Advances in Obstetrics and Gynecology Research, 2024, Volume 2, Issue 4
https://ojs.bbwpublisher.com/index.php/AOGR
Online ISSN: 2981-8060

Ultrasonographic Performance and Clinical Analysis of Ultrasound in the Diagnosis of Uterine Fibroids

Shan Wang[1]*, Xiaoyan Li[2]

[1]Balihan Town Central Health Hospital, Ningcheng County, Chifeng City, Inner Mongolia 024231, China
[2]Mujiayingzi Township Central Health Hospital, Songshan District, Chifeng City, Inner Mongolia 024000, China

Corresponding author: Shan Wang, 13245957078@163.com

Abstract: *Objective:* To assess ultrasound's ultrasonographic performance and clinical value in diagnosing uterine fibroids. *Methods:* 60 patients with suspected uterine fibroids admitted to the hospital between March 2021 and March 2024 were selected for this study. Abdominal B-mode ultrasound was used as the gold standard to detect pathological findings, and the results were compared and analyzed. *Results:* 54 patients were diagnosed after the gold standard, and the results of abdominal B-mode ultrasound were positive predictive value: 96.29%; negative predictive value: 66.67%; accuracy: 93.33%; sensitivity: 96.29%; specificity: 66.67%. Among 60 patients examined by B-mode ultrasound, there were a total of 54 patients who were diagnosed by the gold standard, and 19 cases of uterine leiomyosarcoma were confirmed by the detection of uterine leiomyosarcoma by the gold standard, and B-mode ultrasound (94.73%); 21 cases of cervical leiomyoma were confirmed by gold standard test and 20 cases of cervical leiomyoma were diagnosed by ultrasound (95.24%); 14 cases of mixed leiomyoma were confirmed by gold standard test and 14 cases of mixed leiomyoma were diagnosed by ultrasound (100.00%). *Conclusion:* Using abdominal ultrasound to examine patients with uterine fibroids can significantly improve the efficiency of diagnosis and treatment and provide a strong scientific basis for subsequent treatment decisions.

Keywords: Ultrasound; Uterine fibroids; Ultrasonographic performance; Accuracy rate

Online publication: September 6, 2024

1. Introduction

Uterine fibroids are smooth muscle tumours of the uterus. As a common obstetrics and gynecology condition, uterine fibroids have a certain incidence in the clinic, and most of them occur in young and middle-aged women [1]. The disease consists of connective tissue and smooth muscle. It mostly occurs between the ages of 30 and 50 years old, while those under 20 years old are rare. The course of the disease is long, the etiology is complex, and there are no significant signs in the early stage, but the enlargement of fibroids in the late stage may lead to symptoms such as irregular menstruation, abdominal pain, and even affect the ability to bear children, so it is necessary to

diagnose and treat it as early as possible to alleviate the symptoms. Since fibroids are often associated with little or no symptoms, the reported incidence of the disease is much lower than the actual incidence [2,3]. As there are various diagnostic methods for uterine fibroids nowadays, it is crucial to increase the detection rate at the first visit to the clinic, which will help to start the treatment as early as possible. Ultrasound is now widely used in the clinical diagnosis of uterine fibroids and has become one of the most commonly used diagnostic methods in the clinic due to its many advantages, such as cost-effectiveness, minimal damage and rapidity [4]. This study explores the ultrasonographic performance and clinical analysis of ultrasound in the targeting of uterine fibroids in patients with suspected uterine fibroids. It is reported as follows.

2. Data and methods

2.1. General information

Sixty patients with suspected uterine fibroids admitted to the hospital was selected, and in this group, the age of the patients ranged from 32 to 41 years old, with an average age of (47.59 ± 2.48) years old. All patients and their families were fully informed and voluntarily participated in this research activity to achieve its efficacy and safety assessment. The Ethics Committee of the hospital approved this study.

2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) In patients with suspected uterine fibroids, symptoms include excessive menstruation, prolonged menstrual period or irregular bleeding, hard lumps in the lower abdomen, a small number of pain and compression symptoms, or accompanied by pelvic blood, uterine enlargement, detecting the growth or deformation of the uterine cavity, and touching the raised surface of the uterine cavity during the diagnosis and scraping; (2) Patients with no history of mental disorders; (3) Patients with non-uterine malignant tumours; (4) Patients with no omissions from the medical records.

Exclusion criteria: (1) Abnormal function of vital organs; (2) Patients with a history of mental disorder and unable to communicate normally; (3) Patients with uterine malignant tumor; (4) Incomplete medical records; (5) Pregnant women and breastfeeding women patients.

2.3. Methods

All female patients underwent abdominal ultrasound using Xuzhou Atman Electronic Technology Co., Ltd.'s all-digital color Doppler ultrasound diagnostic instrument K model. Before the examination, the patients were given 500 mL of water to make the bladder full, assisted in adjusting to the supine position, and ensured the position was stable. The probe frequency was adjusted to 3.5–5.0 MHz, and longitudinal, transverse and oblique three-dimensional scans from the pubic bone downward to view and record in detail whether the women were suffering from uterine fibroids and their specific conditions through ultrasound, including the thickness of the uterine wall, the size of the mass, its location and the number and other key information, and then analyzed them scientifically. Further pathological examination is required to confirm the diagnosis for fibroids detected by ultrasound.

2.4. Observational indicators

Analyze the degree of proximity between the comprehensive diagnostic efficacy of abdominal ultrasound and the pathological-anatomical results. In this study, regarding the pathological results as the gold standard, patients with uterine fibroids were treated surgically and observed to study the performance and results of this lesion. On this basis, the diagnostic correctness, sensitivity, specificity, positive predictive value and negative

predictive value were calculated by comparing the abdominal ultrasound examination and its judgment of consistency with the pathological diagnostic results to assess the level of recognition of ultrasound in the diagnosis of uterine fibroids.

(1) Sensitivity = true positive/ (true positive + false negative) × 100.00%;

(2) Specificity = true negative/ (true negative + false positive) × 100.00%;

(3) Accuracy = (true positive + true negative)/ total number of cases × 100.00%;

(4) Positive predictive value = true positive/ (true positive + false positive) × 100.00%;

(5) Negative predictive value = true negative/ (false negative + true negative) × 100.00%.

2.5. Statistical methods

SPSS 20.0 statistical software was used to compare the categorical data, such as diagnostic efficacy between groups, using the chi-square test. Kappa test was used for consistency, and when Kappa > 0.60, it was regarded as high consistency of the examination results, and $P < 0.05$ suggested that the comparison between groups had statistical significance.

3. Results

3.1. Detection results and diagnostic efficacy kappa value

After the gold-standard diagnosis of 54 patients, abdominal B-type ultrasound results confirmed 52 cases, with a positive predictive value of 96.29%, a negative predictive value of 66.67%, an accuracy of 93.33%, a sensitivity of 96.29%, a specificity of 66.67%, and a kappa value of 0.629. See **Table 1**.

Table 1. 60 Ultrasound diagnostic detection results

Detection methods	Nature	Postoperative pathological findings		Total
		Positive	Negative	
Abdominal B-mode ultrasound	+	52	2	54
	-	2	4	6
Total		54	6	60

3.2. Ultrasound results

Of the 60 patients examined by ultrasound, a total of 54 patients were diagnosed by the gold standard. The gold standard test confirmed 19 cases of uterine leiomyomas and 18 cases were detected by ultrasound diagnosis (94.73%); 21 cases of cervical leiomyomas and 20 cases of cervical leiomyomas were diagnosed by ultrasound diagnosis (95.24%); 14 cases of mixed leiomyomas and 14 cases of mixed leiomyomas were diagnosed by ultrasound diagnosis (100.00%).

3.3. Clinical diagnostic image performance of ultrasound

The diagnostic image of abdominal ultrasound is clearer and more perfect, truly and precisely revealing the lesion status of the patient's disease. It involves the location, size, shape, thickness of the lining, internal echo characteristics of the specific leiomyosarcoma and other related information to help the later judgement and processing.

4. Discussion

The fast pace and high pressure of modern life have led to an increase in the incidence of diseases, such as uterine fibroids, which have become one of the most common benign tumours in gynecology. Its etiology includes genetic, estrogen and progesterone factors, but also age, lifestyle and obesity factors are involved [5]. In the early stage, the tumour often lacks significant symptoms, but it may impact physiological functions over time, so it needs to be diagnosed and treated as early as possible. Primary symptoms often include miscarriage, anaemia and erythrocytosis, which are serious threats to the patient's life and health. Currently, fibroids can be detected by various methods, including magnetic resonance imaging (MRI), hysteroscopy, laparoscopy and ultrasound. Although MRI can accurately diagnose uterine fibroids, define the location, size and number of lesions and help to differentiate between other related conditions, such as adenomyosis, it is more costly and not suitable for routine medical check-ups and is more suitable for pre-surgical evaluation and post-surgical monitoring. In contrast, laparoscopy and hysteroscopy focus more on viewing the uterine cavity to identify fibroids or lesions. Microscopic biopsies can also be performed to confirm the pathological nature of the lesion. However, both techniques are relatively difficult to perform [6,7].

With the increasing scale of colour Doppler ultrasound medical applications, its performance has been continuously improved. Using advanced imaging, measurement and quantification technologies, it achieves undisturbed blood flow image acquisition in the patient's body, and ultrasound, as a highly efficient and high-resolution acoustic imaging technology, has been widely used in diagnostic work in various clinical fields [8]. In particular, it plays a key role in the detection of gynecological diseases, and is especially good at the meticulous observation of the fetus and the uterus, such as the diagnosis of uterine fibroids, and can accurately measure the volume and morphology of the uterus and the blood flow around it, which can provide a powerful reference for the judgment of the condition. Compared with other diagnostic means such as magnetic resonance imaging and hysteroscopic biopsy, ultrasound has unique advantages, such as (1) moderate cost, outstanding economy, easy to be accepted by the patients; (2) easy and fast operation, no need for special position, and can be carried out at any time; (3) high efficiency and sensitivity of the detection, which can help to distinguish similar diseases; (4) clear and intuitive images, which is convenient to understand the acoustic and visual characteristics of uterine fibroid, and is suitable for use as a routine health check-up item. Therefore, it can be seen that ultrasound has great practical value in physical examination and preliminary diagnosis [9].

In this study, 54 patients were diagnosed after the gold standard, and the results of abdominal B-mode ultrasound were as follows:

(1) Positive predictive value: 96.29%;

(2) Negative predictive value: 66.67%;

(3) Accuracy: 93.33%;

(4) Sensitivity: 96.29%;

(5) Specificity: 66.67%.

Of the 60 patients examined by ultrasound, the gold standard confirmed 54 patients and 19 cases of uterine fibroids were confirmed by the gold standard test. Abdominal ultrasound is suitable for a variety of uterine fibroid disease classifications. For cases that cannot be diagnosed, the combination of pathological examination and B ultrasound can effectively improve the accuracy of clinical diagnosis. This study showed that the diagnosis rate of abdominal ultrasound was 96.29%, similar to the research results of Yang Y (2022) [10].

Ultrasonography is widely used to diagnose and treat uterine fibroids, mainly detected by abdominal ultrasound. This method can accurately find out whether there are tumors in the uterus and fluid in the uterine cavity. Abdominal B-mode ultrasound is non-invasive and non-disease-promoting. The measurement

of endometrial thickness in clinical diagnosis can help to predict endometrial pathology and provide strong support to help the clinic accurately assess the condition of patients with uterine fibroids. In diagnosing fibroids, it should be noted that the endometrium with endometrial tissue grows backward and invades into the myometrium, with typical symptoms such as increased menstrual flow, uterine distension and dysmenorrhoea and some mild dysmenorrhoea often mistaken for fibroids.

Myxomatosis can be recognized by sonographic observation of uniform enlargement of the uterus with an asymmetrical thickness of the anterior and posterior walls (the posterior wall is thicker, resulting in bowing of the endometrium), increased ultrasound reflexes and disorganized echoes in the uterine section. Adenomyoma can be identified if there is an accumulation of tumour-like changes in the muscular layer of the uterus and a marked increase in the intensity of the echoes. Adenomyomas have similarities with fibroids, but the former is often associated with the experience of progressively worsening dysmenorrhoea and may be accompanied by endometriotic cysts of the ovaries. Clinical symptoms of fibroids are more commonly seen as prolonged periods, lower abdominal masses and excessive menstrual blood flow. In ultrasound images, adenomyomas are not precisely identified by blurring of the outline of the adenomyoma from the surrounding tissues and the absence of an external envelope, while the internal structure is visible with an intact envelope, thus making it an important basis for the diagnosis of uterine fibroids by B-mode ultrasound [11–13].

5. Conclusion

In conclusion, B-mode ultrasound has significant utility in diagnosing and treating uterine fibroids, helps formulate clinical diagnoses and treatment plans accurately and has a critical impact on clinical practice.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Xu W, 2024, The Differential Diagnostic Value of Uterine Fibroids and Adenomyosis by 3.0T MRI. Imaging Research and Medical Application, 8(15): 158–160.

[2] Zhao Y, Jinou, 2024, Application of Three-Dimensional Ultrasound Free Anatomical Imaging Combined with VCI in the Preoperative Diagnosis of Submucosal Uterine Fibroids. Zhejiang Trauma Surgery, 29(7): 1356–1358.

[3] Zhang A, 2024, The Value of Transabdominal and Transvaginal Ultrasonography in the Diagnosis of Uterine Fibroids. Imaging Research and Medical Application, 8(14): 159–162.

[4] Zhang J, 2024, Differential Diagnostic Value of Colour Doppler Ultrasound for Uterine Fibroids and Adenomyosis. Imaging Research and Medical Application, 8(14): 144–146.

[5] Zhang X, Duan C, Zeng Z, et al., 2024, Clinical Value of Transvaginal and Abdominal Colour Doppler Ultrasound in the Differential Diagnosis of Uterine Fibroids and Adenomyomas. Modern Medical Imaging, 33(6): 1118–1121.

[6] Guo X, Zhong Y, 2024, Clinical Significance of Abdominal Ultrasound Combined with MRI Image Texture Analysis for Differential Diagnosis of Uterine Fibroids and Adenomyosis. China Medical Device Information, 30(12): 4–6.

[7] Ma J, Zhang H, Wang X, et al., 2024, Application of Enhanced CT Combined with Ultrasonography in the Diagnosis of Uterine Fibroids. Chinese Rural Medicine, 31(12): 62–63.

[8] Liao Q, 2023, Clinical Value of Vaginal Ultrasound and Abdominal Ultrasound in the Diagnosis of Uterine Fibroids. Chinese Community Physician, 39(22): 63–65.

[9] Wang J, 2022, Comparison of the Effects of Abdominal Ultrasound and Vaginal Ultrasound in the Diagnosis of Uterine Fibroids. Modern Diagnosis and Treatment, 33(12): 1819–1821.

[10] Yang Y, 2022, Analysing the Accuracy of Abdominal Ultrasound in Routine Diagnosis of Patients with Uterine Fibroids. Imaging Research and Medical Application, 6(2): 149–151.

[11] Yang H, Liang X, Yu Y, 2021, Clinical Application Value of CT Combined with MRI in the Diagnosis of Metaplastic Giant Uterine Fibroids. Zhejiang Trauma Surgery, 26(5): 873–875.

[12] Zeng F, 2024, Clinical Value of Magnetic Resonance Imaging in the Diagnosis of Uterine Fibroids. China Medical Innovation, 21(19): 147–150.

[13] Zhou H, 2023, Clinical Value of Transvaginal Colour Doppler Ultrasound Diagnosis of Uterine Fibroids. Modern Medicine and Health Research Electronic Journal, 7(10): 109–112.