STUDY ON SENSITIVITY DIFFERENCE OF BI-RADS CLASSIFICATION OF BREAST TUMOURS WITH DIFFERENT PATHOLOGICAL TYPES

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ABSTRACT

Objective: *The objective was to study the sensitivity difference of BI-RADS classification in breast tumours of different pathological types.*

Methods: *From April 2017 to October 2018, 193 patients who underwent breast ultrasound examination in our hospital and found breast tumours were treated with parallel surgery. Ultrasound was performed using a colour Doppler ultrasound system to perform a BI-RADS grading assessment of breast masses. After the breast mass was found, the surgical treatment was performed after adequate surgical evaluation, and pathological diagnosis was performed after resection. Results of BI-RADS classification and pathological diagnosis were analysed and compared.*

Results: *A total of 203 subjects were examined for 200 lesions, and all were surgically removed for pathological examination. Among the 200 lesions, there were 171 benign BI-RADS grades, 29 of which were malignant; 171 were pathologically benign, and 25 were malignant. There was no statistical difference between the two diagnostic methods (X^2=0.34, P>0.05). Of the 175 lesions diagnosed as benign by BI-RADS, seven were pathologically confirmed as malignant lesions. Three of the 25 lesions were diagnosed as malignant using BI-RADS, and three were pathologically confirmed to be benign lesions. The diagnostic sensitivity of BI-RADS classification for benign and malignant breast masses was 75.86% (22/29), with a specificity of 98.24% (168/171) and an accuracy of 95% (190/200). BI-RADS classification has high diagnostic sensitivity for benign breast mass epidermal cysts, malignant breast papillary carcinoma, and relatively low sensitivity to other pathological types of breast masses.*

Conclusion: *The BI-RADS classification has a high diagnostic sensitivity for benign and malignant breast masses, and there are differences in the sensitivity of breast tumours of different pathological types.*

Keywords: *Breast mass, pathology, BI-RADS classification, sensitivity.*

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Introduction

The most common malignant tumour in women is breast cancer, and it occurs more in younger women, causing a heavy medical and social burden. Breast cancer is prone to lymphatic metastasis or distant metastasis. Early detection, early diagnosis, and early treatment are effective means to reduce the impact of breast cancer[1]. At present, the examination method of breast mass is widely used because of ultrasound's simplicity, safety, and reproducibility[2]. The Breast Imaging-Reporting and Data System (BI-RADS), proposed and recommended by the American College of Radiology (ACR) in 1992, has been revised for breast ultrasound and MRI diagnosis. Therefore, this study analysed the sensitivity of BI-RADS in different pathological types of breast masses and improved the accuracy of ultrasound and other imaging examinations on breast masses.

Materials and methods

Clinical data

From April 2017 to October 2018, 193 patients underwent breast ultrasound examinations in our hospital, and breast masses were treated with

concurrent surgery. Patients were aged 21-77 years, with an average age of 42.17±4.85 years.

Instruments and inspection methods

Each patient was placed in a supine position at rest, fully exposed to the bilateral mammary glands. The ultrasound examination was performed using a colour Doppler ultrasound system (Siemens G60s) with a 7-10 MHz probe frequency, with the nipple as the centre, and a radial slow sliding probe in the clockwise direction. Furthermore, it scanned in multiple sections while sliding and observing, comparing the shape of the bilateral breasts and scanning blood flow. It paid attention to observing the presence of large or small masses to avoid missed diagnoses. After finding the breast mass, it focused on the number, boundary, edge, internal echo and posterior echo characteristics, surrounding tissue, blood vessel distribution, presence or absence of calcification, elasticity, presence or absence of axillary lymph nodes, and axillary lymphadenopathy.

Consequently, a BI-RADS grading assessment of breast masses was performed. After the breast mass was found, the surgical treatment was performed after adequate surgical evaluation, and after resection, the pathological diagnosis was made. Thereafter, the BI-RADS classification and pathological diagnosis results were analysed and compared.

BI-RADS evaluation criteria

The BI-RADS evaluation criteria were divided into various levels[3]

Level 0:

No obvious abnormalities were found during the examination. The information obtained may not be complete and needs to be recalled and combined with other examinations.

Grade I:

No abnormalities in the ultrasound, no mass, no structural disorder, and slight calcification.

Grade II:

Considering benign changes, the mammary gland structure is not regular, and there are no significant changes after repeated ultrasonography. Regular follow-up is recommended.

Grade III:

Benign diseases can be large, and the proportion of malignancy is less than 2%, but the follow-up period needs to be shortened.

Grade IV:

There is an abnormality, and the possibility of malignant lesions cannot be completely ruled out. The malignant proportion is less than 10%, and a biopsy is required.

Grade IV is further divided into three subtypes:

Grade IVa:

The tendency to be malignant is low, and an ultrasound biopsy is recommended.

Grade IVb:

Moderate to the possibility of malignancy.

Grade IVc:

The tendency to be malignant is high.

Grade V:

Highly suspected of malignant lesions (almost identified as malignant diseases), breast masses under ultrasound showed changes in tissue structure, ligament thickening, and microcalcification, requiring surgical biopsy.

Grade VI:

Confirmed by pathology as a malignant lesion.

Observation indicators

The first observation indicator is the benign and malignant judgment of breast mass. For benign breast mass, ultrasound BI-RADS Grade III or less is considered a benign lesion, consistent with pathological results. For malignant breast mass, ultrasound BI-RADS Grades IV and V were identified as malignant lesions, which were consistent with pathological findings for accurate diagnosis. The second indicator is the sensitivity, specificity, and accuracy of BI-RADS classification to diagnose different pathological types of breast masses.

Statistical methods

All data in this study were analysed and processed by SPSS 22.0 software. The normal distribution measurement data were expressed as mean±standard deviation ($\bar{x}\pm s$). Additionally, a t-test was used for comparison between groups. The count data was used to indicate the comparison between groups, and the difference was statistically significant at $P<0.05$.

Results

Pathological diagnosis of breast mass and BI-RADS classification diagnosis results

A total of 203 subjects were examined for 200 lesions, and all underwent pathological examination after surgical resection. The pathological diagnosis and BI-RADS diagnosis of 200 breast masses are shown in Table 1.

Diagnosis method	Benign (example)	Malignant (example)	χ^2	P
Pathological diagnosis	171	29	0.34	>0.05
BI-RADS rating	175	25		

Table 1: Pathological diagnosis and BI-RADS diagnosis.

BI-RADS classification for the diagnosis of different pathological types of breast masses

Of the 175 lesions diagnosed as benign by BI-RADS, seven were pathologically confirmed as malignant lesions. Furthermore, three of the 25 lesions were diagnosed as malignant by BI-RADS, and three were pathologically confirmed to be benign lesions. The diagnostic sensitivity of BI-RADS classification for benign and malignant breast masses was 75.86% (22/29), with a specificity of 98.24% (168/171) and an accuracy of 95% (190/200). The diagnostic sensitivity of BI-RADS in the diagnosis of epidermal cysts and papillary carcinoma is 100%, followed by an 87.93% diagnostic sensitivity of breast fibroadenoma.

The diagnostic sensitivity is lower for mastitis lesions, intraductal papilloma, invasive ductal carcinoma, catheter breast cancer masses, such as cancer and other pathological types. The specific diagnostic sensitivity of BI-RADS classification to specific pathological types is shown in Table 2.

Pathological type of breast mass	BI-RADS graded benign (a)	BI-RADS classification malignancy (a)	Sensitivity (%)
Benign breast mass			
Epidermal cyst	4	0	100
Fibroadenomas	102	14	87.93
Mastitis lesion	11	18	57.89
Adenosis with cyst	6	5	54.55
Intraductal papilloma	3	8	27.27
Malignant breast mass			
Papillary carcinoma	0	11	100
Invasive ductal carcinoma	2	8	80
Intraductal carcinoma	3	5	62.5

Table 2: Diagnostic sensitivity of BI-RADS classification for different pathological types of breast masses.

Discussion

The breast is an important organ of women. The breast is located between the superficial and deep layers of the superficial fascia. Unfortunately, various lesions can occur in breasts, such as breast fibroadenomas, breast hyperplasia, breast cysts, mastitis, and even breast cancer. The impact of this on a patient's life is significant. The incidence of breast cancer has been on the rise since the late 1970s and has become a major public health problem in the current society. Early detection and early diagnosis of breast cancer is the key to improving the efficacy of diagnosis and treatment of breast cancer.

In addition to the collection of medical history and physical examination by the physician, the primary examination method is through imaging. Ultrasound has many advantages. For example, it is non-invasive, easy to operate, and highly reproducible. It is currently recommended to screen breast masses[4,5] and can fully observe the size, echo, and lymph node metastasis of breast masses. Although ultrasound examination has many advantages, its diagnostic accuracy and the identification of benign and malignant breast masses mainly depend on the ultrasound operation technology, proficiency level, level of professional knowledge, and work experience of the ultrasound doctor. Therefore, this examination is very subjective. As a result, there is a certain degree of uncertainty in the diagnosis of breast masses, and even misleading diagnosis and delay in treatment. According to statistics, the current diagnostic accuracy for breast cancer is only 75%, sensitivity is about 80%, and specificity is about 70%[6]. Improving the sensitivity of ultrasound for the diagnosis of breast mass and the accurate determination of the benign and malignant types of breast mass and the type of pathology is essential for grasping the timing of treatment and formulating treatment plans.

In 2003, the American Radiation Association developed the BI-RADS grading diagnostic system, which was applied to the diagnosis of breast masses by ultrasound. Furthermore, it reduced the influence of the ultrasound examiner on the diagnosis of breast mass to some extent. It increased the objectivity of ultrasound diagnosis, thereby increasing the accuracy and making it more repeatable. The BI-RADS grading diagnostic application is used to describe the audio-visual features of breast lumps, which enables different departments to communicate about the lesions, which is evidence-based and valuable for

the development of treatment plans. The patient also explained the extent of the lesion and followed up[7]. Therefore, the focus of this study was to analyse the efficacy of BI-RADS classification in the diagnosis of breast masses, specifically the correspondence between BI-RADS classification and pathological types of breast masses and the sensitivity of BI-RADS classification of breast lesions of different pathological types. The results of pathological diagnosis and BI-RADS grading diagnosis of 200 breast masses were compared, and it was found that the accuracy of the diagnosis of benign and malignant breast tumours was improved. The ultrasound BI-RADS classification had a high degree of matching with pathology and can accurately identify benign and malignant breast lesions. Zhang Zhibin et al.[8] analysed the sonographic features of breast lesions. They compared them with the pathological results to conclude that the sensitivity of BI-RADS-US classification for the diagnosis of breast lesions was 88.89%, the specificity was 85.83%, and the accuracy was 86.17%. Additionally, the positive predictive rate of Grade III~V in the BI-RADS-US classification is gradually increasing.

Other related studies have also confirmed that ultrasound BI-RADS classification has a higher value in diagnosing breast masses[9, 10]. This study further analysed the BI-RADS classification sensitivity of breast tumours with different pathological types. Among them, the diagnostic sensitivity of benign breast mass epidermal cyst and malignant breast papillary carcinoma was the highest, both of which were 100%. The sensitivity of BI-RADS classification varies with the pathological type of breast mass, which may be related to the different pathological types of breast mass[11, 12]. For example, ultrasound manifestations of epithelial cysts of benign breast mass have certain characteristics, such as a clear and enveloped boundary. After compression, the shape changes and relaxes. The internal echo is mostly hypoechoic to moderate echo, which is easy to identify during an ultrasound examination. The typical ultrasound findings of papillary carcinoma of the malignant breast mass are irregular in shape, with an unclear boundary, low internal echo unevenness or slightly lower echo, and easy to distinguish during an ultrasound examination.

In this study, seven of the 175 BI-RADS graded, benign breast masses were pathologically diagnosed as malignant lesions, which may be evaluated as BI-RADS with a clear border and some malignant tumours, such as phyllodes tumours, or with smooth edges and benign tumours. Misdiagnosis occurs below Grade III. There were three pathologically confirmed benign lesions among the 25 lesions diagnosed as malignant by BI-RADS. The possible causes were mastitis lesions, intraductal papilloma, and adenosis with cysts, expressed as malignant breast masses. Additionally, ultrasound features, such as unclear borders, unsmooth edges, and uneven internal echo, were misidentified as malignant breast masses assessed as BI-RADS Grade III or higher lesions[13-15]. This suggests that the diagnostic sensitivity of ultrasound BI-RADS classification to breast masses is related to the morphology of different pathological types of breast masses. For example, inflammatory lesions may show irregular shape, while malignant breast masses may also be oval[16], using ultrasound. BI-RADS graded breast mass diagnosis does not rely entirely on conventional benign and malignant masses. It is necessary to thoroughly combine other ultrasound features to accumulate experience and improve the sensitivity of diagnosis.

Conclusion

In summary, the BI-RADS classification has high diagnostic sensitivity for benign and malignant breast tumours. However, there are differences in the sensitivity of different pathological types of breast masses. It should be noted in clinical work to improve the diagnostic sensitivity of ultrasound for different pathological types of breast masses.

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