Pictorial review

Intramammary lymph nodes: normal and abnormal multimodality imaging features

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ABSTRACT

Intramammary lymph nodes (IMLN) are one of the most common benign findings at screening mammography. However, abnormal IMLN features, such as diminished or absent hilum, thickened cortex, not circumscribed margins, increased size or interval change, warrants additional follow-up or pathologic analysis to exclude malignancy. Some benign inflammatory conditions may be associated with imaging-detected suspected abnormal IMLN, such as reactive hyperplasia and silicone-induced lymphadenopathy. In patients with known breast cancer, IMLN are a potential site of locoregional spread, which can change the prognosis and management. In some cases, initial breast carcinomas can also mimic IMLN. Breast radiologists must also be aware of the typical and atypical characteristics of IMLN to suggest further investigation when it is necessary.

INTRODUCTION

The expansion of breast cancer screening exams led to the increase of breast lesions detection. Intramammary lymph nodes (IMLN) are one of the most common benign findings at screening mammography. They are defined as lymph nodes that should be surrounded by breast tissue in all sides, which differentiate them from those in the lower axillary region. The prevalence of IMLN ranges between 0.7 and 48% on current studies, depending on the method used for identification, radiological or pathologic examination.

IMLN with typical features identified in imaging exams are considered a benign finding. However, breast radiologists must also be aware of the atypical characteristics of IMLN to suggest further investigation when it is necessary. The aim of this review is to present normal and abnormal features of IMLN in the most common imaging modalities (mammography, ultrasound and MRI).

NORMAL AND ABNORMAL IMAGING FEATURES

Normal IMLN are typically described in all imaging exams as a circumscribed mass, smaller than 10 mm, with oval or reniform shape and hilar fat, usually at a peripheral location, adjacent to a vein (Figure 1). The most common location (about 70%) is the upper outer quadrants, however, it may be located anywhere in the breast. They are stable over time in comparison to previous exams.

Besides morphological features, a normal IMLN may show hilar vascularization at Doppler ultrasound. At MRI, the IMLN cortex shows high signal intensity at T2 weighted images, homogeneous enhancement after contrast administration and may show suspicious findings on kinetic curve assessment, such as washout type in the delayed phase.

Breast masses lacking these features cannot be reported as normal IMLN. Abnormal IMLN features, such as diminished or absent hilum, thickened cortex, not circumscribed margins, increased size or interval change, warrants additional follow-up or pathologic analysis to exclude malignancy. Some benign inflammatory conditions may be associated with imaging-detected suspected abnormal IMLN, such as reactive hyperplasia and silicone-induced lymphadenopathy. In patients with known breast cancer, IMLN are a potential site of locoregional spread, which can change the prognosis and management. In some cases, initial breast carcinomas can also mimic IMLN. Breast radiologists must also be aware of the typical and atypical characteristics of IMLN to suggest further investigation when it is necessary.

ABNORMAL BENIGN IMLN

Some benign inflammatory conditions may be associated with imaging-detected suspected abnormal IMLN. One cause of false-positive IMLN is reactive hyperplasia, which is just the normal lymph node response to any antigenic stimulus, such as localized or systemic inflammation. For example, patients submitted to breast cancer treatment,
including mastectomy or breast conservative surgery and radiotherapy, may present atypical reactive IMLN with enlargement and cortical thickening (Figure 2). However, sometimes it is difficult to exclude the possibility of recurrence based solely on imaging findings. Sometimes, reactive IMLN may show spontaneous regression on follow-up studies (Figure 3), which confirm its benign aetiology.

Another cause of benign atypical IMLN is silicone-induced lymphadenopathy related to implant ruptures and silicone leakage, which can also mimic malignancy, especially at mammography (Figure 4). At ultrasound, these lymph nodes present a characteristic snowstorm appearance, which is even much more sensitive for silicone lymphadenopathy than the silicone signal at MRI.

Other rare benign causes of abnormal IMLN reported in the literature include Castleman’s disease, HIV-associated lymphadenopathy, tuberculosis and toxoplasma lymphadenitis.

Table 1. Normal and abnormal IMLN imaging features

<table>
<thead>
<tr>
<th>IMLN FEATURES</th>
<th>NORMAL</th>
<th>ABNORMAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHAPE</td>
<td>Ovoid or reniform</td>
<td>Round or lobulated</td>
</tr>
<tr>
<td>MARGINS</td>
<td>Circumscribed</td>
<td>Not circumscribed</td>
</tr>
<tr>
<td>SIZE</td>
<td>Less than 1 cm</td>
<td>More than 1 cm</td>
</tr>
<tr>
<td>CALCIFICATIONS</td>
<td>Absent</td>
<td>Present</td>
</tr>
<tr>
<td>HILAR FAT</td>
<td>Present, may be pronounced</td>
<td>Absent or eccentric</td>
</tr>
<tr>
<td>PARTICULARITIES</td>
<td>Usually adjacent to a vein</td>
<td>Significant alteration in size or morphology at follow-up</td>
</tr>
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IMLN, intramammary lymph nodes.

Metastatic IMLN

IMLN are a potential site of locoregional spread for ipsilateral breast carcinoma. The incidence of metastases in these nodes ranges between 1 and 34% and they are found in the same quadrant as the primary tumour in almost 50% of cases.

The evaluation of IMLN should be meticulous in patients with breast cancer. “Low suspicion” imaging features, such as eccentric/diffuse cortical thickness equal to or greater than 3 mm, should be used for threshold to biopsy in these patients. In contrast, due to the low prevalence of malignancy in imaging-detected suspected abnormal IMLN in females without concurrent breast cancer, only “high suspicion” features, such as eccentric/diffuse cortical thickness equal to or greater than 5 mm or loss of fatty hilum, should be used for threshold to biopsy in this population.

Metastatic IMLN may mimic a synchronous benign mass in a patient with breast cancer; however, its location and proximity of an artery or vein should alert the radiologist to the possibility of a metastatic IMLN (Figures 5 and 6).

There is a lack of good quality data on the management of IMLN metastasis and their clinical significance remains uncertain. Metastatic IMLN are usually associated to axillary lymph nodes metastasis. However, many papers have shown that metastasis to IMLN is an independent factor of poor prognosis for breast cancer patients, regardless of the axillary status.
Intramammary Lymph Nodes: Multimodality Imaging Features

the eighth edition of the American Joint Committee on Cancer staging system, IMLN are designated as axillary lymph nodes for staging purposes. Thus, presence of IMLN metastasis changes the pathologic and clinical staging even in the absence of positive axillary lymph nodes.

On the other hand, there is a prognostic advantage in the presence of an isolated metastatic IMLN when compared to a solitary metastatic axillary lymph node. Based on these findings, some authors raised questions about how to treat patients who have a positive IMLN and negative axilla, whether it would be more appropriate to manage the involved IMLN as a separate focus of cancer within the breast parenchyma or as a metastatic lymph node, as suggested by the American Joint Committee on Cancer.

Because IMLN metastasis alone does not represent multicentric disease, breast conservation therapy can be contemplated in such cases. However, an axillary sentinel lymph node biopsy should always be performed to accurately assess the disease status of the axilla. IMLN metastases in the presence of a negative axillary sentinel lymph node biopsy should not imply the radiation or surgical treatment of the axillary lymph nodes.

Invasive breast carcinoma mimicking IMLN
In rare cases, small breast carcinomas can mimic IMLN at mammography. Comparison to prior exams can help to identify these cases and complementary ultrasound or short-term follow-up may be useful. Any new or enlarging masses should be carefully assessed for minimally suspicious signs, such as slight blurring of margins, to avoid missing early cancers.

CONCLUSION
Normal IMLN is a common finding at screening mammography. Both benign and malignant conditions can cause abnormal IMLN.
imaging features. It is important for the breast radiologist to be aware of these conditions in order to avoid delay in the diagnosis and provide proper treatment of malignancies. In patients with breast cancer, further studies are necessary to standardize the management of patients with IMLN metastasis, however, its prognostic value have been already demonstrated.

Figure 8. Patient with previous left breast cancer submitted to conservative surgery presented a small circumscribed mass on the left upper outer quadrant at follow-up mammography, mimicking an IMLN (A). Prior exams were not available. At 6 month follow-up, there was an increase in the mass (B), which corresponded to an irregular hypoechoic mass at ultrasound (C) and was confirmed as a recurrent invasive carcinoma after biopsy. IMLN, intramammary lymph nodes.

REFERENCES


