocarcinoma of cervical origin	2	0.7
Total	291	

logists and gynecologists would be limited to their own fields rather than to turning them into improvised specialists for their counterpart disciplines. The coordinating role of the gynecologist as a specialist for women's integral health should continue to be defended and in this respect, colposcopy should be considered a routine technique in daily practice.

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