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ROLE OF ULTRASOUND FINDINGS AND HISTOPATHOLOGICAL DATA FROM ULTRASOUND GUIDED TRUCUT BIOPSY IN DIAGNOSIS OF SUSPICIOUS BREAST MASSES

By

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ABSTRACT

Background: Breast ultrasound being the first tool in diagnosis of suspicious breast masses especially in combination with mammographic study.

Objective: To assess the diagnostic value of the ultrasound of suspicious breast masses by correlation of the ultrasound findings with those obtained from the histopathological data resulting from U/S guided Tru Cut biopsy.

Patients and methods: The study was carried out at the Department of Radio diagnosis, Al-Hussien University Hospital - Cairo. The study was carried out during the period between December 2020 and June 2021. A total of 40 cases in which US revealed suspicious breast masses, all of those patients agreed to undergo tru-cut biopsy after ultrasound examination. The samples were sent for histopathological assessment to confirm the results of the ultrasound.

Results: Our results yielded a high sensitivity of 100% with 60% specificity, and a PPV and NPV, of 94.6%, 100% respectively with 95% accuracy.

Conclusion: Our study revealed that Tru-cut biopsy was an accurate diagnostic tool of suspicious breast masses with a high diagnostic accuracy of 95 % as it supplied enough tissue for pathologists to establish a correct histological assessment. So, it is a preferable procedure for the diagnosis of breast lesions prior to operation rendering to its low cost, high accuracy, minimal complications, safe and short time procedure.

Keywords: Suspicious breast masses, Ultrasound, U/S guided Tru cut biopsy, histopathological assessment.

INTRODUCTION

The incidence of breast cancer worldwide is increasing. However, with the advent of regular screening, more women are being diagnosed with early-stage disease. With the improved understanding of the heterogeneity of the molecular subtypes of cancer and thus development of more sophisticated treatment, breast cancer mortality continues to decrease *(Rojas and Stuckey, 2016)*.

Detection of breast nodules for diagnosing cancer precursor lesions before clinical manifestations is essential, considering its early discovery allows a

less aggressive treatment and yet more effective for these diseases. Imaging studies have greatly aided in the detection of non-palpable breast lesions, with emphasis on mammography, which identifies micro-calcifications, asymmetries and nodules, and on mammary ultrasonography (US), which is the most commonly used complementary method to characterize mammographic findings or to assist in the investigation of dense breasts. The identification of lesions suspicious of malignancy determines the need of cytological or histopathological evaluation through a minimally invasive procedure, whose arsenal consists basically of fine needle aspiration (FNAB) or core-biopsy *(Silva et al., 2017)*.

However, early detection requires an accurate and reliable diagnosis which should also be able to distinguish benign and malignant tumors. A good detection approach should produce both low false positive (FP) rate and false negative (FN) rate *(Huang et al., 2017)*.

US intervention has become a primary tool in the diagnostic workup of breast lesions. These interventions are safe, effective, and accurate owing to the lack of ionizing radiation and dynamic visualization capabilities *(Reisenauer et al., 2017)*.

Lumps or focal lesions in the breast detected by physical examination, mammography, or other imaging studies are subjected to US guided biopsy to differentiate between benign, malignant or grey zone lesions. A breast biopsy is performed to remove a thin core tissue from a suspicious area in the breast and give for histopathological examination. This is mostly performed by an experienced radiologist using a less invasive procedure. It is done in cases of a suspicious solid mass, a distortion in normal architecture or density of the breast tissue. This is very useful in suspicious lesions picked up by an US guided and then sampled accordingly *(Rakesh et al., 2017)*.

Dealing with a significant breast lesion involves the correlation of clinical imaging and the histopathological findings. This is best achieved with a multidisciplinary open forum with the clinician, radiologist and pathologist reaching a consensus on the management of each case using predefined protocols. The highest levels of diagnostics accuracy are achieved if such triple approach of imaging, clinical diagnosis and biopsy is used *(Ahmed and Kadhim, 2016)*.

The present work aimed to assess the diagnostic value of the ultrasound of suspicious breast masses by correlation of the ultrasound findings with those obtained from the histopathological data resulting from U/S guided Tru Cut biopsy.

PATIENTS AND METHODS

This prospective study comprised of 40 cases in which US revealed suspicious breast masses. All of those patients, investigated by breast ultrasound and, agreed to undergo U/S guided tru-cut biopsy after ultrasound examination. The samples are sent for histopathological assessment to confirm the results of the ultrasound. The work was done at the Radiology Department, Al-Hussien University Hospital. Ethical approval from Al-Hussien University Ethics Committee was obtained .The study was

carried out during the period between December 2020 till June 2021.

Inclusion criteria: Patients presented to the radiology department at Al-hussien university hospital for breast US and /or mammographic evaluation that revealed suspicious breast masses indicative for biopsy that was performed by ultra sound guidance under complete aseptic conditions.

Exclusion criteria: Patients refusals, Patients were not candidate for the biopsy as those with bleeding tendency and Patients with sonographic benign criteria of breast masses.

Statistical analysis: The clinical data were recorded on a report form. These data were tabulated and analyzed using the computer program SPSS (Statistical package for the social sciences) version 20 to obtain both descriptive data (for quantitative data in the form of Mean, standard deviation (±SD), median and interquartile range (IQR) in addition to frequency and distribution for qualitative data) and analytical statistics (Inter-group comparison of categorical data was performed by using Fisher exact test (FET)). A P value <0.05 was considered statistically significant.

RESULTS

This study included 40 patients. It was conducted in radiology department of Al-hussien university hospital. Mean age of patients was 47±9 (Mean±SD) with minimum of 38 years old and maximum of 65 years old. All of our samples were females.

There was no statistically significant difference between benign and malignant US regarding age of the patients, nipple discharge, sense of pain and lump and positions of the mass. While there was statistically significant difference according to family history **(Table 1)**.

Table (1): Comparison between results by US (benign and malignant) regarding the demographic data

Demographic data \ Results by U/S		Benign No. = 3	Malignant No. = 37	P-value
Age (years)	Mean ± SD	44.33 ± 10.12	47.16 ± 8.99	0.606
	Range	38 – 56	38 – 65	
Discharge	No	2 (66.7%)	24 (64.9%)	0.230
	Bloody	0 (0.0%)	11 (29.7%)	
	Yellowish	1 (33.3%)	2 (5.4%)	
Pain	No	2 (66.7%)	26 (70.3%)	0.896
	Yes	1 (33.3%)	11 (29.7%)	
Lump	No	2 (66.7%)	11 (29.7%)	0.189
	Yes	1 (33.3%)	26 (70.3%)	
Position	Right	1 (33.3%)	24 (64.9%)	0.278
	Left	2 (66.7%)	13 (35.1%)	
Family history	Negative	3 (100.0%)	11 (29.7%)	0.037
	Positive	0 (0.0%)	26 (70.3%)	

The total number of the patients in the study and the percentage of them in groups according to the site, echogencity, length, width, shape, margins and BIRADs of the mass **(Table 2)**.

Table (2): Radiologic data of the breast lesions

Breast lesions		**Total no. = 40**
Site of mass	Upper inner quadrant Upper outer quadrant	19 (47.5 %) 17 (42.5 %)
	Axillary tail	3 (7.5%)
	Left operative bed	1 (2.5%)
Echogencityof mass	Hypoechoic	38 (95.0%)
	Isoechoic	1 (2.5%)
	Mixed hyperehoic and hypoechoic	1 (2.5%)
Width (mm)	Median (IQR)	23.25 (15.6 – 27.75)
	Range	7 – 50
Length (mm)	Median (IQR)	17 (12.4 – 19)
	Range	4 – 40
Shape	Oval	31 (77.5%)
	Round	9 (22.5%)
Margin	Ill defined	31 (77.5%)
	Well defined	9 (22.5%)
BIRADs	III	2 (5.0%)
	IV a	2 (5.0%)
	IV b	14 (35.0%)
	IV c	22 (55.0%)

There was no statistically significant difference between benign and malignant histopathology regarding the ages of the patients, nipple discharge and pain. While there was statistically significant difference according to sense of breast lump, position of the mass and family history **(Table 3)**.

Table (3): Comparison between results by hisopatholgy and the demographic data

Results by histopathology **Parameters**		**Benign** **No. = 5**	**Malignant** **No. = 35**	**P-value**
Age (years)	Mean ± SD	46.20 ± 7.89	47.06 ± 9.21	0.845
	Range	38 – 56	38 – 65	
Discharge	No	3 (60.0%)	23 (65.7%)	0.514
	Bloody	1 (20.0%)	10 (28.6%)	
	Yellowish	1 (20.0%)	2 (5.7%)	
Pain	No	3 (60.0%)	25 (71.4%)	0.602
	Yes	2 (40.0%)	10 (28.6%)	
Lump	No	4 (80.0%)	9 (25.7%)	0.015
	Yes	1 (20.0%)	26 (74.3%)	
Position	Right	1 (20.0%)	24 (68.6%)	0.036
	Left	4 (80.0%)	11 (31.4%)	
Family history	Negative	5 (100.0%)	9 (25.7%)	0.003
	Positive	0 (0.0%)	26 (74.3%)	

There was no statistically significant difference between benign and malignant histopathology regarding site of mass and width of the mass. While there was statistically significant difference according to echogencity, length, shape margin and BIRADs of the masses **(Table 4)**.

Table (4): Comparison between results by histopathology (benign and malignant) regarding breast lesions

Parameters \ Results by histopathology		Benign No. = 5	Malignant No. = 35	P-value
Site of mass	Upper inner quadrant Upper inner quadrant	1 (20.0%) 3 (60.0 %)	18 (51.4%) 14 (40.0 %)	0.154
	Axillary tail	0 (0.0%)	3 (8.6%)	
	Left operative bed	1 (20.0%)	0 (0.0%)	
Echogencity of mass	Hypoechoic	3 (60.0%)	35 (100.0%)	0.013
	Isoechoic	1 (20.0%)	0 (0.0%)	
	Mixed hyperehoic and hypoechoic	1 (20.0%)	0 (0.0%)	
Width (mm)	Median (IQR)	15.2 (13 – 21)	24.5 (18 – 28)	0.105
	Range	7 – 35	14 – 50	
Length (mm)	Median (IQR)	7 (5 – 12.4)	17.4 (13.5 – 19.5)	0.006
	Range	4 – 17	12 – 40	
Shape	Oval	1 (20.0%)	30 (85.7%)	0.001
	Round	4 (80.0%)	5 (14.3%)	
Margin	Ill defined	1 (20.0%)	30 (85.7%)	0.001
	Well defined	4 (80.0%)	5 (14.3%)	
BIRADs	III	2 (40.0%)	0 (0.0%)	0.000
	IV a	2 (40.0%)	0 (0.0%)	
	IV b	0 (0.0%)	14 (40.0%)	
	IV c	1 (20.0%)	21 (60.0%)	

All malignancies proved by histopatholoy are seen by ultrasound, while only 60 % of benign lesions proved by histopathology are seen by ultrasound **(Table 5)**.

Table (5): Comparison between results by histopathology (benign and malignant) regarding results by US

Final results by U/S \ Results by histopathology	Benign No. = 5	Malignant No. = 35	P-value
Benign	3 (60.0%)	0 (0.0%)	0.001
Malignant	2 (40.0%)	35 (100.0%)	

There was no statistically significant difference between benign and malignant US regarding site of mass, echognecity, width and length. While there was statistically significant difference according shape, margin and BIRADs **(Table 6)**.

Table (6): Comparison between results by US (benign and malignant) regarding the breast lesions

Breast Lesions \ Results by U/S		Benign No. = 3	Malignant No. = 37	P-value
Site of mass	Upper inner quadrant	0 (0.0%)	19 (51.4%)	0.248
	Upper outer quadrant	3 (100 %)	14 (37.8%)	
	Axillary tail	0 (0.0%)	3 (8.1%)	
	Left operative bed	0 (0.0%)	1 (2.7%)	
Echogencity of mass	Hypoechoic	2 (66.7%)	36 (97.3%)	0.146
	Isoechoic	1 (33.3%)	0 (0.0%)	
	Mixed hyperehoic and hypoechoic	0 (0.0%)	1 (2.7%)	
Width (mm)	Median (IQR)	15.2 (13 – 35)	24.5 (18 – 27.5)	0.395
	Range	13 – 35	7 – 50	
Length (mm)	Median (IQR)	12.4 (4 – 17)	17 (13.5 – 19)	0.104
	Range	4 – 17	5 – 40	
Shape	Oval	0 (0.0%)	31 (83.8%)	0.009
	Round	3 (100.0%)	6 (16.2%)	
Margin	Ill defined	0 (0.0%)	31 (83.8%)	0.009
	Well defined	3 (100.0%)	6 (16.2%)	
BIRADs	III	2 (66.7%)	0 (0.0%)	<`0.001
	IV a	1 (33.3%)	1 (2.7%)	
	IV b	0 (0.0%)	14 (37.8%)	
	IV c	0 (0.0%)	22 (59.5%)	

The true positive, true negative, false positive and false negative values, sensitivity, specificity, positive predictive value, negative predictive value and accuracy **(Table 7)**.

Table (7): Results of ultrasound

	TP	TN	FP	FN	Sensitivity	Specificity	PPV	NPV	Accuracy
Results by U/S	35	3	2	0	100.0%	60.0%	94.6%	100.0%	0.950

The total number of the patients in the study and the percentage of them in groups according to the results seen by ultrasound (benign or malignant), results by histopathology (benign or malignant) and all histopathological results of the all patients **(Table 8)**.

Table (8): Descriptive data of the results

Results		Total no.=40
Results by U/S	Benign	3 (7.5%)
	Malignant	37 (92.5%)
Results by histopathology	Benign	5 (12.5%)
	Malignant	35 (87.5%)
Histopathological results	Invasive ductal carcinoma	10 (25.0%)
	Invasive lobular carcinoma	9 (22.5%)
	Invasive mammary carcinoma	4 (10.0%)
	Solid ductal carcinoma in situ.	2 (5.0%)
	Ductal carcinoma tubular variant	2 (5.0%)
	Invasive breast carcinoma tubule lobular	3 (7.5%)
	Intraductal papilloma	1 (2.5%)
	Benign fibroadenomatosis	3 (7.5%)
	Fat necrosis with benign proliferative lesion	1 (2.5%)
	Liposarcoma	1 (2.5%)
	Mixed tubular and lobular carcinoma	2 (5.0%)
	Invasive terminal duct / lobular carcinoma	2 (5.0%)

Invasive ductal carcinoma has penetrated through the duct wall into stroma **(Figure 1)**.

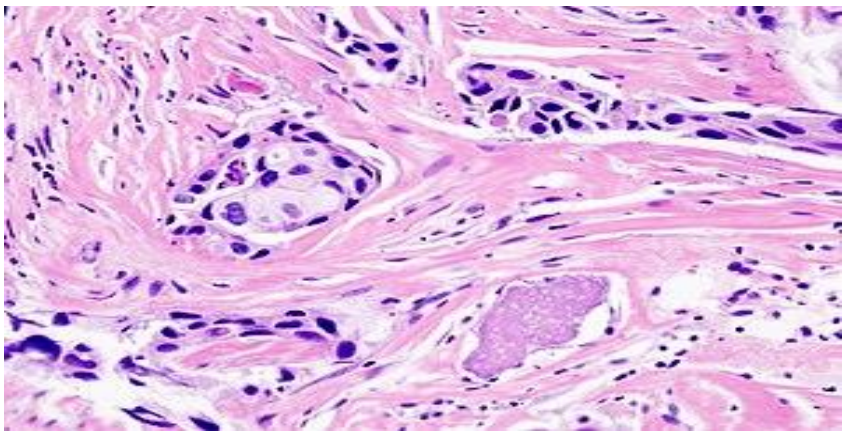

Figure (1): Invasive ductal carcinoma

Intraductal papilloma with benign proliferation of the intraductal epithelial cells, fibrovascular cores and underlying myoepithelial cells **(Figure 2)**.

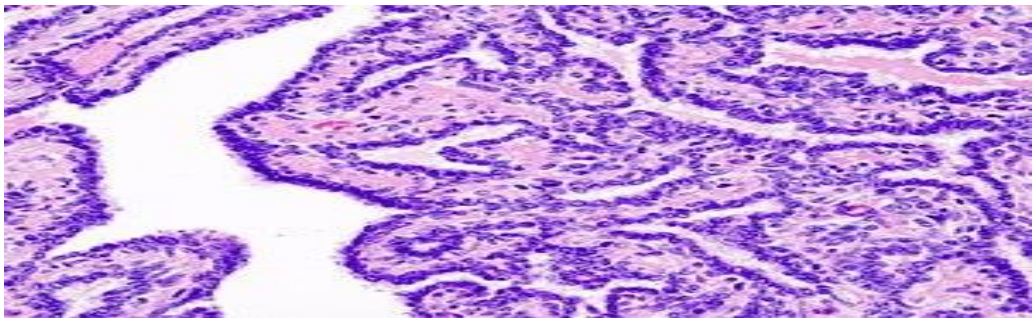

Figure (2): Intraductal papillom

Invasive lobular carcinoma with lobular neoplasia, intracellular mucin pushing the nucleus to one side created the characteristic signet ring morphology **(Figure 3)**.

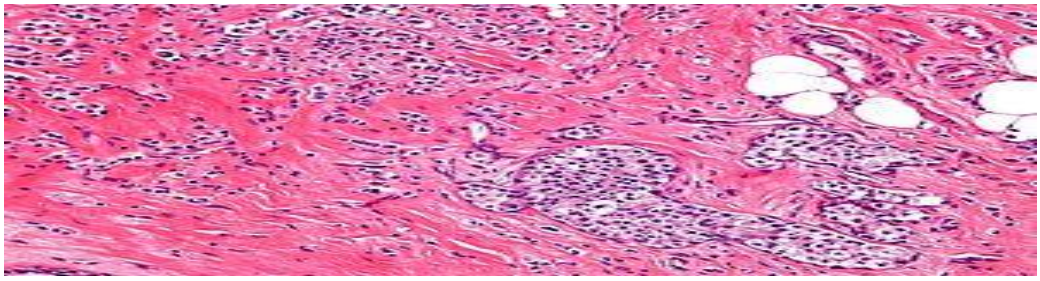

Figure (3): Invasive lobular carcinoma

DISCUSSION

The patient's age in our study ranged between 38 and 65 years with a mean of 47 years (±SD 9).

The study included 25 patients (62.5%) were right sided breast lesions which were more common than left sided lesions that included 15 patients (37.5%). which was similar to results of *Yasemin and Mehmet (2019)* in which right sided lesions include 268 patients (%56.8) that was more common than left sided lesions that include 204 patients(43.2%).

In our study the most frequent location of the masses was breast upper inner quadrant 47.5% of cases, while 42.5% of cases located at upper outer quadrant of the breast. The other locations were respectively axillary tail with a rate of 7.5% and operative bed region with a rate of 2.5%.

Yeniçeri et al (2015) showed that the most frequent location of the masses was breast upper outer quadrant (49.5%) and others were upper inner quadrant with a rate of 18.4%, lower inner quadrant with 8.7%, lower outer quadrant with 18.4% and retroareolar region with 4.9%.

As regards the BIRADS (breast imaging reporting and data systems) of each lesion, our study included 5.0% of patients of BIRADS III, 5.0% of BIRADS Iva, 35.0% of BIRADS IV b, and 55.0% of BIRADS IVc. *Yeniçeri et al. (2015)* showed that 42% were classified as BIRADS III, 19% as BIRADS IV, and 39% as BIRADS V. *Yasemin and Mehmet*

(2019) showed that BI-RADS III was 71.6% and, BI-RADS IV were 28.4%.

According to family history, our study included 65.0 % of positive family history; while *Yasemin and Mehmet (2019)* showed that the percentage was lower than our study, i.e. 12%.

Our results yielded a high sensitivity of 100 % with 60 % specificity, and a PPV and NPV, of 94.6 %, 100 %, respectively with 95 % accuracy. Our results with US-guided core biopsy were similar to those in other reported series in which sensitivity ranged from 90% to 100 % according to *Ahmed and Kadhim (2016)*.

With results seen by *Yasemin and Mehmet (2019)* showed different percentage due to the large number of cases. *Ahmed and Kadhim (2016)* showed that the sensitivity of core biopsy was 94.64%, specificity was 91.30% and accuracy rate was 94.87%. *Yasemin and Mehmet (2019)* showed that the sensitivity was 95.4% with 100% specificity, and a PPV, NPV, and diagnostic accuracy of 100%, 96.1%, and 98.9%, respectively.

CONCLUSION

Tru-cut biopsy was an accurate diagnostic tool of suspicious breast masses with a high diagnostic accuracy of 95 %. It was a preferable procedure for the diagnosis of breast lesions prior to operation rendering to its low cost, high accuracy, minimal complications, safe and short time procedure.

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دور نتائج الموجات فوق الصوتية والبيانات النسيجية المرضية من خزعة الهدنة الموجهة بالموجات فوق الصوتية في تشخيص كتل الثدي المشبوهة

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خلفيـــة البحـــث: تعتبـــر الموجـــات الفـــوق الصـــوتية علـــي الثـــدى الأداه الأولـــي فـــي تشخيص أورام الثدي لاسيما عند إستكمال الفحص بالماموجرام.

الهـدف مـن البحـث: هـو تقيـيم مـدى كفـاءة الموجـات فـوق الصـوتية علـي الثـدي فـي تشـخيص الاورام المبكـرة والتنبـؤ بـالأورام السـرطانية الخبيثـة وتمييزهـا عـن الاورام الحميـدة كمـا تهـدف دراسـتنا علـي التركيـز علـي أهميـة عينـه الثـدي قبـل الجراحـة فـي تشـخيص سـرطان الثـدي والتـي تسـاعد علـي زيـادة كفـاءة العمليـات الجراحيـة لأن التشـخيص المبكـر يـؤدي الـي نتـائج افضـل فـي العـلاج عـن التشـخيص المتـأخر للمـرض وبعـذ ذلـك نقـوم بمطابقـة ارتبـاط النتـائج النسـيجية المرضـية للخزعـة الموجهـة بالأشـعه التلفزيونيـه مـع تلـك المعلومـات والنتـائج التـي تـم الحصـول عليهـا من الموجات فوق الصوتية.

المريضـات وطـرق البحـث: تضـمنت هـذه الدراسـة 40 مريضـة يعـانين مـن شـكاوي مختلفـة بالثـدي والتـي تتركـز معظمهـا فـي وجـود تـورم أو إفـرازات مـن الحلمـة بالاضـافة إلـى ألـم الثـدى، وقـد تـم فحصـهن بالموجـات فـوق الصـوتية وأشـعة المـاموجرام فـي قسـم الأشـعة بمستشـفى الحسـين الجـامعي .كمـا تـم إجـراء الاختبـارات التشخيصـية بطريقـة موحـدة. وتمـت عمليـة أخـذ العينـة بشـكل منهجـي كامـل مـع مراعـاة أعلـي معـايير التعقـيم. وتـم تسـجيل كـل مـن النتـائج الإيجابيـة والسـلبية لجميـع المتغيرات.

نتـــائج البحـــث: هنـــاك حساســـية عاليـــة بنســـبة 100٪ مـــع 60٪ نتـــائج محـــددة ، والقيمـــة التنبؤيـــة الايجابيـــة و القيمـــة التنبؤيـــة الســـلبية علـــي 94.6٪و 100٪ علـــى التـــوالي، ممـــا يعنـــي أن خزعـــة العينـــة الموجهـــة بالأشـــعة التلفزيونيـــة تـــوفر تشـــخيص ســـرطان الثـــدي بدرجة عالية من الثقة.

الإســـتنتاج: خزعـــة العينـــة الموجهـــة بالأشـــعة التلفزيونيـــة هـــي أداة تشـــخيص دقيقـــة لكتـــل الثـــدي المشـــتبه بهـــا مـــع دقـــة تشخيصـــية عاليـــة تصـــل إلـــى 95٪حيـــث تـــوفر أنســـجة كافيـــة لاجـــراء تقيـــيم نســـيجي صـــحيح. لـــذلك فهـــو إجـــراء مثـــالي لتشـــخيص كتـــل الثـــدي قبـــل إجـــراء العمليـــة ممـــا يجعلهـــا مخفضـــة التكلفـــة، ودقـــة عاليـــة، وأدنـــى المضـــاعفات، وإجراءات آمنة وقصيرة المدة.

الكلمـــات الدالـــة: كتـــل الثـــدى المشـــتبه بهـــا، الموجـــات فـــوق الصـــوتية، خزعـــة الهدنـــة الموجهة بالموجات فوق الصوتية، تقييم الأنسجة المرضية.