Benha Journal of Applied Sciences (BJAS) **print: ISSN 2356–9751**
Vol. (8) Issue (1) (2023), (87-98) **online: ISSN 2356–976x**
http://bjas.journals.ekb.eg

Role of Ultrasound and Ultrasound Guided Interventional Procedures in the Evaluation of Mammographically Detected Breast Calcifications

Marwa.M.Fathy[1], Hesham.E.Elsheikh[1], Osama.T.Galal[1]and Ayman.A. Mehanna[2]
[1]Diagnostic and Interventional Radiology Dept., Faculty of medicine Benha University
[2]Consultant of Diagnostic and Interventional Radiology Medical Research Institute, Alexandria University
E-mail: marwafathygomaa@gmail.com

Abstract

Background: Breast calcifications may be the sole observable indicator of early breast cancer, making them a significant finding on a mammography. This research aimed to evaluate the usefulness of ultrasonography and ultrasound-guided interventional treatments in the assessment of breast calcification diagnosed by mammography. Methods: This investigation was done on thirty individuals whose mammograms revealed worrisome microcalcifications. Each patient had a comprehensive history, physical examination, laboratory analysis, mammography, ultrasound, core biopsy under sonographic guidance, and guide wire localisation under sonographic direction. Twenty patients got ultrasound-guided breast biopsies, and ten patients had ultrasound-guided wire localisation. Results: 75 percent of the 20 lesions that underwent guided biopsy were diagnosed sonographically as masses, while the other lesions were classified as parenchymal distortions or calcifications. 75% of the cases were malignant, whereas 25% were benign lesions. In 7/10 (70%) instances, wire localization was successful; in 2 cases, the wire reached the posterior side of the lesion but did not transfix it, and in 1 case, the wire reached only the anterior aspect of the lesion. Conclusions: Based on the findings of the current investigation, we have shown that targeted US is an excellent tool for the characterisation of microcalcification observed on mammography and may be useful for predicting invasive breast tumours. Sonographically detectable microcalcifications appear as small echogenic, non-shading foci, particularly if they are coupled with sonographic hypoechoic lesions.

Keywords: Ultrasound Guided, Interventional Procedures, Mammographically, Breast Calcifications.

1. Introduction

Breast calcifications may be the sole observable indicator of early breast cancer, making them a significant finding on a mammography.

Breast calcifications may result from a variety of causes. They are quite prevalent and may be detected in 85% of mammograms. Their prevalence grows with age. Up to fifty percent of breast tumours are linked with calcification, and 15 to 30 percent of biopsied calcifications in asymptomatic women likely to be malignant. [1, 2]

Ninety-nine percent (99%) of the calcium that enters the body is deposited in the bones and teeth. Blood dissolves the leftover calcium.

Breast cancer is the most prevalent cancer in both industrialised and developing nations, accounting for 22.9% of all female cancers. An estimated 1 in 8 women will acquire breast cancer in their lifetime. Additionally, it is the greatest cause of cancer-related mortality in women, accounting for 13.7% of their cancer-related mortality.

Breast cancer is predicted to be the most prevalent cancer among women in Egypt, accounting for 37.7 percent of all cancer cases. It is also the main cause of cancer-related death, accounting for 29.1% of all cancer-related deaths.

Non-palpable breast cancers account for approximately one-third of all diagnosed breast cancers; the primary tumour detected in 28 percent of the analysed patients was at the non-palpable stage; additionally, the increase in the use of screening examinations led to a statistically significant increase in the frequency of breast-conserving surgical procedures. [4, 5]

This research aimed to evaluate the usefulness of ultrasonography and ultrasound-guided interventional treatments in the assessment of breast calcification diagnosed by mammography.

2. Patients and methods

This study was conducted on 30 patients referred to the radiodiagnosis and interventional radiology department at Alexandria Medical Research Institute for assessment of breast calcifications that needed diagnostic sonomammogram or are candidates of screening mammogram with accidently discovered breast lesions and the female patients suggested as having non palpable breast lesions on mammographic or sonographic basis, referred to the breast imaging unit of radiology department at Medical Research Institute of Alexandria university; and assigned for breast conserving surgery (BCS).

Inclusion criteria were patients with suspicious microcalcifications on mammography.

Exclusion criteria were typically, benign calcifications, lesions not visible on ultrasound, history of anticoagulants and associated breast infections.

Each patient was subjected to: Full history taking .Clinical examination (of both breast and axillae, if a mass was detected; it was assessed for size, shape, mobility, tenderness, overlying skin ...etc). Laboratory investigation e.g., bleeding time for core needle biopsy was done.

Mammographic and sonographic breast examination: The imaging features were analyzed based on mammographic breast density, largest diameter of the group of microcalcifications, microcalcification morphology and distribution, and Breast Imaging Reporting and Data System (BI-RADS) final assessment category.

Mammography: All mammograms were performed using a dedicated X-ray unit (Toshiba NGU-100A mammorex machine) having 0.5 target focal spot in a molybdenum anode. Technique used for a mammogram is low Kilo-voltage Peak (KvP) about 24 to 30. The milli-Ampere-seconds (mAs) is automatically selected by the machine. This technique results in mammograms with a high film contrast, making it easier for the radiologist to read.

Four views were obtained, two views for each breast, the cranio-caudal and the medio-lateral oblique views. Cranio-caudal views were done as including all the medial and lateral breast tissues.

Technique: The patient was standing with her breast placed horizontally on the film cassette and compression applied to flatten out the breast, then a craniocaudal film was taken, where the beam was directed 90 degrees from the cranial to caudal directions. Then breast was held vertically, side to side compression was applied and a medio-lateral film was taken where the X-ray beam was directed from medial to lateral**.**

Interpretation and data analysis: A comparison of both breasts was done. Both the MLO and CC views are mounted back-to-back; so, the density is compared and any suspicious area is localized at its quadrant. Other findings as calcifications, asymmetrical density or architectural distortion are also identified. Interpretation involves careful viewing of the normal mammographic pattern and any abnormalities which present itself as a disruption of the normal pattern.

A magnification lens was used sometimes to confirm subtle findings. Confirming adequate positioning was done, using the following criteria: The whole breast tissue was included in the mammogram. The pectoralis major muscle was seen till the level of the nipple in the MLO view. The axilla and inframammary fold were included in the MLO films. The nipple should be seen in profile in all projections, Any lesion detected in mammography in the CC view, should be detected within 1cm from its depth at the MLO view. Fat should be seen posterior to breast parenchyma in all views.

Identifying the normal breast pattern and detecting any abnormality. The lesions were evaluated as follows: Position of the lesion (upper outer, upper inner, lower inner or lower outer quadrants, retro areolar or axillary). The borders were described as circumscribed, obscured, lobulated, speculated or ill defined. Regular or irregular outlines. The lesions were classified as lucent or dense.

Calcifications were classified according to size into macro and micro calcifications and according to distribution as segmental and regional.

Ultrasound: All the patients were subjected to bilateral breast US using 7.5 MHz linear probe (Siemens Acuson X300 machine). The transducers were directly applied to the skin surface with the patient in the supine position to examine the inner quadrants of the breasts, and the supine oblique position to evaluate the outer quadrants. The examined side is elevated, and the ipsilateral arm is extended above the head to stabilize the breast and flatten it against the chest wall. Scanning was performed in the radial and anti-radial planes in relation to the nipple. Both axillary regions are then examined by longitudinal scanning. All nodes were examined in the transverse and longitudinal nodal planes.

The following was the statement regarding the United States: Description of the pattern of breast parenchyma. Detection results in a thickening of the skin. Examining the ducts for ectasia and intraductal soft tissue abnormalities. Detection of any localised lesions, using the following examination of the lesions: The location and size of the lesion. Regular or uneven shape. Echogenesis (hypo, hyper, iso or anechoic). Echo structure (homogenous or heterogonous). They may be well-defined, poorly-defined, angular, or microlobulated. Rearward acoustic phenomena (shadowing, enhancement, or none). associated structural deformation or tissue edoema. Doppler testing reveals vascularity of the lesion. Effect of compression on the lesion, whether or not compressed.

The axilla was examined for detection of lymph nodes, which were classified as nonspecific or suspicious.

Core biopsy under sonographic guidance: For microcalcifications that underwent core biopsy under sonographic guidance, high-resolution sonographic equipment and a 13.5-MHz 1.5-dimensional linear array probe was used with semiautomated gun and a 16-gauge needle. Percutaneous core biopsies were performed under sonographic guidance for lesions visible on sonography. The core biopsies were immediately fixed in 10% neuteral buffered formalin and processed to paraffin blocks. 6mm thick sections were then cut and stained by Haematoxyl and Eosin (H&E) for histopathological examination. Tumor typing was done following the WHO classification.

Guide wire localization under sonographic guidance: Done for localization of requested lesions which was seen on sonography. The lesion requested for wire localization was re-examined, adequate positioning of the patient was done; as the patient in the supine position if the lesion was in the inner quadrants and the patient in supine oblique position if the lesion was in outer quadrant, with the arms abducted 90 degrees. The entrance point of the wire was chosen to acquire the shortest distance to the lesion; then local anaesthesia was introduced by initial superficial injection of lidocaine followed by deeper injection into the tissues surrounding the requested lesion. Then the needle wire complex was introduced under real time guidance in a maximum 20 degrees form the vertical plane along the lateral margin of the transducer proceeding to the central portion of the examined field. This procedure fulfills two advantages; the first one was acquiring accepted visualization of the whole wire under sonographic guidance, and the second was passing the

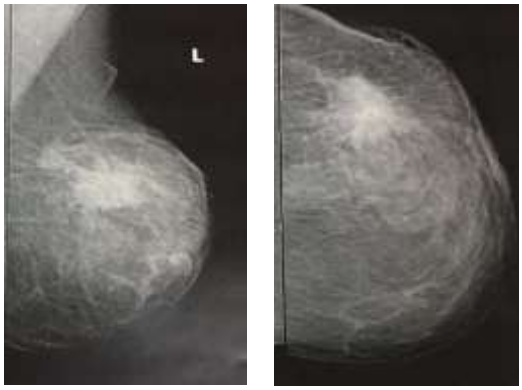
hook in the shortest distance before reaching the lesion; hence enabling the surgeon to excise the least amount of breast tissue. The freehand method was applied in all procedures; this includes holding the transducer by the non-dominant hand, the breast localization needle by the other hand. Ideally the tip of needle wire is positioned 1 cm beyond the lesion, and once position is determined to be satisfactory, the wire was advanced over, and the needle withdrawn gently taking care not to withdraw the wire with the needle. [6] After localization by sonographic guidance, two view mammograms with wire in satisfactory position were obtained and sent to the surgeon. Then the wire was taped firmly in position with a full descriptive report about the process of wire localization including: the description of the site, shape, size of the localized lesion; the position of the patient during wire localization; and the direction, distance that the wire introduced through the breast tissue to reach the lesion.

Histo-pathological findings correlation: The core biopsies were immediately fixed in 10% neutral buffered formalin and processed to paraffin blocks. 6mm thick sections were then cut and stained by Haematoxyl and Eosin (H&E) for histopathological examination. Tumor typing was done following the WHO classification. The excised specimen in guide-wire localization was placed in formalin and sent to the pathology laboratory department where it was sectioned, pinned out to confirm histopathological safety margins of the excised specimen and determine the histopathology of the excised lesion.

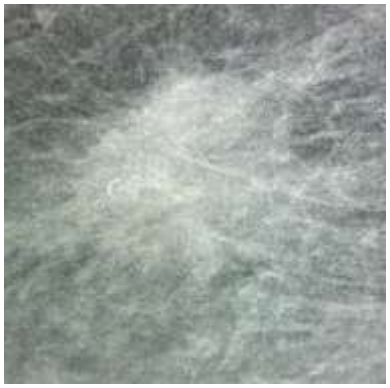
Statistical Methods:

Data were statistically described in terms of range, mean standard deviation (SD), median, frequencies (number of cases) and percentages when appropriate. Comparison of quantitative variables at the baseline and the follow-up in the study groups was done using paired t test. ROC curves were plotted to determine cutoff values. A probability value (p value) less than 0.05 was considered statistically significant. All statistical calculations were done using computer programs Microsoft Excel 2016 (Microsoft Corporation, NY, USA) and SPSS (Statistical Package for the Social Science; SPSS Inc., Chicago, IL, USA) version 26 for Microsoft Windows.

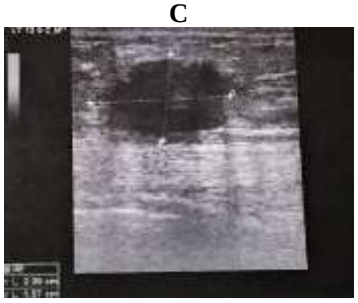
Case 1:



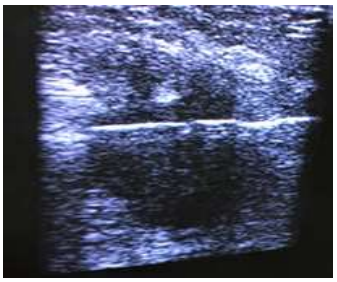
A **B**



C



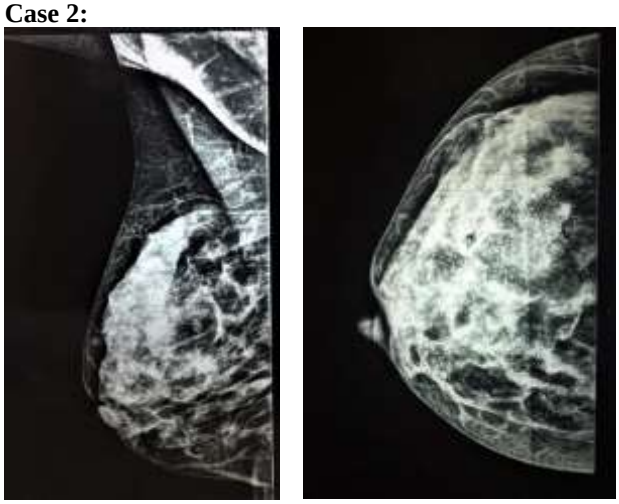
D



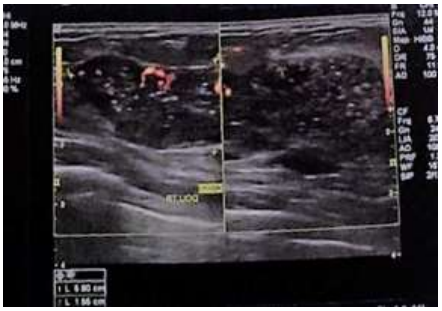
E

Fig. (1) Invasive ductal carcinoma, A and B, Mediolateral oblique and craniocaudal images of the left breast in 64-year-old woman with palpable lump show a hyperdense speculated lesion with overlying amorphous microcalcifications. C: an image of the mass and microcalcifications. D: targeted ultrasound of the lesion shows a hypoechoic well-defined irregular lesion with overlying calcific foci. E: ultrasound of the lesion shows the needle path within the mass during biopsy. Biopsy of mass showed IDC.

Case 2:



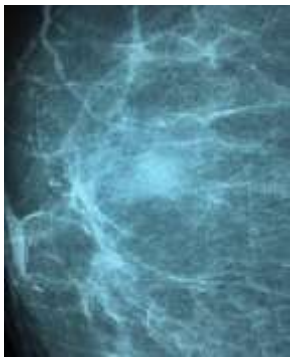
A **B**



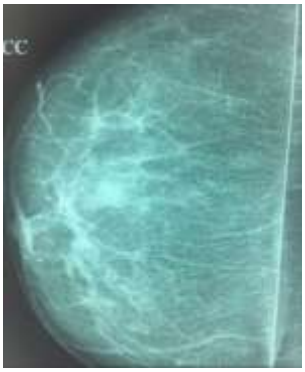
D

Fig. (2) Invasive ductal carcinoma, A and B, Craniocaudal (A) and mediolateral oblique (B) images of right breast in 42-year-old woman with palpable lump show scattered fine pleomorphic microcalcifications. C: ultrasound of the breast shows multiple hypoechoic irregular masses with overlying calcific foci and internal vascularity. Biopsy of mass showed IDC.

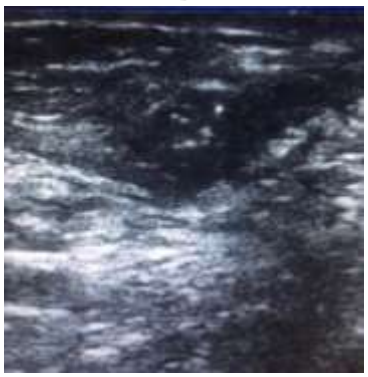
Case 3:



A



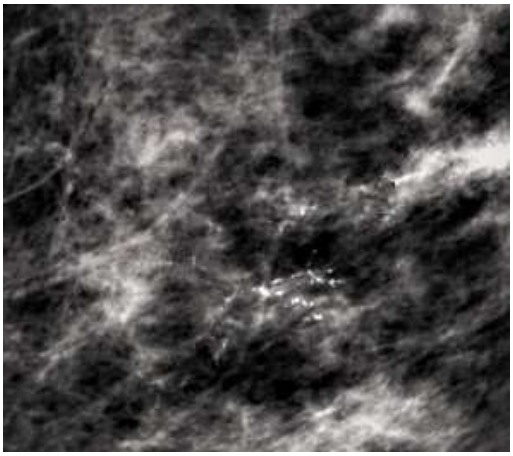
B



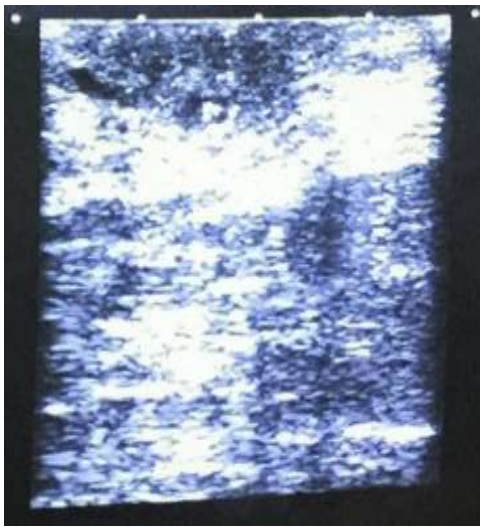
C

Fig. (3) Ductal carcinoma in situ, A and B, Craniocaudal image of the right breast in 63-year-old woman with palpable lump show a dense ill-defoned opacity associated with linear microcalcifications. C: targeted ultrasound of the lesion shows a hypoechoic ill-defined irregular lesion with overlying calcific foci. Biopsy of mass showed DCIS.

Case 4:



A



B

Fig.(4) Intraductal papilloma, A: Mammography of the left breast in 42-year-old woman with nipple discharge shows a grouped fine linear branching microcalcifications. B: Targeted ultrasound of the lesion shows a well-defined iso-echoic lesion at the retroaereolar region with overlying calcific foci and partially outlined by fluid. Biopsy of mass showed duct papillomatosis.

3. Results

Results of the biopsy cases: Distribution of the studied cases according to age, complaint, site of mammographic abnormality, ACR, mammographic abnormalities, sonographic findings, associated findings, pathological diagnosis by biopsy and analysis of calcification were shown in **Table 1.**

Table (1) Distribution of the studied cases according to age, complaint, site of mammographic abnormality, ACR, mammographic abnormalities, sonographic findings, associated findings, pathological diagnosis by biopsy and analysis of calcification (n = 20)

Age (years)	**No.**	**%**
30 – 40	4	20.0
41 - 50	8	40.0
51 – 60	5	25.0
>60	3	15.0
Mean ± SD.	49.80 ± 10.07	
Mass	13	65.0
Incidental	7	35.0
Side		
Right	8	40.0
Left	11	55.0
Both	1	5.0
Quadrant		
UOQ	13	65.0
UIQ	1	5.0
LIQ	2	10.0
LOQ	1	5.0
Retroaereolar	3	15.0
Depth		
Anterior 1/3	8	40.0
Middle 1/3	10	50.0
Posterior 1/3	2	10.0
ACR		
a	7	35.0
b	8	40.0
c	5	25.0
d	0	0.0
Mass with calcifications	**15**	**75.0**
Shape (n = 15)		
Oval	5	33.3
Rounded	4	26.7
Irregular	6	40.0
Margins (n = 15)		
Circumscribed	8	53.3
Not circumscribed (Indistinct-Irregular-Microlobulated-Spiculated)	7	46.7
Echopattern (n = 15)		
Anechoic	1	6.7
Hperechoic	0	0.0
Hypoechoic	9	60.0
Isoechoic	1	6.7
Complex	1	6.7
Heterogenous	3	20.0
Posterior Features (n = 15)		
No feature	8	53.3
Shadowing	5	33.3
Enhancement	2	13.3
Size in comparison with mammogram (n = 15)		
Smaller	12	80.0
Equal	3	20.0
Larger	0	0.0
Parenchymal distortion with calcifications	**3**	**15.0**
Only calcifications	**2**	**10.0**
Associated findings		
Skin thickening	3	15.0
Architectoral distortion	3	15.0
Duct Changes	9	45.0

Suspecious LNs	8	40.0
Vascularity	5	25.0
Pathological diagnosis		
DCIS	7	35.0
IDC	8	40.0
Fibroadenoma	1	5.0
Fibrocystic disease	2	10.0
Pappillomatosis	2	10.0
Analysis of calcification	**No.**	**%**
Cluster Size		
<1cm	6	30.0
1-<2 cm	7	35.0
2-5 cm	5	25.0
>5 cm	2	10.0
Morphology		
Amorphous	4	20.0
Coarse heterogenous	6	30.0
Fine pleiomorphic	5	25.0
Fine linear	5	25.0
Distribution		
Diffuse	1	5.0
Regional	3	15.0
Grouped	13	65.0
Linear	1	5.0
Segmental	2	10.0

Table (2) Correlation between age and ACR (n = 20)

ACR	**Age (years)**								**Total (n = 20)**		χ^2	**p**
	30 - 40 (n = 4)		**41 - 50 (n = 8)**		**51 - 60 (n = 5)**		**>60 (n = 3)**					
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**		
A	0	0.0	2	25.0	3	60.0	2	66.7	7	35.0	7.044	0.310
B	2	50.0	4	50.0	2	40.0	0	0.0	8	40.0		
C	2	50.0	2	25.0	0	0.0	1	33.3	5	25.0		
D	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0		

χ^2: Chi square test, p: p value for association between different categories .

Table (3) Correlation between analysis of microcalcification in mammogram & its sonographic visibility

	Visible	**Non visible**	**Total**
Cluster Size			
<1cm	5	1	6
1-<2 cm	5	2	7
2-5 cm	5	0	5
>5 cm	2	0	2
Morphology			
Amorphous	4	0	4
Coarse heterogenous	7	0	7
Fine pleiomorphic	5	1	6
Fine linear	3	0	3
Distribution			
Diffuse	1	0	1
Regional	3	0	3
Grouped	10	3	13
Linear	1	0	1
Segmental	2	0	2

Table (4) Correlation between Pathological diagnosis and its sonogrphic visibility and microcalcification

	Visible	Non visible	Total
Cluster Size			
<1cm	5	1	6
1-<2 cm	5	2	7
2-5 cm	5	0	5
>5 cm	2	0	2
Morphology			
Amorphous	4	0	4
Coarse heterogenous	7	0	7
Fine pleiomorphic	5	1	6
Fine linear	3	0	3
Distribution			
Diffuse	1	0	1
Regional	3	0	3
Grouped	10	3	13
Linear	1	0	1
Segmental	2	0	2

Results of the Guide wire cases: This study was carried out on 10 female patients suggested as having non palpable breast lesions and assigned for breast conserving surgeries.

Table (5) Distribution of the studied cases according to age, mammographic abnormality, sonographical abnormality, complaint, size of the lesion, site of wire insertion at lesion in post wire insertion mammogram, difficult lesional excision, condition of lesional excision, location of the lesion inside the specimen, location of the wire inside the excised lesion, histopathological marginal status of the specimen and final histopathological characterization of the excised lesion (n=10)

Age (years)	No.	%
30 – 40	2	20.0
41 – 50	4	40.0
51 – 60	3	30.0
>60	1	10.0
Mean ± SD.	49.10 ± 8.60	
Mammographic abnormality		
Suspicious calcification	3	30.0
Architectural distortion	1	10.0
ILL-defined opacity	4	40.0
Well defined opacity	2	20.0
Sonographical abnormality		
Only calcifications	2	20.0
ILL-defined hypoechoic lesion	3	30.0
Well-defined hypoechoic lesions	5	50.0
Complaint		
Annual examination	4	40.0
Lump	4	40.0
Nipple discharge	1	10.0
Axillary lump	1	10.0
Size of the lesion		
< 5mm	0	0.0
5 –<10 mm	3	30.0
10 – <15 mm	2	20.0
15 –<20 mm	4	40.0
>20 mm	1	10.0
Site of wire insertion at lesion in post wire insertion mammogram		
Is inserted through the lesion and transfixing the posterior aspect of the lesion	7	70.0
Is inserted through the lesion and only reaching the posterior aspect of the lesion	2	20.0
Is insrted through the lesion and only reaching the middle aspect of the lesion	0	0.0

Is inserted through the lesion and only reaching the anterior aspect of the lesion	1	10.0
Is not inserted through the lesion	0	0.0
Difficult lesional excision		
Failure of localization	0	0.0
Deep wire insertion	0	0.0
Wire migration	1	10.0
Wire dislogement	1	10.0
Wire fragmentation	0	0.0
Condition of lesional excision		
Complete excision	8	80.0
Incomplete excision	2	20.0
Location of the lesion inside the specimen		
The lesion is in the centre of the specimen	6	60.0
The lesion is in the periphery of the specimen	4	40.0
Location of the wire inside the excised lesion		
Transfixing the lesion from its centre	6	60.0
Passing the posterior aspect of the lesion	1	10.0
Passing to middle aspect of the lesion	1	10.0
Passing to anterior aspect of the lesion	1	10.0
Passing deeper than 2 cm to the lesion	1	10.0
Histopathological marginal status of the specimen		
No margins infiltrated	7	70.0
Margin infiltrated under-went wider excision	3	30.0
Final histopathological characterization of the excised lesion		
DCIS	3	30.0
IDC	6	60.0
ILC	1	10.0

Effect of size of the targeted lesion on the process of wire localization: Histopathological marginal infiltration occurred in 3/10 cases; seen one for each category of the lesion size of 10 – <15 mm, 15 – <20 mm and >20 mm. **Table 6**

Table (6) Relation between condition of lesional excision and size of the lesion

Size of the lesion	**Condition of lesional excision**				χ^2	^{MC}p
	Complete excision (n = 8)		**Incomplete excision (n = 2)**			
	No.	**%**	**No.**	**%**		
5 – <10 mm	3	37.5	0	0.0		
10 – <15 mm	2	25.0	0	0.0	3.949	0291
15 – <20 mm	3	37.5	1	50.0		
>20 mm	0	0.0	1	50.0		

χ^2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups.

Histopathological marginal infiltration occurred in 3/10 cases: seen one for each category of the lesion size of 10 – <15 mm, 15 – <20 mm and >20 mm. **Table 7**

Table (7) Relation between Safety margin of the excised specimen and size of the lesion

Size of the lesion	**Histopathological marginal status of the specimen**				χ^2	^{MC}p
	No margins infiltrated (n = 7)		**Margin infiltrated under-went wider excision (n = 3)**			
	No.	**%**	**No.**	**%**		
5 – <10 mm	3	42.9	0	0.0		
10 – <15 mm	1	14.3	1	33.3	3.709	0.357
15 – <20 mm	3	42.9	1	33.3		
>20 mm	0	0.0	1	33.3		

χ2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups

Table (8) Relation between condition of lesional excision and Site of wire insertion at lesion in post wire insertion mammogram

	Condition of lesional excision				χ^2	^{MC}p
Site of wire insertion at lesion in post wire insertion mammogram	**Complete excision (n = 8)**		**Incomplete excision (n = 2)**			
	No.	**%**	**No.**	**%**		
Is inserted through the lesion and transfixing the posterior aspect of the lesion	5	62.5	2	100.0	1.177	1.000
Is inserted through the lesion and only reaching the posterior aspect of the lesion	2	25.0	0	0.0		
Is inserted through the lesion and only reaching the anterior aspect of the lesion	1	12.5	0	0.0		

χ2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups

Table (9) Relation between Histopathological marginal status of the specimen and condition of lesional excision

	Histopathological marginal status of the specimen				χ^2	^{MC}p
Condition of lesional excision	**No margins infiltrated (n = 7)**		**Margin infiltrated under-went wider excision (n = 3)**			
	No.	**%**	**No.**	**%**		
Complete excision	7	100.0	1	33.3	5.833	0.067
Incomplete excision	0	0.0	2	66.7		

χ2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups

Table (10) Agreement (sensitivity, specificity and accuracy) of histopathological marginal status of the specimen and condition of the excised specimen

	Histopathological marginal status of the specimen				**Sensitivity**	**Specificity**	**PPV**	**NPV**	**Accuracy**
Condition of lesional excision	**No margins infiltrated (n = 7)**		**Margin infiltrated under-went wider excision (n = 3)**						
	No.	**%**	**No.**	**%**					
Complete excision	7	100.0	1	33.3	66.67	100.0	100.0	87.50	90.0
Incomplete excision	0	0.0	2	66.7					
χ^2 (^{FE}p)	5.833 (0.067)								

χ^2: Chi square test, MC: Monte Carlo, p: p value for comparing between the studied groups, PPV: Positive predictive value, NPV: Negative predictive value

4. Discussion

Each year, millions of asymptomatic women get mammography screening due to the increased awareness of breast cancer prevention among the female population. These screenings result in a large rise in the detection of non-palpable breast lesions, some of which cannot be categorised with confidence by mammography and need further examination for identification. (14, 2015)

The selection of stereotactic vs US-guidance is contingent on a number of variables, including equipment availability, lesion visibility, accessibility, and operator and patient preferences. It is possible to employ stereotactic guidance for all mammographic lesions that cannot be identified by ultrasound, such as parenchymal distortions and microcalcifications, however specialised equipment is required. (17, 2014, 8, 2007)

In the ultrasound-guided biopsy investigation, the peak age incidence varied between forty and fifty years old. (13,14, 2014) reported a mean age of 38 years and indicated that all research participants had mammographically dense breasts. Dense breast tissue is often linked with younger age and premenopausal

status, and as age increases, the density of breast tissue diminishes. (5, 2006)

The most prevalent patient complaint was palpable breast mass, which was reported by 13 (65%) of 20 patients. This concurred with (7) (2007) who stated that breast mass palpability is the most prevalent complaint.

In the current research, ACR c patients represented the lowest age group, whereas ACR a cases represented the oldest age group.

(14). (14, 2012) elucidated the association between mammographic breast density and age, reporting a substantial negative relationship between age and mammographic breast density (p 0.001).

(12). Targeted ultrasound is an excellent approach for the characterisation of microcalcification-only lesions on mammography and may be useful for predicting invasive breast malignancies, according to a 2014 study.

In the present investigation, we discovered that sonographically detectable microcalcifications appeared as small, highly echogenic, non-shadowing foci, particularly when linked with sonographically hypoechoic masses.

. 73 (87%) of the 84 DCIS lesions with microcalcification observed by US were mass-forming malignancies with microcalcification or unclear hypo-echoic regions with microcalcification, indicating that a hypo-echoic backdrop might improve US detection of the brilliant punctate calcification echoes. (8, 2015)

In the present investigation, eighty percent of the linked sonographically detectable lesions were smaller than the accompanying mammographic abnormalities, whereas twenty percent were approximately the same size. All evident calcific foci on sonography were less in number than on mammography.

As observed by (7,2003), the sonographically displayed masses or ducts containing microcalcifications tended to be smaller than the comparable group of microcalcifications on mammography in the majority of instances of his research (66.7 percent).

The masses associated with sonographically evident calcifications in our investigation exhibited malignancy-suspicious characteristics, including hypoechoic echopattern (60 percent), lack of circumscription (47 percent), rounded or irregular shape (67 percent), and extensive posterior shadowing (100 percent) (33 percent).

On the second part of the study, guided wire localization, precise localization of non-palpable lesions is essential to ensure cancer clearance without compromising cosmetic results. Various modalities have been tried for accurate localization of non-palpable breast lesions, but Wire guided localization (WGL) is the most frequently used localization technique for non-palpable breast lesions. (9,2007, 10, 2012)

In the present investigation, 10 patients were checked by the breast imaging unit of the Medical Research Institute Hospital, identified with non-palpable breast lesions by sonomammography, and opted to have wire-guided lumpectomy by the breast surgical unit. In the present research, patient ages ranged from 37 to 62 years, with a mean age of 49.10 8.60 years; this is comparable to (11, 2008), who reported a mean age group of 49.9 years in his study. The following were the ten patients' major complaints: One patient complained of nipple discharge, four patients complained of breast lumpiness, and one patient presented with an axillary lump.

60 percent of patients in the current research presented with mass and calcifications; a lower frequency of mass lesions (55 percent) was found in the study of (13), which may be ascribed to the larger sample size of his study group. In the present investigation, three individuals had merely worrisome calcifications, whereas the remaining patient had architectural deformity.

In contrast, (14). indicated that the guide wire should preferably penetrate the breast lesion to a depth of no more than 1 centimetre; in the present investigation, we adhered to the proposed criterion (7).

Nine out of ten (90 percent) occurrences of successful wire localisation were reported in the present investigation; a virtually same proportion was reported by (19). In their report, 67/70 (95.5%) were effectively translated despite applying the suggested localization criteria (21). Mazouni, 2006 #5; hence, we may claim that the criteria utilised by both writers are equally effective. In 1/20 (10%) of the present study's instances, appropriate localisation was not achieved because the wire tip only reached the front portion of the lesion and did not transfix its posterior boundary. In spite of this, none of the localization methods missed the lesion in all 10 cases.

In the present investigation, proper wire localization failed in 1/10 (10 percent) of instances localised with the use of ultrasound guidance. The present investigation revealed that for each problem, including wire dislodgement and wire migration, one patient (10 percent) was affected. Identical problems were described by (25). (25, 2008) who reported migration in one in fifty instances (2 percent). In contrast, they documented problems not recorded in the present research, such as deep wire insertion, haemorrhage, visceral intrathoracic injuries, and iatrogenic wire transection.

The smallest lesion was 8 millimetres, while the biggest measured 23 millimetres. The majority of lesions were in the 15–20 mm range. This corresponded (23). (23, 1999), who observed that the mean size in his research group is around 15 mm.

(15). Failure of localization occurred in quite large lesions; one lesion measuring 15-20mm, and the other lesion measuring more than 20 mm.

The present investigation revealed that 8/10 (80%) of the localised breast lesions were found in the upper breast quadrants, whereas 2/10 (20%) were found in the inferior breast quadrants. This was consistent with

the findings of (24) (24, 2006), who reported (66%) of his cases in the upper breast quadrants.

The final histological analysis of the surgically removed tissues revealed that all lesions were malignant. In addition, the present investigation revealed that 7/10 (70 percent) specimens had uninfiltrated safety margins, whereas 3/10 (20 percent) had infiltrated margins; this is close to 14. (14, 2009).

In the present research, full lesional excision was recorded in 8/10 instances (80%), whereas partial excision was documented in 2/10 cases (2%). (20 percent). This is comparable to the outcomes of (27). (27, 1995).

In the current study, the relationships between surgical success of lesional excision according to specimen mammogram and histopathological safety margins were as follows: (7/8) 87.5 percent of completely excised lesions had free histopathological margins, and 1/8 (12.5 percent) of completely excised lesion had infiltrated margins, while the remaining 2 cases were incompletely excised and had infiltrated margins by histopathological assessment with total accuracy of 87.5 percent.

5. Conclusion

Targeted US is an excellent tool for the characterisation of microcalcification found on mammography and may be useful for predicting invasive breast tumours, according to the findings of the current investigation. Sonographically detectable microcalcifications appear as small echogenic, non-shading foci, particularly if they are coupled with sonographic hypoechoic lesions. The discovery of a suspicious mass by sonography in lesions with microcalcifications alone on mammography may enhance the likelihood that the lesion is malignant. Localization through wire is regarded as a necessary step for lumpectomy of non-palpable breast tumours. The accuracy of wire insertion is the most crucial factor influencing the success of lesion excision and histopathological safety margins. The size of the lesion being treated may affect the effectiveness of ultrasound-guided localisation. Only a post-insertion mammography can validate the precision of a wire insertion done under sonographic guidance, making it a critical step. Obtaining a mammography of the specimen is crucial for determining the correctness of the lesion excision and confirming the whole removal of the wire.

References

[1] A.J. Evans, S.E. Pinder, I.O. Ellis, A.R. Wilson. Screen detected ductal carcinoma in situ (DCIS): overdiagnosis or an obligate precursor of invasive disease? J Med Screen.vol.8,pp.149-51, 2001.

[2] M. Scimeca, E. Giannini, C. Antonacci, C.A. Pistolese, L.G. Spagnoli, E. Bonanno. Microcalcifications in breast cancer: an active phenomenon mediated by epithelial cells with mesenchymal characteristics. BMC Cancer.vol.14,pp.286,2014.

[3] H. Change. Cellular Responses to Stress and Toxic Insults: Adaptation, Injury, and Death. Robbins and Cotran Pathologic Basis of Disease, Professional Edition E-Book, pp. 17-23,2009.

[4] M. Ahmed, M. Douek. ROLL versus RSL: toss of a coin? Breast Cancer Res Treat.vol. 140,pp.213-7 ,2013.

[5] T. Nowikiewicz, W. Zegarski, M. Piątkowska, M. Klag. Evaluation of the effects of mammography screening program on cancer progression and implemented treatment in patients with breast cancer. Pol Przegl Chir.vol.85,pp.204-9,2013.

[6] P. Machado, J.R. Eisenbrey, B. Cavanaugh, F. Forsberg. Microcalcifications versus artifacts: initial evaluation of a new ultrasound image processing technique to identify breast microcalcifications in a screening population. Ultrasound Med Biol.vol.40,pp.2321-4,2014.

[7] I. Muraca, N. Carrabba, G. Virgili, F. Bruscoli, A. Migliorini, M. Pennesi, et al. Chronic total occlusion revascularization: A complex piece to "complete" the puzzle. World J Cardiol. vol.14,pp.13-28. ,2022.

[8] Y. Hafeez, V. Varghese. Chronic Total Occlusion of The Coronary Artery. StatPearls. Treasure Island (FL): StatPearls Publishing Copyright © 2022, StatPearls Publishing LLC.; 2022.

[9] R.R.L. Blessing, M. Ahoopai, M. Geyer, M. Brandt, A.M. Zeiher, M. Vasa-Nicotera, et al. Percutaneous coronary intervention for chronic total occlusion in octogenarians: a propensity score study. Sci Rep.vol.12,pp.3073,2022.

[10] K.S. Vemuri, B.K. Sihag, Y. Sharma, K.P. Nevali, R. Vijayvergiya, R.M. Kumar, et al. Real world perspective of coronary chronic total occlusion in third world countries: A tertiary care centre study from northern India. Indian Heart J.vol.73,pp.156-60,2021.

[11] H. Everaars, S.P. Schumacher, W.J. Stuijfzand, M. van Basten Batenburg, J. Huynh, P.A. van Diemen, et al. Functional recovery after percutaneous revascularization of coronary chronic total occlusions: insights from cardiac magnetic resonance tissue tracking. Int J Cardiovasc Imaging.vol.37,pp.3057-68, 2021.

[12] R. Hajar. Risk Factors for Coronary Artery Disease: Historical Perspectives. Heart Views.vol.18, pp.109-14,2017.

[13] X. Zhao, X. Yuan, Y. Zhong, G. Wang. Risk Factor Analysis and Construction of a Prognostic Model after Percutaneous Coronary Intervention in Patients with Chronic Total Occlusion. Comput Math Methods Med;2022,pp.23-80,2022.

[14] D.M. Abdulah, S.S. Miro. Prevalence and correlated factors for chronic total occlusion in patients with coronary artery disease in Iraqi Kurdistan. Ann Med Res.vol.3,2022.

[15] H.M. Almutairi, R. Boubertakh, M.E. Miquel, S.E. Petersen. Myocardial deformation assessment using cardiovascular magnetic resonance-feature tracking technique. Br J Radiol.vol. 90,pp.20170072. ,2017.

[16] G.Y. Cho, T.H. Marwick, H.S. Kim, M.K. Kim, K.S. Hong, D.J. Oh. Global 2-dimensional strain as a new prognosticator in patients with heart failure. J Am Coll Cardiol.vol.54,pp.618-24, 2009.

[17] S.J. Buss, M. Emami, D. Mereles, G. Korosoglou, A.V. Kristen, A. Voss, et al. Longitudinal left ventricular function for prediction of survival in systemic light-chain amyloidosis: incremental value compared with clinical and biochemical markers. J Am Coll Cardiol.vol. 60,pp.1067-76,2012.

[18] S. Romano, R.M. Judd, R.J. Kim, J.F. Heitner, D.J. Shah, C. Shenoy, et al. Feature-Tracking Global Longitudinal Strain Predicts Mortality in Patients With Preserved Ejection Fraction: A Multicenter Study. JACC Cardiovasc Imaging;13:940-7. 2020

[19] S. Romano, R.M. Judd, R.J. Kim, H.W. Kim, I. Klem, J.F. Heitner, et al. Feature-Tracking Global Longitudinal Strain Predicts Death in a Multicenter Population of Patients With Ischemic and Nonischemic Dilated Cardiomyopathy Incremental to Ejection Fraction and Late Gadolinium Enhancement. JACC Cardiovasc Imaging;11:1419-29. 2018

[20] S. Romano, R.M. Judd, R.J. Kim, H.W. Kim, I. Klem, J. Heitner, et al. Association of Feature-Tracking Cardiac Magnetic Resonance Imaging Left Ventricular Global Longitudinal Strain With All-Cause Mortality in Patients With Reduced Left Ventricular Ejection Fraction. Circulation;135:2313-15. 2017

[21] S.J. Buss, K. Breuninger, S. Lehrke, A. Voss, C. Galuschky, D. Lossnitzer, et al. Assessment of myocardial deformation with cardiac magnetic resonance strain imaging improves risk stratification in patients with dilated cardiomyopathy. Eur Heart J Cardiovasc Imaging;16:307-15. 2015

[22] G.C. Coleman, P.W. Shaw, P.C. Balfour, Jr., J.A. Gonzalez, C.M. Kramer, A.R. Patel, et al. Prognostic Value of Myocardial Scarring on CMR in Patients With Cardiac Sarcoidosis. Catheter Cardiovasc Interv;10:411-20. 2017

[23] D. Buckert, S. Kelle, S. Buss, G. Korosoglou, R. Gebker, R. Birkemeyer, et al. Left ventricular ejection fraction and presence of myocardial necrosis assessed by cardiac magnetic resonance imaging correctly risk stratify patients with stable coronary artery disease: a multi-center all-comers trial. Clin Res Cardiol;106:219-29. 2017

[24] T. Nakachi, S. Kato, N. Saito, K. Fukui, T. Iwasawa, T. Endo, et al. Non-Invasive Evaluation of Patients Undergoing Percutaneous Coronary Intervention for Chronic Total Occlusion. J Clin Med;10:15-74. 2021

[25] T. Nakachi, S. Kato, H. Kirigaya, N. Iinuma, K. Fukui, N. Saito, et al. Prediction of functional recovery after percutaneous coronary revascularization for chronic total occlusion using late gadolinium enhanced magnetic resonance imaging. J Cardiol;69:836-42. 2017

[26] E. Tsuchikane, M. Yamane, M. Mutoh, T. Matsubara, T. Fujita, S. Nakamura, et al. Japanese multicenter registry evaluating the retrograde approach for chronic coronary total occlusion. Catheter Cardiovasc Interv;82:654-61. 2013

[27] S. Carasso, Y. Agmon, A. Roguin, Z. Keidar, O. Israel, H. Hammerman, et al. Left ventricular function and functional recovery early and late after myocardial infarction: a prospective pilot study comparing two-dimensional strain, conventional echocardiography, and radionuclide myocardial perfusion imaging. J Am Soc Echocardiogr;26:1235-44. 2013

[28] M. Samy, W.S. El Awady, M.M. Al-Daydamony, M.M. Abd El Samei, K. Shokry. Echocardiographic assessment of left ventricular function recovery post percutaneous coronary intervention of chronic total occlusions in patients with low and mid-range left ventricular ejection fractions. Echocardiography;37:239-46. 2020