Primary Breast Liposarcoma

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ABSTRACT

Liposarcoma of breast is a rare breast malignancy. It accounts for 0.3% of the breast sarcomas. Subtypes of breast sarcomas are angiosarcoma (most common), liposarcoma, malignant fibrous histiocytoma, leiomyosarcoma and fibrosarcoma. We hereby report a case of liposarcoma in a 55 year old female emphasizing the imaging features that can aid in differentiating it from carcinomas, other sarcomas and benign fat containing masses. This is important as treatment of these varying conditions differ widely. Histologically, liposarcoma may be well differentiated, mixed or dedifferentiated (high grade). Risk of metastasis and recurrence increase with higher grade. Determination of the degree of differentiation is important for surgical planning and prognosis.

CASE REPORT

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A 55 year old female presented with a lump in the left breast since 3-4 years which had increased in size since 1 month. On physical examination, a soft to firm lump could be felt at the symptomatic site. Her past history was not significant, and she had no prior imaging studies for the breast.

A mammogram was done which showed a large well-defined encapsulated fat containing mass mainly in the upper inner quadrant of the left breast (Figures 1, 2 - red arrow). A peripheral dense solid component was seen adjacent to it (Figures 1, 2 - white arrow). Margins between the two lesions were not well defined. No enlarged axillary lymph nodes were noted. On breast ultrasound, a large 6.7 x 5.6 cm predominantly echogenic mass was seen suggestive of a fat containing mass (Figure 3 - red arrow). A 3.8 cm solid irregularly marginated component was seen adjacent to it. Colour Doppler showed moderate internal arterial flow in the solid component. (Figures 3, 4, 5 – white arrow).

A diagnosis of a large encapsulated fat containing mass with a dense irregular peripheral component was given, suspicious for a malignancy. Differential diagnoses were provided, one of a breast liposarcoma and second of a fat containing benign breast lesion such as necrosis in a lipoma (less likely).

Ultrasound guided core biopsy was done from the dense peripheral component.

The initial histopathology showed a spindle cell neoplasm with spindle cells in fascicles within a collagenous stroma (Figure 6). The elongated densely staining nuclei were uniform appearing with rare mitoses (Figure 6 - white arrow). Several intermingled inflammatory cells were seen (Figure 6 - red arrow). A diagnosis of spindle cell neoplasm was given. Wide excision of the mass was advised with histological evaluation.

Due to cost constraints and as a provisional diagnosis was obtained on ultrasound guided biopsy, further evaluation with MRI was not performed.

Histopathology after wide excision showed a dedifferentiated liposarcoma (Figure 7). There were areas showing lobules of lipoblasts with nuclear pleomorphism (Figure 7 - red arrow), well differentiated areas showing abrupt transition into the dedifferentiated areas containing spindle cell fascicles and myxoid matrix (Figure 7-white arrow).

PET-CT was done later which showed no evidence of loco regional lymph nodes or metastatic lesions.

As the liposarcoma was of a dedifferentiated type and the lesion was >5 cm in size, adjuvant radiotherapy was given. After completion of radiation therapy, patient was advised a six-monthly clinical and imaging follow up for the next 5 years. At present, patient is disease- free clinically and on imaging after one year of follow up.

DISCUSSION

Etiology & Demographics:

Of the breast malignancies, ductal carcinomas are most common. Primary breast sarcomas are rare, accounting only for 1% of all breast malignancies. Breast sarcomas include angiosarcoma (most common), liposarcoma, malignant fibrous histiocytoma, leiomyosarcoma and fibrosarcoma [1, 2]. Liposarcomas- a subset of sarcomas are very rare, forming only 0.3% of the sarcomas. No known cause for liposarcoma development is known. Liposarcomas do not develop from lipomas. One of the risk factors may be prior irradiation to the chest. Generally, liposarcomas are seen between 45- 55 years of age [3] and are unilateral at presentation. WHO has classified liposarcoma into seven subtypes – well differentiated, dedifferentiated, myxoid, round cell, pleomorphic, mixed type and not otherwise specified [4].

Liposarcomas on imaging, have to be differentiated from benign fat containing masses, invasive breast carcinomas and other breast sarcomas.

Clinical & Imaging Findings:

Liposarcomas are usually slow growing masses. Their size is generally large on presentation. Median size is around 8 cm. However, these can grow large up to 20 cm. Pectoral muscle invasion, skin changes, nipple retraction are rare in liposarcomas.

On mammography, these tumors often present as an ill-defined opacity with fat and soft tissue components within. On breast ultrasound, these appear predominantly echogenic with solid areas and vascularity within. MRI helps in characterisation of the fat and soft tissue components, determination of exact extent and presence of axillary lymphadenopathy. On contrast enhanced MRI, these appear as enhancing masses with early peak contrast enhancement and gradual fading or plateauing of the contrast enhancement on kinetic analysis. Positron emission tomography-computed tomography (PET-CT) helps to determine metabolic activity within the primary lesion, presence of loco regional lymphadenopathy and distant metastases. These tumours show increased uptake and are avid on fludeoxyglucose (FDG) PET. Maximum standardized uptake value (SUVmax) is more than 4.

Treatment & Prognosis:

Diagnosis is confirmed by an imaging guided Tru-Cut biopsy. Surgery is the most important part of treatment. Wide local excision is done with 2 cm margins. Mastectomy or axillary lymph node dissection is only required if these are necessary to obtain tumor free margins. Adjuvant chemotherapy or radiotherapy may be needed in cases where negative margins cannot be obtained by surgery alone, size > 5 cm or high grade such as pleomorphic or round cell liposarcomas [5, 6].

Prognosis depends on grade. 5 year survival is 90% for well differentiated type and 20% for the higher grades pleomorphic and round cell. Well differentiated can recur locally whereas higher grade can have metastases.

Differential Diagnosis:

Some of the differentials in imaging of a fat-containing suspicious breast mass are 1. Benign fat- containing lesions such as lipoma and hamartoma 2. Invasive breast carcinomas and 3. Other breast sarcomas

1. Benign fat containing lesions

A. Lipoma and fat necrosis in a lipoma

Lipoma is seen on mammography as a radiolucent mass without calcification. On ultrasound, it is isoechoic or hyperechoic to surrounding fat. Absence of a soft tissue or solid component on imaging helps to differentiate a lipoma from liposarcoma.

Fat necrosis in a lipoma would have fat content as well as a mixed echogenic soft tissue component. However, absence of vascularity in the soft tissue on Colour Doppler is a differentiating point from a liposarcoma.

On MRI, lipoma will be T1 hyperintense lesion with suppression on fat saturated sequences. It will not enhance on contrast study. Also on PET, lipomas usually are not FDG avid. Fat necrosis in a lipoma may cause increased uptake of FDG due to inflammatory cells.

B. Hamartoma

Hamartoma is seen on mammography as a well-circumscribed mass comprising both fat and soft-tissue densities. Classic description used for a hamartoma is a "breast within a breast" appearance. On mammography, margins would be well circumscribed as opposed to a liposarcoma. Also on Color Doppler, no significant vascularity would be seen. On MRI, a hamartoma is seen as a hypointense lesion with areas of T1 hyperintensity within corresponding to the fat. Again, the margins would be circumscribed unlike a liposarcoma. Also, hamartomas would not show enhancement on contrast study. On PET-CT, they are not FDG avid.

2. Invasive breast carcinomas and other breast sarcomas

Other breast malignancies almost never have fat, in particular on imaging.

Carcinomas and other sarcomas are seen on mammography as irregularly marginated masses with no fat content. Posterior acoustic shadowing, skin thickening, nipple inversion and axillary adenopathy may be seen additionally. Microcalcifications may be seen in carcinomas.

On MRI, carcinomas and sarcomas are seen as enhancing irregular masses with early peak contrast enhancement and gradual fading or plateauing of the contrast enhancement on kinetic analysis. Also, no fat content will be seen. PET-CT shows increased FDG uptake. Again, no fat content will be seen on the CT.

Thus, the unique imaging features of this case helped us to confidently narrow down to the rare diagnosis of liposarcoma in the breast.

TEACHING POINT

Liposarcoma is a rare breast neoplasm. The fat component of this mass seen on the mammogram and ultrasound helped to differentiate it from other malignancies such as carcinomas and other sarcomas. The presence of a solid /soft tissue component on mammogram and ultrasound and internal vascularity seen on color Doppler helped to differentiate it from benign fat containing masses. Histologic type and degree of differentiation in a liposarcoma are crucial for surgical planning and prognosis. Wide excision is the most important mode of treatment. Adjuvant chemotherapy or radiotherapy may be needed in higher grades.

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FIGURES

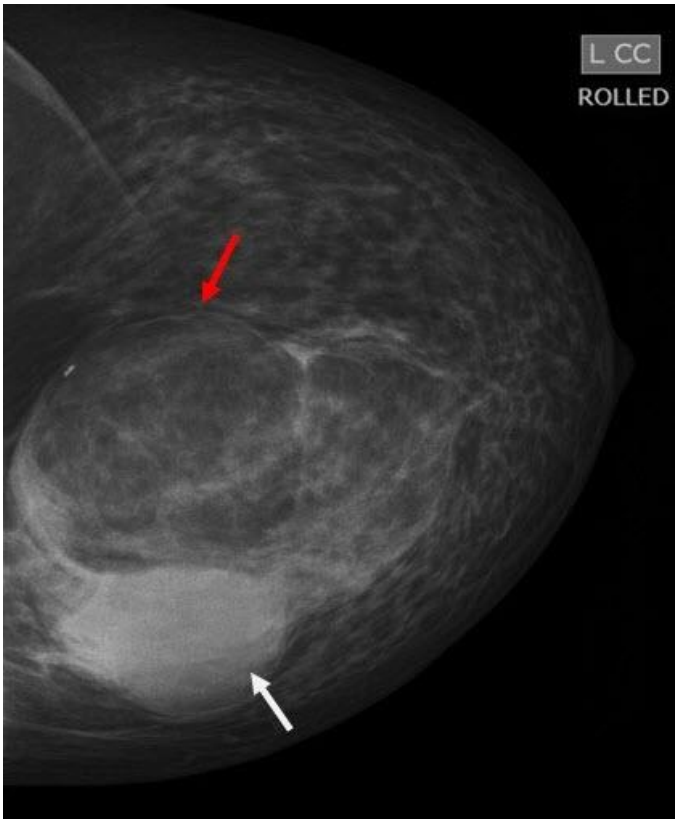


Figure 1: 55 year old female with a lump in the left breast.
TECHNIQUE: Mammogram of the left breast in rolled cranio-caudal rolled view. Tungsten anode; rhodium filter; kVp: 31; mAs: 110.
FINDINGS: Mammogram of the left breast cranio-caudal rolled view showing a large well-defined encapsulated fat containing mass in the upper inner quadrant of the left breast (red arrow) with a peripheral dense solid component adjacent to it (white arrow).

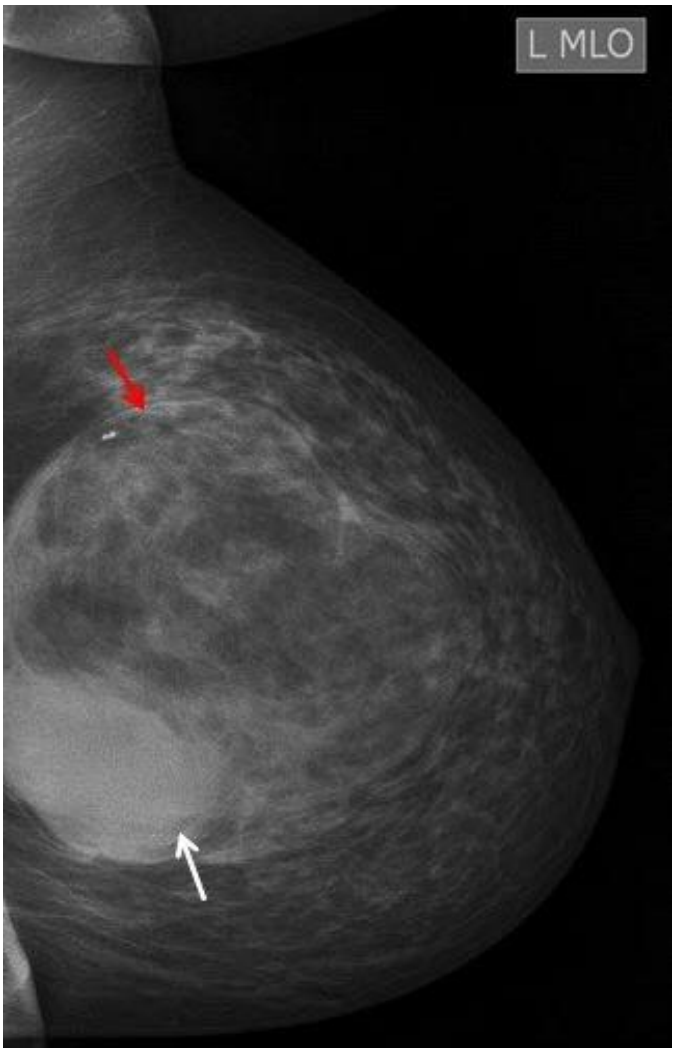
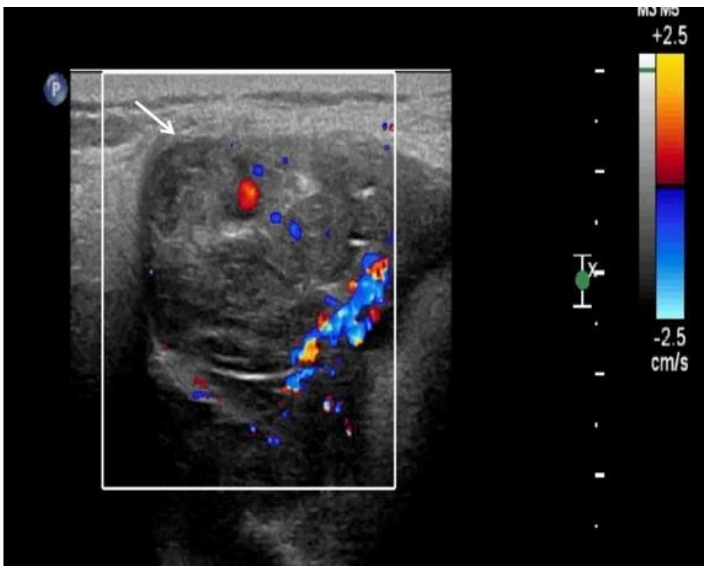


Figure 2: 55 year old female with a lump in the left breast.
TECHNIQUE: Mammogram of the left breast mediolateral view. Tungsten anode; rhodium filter; kVp: 31; mAs: 138
FINDINGS: Mammogram of the left breast showing a large encapsulated well-defined fat containing mass in the upper inner quadrant of the left breast (red arrow) and a peripheral dense solid component adjacent to it (white arrow).



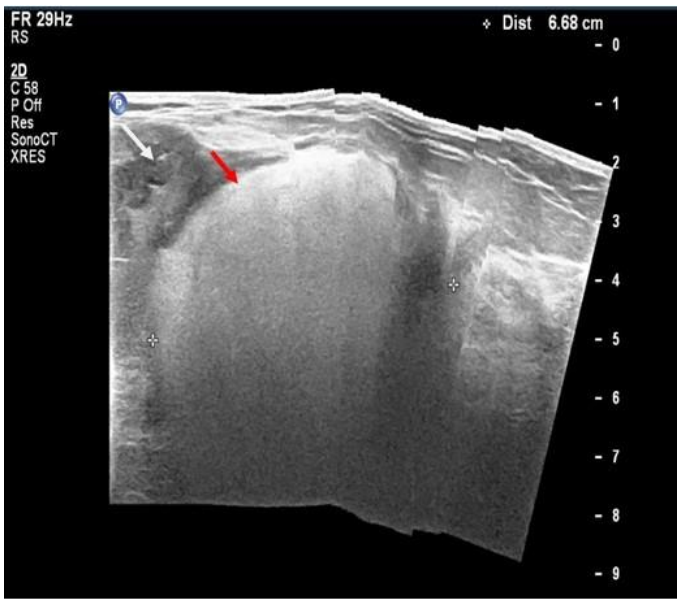


Figure 3: 55 year old female with a lump in the left breast.
TECHNIQUE: Panoramic ultrasound with image magnification factor of 1.2, using a high frequency linear transducer (12 Megahertz)
FINDINGS: Ultrasound showing a 6.7 cm predominantly echogenic mass (red arrow) with a solid irregularly marginated component seen adjacent to it (white arrow).

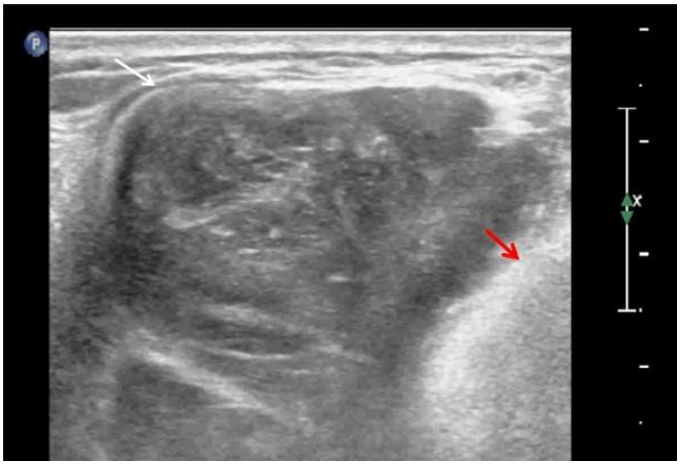


Figure 4: 55 year old female with a lump in the left breast.
TECHNIQUE: Ultrasound with image magnification factor of 1.2, using a high frequency linear transducer (12 Megahertz)
FINDINGS: Ultrasound image showing the solid component measuring approximately 3.8 cm (white arrow) adjacent to the echogenic mass (red arrow).

Figure 5 (left): 55 year old female with a lump in the left breast.
TECHNIQUE: Ultrasound and Color Doppler using a high frequency linear transducer (12 Megahertz) with low color flow settings.
FINDINGS: Colour Doppler image showing the solid component measuring approximately 3.8 cm with vascularity within (white arrow).

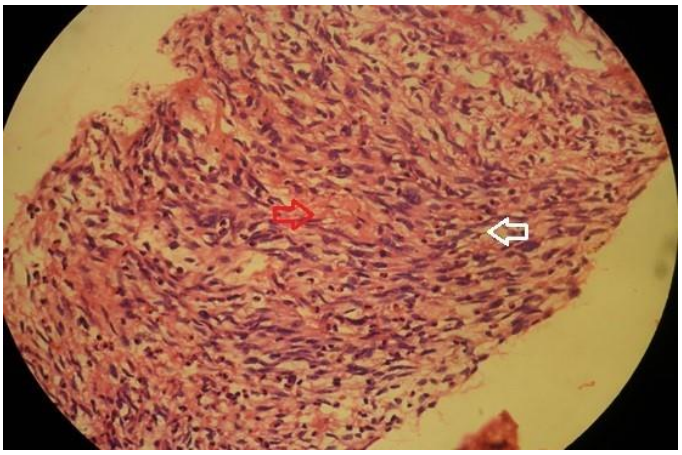


Figure 6: 55 year old female with a lump in the left breast. TECHNIQUE: H&E (Haematoxylin and eosin staining; 200 X). Tru-cut biopsy from the lump.
FINDINGS: Histopathology showing a spindle cell neoplasm. The elongated densely staining nuclei appear uniform with rare mitoses (white arrow) .Several intermingled inflammatory cells seen (red arrow).

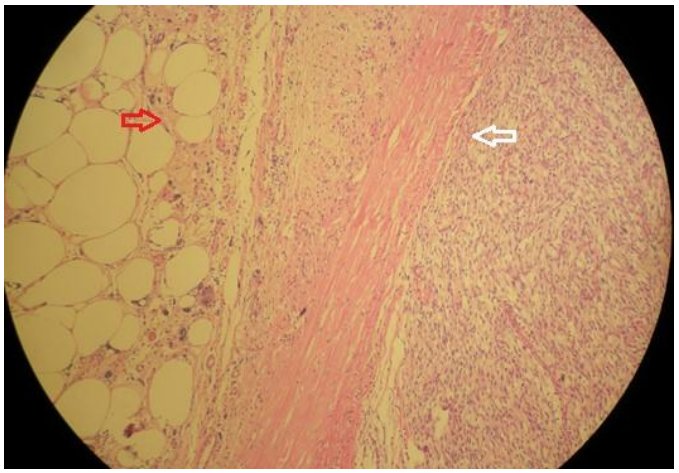


Figure 7: 55 year old female with a lump in the left breast. TECHNIQUE: H&E (Haematoxylin and eosin staining; 200 X), after wide excision
FINDINGS: Histopathology showing a dedifferentiated liposarcoma. Well differentiated lipomatous areas are seen on the left containing lobules of lipoblasts with significant nuclear pleomorphism (red arrow). There is an abrupt transition with the dedifferentiated areas being hypercellular composed of spindle cell fascicles and focal myxoid matrix (white arrow).

Aetiology	Sporadic, inherited.
Incidence	0.3% of breast sarcomas, 0.003% of all breast tumours.
Gender ratio	Females>>>Men, only 3 cases have been reported in men.
Age predilection	45-55 years.
Risk factors	Genetic mutations.
Treatment	Wide local excision with 2 cm margins. Mastectomy or axillary lymph node dissection required if necessary, to obtain tumour free margins. Adjuvant chemotherapy or radiotherapy may be needed.
Prognosis	5-year survival 90% for well differentiated type and 20% for the higher grades pleomorphic and round cell.
Imaging Findings	On mammography, these tumours often present as an ill-defined opacity with fat and soft tissue components within. On breast ultrasound, these appear predominantly echogenic with solid areas and vascularity within. On MRI, fat is suppressed on fat saturated sequence. On contrast enhanced MRI, these are enhancing with early peak contrast enhancement and gradual fading or plateauing of the contrast enhancement on kinetic analysis. These tumours show increased uptake and are avid on fludeoxyglucose (FDG) PET.

Table 1: Summary table for Primary Breast Liposarcoma.

Diagnosis	Mammography	Ultrasound	MRI	PET-CT
Lipoma	• Radiolucent mass without calcification.	• Isoechoic/ slightly hyperechoic. • Solid component absent. • Fat necrosis in a lipoma may have a soft tissue component. • However, absence of vascularity is a differentiating point.	• T1 hyperintense lesion. • Suppression on fat saturated sequences. • No enhancement	• Usually not FDG avid.
Hamartoma	• Well-circumscribed mass with both fat and soft-tissue densities. • "Breast within a breast" appearance.	• Well-circumscribed, solid lesion with both hyperechoic and hypoechoic components. • No significant vascularity on color doppler.	• Fat containing lesion. • Circumscribed margins	• Usually not FDG avid.
Carcinoma	• A spiculated radiodense lesion. • Fat component is absent.	• Ill-defined hypoechoic mass with microcalcifications and vascularity within. • Fat content absent.	• Enhancing irregular masses with spiculated margins. • Fat content is absent.	• Increased FDG uptake. • No fat content on PET-CT.
Other sarcomas	• Irregular high-density masses.	• Irregular mass with indistinct margins, posterior acoustic shadowing. • May show vascularity. • No fat content	• Enhancing irregular masses. • No fat content on MRI.	• Increased FDG uptake in the breast mass, axillary lymph nodes, distant metastases. • No fat content on PET-CT

Table 2: Differential diagnoses table for Primary Breast Liposarcoma.

ABBREVIATIONS

cm - centimetre
FDG - fludeoxyglucose
MRI - Magnetic Resonance Imaging
PET - Positron Emission Tomography
PET-CT - Positron Emission Tomography-Computed Tomography
SUVmax - Maximum standardized uptake value

KEYWORDS

Liposarcoma; breast; breast cancer; mammography; ultrasound

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