

SONOGRAPHIC PARAMETERS IN THE DIAGNOSIS OF CHRONIC CERVICITIS

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Summary

Introduction. Inflammatory diseases of the pelvic organs (IDPO) remain the most relevant issue in contemporary gynecology. In modern diagnostics of reproductive organ pathologies, a highly effective and accessible method is ultrasound examination. Recent studies in this field, conducted using high-frequency digital transvaginal echography, have significantly contributed to reevaluating the potential of ultrasonographic diagnosis of the cervix; however, further research is warranted.

The aim of this research is to enhance the diagnosis of cervical changes in cervicitis.

Materials and methods. The study included 68 women with chronic cervicitis. The diagnosis was established based on clinical, colposcopy, and bacterioscopic examinations. During transvaginal ultrasound examinations, the cervix was visualized in both longitudinal and transverse projections for all patients. The patients with chronic cervicitis were divided into two groups: Group I consisted of 37 patients with visual changes in the cervix, while Group II comprised 31 women without any changes. A comparison group included 35 healthy women.

Results. Chronic cervicitis is characterized by an increase in the thickness and volume of the cervix, as well as the heterogeneity of the stroma due to cystic cavities, with elevated ratios of cervix thickness to length and endocervix thickness to cervix thickness. Significant sonographic signs of the inflammatory process in the endocervix also include certain structural features, such as indistinct contours, increased echogenicity, small cysts, and multiple microcalcifications in the endocervix, uneven dilation of the cervical canal, and an area of reduced echogenicity.

Conclusions. Therefore, a thorough ultrasound examination to determine the condition of the cervix, thickness, and structure of the endocervix can be a valuable adjunct non-invasive tool in the diagnosis of chronic cervicitis and can assist clinicians in diagnosing this pathology even in cases where there are no visual changes in the cervix during an examination.

Keywords: chronic cervicitis, cervix, endocervix, ultrasound examination of the cervix

INTRODUCTION

Inflammatory diseases of the pelvic organs (IDPO) continue to be a pressing issue in modern gynecology. Each year, approximately 350 million women worldwide develop pelvic inflammatory diseases [1]. In most cases, these diseases become chronic, leading to infertility in 40–80 % of cases [1]. Risk factors for the development of cervicitis include cervical canal expansion, curettage, surgical interventions on the cervix, and the use of intrauterine contraceptives (IUCs).

The epithelium of the exocervix and vagina shares a similar structure and undergoes cyclic changes under the influence of hormones [2]. The area of the cervix where glandular cells transition to squamous epithelium is referred to as the transformation zone [3]. In most cases, the transition boundary between multilayered squamous and columnar epithelium is located in the vaginal part of the cervix. As the body matures and hormonal balance changes, the transformation zone may shift toward the cervical canal and sometimes be

concealed within it, causing ectopia (pseudo-erosion) to disappear. However, in 30 % of cases, ectopia of columnar epithelium persists into the reproductive years. Women with persistent ectopia of columnar epithelium are more susceptible to inflammatory and proliferative changes and traumatic injuries [4]. Ectopia of columnar epithelium can exist for an extended period until the pathological processes causing its development are resolved. In the meantime, it perpetuates the inflammatory process in the cervix by infecting ectopic glands, creating a «vicious circle» in the mechanisms of this pathology's prolonged existence. Microorganisms can persist for years in the deep parts of such glands [5]. Various pathogenic factors of inflammation, such as *Gardnerella*, and vaginal candidiasis, lead to changes in the ectocervix, often necessitating differential diagnosis between hyperplastic and non-tumor diseases [6].

The diagnosis of cervicitis is typically based on the patient's medical history, the results of gynecological examinations using speculums, colposcopy, and laboratory tests. To diagnose chronic cervicitis, it is advisable to conduct specific laboratory investigations, such as bacterioscopic examination of urogenital secretions from three sites (urethra, cervical canal, and vagina), bacterial culture to identify the type of causative agent, and cytomorphological analysis. Endoscopic methods provide information about the condition of the mucous membrane of the cervical canal but do not allow visualization of the intermediate layers of the endocervix and the cervix stroma. Therefore, the diagnosis of cervicitis is primarily based on indirect evidence [7]. The most reliable confirmation of the diagnosis is the result of a pathohistological examination of cervical canal scrapings. However, the decision to proceed with invasive diagnostics should be based on clinical and laboratory researches.

Colposcopy allows the visualization of the vaginal part of the cervix and the identification of not only suspicious changes in the transformation zone but also colposcopic signs of inflammation. Cervicospopy enables the visualization of the mucous membrane of the cervical canal, a visual assessment of its condition, and the determination of the precise location and size of any lesions. When a pathological focus is detected during the procedure, a targeted biopsy is performed for subsequent histology. In most cases, these methods allow for the detection of dysplasia, true cervical erosion of traumatic origin, ectopia of columnar epithelium, ectocervical inflammation, cervical intraepithelial neoplasia of various degrees, and cervical cancer localized in the transformation zone [8]. It is known that cervicitis often coexists with the presence of long-standing ectopia of columnar epithelium and ectropion. Their presence not only creates a favorable environment for pathogenic flora that sustains the inflammatory process but can also contribute to the development of neoplastic transformation and malignancy [9].

In modern diagnostics of reproductive organ pathologies, a highly effective and accessible method is ultrasound examination. The capabilities of transvaginal sonography in diagnosing conditions of the endometrium, including chronic endometritis, have been widely studied [10]. However, regarding the assessment of cervical conditions, this method is more commonly used for diagnosing polyps, endometrioid cysts, and cervical fibroids. Recent studies in this field, conducted using high-frequency digital transvaginal echography, have significantly contributed to reevaluating the potential of ultrasound diagnosis of the cervix. Still, there is a need for further research. In contemporary literature, there are only isolated publications on sonographic signs of cervical changes in inflammatory conditions.

THE AIM OF THE STUDY

The aim of this research is to enhance the diagnosis of cervical changes in cervicitis.

MATERIALS AND METHODS

The study involved 68 women with chronic cervicitis. The diagnosis was established based on clinical, colposcopy, and bacterioscopic examinations. During transvaginal ultrasound examinations, the cervix was visualized in both longitudinal and transverse projections. The examinations were performed during the early proliferative phase of the menstrual cycle. In the middle third of the cervix, between the 5th and 10th day of the menstrual cycle, the echotexture and the overall thickness of the endocervical walls were determined. Various sonographic parameters were examined, including echogenicity, homogeneity, contour clarity, the presence of echopositive inclusions, endocervical and stromal cysts, the pattern of cervical canal dilation. Additionally, the thickness and length of the cervix were measured, their ratios calculated, and the proportion of endocervical thickness to the overall thickness of the cervix was assessed.

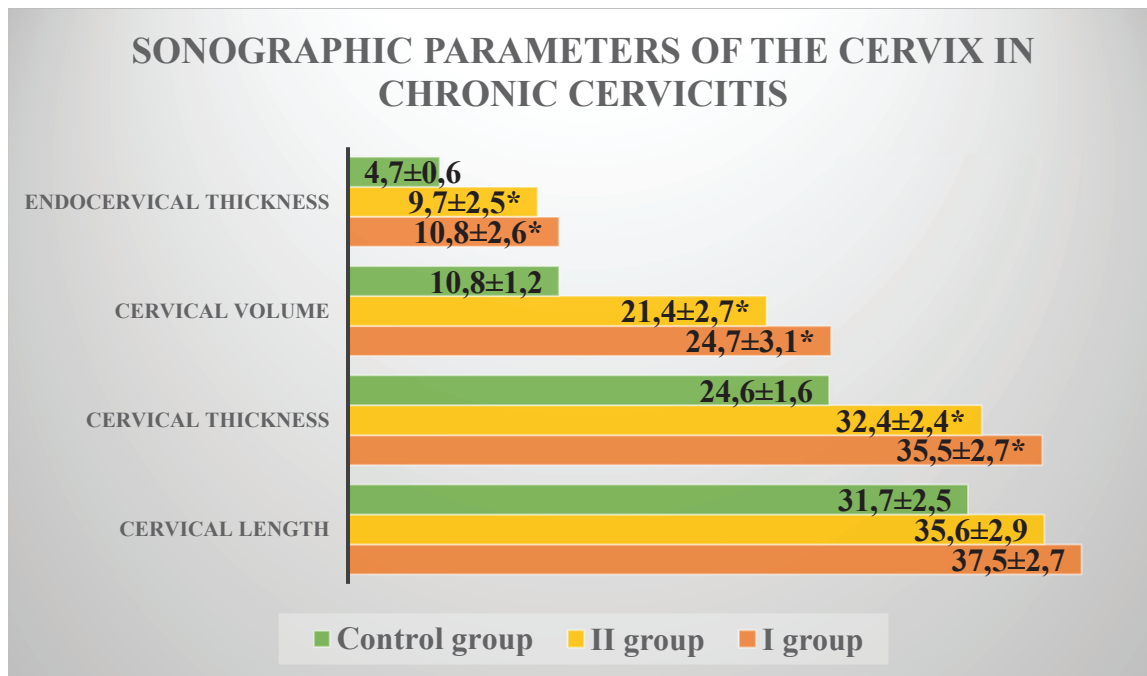
Patients with chronic cervicitis were divided into two groups: Group I consisted of 37 patients with visual changes in the cervix, while Group II comprised 31 women without any changes. A comparison group included 35 healthy women who had a history of childbirth and abortions, had normal vaginal flora with no pathological changes in the cervix. The age of all patients ranged from 19 to 45 years, with an average age of 37.2 ± 4.7 .

RESULTS AND DISCUSSION

The average length of the cervix did not significantly differ between the control group and the study group (histogram 1). However, there were notable increases in sonographic parameters such as cervix thickness and volume, endocervical thickness, and the ratio of cervix

thickness to length in women with chronic cervicitis compared to healthy women (histogram 2). The cervix's thickness was highest in women in Group I, averaging 35.5 ± 2.7 mm, significantly exceeding the measurements

in the control group. In the same group, the ratio of cervix thickness to length was the highest, with an average of 0.94 ± 0.07 , significantly greater than that in the control group ($p1-3, 2-3 < 0.05$) (histogram 1).



Histogram 1. Sonographic parameters of the cervix in chronic cervicitis

Note: * – $P < 0.05$

The cervix volume in women in Groups I and II was 24.7 ± 3.1 mm and 21.4 ± 2.7 mm, respectively, significantly higher than in the control group ($p1-3, 2-3 < 0.05$). The endocervical thickness in women with a combination of chronic cervicitis and visual cervix changes was 10.8 ± 2.6 , significantly greater than in healthy women ($p1-3, 2-3 < 0.05$) (fig.1).

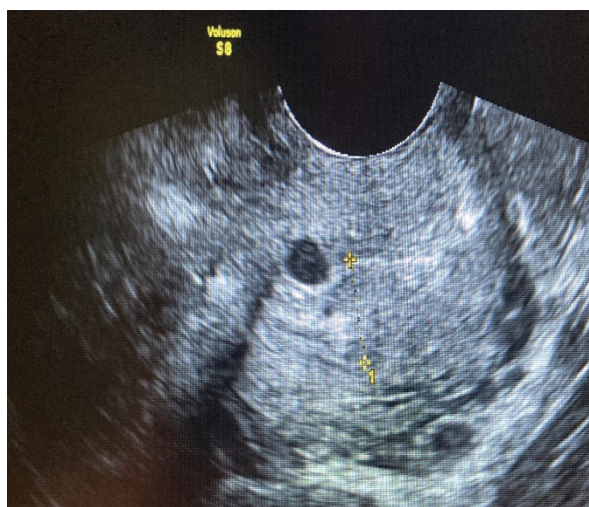


Figure 1. Thickening of the endocervix

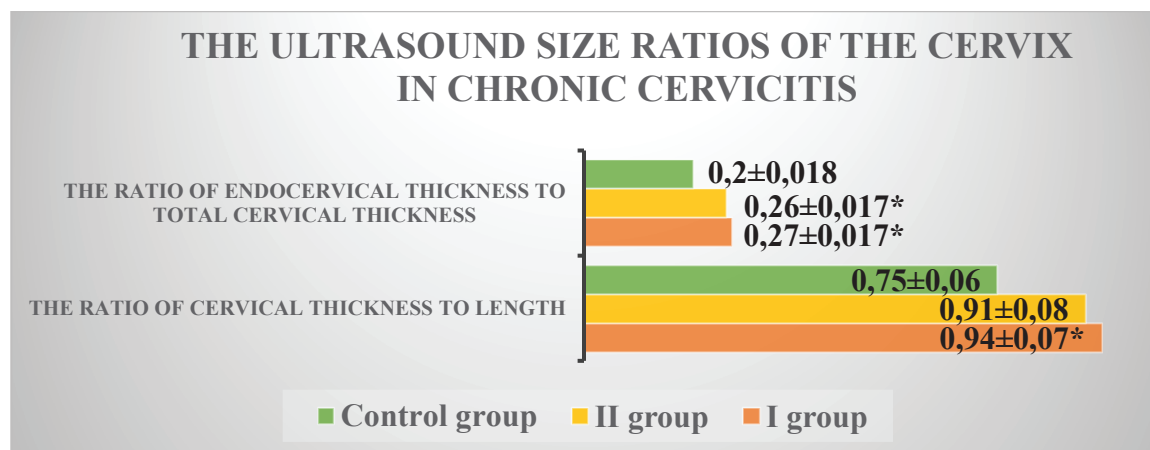
Therefore, the difference in cervical sonographic parameters between women with and without cervicitis

suggests the potential diagnostic value of a thorough cervical ultrasound examination for the diagnosis of chronic cervicitis.

Upon further analysis of the sonographic characteristics of the cervix and endocervix structure, there was a notably higher frequency of changes such as unclear endocervical contours, uneven cervical canal dilation, the presence of a zone with reduced echogenicity around the endocervix, multiple calcifications, and endocervical cysts, even with the presence of cystic cavities in the cervix stroma in Groups I and II. In other words, sonographic characteristics of the cervix structure in women with chronic cervicitis were not dependent on the presence of visual changes in the cervix (table 1).

Indeed, in the majority of women in Groups I and II, 28 (75.3 %) and 24 (77.5 %) respectively, unclear endocervical contours were noted, which likely exceeded the measurements in the control group ($p1-3, 2-3 < 0.001$).

Uniform dilation of the cervical canal was observed in only a few women in the control and study groups, while uneven dilation was diagnosed in more than half of the patients with cervicitis – in 28 (75.6 %) cases in Group I and 17 (54.8 %) in Group II ($p1-3, 2-3 < 0.001$), which was not observed in the control group (figure 2).



Histogram 2. The ultrasound size ratios of the cervix in chronic cervicitis

Note: * – $P < 0.05$

Table 1

Sonographic characteristics of the cervix and endocervix structure

Sonographic parameters/ Groups	I group, n-37	II group, n-31	Control group, n-35
Clear contours of the endocervix	9 (24,3 %)*	7 (22,5 %)*	32 (91,4 %)
Unclear contours of the endocervix	28 (75,3 %)*	24 (77,5 %)*	3 (8,6 %)
Even enlargement of the cervical canal	4 (10,8 %)	1 (3,2 %)	4 (11,4 %)
Uneven enlargement of the cervical canal	22 (59,4 %)*	17 (54,8 %)*	0
Multiple calcifications	17 (45,9 %)*	11 (35,4 %)*	0
Endocervical cysts	18 (48,6 %)*	13 (41,9 %)*	0
Cystic spaces in the cervix stroma	26 (70,2 %)*	16 (51,6 %)*	3 (8,6 %)
Zone of reduced echogenicity around the endocervix	16 (43,2 %)*	10 (32,2 %)*	1 (2,8 %)

Note: * – $P < 0.001$ 

Figure 2. Uneven dilation of the cervical canal

It's worth noting that multiple calcifications and endocervical cysts were found only in patients with cervicitis, specifically in Groups I and II.

A zone of reduced echogenicity around the endocervix was significantly more common in Group I (16 cases – 43.2 %) and Group II (10 cases – 32.2 %) than in the control group (1 case – 2.8 %) ($p_{1-3}, 2-3 < 0.001$) (figure 3).

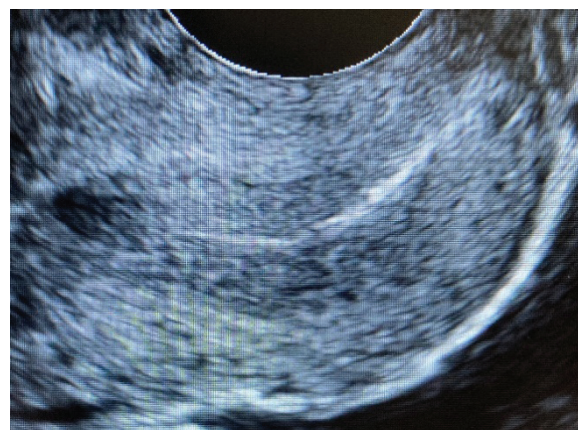


Figure 3. Zone of reduced echogenicity around the endocervix

Endocervical cysts and cystic cavities in the stroma of the cervix were significantly more frequently visualized in patients with both visual changes in the cervix and those without changes – 18 (48.6 %) and 26 (70.2 %) cases in Group I and 13 (41.9 %) and 16 (51.6 %) cases in Group II, respectively, which were not observed in healthy women (figure 4).

Moreover, chronic inflammation of the endocervix often leads to the visualization of deep cystic cavities in the cervical stroma.

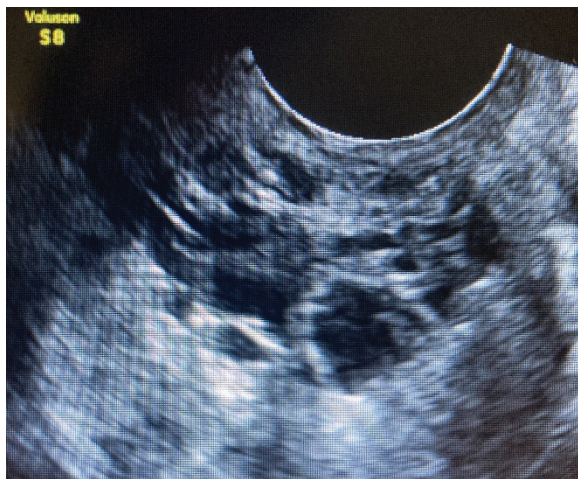


Figure 4. Multiple cystic cavities of the cervical stroma

CONCLUSIONS

In conclusion, the obtained results indicate that chronic cervicitis is characterized by an increase in the thickness and volume of the cervix, heterogeneity of the stroma due to cystic cavities, an increase in the ratio of the thickness to length of the cervix, and the ratio of endocervical thickness to cervical thickness.

Significant sonographic signs of the inflammatory process in the endocervix include structural features such as unclear contours, increased echogenicity, small cysts, multiple microcalcifications in the endocervix, uneven

dilatation of the cervical canal, and a zone of reduced echogenicity.

Therefore, thorough ultrasound examination to assess the condition of the cervix, the thickness, and the structure of the endocervix can be a valuable non-invasive tool in diagnosing chronic cervicitis and can assist clinicians in diagnosing this pathology, even in the absence of visual changes in the cervix.

Prospects for further research. Based on the obtained data, it is advisable to conduct a thorough ultrasound examination to determine the state of the cervix during a standard gynecological examination.

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COMPLIANCE WITH ETHICAL REQUIREMENTS

The study was conducted in accordance with the principles of the Helsinki Declaration of the World Medical Association «Ethical principles of medical research involving a person as an object of research». All study participants provided informed consent in writing to participate in the study.

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*Резюме***СОНОГРАФІЧНІ ПАРАМЕТРИ В ДІАГНОСТИЦІ ХРОНІЧНОГО ЦЕРВІЦИТУ****Наталія В. Косей^{1,2}, Галина В. Ветох¹, Еліна Ф. Чайківська³, Тетяна І. Юско², Інна І. Дайнеко⁴**

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Вступ. Запальні захворювання органів малого тазу (ЗЗОМТ) залишаються найактуальнішою проблемою сучасної гінекології. В сучасній діагностиці патології репродуктивних органів велике значення має такий високоефективний та доступний метод, як ультразвукове дослідження. Останні дослідження в цій галузі, проведені за допомогою високочастотної цифрової трансвагінальної ехографії, суттєво допомогли переглянути можливості ультразвукової діагностики шийки матки, однак вивчені недостатньо.

Мета роботи. Удосконалити діагностику змін шийки матки при цервіцитах.

Матеріали та методи. У дослідженні взяли участь 68 жінок з хронічним цервіцитом. Діагноз встановлювали на підставі клінічних, кольпоскопічних та бактеріоскопічних досліджень. Всім пацієнткам при трансвагінальному ультразвуковому дослідженні візуалізували шийку матки в поздовжній та поперечній проекціях. Пацієнтки з хронічним цервіцитом були розподілені на 2 групи: I групу склали 37 пацієнток з візуальними змінами шийки матки, II – 31 жінок без змін. Групу порівняння склали 35 здорових жінок.

Результати. Для хронічного цервіциту характерне збільшення товщини та об'єму шийки матки, неоднорідність строми за рахунок кістозних порожнин з підвищенням показників співвідношення товщини та довжини шийки матки та співвідношення товщини ендочервіксу до товщини шийки матки. Вагомими сонографічними ознаками запального процесу в ендочервіксі є також деякі структурні особливості, зокрема нечіткість контурів, підвищена ехогенність, дрібні кісти та множинні мікрокальцинати ендочервіксу, нерівномірне розширення цервікального каналу та зона зниженої ехогенності.

Висновки. Отже ретельне, ультразвукове дослідження з визначенням стану шийки матки, товщини та структури ендочервіксу може бути цінним допоміжним неінвазивним інструментом в діагностиці хронічного цервіциту та допомогти клініцисту в діагностиці даної патології навіть за умови відсутності при огляді візуальних змін шийки матки.

Ключові слова: хронічний цервіцит, шийка матки, ендочервікс, ультразвукове дослідження шийки матки