

## Analyzing the Importance of Mammography and Sonography in Fat Necrosis: Prospective Clinicopathological Study

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### Abstract

**Aim:** The aim of the present study was to analyze the importance of mammography and sonography in fat necrosis.

**Methods:** A prospective clinicopathological study was conducted on 100 female patients of different age groups from 30 to 60 years. Patients' information is collected from at Department of Obstetrics and Gynaecology, Nalanda Medical College and Hospital, Patna, Bihar, India for one year.

**Results:** 100 lesions were identified on mammograms. The predominant mammographic features of the 100 lesions apparent on mammograms were as follows, 25 (25%) radiolucent oil cyst (either with or without curvilinear mural calcification), 14 (14%) round opacity, 15 (15%) asymmetrical opacity or heterogeneity of the subcutaneous tissues 25 (25%) dystrophic calcifications 4 (4%) clustered pleomorphic microcalcifications and 4 (4%) suspicious speculated mass. 100 lesions were identified at sonography. The predominant US features of the 100 lesions apparent on sonograms were as follows 15 (15%) solid appearing masses, 16 (16%) anechoic masses with posterior acoustic enhancement (cyst), 16 (16%) anechoic masses with posterior acoustic shadowing (cyst with mural calcification), 10 (10%) cystic masses with internal echoes 5 (5%) cystic masses with mural nodule and 25 (25%) increased echogenicity of the subcutaneous tissues (small cysts inside this area±). In 13 (13%) masses, no discrete lesion could be identified on sonograms.

**Conclusion:** In conclusion, there is a wide range of mammographic and ultrasonographic patterns of fat necrosis.

**Keywords:** Breast cancer, screening, Benign, Tumors.

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### Introduction

Fat necrosis, which may be the result of surgical or noniatrogenic trauma and has a wide spectrum of clinical and radiologic appearance varying from that of a benign oil cyst to that of a speculated mass mimicking carcinoma. Histologically, fat necrosis is recognised as a sterile inflammatory process with fat filled macrophages and foreign body giant cells surrounded by interstitial infiltration of plasma cells. [1] Majority present with a palpable lump, typically periareolar, [2] that can clinically mimic malignancy and pose a diagnostic challenge. If a patient presents for evaluation in the early stages of fat necrosis, a systematic approach using American College of Radiology (ACR) guidelines [3] can help to avoid misdiagnosis and ensure confident exclusion of malignancy.

Mammography is the most important diagnostic tool in early fat necrosis. [2] However a normal mammogram does not always exclude underlying pathology [4] and the same holds true for fat necrosis. USG plays an important role in ruling out malignancy and suggesting fat necrosis as the diagnosis. The USG examination is abnormal in almost all the cases including those cases with normal mammogram. [5] Patients with fat necrosis typically experience calcifications, which can occasionally be the only mammographic result [13]. The different sonographic characteristics of fat necrosis reflect the level of fibrosis. The precise cause of fat necrosis is unknown, but it is believed to be a result of the accumulation of fat in and around the vessels that supply blood to the fat

tissue. This accumulation of fat can cause the skin and underlying tissues to become swollen and inflamed, which can lead to the development of fat necrosis. Mammography is an important diagnostic tool for fat necrosis and other common causes of pelvic pain. Mammography can help identify the presence of cancer and help in planning the best course of medical treatment. [6] In addition to that, Sonography is useful in distinguishing fat necrosis from other types of necrosis. Sonography can also help to identify the extent and severity of fat necrosis. Although the fibrous edge of the cyst could calcify or collapse and may result in a morphology that is mammographically equivocal and requires a biopsy to rule out malignancy, lipid cysts are symptomatic of benign fat necrosis. [7]

The majority of perimenopausal women experience breast fat necrosis. Both radiologically and clinically, this condition has the ability to mimic breast cancer. It normally develops as a result of trauma; however, it can also be idiopathic. Trauma can be iatrogenic or unintentional in origin. Accidental injury examples include seat belt trauma. Breast surgery is one of the most common iatrogenic events. [8] Hence, one needs to be cautious about hyperechoic nodule in the deeper tissue planes, and findings like “taller-than-wide” morphology, irregular shape, posterior acoustic shadowing need to be given due importance when considering the nature of the lesion. [9]

Fat necrosis is most commonly the result of trauma to the breast (21–70%), radiotherapy, anticoagulation (warfarin), cyst aspiration, biopsy, lumpectomy, reduction mammoplasty, implant removal, breast reconstruction with tissue transfer,

duct ectasia, and breast infection. Other rare causes for fat necrosis include polyarteritis nodosa, Weber-Christian disease, and granulomatous angiopanniculitis. In some patients, the cause for fat necrosis is unknown. [10] The aim of the present study was to analyze the importance of mammography and sonography in fat necrosis.

### Materials and Methods

A prospective clinicopathological study was conducted on 100 female patients of different age groups from 30 to 60 years. Patients' information is collected from at Department of Obstetrics and Gynaecology, Nalanda Medical College and Hospital, Patna, Bihar, India for one year.

Data has been collected for a one-year period from the imaging laboratory of the mentioned institutes to get real-time clinical information regarding patient condition. Relevant mammographic data were obtained from hospitals' imaging process that includes microscopic view as well. Medical Screening techniques such as mammography and sonography were used to obtain valid clinical insights.

### Results

All the 50 patients were women, who ranged in age from 37 to 68 (mean, 46.4 years). 30 patients (60%) had a known history of trauma related to the region of abnormality. Trauma was due to surgery, motor vehicle injury, kick or pinching. 32 patients (64%) had one or more palpable masses. In four patients, the palpable mass was strongly suggesting malignancy.

**Table 1: Mammographic features of lesions**

Radiolucent oil cyst (mural calcification ±)	25 (25%)
Round opacity	14 (14%)
Asymmetrical opacity-heterogeneity of subcutaneous tissues	15 (15%)
Calcification — dystrophic	25 (25%)
— clustered pleomorphic type	4 (4%)
Suspicious speculated mass	4 (4%)
Negative	13 (13%)

100 lesions were identified on mammograms. The predominant mammographic features of the 100 lesions apparent on mammograms were as follows, 25 (25%) radiolucent oil cyst (either with or without curvilinear mural calcification), 14 (14%)

round opacity, 15 (15%) asymmetrical opacity or heterogeneity of the subcutaneous tissues 25 (25%) dystrophic calcifications 4 (4%) clustered pleomorphic microcalcifications and 4 (4%) suspicious speculated mass.

**Table 2: Sonographic features of lesions**

Solid	15 (15%)
Anechoic with posterior acoustic enhancement	16 (16%)
Anechoic with posterior acoustic shadowing	16 (16%)
Complex with internal echoes	10 (10%)
Complex with mural nodule	5 (5%)
Increased echogenicity of subcutaneous tissues	25 (25%)
Negative	13 (13%)

100 lesions were identified at sonography. The predominant US features of the 100 lesions apparent on sonograms were as follows 15 (15%) solid appearing masses, 16 (16%) anechoic masses with posterior acoustic enhancement (cyst), 16 (16%) anechoic masses with posterior acoustic shadowing (cyst with mural calcification), 10 (10%) cystic masses with internal echoes 5 (5%) cystic masses with mural nodule and 25 (25%) increased echogenicity of the subcutaneous tissues (small cysts inside this area±). In 13 (13%) masses, no discrete lesion could be identified on sonograms.

### Discussion

The typical clinical presentation of fat necrosis can range from an incidental benign finding to a lump. However, in around half of the cases patients do not report any injury to the breast and are clinically occult. Following injury to breast tissue, hemorrhage in the fat leads to induration and firmness, which demarcates and may result in a cavity caused by cystic degeneration. The clinical features of fat necrosis vary from indolent single or multiple smooth round nodules to clinically worrisome fixed, irregular masses with overlying skin retraction. [11-15] Other clinical features associated with fat necrosis include ecchymosis, erythema, inflammation, pain, skin retraction or thickening, nipple retraction, and occasionally lymphadenopathy. [11]

100 lesions were identified on mammograms. The predominant mammographic features of the 100 lesions apparent on mammograms were as follows, 25 (25%) radiolucent oil cyst (either with or without curvilinear mural calcification), 14 (14%) round opacity, 15 (15%) asymmetrical opacity or heterogeneity of the subcutaneous tissues 25 (25%) dystrophic calcifications 4 (4%) clustered pleomorphic microcalcifications and 4 (4%) suspicious speculated mass. 100 lesions were identified at sonography. The predominant US features of the 100 lesions apparent on sonograms were as follows 15 (15%) solid appearing masses, 16 (16%) anechoic masses with posterior acoustic enhancement (cyst), 16 (16%) anechoic masses with posterior acoustic shadowing (cyst with mural calcification), 10 (10%) cystic masses with internal echoes 5 (5%) cystic masses with mural nodule and 25 (25%) increased echogenicity of the subcutaneous tissues (small cysts inside this area±). In 13 (13%) masses, no discrete lesion could be identified on sonograms. Fat necrosis is a process which results from aseptic saponification of fat by means of blood and tissue lipase. [15] Fat necrosis of the breast is important because it is often confused with carcinoma, both clinically and radiologically. [16] The clinical findings vary from non-palpable masses to mobile or fixed hard masses mimicking carcinoma. [17] Pathologically,

fat necrosis is a sterile, inflammatory process that varies in appearance depending on the stage of the lesion. Foreign body giant cells, fat-filled macrophages, and interstitial infiltration by plasma cells are consistently present. Saponification of fat leads to the formation of vacuoles that then become surrounded by macrophages. Healing by fibrosis begins at the periphery and eventually may replace the entire area or leave a persistent cystic cavity. [17]

The spectrum of mammographic findings of fat necrosis include lipid filled cysts with or without calcified walls, round water density opacities, dystrophic or clustered pleomorphic calcifications and speculated densities indistinguishable from carcinoma. Although the mammographic spectrum of fat necrosis has been well documented, to our knowledge, the evolution in mammographic appearance has not been previously reported in large series. [12,17-20]

There are two forms of fat necrosis, depending on the reaction of the surrounding breast, and they differ clinically, mammographically and ultrasonographically. When the fat necrosis stimulates a fibrotic response, it presents as a firm mass that is fixed to the surrounding tissues. The other type forms an oil cyst due to release of free lipid without eliciting a surrounding reaction. [21,22] In literature, the monographic appearance of most oil cysts are described as hypoechoic masses with smooth walls and have neither posterior acoustic enhancement or shadowing. [23,24] In contrast to these studies, in 19 of the 34 oil cysts diagnosed in the study, US showed either posterior acoustic enhancement or shadowing. The oil cyst which showed posterior acoustic shadowing corresponded to round radiolucent lesions with curvilinear wall calcification on mammography. The most common mammographic findings in our series were dystrophic calcifications, followed by radiolucent oil cysts. On US examination however, the most common finding was increased echogenicity of subcutaneous fat tissues (with or without small cysts). In these patients with palpable masses, history of trauma was also present. In our study with the follow-up patients, we have seen that, in the setting of trauma, the sonographic depiction of increased echogenicity of subcutaneous fat tissues, which probably represents the sterile inflammatory process that defines fat necrosis histopathologically, is strongly suggestive of fat necrosis.

### Conclusion

In conclusion, there is a wide range of mammographic and ultrasonographic patterns of fat necrosis. Knowledge of the appearance and evolution of these patterns and a careful

investigation of history of the patient may enable imaging follow-up of these lesions rather than unnecessary biopsies.

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