



Journal Homepage: - www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI: 10.21474/IJAR01/11932

DOI URL: <http://dx.doi.org/10.21474/IJAR01/11932>



RESEARCH ARTICLE

EVALUATION OF DIAGNOSTIC ACCURACY OF ULTRASOUND-GUIDED SEMI-AUTOMATED CORE NEEDLE BIOPSY OF BREAST SUSPICIOUS MICROCALCIFICATIONS

Dr. Alyaa Saad Bunyan¹, Dr. Sarah Saad Bonyan² and Dr. Akeel Saad Bonyan³

1. (M.B.,B.CH.),(M.Sc.Radiology), Radiology Department,AL-Haboubi (AL-Nasrya) Teaching Hospital.
2. (M.B.,B.CH.),(M.Sc.Path.), Pathology DepartmentAL-Hussain (AL-Nasrya) Teaching Hospital.
3. (M.B.,B.CH.),(D.G.S), Diploma of General surgery, AL-Hussain (AL-Nasrya) Teaching Hospital.

Manuscript Info

Manuscript History

Received: 27 August 2020

Final Accepted: 30 September 2020

Published: October 2020

Key words:-

Breast Biopsy, Breast Ultrasound, Breast
Cancer, Breast Microcalcifications

Abstract

Back ground: Breast microcalcifications are considered an early mammographic sign of breast cancer which are present with tiny bright spots of different morphology. In an ultrasound (US) image, the presence of microcalcifications within breast is an important indicator of malignancy. With an improved sonographic detection of microcalcification, ultrasound could be used for biopsy guidance for target sampling of tissue containing suspicious microcalcifications. If the biopsied lesions had a suspicious microcalcifications, specimen radiograph is mandatory to confirm the presence of microcalcifications in which a core containing any calcification on specimen radiography was defined as a successfully retrieved core. 14-G (Gauge) semi-automated core needle biopsy (CNB) device is less costly than other biopsy device.

Methods: A prospective study was conducted on thirty female patients with thirty-two lesions; their mean age was 48.53 years (age range, 21-75 years) radiologically classified as BIRADS (Breast Imaging Reporting and Data system) 4 (b, c) and 5 from those referred to women imaging health unit in Radiology department for Sono-Mammography and those patients were referred from the inpatient wards and outpatient clinics of the surgery departments during the period from September 2018 till May 2019. All patients underwent conventional digital mammography and B-mode ultrasound examination and Ultrasound guided biopsy, specimen radiography then tissue samples were sent to histopathology department in which slide picture was done. Then (28) females done surgery and (2) patient still for follow up.

Results: Radiological diagnosis of our lesions using BIRADS (Breast Imaging Reporting and Data system) categorical method were identified as two intermediate suspicious lesions (BIRADS 4B; 6.3 %), twelve moderate suspicious lesions (BIRADS 4C; 34.4 %), and 19 highly suggestive of malignancy lesions (BIRADS 5; 59.4 %). Retrieval rate of calcifications according to specimen radiography were successfully retrieved in 30/32 lesions (93.8 %) and confirmed on specimen radiography. CNB (core needle biopsy) identified 28 lesions (87.5 %) malignant and four (12.5 %) benign lesions. Distribution of

lesions according to pathological diagnosis in successful and fail retrieval group, the successful retrieval group comprised 26 malignant (22 IDC(Invasive ductal carcinoma), 2 DCIS(Ductal carcinoma Insitu), 2 ILC(Invasive Lobular carcinoma)) and four benign lesions. After CNB(core needle biopsy), 30 lesions underwent surgical excision and final pathology results were provided. All 24 IDC on 14-G semi-automated CNB (core needle biopsy) were confirmed to be IDC(Invasive ductal carcinoma) on final pathology. Of the two DCIS(Ductal carcinoma Insitu) on US(Ultrasound) guided CNB(core needle biopsy), one DCIS, were upgraded to IDC, the other one confirmed to be DCIS on final pathology, the two ILC were confirmed to be ILC on final pathology. Of the four benign lesions, the two ADH(Atypical Ductal hyperplasia) underwent surgical excision, finally diagnosed as DCIS, the other two benign lesions (fibroadenoma and fibroadenosis) their BIRADS assessments were category 4C and were recommended for follow-up. The overall accuracy of US-guided 14-G(Gauge) semi-automated CNB(core needle biopsy) was 90.0 % (27/32).

Conclusion: The present study confirms the good retrieval rate (93.8%) of US-guided 14-G semi-automated CNB and diagnostic accuracy of (90.0%). Thus, this could be useful procedure for suspicious microcalcifications apparent on sonography. Specimen radiography proved to be a great help in deciding the accurate retrieval of microcalcifications by core biopsy. It should be done in all cases of core biopsy for calcifications with marking of the core containing calcifications to be specially assessed by histopathology. We should try to do core biopsy before using VAB (Vacuum-Assisted Biopsy) for calcifications if well seen by ultrasound.

Copy Right, IJAR, 2020,. All rights reserved.

Introduction:-

Breast cancer in women is a major public health problem throughout the world. It is the most common cancer among women both in developed and developing countries, accounting for 22.9% of all new female cancers^[14]. The presence of microcalcification on mammography is one of the earliest signs in breast cancer detection. However, it is difficult to distinguish malignant calcifications from benign calcifications^[17]. Breast microcalcifications, detected by mammography resulted from inflammation of the breast, intraductal papilloma, fibroadenoma, cystic fibrosis, fat necrosis and breast cancer; this is because calcification itself can be a normal or abnormal cell-death metabolic physiological phenomenon or the result of cancer^[31]. Mammography currently has a significant advantage over ultrasound for the diagnosis of microcalcifications in breast examinations. The main reason is that in mammography, the probability of malignancy can be assessed using established categories that are based on the morphology (small round, amorphous, pleomorphic, or fine linear) and distribution pattern (clustered, segmental, linear, regional, or diffuse) of microcalcifications^[8]. Breast microcalcifications are observed on sonography as distinct echogenic dots without posterior acoustic shadowing and are more readily identified when associated with a hypoechoic mass or duct-like structures than when no associated sonographic abnormality is present^[2]. Standard of care for suspicious microcalcifications in the breast is stereotactic-guided percutaneous biopsy or mammography (MG)-guided wire localization and surgical excision^[11]. Ultrasound (US)-guided biopsy has many advantages over the Mammography(MG)-guided procedure including no ionizing radiation, greater patient comfort, no need for breast compression, real-time confirmation of needle location, lower cost, and universally available sonography equipment^[12]. Improvements in the resolution of sonographic equipment have led to the use of Ultrasound (US)-guided biopsy for histologic assessment of suspicious microcalcifications in the breast those are apparent on sonography^[2]. Ultrasound-guided 14-G(Gauge) core breast biopsy has been introduced for palpable as well as non-palpable solid breast lesions^[15].

Patients And Methods:-

Patients:

A prospective study was conducted on thirty female patients with thirty- two lesions ; their mean age was 48.53 years (age range, 21-75 years) radiologically classified as BIRADS(Breast Imaging Reporting and Data system) 4 (b, c) and 5 from those referred to women imaging health unit in Radiology department of Kasr Al Aini hospital for Sono- Mammography and those patients were referred from the inpatient wards and outpatient clinics of the surgery departments during the period from September 2018 till May 2019. The patients underwent full history taking and clinical examination. All patients underwent conventional digital mammography and B-mode ultrasound examination and Ultrasound guided biopsy, specimen radiography then tissue samples were sent to histopathology in which slide picture was done. Then (28) females done surgery and (2) patient still for follow up.

Inclusion criteria:

Women with suspicious microcalcifications apparent on mammography and sonography.

Exclusion criteria:

1. Lesions not detected sonographically.
2. lesion located in the posterior portion of the mammary zone of very thin patients who had obliterated retro mammary fat layer were excluded to avoid complications such as pneumothorax .
3. Contraindications to ultrasound guided biopsy such as bleeding tendency.
4. Contraindications to mammography such as pregnant women.

Methodology:-

1. Digital Mammography Technique:

Patients were examined by using General Electric GE Senographe 2000 Full Field digital mammography machine (GE Senographe, Buc, and Versaie, France). Standard two view done for each breast craniocaudal (CC) and mediolateral oblique (MLO) views were performed , with spot compression magnification view when necessary **Figure(1-4)**

2. Ultrasound Technique:

Ultrasound was performed for all patients using General Electric Logic 7 machine (GE health care, Tokyo, japan) device using a high frequency probe (7.5MHZ). Scanning was done in two orthogonal (longitudinal and transverse) planes and measurement was taken.

3. Biopsy Procedure:

Biopsy was performed to all patients under local anesthesia using a 14-G(Gauge) semi-automated CNB(Core needle biopsy) set (HS Hospital Service S.P.A. ITALY). The serving tray should include the following: Dressing, gloves, betadine, Xylocaine, 10ml &20ml syringes, spin needle for make the skin puncture, formalin in a small jar for tissue samples, small forceps to get the tissue from collecting chamber of the needle, saline to wash the needle if obstructed by the tissue. After localizing the lesion with ultrasound, sterilization was done with betadine and alcohol then local anesthesia was done. The probe was covered with sterile plastic sheath and disinfected with alcohol. The procedure was performed in an outpatient setting, using the free-hand technique: one hand holds the probe and the other hand holds the needle. An oblique approach, as parallel to the chest wall as possible was used, this is the way to avoid pneumothorax which is the worst complication of this technique. The skin was punctured with a spinal needle (2-3mm).The needle was removed and a biopsy needle was inserted. The biopsy needle was pushed manually into the lesion. The location of the needle within the lesion was confirmed on transverse and longitudinal scans. The biopsy needle was fired, and tissue remove from the lesion, then withdrawn the needle. The specimen could then be observed in the notch. Insertion of the biopsy needle was repeated after changing the angle of insertion. Several cores of more than 1 cm length were obtained for each lesion; at least 6 cores were taken. Following withdrawal of the needle, firm pressure is applied for several minutes to the area of tissue removal **Figure(1).**

4. Specimen Radiography:

After biopsy, the cores were placed on transparent disposable gloves, and specimen radiography was performed to identify the presence of microcalcifications. The radiograph was taken in a digital mammographic unit ,the parameters of exposure were 28kVp, 50mAs. **Figure (1-4).**

5. Histopathology examinations:

The pathologic analysis of samples of breast lesions was performed in the pathologic department of the kasr Al Aini hospital for histopathological correlation and slides pictures were done. Results of histopathology

examinations of CNB biopsy and surgical specimens were obtained for comparison by comparing the results with surgical pathology **Figure(1-4).**

Interpretation:

Mammographic Interpretation:

Mammographic images were analyzed based on the Breast Imaging Reporting and Data System (BI-RADS).

Breast density:

According to the American College of Radiology (ACR), Breast density is classified in to four

Categories:

1. The breast is almost entirely fatty.
2. There are scattered areas of fibroglandular density.
3. The breast is heterogeneously dense, which make obscure small mass.
4. The breast is extremely dense which lower the sensitivity of mammography.
5. Lesion site (affected breast): right, left, bilateral.
6. Regarding the presence of microcalcifications:

A)Extent of calcifications.

B)Morphology : fine linear , fine linear branching ,coarse heterogeneous, amorphous, fine pleomorphic.

C)BI-RADS(Breast Imaging Reporting and Data system) category:-Category4: suspicious:4b: moderate suspicion for malignancy, 4c: highly suspicion for malignancy.

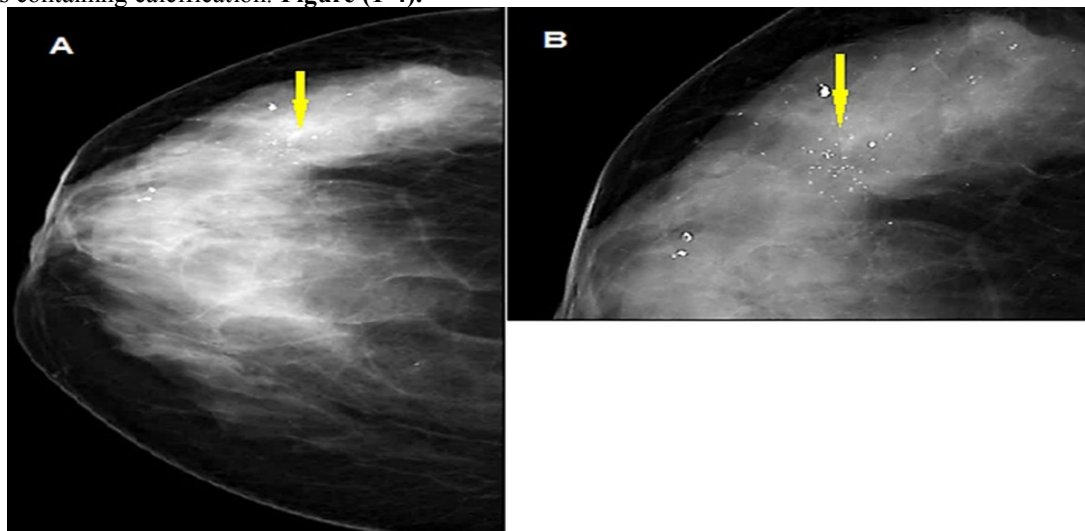
-Category5: highly suggestive of malignancy.

D) Distribution: Linear/segmental,Cluster,Regional, Diffuse. Associated masses: shapedescription, margins, density ,associated features: nipple retraction, skin thickening, skin retraction, axillary lymph nodes, anterior chest wall extension, and duct dilatation.

Mode ultrasound Interpretation:

The microcalcifications appear on gray scale US(Ultrasound) as hyperechoic foci, which usually do not have an acoustic shadow. Were reevaluated by US(Ultrasound) regarding:1) associated with masses.2)If associated with mass, whether microcalcifications site: in mass,outside mass , intraductal calcification.3)masses were reevaluated by US considering BI-RADS(Breast Imaging Reporting and Data system) US lexicon regarding:their shape (oval, round, irregular),orientation (parallel, not parallel), margins (circumscribed, not circumscribed), echo pattern (anechoic, hyperechoic, complex cystic and solid, hypoechoic, isoechoic, heterogeneous) and presence or absence of acoustic shadowing or enhancement .

Specimen Radiography Interpretation:The Cores radiography was performed to confirm if cores containing microcalcification or not.On work station by using different zooming, we compared the characteristics of specimen radiography according to the retrieval of calcifications: a. The total number of retrieved cores. b. The mean number of cores containing calcification. **Figure (1-4).**



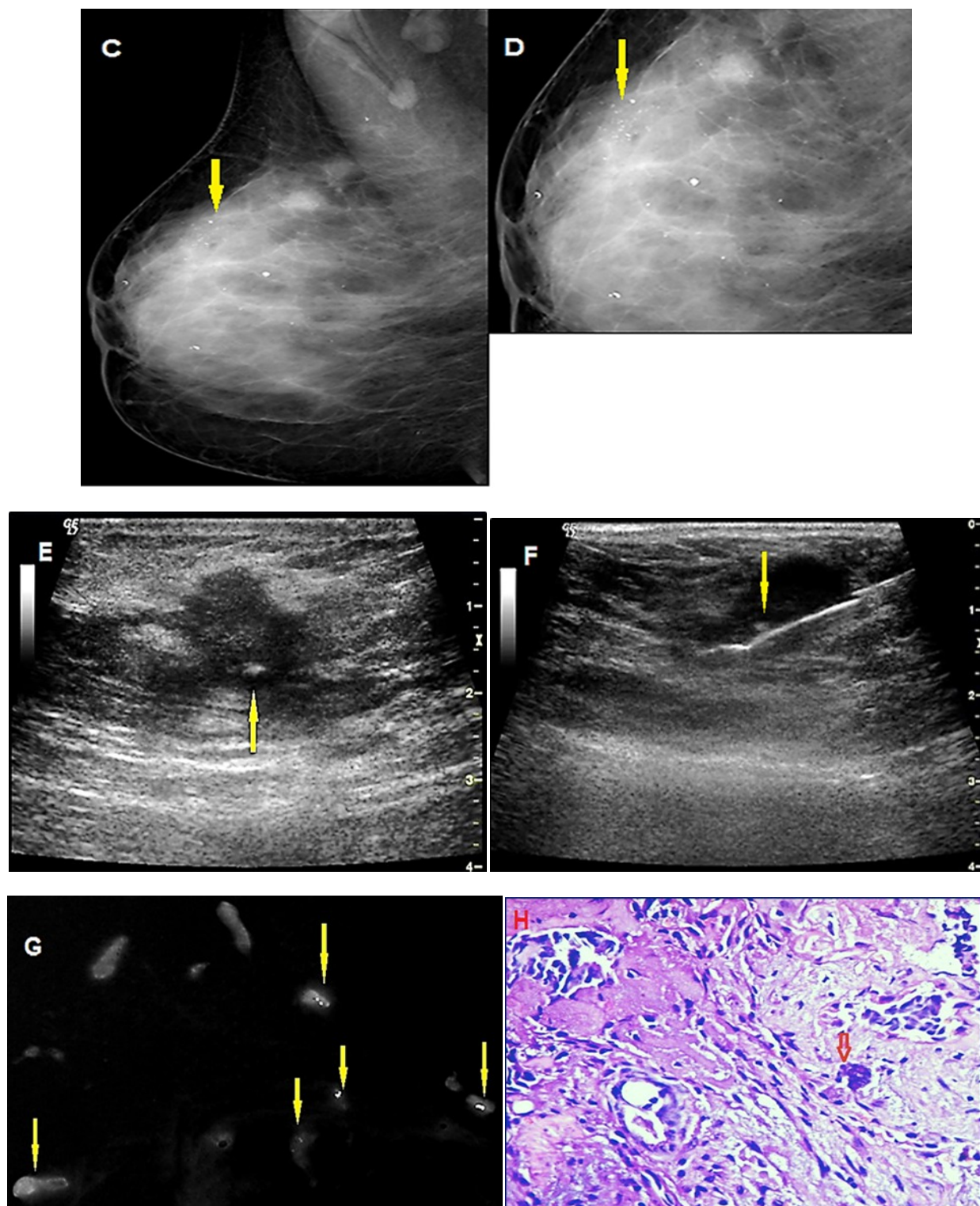


Fig (1): Digital Mammography CC(CranioCaudal) (A , B) & MLO(Mediolateral Oblique) (C , D) views of the right breast show dense breast with pleomorphic cluster microcalcifications seen at the UOQ(Upper outer quadrant) associated with obscured focal density (arrows),the microcalcifications seen more clearly on the magnified view (B , D).Right breast axillary tail multiple pathological lymph nodes, BIRADS . B-mode ultrasound (E) showed right breast upper outer quadrant ill defined hypoechoic lesion with internal echogenic foci of microcalcifications (arrow). US(Ultrasound)-guided 14-G(Gauge) semi-automated core needle biopsy was done in which the needle

target the microcalcific foci (F). (G): Specimen radiography.(H)Histopathology: Invasive ductal carcinoma grade II with microcalcifications (arrow).

Statistical Analysis:

The collected data were coded, tabulated, and statistically analyzed using statistical package for social sciences software, SPSS version 15. Descriptive statistics were performed using number and percentage (%). for qualitative variable, and mean \pm SD (standard deviation) for normally distributed quantitative variables, while median and IQR (Interquartile range) was used for quantitative variables which was not normally distributed. Comparison between groups was done using Chi square test for qualitative variables and non-parametrical NPar test for quantitative variables. The P-value equal or less than 0.05 were considered to indicate statistical significance.

Results:-

The study included 30 female patients with 32 breast lesions, their age ranges from (21 – 75) years with a mean age (48.53 \pm 11.17) years (mean \pm SD(standard deviation)), were subjected to conventional digital mammography , B-mode ultrasound examination ,Ultrasound Guided biopsy, and specimen radiography. Two patients had two lesions, one had suspicious microcalcifications in both breasts, and the other patient had two lesions in the same breast. Twenty seven patients (90.3 %) had a clinically felt breast mass. One patient (3.2%) had bloody nipple discharge, one (3.2%) complained of mastalgia, and one patient (3.2%) coming for follow up after breast conservative surgery. Radiological diagnosis of our lesions using BIRADS(Breast Imaging Reporting and Data System) categorical method were identified as two intermediate suspicious lesions (BIRADS(Breast Imaging Reporting and Data System) 4B; 6.3 %), twelve moderate suspicious lesions (BIRADS 4C; 34.4 %), and 19 highly suggestive of malignancy lesions (BIRADS 5; 59.4 %). Retrieval rate of calcifications according to specimen radiography were evaluated. Calcifications were successfully retrieved in 30/32 lesions (93.8 %) and confirmed on specimen radiography were assigned to the successful retrieval group and the remaining two lesions (6.3%) were assigned to the failed retrieval group(**Table 1**).

Table 1:- Retrieval rate of Calcifications according to specimen radiography.

Retrieval	Number of lesions	Percentage (%)
success	30	93.8 %
Fail	2	6.3 %

We reviewed imaging findings of microcalcifications on MG(Mammography) according to retrieval, including the extent of the calcification, morphology, and distribution, and associated features on US. Based on the MG findings, the extent of calcification was 29.35mm (range, 11.40 -127.30 mm) in the successful retrieval group and 95.25mm (range, 93.70 -96.80 mm) in the failed retrieval group, p value = 0.029. The morphology of calcification did not differ between two groups, fine pleomorphic 29/30 (96.7%) lesions and coarse heterogeneous 1/30 (3.3%) lesions calcifications in the successful retrieval group while fine Pleomorphic 2/2 (100%) lesions in the failed retrieval group (p =1.000). The distribution of calcification, linear/segmental 4/30 (13.3%) and Cluster 26/30 (86.7%) lesions in the successful retrieval group, while Cluster 2/2 (100%) lesions in the failed retrieval group (p =1.000). On US, microcalcifications were associated with mass 24/30 (80.0%) lesion , non-mass 3/30 (10.0%) lesions and non (isolated microcalcifications) 3/30 (10.0%) lesions in the successful retrieval group, whereas they were associated with non- mass 2/2 (100%) lesions in the failed retrieval group(**Table 2**).

Table 2:- Imaging findings of microcalcifications on MG(Mammography) and US(Ultrasound) according to retrieval.

Microcalcification on MG	Success (n = 30)	Fail (n = 2)	p -values
Extent of calcifications	29.35mm(11.4 - 127.3)	95.25mm (93.7 - 96.8)	0.029
Morphology			1.000
Amorphous	0	0	
Fine pleomorphic	29/30 (96.7%)	2/2 (100%)	
Coarse heterogeneous	1 / 30 (3.3%)	0	
Fine Linear	0	0	

Fine linear branching	0	0	
BI-RADS category			0.482
4B	2/30 (6.7%)	0	
4C	11/30 (36.7%)	0	
5	17/30 (56.7%)	2/2 (100%)	
Distribution			1.000
Linear/segmental	4/30 (13.3%)	0	
Cluster	26/30 (86.7%)	2/2 (100%)	
Regional	0	0	
Associated feature on US			0.003
Mass	24/30 (80.0%)	0	
Non-mass	3/30 (10.0%)	2/2 (100%)	
None	3/30 (10.0%)	0	

Distribution of benign and malignant groups within the studied population according to ultrasound guided core needle biopsy results, CNB identified 28 lesions (87.5 %) malignant and four (12.5 %) benign lesions. Distribution of lesions according to pathological diagnosis in successful and fail retrieval group, the successful retrieval group comprised 26 malignant (22 IDC (Invasive ductal carcinoma), 2 DCIS (Ductal carcinoma insitu), 2 ILC (Invasive lobular carcinoma) and four benign lesions. The four benign lesions were two ADH (Atypical ductal hyperplasia), one fibroadenoma, and one fibroadenosis. In the failed retrieval group, two IDC grade II (Table 2).

Table 2:- Distribution of lesions according to pathology diagnosis in successful and fail retrieval group.

Pathologic Diagnosis	Retrieval	
	success	Fail
Invasive ductal carcinoma GII	22 (73.3%)	2 (100%)
Ductal carcinoma insitu	2 (6.7%)	
Invasive lobular carcinoma	2 (6.7%)	
Fibroadenosis	1 (3.3%)	
Atypical ductal hyperplasia	2 (6.7%)	
Fibroadenoma	1 (3.3%)	

After CNB (Core Needle Biopsy), 30 lesions underwent surgical excision and final pathology results were provided. All 24 IDC on 14-G (Gauge) semi-automated CNB (Core Needle Biopsy) were confirmed to be IDC on final pathology. Of the two DCIS on US guided CNB (Core Needle Biopsy), one DCIS, were upgraded to IDC, the other one confirmed to be DCIS on final pathology. The rate of DCIS underestimation was 50.0% (1/2) and their BIRADS assessments were categories 4C and 5, respectively. The two ILC on 14-G (Gauge) semi-automated CNB (Core Needle Biopsy) were confirmed to be ILC on final pathology. Of the four benign lesions, the two ADH underwent surgical excision, and were finally diagnosed as DCIS. The rate of ADH underestimation was 100.0% (2/2) and their BIRADS assessments were category 4B and 4C. The other two benign lesions (fibroadenoma and fibroadenosis) their BIRADS assessments were category 4C and were recommended for follow-up (Table 3).

Table 3:- Results of US-Guided 14-G Semi-Automated CNB According to BI-RADS Categories.

Pathologic Diagnosis	BIRADS			Total
	4B	4C	5	
Invasive ductal carcinoma GII	1 (50.0%)	6 (54.5%)	17 (89.5%)	24 (75.0%)
Ductal carcinoma Insitu		1 (9.1%)	1 (5.3%)	2 (6.3%)
Invasive lobular carcinoma		1 (9.1%)	1 (5.3%)	2 (6.3%)

Fibroadenosis		1 (9.1%)		1(3.1%)
Atypical ductal hyperplasia	1(50.0%)	1(9.1%)		2(6.3%)
Fibroadenoma		1(9.1%)		1(3.1%)

According to the BI-RADS categories, two category 4B calcifications were successfully retrieved and 14-G semi-automated CNB results were one benign (ADH) considered to be discordant, and one malignant (IDC) are concordant. Finally ADH confirming the 14-G semi-automated CNB result to be a DCIS underestimates. The IDC after breast cancer surgery, confirming the 14-G semi-automated CNB results to be accurate. All of the category 4C lesions were successfully retrieved and the 14-G semi-automated CNB results were one ADH, one fibroadenoma, one fibroadenosis, one DCIS, one ILC and six IDC. The ADH, fibroadenoma, and fibroadenosis cases were considered discordant, but was finally ADH confirming the CNB result to be a DCIS underestimates. Both of fibroadenoma, and fibroadenosis had a follow up after six month and none of them show any new changes so still for follow up. Of the 19 lesions categorized as BIRADS 5 lesions, 17 were successfully retrieved and were coordinate with final pathology results. One was DCIS, one was ILC, and 15 were IDCs. Retrieval of calcification failed in the other two BIRADS 5 lesions and its CNB results were IDC, which was considered to be concordant. Both cases were finally diagnosed as IDC after breast cancer surgery, confirming the CNB result to be accurate (Table 4).

Table 4:- Results of US-Guided 14-G Semi-Automated CNB According to BI-RADS Categories compared with final pathology results.

BI-RADS Category on MG	Retrieval	CNB Result	Compared with Final Pathology results
4B (n=2)	2 success	1 Benign /discordant 1 Malignant /concordant	1 underestimate 1 accurate
4C (n=11)	11 success	3 Benign / discordant 8 Malignant /concordant	2 follow up 1 underestimate 7 accurate 1 underestimate
5 (n=19)	17 success 2 Fail	17 Malignant /concordant 2 Malignant /concordant	17 accurate 2 accurate

Of the 30 lesions in the successful retrieval group, four (13.4%) showed a radiology-pathology discordance. Of 28 lesions, 25 (89.3%) lesions were accurately diagnosed, three (10.7%) lesions were underestimated, and two lesions recommended for follow up. Both lesions in the failed retrieval group were accurately diagnosed (100.0%). The overall accuracy of US-guided 14-G semi-automated CNB was 90.0 % (27/32) because of two ADH and one DCIS underestimates lesions and both of fibroadenoma, and fibroadenosis underwent mammographic follow up (Table 5).

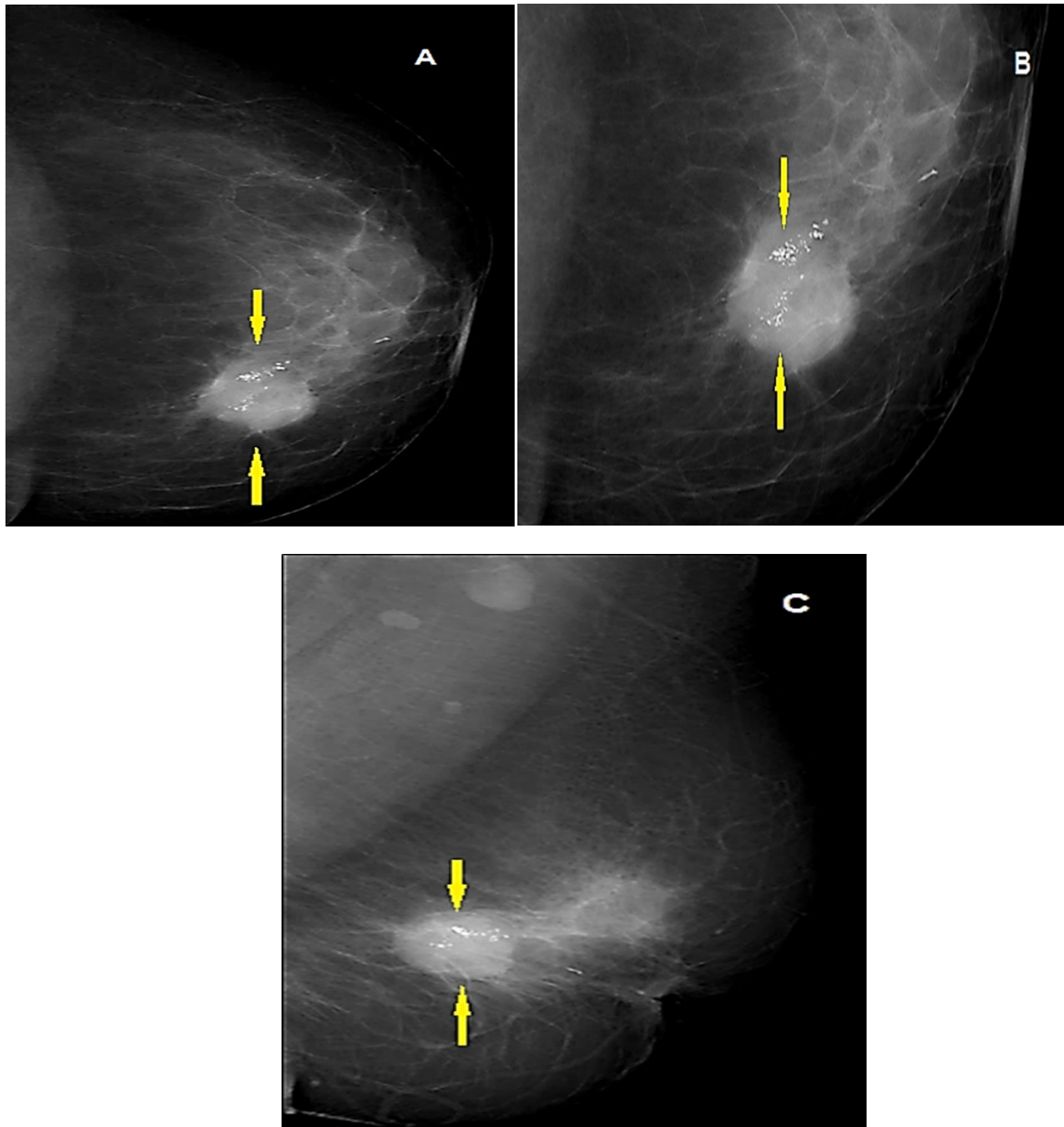
Table 5:- Percentage of accuracy of US-guided 14-G semi-automated CNB.

Final Pathology	Accuracy (%)
Accurate	90.0
Underestimate	10.0

We compared the characteristics of specimen radiography according to the retrieval of calcifications. The total number of retrieved cores did not differ between groups: the mean 7.73 (range, 6-11) in the successful retrieval group and 9.50 (range, 7-12) in the failed retrieval group ($p = 0.61$). In the successful retrieval group, the mean number of cores containing calcification was 5.50 (range, 2-9) (Table 6). Figure (1-4).

Table 6:- Characteristics of Specimen Radiography According to Retrieval of Calcifications.

Specimen radiography	Success(n= 30)	Fail(n = 2)	p –values
Total No. of cores	Mean (7.73)	Mean(9.50)	0.61
No. of cores containing microcalcification	Mean (5.50)	0	



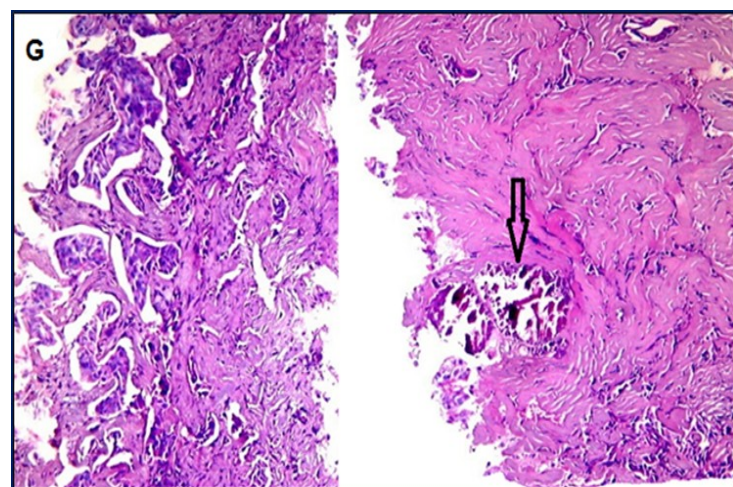
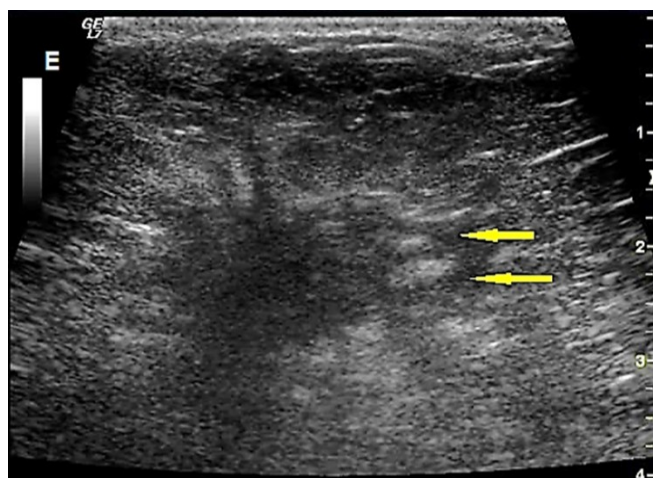
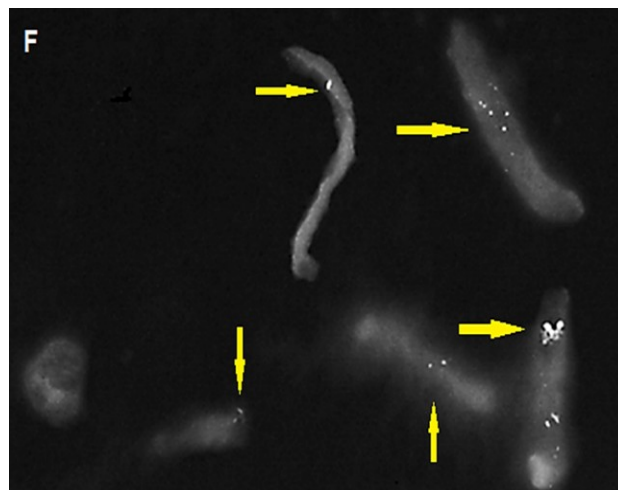
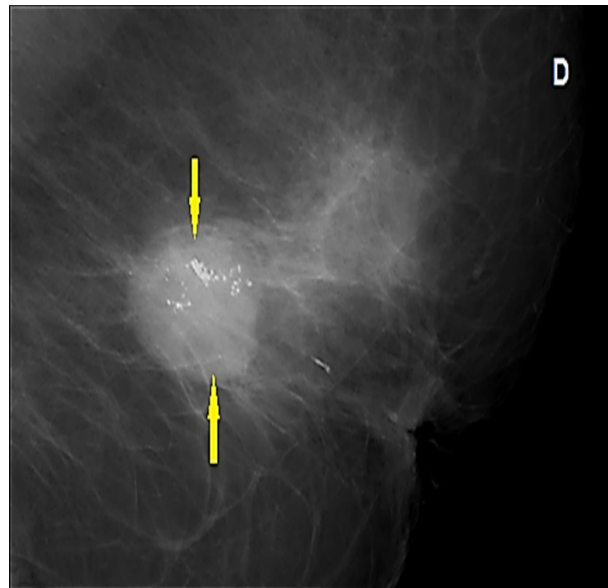
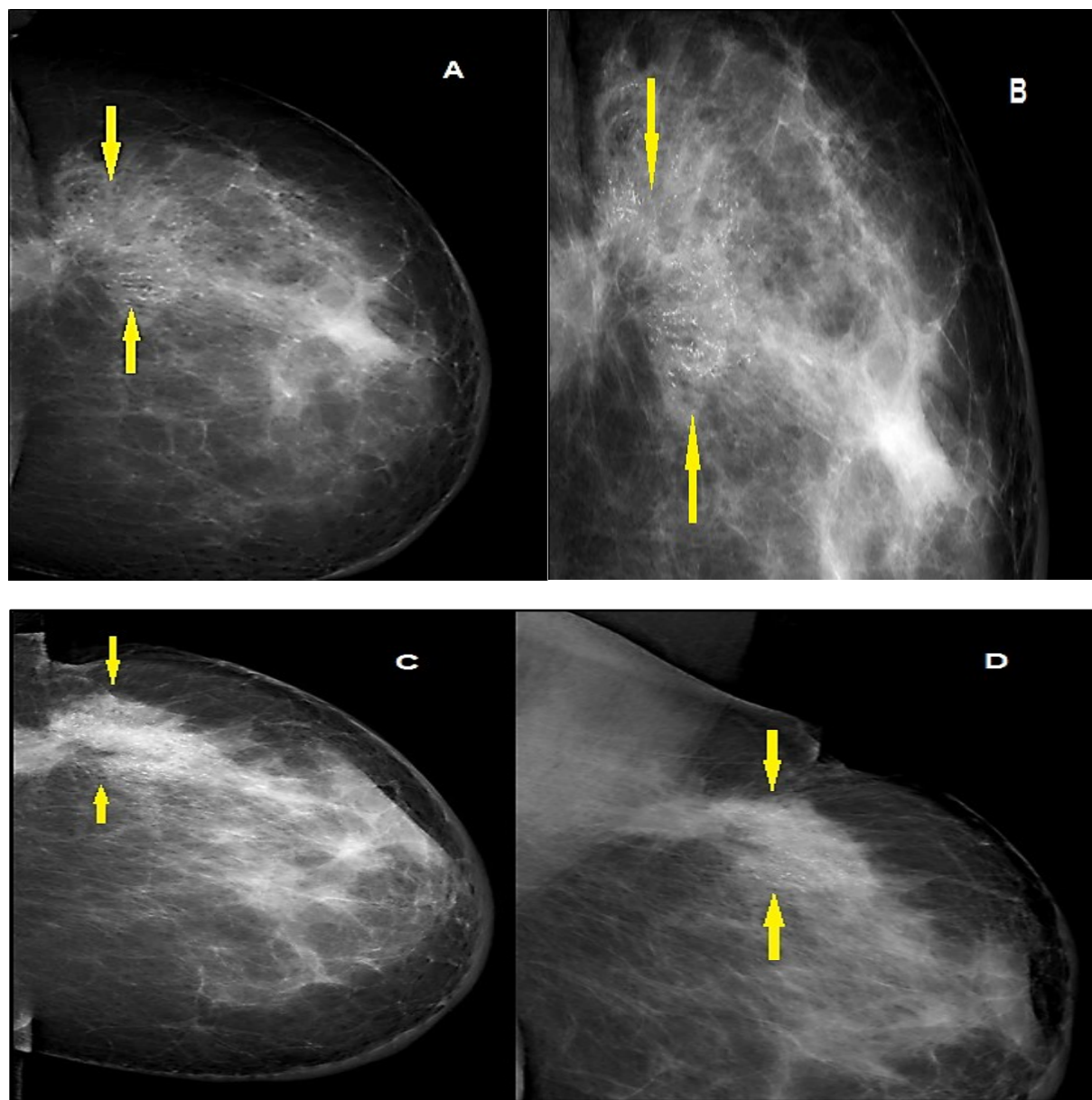


Fig (2):Digital Mammography CC(CranioCaudal) (A, B)& MLO(Mediolateral Obligue) (C, D) views of the left breast shows an ill define, finely speculated mass at UIQ(Upper inner quadrant) with pleomorphic cluster of microcalcifications (arrows). The microcalcifications seen more clearly on the magnified view (B, D),BIRADS 5.(E): B-mode US Left UIQ(Upper inner quadrant), 10'oclock position speculated hypoechoic mass with echogenic foci of microcalcification (arrows). (F) : Specimen radiography.(G)Histopathology: Invasive ductal carcinoma grade II with microcalcifications (arrow).



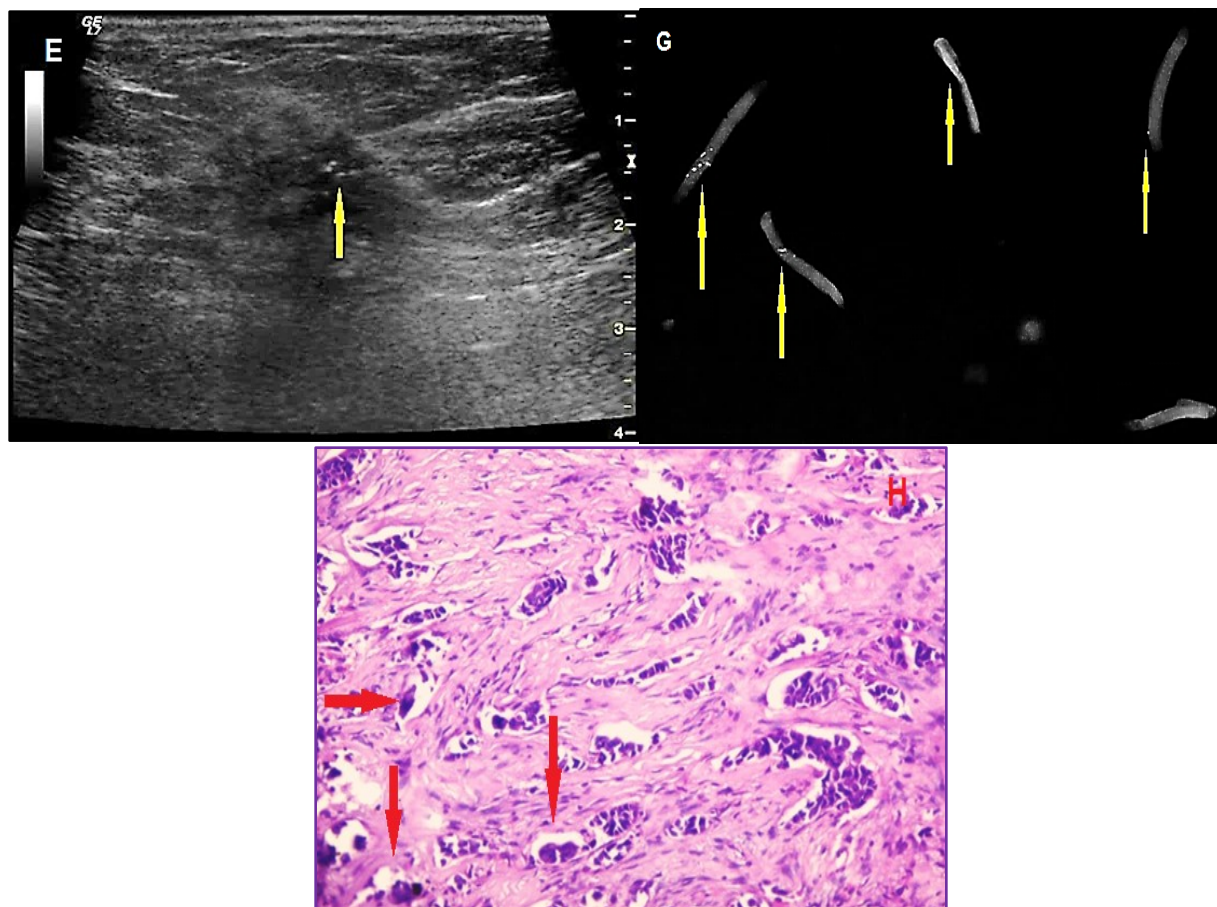
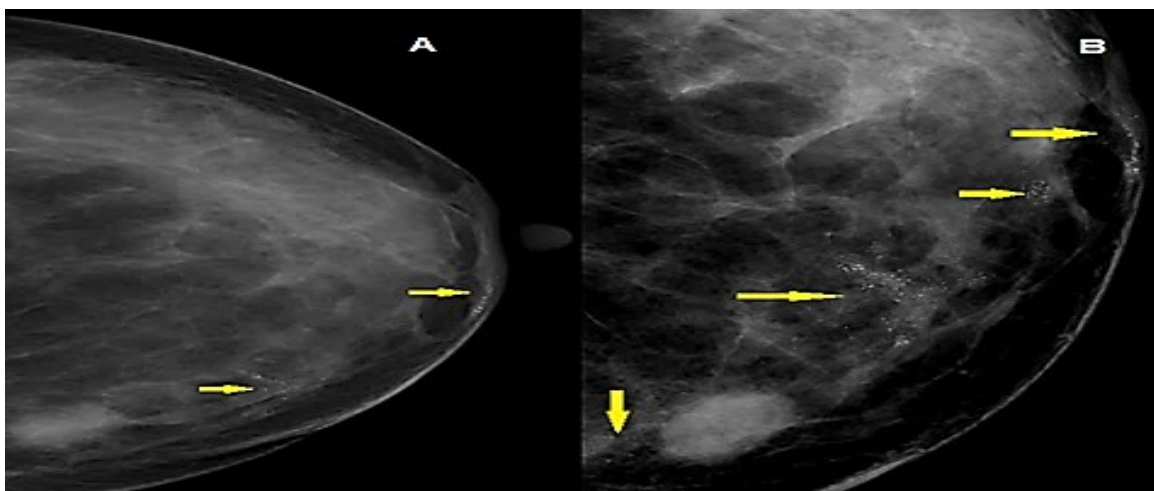


Fig (3 A-D):- Digital Mammography CC(CranioCaudal) (A,B) & MLO(Mediolateral Obligue) (C,D) views of the left breast showing UOQ(Upper outer quadrant) post operative distortion accompanied with linear branching segmental microcalcifications (arrows). The microcalcifications seen more clearly on the magnified view (B,D),BIRADS 5.(E)B-mode US show hypoechoic area corresponding to the operative bed with echogenic foci of microcalcifications (arrows) .(G)Core Imaging: Specimen radiography of biopsy cores ,some with multiple microcalcifications (arrows).(H)Histopathology result of CNB proved to be IDC grade II Fig Result was confirmed to be IDC on final pathology (arrows).



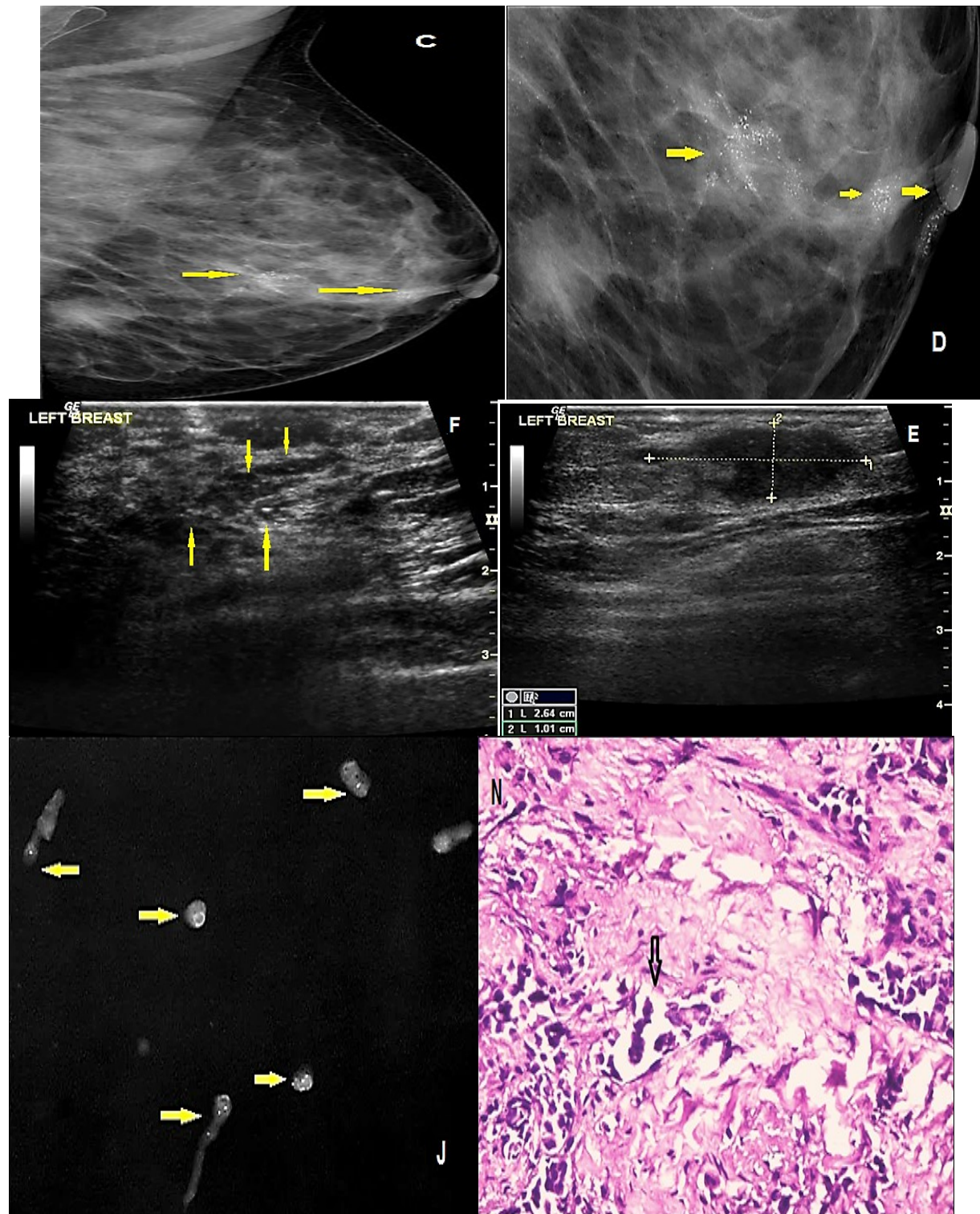


Fig (4 A-D): Digital Mammography CC(CranioCaudal) (A,B) & MLO(Mediolateral Oblique) (C,D) views of the left breast show a mass lesion with indistinct margins at LIQ (Lower Inner Quadrant) with nearby clusters of fine pleomorphic microcalcifications is seen extending in a segmental distribution to reach the nipple (arrows). The microcalcifications seen more clearly on the magnified view (B,D) ,BIRADS 5. (E,F) US shows an LIQ ill defined hypoechoic mass lesion (E) with closely related echogenic foci of microcalcification (arrows). (J)Specimen radiography for cores obtained from micro calcifications. All cores show micro calcific foci. (N) histopathology:

CNB result for the mass proved to be ductal carcinoma insitu grade II with microcalcifications (arrow). After surgery the result was Finally proved to be IDC.

Discussion:-

The presence of microcalcification on mammography is one of the earliest signs in breast cancer detection. However, it is difficult to distinguish malignant calcifications from benign calcifications^[7]. The calcifications in mammograms appear as relatively bright regions in comparison with the surrounding breast tissue or masses. Benign calcifications are generally larger, more rounded, and lesser in number. On the other hand, malignant calcifications tend to be irregular, numerous, clustered, small, varying in size and shape, and branched in orientation^[9]. Advances have been made in the sonographic detection of microcalcifications in recent years after Kasumi first reported the feasibility of sonographic detection of microcalcifications above a size threshold of 110µm as early as 1988. Nevertheless, reliable sonographic identification of microcalcifications continues to be difficult, especially in dense breasts. This difficulty is attributable to the fact that collagen fibers, just like microcalcifications, are seen as bright foci^[4]. With an improved sonographic detection of microcalcification, ultrasound could be used for biopsy guidance for target sampling of tissue containing microcalcifications. Ultrasound-guided breast biopsy is less expensive and does not involve radiation exposure, and it is more comfortable for the patient compared with stereotactic sampling as it does not require compression of the breasts^[4]. Microcalcifications in malignant tumors are more likely to be detected by US than those in benign tumors because most malignant calcifications occur within the masses as opposed to within the echogenic breast parenchyma. Most benign microcalcifications are less likely to be detected by US, especially for fibrocystic diseases^[1]. Our study is a prospective study where 30 women with 32 lesions with suspicious microcalcifications given BIRADS 4B, C and 5 included 28 cases presented with single lesion for each case while two cases presented with two lesions for each case. All cases in our study were subjected to digital Mammography, Ultrasonography, Ultrasound guided CNB and Specimen Radiography to identify the presence of microcalcifications. Pathological analysis of samples and slides picturing were done. Results of histopathology examinations of CNB biopsy and surgical specimens were obtained for comparison by comparing the results of CNB with surgical pathology. Regarding mammographic BIRADS category in our study the results revealed 2 (6.3%) cases were categorized as BIRADS 4B, while 11 (34.4%) cases as BIRADS 4C, and the remaining 19 (59.4%) cases belonged to BIRADS 5 category. In our study, the retrieval rate of microcalcifications according to specimen radiography were evaluated. Calcifications were successfully retrieved in 30/32 lesions (93.8%) and the remaining two lesions (6.3%) were assigned to the failed retrieval group. These results were comparable to the results reported by^[11], where 33 cases had given BIRADS categories as four cases with low suspicious lesions (4A; 15.2%), five with intermediate suspicious lesions (4B; 12.1%), eight with moderate suspicious lesions (4C; 24.2%), and 16 highly suggestive of malignancy lesions (5; 48.5%) of suspicious microcalcifications apparent on sonography. This study was similar to our study by using the same needle size and using US guided for core biopsy, the retrieval rate was successfully in 30/33 cases (90.9%). In another study held by^[10], the retrieval rate of microcalcifications using US-guided automated core needle biopsy was successfully 6/7 cases (85.7%). As regards imaging findings of microcalcifications on MG, including the extent of the calcification, morphology, and distribution. In our study the extent of calcifications was 29.35mm (range, 11.40 -127.30 mm) in the successful retrieval group while in the failed retrieval group the extent of calcifications was 95.25mm (range, 93.70 -96.80 mm) with (p-value = 0.029). The morphology of calcification in our study did not differ between successful and failed retrieval groups, fine Pleomorphic 29/30 (96.7%) lesions and coarse heterogeneous 1/30 lesion (3.3%) calcifications in the successful retrieval group while fine Pleomorphic 2/2 (100%) lesions in the failed retrieval group. The distribution of calcification in our study also did not differ between successful and failed retrieval groups. Linear/segmental calcification 4/30 (13.3%) and clustered calcification 26/30 (86.7%) in the successful retrieval group, while clustered microcalcification 2/2 (100%) in the failed retrieval group. Regarding the extent, our results were comparable to the results reported by [6], the extent of calcification did not differ between the two groups. 16.7 mm extension (range, 3-70mm) in the successful retrieval group and 18.0 mm extension (range, 9-30 mm) in the failed retrieval group. As regards morphology punctate calcifications 2/3 lesions (66.7%) were more common in the failed retrieval group than in the successful retrieval group. Linear/branching 10/30 (33.3%) and coarse heterogeneous 5/30 (16.7%) calcifications were more common in the successful retrieval group. The proportions of linear/segmental and clustered distributions were similar in both groups. In our study in the successful retrieval group, as regards associated features on US, microcalcifications were associated with mass lesions 24/30 (80.0%), non-mass lesions 3/30 (10.0%) and non lesions (isolated microcalcifications) 3/30 (10.0%), whereas they were associated with non-mass lesions 2/2 (100%) in the failed retrieval group. In a study for^[11] results as microcalcifications were associated with mass 19/30 (63.3%) and non-mass 9/30 (30.0%) lesions in the successful retrieval group, whereas they were associated with mass 3/3 (100%) in the failed retrieval group. In our study, the

pathological diagnosis according to US guided CNB results revealed 4 (12.5 %) benign breast lesions. The remaining 28 lesions (87.5 %) were diagnosed pathologically as malignant lesions. Distribution of lesions in our study according to pathological diagnosis in successful and fail retrieval group. The successful retrieval group comprised four benign lesions including 1 (3.3%) fibroadenosis, 1 (3.3%) fibroadenoma, 2 (6.7%) atypical ductal hyperplasia and 26 malignant lesions including 22 (73.3%) lesions invasive ductal carcinoma GII, 2 (6.7%) ductal carcinoma insitu, and 2 (6.7%) invasive lobular carcinoma. While pathological results in failed retrieval group were two 2 (100%) IDC GII. [11] reported that results of US-guided CNB identified 26 (78.8%) malignant and seven (21.2%) benign lesions. The successful retrieval group comprised 25 malignant (15 DCIS and 10 IDC) and five benign lesions. The five benign lesions were one ADH, one columnar cell hyperplasia, one fibrocystic disease, one fibroadenoma, and one fat necrosis. In the failed retrieval group, one was DCIS and two fibrocystic disease were identified. In our study, 30 lesions underwent surgical excision and final pathology results were provided. All 24 IDC on CNB were confirmed to be IDC on final pathology results. Of the two DCIS on US guided CNB, one DCIS, which belonged to the successful retrieval group, were upgraded to IDC, the other one confirmed to be DCIS on final pathology results. The rate of DCIS underestimates was 50.0% (1/2). The two ILC on CNB were confirmed to be ILC on final pathology results. Of the four benign lesions, the two ADH underwent surgery, and were finally diagnosed as DCIS. The rate of ADH underestimated was 100.0% (2/2) and the other two benign lesions (fibroadenoma and fibroadenosis) still on follow-up. So that, the accuracy of 14-G semi-automated CNB in our study was 27/32 cases (90.0%). [11] reported that, 30 lesions underwent cancer surgery. Of the 16 DCIS on CNB, 14 were confirmed to be DCIS on final pathology. The remaining two DCIS, which belonged to the successful retrieval group, were upgraded to IDC. The rate of DCIS underestimates was 12.5% (2/16). All 10 IDC were confirmed to be IDC on final pathology. Of the seven benign lesions, four underwent MG-guided wire localization and excision, and were finally diagnosed as three fibroadenosis and one DCIS. The latter was the only false-negative case of CNB and belonged to the failed retrieval group. The other three benign lesions underwent mammographic follow-up for 2 years and no missed cancers were found. There was no ADH underestimate. So that, the accuracy was similar to our study accuracy (91%). Our study similar to [13] reported that ADH diagnosed at sonographically guided 14-gauge core needle biopsy has a high underestimation rate with respect to the results of surgical excision. 13/21 cases (62%) in which two lesions from these underestimation 2/13 present with calcification visible on sonography were found to be diagnosed finally as DCIS 2/2 cases, (100%) underestimation rate. In another study held by [6] the accuracy of US-guided VAB (Vacuum Assisted Biopsy) in 70/73 cases was (95.9%) and DCIS underestimates was 0/17 cases but an ADH underestimation of 1/3 cases (33%). 14-G semi-automated CNB is similar to VAB in terms of the single skin puncture and repeated needle passes. VAB (Vacuum Assisted Biopsy) is superior to automated CNB for the accuracy of microcalcifications. On the other hand, the cost of 14-G semi-automated CNB is lower than that of VAB. Thus, US-guided CNB may be an acceptable and cost-effective procedure for suspicious microcalcifications compared with US-guided VAB [11]. As regards the characteristics of specimen radiography according to retrieval of calcifications, our study found that the total number of retrieved cores did not differ between successful and failed retrieval groups: the mean was 7.73 (range, 6-11) in the successful retrieval group while the mean was 9.50 (range, 7-12) in the failed retrieval group. In the successful retrieval group, the mean number of cores containing calcification was 5.50 (range, 2-9). This result was agree with [11] that also found the total number of retrieved cores did not differ between groups. the mean was 6.5 (range, 4-9) in the successful retrieval group and was 7.3 (range, 6-10) in the failed retrieval group and in the successful retrieval group, the mean number of cores containing calcification was 4.8 (range, 1-8). This study has some limitations. First, the number of enrolled cases was small, which may have limited a conclusive inference. Second, all procedures were performed by one experienced breast radiologist who had used 14-G semi-automated CNB for many years. The proficiency radiologist of 14-G semi-automated CNB can affect the retrieval rate of microcalcifications. Third, US-guided CNB was not applicable to all suspicious microcalcifications; Nevertheless, in selected cases, US-guided CNB can provide a reliable and cost-effective diagnosis of suspicious microcalcifications. Although the number of cases was too small to deduce a conclusive inference, it could be suggested that microcalcifications lesions could be successfully retrieved using 14-G semi-automated CNB in the era of high-resolution sonography. Specimen radiography proved to be a great help in deciding the accurate retrieval of microcalcifications by core biopsy. It should be done in all cases of core biopsy for calcifications with marking of the core containing calcifications to be specially assessed by histopathology. We should try to do core biopsy before using VAB (Vacuum Assisted Biopsy) for calcifications if well seen by ultrasound.

References:-

1. Chang RF, Hou YL, Huang CH, Chen JH, Chang JM and Moon WK., Automatic detection of microcalcifications in breast ultrasound. Med Phys (2013); 40(10):102901.

2. **Cho N and Moon WK.** Digital mammography-guided skin marking for sonographically guided biopsy of suspicious microcalcifications. *AJR Am J Roentgenol* (2009);192:W132-W136.
3. **Chou CP, Huang NC, Jhuang SJ, Pan HB, et al.,** Ubiquitin-Conjugating Enzyme UBE2C Is Highly Expressed in Breast Microcalcification lesions. *PLoS ONE* (2014); 9(4): e93934. doi: 10.1371/journal.pone.0093934.
4. **Grigoryev M, Thomas A, Plath L, Durmus T, Slowinski T, Diekmann F, Fischer T.,** Detection of Microcalcifications in Women with Dense Breasts and Hypoechoic Focal Lesions: Comparison of Mammography and Ultrasound. *Ultraschall in Med* (2014); 35(06): 554-560.
5. **Gruber R, Walter E and Helbica TH.,** Cost comparison between ultrasound-guided 14-g large core breast biopsy and open surgical biopsy: An analysis for Austria. *European Journal of Radiology* 74(2010);519-524.
6. **Hahn SY, Shin JH, Han BK, Ko EY.** Sonographically-guided vacuum-assisted biopsy with digital mammography-guided skin marking of suspicious breast microcalcifications: comparison of outcomes with stereotactic biopsy in Asian women. *Acta Radiol* (2011);52:29-34.
7. **Kim KI, Lee KH, Kim TR, Chun YS, Lee TH, Choi HY, Park HK.,** Changing patterns of microcalcification on screening mammography for prediction of breast cancer. *Breast Cancer* (2015); DOI 10.1007/s12282-015-0589-8.
8. **Mansour SM and Adel L.,** Characterization and guided-procedures of breast suspicious Microcalcifications : can MicroPure ultrasound do it?. *The Egyptian Journal of Radiology and Nuclear Medicine* (2012); 43: 499-505.
9. **Shao Y, Liu L, Bie M, Li C, Wu Y, Xie X & Li L.,** Characterizing the Clustered Microcalcifications on Mammograms to Predict the Pathological Classification and Grading: A Mathematical Modeling Approach. *J Digit Imaging* (2011); 24:764-771.
10. **Soo MS, Baker JA, Rosen EL.,** Sonographic detection and sonographically guided biopsy of breast microcalcifications. *AJR Am J Roentgenol* (2003);180:941-948.
11. **Yi J, Lee EH, Kwak JJ, Cha JG and Jung SH.,** Retrieval Rate and Accuracy of Ultrasound-Guided 14-G Semi-Automated Core Needle Biopsy of Breast Microcalcifications. *Korean J Radiol* (2014);15(1):12-19.
12. **Youk JH, Kim EK, Kim MJ, Lee JY, Oh KK.** Missed breast cancers at US-guided core needle biopsy: how to reduce them. *Radiographics* (2007);27:79-94.
13. **Youk JH, Kim EK, Kim MJ.,** Atypical Ductal Hyperplasia Diagnosed at Sonographically Guided 14-Gauge Core Needle Biopsy of Breast Mass. *AJR* (2009); 192:1135-1141.
14. **Zeeneldin AA, Ramadan M, Gaber AA, Taha FM.** Clinico-pathological features of breast carcinoma in elderly Egyptian patients: a comparison with the non-elderly using population-based data. *J Egypt Natl Canc Inst.* (2013) Mar; 25(1):5-11.