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Evaluation of Sensitivity, Specificity, Positive and Negative Predictive Values of Digital Cervicography in Diagnosis of Intraepithelial Lesions, Carcinoma in Situ, and Cervical Cancer in Patients Referred to Tabriz Al-Zahra Hospital

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Abstract

Objectives: Visual inspection is a known procedure for cervical cancer screening in low income societies. The present study aimed to assess the sensitivity, specificity, and positive and negative predictive values of digital cervicography in the diagnosis of cervical precancerous lesions.

Materials and Methods: Patients who had referred to Colposcopy Clinic of Al-Zahra Hospital (Tabriz-Iran) between September 23, 2017 and September 23, 2018 and underwent digital cervicography were included in the study. Before the procedure, written informed consent was obtained from all the cases. Digital photographs were captured before and after the application of 4% acetic acid in addition to the routine colposcopy. Modified Reid index was used for the interpretation of the images as positive, negative, and suspicious, and the results were compared to cervical biopsy findings as a gold standard.

Results: From 95 patients, 31 positive and 64 negative cases were reported in the colposcopy procedure. The sensitivity, specificity, positive and negative predictive values of digital cervicography were calculated as 89.47%, 81.57%, 54.83%, and 96.87%, respectively.

Conclusions: To sum up, digital cervicography can be used as an effective screening tool for cervical cancer prevention in low and middle income countries.

Keywords: Digital cervicography, Cervical cancer, Cervical intraepithelial lesion

Introduction

Cervical cancer is one of the most common causes of mortality in developing countries. Approximately, 500 000 women around the world are affected by cervical cancer with 270 000 deaths annually. Studies have shown that 80% of deaths from cervical cancer and 88% of the cancer-related deaths occur in developing countries (1). Therefore, early diagnosis of the cervical cancer can reduce the mortality (2). Moreover, screening has a great importance in the detection of pre-invasive disease. Research has shown that Pap smear by itself has a sensitivity of 50% (3). This limitation has led to the application of new diagnostic procedures. Digital cervicography is one of the procedures that is easy to perform (4).

Cervicography is widely used for cervical cancer screening. Owing to the simultaneous employment with Pap smear test, the technique has many other applications. Digital cervicography reduces the mortality and improves and facilitates the diagnosis of recently-developed diseases (5).

The mortality from cervical cancer has been dramatically decreased using Pap smear tests (6). Pap smear test, HPV test, and co-test are regarded as important screening procedures for cervical cancer. Cases of false negative Pap smear result vary from 20% to 44.9% (7). Colposcopy with biopsy and histological results are the final diagnosis of cervical cancer (8). Pap smear, colposcopy, cervicography, and ThinPrep liquid-based smears are important screening procedures for cervical cancer (9). Cervicography was first introduced in 1981 by STAFL. Researchers believe that cervicography can be easily used to further examine the unusual cases of screening tests though it is not an alternative to colposcopy (10).

Recording surgical images is a convenient way, however the interpretation of the results requires specialization. Digital cervicography with the ability to transfer images

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online has recently been developed (6). Moreover, early diagnosis of cervical cancer is critical to reduce mortality. Research also suggests that application of digital cervicography with Reid colposcopic index grading system could be useful in assessing abnormal Pap smear results. (9). In addition to having high sensitivity, digital cervicography can be easily performed and compared to cytological smears (11).

Considering the above-mentioned, the aim of this study was to assess the sensitivity, specificity, and positive and negative predictive values of digital cervicography in diagnosing intraepithelial lesions, carcinoma in situ, and cervical cancer in patients referred to Tabriz Al-Zahra hospital.

Materials and Methods

All the patients who had indications for colposcopy and had been referred to the Oncology Clinic of Al-Zahra hospital were included in the study.

Written informed consent was obtained from the patients before performing the colposcopy.

Cervical mucus was removed and the cervix was photographed using a specialized cervicography camera before the application of acetic acid.

The cervix was photographed again during the colposcopy, after the application of acetic acid.

The images were filed and labeled with patients' names, and then were evaluated by a gynecologic oncologist. The proposed diagnoses for the images were documented in another file without knowing the patients' history and pathological results. The diagnoses were compared to standard diagnoses to determine the sensitivity, specificity, and positive and negative predictive values of digital cervicography in diagnosing cervical precancer lesions and cervical cancers.

Given the complexity of screening processes including liquid-based cytology, and unavailability of HPV typing for the absolute majority of women, digital cervicography could be attended as an appropriate alternative for cervical cancer screening in developing countries.

Results

A total of 95 patients who underwent colposcopy procedure were included in this study. Out of these patients, 31 cases were positive and 64 cases were negative for the cervicography. Moreover, the pathology report showed that 19 cases were positive and 76 cases were negative. Further evaluations revealed that out of the 31 cases reported positive for the cervicography test, 17 cases were positive and 14 cases turned to be negative for the pathology test. Furthermore, out of the 64 cases reported negative for the cervicography, 2 cases turned to be positive and 62 cases were negative for the pathology test (Table 1).

The representative images from normal cervix, low grade squamous intraepithelial lesion, and invasive squamous cell carcinoma are illustrated in Figure 1A-1F.

Table 1. Results of Cervicography

	Pathology – Positive No. (%)	Pathology – Negative No. (%)	Total No. (%)
Cervicography – positive	17 (18)	14 (15)	31 (33)
Cervicography – negative	2 (2)	62 (65)	64 (67)
Total	19 (20)	76 (80)	95 (100)

The sensitivity, specificity, positive predictive value, and negative predictive value of the cervicography test were 89.47%, 81.57%, 54.83%, and 96.87%, respectively.

Discussion

The cervicography screening plays an important role in improving the low sensitivity and high false positive rate of the Pap smear test for cervical cancer diagnosis (12). In the study of Singhakum et al, cervical intraepithelial neoplasia (CIN) was diagnosed in 68% of the patients using Pap smear and in 89% of the patients using cervicography (13). Another study showed that Pap smear and cervicography procedures detected CIN in 37.5% and 77.8% of the patients, arguing that simultaneous application of the 2 procedures would increase the sensitivity by 8.3% (14). The results of a study on 12 000 patients displayed that cervicography was the most sensitive screening test for the diagnosis of cervical cancer; therefore, combination of the two procedures would significantly improve the diagnosis (15). Some researchers have reported a sensitivity of 100% for cervicography ((15). while, other studies have shown a sensitivity of 94.3% (16). The high false positive rate and low specificity with cervicography have been improved with a modified method of reporting. The specificity was reported 99.1% in one study (17) and 89.8% in another (16).

Evaluation of the sensitivity and false positive results of Pap smear test, HPV test, cervicography, Pap smear with HPV, Pap smear with cervicography, and Pap smear with HPV and cervicography showed that the combination of the 3 procedures was the most sensitive diagnostic procedure for cervical cancer. The sensitivity of Pap smear with cervicography was 98.1% and the sensitivity of Pap smear with HPV was 92.3%. The findings of this study showed that Pap smear had the highest specificity (93.5%) and positive predictive value (77.8%). Our further results demonstrated that the combination of the 3 procedures was the best diagnostic method for cervical cancer (100% sensitivity) (16). The specificity of the Pap smear test and that of the combination of the 3 tests were reported as 93.5% and 82.8%, respectively (16).

One study showed that in diagnosing cervical cancer, the sensitivity and specificity of digital cervicography were 100% and 69.1% and those of cytology were 14.8% and 95.4%, respectively. The negative and positive predictive values of digital cervicography were 100% and 54.4%, respectively. It was also declared that sensitivity,

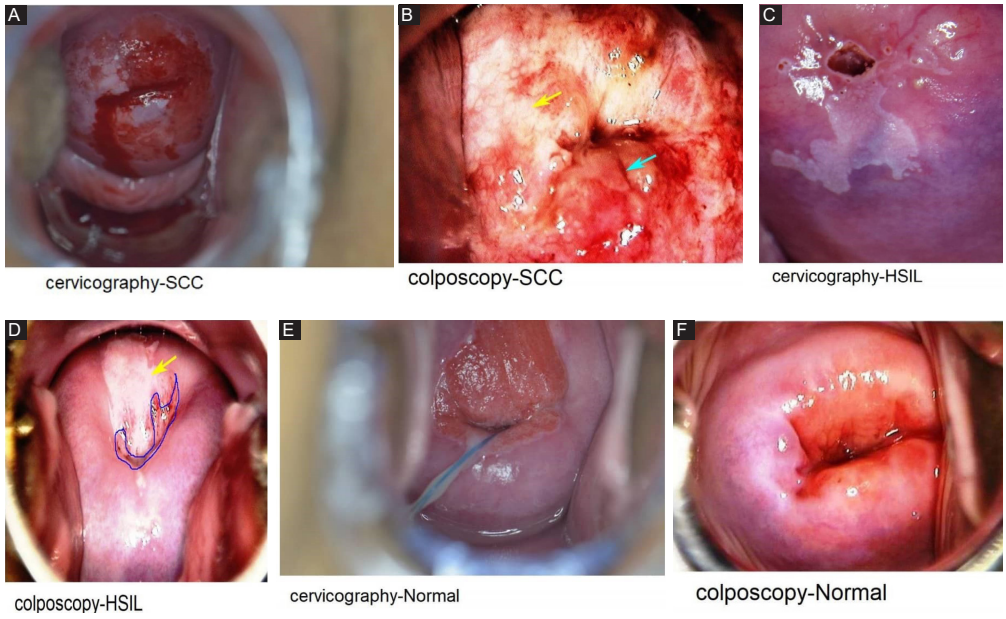

Figure 1. (A) Irregular, raised oyster colored acetowhite foci in T. zone mucosa (arrows) indicate high grade cervical lesion. Histopathologic examination revealed cervical squamous cell carcinoma (cervicographic view). **(B)**Colposcopic Appearance of Cervical Squamous Cell Carcinoma. Note. Green arrow indicates acetowhite area with coarse mosaicism. **(C)**Raised Acetowhite Area in Cervicography, Showing Coarse mosaicism (Black Arrow). Note. Histopathology revealed high grade squamous intraepithelial lesion. **(D)** Colposcopic Appearance of High Grade Squamous Intraepithelial Lesion (Green Arrow). **(E)**. Normal Cervix in Cervicography (Ectropion or Eversion). **(F).** Normal Appearance of Cervix in Colposcopy (Eversion or Ectropion).

specificity and positive predictive value were higher in digital cervicography (18). In a study on 6301 patients, the sensitivity of cytology, cervicography, and acetic acid test was 19.3%, 41.8%, and 49.4% respectively, while their specificity values were 99.3%, 78.8%, and 48.5%, respectively. Moreover, all the 3 tests were negative in 23% of the biopsies, showing grades 1-3 of CIN. Combination of the 3 tests also increased the sensitivity up to 76.9% (19).

In another study on 100 patients, the sensitivity, specificity, positive predictive value, negative predictive value and accuracy of Pap smear, visual inspection with acetic acid (VIA), and digital cervicography tests were estimated as 23.5%, 100%, 100%, 86.5%, and 87%; 62.5%, 98.8%, 90.9%, 93.2%, and 92.9%; and 46.7%, 97.6%, 77.8, 91%, and 89.8% respectively for the diagnosis of cervical neoplasia (4).

In a study on women with HIV, the sensitivity and specificity of cervicography in diagnosing grade 2 intraepithelial neoplasia were 84% and 58%, respectively (20).

Our study showed that the sensitivity, specificity, positive predictive value, and negative predictive value of the cervicography test were 89.47%, 81.57%, 54.83%, and 96.87%, respectively. These results support the findings of a number of previous studies. Nevertheless, the literature has offered evidence that when simultaneously applied with other diagnosis techniques, the sensitivity and specificity of cervicography may reach above 90% or even 100%.

Conclusions

Simultaneous application of Pap smear could enhance the sensitivity of cervicography by 8.3%. This procedure can be used simultaneous with other methods to accurately diagnose the cervical cancer.

Limitations

This cross-sectional study may suffer from some limitations. Therefore, to achieve better results, study with larger sample sizes is recommended..

Conflict of Interests

Authors have no conflict of interests.

Ethical Issues

This study was approved by the Ethics Committee of Tabriz University of Medical Sciences (IR.TBZMED.REC.1398.032).

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