Axillary lymph nodes, the usual suspects

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Learning objectives

The main objective of this poster is to be familiar with the radiological features of abnormal lymph nodes; if present, a biopsy or fine needle aspiration should be performed.
Background

Breast cancer is the second malignancy in women worldwide. The main prognostic factor is lymph node involvement, hence the importance of knowing the normal anatomy and radiological features of the axillary lymph nodes.
1. INTRODUCTION

Breast cancer is the most common cancer worldwide after lung cancer in the general population, considering both sexes. Ninety percent of the cases show microcalcifications, a mass or both findings. The remaining ten percent can appeared as an asymmetry, a dilated duct, thickening skin, architectural distortion, Paget disease or skin and nipple retraction. It is important to mention that the main surveillance factor is the absence of metastatic lymph nodes.

2. LYMPHATIC DRAINAGE OF THE BREAST

The lymphatic drainage of the breast is made by the axillary, transpectoral and internal mammary lymph nodes. Occasionally, when the tumour blocks the normal lymphatic drainage, alternative routes arise, such as the contralateral internal mammary chain, mediastinal nodes, rectus abdominis muscle lymph nodes, abdominal lymphadenopathies...

The axillary lymph nodes are divided into three levels regarding to their position relative to the pectoralis minor muscle (fig.1). Level I nodes or low axillary nodes, are lateral to the lateral margin of the pectoralis minor muscle. Level II nodes are located between the lateral and medial borders of the pectoralis minor muscle; interpectoral nodes of Rotter belong to this level. Level III nodes lie medial to the medial edge of the pectoralis minor muscle.

Intramammary lymph nodes (figs.2 y 3) are not related to normal lymphatic drainage and are a frequent normal finding (28%). They differ in size and are usually located within the subcutaneous tissue or surrounded by fibroglandular tissue, specially in the upper outer quadrant. As every other normal lymph node, all have a fatty hilium and a diameter less than 10 mm.

3. RADIOLOGICAL FEATURES OF A NORMAL LYMPH NODE

Normal lymph nodes are reniform or oval-shaped with well-defined straight borders. Moreover, the cortex is thin and the hilum is made of a big fatty center. The vascular hilum is composed by an artery and a vein. It should be noted that the size is not a good predictor of benign or malignant origin(figs.4, 5, 6 y 7).
4. RADIOLOGICAL FEATURES OF A LYMPHADENOPATHY

Suspicious findings of lymph node metastases are: thickened or eccentrically bulged cortex, diminished-to-absent fatty hilum and hyperemia due to tumour angiogenesis; although this late finding can also be present in inflammatory nodes. Biopsy should be performed to reach the cortex (figs. 8, 9, 10, 11 y 12).

Lymph node calcifications can be noted in case of calcifying tumour metastases or granulomatous diseases. Others particles deposits that can be found are gold particles in case of reumatoid arthritis treatment with gold salts or silicone due to particles migration when a broken silicone gel implant is present (fig 13).

Unilateral lymphadenopathies are usually secondary to mastitis or breast cancer; if bilaterally, sistemic infection, reumatoid arthritis, disorders affecting conective tissue, lymphoma or metastases should be suspected.

5. MRI

MRI is not a reliable tool to predict the presence or absence of lymph node metastases. On dinamic contast-enhanced MRI, normal lymph nodes show an initial increase in signal intensity followed by a flattening of the enhancement curve (type II or undetermined curve) or by a washout (type III or malignant pattern). Therefore, the pattern of enhancement of lymph nodes cannot distinguish between malignant or benign and are the morphologic aspects which give the clue. In case of doubt, an ultrasound study should be performed. (figs. 14, 15 y 16).

6. SENTINEL LYMPH NODE MAPPING

This technique consists of a injection of TC 99 in the fibroglandular tissue that surrounds the tumour, the retroareolar area or the skin above the tumour. After a few minutes, the hypothetical first lymph node or group of nodes draining a cancer are detected as the ones with the greatest amount of the radioactive substance. If this lymph node is positive, a further axillary lymph node dissection is performed including the I and II levels.

Normal lymphatic drainage can be blocked by tumoural cells, changing the pathway of the lymphatic drainage. So the lymph nodes identified as the sentinel lymph node are not the true ones.

7. N STAGING SYSTEM FOR BREAST CANCER

N stage is defined as follows:
**Nx** Regional lymph nodes cannot be assessed (eg, previously removed)

**N0** No regional lymph node metastasis

**N1** Metastasis in movable ipsilateral axillary lymph node(s)

**N2** Metastases in ipsilateral axillary lymph nodes fixed or matted, or in ipsilateral internal mammary nodes in the absence of axillary lymph nodes metastasis

- **N2a** Metastasis in ipsilateral axillary lymph nodes fixed to one another (matted) or to other structures
- **N2b** Metastasis ipsilateral internal mammary nodes and in the absence of axillary lymph node metastasis

**N3** Metastasis in ipsilateral infraclavicular lymph node(s), or ipsilateral internal mammary lymph node(s) and in the presence of axillary lymph node metastasis; or metastasis in ipsilateral supraclavicular lymph node(s) with or without axillary or internal mammary lymph node involvement

- **N3a** Metastasis in ipsilateral infraclavicular lymph node(s) and axillary lymph node(s)
- **N3b** Metastasis in ipsilateral internal mammary lymph node(s) and axillary lymph node(s)
- **N3c** Metastasis in ipsilateral supraclavicular lymph node(s)

Treatment varies regarding to lymphatic involvement. Chemotherapy/Hormonotherapy and surgery are proposed for N1 stage; Chemotherapy, Radiotherapy and surgery are considered in case of N2 stage and presurgical Chemotherapy for N3 stage.

Occasionally, the only pathologic finding is axillary lymph node metastasis without a primary breast cancer identified neither mammographically nor in the physical examination. In such cases, ultrasound and MRI images improve the primary tumour detection, however, there’s still some cases in which the primary tumour is not detected.
Images for this section:

**Fig. 1:** The axillary lymph nodes are divided into three levels regarding to their position relative to the pectoralis minor muscle. Level I nodes or low axillary nodes, are lateral to the lateral margin of the pectoralis minor muscle. Level II nodes are located between the lateral and medial borders of the pectoralis minor muscle; interpectoral nodes of Rotter belong to this level. Level III nodes lie medial to the medial edge of the pectoralis minor muscle.

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**Fig. 2:** Craniocaudal projection of the right breast depicts a small oval intrammary lymph node situated in the outer region (and in the upper region in the mediolateral view).

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Fig. 3: Mediolateral projection of the right breast depicts a small oval intrammary lymph node situated in the upper region (and in the outer region in the craniocaudal view).

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Fig. 4: Mediolateral projection of the right breast demonstrates several axillary lymph nodes with fatty hilum

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Fig. 5: Imaging findings of a normal lymph node: this axillary ultrasound image shows a lymph node with uniform cortical thickness, next to the axillary vessels.

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Fig. 6: US image shows a normal lymph node with a thin cortex and a fatty hilum. Color Doppler US image demonstrates a vascular hilum formed by one artery and one vein.

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Fig. 7: Normal lymph node findings, the ultrasound image depicts a thin cortex and a fatty hilum.

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**Fig. 8:** US image shows an abnormal lymph node with asymmetric cortical thickening

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Fig. 9: Metastasic lymphadenopathy: the "hump" in the cortex is very suspicious.

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**Fig. 10:** Assymetrically thickened cortex and increased vascularization are present in this axillary abnormal lymph node.

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**Fig. 11:** Absence of the fatty hilum and a remarkable increase in size shown in these axillar lymphadenopathies. The patient was diagnosed of lymphoma.

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Fig. 12: Suspicious ultrasound findings in an axillary lymph node. Note the eccentrically bulging cortex and the absent hilum which make necessary a biopsy or a fine needle aspiration to rule out a metastasic disease.

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Fig. 13: Siliconoma. The ultrasound image of the left axilla depicts an echogenic area with acoustic shadowing within a lymph node, these findings are compatible with siliconoma. In the STIR images, the signal intensity in the axillary lymph node is the same as in the breast implant. Note the bilateral silicone implants and the signs of rupture of the left implant.

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Fig. 14: Contrast-enhanced MRI Axial T1 image depicts small left axillary lymph nodes with fatty hilum

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**Fig. 15:** Axial STIR image. Bulky left axillary lymphadenopathy corresponding to a metastasis of a melanoma which had been removed several years before.

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Fig. 16: Saggital T2 image. A bulky left axillar lymphadenopathy and a inferior smaller one; both are metastasis of a melanoma removed several years before.

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Conclusion

The knowledge of the radiological features of a normal lymph node are very important. It should be pointed out that lymph node involvement is one of the main prognostic factors in the assessment of breast cancer patients.
References


