Kurdistan Journal of Applied Research (KJAR)
Print-ISSN: 2411-7684 | Electronic-ISSN: 2411-7706
Volume 3 | Issue 1 | June 2018 | DOI: 10.24017/science.2018.1.5

Received: February 4, 2018 | Accepted: April 22, 2018

A Comparison Between Core Biopsy and Imaging Techniques (Ultrasound and Mammography) In diagnosis of Breast Cancer in Slemani Breast Center

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Abstract - ***Breast cancer is the global health problem. It is the highest prevalent site-specific cancer in women throughout the world and the most common reason of death in middle age women, following lung cancer. Up to 5% of breast cancers are caused by inheritance. Male breast cancer accounts for less than 1%. Mammography is the first imaging study to evaluate breast abnormalities, Ultrasound is particularly useful in young women with dense breasts. Core needle biopsy permits the analysis of breast tissue architecture and whether invasive cancer is present. To compare core needle biopsy and imaging, accuracy of each modality for the purpose of the diagnosis and their impact on preoperative planning before surgical treatment. A retrospective cohort study was performed in 70 cases of breast cancer during 2015-2017 at Slemani Breast Center/ Kurdistan region. Inclusion criteria any patient with diagnosed as breast cancer for whom core biopsy and imaging techniques (ultrasound and mammography) were done, Age 25 years and above. Exclusion criteria, patient with breast mass who did not underwent: one of the two modalities, Age below 25 years, pregnant women. In the current study: mean age / year for the participants were Mean age = 51.34 year ± 12.85 SD), Sixty nine cases were female and one male. By core biopsy (97.1%) is positive for malignancy. In this study: results about 34.28% of BIRADS V (ultrasound)lesions proved to be positive for malignancy by core biopsy, 1.43% of BIRADS V were negative for malignancy and the association were statistically highly significant, for BIRADS III lesions 17.14% were proved as positive for malignancy by core biopsy. About 45.7% of BIRADS V (mammography were positive for malignancy by core biopsy and the associations were found to be statistically highly significant and for BIRADS III 12.85% of lesions were positive for malignancy by core biopsy. There was statistically significant association between radiological investigation(ultrasound, mammography) and histopathological finding (core biopsy).***

Keywords: Breast cancer, Mammography, ltrasound, and; core Biopsy

1. INTRODUCTION

Breast cancer is the global health problem [1]. It is the well known cancer in women world-wide accounting for 21-23% of all cancers diagnosed in women [2,3]. It is the highest prevalent site-specific cancer in women throughout the world and the most common reason of death in middle age women, following lung cancer [1,4,5]. The incidence of this type of cancer in the world continues to rise with more than 1.4 million new cases diagnosed annually [3]. In United Kingdom 1 in 12 ladies will develop the disease during their lifetime compared to Unites States has 1-in-8 lifetime risk [5,6].

Up to 5% of breast cancers are caused by inheritance (BRCA1, BRCA2, P53 and PTEN) [1,3,4,6]. Male breast cancer accounts for less than 1% [1,6].

If breast cancer is diagnosed earlier: better and less aggressive treatment options are possible and mortality falls. Accurate premanagement diagnosis of cancer is important for optimal therapeutic planning [7,8].

Breast imaging techniques: are used to detect small breast lesion, evaluate clinical findings and guide diagnostic procedures [1]. Radiological and histopathological results are supposed to be harmony if the histpathological results give an acceptable explanation for the radiological results and vice versa. When the evaluation of results (radiological and histopathological) is accomplished a management workup is recommended [9].

In 1993 The Breast Imaging Reporting and Data System (BI-RADS) lexicon was invented by the American College of Radiology (ACR), for purposes of diagnosing uncertain results.

BIRADS category:

- **Category 0:** incomplete, further imaging evaluation.
- **Category I:** negative, yearly check up.
- **Category II:** benign lesion recommends screening annually.
- **Category III:** likely to be a benign lesion short-interval follow- up.
- **Category IV:** suspicious finding biopsy recommended.

- **Category V:** highly suggestive of malignant lesion work-up must be considered.
- **Category VI:** known or confirmed [1,10-,13].

Mammography is the first imaging study to evaluate breast abnormalities. It can be used as a screening tool to find unexpected breast cancer in asymptomatic females, have a better prognosis and require less aggressive treatment than cancer identified by palpation. It is sensitivity increasing with age as the breast becomes less dense [1,4,6].

Nowadays mammography is the most reliable way for early diagnosis of breast tumour; however, it has some drawbacks. Density of breast tissue is one of the reason that make the diagnosis difficult, the differentiation between tumour and normal dense breasts in mammography is very poor, which can affect the diagnosis [8].

Indicators for breast cancer survival that affect the prognosis include size of tumour , type of tumour, grade of tumour, mammographic findings, status of regional lymph node, and metastasis [14].

Nowadays ultrasound is a major modality of imaging for the diagnosis of breast diseases. It is a useful diagnostic tool in young females with dense breasts. It is distinguishing cysts from solid lesion, it can detect, localized impalpable areas of breast pathology. It is an important method of resolving equivocal mammographic finding and it is useful to guide invasive techniques such as fine needle aspiration, core-needle biopsy and needle localization of suspicious breast lesion [1,4,6-8].

Core needle biopsy permits the analysis of breast tissue architecture and whether invasive cancer is present, it also helps the patient and surgeon to discuss the specific management plan of a breast cancer before therapy begins [3,4].

1. Advantages of core needle biopsy:

It is a good diagnostic tool in the assessment of micro-calcifications, used when FNAC not conclusive, it provides tissue pieces showing architectural features of the lesion for identification and differentiation between DCIS and invasive ductal carcinoma and tissue usually available for adjunctive tests (Hormone Receptor).

2. Disadvantages:

Accuracy of the procedure is operator dependant, false negatives may be due to associate missing of tumour sampling, if core needle biopsy is compared with FNAC it shows more complications as (pain, hematoma, hemorrhage and tumour cells seeding in the tract), core biopsy needs adequate fixation and processing and it is more expensive and time consuming than FNAC [15].

3. Aim of the study:

Comparison between core biopsy and imaging techniques (Ultrasound and Mammography) in breast cancer diagnosis.

4. Specific aims of the study:

To compare core needle biopsy and imaging, the accuracy of each modality for thepurpose of the diagnosis and their impact on preoperative planning before surgical treatment.

5. Justification of the study:

Identifying breast cancer can be achieved through history, physical examination and radiological studies with the gold standard being histology to reach a definitive diagnosis.

With the current advances in reporting with the use of BI-RADS, the standardization is achieved, but its accuracy in terms of histological correlation remains unanswered.

This study will try to establish the same and also aid in improving the management of patients.

2. PATIENT & METHOD

A retrospective observational study was performed in 70 cases of breast cancer during 2015-2017 at Slemani Breast Center/ Kurdistan region. Inclusion criteria any patient diagnosed with breast cancer for whom core biopsy and imaging techniques (ultrasound and mammography) were done and Age 25 years and above. Exclusion criteria, patient with breast mass who did not undergo one of the two modalities, Age below 25 years and pregnant women. Data analyzed with Statistical Package for the Social Science (SPSS) version 20 software program, for comparison between means using a student T-test, P-value equal or less than 0.05 regarded as statistically significant, while P-value equal or less than 0.001 regarded as statistically highly significant.

- **Study design:** retrospective cohort study.
- **Duration:** September 2015 to September 2017.
- **Setting:** This study was carried out in Slemani Breast Center, which is located in Slemani / Kurdistan region. It receives patients from all parts of Slemani Governorate and seen by a breast surgeon and a breast physician. The center was established in 2007 and registered more than 903 patients diagnosed with breast cancer, follow up and management was done for them.
- **Sampling method and sample size:**
- A convenient sampling with a sample size of 70 cases of breast cancer.
- **Ethical considerations:**
- A research protocol was approved by research and ethical committee of the Kurdistan Board for Medical Specialties and a formal acceptance letter was obtained from the ethical committee of the college of medicine / Slemani University.
- **Data collection:** Data collection was done through patients' records.
- **The questionnaire:** The questionnaire had been divided into five sections; (1)demographic characteristics (including age, gender, marital status, occupation, education level and residency); (2)medical history (including duration of diagnosis , past medical diseases, BMI, co-morbidities and past surgical diseases); (3)family history of breast malignancy; (4)breast examination (breast mass, nipple retraction, nipple discharge and axillary lymph node involvement); (5)ultrasound, mammography and core needle biopsy. Regarding mammography and ultrasound: In each patient, full clinical examination of both breasts was performed by breast physicians and breast surgeons at Slemani Breast Center, and the imaging results classified according to BIRADS category. Ultrasound has a crucial role for studying breast pathologies, and it is particularly

important in women with dense breasts and aged under 40 years. Mammography taken (in two view) of each breast [16,17].

- **Regarding core needle biopsy:** Minimally invasive breast biopsies (MIBB) are performed to clarify unclear mammography and ultrasound of the breast [18]. A core needle biopsy is the last step when a mammogram or other radiological studies found to be abnormal [8].

3. RESULTS

The mean age/ year is 51.34 ± 12.85 SD. Sixty nine cases were female and one male. By core biopsy (97.1%) is positive for malignancy. In study results about 34.28% fall into BIRADS V (ultrasound) lesions proved to be positive for malignancy by core biopsy, 1.43% of BIRADS V were negative for malignancy and the association were statistically highly significant. For BIRADS III lesions 17.14% were proved to be positive for malignancy by core biopsy. About 45.7% of BIRADS V (mammography) were positive for malignancy by core needle biopsy and the associations were found to be statistically highly significant and for BIRADS III 12.85% of lesions were positive for malignancy by core needle biopsy.
Demographic characteristics of the study sample:

Mean age/ years = 51.34 ± 12.85 SD

Table 1. Distribution of the research sample according to the demographic characteristics; the highest percentage was among females (98.6%), while only (1.4%) was male, married (90%) and inside city center accounts (54.3%).

Table 1. Demographic characteristics of the research sample.

Variables	Frequency	Percentage (%)
Gender		
Male	1	1.4
Female	69	98.6
Marital status		
Single	4	5.7
Married	63	90.0
Widow	1	1.4
Divorced	2	2.9
Residency		
Inside city	38	54.3
Outside city	32	45.7
Total	70	100

Table 2. Mammographic results of the research, the highest percentage (47.1%) of the study sample under the category of BIRADS V.

Table 2. Mammographic results of the research.

Mammography	Frequency	Percent (%)
BIRADS 0	1	1.4
BIRADS I	1	1.4
BIRADS II	1	1.4
BIRADS III	10	14.3
BIRADS IV	21	30
BIRADS V	33	47.1
BIRADS VI	3	4.3
Total	70	100

Table 3. Ultrasonographic finding of the research, the highest percentage (38.6%) of the study sample under the category of BIRADS IV

Table 3. Ultrasonographic finding of the research.

Ultrasound	Frequency	Percent (%)
BIRADS II	2	2.9
BIRADS III	13	18.6
BIRADS IV	27	38.6
BIRADS V	25	35.7
BIRADS VI	3	4.3
Total	70	100

Table 4. Core needle biopsy results of the study sample, most of the study sample (97.1%) are positive for malignancy.

Table 4. Core needle biopsy results of the study sample.

Core biopsy	Frequency	Percent (%)
Positive for malignancy	68	97.1
Negative for malignancy	2	2.9
Total	70	100

Table 5. Association between ultrasound and core biopsy of the participants, highest percentage (38.57%) of the study sample were among BIRADS IV. And the association were statistically highly significant.

Table 5. Association between ultrasound and core needle biopsy of the participants.

Ultrasound	Core biopsy		Total	P-value
	Positive for malignancy	Negative for malignancy		
BIRADSII	2 (2.85%)	0(0%)	2(2.85%)	≤0.001
BIRADSIII	12(17.14%)	1 (1.43%)	13(18.57%)	
BIRADSIV	27(38.57%)	0 (0%)	27(38.57%)	
BIRADS V	24(34.28%)	1 (1.43%)	25(35.71%)	
BIRADSVI	3 (4.3%)	0 (0%)	3(4.3%)	
Total	68 (97.14%)	2 (2.86%)	70 (100%)	

Table 6. Association between mammography and core needle biopsy of the participants, highest percentage (47.13%) of the study sample were among BIRADS V. And the association were statistically highly significant.

Table 6. Association between mammography and core biopsy of the participants.

Mammography	**Core biopsy**		**Total**	**P-value**
	Positive for malignancy	**Negative for malignancy**		
BIRADS 0	1 (1.43%)	0 (0%)	1 (1.43%)	≤0.001
BIRADS I	1 (1.43%)	0 (0%)	1 (1.43%)	
BIRADS II	1 (1.43%)	0 (0%)	1 (1.43%)	
BIRADS III	9 (12.85%)	1 (1.43%)	10 (14.28%)	
BIRADS IV	21 (30%)	0 (0%)	21 (30%)	
BIRADS V	32 (45.7%)	1 (1.43%)	33 (47.13%)	
BIRADS VI	3 (4.3%)	0 (0%)	3 (4.3%)	
Total	68 (97.14%)	2 (2.86%)	70 (100%)	

4. DISCUSSION

The ideal assessment for patients with suspicious breast lesion is a triple assessment (clinical, radiological and histopathology) [19]. The diagnostic results of breast diseases can be achieved with mammography and ultrasound or both. Which are fast, easily accessible and cost effective. Combination with core needle biopsy will provide enough clue for definitive management , either surgery for malignant, or regular followup benign diseases [16].

During the past decade, the diagnostic work-up for breast cancer has undergone major changes, this in turn created many controversies. Surgical excisional biopsy has been replaced by other alternatives like FNAC, and more commonly used core needle biopsy [20].

- **Demographic characteristics of the study sample:**

In the current study, mean age / years for the participants was (mean age = 51.34 year ± 12.85 SD), which is consistent with a study was done in India [19] (mean age = 52.66), a study was done in South Korea [21] (mean age = 51.4 ±9.5 SD), a study was done in USA [22] (mean age = 52.39 ±10.3 SD), Our study is inconsistent with a study done in Puerto Rico [11] (mean age = 57 years), a study was done in Spain [23] (mean age = 57 years) , a study was done in Turkey [24] (mean age = 55 years) and a study was done in Canada [25] (mean age = 58.1 years).

In the current research showed the incidence of female to male ratio was (69:1), Similar result was found in a study was done in Israel [26] in which female to male ratio was (67:1).

- **Core needle biopsy:**

It was used as a gold standard in the diagnosis of breast cancer. In the current study, 68 cases (97.14%) were diagnosed to be malignant by core biopsy, the other 2 cases (2.86%) were diagnosed to be negative for malignancy by core biopsy, but later on proved to be malignant by excisional biopsy, the same results was found in a study done in Bulgaria [27] in 2016 in which study (93.7%) of cases diagnosed as malignant by core biopsy and (6.3%) of which were benign.

- **Association between Ultrasound BIRADS and histopathology findings (core needle biopsy):**

In the current study results, about 34.28% of BIRADS V lesions proved to be positive for malignancy by core needle biopsy, 1.43% of BIRADS V were negative for malignancy and the association were statistically highly significant; in contrast to a study was done in India [2] in 2013 in which 93.2% of BIRADS V were found to be malignant by core biopsy, our explanation for this difference belongs to the difference in sample size and in our study we collected only cases which were diagnosed as breast cancer, while in that study both malignant and benign breast lesions were included.

For BIRADS III lesions 17.14% were proved as positive for malignancy by core biopsy, 1.43% of them were negative for malignancy by core biopsy and the association were statistically highly significant; in contrast to a study done in India [2] in 2013 were 1.6% of BIRADS III lesions diagnosed as positive for malignancy.

- **Association between Mammographic BIRADS and histopathology findings (core needle biopsy):**

About 45.7% of BIRADS V were positive for malignancy by core biopsy and the associations were found to be statistically highly significant, the same results were found in a study was done in Kenya[15] in 2015 43.8% of BIRADS V were positive for malignancy, while in a study was done in Puerto Rico [11] in 2003 about 79.4% BIRADS V were positive for malignancy; this difference may be due to a high number of participants.

For BIRADS III 12.85% of lesions were positive for malignancy by core biopsy, only 1.43% of them were negative for malignancy by core biopsy, in contrast to a study was done in Kenya [15] in 2015 in which 1.6% of BIRADS III lesions were found to be positive for malignancy, and in a study was done in Puerto Rico [11] in 2003 about 4.5% of BIRADS III were diagnosed to be malignant. In a study was done in Austria [17] in 2004 less than 2% of BIRADS III were diagnosed to be malignant.

We can understand that 13% of invasive breast cancer fall in BIRAD-3 by ultrasound screening, which is high compared to results reported in other studies conducted

which was 4.5%, this might reflect many reasons including the quality of the ultrasound machine, skill of the radiologist also local variables can be a factor.

The result with mammography in our study was 14% for breast cancer, which are in the BIRAD-3 category of mammography , while other studies are reported lower rates around 5% of breast cancer in BIRAD-3 by mammography.

Thus we understand that in our locality these non-invasive screening tools downgrade BIRADs and should be more cautious dealt, thus further invasive diagnostic tests can be requested in BIRAD-3 cases to have least false negative results.

5. CONCLUSION

There was statistically significant association between radiological investigations (ultrasound & mammography) and histopathological finding (core needle biopsy).

- Mean age of the study participants were 51 years.
- Most of the participants were female.
- Most of the core biopsy results were positive for malignancy.
- There was a statistically significant association etween ultrasound and histopathological finding (core needle biopsy).
- Statistically significant association was found between mammography and core needle biopsy.

6. RECOMMENDATIONS

1. Encourage use of the standardized BI-RADS lexicon among radiologists involved with breast imaging.
2. Further education of breast physicians and breast surgeons about the BI-RADS assessment categories and the correlation with core needle biopsy.
3. Patients with category BI-RADs III should undergo core needle biopsy because of the high percentage of malignant results were found in our study.

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