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Assessing Intracavitary Three-Dimensional Ultrasound for Endometrial Polyps Diagnosis

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Abstract: *Objective:* To discuss the clinical effectiveness of intracavitary three-dimensional ultrasound in diagnosing endometrial polyps and evaluate its detection status. *Methods:* A total of 155 patients with suspected endometrial polyps underwent examination using the GE-Voluson-E10 three-dimensional ultrasound diagnostic instrument at the Department of Ultrasound Medicine in Lijiang People's Hospital. Among them, 92 cases underwent intracavitary three-dimensional ultrasound examination between November 1, 2022, and June 2, 2023. Using histopathological results as the diagnostic criteria, a retrospective analysis was conducted on the clinical effects of intracavitary three-dimensional ultrasound diagnosis in patients with endometrial polyps. *Results:* Intracavitary three-dimensional ultrasound examination of 92 patients with suspected endometrial diseases revealed that 32 patients were diagnosed with endometrial polyps, including 9 with single lesions and 23 with multiple lesions, with a polyp diameter range of 3–16 mm. The examination displayed clear arc-shaped edges of the polyps in the endometrium. The section diameter was less than 16 mm, and the echo was relatively strong. The base of the uterine cavity was relatively narrow, and the endometrium line was neat. Color Doppler revealed strip-like or dot-like colored blood flow signals in the center and base. Among the 92 patients with suspected endometrial polyps, 30 cases were confirmed by histopathology, and 32 cases were confirmed by intracavitary three-dimensional ultrasound. The sensitivity of intracavitary three-dimensional ultrasound in diagnosing endometrial polyps was 100.00% (30/30), the specificity was 96.77% (60/62), and the accuracy was 97.83% (90/92). *Conclusion:* The application of intracavitary three-dimensional ultrasound in the diagnosis of endometrial polyps yielded significant diagnostic results. It provided detailed morphology of the endometrium, delivering vivid and three-dimensional imaging images. The diagnostic efficiency was high and consistent with pathological and histological diagnoses.

Keywords: Intracavitary three-dimensional ultrasound; Endometrial polyps; Diagnosis; Effect; Detection status

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1. Introduction

Endometrial polyps represent a prevalent condition in the female reproductive system, with an incidence rate ranging from 8% to 25%. While most cases are benign, a small percentage can be malignant. Various factors contribute to the development of this condition, including abnormal estrogen levels, inflammatory reactions in the body, and endocrine disorders. Elevated estrogen levels, in particular, are known to be a significant cause of

endometrial polyps [1].

Currently, clinical diagnosis of endometrial polyps involves methods such as ultrasound, dilation and curettage, and hysteroscopy. Although hysteroscopy boasts high diagnostic accuracy, it is an invasive procedure with limited tolerance among female patients [2,3]. Vaginal ultrasound technology has matured and is widely employed in the diagnosis of endometrial polyps, offering the advantage of repeated operations. However, two-dimensional ultrasound has limitations, lacking the capability to present three-dimensional images, thereby leading to potential misdiagnosis and missed diagnosis [4,5].

Intracavitary three-dimensional ultrasound, on the other hand, excels in providing clear, dynamic three-dimensional images that reveal endometrial lesions and display the overall structure of the endometrium. This ability facilitates the examiner in observing spatial locations and confirming the diagnosis of endometrial polyps with high accuracy. Patients and medical professionals alike appreciate this approach [6]. Moreover, intracavity three-dimensional ultrasound is non-invasive, reproducible, and more acceptable to female patients.

This article focuses on a cohort of 92 patients with suspected endometrial polyposis treated between November 1, 2022, and June 2, 2023. The aim is to explore the diagnostic value of intracavitary three-dimensional ultrasound.

2. Materials and methods

2.1. General information

Out of the 155 patients examined for suspected endometrial polyps using the GE-Voluson-E10 three-dimensional ultrasound diagnostic instrument in Lijiang People's Hospital's Department of Ultrasound Medicine, 92 cases underwent intracavitary three-dimensional ultrasound examination from November 1, 2022, to June 2, 2023. Their ages ranged from 21 to 56 years, with an average age of 37.16 ± 5.38 years. The inclusion criteria comprised patients with a history of sexual activity, experiencing symptoms such as prolonged menstruation, increased menstrual volume, irregular vaginal bleeding, heightened leucorrhea, vaginal discharge, abdominal pain, infertility, or pregnancy loss. Additional criteria included patients with complete clinical data and those over 20 years old. Exclusion criteria covered patients with unclear language expression, disorders of consciousness or mental illness, pregnant and lactating women, those suffering from malignant neoplastic diseases, study dropouts, and individuals with poor compliance. No significant differences were noted in basic clinical information ($P > 0.05$). Informed consent was obtained from all the participating patients.

2.2. Methods

The three-dimensional color ultrasound diagnostic instrument was employed for endometrial polyp screening, using an intracavity three-dimensional ultrasound probe with a frequency set to 5–9 MHz for three-dimensional volume imaging. Examinations were conducted post-menstrual cycle completion, within 3 to 7 days after menstruation. Patients were positioned in bladder lithotomy, and the three-dimensional volume probe was inserted for scanning. The personnel guided the examination, observed the condition of the appendages and uterus, recorded relevant information, focused on the endometrium area, and completed intimal tissue sampling [7]. A two-dimensional imaging scan was performed, converted to a three-dimensional program, and three-dimensional data were acquired, covering the uterus and cervix. Uterine information was transmitted to the computer, and vegetations in the uterine cavity were observed, recording abnormal areas' echo and shape. Vegetations' size, location, and the connection between the inner wall of the uterus and the endometrium were analyzed [8].

2.3. Indicator observation

Intracavity three-dimensional ultrasound diagnosis results were observed and compared with pathological diagnoses. Experienced doctors from Lijiang People's Hospital analyzed intracavity three-dimensional images, using three-dimensional data for a qualitative assessment of endometrial polyps. The diagnostic value of three-dimensional color ultrasound was retrospectively evaluated by comparing three-dimensional images with pathology. The sensitivity, specificity, and accuracy of three-dimensional ultrasound were calculated, and the consistency between three-dimensional ultrasound and pathological diagnosis was analyzed.

2.4. Statistical analysis

Data on suspected endometrial polyps were processed using SPSS 21.0. Count indices of suspected endometrial polyps were recorded in percentages (χ^2 test), and measurement indices were recorded as mean ± standard deviation (SD; *t*-test). Statistical significance was considered at $P < 0.05$.

3. Results

3.1. Ultrasound signs

Out of the 92 suspected endometrial polyps, three-dimensional intracavitary ultrasound confirmed 32 cases. Among these, 23 cases exhibited multiple lesions, and 9 cases presented as single lesions. The minimum diameter measured 3 mm, while the maximum diameter reached 16 mm. Utilizing intracavitary three-dimensional ultrasound, the triangular edge of the basal layer was clearly displayed, with a strong echo. The intrauterine cavity cut line appeared relatively neat, and diameters less than 15 mm indicated a relatively narrow basal layer. Colored blood flow signals in the form of strips or dots were observable through intracavitary three-dimensional ultrasound.

3.2. Diagnostic performance

Out of the 92 suspected cases of endometrial polyps, 30 cases were confirmed pathologically, and 32 were confirmed by intracavitary three-dimensional ultrasound. The sensitivity of intracavitary three-dimensional ultrasound in diagnosing endometrial polyps was 100.00% (30/30), with a specificity of 96.77% (60/62) and an accuracy of 97.83% (90/92). Specific detailed research information is provided in **Table 1**.

Table 1. Comparison of pathological diagnosis and three-dimensional ultrasound diagnosis accuracy [*n* (%)]

Group	Pathologically positive	Pathologically negative	Total
Three-dimensional ultrasound positive	30	2	32
Three-dimensional ultrasound negative	0	60	60
Total	30	62	92

4. Discussion

Endometrial polyps, a common clinical disease, pose a challenge in terms of treatment due to their increasing prevalence and occurrence in younger individuals, resulting in substantial physical and mental health implications for women. Early diagnosis and timely treatment are imperative to mitigate the impact of this condition [9]. Endometrial polyps, characterized as tumor-like lesions within the uterine cavity, primarily arise from the proliferation of endometrial stroma and glands. They can manifest as multiple or solitary, pedunculated

or sessile, potentially leading to infertility in affected women [10].

Given that endometrial polyps can occur across all age groups, women should prioritize uterine health and undergo regular examinations post-puberty. The incidence rate is notably higher in women over 35 years old, often correlated with mental factors and life stress, contributing to hormonal imbalances [11]. Abnormalities in a patient's body can result in various pathological changes in the endometrium, making early detection crucial. Traditional diagnostic methods such as hysteroscopy, while accurate, are invasive, painful, and less accepted by patients [12].

In contrast, three-dimensional ultrasonic examination facilitates dynamic three-dimensional imaging, enhancing spatial clarity and accurately delineating lesion shapes. It surpasses the limitations of two-dimensional ultrasound, providing clearer and more precise images of surrounding tissues and uterine cavity lesions, significantly improving diagnostic accuracy. Comparative studies have shown that three-dimensional imaging offers superior endometrial thickness, uterine cavity imaging, and overall shape compared to contrast-enhanced ultrasound, two-dimensional ultrasound, and hysteroscopy [13].

Distinguishing between endometrial cancer, endometrial hyperplasia, and endometrial polyps poses a significant challenge due to their often similar clinical features. However, three-dimensional ultrasound examination proves invaluable, revealing distinct features such as clear borders, a narrow base, a strong mass echo, and a relatively complete intimal line of the basal layer. The polyp's shape may be oval or irregular, displaying clear borders close to the root, along with shaved and thickened blood vessels. Color Doppler flow imaging (CDFI) can detect punctate and short-tubular blood flow signals.

In contrast, submucosal fibroids typically appear hypoechoic and round, with relatively disorganized internal echoes that can be sessile or pedunculated. They are a subtype of uterine fibroids that grow into the uterine cavity, in direct contact with the mucosal layer, and accounting for 10%–15% of cases. CDFI can identify abundant blood flow signals in the pedicle and annular blood flow signals around it. Some uterine cavities may exhibit mild liquid separation due to fibroid surface coverage, resulting in an incomplete endometrium. When assessing submucosal uterine fibroids using three-dimensional ultrasound imaging, irregularities and defects in the uterine cavity contour become apparent.

Analyzing pathological changes in endometrial hyperplasia, a condition related to abnormal endometrial growth rates, three-dimensional ultrasound imaging reveals diffuse thickening-like changes in the endometrium, and a complete endometrial base can be observed [14]. For endometrial cancer, ultrasound depicts a thickened, unevenly thick endometrium with visible light groups, contributing to an irregular overall shape. Further analysis of three-dimensional ultrasound images and observation of the coronal section of the uterine cavity unveil irregular masses, involvement of the basal layer of the endometrium, and interruptions in the endometrial line [15].

Based on the data analysis in this study involving 92 patients with suspected endometrial polyps, 30 cases were confirmed by histopathology, and 32 cases were confirmed by intracavitary three-dimensional ultrasound. The sensitivity, specificity, and accuracy of intracavitary three-dimensional ultrasound in diagnosing endometrial polyps were notably high, at 100.00%, 96.77%, and 97.83%, respectively. This underscores the efficiency of intracavitary three-dimensional ultrasound as a diagnostic tool. In summary, the application of intracavitary three-dimensional ultrasound in identifying and diagnosing endometrial polyps, compared to conventional two-dimensional ultrasound imaging, offers comprehensive endometrial images with the advantages of non-invasiveness and high diagnostic efficiency, making it a promising technology for widespread adoption.

Disclosure statement

The author declares no conflict of interest.

References

[1] Ma H, Xie J, Dong L, 2023, Comparison of the Value of Transabdominal Two-Dimensional Ultrasound and Transvaginal Color Doppler Ultrasound in the Early Diagnosis of Endometrial Polyps. Clinical Medicine, 43(7): 83–85.

[2] Yang S, 2023, The Clinical Value of Three-Dimensional Reconstruction of Transvaginal Color Doppler Ultrasound in the Diagnosis of Endometrial Polyp and Endometrial Hyperplasia. Chinese Medical Device Information, 29(6): 109–111.

[3] Liang X, Lu F, Xu Y, et al., 2022, Comparison of the Diagnostic Value of Transvaginal Three-Dimensional Ultrasound and Two-Dimensional Ultrasound for Endometrial Polyps. Shenzhen Journal of Integrated Traditional Chinese and Western Medicine, 32(22): 76–78.

[4] Shi L, 2022, Clinical Value of Transabdominal and Transvaginal Two-Dimensional Ultrasound Combined with Vaginal Three-Dimensional Ultrasound in the Diagnosis of Endometrial Polyps. Chinese Contemporary Medicine, 29(31): 140–143.

[5] Liu Q, 2022, Clinical Analysis of Transvaginal Three-Dimensional Power Doppler Ultrasound Combined with Gynecologic Ultrasonography Endometrial Polyp. Journal of Aerospace Medicine, 33(9): 1043–1045.

[6] Long F, Zhang H, Wen J, et al., 2020, The Impact of Transvaginal Three-Dimensional Ultrasound Examination Combined with Hysteroscopy Diagnosis and Treatment on the Outcomes of *In Vitro* Fertilization and Embryo Transfer in Patients with Uterine Cavity and/or Endometrial Lesions. Guangxi Medicine, 42(21): 2785–2789.

[7] Zhao W, Liu Z, Chang C, 2010, The Differential Diagnostic Value of Endometrial Volume and Three-Dimensional Power Doppler for Endometrial Polyps and Endometrial Hyperplasia. Chinese Journal of Ultrasound Imaging, 2010(1): 40–42.

[8] Zhang Y, Wan N, Wen S, et al., 2017, Discussion on the Clinical Value of Transvaginal Three-Dimensional Ultrasound Technology in the Clinical Diagnosis of Endometrial Lesions. Journal of Medical Imaging, 27(7): 1335–1337.

[9] Zhang M, Ju R, Guo R, et al., 2022, Research on the Application of Transvaginal Three-Dimensional Ultrasound in the Diagnosis of Endometrial Polyps and Malignant Transformation of Endometrial Polyps. Beijing Medicine, 44(3): 276–278.

[10] Wu W, Huang Y, Liu Y, et al., 2017, The Differential Diagnostic Value of Vaginal Three-Dimensional Ultrasound in Premenopausal Endometrial Polyps and Analysis of the Causes of Misdiagnosis. Chinese Journal of Endemic Disease Prevention and Control, 32(11): 1312.

[11] Cao C, Zhai H, Zhou J, et al., 2023, Application of Intracavitary Three-Dimensional Ultrasound in the Diagnosis of Endometrial Polyps. Chinese Science and Technology Journal Database (Full Text) Medicine and Health, 2023(5): 29–32.

[12] Deng X, Tian H, Ning X, 2022, Comparison of the Diagnostic Effectiveness of Transvaginal Three-Dimensional Ultrasound Render Imaging and Omniview Imaging Technology for Uterine Cavity Diseases. Chinese Journal of Ultrasound Medicine, 38(2): 184–188.

[13] Hu B, Lai G, Shi L, et al., 2019, Differential Diagnosis of Endometrial Polyps by Abdominal and Transvaginal Ultrasonography Combined with Three-Dimensional Ultrasonography. Chinese Contemporary Medicine, 27(6): 140–142 + 146.

[14] Xiao L, Ma Z, Zhang L, et al., 2019, Research on the Differential Diagnosis of Endometrial Polyps and Proliferative Endometrium by Transvaginal Three-Dimensional Ultrasound. Corps Medicine, 2019(2): 48–50.

[15] Peng H, Chen X, Xiao X, et al., 2019, Diagnostic Value of Transvaginal Three-Dimensional Ultrasound Free Anatomical Imaging Technology for Endometrial Polyps. Imaging Research and Medical Applications, 3(5): 24–25.