Pattern of Ultrasonographic Breast Findings in Jos University Teaching Hospital

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Authors' contributions

We certify that all individuals listed as authors of this manuscript contributed substantially to the research or contents of the manuscript. Author AJS participated in designing the study protocol, collecting data, manuscript preparation and final review. Author SMD participated in study protocol and final review of manuscript. Author AAS was involved in data analysis and review of the manuscript.

Original Research Article

ABSTRACT

Introduction: Radiological examination of the breast is established as an essential part of the modern multidisciplinary approach to effective investigation and management of breast disease. Ultrasonography of the breast plays a prominent role in radiological management of breast lesions.
Methods: The study was a retrospective analysis of all the breast ultrasound scan at the Jos university Teaching Hospital (JUTH), Jos, Plateau State. Over a one year period of January 2nd 2013-January 2nd 2014. All the breast ultrasound scan results were retrieved from the archive of the department after necessary approval. Information soughts for included patient age, sex, indications for the scanning and outcome of the scanning.
Results: Women constituted 88.56% of the 201 patients scanned. There was an increase in the age of the patients to the age group of 20-29 after which, there was a steady decline? Fibroadenoma was the highest indication and the second highest finding. There was a good

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relationship between indications and findings, with a p value of 0.001.

Conclusion: It was noted that younger age groups had more breast US, in which benign lesions constituted the major abnormal findings. Most of the males US scans were abnormal compared to females. The clinico-radiological correlation was significant.

1. INTRODUCTION

The breast or mammary gland is a modified sweat gland that has the specific function of milk production. An understanding of the basic anatomy, physiology, and histology is important in the interpretation of ultrasound mammography. With an understanding of the normal breast, one is better able to correlate radiologic-pathologic entities [1].

In the young non-lactating breast, the parenchyma is primarily composed of fibroglandular tissue, with little or no subcutaneous fat. With increasing age and parity, more and more fat gets deposited in both the subcutaneous and retromammary layers [2]. It is composed of predominantly fat in males [3].

The initial primary role of ultrasound was the differentiation of solid versus cystic masses. Sonography is ideal for this role and is important in planning the management of the patient [3].

The ACR BI-RADSÂ® Lexicon for Breast Imaging also has descriptions for ultrasound reporting. In the BI-RADSÂ® for ultrasound, the following are described: background echotexture, mass features, calcifications, special cases, and vascularity. Masses are described according to their shape, orientation, margins, lesion boundary, echo pattern, posterior acoustic enhancement features, and effect on surrounding tissue. The background echotexture may be homogeneous-fat, homogeneous-fibroglandular, or heterogeneous [4,5].

Mass shapes may be oval, round, or irregular, and their orientation is parallel or not parallel to the chest wall. The margination of masses may be described as circumscribed or not circumscribed (indistinct, angular, microlobulated, or spiculated) [6].

Sonographic features of benign appearing solid masses include an oval or ellipsoid shape, "wider-than-tall" orientation parallel to the skin, circumscribed margins, gentle and smooth (less than three) lobulations, as well as absence of any malignant features. Lesions with these features are commonly fibroadenomas or other benign masses and can often be safely followed, even if the mass is palpable [7].

Malignant features of solid masses include spiculations, angular margins, marked hypoechogenicity, posterior acoustic shadowing, microcalcifications, ductal extension, branching pattern, and 1–2-mm microlobulations. These are also often taller-than-wide lesions with a non-parallel orientation to the skin and may occasionally be associated with thickened Cooper ligaments and/or or skin thickening. Most cancers have more than one malignant feature, spiculation being the most specific and angular margins the most common [7]. There is, however, considerable overlap between these benign and malignant US features and careful scanning technique, as well as direct correlation with mammography, is essential [7].

Early studies investigating the use of color, power, and quantitative spectral Doppler US in the breast reported that the presence of increased vascularity, as well as changes in the pulsatility and resistive indexes, showed that these Doppler findings could be used to reliably characterize malignant lesions. Color and power Doppler US are also useful to evaluate cysts and complex cystic masses that contain a solid component [8].

At physical examination, it has long been recognized that malignant tumors tend to feel hard when compared with benign lesions. US elastography can be used to measure tissue stiffness with the potential to improve specificity in the diagnosis of breast masses. There are two forms of US elastography available today: strain and shear wave. With either technique, acoustic information regarding lesion stiffness is converted into a black-and-white or color-scaled image that can also be superimposed on top of a B-mode gray-scale image [9,10].

US is often preferred to galactography in the study of nipple discharge, as it may provide a diagnosis of papilloma and localize the lesion

with a view to surgical biopsy [11]. US is also used as a guide for needle biopsy with vacuum-assisted devices, which is preferred to core biopsies because a greater amount of tissue is obtained (sometimes the entire lesion) with the possibility to make a more accurate histological diagnosis and often definitively stop the secretion [11,12].

A cyst is seen on USG as a well-defined, round or oval, anechoic structure with a thin wall. They may be solitary or multiple [2]. Breast cysts are the commonest cause of breast lumps in women between 35 and 50 years of age [2]. If the mass is mammographically visible or palpable, it is important to make sure that this finding corresponds to the cyst and that there are no adjacent, more important, solid lesions [8].

The use of screening breast US in addition to mammography, particularly in women with dense breast tissue, is becoming more widely accepted in the United States. 2 Breast US guidance is the primary biopsy method used in most breast imaging practices, and the radiologist should be familiar with various biopsy devices and techniques to adequately sample any breast mass identified at US [13].

Radiological examination of the breast is established as an essential part of the modern multidisciplinary approach to effective investigation and management of breast disease. [2] US, CT (computed tomography), MRI (magnetic resonance imaging) and Scintigraphy can all be used in evaluating the breast [3].

This article aim to highlight the clinico-radiological features of breast pathologies in our center.

2. METHODS

The study was a retrospective analysis of all the breast ultrasound scan at the Jos University Teaching Hospital (JUTH), Jos, Plateau State, over a one year period (January 2nd 2013-January 2nd 2014). All the breast ultrasound scans were retrieved from the archive of the department after necessary approval. Information sought for included patient's age, sex, indications for the scanning and outcome of the scanning.

Data was analyzed using SPSS Version 20. Statistical parameters such as chi square, student's T-test ANOVA and pearson's correlation were used for association between different variables. P value of <0.05 was considered statistically significant. The results were presented in the form of tables, charts and images.

3. TECHNIQUE

During the initial US survey of the region of interest in the breast, the depth was set so that the pectoralis muscle is visualized along the posterior margin of the field of view. Initial gain settings were adjusted so that fat at all levels is displayed as a midlevel gray. Simple cysts are anechoic. Compared with breast fat, most solid masses are hypoechoic, while the skin, Cooper ligaments, and fibrous tissue are echogenic.

All examinations were performed using LOGIC 5, GE real-time ultrasound machine using a 10MHZ linear transducer and ultrasound transmission gel to act as a coupling gel. The patient was examined in the supine oblique position. The side being examined was raised and the arm placed below the head to ensure that the breast tissue was evenly distributed over the chest wall. Medial lesions were scanned in the supine position, and lateral lesions, including the axilla, was scanned with the patient in the contralateral oblique position. This allowed for elimination of potential artifact secondary to inadequate compression of breast tissue.

4. RESULTS

201 patients had breast scan, of which 88% were females and males constitute the rest.

The youngest patient in the study was 17 years and the oldest was 62 years. The 20-29 age group had the highest patients. There was a steady decrease in number of patients as the age increased. Fig. 1.? Fibroadenoma had the highest indication, followed by mastitis and mastalgia Table 2.

The findings varied, with the highest incidence being normal (over 40%) among females. Fibroadenoma was the commonest abnormal findings. This was closely followed by cyst and then abscess. Those with malignant lesion were less than 5% and this may be due to the cluster of age group involved in the study Figs. 2 and 3.

Abscess was the commonest finding in males. Cyst and gynaecomastia were the next common abnormal findings. Malignant lesions were less than 5% Fig. 2.

Table 1. Relationship between demographic variables and findings

Variables	Findings		P
	Normal	**Abnormal**	
Gender			
Male	5(21.7)	18(78.4)	0.034
Female	80(44.9)	98(55.1)	
Total	85(42.3)	116(57.7)	
Age group			
<20	5(35.7)	9(64.3)	0.033
20-29	28(38.4)	45(61.6)	
30-39	35(58.3)	25(41.7)	
40-49	10(30.3)	23(69.7)	
50-59	3(21.4)	11(78.6)	
>59	4(57.1)	3(42.9)	
Total	85(42.3)	116(57.7)	

Table 2. Relationship between indications and findings

Indications	Findings		P
	Normal	**Abnormal**	
Fibroadenoma	36(42.4)	43(54.4)	0.001
Mastitis	8(26.7)	22(73.3)	
Benign mammary dysplasia	3(20.0)	12(80.0)	
Numbness	2(28.6)	5(71.4)	
Mastalgia	14(63.6)	8(36.4)	
Fibroadenosis	1(33.3)	2(66.7)	
Abscess	0(0.0)	7(100.0)	
Cancer	2(50.0)	4(50.0)	
Screening	11(100.0)	0(0.0)	
Cyst	0(0.0)	3(100.0)	
Prolactinoma	3(66.7)	1(33.3)	
Lipoma	0(0.0)	1(100.0)	
Duct Ectasia	2(100.0)	0(0.0)	
Cellulitis	0(0.0)	1(100.0)	
Gynaecomastia	2(28.6)	5(71.4)	
Nipple discharge	1(33.3)	2(66.7)	
Total	85(42.3)	116(57.7)	
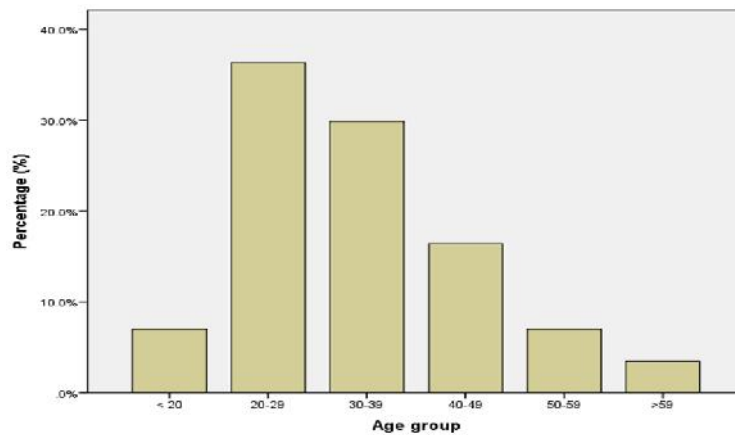
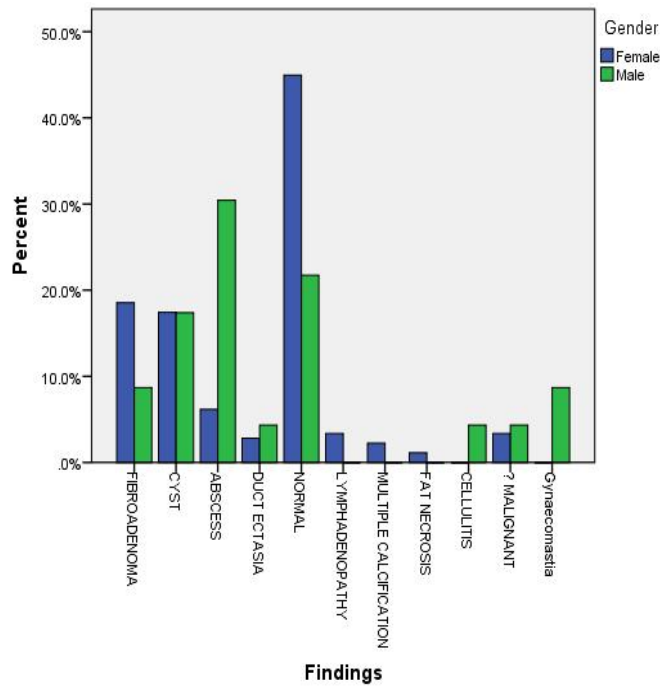**Fig. 1. Age distribution of patients**

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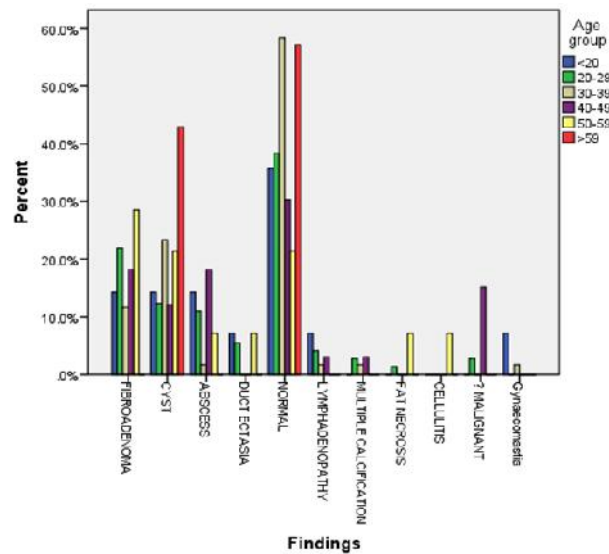**Fig. 2. Distribution of findings among patients based on gender**

Fig. 3. Distribution of findings among patients based on age groups

Comparatively, fibroadenoma was noted more in females. Cyst had equal occurrence in both sexes. Abscess in males was about four times more than in females. Males had more malignant lesions Fig. 2.

Fibroadenoma, fat necrosis and gynaecomastia were noted more in the 50-59 age groups. Cyst occurred more in the >59. Abscess and malignant lesions were noted more in the 40-49 age groups.

Most of the males scanned had pathology in the breast (78.4%) compared to the females that (55.1%) had pathology. 116(57.7%) patients had abnormal findings in total. The relationship between the gender and findings was significant with a p value of 0.034.

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The age group of 20-29 had the highest incidence of abnormal findings of 45 patients. The abnormal findings decreased with increasing age. There was a significant relationship between age group and findings, with a p value of 0.033. There was a significant relationship between the indications and findings, with a p value of 0.001. Table 2.
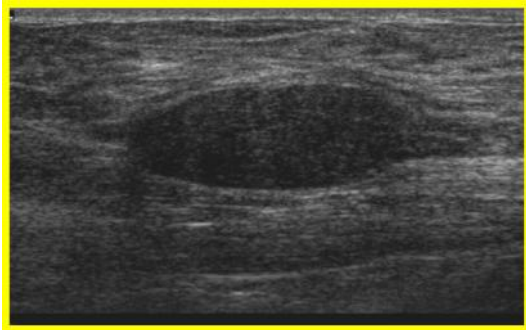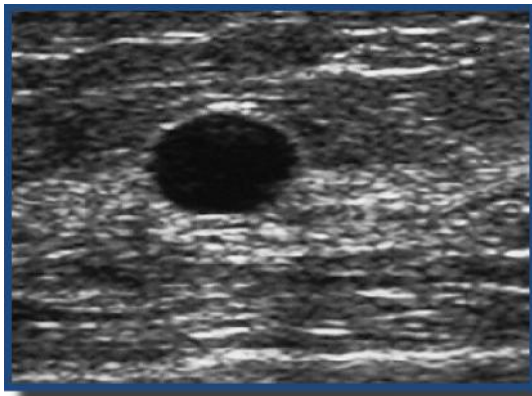

Fig. 4. Fibroadenoma

Fig. 5. Cyst

5. DISCUSSION

A lump in the breast is a cause of great concern. High frequency, high-resolution US (ultrasound scan) helps in its evaluation. This is exemplified in women with dense breast tissue where US is useful in detecting small breast cancers that are not seen on mammography. Several studies in the past have addressed the issue of differentiating benign from malignant lesions in the breast [2]. Ultrasound has been used successfully to differentiate benign and malignant breast lesions [13].

201 patients breast scan results were evaluated of which 23 were males. The females constituted over 88% of the patients and this may be due to the fact that their breasts are bigger than that of males and are involved in milk production [3].
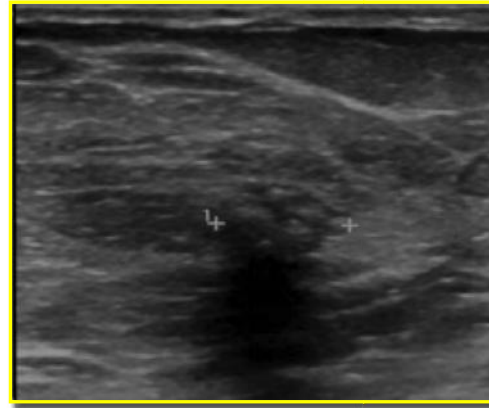
SPICULATED

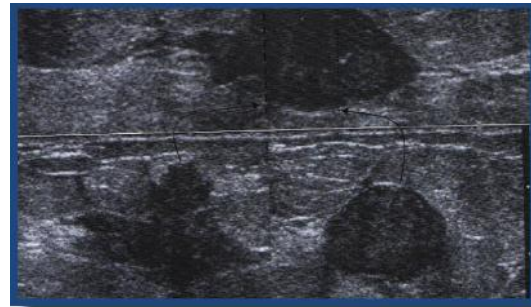**Fig. 6a. Spiculated mass**

Fig. 6b. Malignant mass

Most of the males 18(78.4%) in the study had abnormal lesions as against the females that had 55.1%. This finding was significant with a p value of 0.034.This shows that complaint or swelling in the breast in men is something that should be evaluated thoroughly because they are likely due to diseased process [3].

Gynaecomastia is the most common benign condition of the male breast and the most common cause of a palpable mass in the male patients. It might be due to hormonal inbalance, seen at puberty and around 50 years. It could be associated with other diseased process [3]. Our finding was similar, in the sense that gynaecomastia was one of the commonest breast findings among males. Gynaecomastia was noted in the age group of 50-59 years. Our finding based on age was similar to what was found by Silaja et al. [3].

The age group of 20-29 has the highest number of patients in this study and there was a steady decrease in patients' number as the age increased. This is most likely due to the usage of ultrasound in the younger age groups that have denser breast [2]. Those that are 40 years and above constituted less than 5% of the study population, which is most likely due to mammography usage in evaluating breast lesions in this age groups.

The 20-29 age group had the highest findings, with the abnormal findings constituting 61.6%. The finding was statistically significant with a p value of 0.03.

The indications varied greatly with fibroadenoma being the most, then mastitis and mastagia. These are benign findings seen in the younger age groups in women.

The findings of this study also varied with the highest incidence being normal. This is likely due to the indications that were non-specific. The other findings noted were fibroadenoma, which was the commonest benign lesions seen [2,24]. Other benign lesions noted were cyst and abscess. Malignant lesions were fewer compared than the benign lesions. This finding was noted in this study because of the prevalence of the younger age groups. Masciadri[27] et al also documented that, "it is important to recognize benign breast diseases from the clinical signs as well as mammographic and ultrasound (US) findings, since most lesions found in women consulting a physician are benign"

Fibroadenoma, a benign condition, is the most common cause of breast mass in women younger than 35 years [16,24]. Fibroadenoma is an estrogen-induced tumor that forms in adolescence. It is the third most common breast lesion after fibrocystic disease and carcinoma [2,24]. It is the commonest breast lesion noted in this study. Fig. 1. It usually presents as a firm, smooth, oval-shaped, freely movable mass. It is rarely tender or painful. The size is usually under 5 cm, though larger fibroadenomas are known. Fibroadenomas are multiple in 10–20% and bilateral in 4% of cases. Calcifications may occur [2,24]. Fig. 8. Fibroadenomas persist and may enlarge during pregnancy and lactation in response to increased oestrogen [16]. Most often fibroadenomas are well-defined masses of either homogenous or heterogeneous echogenicity depending on their composition. Most often they transmit sound thus not inducing posterior shadowing artefact. Depending on the age of the fibroadenoma, calcification can be present and may or may not cause posterior shadowing. Central blood flow may or may not be evident on Colour Doppler Imaging [16]. We noted that this lesion occurred more in the 50-59 age groups in our study. Fig. 2. This is at variance with what was found by other researchers [2,24]. But similar to what was found by Masciadri et al. [27]. Fibroadenomas have two peaks of incidence: in the third and in the fifth decade of life, but they may also occur after menopause as a result of hormone replacement therapy [27]. Fibroadenoma in men is extremely a rare entity, because of the absence of lobules in the male breast [14]. This was at variant with what we found in our study, in which some of the males had breast lesions that were suggestive of fibroadenoma.

Mastitis is an inflammation of the breast and has been classified into two types: infectious and non-infectious. Non-infective mastitis can occur as a result of blocked ducts, engorgement or physical injury to the breast resulting in a localized inflammatory response [15]. Patients with abscess may present with fever, pain, tenderness to touch and increased white cell count. Abscesses are most commonly located in the central or sub-areolar area. An abscess may show an ill-defined or a well-defined outline. It may be anechoic or may reveal low-level internal echoes and posterior enhancement [2]. It was noted more in males compared to females in this study. It was noted more in the 40-49 age groups. Breast infections most commonly affect women aged 18-50 [18]. Abscess formation as a complication postpartum mastitis are fewer.18 Lactational mastitis is seen in approximately 2%-3% of lactating women, and breast abscess may develop in 5%-11% of women with mastitis [19].

Breast cysts are the commonest cause of breast lumps in women between 35 and 50 years of age [2]. Our study had patients in this age groups, but the highest occurrence was noted in patients above 59 years. There was equal occurrence of cyst in males and females.

After skin cancer, breast cancer is the most commonly diagnosed cancer in women.20 It accounts for approximately 1 in 4 cancers diagnosed in US women [20]. Breast cancer is on top of the list of cancers among females and the commonest cancer when both sexes are combined in Nigeria [28]. The incidence of male breast cancer peaks at age 71 years [21]. There

are 1,900 men diagnosed with breast cancer yearly, compared with 190,000 women, but the case fatality rate is similar [22]. More than 99% of breast cancers are found in women; 0.7% of breast cancers occur in men [22]. We noted that the incidence of malignant breast lesions in this study was less than 5% in both males and females. We also noted that malignant breast lesions were more in males. This was similar to what was found by other researchers in Nigeria [29]. Men with changes in breast size should undergo diagnostic workup completed as aggressively as in women, to help in early diagnosis of breast lesions [23].

Fat necrosis is benign lesion that is as a result of saponification of local fat [1,24]. It was seen in the breast as a result of trauma. It was noted in this study among females and in the age group of 50-59 age groups. It is usually seen in the middle-aged women [1,24] Fig. 7.
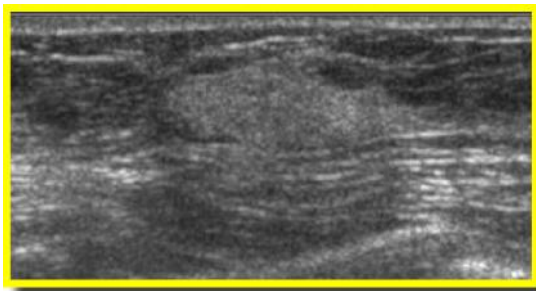

Fig. 7. Fat necrosis
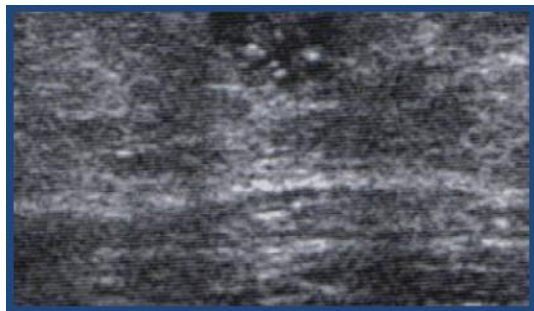
Fig. 8. Calcifications

The study showed a good correlation between indications and findings with a p value of 0.001. Irurhe et al. [25] noted that "when the use of ultrasonography was compared with the histology report in the diagnosis of breast lesion in the study population, the sensitivity was 100%, specificity (96.6%), accuracy (97%), post predictive value (PPV) 81.3%, and negative

predictive value (NPV) 100%. The accuracy, specificity and PPV however decreased with increasing age." Ultrasonography can be used to evaluate breast lesions with some degree of certainty. However, histology report is needed to ascertain diagnosis of breast lesions. A standard examination carried out by experienced operators using equipment of the latest technology has shown an elevated degree of sensitivity and specificity due to the possibility of compound and harmonic imaging which improves the visibility of the margins and the echo-structure of the lesion [26]. Technological progress has also over the years provided software that allows second-level evaluation, which can further improve a non-invasive diagnostic approach in order to avoid an excessive use of biopsy as a definitive diagnostic tool [27].
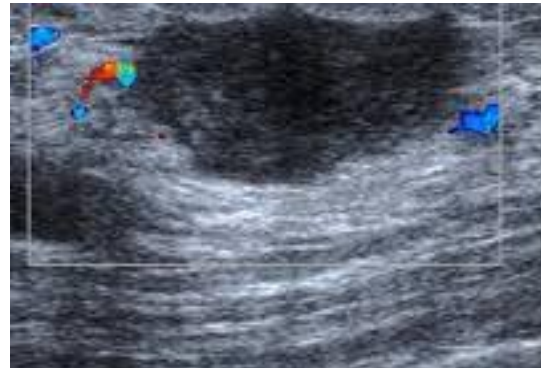
Fig. 9. Abscess

Many imaging modalities can be used in investigating breast lesions. Ultrasonography is cheap, non-invasive, readily available [7]. Advances in the field of ultrasonography are helping in making assessment that are more accurate [8]. Usage of Doppler facility in breast scan has contributed immensely in differentiating benign from malignant lesions. Ultrasound elastography is now being used in assessing the stiffness of the breast. It is noted that the breast is stiffer in malignant breast [8,17]. However, thanks to the technological progress, the diagnostic potential of US examination is far more complete now, and this procedure is very useful in the workup of a lesion and essential in guiding interventional procedures [17].

6. CONCLUSION

In conclusion, It was noted that younger age groups had more breast US, in which benign

lesions constituted the major abnormal findings. Most of the males US scan results were abnormal compared to females. The clinico-radiological correlation was significant.

7. LIMITATION

Histology results were not part of the study because it was a retrospective evaluation of breast scans done in the department.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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