Sarcouncil Journal of Biomedical Sciences

ISSN (Online): 2945-3666

Volume- 02| Issue- 03| 2023

Research Article **Received:** 01-03-2023 | **Accepted:** 20-04-2023 | **Published:** 22-05-2023

Evaluation of Outcomes Shear Wave Elastography of Iraqi Women to Solid Breast Lesions

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Abstract: **Background:** Breast lesions have the potential to be assessed and characterised using elastography, an imaging technique that assesses the elastic characteristics or hardness of tissues. As external pressure is applied, elastography records minute tissue displacements. **Objective:** This paper aims to Evaluate of outcomes shear wave elastography of Iraqi women to solid breast lesions. **Patient and method:** A descriptive study was conducted on breast patients over the age of 20 years for Iraqi women. This research paper contributed to a evaluate of outcomes of shear wave elastography of Iraqi women to solid breast lesions. This study showed the distribution of patients in Baghdad-Iraq, from the 13th of June 2021 to the 23rd of March 2022. Collected data has conducted using the SPSS program. **Results and discussion:** The elasticity (stiffness) of aberrant tumours is compared to normal tissues. Breast cancer tissue tends to be more fragile than normal breast tissue. Shear waves are mechanical waves that move extremely quickly through tissue. ROC curve showing the diagnostic performance of shear wave elastography for the subset of lesions and the degree of sensitivity and selectivity of elastography for differentiating among malignant and benign tumors at various cut-off settings where it shown the raise of sensitivity's degree to the patients and as well as ROC shown the accuracy of shear wave performance. Our study found that the raise of malignant patients in comparison with benign patients were found 103.74 mean and 37.22 SD for elasticity as well as raise of malignant patients in comparison with benign patients were found to be 16.62 mean and 11.22 SD for Stiff ratio by final HPE evaluation. **Conclusion:** To conclude, our study found that most women have been injured within above 30 years, where it can be struggle them with symptoms which it got injured with women above 30 years. Also, our paper has found that most of the Malignant and Benign were distributed in 30 years patients, which Ductal carcinoma in situ, Intraductal papilloma, and Invasive lobular Carcinoma being the most impacted and injured to the women. Furthermore, our study noticed that Malignant lesions was the most impacted on the women throughout the evaluation of stiff ratio and elasticity for breast patients.

Keywords: Breast lesions; Malignant; Benign; HPE; and solid breast lesions symptoms, causes.

INTRODUCTION

Breast lesions have the potential to be assessed and characterised using elastography, an imaging technique that assesses the elastic characteristics or hardness of tissues [Itoh, A. *et al*., 2006; Sigrist, R.M. *et al*., 2017]. As external pressure is applied, elastography records minute tissue displacements. Malignant lesions, which are frequently more rigid in consistency, typically exhibit lower displacement than benign lesions or normal tissue because displacement is inversely proportional to tissue stiffness. Shear wave elastography and strain elastography are the two primary quantitative and qualitative techniques for assessing tissue elasticity. [Bamber, J. *et al*., 2013; Ricci, P. *et al*., 2014]

A color-coded strain map that shows various tissue displacement patterns (also known as electrographic patterns) is provided by qualitative electrography [Barr, R.G. *et al*., 2019]. The spatial interpretation of electrographic results is made easier by the overlay of this map on B-mode grayscale ultrasound pictures. The primary drawbacks of qualitative electrography are its operator dependence (subjective interpretation of the color map), significant inter- and interobserver variability, and a protracted learning curve (a training time of three to six months is often needed to provide consistent findings). [Barr, R.G. *et al*., 2015; Suvannarerg, V. *et al*., 2019]

Shear wave elastography (SWE) were introduced to the market to get over these restrictions [Athanasiou, A. *et al*., 2010]. This technique assesses the rigidity of a lesion by recording and examining propagating shear waves, which are used to cause mechanical vibrations [Tozaki, M. *et al*., 2011]. The level of hardness of the assessed tissue has a direct impact on how quickly shear waves propagate. Kilopascals (kPa) or meters per second (m/s) are units of measurement for tissue elasticity [Chang, J.M. *et al*., 2011; Evans, A. *et al*., 2010], with ranges of 0 to 180 kPa (greater quantitative elastography readings were linked to a

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DOI- https://doi.org/10.5281/zenodo.7958267

higher risk of malignancy). Quantitative elastography, notably BIRADS 3 and 4-A, has demonstrated encouraging findings in several sectors and may be useful in the early characterisation of breast lesions [Berg, W.A. *et al*., 2012; Lee, S.H. *et al*., 2014]. This paper aims to Evaluate of outcomes shear wave elastography of Iraqi women to solid breast lesions.

PATIENTS AND METHODS

A descriptive study was conducted on breast patients over the age of 20 years for Iraqi women. This research paper contributed to a evaluate of outcomes of shear wave elastography of Iraqi women to solid breast lesions. This study showed the distribution of patients in Baghdad-Iraq, from the 13th of June 2021 to the 23rd of March 2022. Collected data has conducted using the SPSS program.

This study Distributing of solid breast lesions patients by main parameters mean, mode, median, Std. Deviation, Skewness, Std. Error of Skewness, Minimum, and Maximum, where all these details can be seen in **Table 1**.

To follow that, this paper was identified the symptoms of crosstabulation of solid breast lesions in patients between ages, and symptoms where included Breast changes that are similar to both breasts, Change in the size of the breast nodule, General pain in the breast, Green or dark brown, non-bloody discharge from the nipple, Monthly increase in pain in the breast, and the appearance of lumps in the breast which all these parameters can be clarify in **Table 2**.

this paper was identified the causes of crosstabulation of solid breast lesions in patients between ages, and causes, where have to contain enlarged breast lobules (sclerosing), Scar-like fibrous growths of tissue (fibrosis), and Swelling (enlargement) of the cells lining the milk ducts and this information, can be shown in **Table 3**.

This study was extended to Distribute of Malignant and Benign by final HPE and could include Ductal carcinoma in situ, Fibroadenoma, Intraductal papilloma, Intramammary lymph node, Invasive ductal, Carcinoma, Invasive lobular Carcinoma, and Mastitis. These details have seen in **Table 4**.

In comparison with previous studies, this paper had differentiating benign from malignant tumors as well as depicts the diagnostic effectiveness of shear wave elastography by ROC curve by ROC curve, and these details can be seen in **Figure 1** and **Figure 2**.

This data is also established with the distribution of patients by basics using, which are stiff ratio and elasticity, which can be presented in **Figure 3** and **Figure 4.**

Finally, this paper was examined the crosstabulation of solid breast lesions in patients between age and HPE where represent within Ductal carcinoma in situ, Fibroadenoma, Intraductal papilloma, Intramammary lymph node, Invasive ductal Carcinoma, Invasive lobular Carcinoma, Mastitis, and Mucinous adenocarcinoma and these results have found in **Table 5**.

RESULTS

Table 1: Distribution of solid breast lesions patients

Statistics		
Age		
N	Valid	40
	Missing	0
Mean		37.9250
Median		38.0000
Mode		38.00[a]
Std. Deviation		9.15784
Skewness		.293
Std. Error of Skewness		.374
Minimum		25.00
Maximum		55.00
Sum		1517.00

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Table 2: Crosstabulation of solid breast lesions patients between age and symptoms

Age * symptoms Crosstabulation								
Count								
		symptoms						Total
		Breast changes that are similar to both breasts	Change in the size of the breast nodule	General pain in the breast	Green or dark brown, non-bloody discharge from the nipple	Monthly increase in pain in the breast	The appearance of lumps in the breast	
Age	25.00	1	0	0	5	0	0	6
	28.00	4	0	0	0	0	0	4
	33.00	3	2	0	0	0	0	5
	38.00	0	8	0	0	0	1	9
	42.00	0	0	0	0	4	5	9
	50.00	0	0	0	0	3	0	3
	55.00	0	0	4	0	0	0	4
Total		8	10	4	5	7	6	40

Table 3: Crosstabulation of solid breast lesions patients between age and causes

Age * causes Crosstabulation					
Count					
		causes			Total
		enlarged breast lobules (sclerosing)	Scar-like fibrous growths of tissue (fibrosis)	Swelling (enlargement) of the cells lining the milk ducts	
Age	25.00	0	0	6	6
	28.00	0	0	4	4
	33.00	0	0	5	5
	38.00	0	3	6	9
	42.00	4	5	0	9
	50.00	3	0	0	3
	55.00	4	0	0	4
Total		11	8	21	40

Table 4: Distribution of Malignant and Benign by final HPE

HPE					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Ductal carcinoma in situ	10	25.0	25.0	25.0
	Fibroadenoma	3	7.5	7.5	32.5
	Intraductal papilloma	7	17.5	17.5	50.0
	Intramammary lymph node	4	10.0	10.0	60.0
	Invasive ductal Carcinoma	3	7.5	7.5	67.5
	Invasive lobular Carcinoma	6	15.0	15.0	82.5
	Mastitis	2	5.0	5.0	87.5
	Mucinous adenocarcinoma	5	12.5	12.5	100.0
	Total	40	100.0	100.0	

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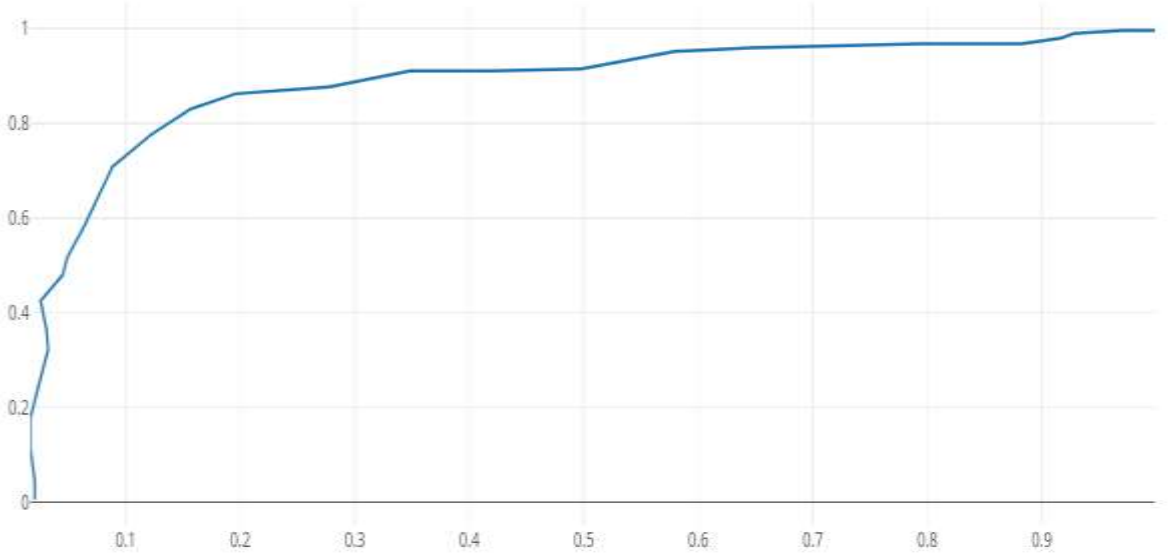

Figure 1: Differentiating benign from malignant tumors by ROC curve

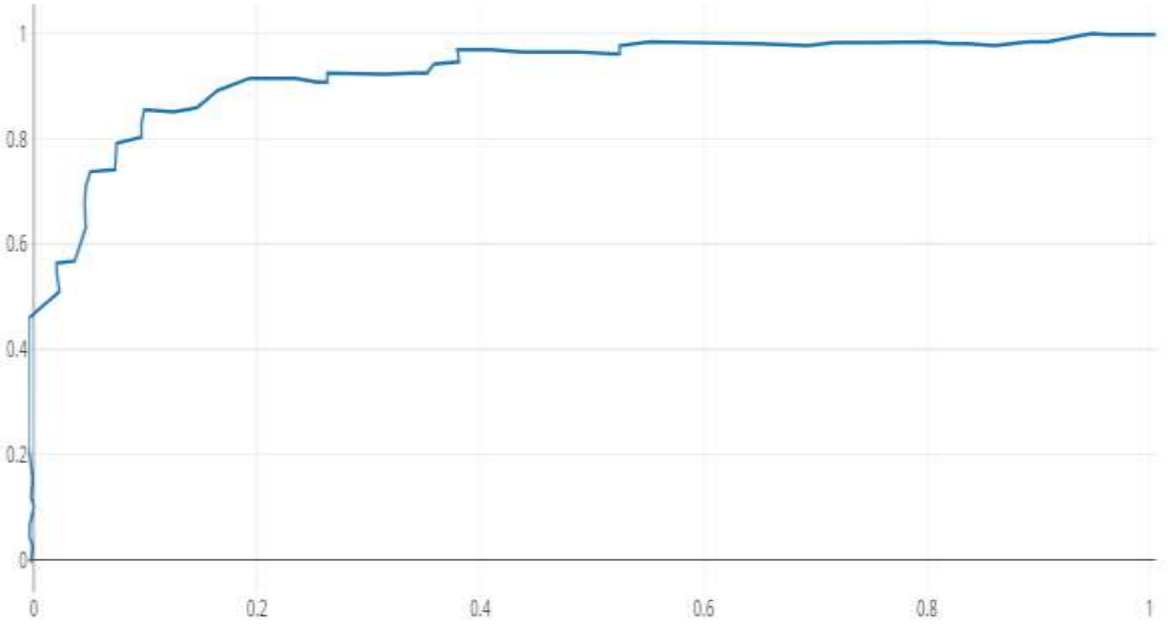

Figure 2: Depicts the diagnostic effectiveness of shear wave elastography by ROC curve

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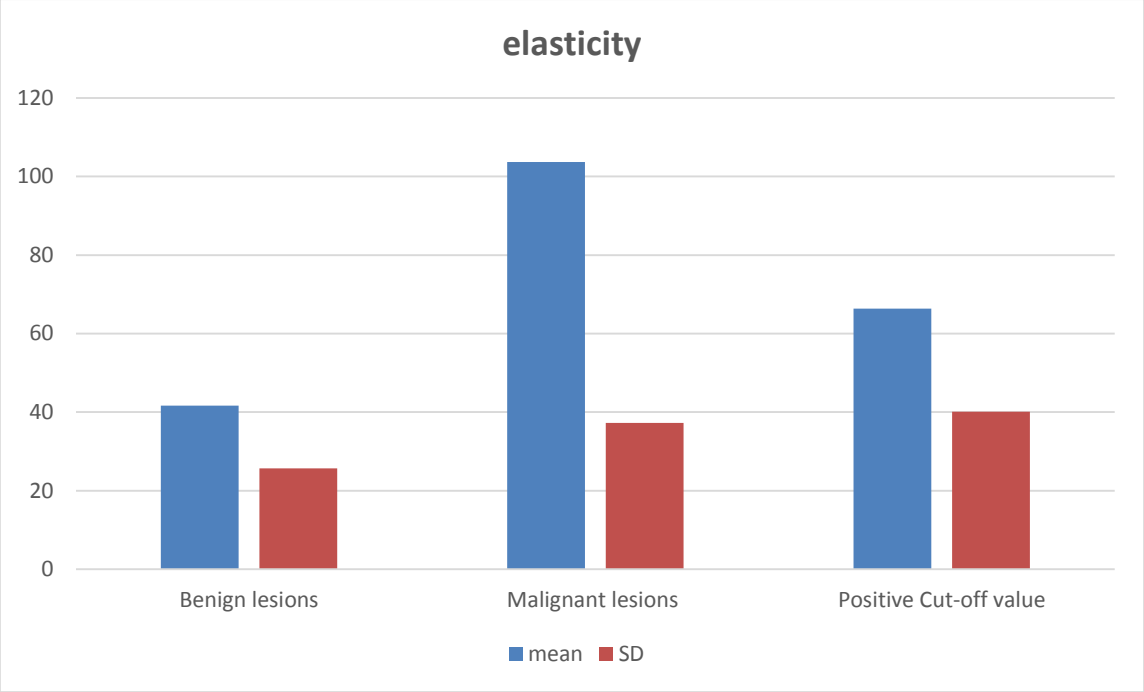

Figure 3: Distribution of elasticity for breast patients

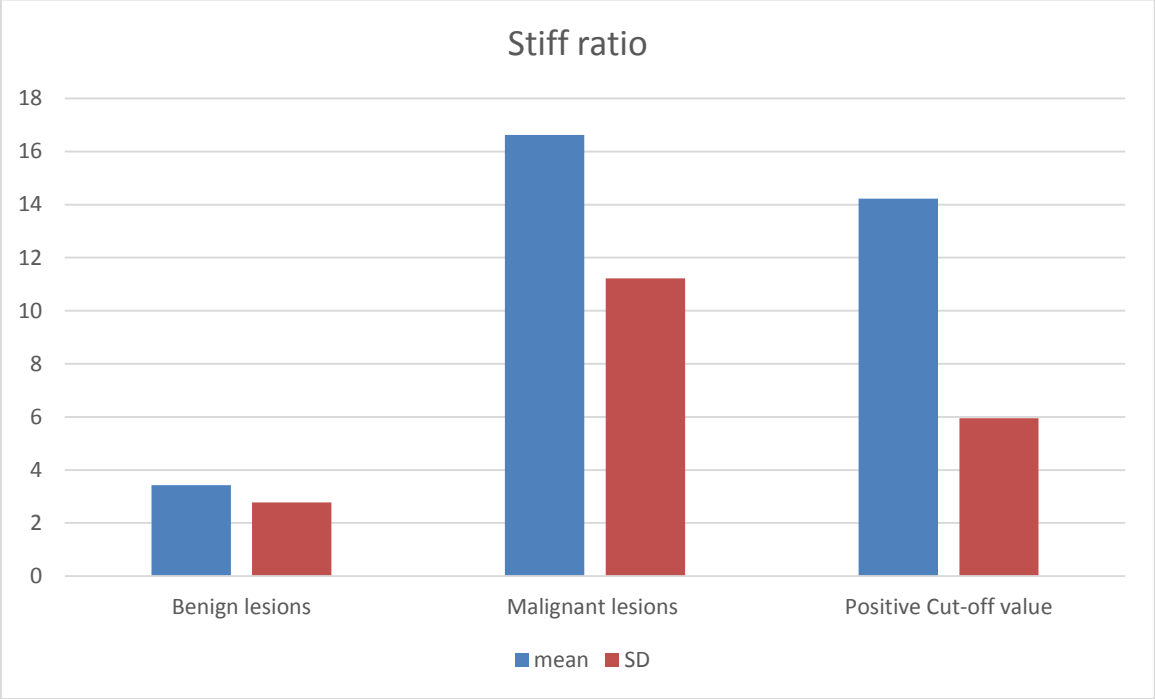

Figure 4: Distribution of stiff ratio for breast patients

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Table 5: Crosstabulation of solid breast lesions patients between age and HPE

Age * HPE Crosstabulation										
Count										
		HPE								Total
		Ductal carcinoma in situ	Fibroadenoma	Intraductal papilloma	Intramammary lymph node	Invasive ductal Carcinoma	Invasive lobular Carcinoma	Mastitis	Mucinous adenocarcinoma	
Age	25.00	0	1	0	0	0	0	0	5	6
	28.00	1	2	0	1	0	0	0	0	4
	33.00	1	0	1	3	0	0	0	0	5
	38.00	4	0	2	0	0	1	2	0	9
	42.00	2	0	2	0	0	5	0	0	9
	50.00	2	0	0	0	1	0	0	0	3
	55.00	0	0	2	0	2	0	0	0	4
Total		10	3	7	4	3	6	2	5	40

DISCUSSION

The elasticity (stiffness) of aberrant tumours is compared to normal tissues. Breast cancer tissue tends to be more fragile than normal breast tissue. Shear waves are mechanical waves that move extremely quickly through tissue [Au, F.W.F. *et al*., 2014]. The direction of the waves is influenced by the surrounding tissue's stiffness. Young's modulus, on which the shear wave technique is based, may be used to assess the differences in characteristics across various biological tissues and, in addition, to quantitatively show tissue stiffness. The tissue probing that occurs during a clinical examination is congruent with this stiffness simulation. Our study proved that almost of Malignant and Benign occurs within women above 30 years. [Evans, A. *et al*., 2012; Erdoğan, H. *et al*., 2020]

ROC curve showing the diagnostic performance of shear wave elastography for the subset of lesions and the degree of sensitivity and selectivity of elastography for differentiating among malignant and benign tumors at various cut-off settings where it shown the raise of sensitivity's degree to the patients and as well as ROC shown the accuracy of shear wave performance. [Kara, T. *et al*., 2020]

Our study found that the raise of malignant patients in comparison with benign patients were found 103.74 mean and 37.22 SD for elasticity as well as raise of malignant patients in comparison with benign patients were found to be 16.62 mean and 11.22 SD for Stiff ratio by final HPE evaluation.

It has been demonstrated that the EM features of solid breast tumors can aid in identifying benign from malignant solid breast cancer [Paternostro, R. *et al*., 2019]. When compared to regular rubber, shear wave elastography looks to be somewhat repeatable and offers quantifiable data. The average stiffness within a region of interest (ROI), which seems to be determined by the stiffer area of the recorded picture, appears to be the most significant characteristic of the shear wave. When the average body stiffness is more than 67 kPa, malignancy is almost certainly present. [Ozgokce, M. *et al*., 2019; Gheonea, I.A. *et al*., 2011]

CONCLUSION

To conclude, our study found that most women have been injured within above 30 years, where it can be struggle them with symptoms which it got injured with women above 30 years. Also, our paper has found that most of the Malignant and Benign were distributed in 30 years patients, which Ductal carcinoma in situ, Intraductal

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papilloma, and Invasive lobular Carcinoma being the most impacted and injured to the women. Furthermore, our study noticed that Malignant lesions was the most impacted on the women throughout the evaluation of stiff ratio and elasticity for breast patients.

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Source of support: Nil; **Conflict of interest:** Nil.

Cite this article as:

Al-dujaili, M.A.A., Omar, A.F., Darb, A.A. and Abdulkafi, A.Q. "Evaluation of Outcomes Shear Wave Elastography of Iraqi Women to Solid Breast Lesions." *Sarcouncil Journal of Biomedical Sciences* 2.3 (2023): pp 8-15.

Publisher: SARC Publisher