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Accuracy of the Radiological Assessment of Tumor-to-Breast Volume Ratio by Sonomammography to Assist Planning of Oncosurgical Procedures in Breast Cancer

FATMA M. AWAD, M.D.*; YASMIN M. GAMIL, M.Sc.*; AHMED M. FARAHAT, M.D.** and AMIRA H. RADWAN, M.D.***

The Department of Radiology, Faculty of Medicine, Cairo University, Departments of Surgery** and Radiology***, National Cancer Institute, Cairo University*

Abstract

Background: Accurate preoperative assessment of tumor size in relation to that of the breast is an important part of clinical cancer staging that helps in treatment planning. Sonomammography offers adequate accuracy in estimating the tumor-to-breast volume ratio and hence helps in guiding the proper surgical decision.

Aim of Study: This study was designed to evaluate the accuracy of the preoperative radiological assessment of tumor size & the tumor-to-breast volume ratio, to guide the appropriate surgical decision.

Patients and Methods: The study was conducted from October 2019 to August 2020. A total of 40 cases diagnosed as having breast cancer using core-needle biopsy after sonomammography were included in the study. On mammography, the maximum tumor dimensions and the breast volume were calculated. On mammography and ultrasound, three measurements of the tumor were obtained, from which the tumor volume was measured. Tumor to breast volume ratio was then calculated. The measurements were compared to the postsurgical pathology reports, which were the gold standard.

Results: A total of 40 patients were included in the study. No significant difference was found when comparing the mean of maximum tumor dimension measured on the final pathology (3.240±0.239) to that measured on preoperative ultrasound (3.057±0.237, p=0.868) and preoperative mammography (3.460±0.282, p=0.814), and on applying Lin's concordance correlation coefficient, both modalities showed strong correlation with the final pathology. On correlating between the Tumor-to-Breast Volume (TTBV) ratio and the type of surgery, it was found that breast-conserving surgery can safely be done up to a ratio of about 10%.

Conclusion: Sonomammography has shown strong reliability in the pre-operative estimation of breast cancer size when compared to the final pathological size. The Tumor-to-Breast Volume Ratio is a very useful tool in surgical planning for treatment of breast cancer.

Correspondence to: Dr. Fatma M. Awad,
The Department of Radiology, Faculty of Medicine,
Cairo University

Key Words: *Breast cancer – Sonomammography – Tumor-to-breast-volume ratio – Oncosurgical procedures.*

Introduction

BREAST cancer is the most frequent cancer in women and the second most common cancer in the world, with around 1.67 million new cases diagnosed in 2012. Diagnostic radiology has the purpose of early diagnosis of breast cancer [1].

In Egypt, the incidence of female breast cancer patients has an estimated rise reaching 45,243 patients in 2050. The crude rate of breast cancer in Egyptian females was calculated (2008-2011) to be 35.8 per 100,000 [3].

Primary prevention of breast cancer should be given the highest priority in the fight against the disease. Early detection must be considered the best second choice for reducing mortality. Breast self-examination, physical examination by the treating physician, ultrasound (US) and mammography (MMG) have been used along with other procedures to detect breast cancer early [4].

Early detection of breast cancer by MMG reduces the risk of breast cancer death and increases treatment options, including less extensive surgery and/or the use of chemotherapy with fewer side effects [2].

One of the key determinants for the line of treatment in breast cancer is the size of the tumor in relation to the breast size [5]. Accurate preoperative assessment of maximum tumor size is an important part of clinical cancer staging that helps in treatment planning and further patient management. Although pathologic staging remains the gold standard, management decisions are frequently made preoperatively on the basis of tumor size on physical examination and on imaging [6]. The most commonly used imaging modalities to measure tumor size are mammography, ultrasonography, and magnetic resonance imaging (MRI) [6].

Aim of work:

This study was designed to evaluate the accuracy of the preoperative radiological assessment of tumor size and the tumor-to-breast volume ratio, to guide the appropriate surgical decision.

Patients and Methods

Study population:

The study was conducted at the National Cancer Institute of Egypt from September 2019 to January 2020. A total of 40 female patients, with age range of 31-70 years (mean 51 ± 10.3 years) have been diagnosed as having breast cancer using a core-needle biopsy after breast imaging studies in the form of bilateral sonomammography (Figs. 7,8). All patients had subsequent surgery, with the surgical pathology specimen having negative margins.

Demographic information, including age, sex, breast density, tumor type and type of surgery done were recorded for each patient. The study was accepted by the faculty of medicine ethical committee. No written consent was needed prior to sonomammography.

Inclusion criteria:

Female patients who had sonomammography showing suspicious breast masses, followed by core needle biopsy, which confirmed breast malignancy.

Exclusion criteria:

- Pregnant females.
- Female patients who received neoadjuvant chemotherapy.
- Patients who had previous breast surgeries.

Imaging and image interpretation:

Imaging analysis was performed under the guidance of two experienced consultants, with 25 and 20 years of experience in breast imaging and interventional procedures.

Mammography:

All mammographic (MMG) examinations were performed with a digital Mammography machine (GE, Massachusetts, USA). It consisted of the standard craniocaudal (CC) and mediolateral oblique (MLO) views. Compression thickness was measured manually by a ruler for all patients in the CC view, to calculate the breast volume. Tumor size was measured in both views, and the maximum tumor dimensions were recorded. Breast volume was calculated through the following equation V=4 / 3 π x W x H x CT (where W = Maximum dimension, H = Height, CT = Compression Thickness) and measurements were obtained as in Fig. (1).

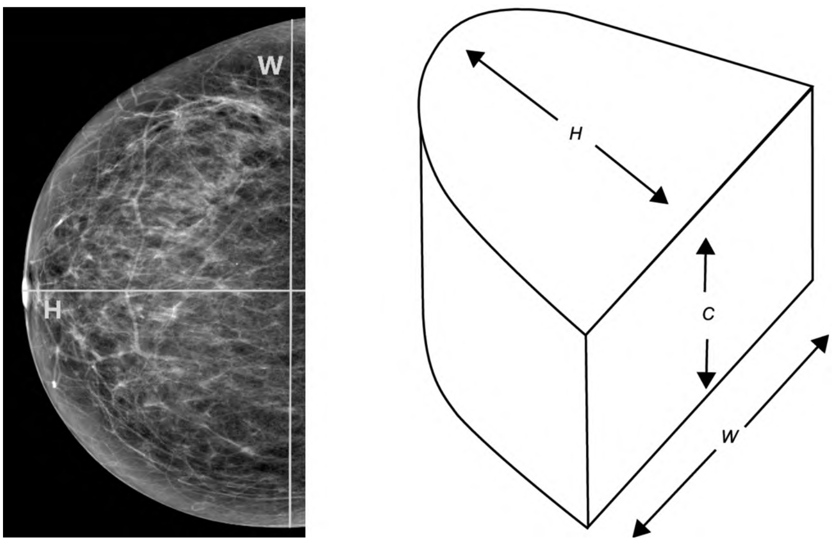

Fig. (1): Mammographic measurement of the breast volume (Kalbhen et al., 1999).

Sonography:

All ultrasound (US) examinations were performed by hand-held technique using a LOGIQ 9 (GE, Massachusetts, USA) or an EPIQ 7 (Philips, Amsterdam, Netherlands) ultrasound machines, equipped with linear transducers of 6-12 MHz. Imaging of the tumors was performed in both longitudinal and transverse planes. Three measurements of the tumors were obtained; longitudinal, transverse, and anteroposterior dimensions and measurements were recorded. From these three measurements, the US machine calculated the tumor volume for each patient and the results were also recorded. Tumor-to-breast volume ratio was then obtained by dividing Tumor volume/Breast volume x 100 to obtain a percentage.

Pathology:

The surgical procedure done for every patient was recorded. Final surgical pathology reports were reviewed to identify the maximum pathologic tumor size (pT size). The type of cancer (in situ or invasive) and the subtype (ductal, lobular, or other) were also recorded, and categorized into 2 groups; IDC, and non-IDC. The pathologic tumor size (pT size) was staged according to the American Joint Committee on Cancer (AJCC) classification system. The eighth edition released on 2017 classifies the T-stage as:

- T 1 (≤20mm).
  - T1mic (≤1mm).
  - T1a (>1mm but ≤5mm).
  - T1b (>5mm but ≤ 10mm).
  - T 1 c (> 1 0mm but ≤20mm).
- T2 (>20mm but ≤50mm).
- T3 (>50mm).
- T4 (any size with direct extension to the chest wall and/or skin, or inflammatory breast cancer).
- In addition to Tis, and Tis (Paget).

Statistical analysis:

Descriptive statistics were calculated as means ± standard error of the mean (SEM) for continuous variables and as numbers and percentages for categorical variables.

Mean tumor size for the imaging methods and the final pathology results were analyzed by using repeated-measures analysis of variance (One-way ANOVA) models, and treated by post-HOC Tukey's honest significant difference testing, to determine specific areas of difference. In addition, these measurements were compared by using Lin's concordance correlation coefficient (CCC) as a measure of reproducibility between the measurement methods and the final pathologic results. Pearson's Chi-square test was used to compare between modalities with respect to their accuracy under certain parameters (i.e., Breast density and type of tumor).

Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 26.0. Released 2019. Armonk, NY: IBM Corp. Lin's CCC was performed using MedCalc® Version 19.1.7 for Windows. MedCalc Software Ltd.

Results whose p-value was equal to or less than 0.05 were considered statistically significant.

Results

This study included 40 patients. Eleven (27.5%) of the patients had dense breasts (ACR C), while the rest (72.5%) had non-dense breasts (ACR A or B).

Table (1): Histopathology and operative data of the patients.

Pathological type:	
IDC	30 (75)
ILC	4 (10)
Mucinous Carcinoma	2 (5)
DCIS	4 (10)
Pathologic T stage:	
pT1c	9 (22.5%)
pT2	28 (70%)
pT3	3 (7.5%)
Type of operation:	
Mastectomy	14 (35)
Breast-Conserving Surgery	26 (65)
Previous Contralateral Mastectomy	2 (5)

According to the final pathology results (Table 1), four patients (10%) had ductal carcinoma in situ, 30 patients (75%) had invasive ductal carcinoma only, two of whom had associated intraductal component, two patients (5%) had mucinous carcinoma and four patients (10%) had invasive lobular carcinoma (ILC). 14 patients (35%) had mastectomy as surgical treatment of breast cancer, while the rest had breast conservative surgery (65%).

Two of the patients had extensive intraductal component detected on frozen section, two had multicentric disease and two had widespread microcalcifications associated with the mass on preoperative MMG.

On analyzing measurements, the difference in the mean tumor maximum dimension measured on US (3.06±0.24cm; p=0.86) and that measured on MMG (3.46±0.28cm, p=0.81) were not statistically significant from that measured in the final pathology specimen (3.24±0.24cm). In addition, the difference in mean tumor maximum dimension measured on both US and MMG was not statistically significant (p=0.5) (Table 2).

Table (2): Mean maximum tumor dimension measured on MMG and US compared to final pathology specimen.

Measurement Method	Mean max. tumor dimension, cm (±SEM)	Difference from final pathology specimen	
		Change in max. dimension, cm	p-value
Final pathology specimen	3.240±0.239		
US	3.057±0.237	–0.183±0.002	0.868
MMG	3.460±0.282	0.220±0.044	0.814

When measured in terms of a ±3mm margin of error, overestimation of the tumor size was encountered 6 cases on US (15%), and 17 cases (42.5%) on MMG (Fig. 2).

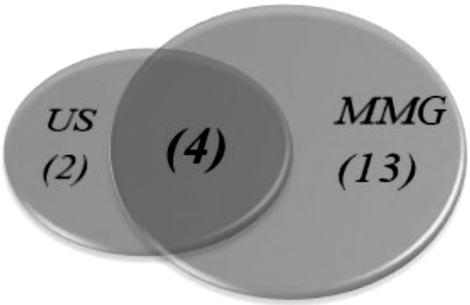

Fig. (2): Elaborative diagram for tumor size overestimation by both modalities.

On the other hand, underestimation was seen in 12 cases on US (30%), and 9 cases on MMG (22%) (Fig. 3).

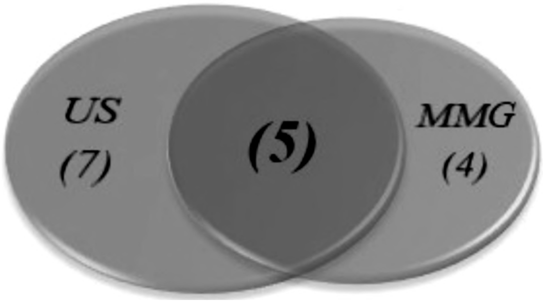

Fig. (3): Elaborative diagram for tumor size underestimation by both modalities.

Both modalities erred on estimation of the tumor size in the same patients 14 times (35%); with 4 instances of overestimation, 5 of underestimation, and 5 of opposing results.

Finally, accurate measurements that were closest to the final pathologic size (±3mm margin of error) were obtained in 22 (55%) cases on US, in 14 (35%) cases on MMG, and both were accurate together in 10 (25%) cases (Table 3).

Table (3): Relationship between imaging modality and estimation of the tumor size. (p=0.036).

	Estimation	
	Over	Under
Modality:		
US:		
Count	6	12
% within Modality	33.3%	66.7%
% within Estimation	26.1 %	57.1%
MMG:		
Count	17	9
% within Modality	65.4%	34.6%
% within Estimation	73.9%	42.9%

Figs. (4,5) illustrate the relationships between the maximum tumor dimension measurements on US, and MMG and the measurement on the final pathology specimen.

On comparison of the measurements obtained with each imaging modality against those obtained on the pathology specimens by applying Lin's CCC, those obtained on US showed strong agreement (CCC, 0.9; 95% confidence interval [CI], 0.84-0.95), whereas those obtained on MMG showed slightly weaker agreement (CCC, 0.87; 95% CI, 0.77-0.92).

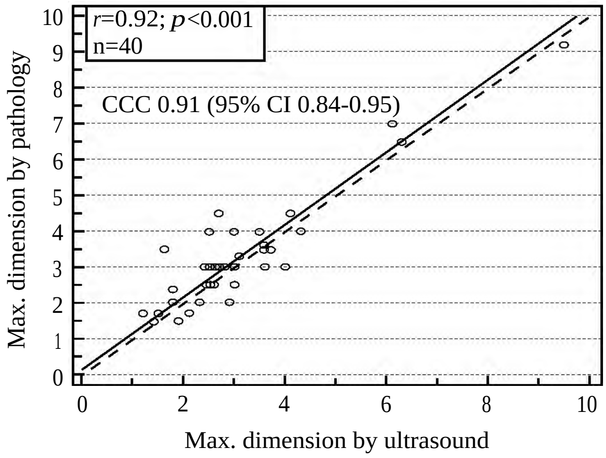

Fig. (4): Lin's CCC between maximum sonographic and pathologic dimensions.

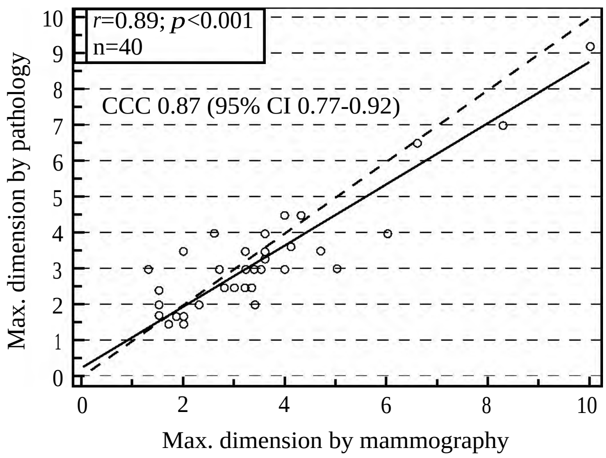

Fig. (5): Lin's CCC between maximum mammographic and pathologic dimensions.

MMG was significantly less accurate than US in measuring the maximum dimension of the tumors in dense breasts (n=11, 27.5%, p=0.03). However, it did not show a significant difference when it came to those with non-dense breasts (n=29, 72.5%); Tables (4,5).

Table (4): Relationship between accuracy and imaging modality in dense breasts (ACR C) (*p*=0.03).

	Accuracy	
	Accurate	Inaccurate
Modality:		
US:		
Count	9	2
% within Modality	81.8%	18.2%
% within Accuracy	69.2%	22.2%
MMG:		
Count	4	7
% within Modality	36.4%	63.6%
% within Accuracy	30.8%	77.8%

Table (5): Relationship between accuracy and imaging modality in non-dense breasts (ACR A, B) (*p*=0.42).

	Accuracy	
	Accurate	Inaccurate
Modality:		
US:		
Count	13	16
% within Modality	44.8%	55.2%
% within Accuracy	56.5%	45.7%
MMG:		
Count	10	19
% within Modality	34.5%	65.5%
% within Accuracy	43.5%	54.3%

The type of tumors, when grouped into IDC (n=30, 75%) and non-IDC (n=10, 25%), did not infer a statistically significant difference on MMG or US measurements of maximum dimension as compared to final pathology specimens (Tables 6,7).

Table (6): Relationship between accuracy and imaging modality in IDC (*p*=0.19).

	Accuracy	
	Accurate	Inaccurate
Modality:		
US:		
Count	16	14
% within Modality	53.3%	46.7%
% within Accuracy	59.3%	42.4%
MMG:		
Count	11	19
% within Modality	36.7%	63.3%
% within Accuracy	40.7%	57.6%

Table (7): Relationship between accuracy and imaging modality in non-IDC (*p*=0.18).

	Accuracy	
	Accurate	Inaccurate
Modality:		
US:		
Count	6	4
% within Modality	60.0%	40.0%
% within Accuracy	66.7%	36.4%
MMG:		
Count	3	7
% within Modality	30.0%	70.0%
% within Accuracy	33.3%	63.6%

Breast cancer is staged according to the AJCC TNM staging system. The performance of each modality was analyzed with respect to accurately identifying the disease stage (Table 8), which showed equal accuracy for both US and MMG in staging. Surgical pathology identified 9 (22.5%) cases of pT1; subclass T1c, 28 (70%) cases of pT2, and 3 (7.5%) cases of pT3. In comparison, over staging was done in 2 (5%) cases on MMG, and 3 (7.5%) cases on US; under staging in 2 (5%) cases on US and 3 (7.5%) on MMG, correct staging in 35 (87.5%) cases each.

Table (8): Accuracy of US and MMG in Determining Tumor Stage.

Imaging Modality	Staging Performance	Staging Accuracy No. (%)
US	Over staged	3 (7.5)
	Correctly staged	35 (87.5)
	Under staged	2 (5)
MMG	Over staged	2 (5)
	Correctly staged	35 (87.5)
	Under staged	3 (7.5)

In the study population, the average breast volume was 1011.4±73.1cc (Range 220-2216cc), with an average tumor volume of 21.2 ±6.2cc (Range 1-223cc). In 33 out of the 40 patients (82.5%), the breast volume was greater than 500cc; Table (9).

Table (9): Descriptive statistics for volume measurements.

	Mean ± SEM	Range (Min-Max)
Tumor Volume	21.21±6.22	222 (1-223)
Breast Volume	1011.39±73.06	1996 (220-2216)
Tumor- to- Breast Volume (TTBV) Ratio (%)	3.11±1.35	53.97 (0.03-54)

Accordingly, with a considerably large mean breast volume of 1011 cc and a mean tumor volume of only 21cc, a consistently low tumor-to-breast volume ratio was obtained, with an average of 3.1%, and a range of 53.9%, as only one patient with a T3 tumor had a ratio of 54%. This resulted in most patients being eligible for BCS, as reflected in our results.

Regarding the type of surgical operation (Table 10), 14 patients (35%) underwent mastectomy for removal of their tumors, and 26 patients (65%) underwent BCS. One patient who underwent mastectomy had it in the form of a skin-sparing mastectomy with immediate reconstruction with a latissimus dorsi (LD) myocutaneous flap (Fig. 6).

Table (10): Descriptive statistics for tumor measurements in relation to type of operation done.

	Range (Min-Max)	Mean
BCS (n=26):		
TTBV	6.97 (0.03-7)	1.42
Max diameter:		
US	2.9 (1.2-4.1)	2.73
MGM	4.7 (1.3-6)	3.12
Mastectomy (n=14):		
TTBV	53.9 (0.1-54)	6.24
Max diameter:		
US	8.1 (1.4-9.5)	3.66
MGM	8.5 (1.5-10)	4.1

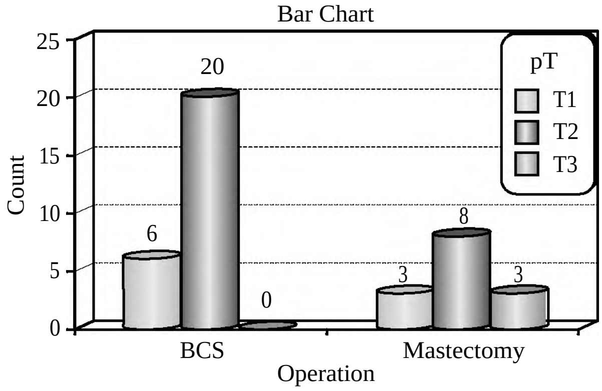

Fig. (6): Bar chart representation of the relationship between type of operation and the tumor stage (pT), p=0.048.

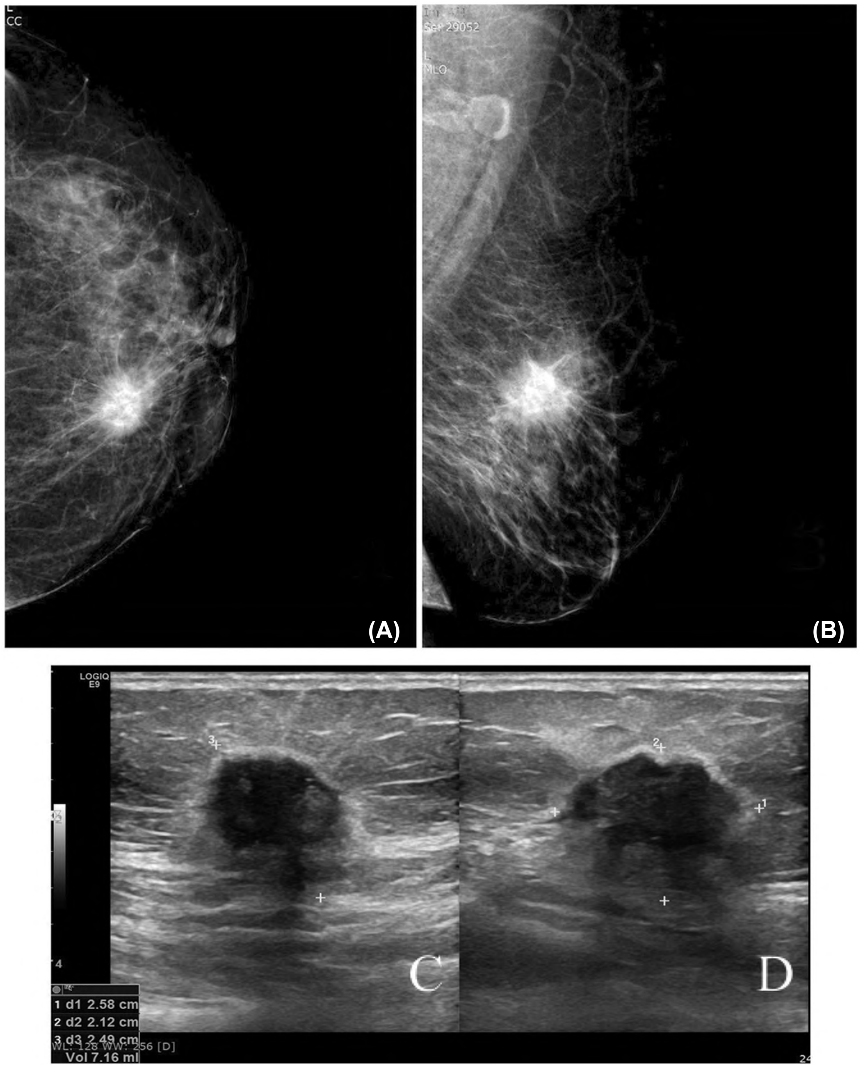

Fig. (7): 56 years old female with left upper inner quadrant (UIQ) breast mass Mammography CC & MLO views (A and B respectively) of the left breast: UIQ dense spiculated mass. US: Longitudinal (C) & transverse (D) views showing left breast 10 o'clock irregular hypoechoic mass.

Tumor Size:
- Tumor size by MMG: 2.6 x 2.8x 3.3 cm.
- Tumor size by US: 2.6 x 2x 2.5 cm
- Post-operative pathological Tumor size: 2x2.5 cm.

Calculated Volumes:
- Tumor Volume: 7 cc.
- Breast Volume: 737 cc.
- Tumor- to -Breast volume Ratio: 1 %

Pathological Diagnosis:
- Invasive duct carcinoma (IDC).

Surgery: Left breast conserving surgery (BCS).

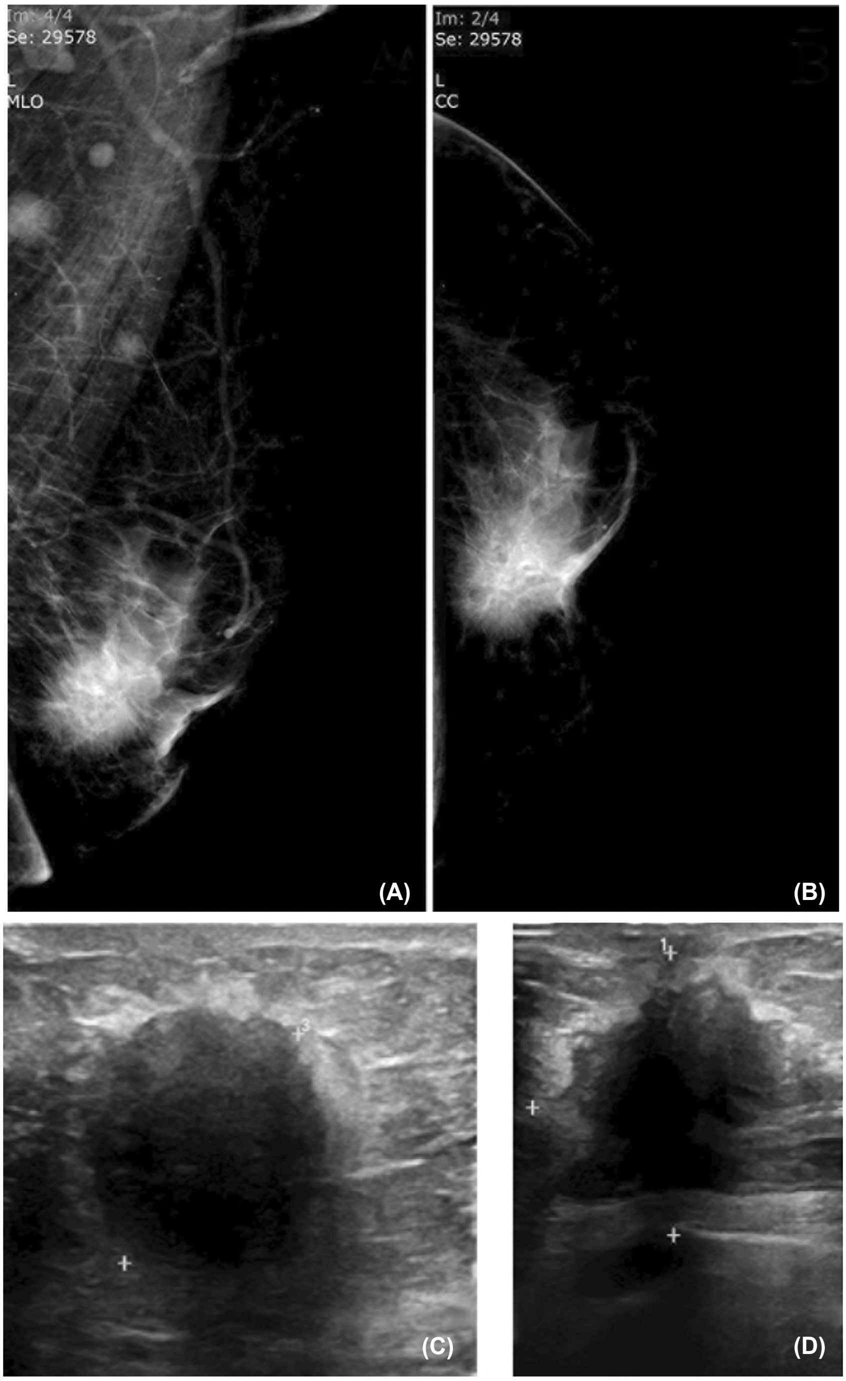

Fig. (8): 60 years old female with left breast mass and nipple retraction. Mammography CC (A) & MLO (B) views of the left breast central retro-areolar irregular spiculated hyperdense mass with overlying nipple retraction. US: Longitudinal (C) & transverse (D) views of the left breast irregular hypo-echoic infiltrative mass.

Tumor Size:
- Tumor size by MMG: 3.4 x 3.6 x 2.7 cm.
- Tumor size by US: 3.5 x 3.3 x 3 cm.
- Post-operative pathological Tumor size: 4 x 3 cm.

Calculated Volumes:
- Tumor Volume: 16.7 cc.
- Breast Volume: 303 cc.
- % Tumor- to -Breast volume Ratio: 5.5

Pathological Diagnosis:
IDC.

Surgery: Left MRM

Discussion

Several studies were done to assess the accuracy of the different imaging modalities of the breast in the preoperative assessment of tumor size, by comparing between the size measured on ultrasonography (US) and mammography (MMG) with the final tumor size obtained on pathologic analysis **[6,8,9,10]**.

In this study, US permitted more accurate tumor size measurement than MMG, showing strong agreement when we applied Lin's CCC (0.9; 95% confidence interval [CI], 0.84-0.95), whereas those obtained on MMG showed slightly weaker agreement (CCC, 0.87; 95% CI, 0.77-0.92 for MMG). This result was similar to those of previous studies **[6,8]** showing stronger correlation between US and pathology than between MMG and pathology **[6,8]**, yet still highlighting considerable reliability of both modalities, as an accurate reflection of the pathological measurement when the lesion is measurable.

According to the National Health Service breast screening program quality assurance, for most of the slides assessed by pathologists, there was over 90% agreement on tumor size within ±3mm. Hence, we measured both modalities in terms of that "accuracy margin", to assume the highest accuracy possible. MMG had a significant tendency to over-estimate the tumor size (p=0.03), which investigators attributed to indistinct tumor boundaries [11], the projection magnification problem on MMG [13] and spiculations that sometimes correspond to desmoplasia in pathology rather than tumor extension [13].

In dense breasts, US was significantly more accurate than MMG (p=0.03). In the Digital Mammographic Imaging Screening Trial, done by Pisano et al. [14], considered using Film-screen mammography (FSM) rather than Digital field mammography (DFM) as the reason behind this. Dense breast parenchyma on MMG can obscure some masses. DFM provides better penetration of the beams than does FSM, allowing for better visibility in dense areas of the breast, and better detection of lesions. In our study, we exclusively used DFM. Many investigators had similar results [6,8]; where US was still better than DFM.

When considering the type of pathology of the tumors, ILC is known for its sinister difficulty to detect at times, both clinically and on imaging. This owes to the fact that it appears as a vague asymmetry, an area of architectural distortion, or -at best- a poorly defined opacity, and is in 33% of cases visualized on MMG [15]. Another study. done by Butler et al. [16], showed that US was able to detect 71 (out of 81, 87.7%) cases of ILC, that were subtle or occult on MMG. In our study, however, we could not perform such a comparison due to the very small number of cases of ILC (4 cases, 10%). Another factor that could have made a difference is that this study focused on patients that presented with measurable "masses", as opposed to the common presentation of ILC, which may have contributed to the limited representation of ILC in our study population, in addition to the natural higher incidence of IDC.

Previous surgical studies have looked at the effect of tumor resection on the aesthetic look of the breast and devised new ways of tumor resection other than conventional BCS and mastectomy to maximize volume resection while minimizing breast deformity, in what is now known as oncoplastic surgery of the breast. Clough et al. [5] concluded that up to 20% of the breast volume can be resected with minimal deformity, using oncoplastic surgery OPS I, and that from 20%-50% of the breast volume can be removed using OPS II to maintain the natural breast look, albeit reducing its volume. Another study [11] predicted poor cosmesis with an excision volume >12%.

In our study, the mean breast volume was 1011.4±73.1cc. The TTBV range was 0.03 to 54%, with only one patient with a T3 tumor having a ratio of 54%. In those patients who had BCS, the TTBV ratio never exceeded 10% (range 0.03-7%, with a mean of 1.42%). This was due to both a high breast volume (mean=1123.63cc) and a small tumor volume (mean=14.47cc).

On the other hand, 14 patients (35%) in our study had mastectomy done as their surgical management. Of those, 11 patients had special considerations. The first one had skin-sparing mastectomy with immediate reconstruction with an LD flap. She had a tumor volume of 45cc, a small breast volume of 220cc, and a TTBV ratio of 20.5%. With such a ratio, achieving an acceptable cosmetic outcome proves very difficult [5,17,18], and level II OPS has to be employed which would result in marked breast volume reduction.

The rest of the 10 patients had TTBV ratios less than 10% but still had mastectomies because: Two had extensive intraductal component detected on frozen section and a negative surgical margin was not attainable, two had multicentric disease, two had widespread microcalcifications associated with the mass on preoperative MMG and two had history of previous contralateral mastectomy and it was the patients' preferences to do mastectomy, planning for delayed bilateral breast reconstruction, another patient had a retro-areolar tumor with ductal extension, and one patient desired mastectomy.

The remaining three patients who had mastectomy all had pT3 tumors, with a TTBV ratio of 54%, 8%, and 5%, respectively. These results give the notion that most of the time, the clinical T stage drives the surgeon's decision for surgical management, rather than the TTBV ratio.

Still, even when those patients who had mastectomy for special considerations were included, when studying the effect of T staging on the surgical decision for the type of operation, T3 stage was exclusively managed by mastectomy, most T2 and T1 were treated with BCS (with 20 cases (71.4%), and 6 cases (66.7%), respectively, p=0.048).

Our study included a small number of patients, but we observed that in general, MMG and US provided a considerably accurate estimation of tumor size. These results have to be interpreted with care, as we need more prospective studies with larger series, while also including other ways of preoperative tumor assessment, e.g. 3D tomosynthesis.

Conclusion:

- Both mammography and ultrasound have shown strong reliability in the pre-operative estimation of breast cancer size when compared to the final pathologic specimen and should be regarded as complementary tests in order to plan the best treatment for the patient.
- The Tumor-to-Breast Volume Ratio is a very useful tool in surgical planning of breast cancer.

Declarations:

The current study had been approved by Cairo University, Faculty of Medicine, Research and Ethical Committee with Ethical Committee approval number MS-66-2019 and approval date 28/9/2019.

References

1- DE BENEDETTO D., ABDULCADIR D., GIANNOTTI E., et al.: Radiological Anatomy of the Breast. Italian Journal of Anatomy and Embryology, 121 (1): 20-36, 2016.

2- Breast Cancer Facts & Figures | American Cancer Society [Internet]. Cancer.org . 2020 [cited 6 March 2020]. Available from: https://www.cancer.org/research/cancer-facts-statistics/breast-cancer-facts-figures.html.

3- IBRAHIM A., KHALED H., MIKHAIL N., et al.: Cancer Incidence in Egypt: Results of the National Population-Based Cancer Registry Program. Journal of Cancer Epidemiology, 1-18, 2014.

4- SEIF N. and AZIZ M.: Effect of Breast Self-examination Training Program on Knowledge, Attitude and Practice of a Group of Working Women. Journal of the Egyptian National Cancer Institute, 12 (2): 105-115, 2000.

5- CLOUGH K., KAUFMAN G., NOS C., et al.: Improving Breast Cancer Surgery: A Classification and Quadrant per Quadrant Atlas for Oncoplastic Surgery. Annals of Surgical Oncology, 17 (5): 1375-1391, 2010.

6- LEDDY R., IRSHAD A., METCALFE A., et al.: Comparative Accuracy of Preoperative Tumor Size Assessment on Mammography, Sonography and MRI: Is the Accuracy Affected by Breast Density or Cancer Subtype? Journal of Clinical Ultrasound, 44 (1): 17-25, 2015.

7- KALBHEN C., MCGILL J.J., FENDLEY P.M., et al.: Mammographic Determination of Breast Volume: Comparing Different Methods. Am. J. Roentgenol., 173: 1643-1649, 1999.

8- WALKER R.: World Health Organization Classification of Tumors. Pathology and Genetics of Tumors of the Breast and Female Genital Organs. Histopathology, 46 (2): 229-229, 2005.

9- COTRAN R., KUMAR V. and ROBBINS S.: Pathologic Basis of Disease. Philadelphia, PA: Saunders Elsevier, 2015.

10- MAKKI J.: Diversity of Breast Carcinoma: Histological Subtypes and Clinical Relevance. Clinical Medicine Insights: Pathology, 8: C Path. S 31563, 2015.

11- ARMES J. and VENTER D.: The Pathology of Inherited Breast Cancer. Pathology, 34 (4): 309-314, 2002.

12- ISMAIL-KHAN R. and BUI M.: A Review of Triple-Negative Breast Cancer. Cancer Control., 17 (3): 173-176, 2010.

13- PRAT A., ADAMO B., CHEANG M., et al.: Molecular Characterization of Basal-Like and Non-Basal-Like Triple-Negative Breast Cancer. The Oncologist, 18 (2): 123-133, 2013.

14- NGUYEN P., TAGHIAN A., KATZ M., et al.: Breast Cancer Subtype Approximated by Estrogen Receptor, Progesterone Receptor, and HER-2 Is Associated With Local and Distant Recurrence After Breast-Conserving Therapy. Journal of Clinical Oncology, 26 (14): 2373-2378, 2008.

15- GRUBER I., RUECKERT M., KAGAN K., et al.: Measurement of Tumor Size with Mammography, Sonography and Magnetic Resonance Imaging as Compared to Histological Tumor Size in Primary Breast Cancer. BMC Cancer, 13 (1), 2013.

16- HIEKEN T., HARRISON J., HERREROS J., et al.: Correlating Sonography, Mammography, and Pathology in the Assessment of Breast Cancer Size. The American Journal of Surgery, 182 (4): 351-354, 2001.

17- LEHMAN C., GATSONIS C., KUHL C., et al.: MRI Evaluation of the Contralateral Breast in Women with Recently Diagnosed Breast Cancer. Obstetrical & Gynecological Survey, 62 (7): 456-458, 2007.

18- VERMA R., MATHUR R., RAIKWAR R., et al.: Comparison Of Clinical Assessment, Mammography and Ultrasound In Pre-Operative Estimation Of Primary Breast-Cancer Size: A Practical Approach. The Internet Journal of Surgery, 16 (2), 2008.

دقة الفحص الاشعاعى والموجات فوق الصوتية للثدى فى تقييم نسبة حجم الورم إلى حجم الثدى للمساعدة فى إدارة عمليات سرطان الثدى

الخلفية : يعد التقييم الدقيق قبل الجراحة لحجم الورم بالنسبة إلى حجم الثدى جزءاً مهماً من التشخيص يساعد فى تخطيط العلاج. يظهر التصوير الشعاعى للثدى والموجات فوق الصوتية دقة كافية فى تقدير نسبة حجم الورم إلى حجم الثدى، وبالتالى يساعد فى توجيه القرار الجراحى المناسب.

المرضى والطرق : أجريت الدراسة فى الفترة من أكتوبر ٢٠١٩ إلى أغسطس ٢٠٢٠. تم تضمين ٤٠ حالة تم تشخيص إصابتها بسرطان الثدى باستخدام الخزعة بعد التصوير الشعاعى للثدى والموجات فوق الصوتية. تم حساب أبعاد الورم وحجم الثدى عن طريق ثلاثة قياسات للورم. تم من خلالها قياس حجم الورم، ثم تم حساب نسبة الورم إلى حجم الثدى. تمت مقارنة القياسات مع تقارير ما بعد الجراحة، والتى كانت المعيار الذهبى.

النتائج : تم تضمين ٤٠ مريضة فى الدراسة لم يتم العثور على فرق كبير عند مقارنة متوسط البعد الأقصى للورم (٢٤٠±٠.٢٣٩) بعد الجراحة، بالموجات فوق الصوتية قبل الجراحة (٣٠.٠٥٧±٠.٢٣٧، ع=٠.٨٦٨) والتصوير الشعاعى للثدى قبل الجراحة (٣.٤٦٠±٠.٢٨٢، ع=٠.٨١٤)، وعند تطبيق معامل ارتباط التوافق الخاص بـ Lin، أظهر كلا الطريقتين ارتباطاً وثيقاً مع الحجم الحقيقى للورم. عند الارتباط بين نسبة الورم إلى حجم الثدى (TTBV) ونوع الجراحة، وجد أن جراحة المحافظة على الثدى يمكن إجراؤها بأمان عند ما تكون النسبة حوالى ١٠٪.

الاستنتاج : أظهر التصوير الشعاعى للثدى والموجات فوق الصوتية موثو قية قوية فى التقدير قبل الجراحة لحجم سرطان الثدى. تعد نسبة حجم الورم إلى الثدى أداة مفيدة جداً فى التخطيط الجراحى لعلاج السرطان.