"ROLE OF COLOUR DOPPLER IMAGING IN DIFFERENTIATING BENIGN AND MALIGNANT BREAST MASSES": A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY"

By

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Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"ROLE OF COLOUR DOPPLER IMAGING IN DIFFERENTIATING BENIGN AND MALIGNANT BREAST MASSES" : A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY,** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Smita Sonoli)
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ABSTRACT

TITLE:

"ROLE OF COLOUR DOPPLER IMAGING IN DIFFERENTIATING BENIGN AND MALIGNANT BREAST MASSES": A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY."

BACKGROUND & OBJECTIVES:

Breast cancer is the most common cancer diagnosed among women. It accounts for almost 23% of all cancer cases and 14% of cancer deaths globally.[2] It is also the root cause of cancer deaths among women. Early diagnosis and treatment of breast cancer will greatly improve the survival rates in women. Mammography acts as a good primary screening tool but it is less sensitive while detecting lesions in dense breasts as in young women. Hence, ultrasonography has emerged as a good tool for identifying breast masses in young women, pregnant and lactating mothers. USG of the breast can also be indicated when the mammography results are inconclusive. Breast tumour growth mandates the formation of abnormal new blood vessels within and around the tumour by a process known as angiogenesis. Colour Doppler ultrasonography will be helpful in detecting the characteristic flow in these abnormal blood vessels and thus helpful to differentiate between benign and malignant breast masses.

MATERIALS & METHODS:

This is a hospital based prospective observational study, conducted from 1st January 2021 to 31st December 2021 for a period of 1 year in female patients referred to Radiology department of KLEs Dr. Prabhakar Kore Hospital for ultrasonography of breast.

A total of 40 patients referred to Radiology department for evaluation of breast masses with USG were included of all age groups. After obtaining informed consent, patients were subjected to USG of breast on GE VOLUSON 7 or GE VOLUSON 8 machine equipped with a 7.5 – 12 MHz high frequency linear array transducer.

The findings of B-Mode and color Doppler ultrasound were assessed, analyzed and later followed up with their histopathological / FNAC results.

Data was analyzed using IBM SPSS Version 22 for Windows.

Descriptive analysis was carried out for all the quantitative data.

Data was represented using appropriate diagrams.

RESULTS:

The mean age (53 years) was significantly higher in the malignant group than in the benign ones (34 years). Malignant lesions were more irregular shaped, ill-defined compared to the oval shaped and smooth margins of the benign ones. 85% of the malignant lesions were heteroechoic predominantly hypoechoic while 95% of the benign ones were hypoechoic. 90% of the benign lesions showed the absence of calcifications within the lesion. In the malignant group, the mean value of PI - 1.59, RI – 0.78 and PSV – 13.9 cm/sec while for the benign group, the mean value of PI – 0.86, RI – 0.60 and PSV – 10.6 cm/sec. Almost 75% of the benign lesions showed peripheral vascularity on color Doppler study and 25% showed both central and peripheral vascularity; while 50% of the malignant lesions had peripheral and other 50% with central & peripheral vascularity as well.60% of the malignant lesions had penetrating vessels while 85% of the benign ones lacked the presence of penetrating vessels on color Doppler study. On the basis of shape of signals on color Doppler study, 45% of the malignant lesions had branching type while 55% of the benign ones

had single dot like. On histopathological correlation, 65% of the malignant lesions came to be invasive ductal carcinoma and almost 50% of the benign lesions came to be fibroadenoma.

CONCLUSION:

In conclusion, CDUS is a very meaningful tool to depict malignant tumors in the breast. Hypervascularity of the breast mass is an important sign to predict the malignant character of the breast lesion. The Doppler parameters like PI, RI and PSV are useful parameters which help to differentiate between the malignant and benign breast masses. Age is an important parameter to distinguish between the two groups. Malignant lesions usually occurred in the women of higher age group. Malignant tumors are more of irregular shaped than the benign ones which is more of oval shaped. Benign lesions have more well-defined margins rather than irregular, lobulated margins of the malignant lesion. Most of the benign lesions showed the absence of calcifications and penetrating vessels within the lesion. Malignant masses show branching type of color Doppler signals while single dot like type predominated in the benign category.

KEYWORDS:

Vascularity, resistive index (RI), pulsatility index (PI), peak systolic velocity (PSV).

LIST OF ABBREVIATIONS:

PI	–	Pulsatility index
RI	–	Resistive index
PSV	–	Peak systolic velocity
CD	–	Color Doppler
CDS	–	Color Doppler signals
CDUS	–	Color Doppler ultrasound
USG	–	Ultrasonography
TDLU	–	Terminal ducto-lobular unit
ID	–	ILL-DEFINED
LO	–	LOBULATED
SP	–	SPICULATED
WD	–	WELL-DEFINED
IRR	–	IRREGULAR
HE	–	HETEROECHOIC PREDOMINANTLY HYPOECHOIC
HYPO	–	HYPOECHOIC
HYPER	–	HYPERECHOIC
CP	–	CENTRAL & PERIPHERAL
P	–	PERIPHERAL

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INTRODUCTION

The most commonly diagnosed cancer among women is breast cancer. It accounts for almost 23% of all cancer cases and 14% of cancer deaths globally.[2] It is also the root cause of cancer deaths among women. Early diagnosis and treatment of breast cancer will greatly improve the survival rates in women. Mammography acts as a good primary screening tool but it is less sensitive while detecting lesions in dense breasts as in young women. Hence, ultrasonography has emerged as a good tool for identifying breast masses in young women, pregnant and lactating mothers. USG of the breast can also be indicated when the mammography results are inconclusive. Breast tumour growth mandates the formation of abnormal new blood vessels within and around the tumour by a process known as angiogenesis. Color Doppler ultrasonography will be helpful in detecting the characteristic flow in these abnormal blood vessels and thus helpful to differentiate between benign and malignant breast masses.

AIMS AND OBJECTIVES

1. To compare the mean value of vascular resistance index between benign and malignant breast masses.

2. To study the location, penetrating vessels and shape of vascular signals in breast masses.

3. To compare the various Doppler indices to differentiate between benign and malignant breast masses.

REVIEW OF LITERATURE

HISTORICAL BACKGROUND:

Female breast signifies a symbol of beauty, feminity and fertility. Since old age, it has become a challenge for the physicians to treat the patients who are suffering from any form of breast disease. Breast carcinoma has become difficult to understand the nature of hormone responsive cancer and the physician`s eagerness to fight against the disease by physical removal (surgery), cellular destruction (chemo-radiotherapy) and targeted therapy (bio-modulation). There are vast areas of intense exploration to look for the tools and equipments that help in its quick &early diagnosis.

ANATOMY OF BREAST:

Breast is a modified apocrine gland. It lies on 2^{nd} to 6^{th} ribs on the anterior chest wall. It is hemispherical in shape with axillary tail of Spence. It consists of fat and variable amounts of glandular tissue depending on the age. Young women have denser breasts due to more amount of fibro-glandular components while older women have breasts containing more amount of fat components compared to fibro-glandular components.

It is entirely covered by fascia of the chest wall splitting into anterior and posterior layers to envelop the breast tissue. The fascia forms septa called Cooper`s ligament which fixes the breast tissue to the skin anteriorly and to the pectoralis muscle posteriorly. They also run throughout the breast parenchyma thus providing a good supportive framework between the fascial layers. Nipple projects out from the anterior surface of the breast. The pigmented nipple is surrounded by the pigmented areola and this nipple-areola complex lies at the level of 4^{th} intercostal space in a non-pendulous breast.

LOBULAR STRUCTURE:

Breast`s internal architecture is formed of 15-20 lobes, each drains into a single major lactiferous duct opening into the nipple. Each lobe consists of several lobules, each of which drains into several acini. Acini are blind saccules which contains the milk secreted during the lactation. The glandular tissue of the acini and the ductal tissue draining them constitutes the breast parenchyma. The fat around the parenchyma and the fibrous component of the breast forms the stroma. The composition of parenchyma and stroma varies according to the age, parity and many other factors.

The functional unit of the breast is terminal ducto-lobular unit (TDLU) consisting of a lobule and its extralobular terminal duct. TDLU consists of 10 -100 acini draining into the terminal duct. They are sites of origin of most breast pathologies and aberrations of normal development and involution (ANDI).

BLOOD SUPPLY:

Medial and central part of the breast is supplied from the branches of the internal mammary artery that pierces the intercostal spaces and traverse the pectoralis muscle comprising approximately 60% of the breast tissue.

The upper & outer quadrant of the breast gets the supply from lateral thoracic branch of the axillary artery comprising approximately 30% of the breast tissue. Medial most portion of the breast parenchyma also receives blood supply from the anterior intercostal arteries via the perforating branches. Venous drainage accompanies the respective arteries to the axillary & subclavian veins and the azygous veins.

LYMPHATIC SUPPLY:

Superficial lymphatic channels lie under the skin of the breast and at a particular concentration in the subareolar plexus beneath the nipple. The lymph travels in a single direction from superficial to deep into the peri-lobular and deep subcutaneous plexus. Lymphatics in the deep plexus centrifugally drains from nipple to axillary and internal mammary group of lymph nodes (5%). But the majority of the lymph drains into the axillary group of lymph nodes (95%).

The axillary lymph nodes are divided into various levels: -

Level I lymph nodes lie lateral to lateral border of pectoralis minor.

Level II lymph nodes lie deep to the pectoralis minor.

Level III lymph nodes lie medial to medial border of pectoralis minor.

Lymph nodes also lie within the breast tissue and axillary tail of Spence. It is important to identify the nodal groups so that breast cancer spreads in a sequential fashion initially to the level I group of lymph nodes. If the level I group of axillary lymph nodes are not involved then it is highly unlikely that the higher group of lymph nodes are involved. Thus negative level I lymph nodes can save the patient from undergoing axillary lymph node dissection.

IMAGING MODALITIES OF THE BREAST:

Various modalities are present to image the breast tissue:

1. Mammography.
2. Ultrasonography.
3. CT scan.
4. MRI.

Mammography:

It uses low energy X ray beam to maximize differences in the soft tissue density and demonstrating the internal architecture of the breast. Compression of the breast tissue, a short exposure time and use of high quality screen-film equipment improves the image quality. Blood vessels run haphazardly and have got a uniform caliber but the ducts increase in caliber as they converge into nipple.

Ultrasonography:

It is done by a high resolution linear probe by direct contact scanning. Cooper` s ligament runs throughout the breast parenchyma which are seen as linear echogenic lines. In young women with denser breasts show homogenously high echogenicity. With the increasing age, the homogenesity decreases with increase in the fat component within; showing as hypoechoic lobules separated by echogenic fibrous strands. The lactiferous ducts are seen as small tubular anechoic structures radiating from the nipple. An anechoic area of retromammary fat lies deep to the breast tissue and anterior to the echogenic pectoralis major muscle.

4 compositions of the breast on USG appearance:

1. Type A: Predominantly fatty tissue.
2. Type B: Scattered areas of fibro-glandular tissue.
3. Type C: Heterogeneously dense.
4. Type D: Extremely dense.

Sonographically, there are 3 zones of breast:

1. Premammary or subcutaneous zone (SCZ).
2. Mammary zone (MZ).
3. Retromammary zone (RMZ).

The premammary zone lies between the skin and the anterior mammary fascia. It is a part of integument. The mammary zone lies between the anterior and retro-mammary fascia. It consists of most of the ducts, lobules and fibro-stromal components of the breast. The retromammary zone lies deep to the retro-mammary fascia and consists of fat, lymphatics and blood vessels. The anterior mammary fascia goes continuous with the Cooper`s ligament which is formed by the two apposed layers of anterior mammary fascia.

USG LEXICON:

BREAST COMPOSITION: a. Homogenous – Fat
b. Homogenous – Fibro-glandular
c. Heterogenous

MASS: SHAPE – Oval / round / irregular

MARGIN – Circumscribed / not-circumscribed (indistinct/ angular/ micro-lobulated / spiculated)

ORIENTATION – Parallel / not parallel

ECHO PATTERN – Hyperechoic / Anechoic / complex cystic / solid hypoechoic – isoechoic / heterogenous

POSTERIOR FEATURES – No features / acoustic enhancement / shadowing / combined pattern

CALCIFICATIONS: Within the mass / outside the mass / intraductal

ASSOCIATED FEATURES: Duct changes / Architectural distortion / skin thickening / retraction / edema / elasticity

vascularity (absent, internal, rim)

SPECIAL CASES:

Simple cyst – Clustered microcysts

Complicated cyst – mass within or on skin

Foreign body (including implants)

Intramammary lymph node

AVM – Arterio-venous malformation

Mondor disease

Post surgery fluid collection / fat necrosis

Magnetic Resonance Imaging:

It is an imaging investigation which is helpful in detecting cancer that are not visualized on conventional imaging. This type of modality is used in patients who are at high risk for breast cancers. It is also helpful in monitoring chemotherapeutic response.

The patient lies in prone position with the breasts suspended in a surface coil. Connective tissues show low signal intensity and fat shows high signal intensity. Parenchyma`s intensity on MRI varies with the age and hormonal status. Fat suppression techniques are available and contrast is given to identify the abnormal areas.

BIRADS CATEGORY:

Breast Imaging Reporting and Data Systems –

It is designed to standardize the imaging of breast reporting and reducing the confusion in its imaging interpretations. It facilitates monitoring of outcome and assessment of quality.

SL.NO	CATEGORY	MANAGEMENT	LIKELIHOOD OF CANCER
0	Needs additional imaging or prior examination	Recall for additional imaging	N/A
1	Negative	Routine screening	Usually 0%
2	Benign	Routine screening	Usually 0%
3	Probably benign	Short interval follow up (6 months)	>0 % but ≤ 2 %
4	Suspicious	Tissue diagnosis	4a – low suspicion for malignancy (>2 % to ≤10 %) 4b – moderate suspicion for malignancy (>10% to ≤50 %) 4c – high suspicion for malignancy (>50 % to < 95%)
5	Highly suggestive of malignancy	Tissue diagnosis	≥ 95 %
6	Known biopsy-proven	Surgical excision when clinically appropriate	N/A

USG CRITERIA FOR DIAGNOSING BENIGN BREAST LESIONS:

1. Well circumscribed and smooth.
2. Wider than tall.
3. Thin echogenic capsule.
4. Hyperechoic, isoechoic or mildly hypoechoic.
5. Ellipsoid shaped.
6. 3 or fewer gentle lobulations.

USG CRITERIA FOR DIAGNOSING MALIGNANT BREAST LESIONS:

1. Hypoechoic with ill-defined borders.
2. Taller than wide.
3. Spiculated margins.
4. Posterior acoustic shadowing.
5. Presence of microcalcifications.

Pulsatility Index (PI):

Term was given by Raymond Gosling in 1974. It is used to assess the resistance within a pulsatile vascular system. Pulsatility is an intrinsic property governed by the resistance differential across the arteriolar bed allowing potential energy to be stored in the elastic proximal arteries to propagate through the microcirculation at a mean pressure consistent with adequate perfusion.

PI – (Vmax - Vmin)/(Vmean).

Resistive Index (RI):

Also known as Pourcelot index. This parameter is also used to assess the resistance in a pulsatile vascular system.

RI – (Vmax - Vmin)/ (Vmax).

A prospective study done by Joel Schmillevitch et al in year 2006 in Sao Paulo, Brazil. Total of 18 benign and 19 malignant lesions were histologically diagnosed. The study showed the mean value of vascular resistance index for malignant nodules was high compared to the benign nodules with the sensitivity of 84.2% and specificity of 88.90%.[1]

A study done by Yasmin Davoudi et al in year 2013 in Tehran, Iran. Total of 20 benign and 18 malignant lesions were histologically diagnosed. The study stated the vascularity of breast mass plays an important role in predicting its possibility of malignancy. According to this study malignant breast lesions were more vascular than the benign lesions.[2]

A study done by Tzu Chieh Chao in year 1995 in Taipei, Taiwan. Total of 590 benign and 534 malignant lesions were histologically diagnosed. The study stated the average values of the vessel number, resistance index (RI), pulsatility index (PI) and peak systolic velocity (Vmax) of malignant breast masses were significantly larger than those of flow indices of benign lesions in the overall patients and patients with different size of breast masses.[3]

A prospective observational study done by Takanori Watanabe et al in year 2013 in Tokyo, Japan. Total of 569 benign and 839 malignant lesions were histologically diagnosed. The study stated the dominant penetrating flow pattern specially vascularity and the incident angle, which were useful findings. The study also showed, with inclusion of age in the Colour Doppler diagnostic criteria, the diagnostic performance of Colour Doppler was improved.[4]

A retrospective study done by Sheen-Woo-Lee et al in year 2001 in South Korea. Total of 75 benign and 54 malignant lesions were histologically diagnosed. The study explained the Doppler features suggestive of malignant lesions were presence of both central & peripheral vascularity, penetrating vessels and branching vessels.[5]

RESULTS

TABLE 01:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF AGE DISTRIBUTION

	MALIGNANT GROUP		BENIGN GROUP	
AGE (YRS)	**NUMBER**	**%**	**NUMBER**	**%**
20 - 29	0	0.00	7	35.00
30 - 39	0	0.00	6	30.00
40 - 49	8	40.00	6	30.00
50 - 59	5	25.00	1	5.00
60 - 69	7	35.00	0	0.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE, THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0001 (HS) THE AGES ARE NOT UNIFORMLY DISTRIBUTED IN THE TWO GROUPS

GRAPH 01:

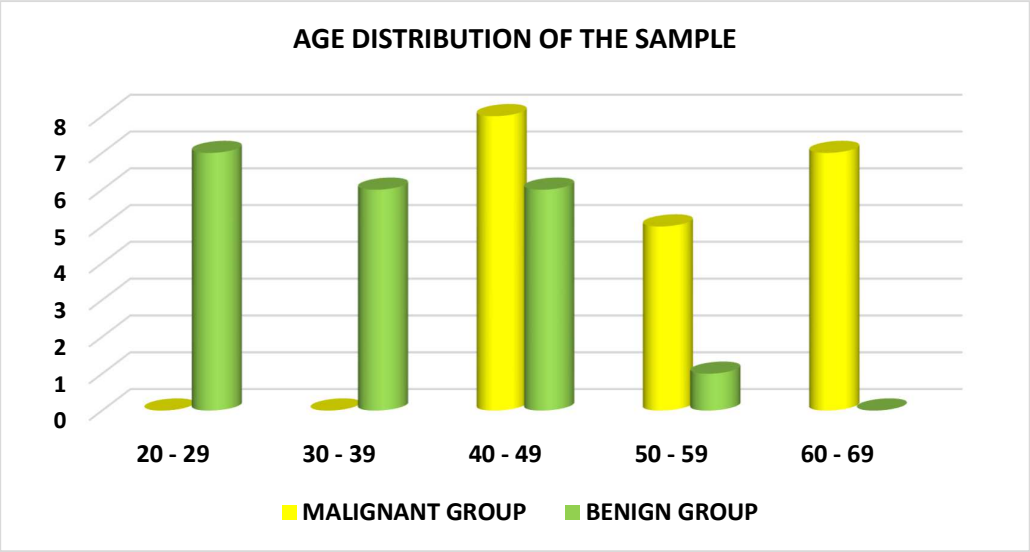

TABLE 02:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF MEAN AGE

	MALIGNANT GROUP				BENIGN GROUP					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
AGE	53.05	8.59	40	69	34.15	9.52	20	52	< 0.0001	HS

FOR THE ABOVE TABLE, p VALUE IS CALCULATED USING STUDENT'S UNPAIRED t TEST

THE MEAN AGE IS SIGNIFICANTLY HIGHER IN THE MALIGNANT GROUP. AGE MAY BE A FACTOR FOR MALIGNANCY.

GRAPH 02:

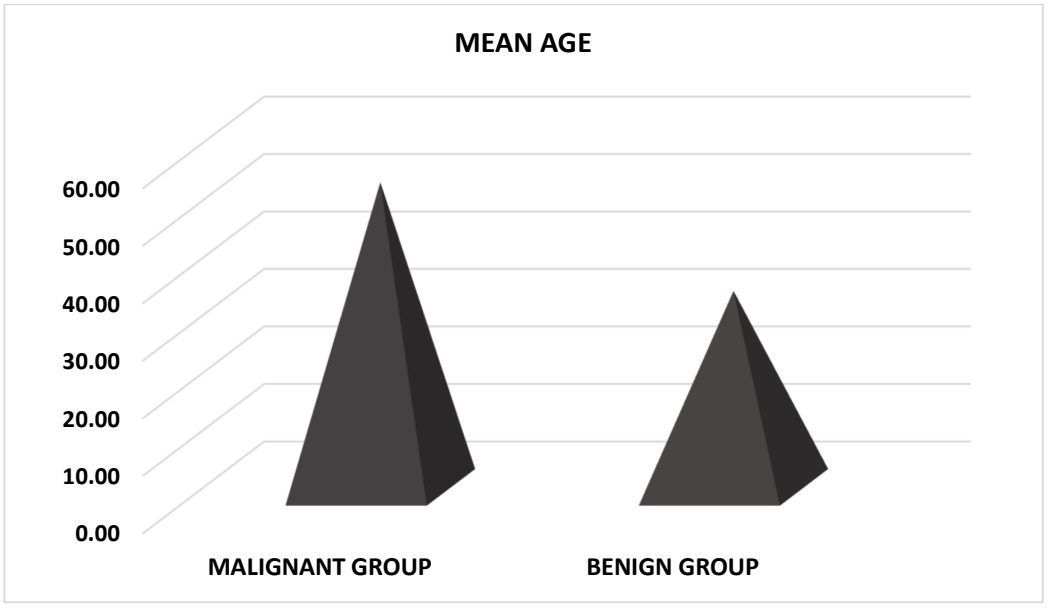

TABLE 03:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF SITE DISTRIBUTION

	MALIGNANT GROUP		BENIGN GROUP	
SITE	**NUMBER**	**%**	**NUMBER**	**%**
LEFT BREAST	8	40.00	13	65.00
RIGHT BREAST	12	60.00	7	35.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.1134 (NS). THE SITES ARE MORE OR LESS IN THE SAME PERCENTAGE

GRAPH 03:

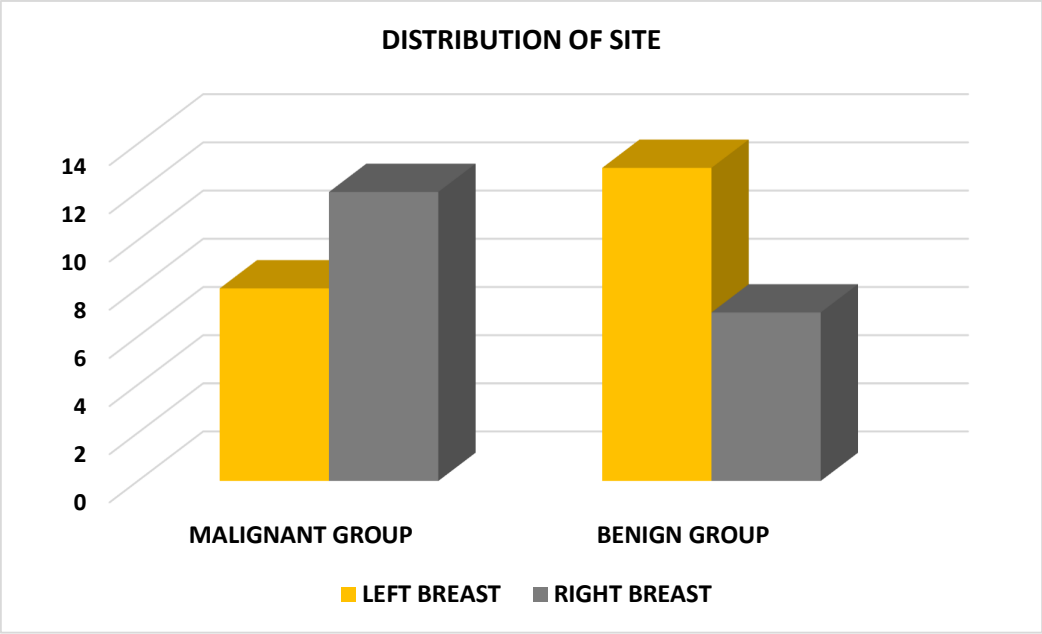

TABLE 04:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF SHAPE

	MALIGNANT GROUP		BENIGN GROUP	
SHAPE	**NUMBER**	**%**	**NUMBER**	**%**
LOBULATED	0	0.00	1	5.00
IRREGULAR	9	45.00	0	0.00
OVAL	9	45.00	10	50.00
ROUND	0	0.00	9	45.00
ROUND TO OVAL	2	10.00	0	0.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0003 (HS).

THE NUMBER OF CASES WITH IRREGULAR SHAPE IS SIGNIFICANTLY MORE IN THE MALIGNANT GROUP.

GRAPH 04:

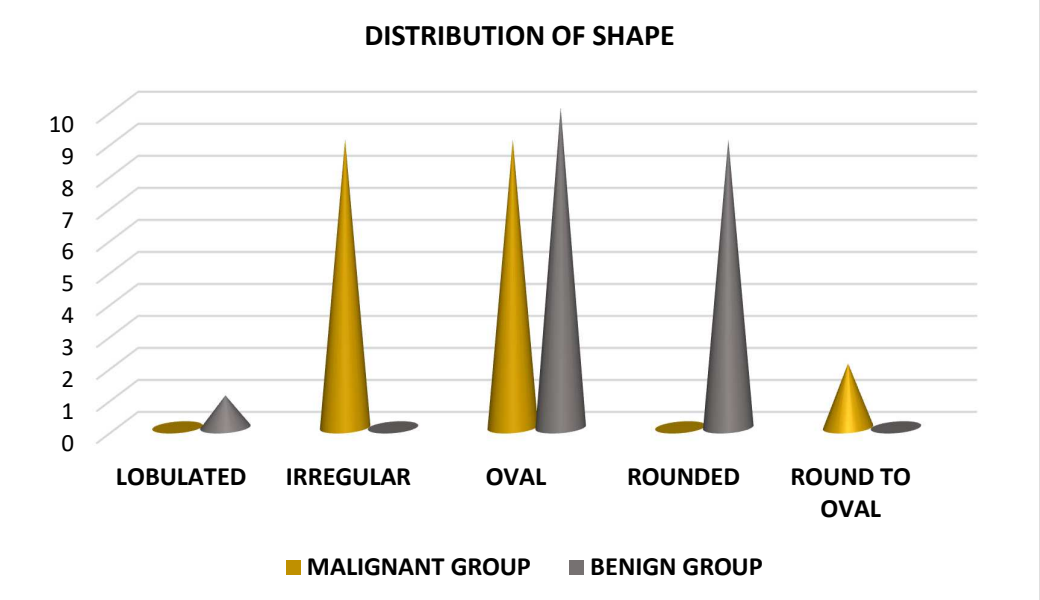

TABLE 05:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF MARGIN STATUS

		MALIGNANT GROUP		BENIGN GROUP	
	MARGIN	NUMBER	%	NUMBER	%
1	ILL DEFINED	1	5.00	0	0.00
2	ILL DEFINED, LOBULATED	2	10.00	0	0.00
3	IRREGULAR	2	10.00	0	0.00
4	IRREGULAR, LOBULATED	1	5.00	0	0.00
5	LOBULATED	5	25.00	0	0.00
6	SPICULATED	5	25.00	0	0.00
7	WELL DEFINED	4	20.00	20	100.00
	TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE, THE VALUE OF p, USING CHI- SQUARE TEST, IS 0.0002 (HS).

THE NUMBER OF CASES WITH WELL DEFINED MARGINS IS SIGNIFICANTLY MORE IN THE BENIGN GROUP

GRAPH 05:

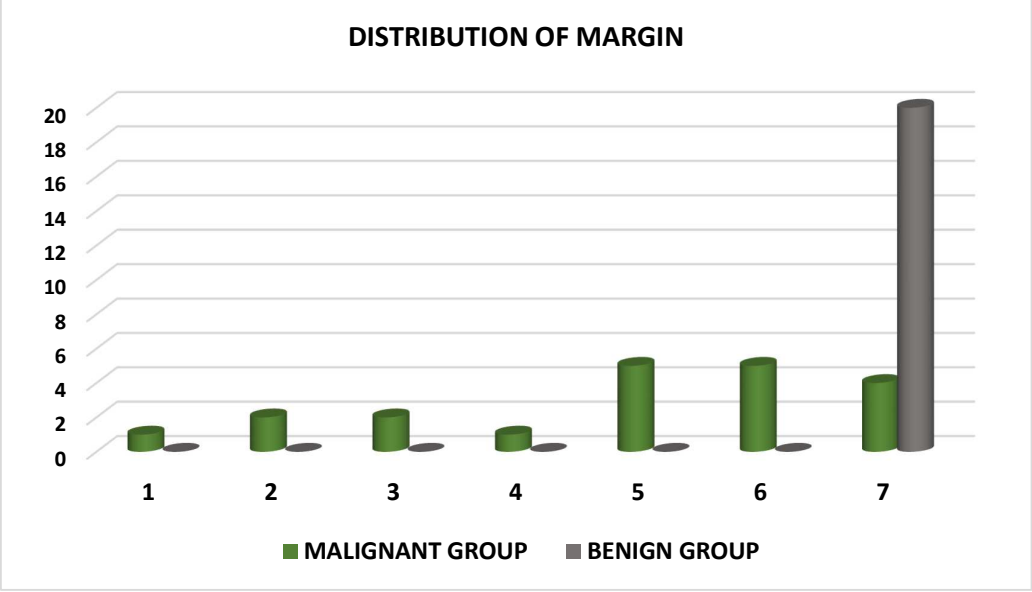

TABLE 06:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF DISTRIBUTION OF ECHO PATTERN

	MALIGNANT GROUP		BENIGN GROUP	
ECHO PATTERN	**NUMBER**	**%**	**NUMBER**	**%**
HETEROECHOIC PREDOM HYPO	7	35.00	1	5.00
HYPOECHOIC	13	65.00	16	80.00
HYPERECHOIC	0	0.00	3	15.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0201 (S).

THE NUMBER OF CASES WITH HYPOECHOIC PATTERN IS SIGNIFICANTLY MORE IN THE BENIGN GROUP.

GRAPH 06:

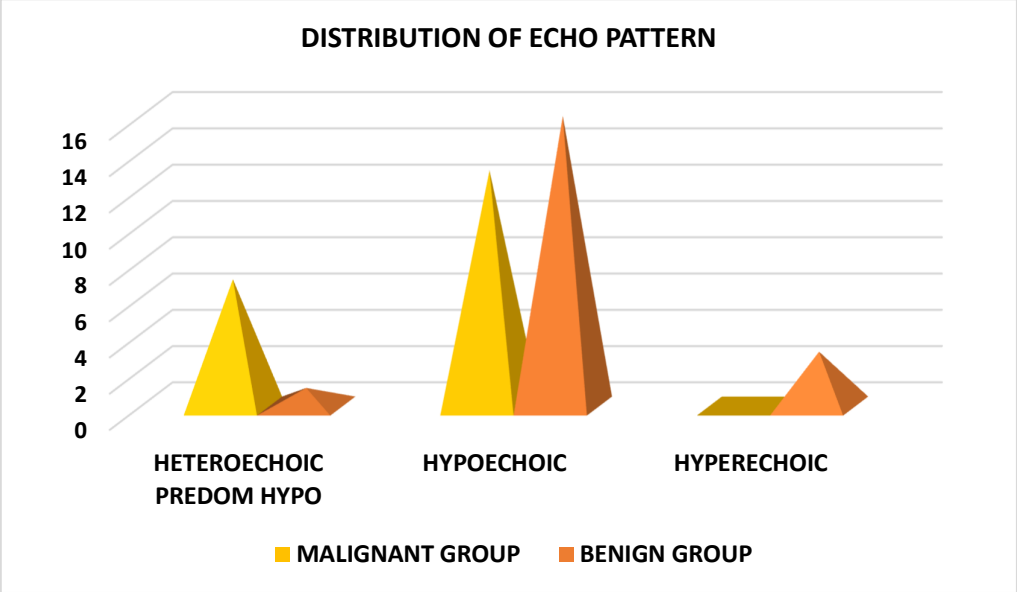

TABLE 07:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF PRESENCE OR ABSENCE OF CALCIFICATIONS

	MALIGNANT GROUP		BENIGN GROUP	
CALCIFICATION	**NUMBER**	**%**	**NUMBER**	**%**
PRESENT	9	45.00	2	10.00
ABSENT	11	55.00	18	90.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0132 (S).

THE NUMBER OF CASES WITH CALCIFICATION ABSENT IS SIGNIFICANTLY MORE IN THE BENIGN GROUP

GRAPH 07:

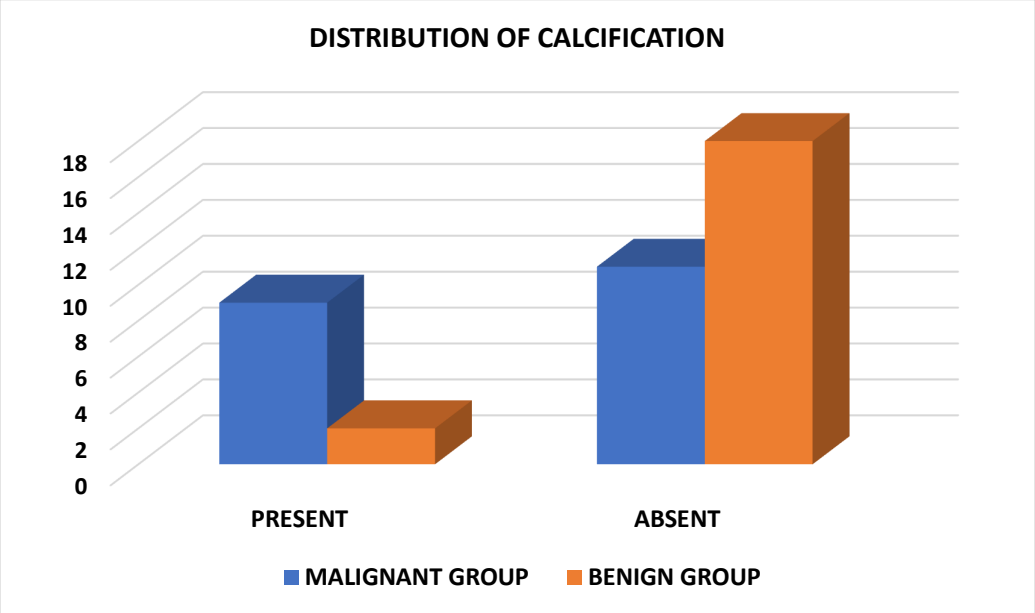

TABLE 08:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF MEAN PULSATILITY INDEX

IN THE FOLLOWING TABLE, p VALUE IS CALCULATED USING STUDENT'S UNPAIRED t TEST

	MALIGNANT GROUP				BENIGN GROUP					
	MEAN	**S.D.**	**MIN**	**MAX**	**MEAN**	**S.D.**	**MIN**	**MAX**	**p VALUE**	**INFERENCE**
PI	1.59	0.38	0.81	2.6	0.86	0.27	0.47	1.8	< 0.0001	HS

THE MEAN PI IS SIGNIFICANTLY HIGHER IN THE MALIGNANT GROUP.

PI MAY BE A FACTOR FOR MALIGNANCY.

GRAPH 08:

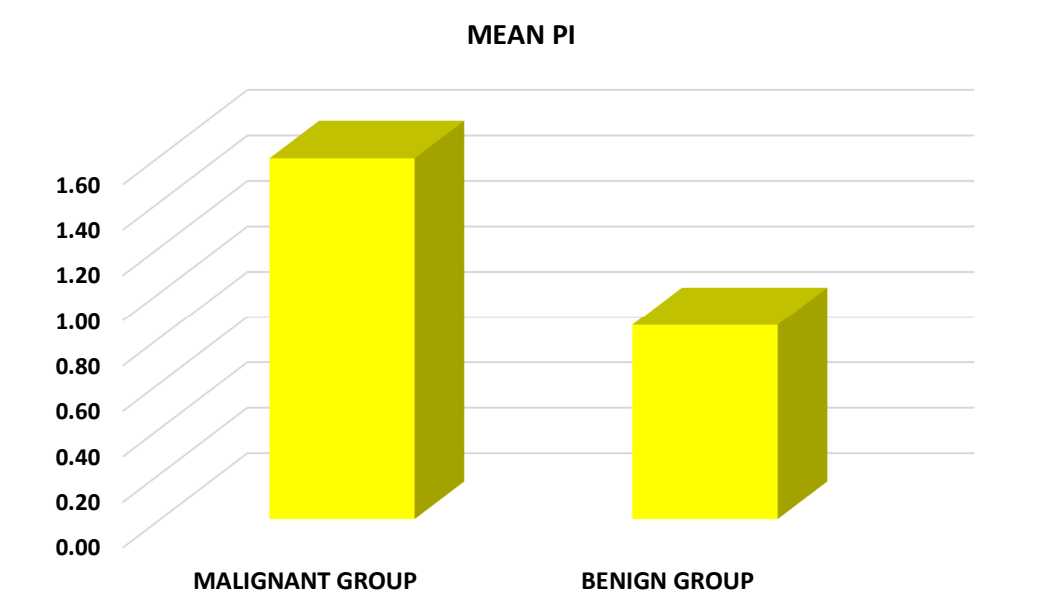

TABLE 09:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF MEAN RESISTIVE INDEX

IN THE FOLLOWING TABLE, p VALUE IS CALCULATED USING STUDENT'S UNPAIRED t TEST

	MALIGNANT GROUP				BENIGN GROUP					
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
RI	0.78	0.08	0.58	0.96	0.60	0.09	0.4	0.82	< 0.0001	HS

THE MEAN RI IS SIGNIFICANTLY HIGHER IN THE MALIGNANT GROUP.

RI MAY BE A FACTOR FOR MALIGNANCY.

GRAPH 09:

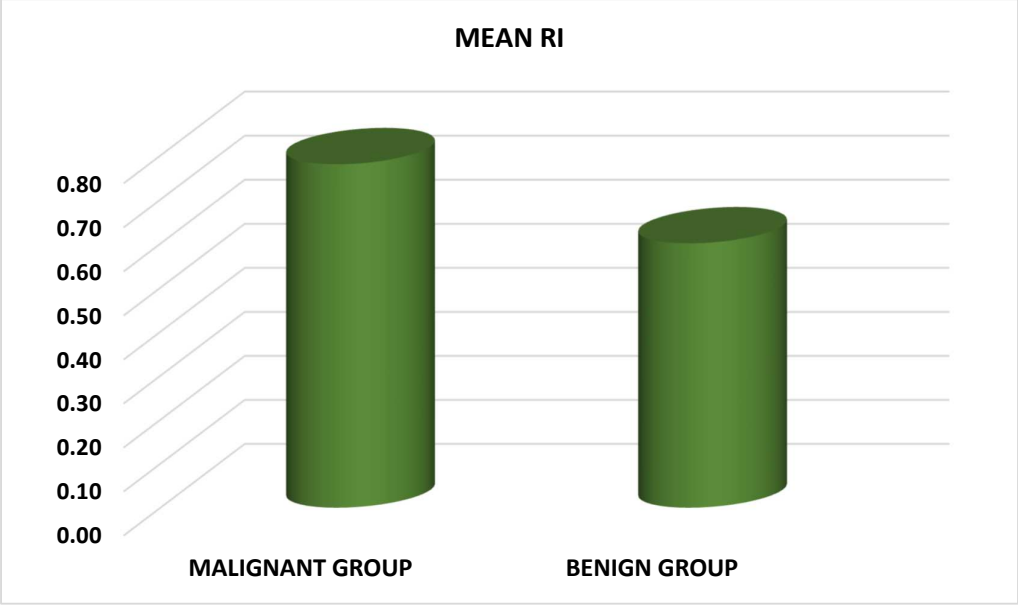

TABLE 10:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF MEAN PEAK SYSTOLIC VELOCITY

	MALIGNANT GROUP				BENIGN GROUP					
	MEAN	S.D.	MIN	MAX	MEAN	S.D.	MIN	MAX	p VALUE	INFERENCE
PSV	13.95	5.28	5.3	23.2	10.69	3.77	5.6	20	0.0304	S

THE MEAN PSV IS SIGNIFICANTLY HIGHER IN THE MALIGNANT GROUP.

PSV MAY BE A FACTOR FOR MALIGNANCY.

GRAPH 10:

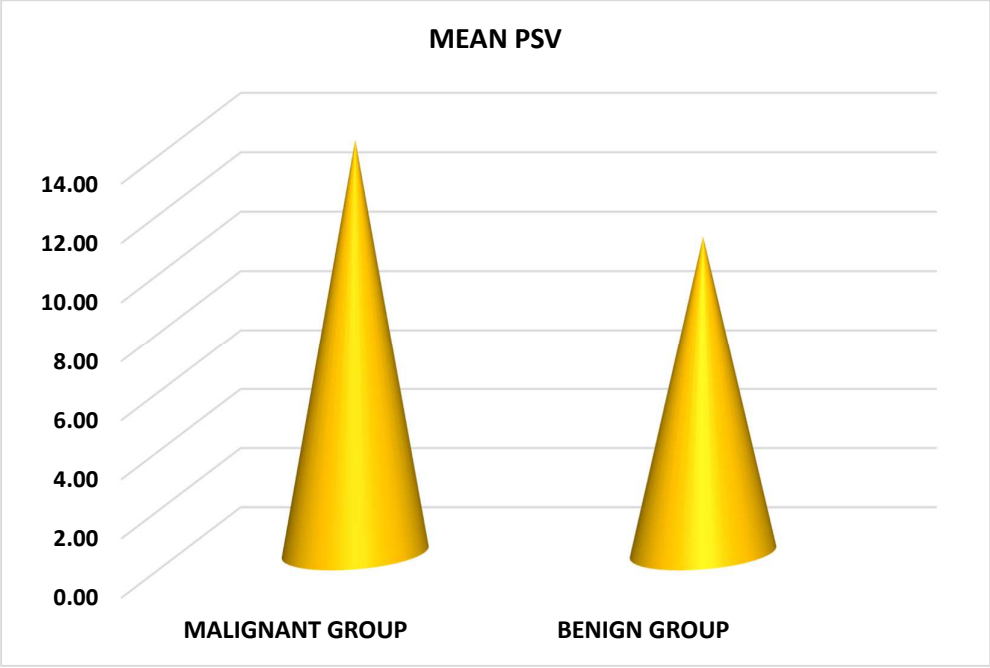

TABLE 11:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF LOCATION OF COLOR DOPPLER SIGNALS

	MALIGNANT GROUP		BENIGN GROUP	
LOCATION OF CDS	**NUMBER**	**%**	**NUMBER**	**%**
CENTRAL & PERIPHERAL	10	50.00	5	25.00
PERIPHERAL	10	50.00	15	75.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE, THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.1025 (NS)

THE NUMBER OF CASES WITH PERIPHERAL CDS IS NUMERICALLY LARGER BUT NOT SIGNIFICANTLY MORE IN THE BENIGN GROUP

GRAPH 11:

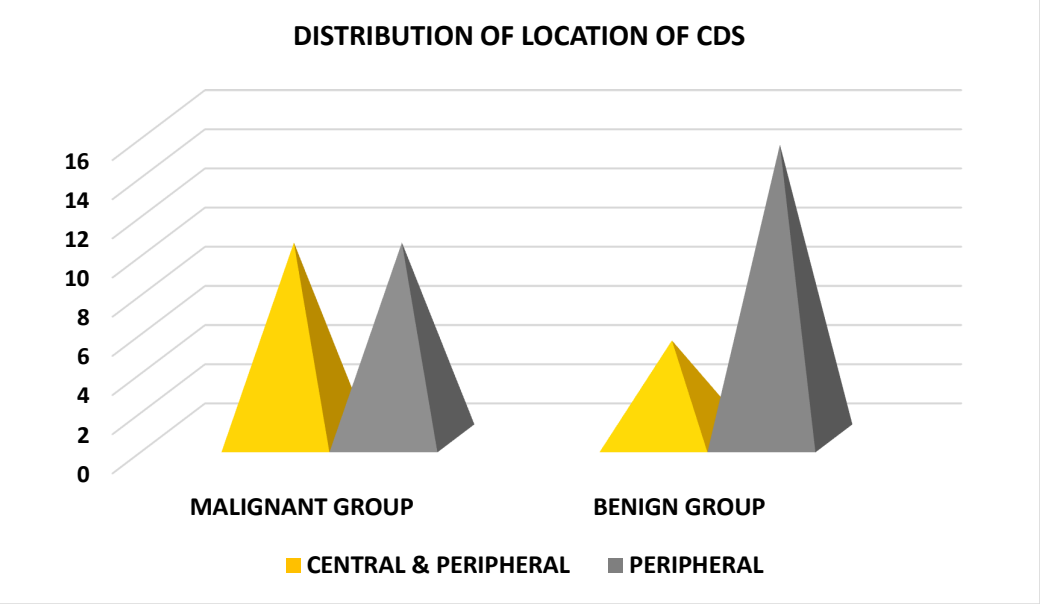

TABLE 12:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF PRESENCE OR ABSENCE OF PENETRATING VESSELS

	MALIGNANT GROUP		BENIGN GROUP	
PENETRATING VESSELS	**NUMBER**	**%**	**NUMBER**	**%**
PRESENT	12	60.00	3	15.00
ABSENT	8	40.00	17	85.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0033 (VS)

THE NUMBER OF CASES WITH ABSENCE OF PENETRATING VESSELS IS SIGNIFICANTLY HIGHER IN THE BENIGN GROUP

GRAPH 12:

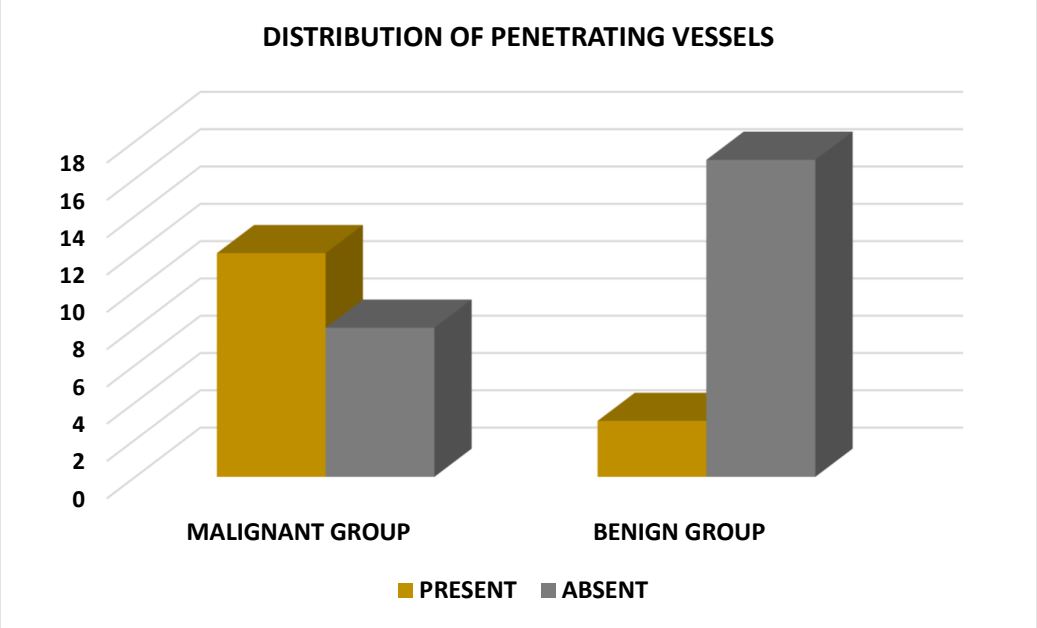

TABLE 13:

COMPARISON BETWEEN THE MALIGNANT & BENIGN BREAST MASSES ON THE BASIS OF SHAPE OF SIGNALS

	MALIGNANT GROUP		BENIGN GROUP	
SHAPE OF SIGNALS	**NUMBER**	**%**	**NUMBER**	**%**
BRANCHING	9	45.00	3	15.00
IRREGULAR	5	25.00	6	30.00
LINEAR	3	15.00	0	0.00
SINGLE DOT LIKE	3	15.00	11	55.00
TOTAL	20	100.00	20	100.00

FOR THE ABOVE TABLE THE VALUE OF p, USING CHI-SQUARE TEST, IS 0.0137 (S).

SHAPE OF SIGNALS ARE NOT UNIFORMLY DISTRIBUTED IN THE TWO GROUPS

GRAPH 13:

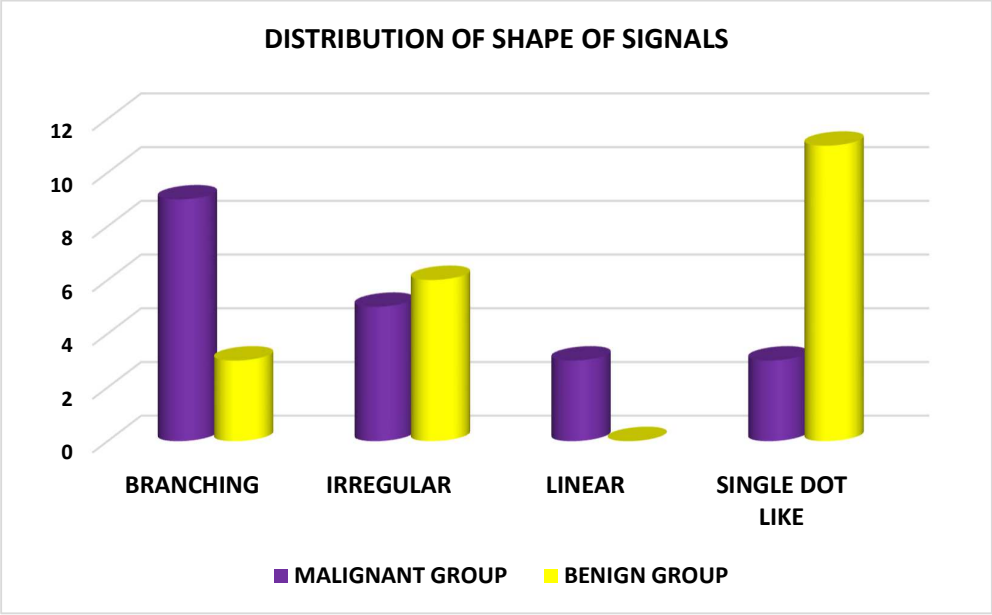

TABLE 14:

	MALIGNANT GROUP		BENIGN GROUP	
HISTOPATHOLOGICAL FINDINGS	**NUMBER**	**%**	**NUMBER**	**%**
DUCTAL CARCINOMA	3	15.00	0	0.00
INVASIVE DUCTAL CARCINOMA	6	30.00	0	0.00
DUCTAL CARCINOMA IN SITU	2	10.00	0	0.00
INVASIVE LOBULAR CARCINOMA	6	30.00	0	0.00
LOBULAR CARCINOMA IN SITU	3	15.00	0	0.00
FIBROADENOMA	0	0.00	10	50.00
INTRADUCTAL PAPILLOMA	0	0.00	3	15.00
LIPOMA	0	0.00	3	15.00
PHYLODES TUMOR	0	0.00	2	10.00
TUBULAR ADENOMA	0	0.00	2	10.00
TOTAL	20	100.00	20	100.00

THERE IS NO COMPARISON BETWEEN THE TWO GROUPS BECAUSE THE HISTOPATHOLOGICAL FINDINGS ARE DISTINCT IN THE TWO GROUPS

METHODOLOGY

MATERIALS & METHODS:

Patients with wide spectrum of breast masses who are referred to the Radio-diagnosis department at the KLE'S DR. PRABHAKAR KORE HOSPITAL & MEDICAL RESEARCH CENTRE AND CHARITABLE HOSPITAL, BELAGAVI in between 1st January to 31st December 2021, over a period of one year.

An informed written consent will be obtained from all the study subjects. A pre-designed and pre-tested proforma shall be used for collection of clinical data. A detailed history, associated risk factors (early menarche, late menopause, alcoholism, family history etc.) will be taken by personal interview of the study subject by the investigator at the hospital.

The above mentioned study population will be subjected to ultrasonography on GE VOLUSON 8 Machine (G E Health care, USA) equipped with a 7.5-12 MHz high frequency linear array transducer.

The patient will wear a gown and she will be asked to undress from the waist up. Then she will be laid supine comfortably on a padded examining table. A non-allergic gel will be applied over the skin of bilateral breasts, one breast at a time, to allow the transducer probe to move over the region for getting the proper image. The gel can be readily wiped off with a clean cloth after the scan is over. The patient may be asked to hold her breath briefly several times. The privacy of the patient will always be maintained.

STUDY DESIGN:

A one year hospital based prospective observational study.

Period of study :1st January 2021 to 31st December 2021.

Sampling method: Universal sampling (All female patients 20-90 years with breast masses attending Radio-diagnosis department of KLES Dr. Prabhakar Kore Hospital & Medical Research Centre, Belagavi)

Sample size :40

Sample size formula:

The minimum sample size formula based on two proportions is

$$n = \frac{(z_\alpha + z_\beta)^2 \bar{p}(1-\bar{p})}{d^2}$$

where p_1 and p_2 are the proportions of the two groups.

$$p = \frac{p_1 + p_2}{2} \text{ and } d = p_1 - p_2$$

z_α is linked with the level of significance and z_β is linked with the power of the test.

For 5% level of the significance z_α = 1.96 and z_β = 0.84 for 80% power of the test.

Ref: Watanabe T, Kaoku S, Yamaguchi T, Izumori A, Konno S, Okuno T, Tsunoda H, Ban K, Hirokaga K, Sawada T, Ito T. Multicenter Prospective Study of Color Doppler Ultrasound for Breast Masses: Utility of Our Color Doppler Method. Ultrasound in medicine & biology. 2019 Jun 1;45(6):1367-79.

By taking proportion of success, p_1 = 58.3% and p_2 = 16.0% the sample size obtained is 40.

There would be two groups with minimum size of 20 in each group, who would be subjected to USG Colour Doppler of breast masses.

All the data collected will be entered into MS Excel sheet and master chart will be prepared. Tables, graphs and charts will be prepared from the master chart.

INCLUSION CRITERIA:

1. Patient's age group lies in the range of 20 years to 90 years at KLE Hospital Radio-diagnosis department.
2. Presence of breast nodules of size greater than 1 cm on mammography.

EXCLUSION CRITERIA:

1. Simple breast cysts on physical examination.
2. Breast masses for which vacuum assisted biopsy has already been done

STATISTICAL ANALYSIS:

The study is focused on comparison of two groups. For the continuous quantitative variables mean and standard deviation will be calculated. The inter group continuous variables will be compared using suitable tools of statistics like unpaired student's 't' test. Two quantitative variables, within a group, will be compared using student's paired t test.

The categorical data will be expressed in terms of rates, ratios and percentages. The association between the outcome, clinical and demographic characteristics will be tested using Chi-square test or Fisher's exact test.

Discrete variables will be represented by median. Nonparametric tests will be used for comparing discrete variables. Suitable graphs will be used to depict the comparison. For all the tests, the value of p less than 5% (0.05) will be considered significant.

DISCUSSION

Ultrasonography has got a very important role in the imaging of various breast pathologies.[1] Many studies have shown the usefulness of CD in the evaluation of breast masses[4]. The technological development has been seen as a useful component in the imaging analysis and its processing[1]. Malignant neoplasms of the breasts require angiogenesis for their growth and its metastasis[2]. Thus the technique of Doppler sonography for visualization of blood vessels may be helpful to differentiate between benign and malignant breast mass lesions[2]. The main finding of our study was that the vascularity of the lesion and that the malignant lesions were more vascular than the benign ones.

Age was an important factor in our study. Malignant breast lesions were most often was seen in the higher age group (mean age – 53 years) as compared to the benign ones which was found in the younger group (mean age – 34 years).

The site of the breast lesion (right / left) was not statistically significant in our study to differentiate between the masses.

The shape of the breast mass taken to differentiate between the two groups was statistically significant. Irregular shaped breast mass was more commonly found in the malignant group while oval shaped breast mass dominated in the benign group. The margin status of the breast lesion was considered among the criteria which was statistically significant that showed more well-defined margins was seen in the benign group and irregular & lobulated margins was more common in the malignant category.

Based on the echo pattern on CDS, the malignant lesions showed heteroechoic predominantly hypoechoic lesion which proved to be statistically significant. Presence

or absence of calcifications within the breast lesion was also taken into consideration which proved to be statistically significant as most of the benign lesions showed the absence of calcifications within the breast lesion.

Three CD parameters was taken into consideration like RI, PI & PSV which showed statistically significant results at the end of the study. All these parameters showed higher values in the malignant lesions as compared to the benign ones. The mean values of RI – 0.78, PI – 1.59 & PSV – 13.9 cm / sec were found in the malignant lesions as compared to the mean values of RI – 0.60, PI – 0.86 & PSV – 10.7 cm / sec found in the benign lesions. Thus these CD parameters are one of the significant major useful factors to differentiate between the malignant and benign breast lesions.

The location of the CDS was taken into consideration which showed that numerically more peripheral location of the CDS was found in the benign lesions but not statistically significant.

On the basis of presence or absence of penetrating vessels, the number of cases with absence of penetrating vessels was significantly higher in the benign group proving this factor to be highly statistically significant.

The shape of CDS was found to be statistically significant in which branching type showed predominantly in the malignant category and single dot like predominantly in the benign group.

All the patients were followed up with the histopathological results which showed invasive ductal carcinoma was predominant in the malignant category and fibroadenoma in the benign category.

CONCLUSION

In conclusion, CDUS is a very meaningful tool in depicting malignant tumors of breast. Hypervascularity of the breast mass was an important sign to predict malignant character of the breast lesion. The Doppler parameters like PI, RI and PSV are useful parameters which helps to differentiate between the malignant and benign breast masses. Age is an important parameter to distinguish between the two groups. Malignant lesions usually occurred in the women of higher age group. Malignant tumors are more of irregular shaped than the benign ones which is more of oval shaped. Benign lesions have more well-defined margins rather than irregular, lobulated margins of the malignant lesion. Most of the benign lesions showed the absence of calcifications and penetrating vessels within the lesion. Malignant masses show branching type of color Doppler signals while single dot like type predominated in the benign category.

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LIMITATIONS OF THIS STUDY

- The size of the sample is limited.
- Inter-observer variance could not be properly assessed because Color Doppler ultrasonography was operator dependant and investigation was conducted only by a single radiologist.

ANNEXURE I – CONSENT FORM

CONSENT TO PARTICIPATE IN RESEARCH STUDY:

1. I understand that I am participating in the study, which shows the relationship between the various colour doppler indices to differentiate between benign and malignant diseases of breast - one year study confirms that I have read and understood the information in the patient information sheet. Procedure is explained to me in details along with information about the advantages and disadvantages of taking part in the study. I have been given the opportunity to discuss all aspects of the trial, to ask questions and hereby consent to participate in the trial outlined above.

2. I understand that the decision to take part in this study is completely voluntary and I am aware that I can choose to withdraw from the study at any point of time.
3. I consent to the photographing or recording of the procedure to be performed including appropriate portions of my body, for medical, scientific or educational purposes provided my identity is not revealed in the pictures or by the descriptive texts accompanying them.
4. I understand that there is no significant risk involved in the test that would be done in this study.
5. No guarantee or assurance has given by anyone as to the results that may be obtained.
6. My signature on this form signifies that I have willingly decided to participate after understanding the above information."

Name of the participant: _____ Signature/Thumb impression

Name of the witness: _____ Signature/Thumb impression

Name of the interviewer: _____Signature

Date: _____ Place: _____

ANNEXURE II – PROFORMA

PROFORMA FOR DATA COLLECTION:

TITLE: - "ROLE OF COLOUR DOPPLER IMAGING IN DIFFERENTIATING BENIGN AND MALIGNANT BREAST MASSES: A ONE YEAR PROSPECTIVE OBSERVATIONAL STUDY."

INVESTIGATOR: - REG. NO.: BS0120013 GUIDE: - DR _____

DATE OF INTERVIEW: -

NAME OF THE PATIENT:

AGE (IN YEARS): **OP/IP NO.:**

MOBILE NUMBER:

ADDRESS:

HOUSE NO.:

_____

_____

WARD/GALLI:

_____

VILLAGE _____TALUK: _____DISTRICT: _____

USG NUMBER:

OCCUPATION: GOVT EMPLOYEE/PVT EMPLOYEE/AGRICULTURE/

HOMEMAKER/SELF EMPLOYED

EDUCATION: ILLITERATE/ 1-5/ 6-10/11-12 OR DIPLOMA/ GRADUATION

CHIEF COMPLAINTS: **DURATION**

HISTORY OF PRESENT ILLNESS **DURATION**

PAST HISTORY :

FAMILY HISTORY :

PHYSICAL EXAMINATION: **BREAST EXAMINATION**

RIGHT BREAST **LEFT BREAST**

CVS:

RS:

RENAL:

PROVISIONAL DIAGNOSIS:

MAMMOGRAPHY:

FNAC:

ULTRASONOGRAPHY FINDINGS:

COMPOSITION: -

SHAPE: -

MARGIN: -

ECHO PATTERN: -

CALCIFICATION: -

COLOUR DOPPLER FINDINGS:

RI: -

PI: -

PSV: -

VASCULAR SIGNALS: -

LOCATION –

SHAPE –

PENETRATING VESSELS –

ANY OTHER ASSOCIATED FINDINGS:

FINAL DIAGNOSIS:

ANNEXURE III – IMAGES

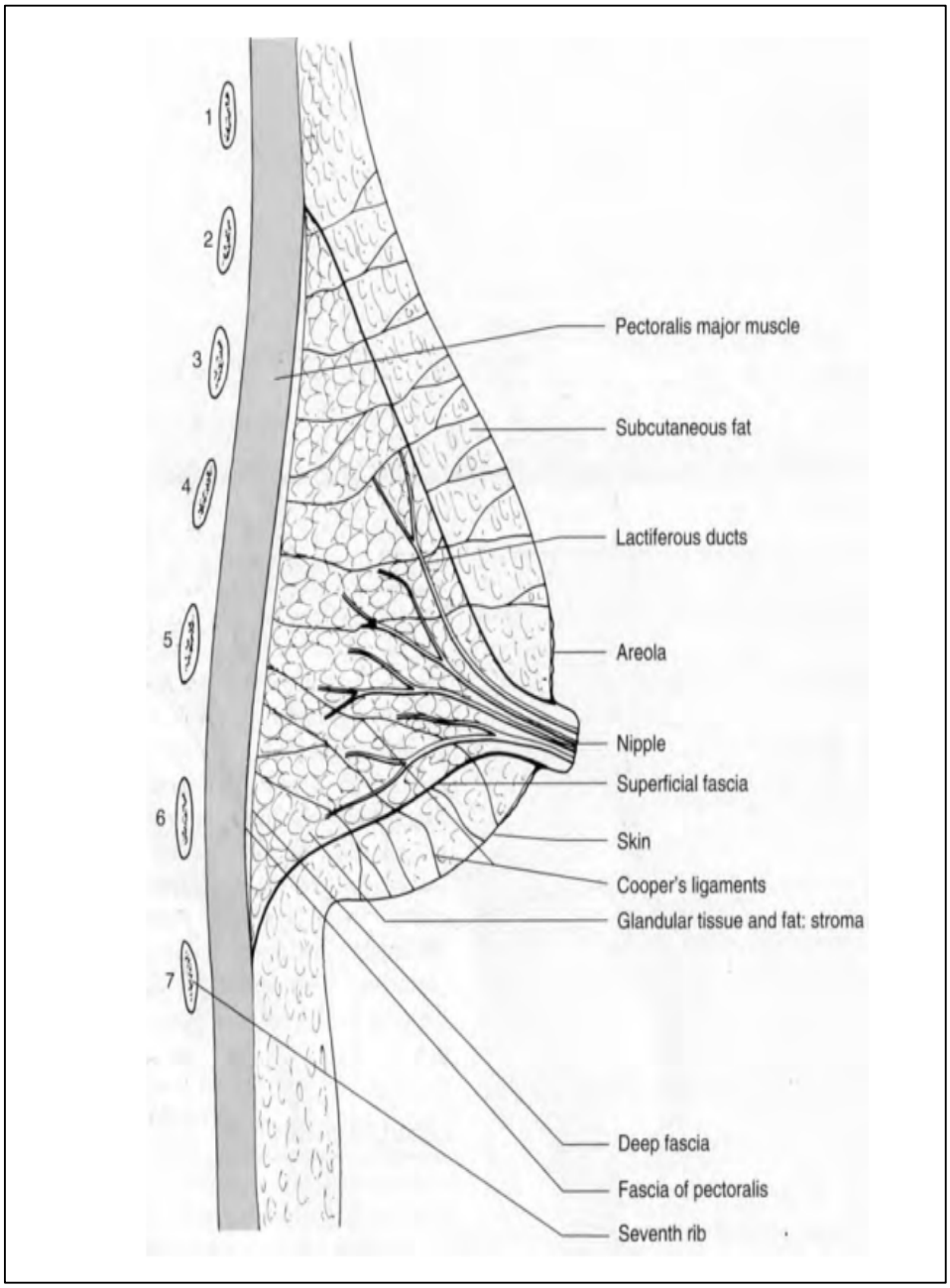

FIG 01: SCHEMATIC DIAGRAM OF THE BREAST

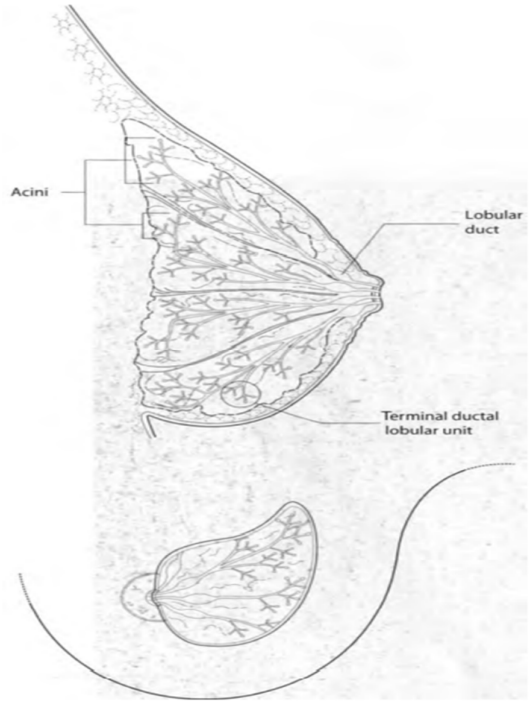

FIG 02: LOBULAR STRUCTURE OF BREAST

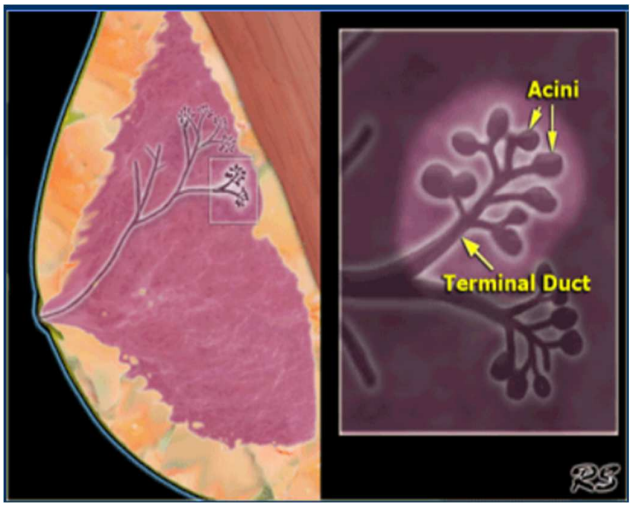

FIG 03: TERMINAL DUCTO-LOBULAR UNIT (TDLU)

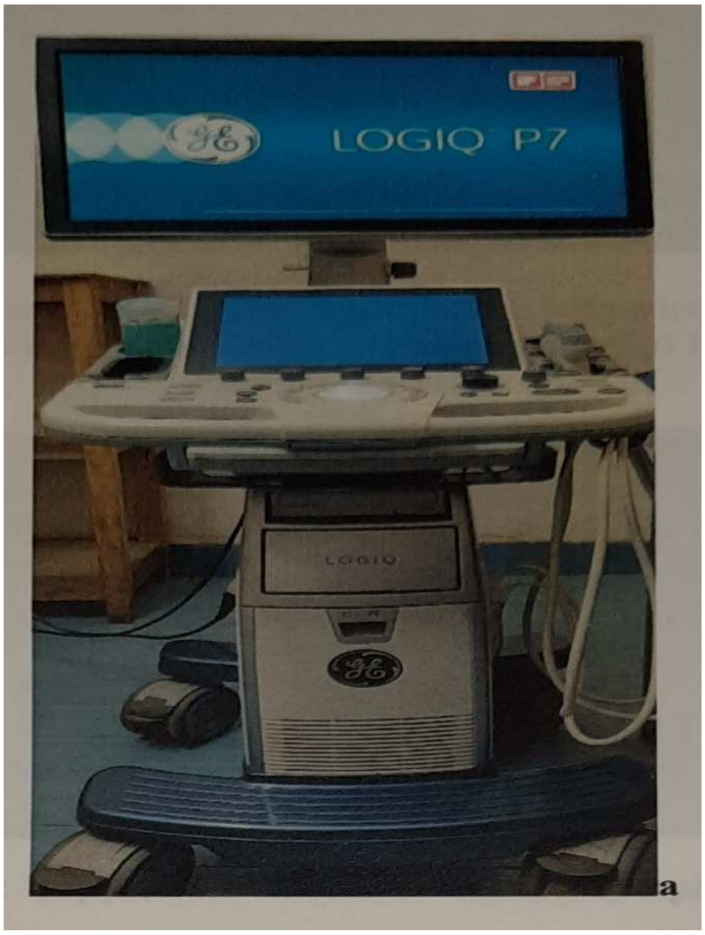

FIG 04: GE VOLUSON USG MACHINE USED FOR THE STUDY PURPOSE

FIG 05: HIGH FREQUENCY LINEAR ARRAY TRANSDUCER USED FOR THIS STUDY

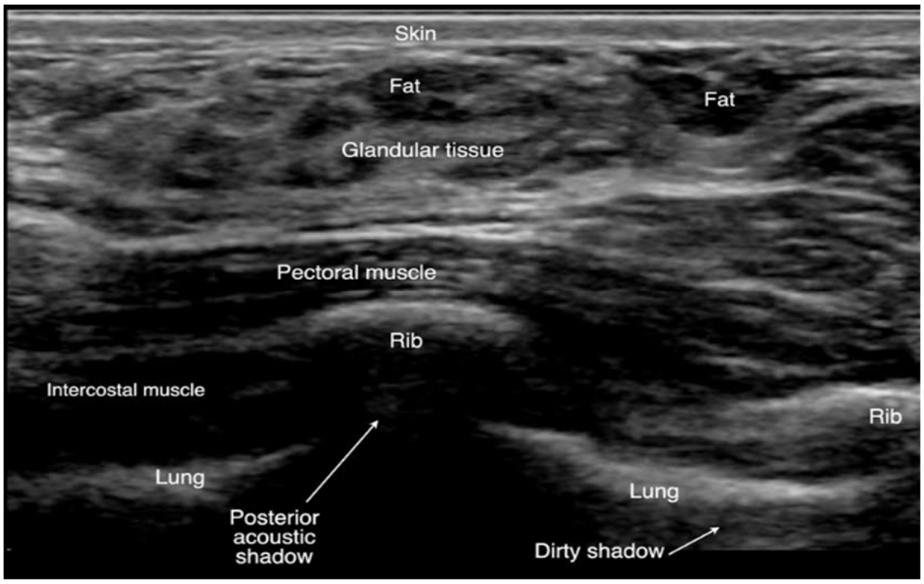

FIG 06: NORMAL ANATOMY OF BREAST ON USG

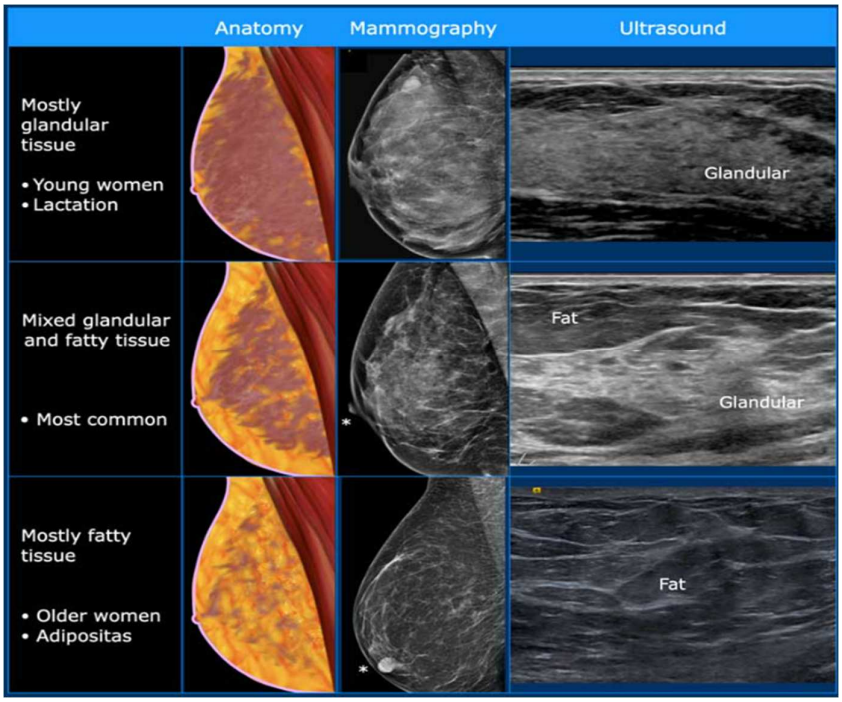

FIG 07: VARIOUS COMPOSITIONS OF BREAST PARENCHYMA

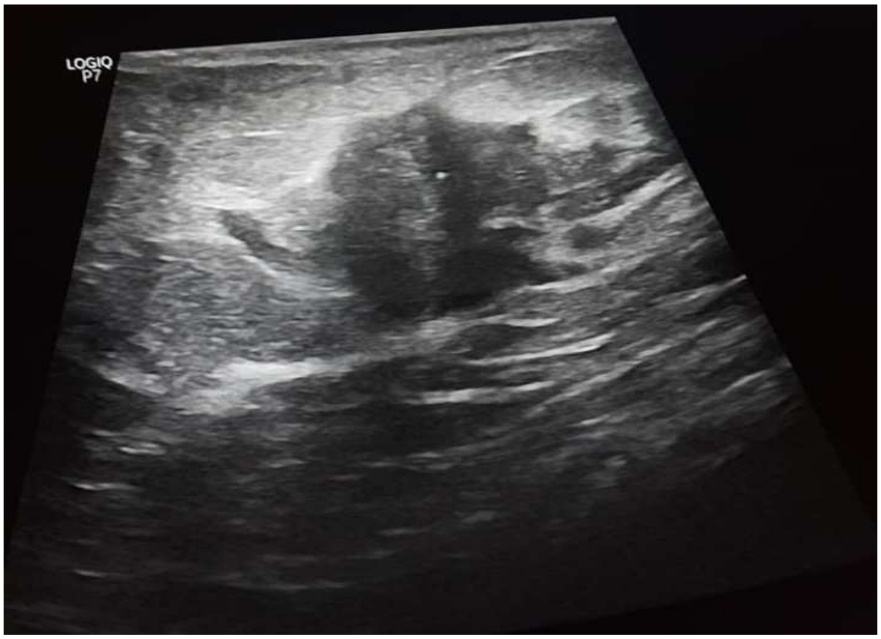

FIG 08: GREY SCALE USG OF THE MALIGNANT BREAST MASS

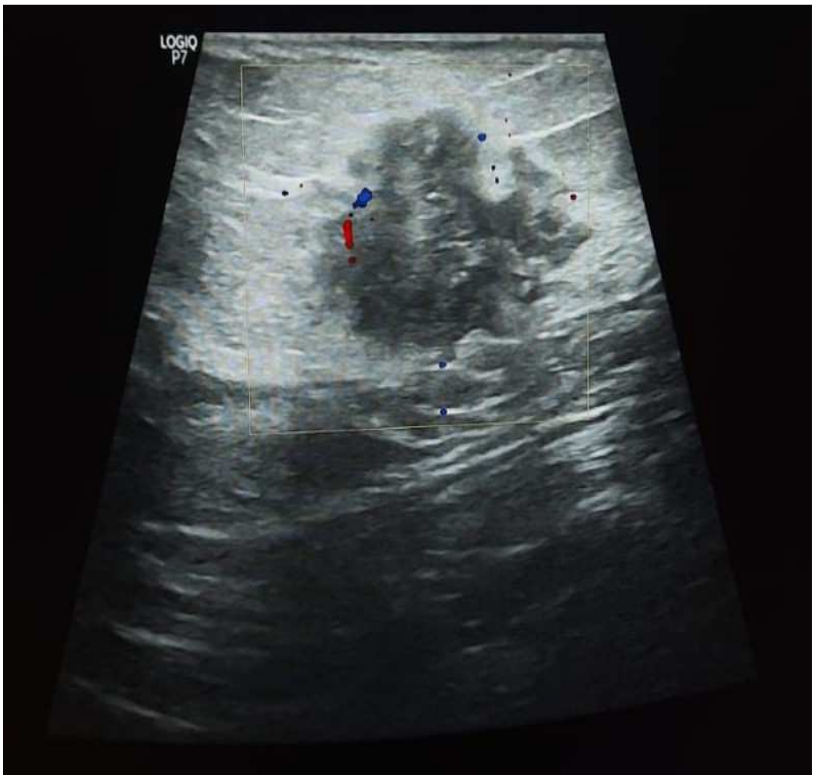

FIG 09: MALIGNANT BREAST MASS WITH MINIMAL PERIPHERAL VASCULARITY

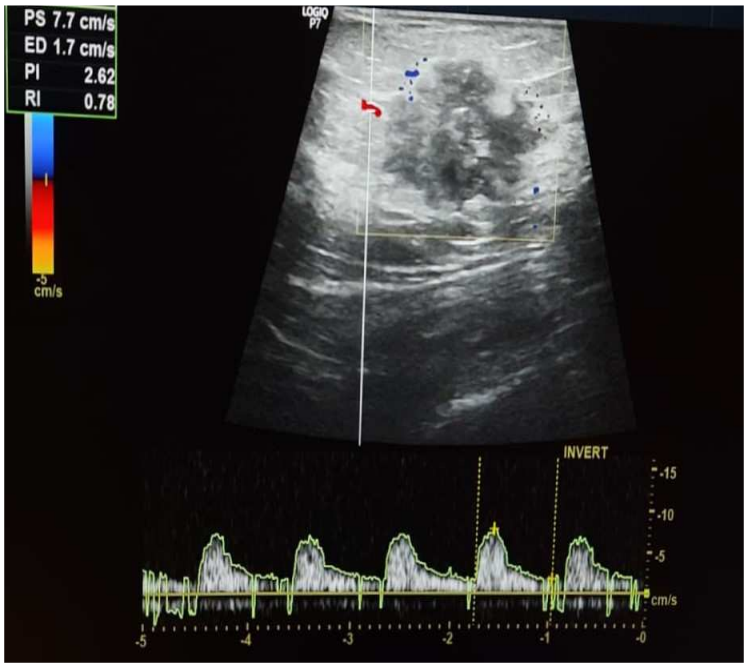

FIG 10: MALIGNANT BREAST MASS WITH RI, PI & PSV VALUES

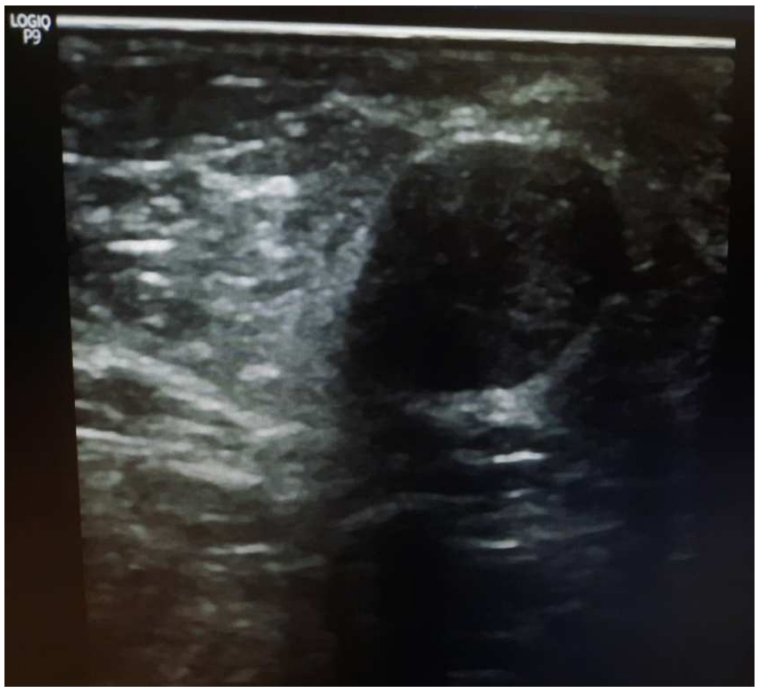

FIG 11: GREY SCALE USG OF BENIGN BREAST MASS

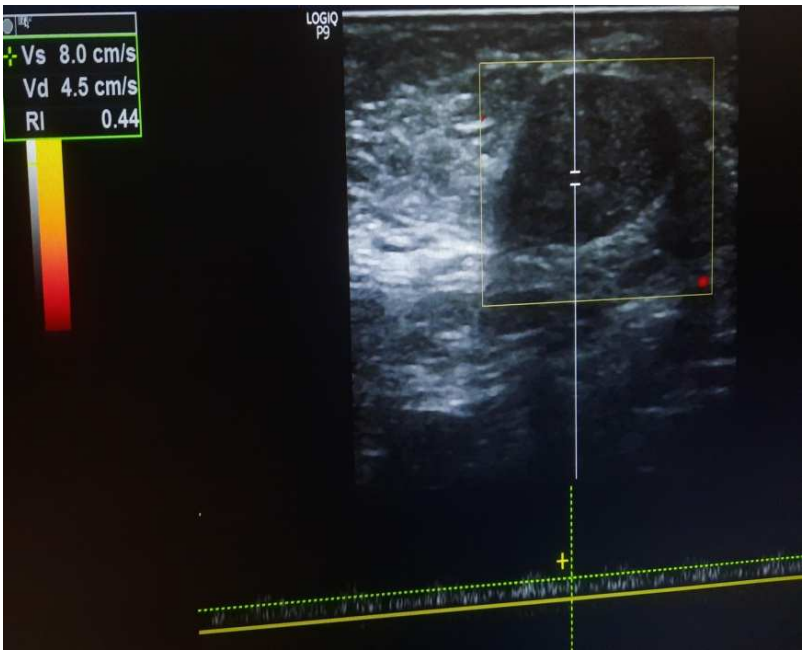

FIG 12: BENIGN BREAST MASS WITH RI, PI & PSV VALUES

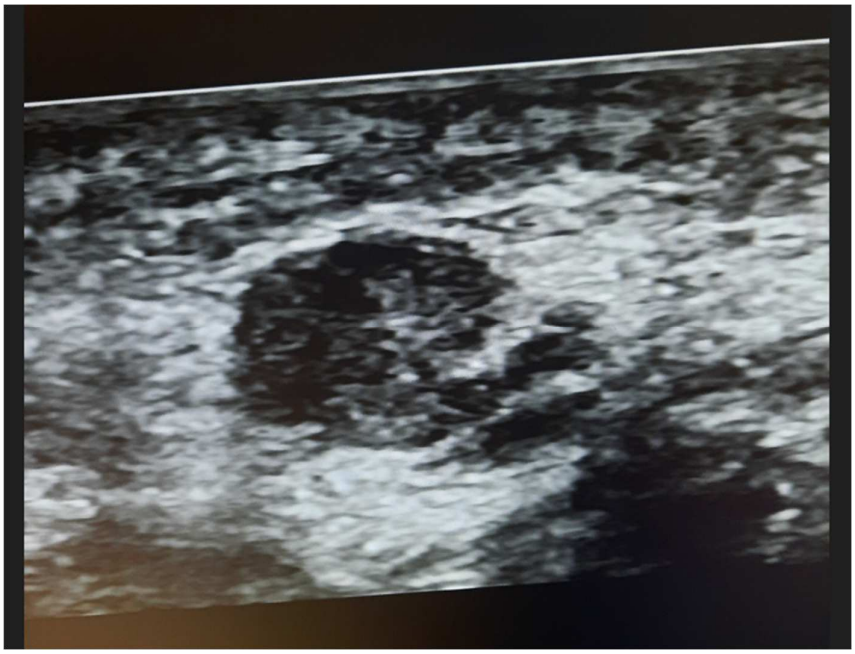

FIG 13: GREY SCALE USG OF MALIGNANT BREAST MASS

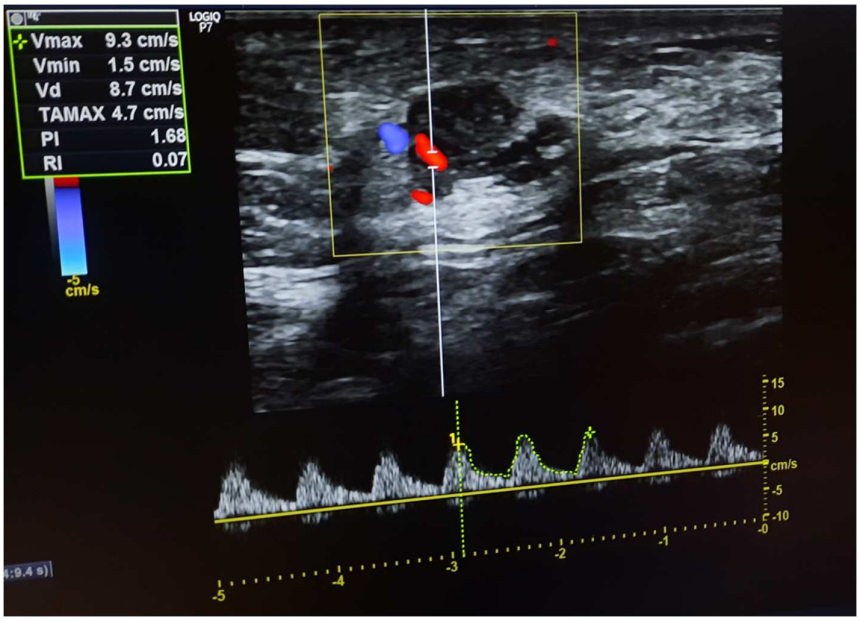

FIG 14: MALIGNANT BREAST MASS SHOWING PERIPHERAL VASCULARITY WITH RI, PI & PSV VALUES

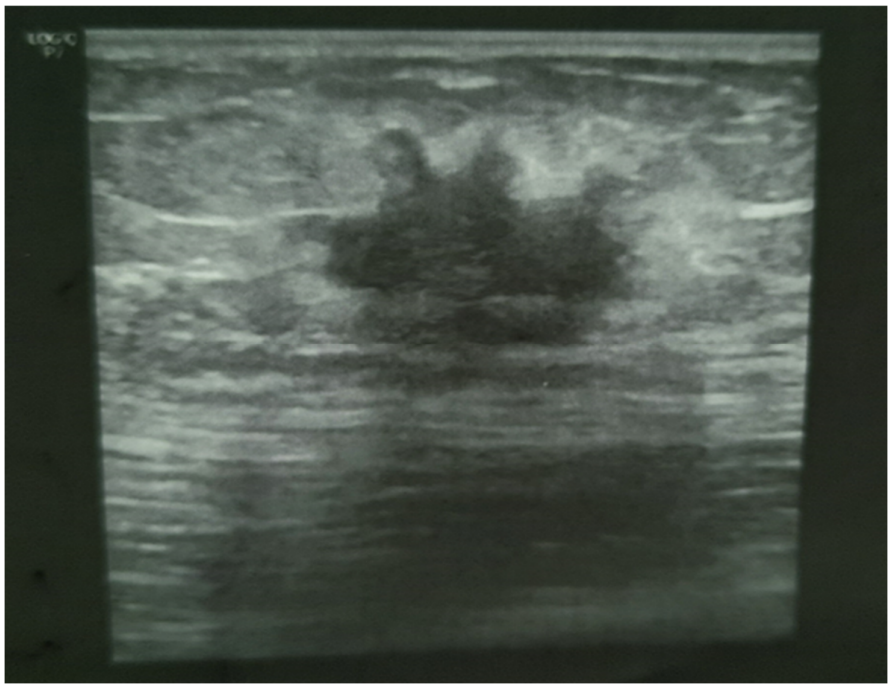

FIG 15: GREY SCALE USG OF MALIGNANT BREAST MASS HAVING LOBULATED CONTOUR

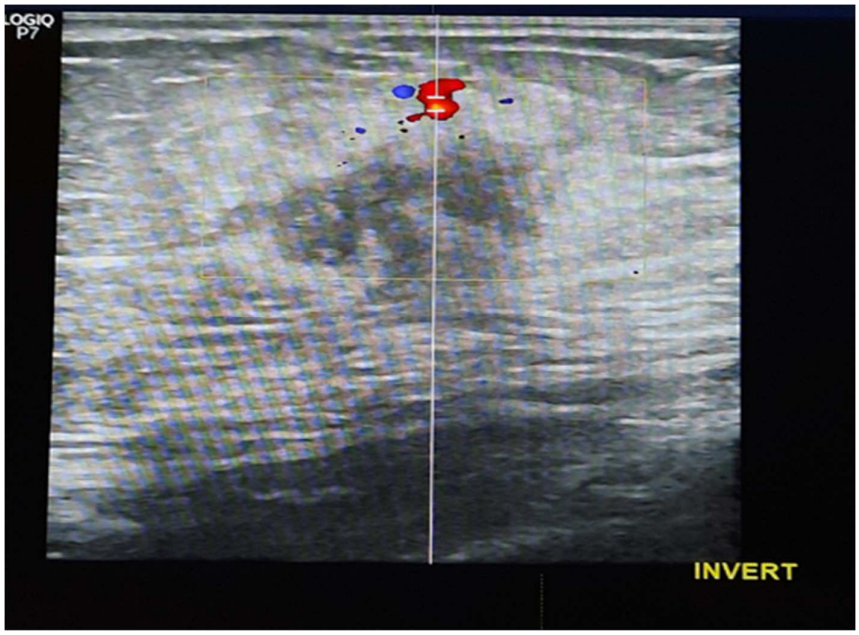

FIG 16: MALIGNANT BREAST MASS SHOWING MINIMAL PERIPHERAL VASCULARITY

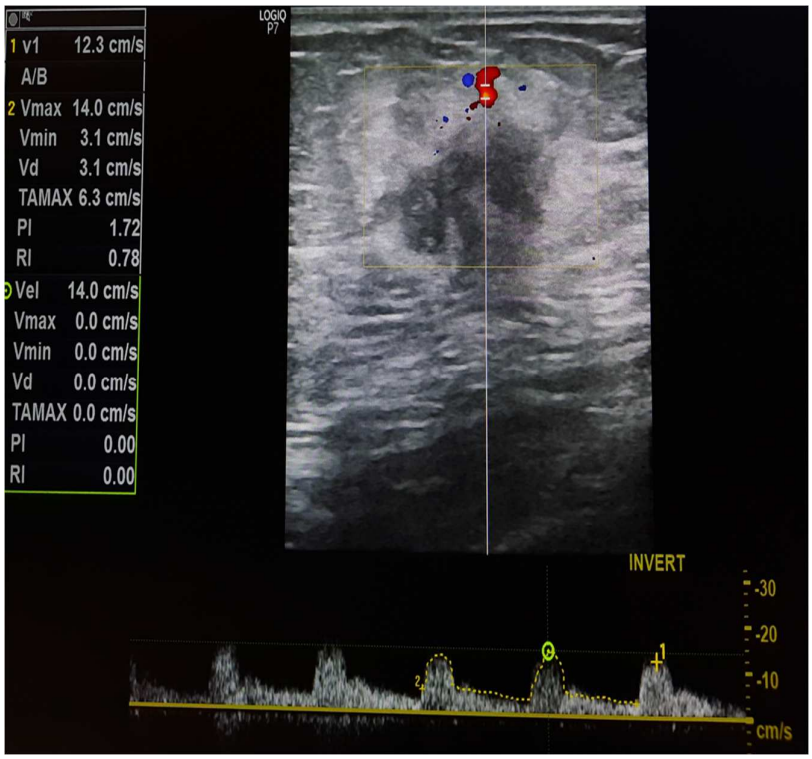

FIG 17: MALIGNANT BREAST MASS WITH RI, PI & PSV VALUES

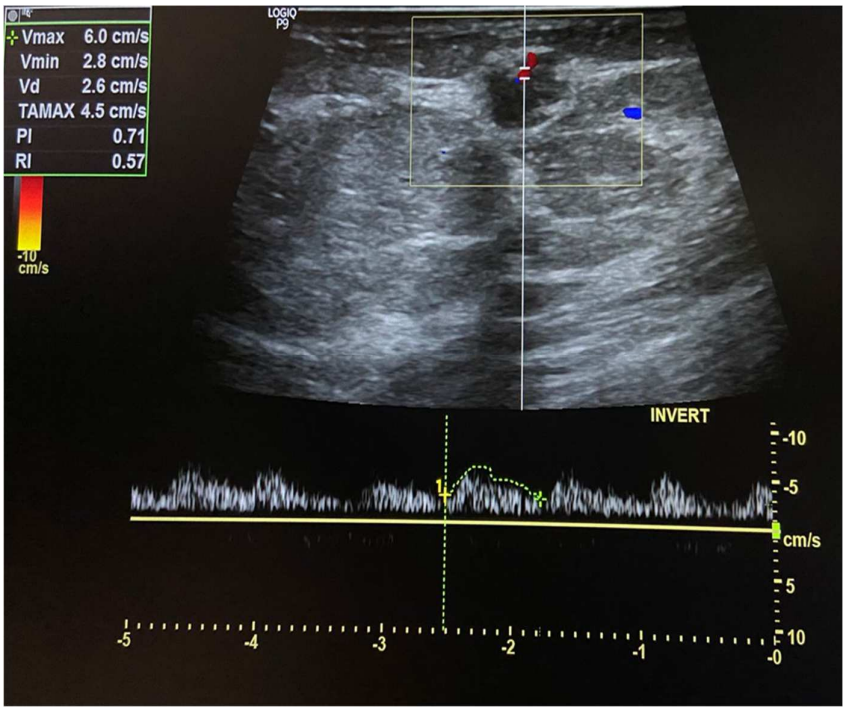

FIG 18: BENIGN BREAST MASS SHOWING SINGLE DOT LIKE VASCULARITY WITH RI, PI & PSV VALUES

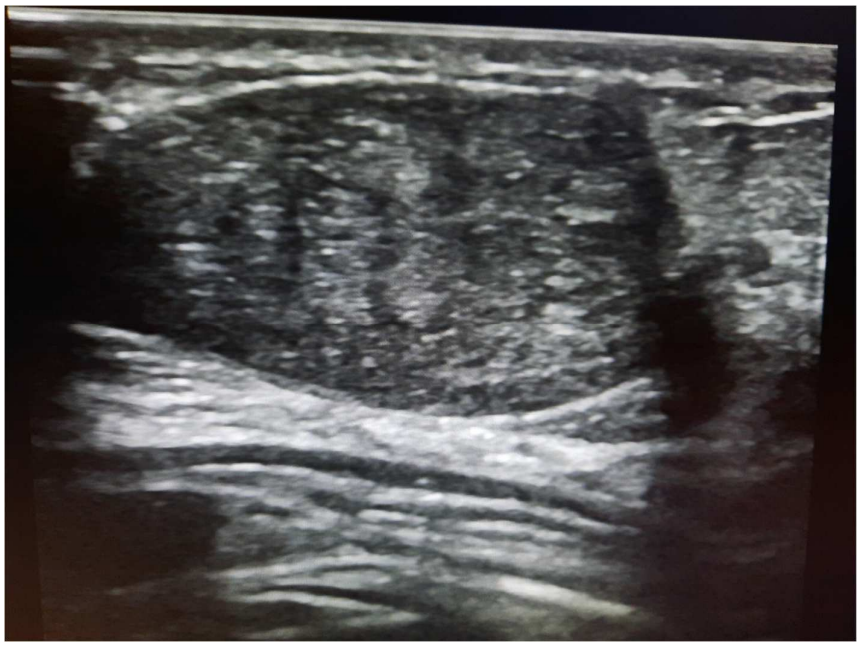

FIG 19: GREY SCALE USG OF BENIGN BREAST MASS

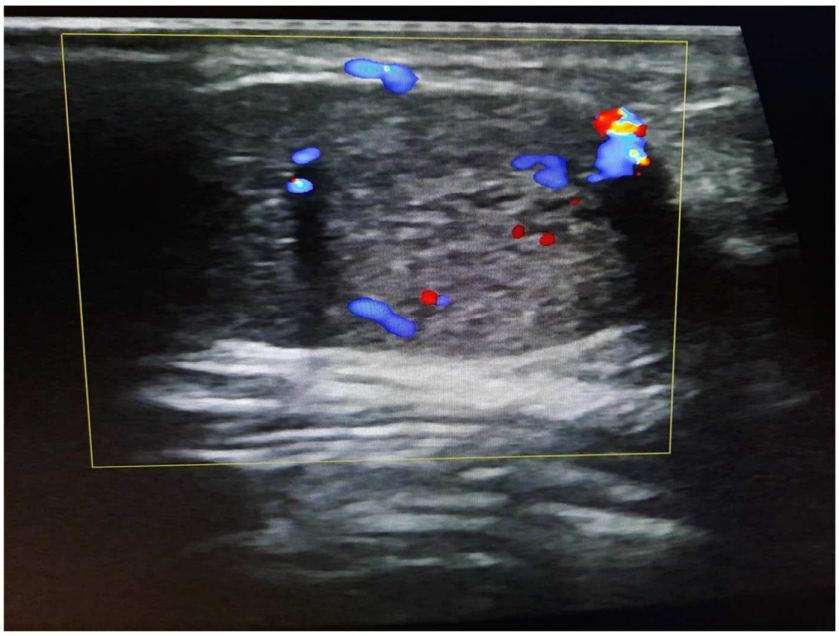

FIG 20: BENIGN BREAST MASS SHOWING CENTRAL & PERIPHERAL VASCULARITY

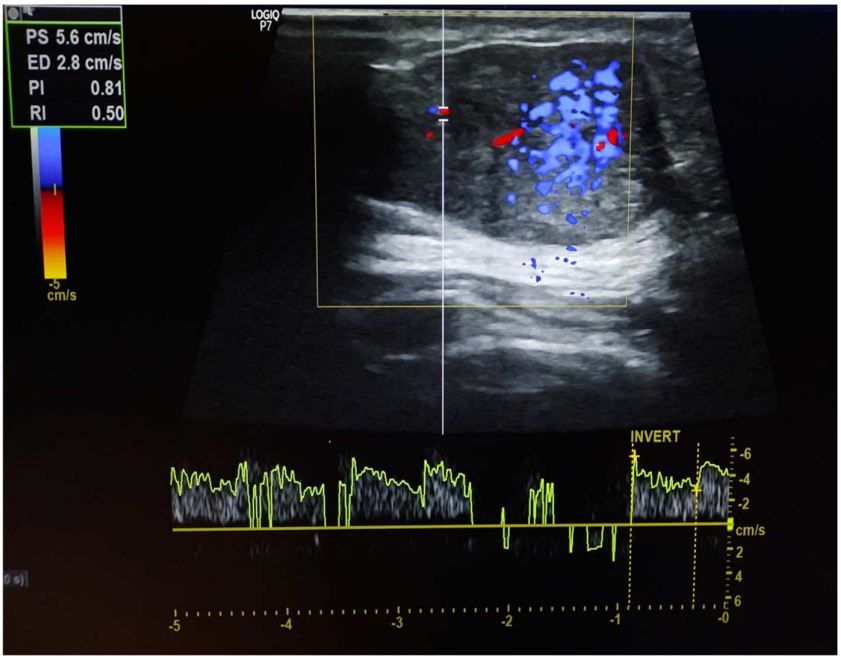

FIG 21: BENIGN BREAST MASS WITH RI, PI & PSV VALUES

ANNEXURE IV – KEY TO MASTER CHART

VARIABLE	CODE	
MARGINS	ID	ILL-DEFINED
	LO	LOBULATED
	SP	SPICULATED
	WD	WELL-DEFINED
	IRR	IRREGULAR
ECHO PATTERN	HE	HETEROECHOIC PREDOMINANTLY HYPOECHOIC
	HYPO	HYPOECHOIC
	HYPER	HYPERECHOIC
CALCIFICATION	0	ABSENT
	1	PRESENT
COLOR DOPPLER PARAMETERS	PI	PULSATILITY INDEX
	RI	RESISTIVE INDEX
	PSV	PEAK SYSTOLIC VELOCITY
VESSEL LOCATION	CP	CENTRAL & PERIPHERAL
	P	PERIPHERAL
PENETRATING VESSELS	0	ABSENT
	1	PRESENT

ANNEXURE V – MASTER CHART

SL NO	AGE (YRS)	SITE	SIZE (cm)	SHAPE	MARGINS	ECHO PATTERN	CALCIFICATION	PI	RI	PSV	LOCATION	PENETRATING VESSELS	SHAPE OF SIGNALS	HISTOPATHOLOGICAL FINDINGS
1.	69	RIGHT	6.6 x 5.9	IRREGULAR	ID	HE	0	0.81	0.58	17.8	CP	1	IRREGULAR	DUCTAL CARCINOMA
2.	40	RIGHT	0.8 x 0.7	OVAL	LO	HYPO	0	1.66	0.78	9.3	P	0	BRANCHING	DUCTAL CARCINOMA
3.	60	RIGHT	2.2 x 1.8	IRREGULAR	SP	HE	0	1.7	0.78	14	P	1	BRANCHING	INVASIVE DUCTAL CARCINOMA
4.	55	RIGHT	4.0 x 3.0	IRREGULAR	LO	HE	0	1.8	0.81	8.2	P	0	SINGLE DOT LIKE	LOBULAR CARCINOMA IN SITU
5.	60	RIGHT	2.8 x 1.8	OVAL	SP	HYPO	1	2.6	0.78	7.7	P	1	BRANCHING	INVASIVE LOBULAR CARCINOMA
6.	60	RIGHT	2.0 x 1.8	IRREGULAR	SP	HYPO	1	1.5	0.73	9.4	CP	1	BRANCHING	INVASIVE DUCTAL CARCINOMA
7.	65	LEFT	3.3 x 1.7	ROUND TO OVAL	ID, LO	HYPO	1	1.5	0.66	9.9	CP	1	BRANCHING	INVASIVE LOBULAR CARCINOMA
8.	48	RIGHT	3.5 x 2.3	OVAL	WD	HYPO	0	1.2	0.77	14.3	CP	0	IRREGULAR	DUCTAL CARCINOMA
9.	43	RIGHT	3.7 x 2.9	IRREGULAR	ID, LO	HYPO	1	1.4	0.9	5.3	CP	1	IRREGULAR	INVASIVE LOBULAR CARCINOMA
10.	45	LEFT	4.0 x 3.2	OVAL	WD	HYPO	0	1.5	0.87	22.3	P	0	LINEAR	INVASIVE DUCTAL CARCINOMA
11.	50	RIGHT	3.2 x 2.3	IRREGULAR	LO	HYPO	1	2	0.75	10.9	P	0	SINGLE DOT LIKE	INVASIVE DUCTAL CARCINOMA
12.	46	LEFT	1.7 x 1.1	ROUND TO OVAL	IRR, LO	HE	1	1.69	0.75	10.5	P	0	IRREGULAR	LOBULAR CARCINOMA IN SITU
13.	52	LEFT	2.1 x 1.6	OVAL	WD	HYPO	0	1.65	0.76	14.1	CP	1	BRANCHING	INVASIVE DUCTAL CARCINOMA
14.	54	RIGHT	4.0 x 2.6	OVAL	IRR	HYPO	1	2.2	0.87	20.1	P	0	BRANCHING	DUCTAL CARCINOMA IN SITU
15.	63	LEFT	3.1 x 2.0	OVAL	SP	HYPO	1	1.7	0.96	22.6	CP	1	SINGLE DOT LIKE	INVASIVE LOBULAR CARCINOMA
16.	46	LEFT	2.0 x 1.5	IRREGULAR	LO	HE	0	1.38	0.82	23.2	CP	1	LINEAR	LOBULAR CARCINOMA IN SITU
17.	40	RIGHT	2.6 x 1.9	IRREGULAR	LO	HE	1	1.4	0.76	18	CP	1	LINEAR	INVASIVE DUCTAL CARCINOMA
18.	63	LEFT	3.2 x 2.6	IRREGULAR	SP	HYPO	0	1.38	0.77	13.8	CP	1	BRANCHING	INVASIVE LOBULAR CARCINOMA
19.	49	RIGHT	2.9 x 2.0	OVAL	WD	HYPO	0	1.35	0.76	15	P	0	BRANCHING	INVASIVE LOBULAR CARCINOMA
20.	53	LEFT	2.8 x 2.2	OVAL	IRR	HE	0	1.36	0.74	12.5	P	1	IRREGULAR	DUCTAL CARCINOMA IN SITU
21.	30	RIGHT	6.5 x 5.4	OVAL	WD	HE	0	0.74	0.55	20	CP	1	IRREGULAR	PHYLODES TUMOR
22.	22	LEFT	2.2 x 1.9	OVAL	WD	HYPO	0	0.71	0.57	6	P	0	SINGLE DOT LIKE	FIBROADENOMA
23.	21	LEFT	2.4 x 1.4	ROUND	WD	HYPO	0	0.81	0.5	5.6	CP	1	IRREGULAR	FIBROADENOMA
24.	44	LEFT	1.5 x 1.1	OVAL	WD	HYPO	0	0.95	0.65	14.1	P	0	SINGLE DOT LIKE	INTRADUCTAL PAPILLOMA
25.	43	LEFT	2.0 x 1.5	OVAL	WD	HYPO	0	1.8	0.82	12.6	P	0	SINGLE DOT LIKE	TUBULAR ADENOMA
26.	41	LEFT	2.2 x 0.9	OVAL	WD	HYPER	0	0.7	0.51	7.7	CP	0	SINGLE DOT LIKE	LIPOMA
27.	20	RIGHT	1.5 x 1.0	ROUND	WD	HYPO	0	0.47	0.4	10.4	P	0	SINGLE DOT LIKE	FIBROADENOMA
28.	21	RIGHT	2.2 x 1.1	ROUND	WD	HYPO	0	0.76	0.66	9.8	P	0	SINGLE DOT LIKE	INTRADUCTAL PAPILLOMA
29.	27	LEFT	2.6 x 1.8	ROUND	WD	HYPER	0	0.84	0.6	19	CP	0	SINGLE DOT LIKE	LIPOMA
30.	27	RIGHT	3.0 X 2.2	ROUND	WD	HYPO	0	0.87	0.65	10.5	P	0	SINGLE DOT LIKE	FIBROADENOMA
31.	37	LEFT	3.4 x 2.0	ROUND	WD	HYPO	0	1	0.72	8.9	P	0	IRREGULAR	FIBROADENOMA
32.	45	RIGHT	2.3 x 1.0	LOBULATED	WD	HYPO	0	0.88	0.62	12.8	P	0	SINGLE DOT LIKE	FIBROADENOMA
33.	32	LEFT	1.8 x 0.7	ROUND	WD	HYPO	0	0.7	0.56	10.8	P	0	BRANCHING	TUBULAR ADENOMA
34.	36	LEFT	3.3 x 2.3	OVAL	WD	HYPO	0	1.3	0.68	12.3	CP	1	IRREGULAR	FIBROADENOMA
35.	43	LEFT	2.4 x 2.2	OVAL	WD	HYPO	0	0.74	0.55	7.2	P	0	BRANCHING	INTRADUCTAL PAPILLOMA
36.	38	LEFT	3.0 x 2.0	OVAL	WD	HYPO	0	0.8	0.59	10.4	P	0	BRANCHING	FIBROADENOMA
37.	52	RIGHT	3.4 x 2.8	ROUND	WD	HYPO	0	0.7	0.59	7.8	P	0	IRREGULAR	PHYLODES TUMOR
38.	32	LEFT	2.3 x 1.8	OVAL	WD	HYPO	1	0.8	0.6	9.8	P	0	IRREGULAR	FIBROADENOMA
39.	44	LEFT	3.4 x 2.3	OVAL	WD	HYPO	0	0.73	0.57	7.7	P	0	SINGLE DOT LIKE	FIBROADENOMA
40.	28	RIGHT	3.5 x 2.9	ROUND	WD	HYPER	1	0.8	0.62	10.3	P	0	SINGLE DOT LIKE	LIPOMA