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INTRODUCTION

Clinical evaluation of the axilla is an area of increasing interest in managing breast cancer. Axillary lymph node status is a critical prognostic indicator. Tissue diagnosis of axillary metastases influences cancer therapeutics and is key to breast cancer staging. Physical exam has proven to be inadequate, with some studies demonstrating error rates as high as 41% and false positive rates as high as 53% [1,2]. Ultrasonography combined with fine needle aspiration or core needle biopsy has shown discrepant results in the sensitivity, specificity and predictive value of this method [4,5,6,7]. Breast MRI is another modality that can be used, however it is time consuming, expensive and often not readily available. A meta analysis of the literature on this method shows promise but remains inconclusive [8]. One recent study found abnormal nodes on US, MRI, or mammogram in clinically node-negative patients are not reliable indicators of the need for ALND [9]. Metabolic information provided by high resolution breast PET could play a major role in guiding the preoperative investigation, to include decisions regarding neoadjuvant chemotherapy and the use of sentinel lymph node biopsy (SLNB) and/or axillary lymph node dissection (ALND).

The objective of this study was to evaluate the ability of high resolution breast PET imaging (BPI) with Fluorodeoxyglucose ¹⁸F (¹⁸F-FDG) to assess axillary lymph node status prior to surgery in patients diagnosed with breast cancer.

METHODS

Patients who had a tissue confirmed diagnosis of invasive breast cancer and in some cases extensive ductal carcinoma in-situ underwent high resolution breast PET imaging to include the axilla on the affected side and bilaterally in four subjects. The determination of abnormal lymph nodes was based on visible radiotracer uptake and lesion to background (LTB) ratio measurements. In our initial experience malignant nodes tend to have > 2x the uptake as compared to normal background tissue.

RESULTS

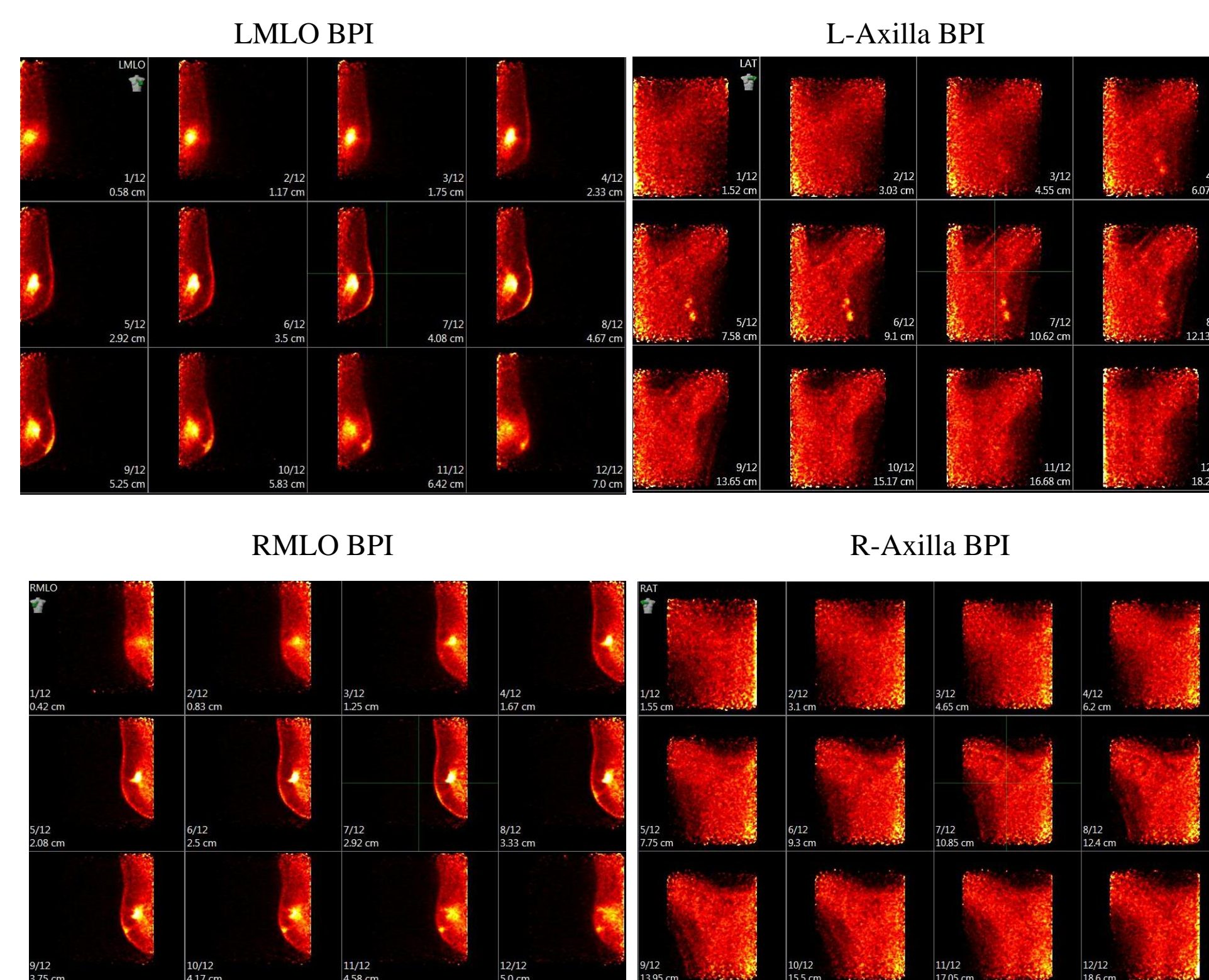
Results were obtained on one hundred thirty three patients, one hundred thirty nine at the breast level, who completed imaging and proceeded to sentinel lymph node biopsy (SLNB) and or axillary lymph node dissection (ALND). Breast PET imaging (BPI) results are presented in Table 1.

Table 1

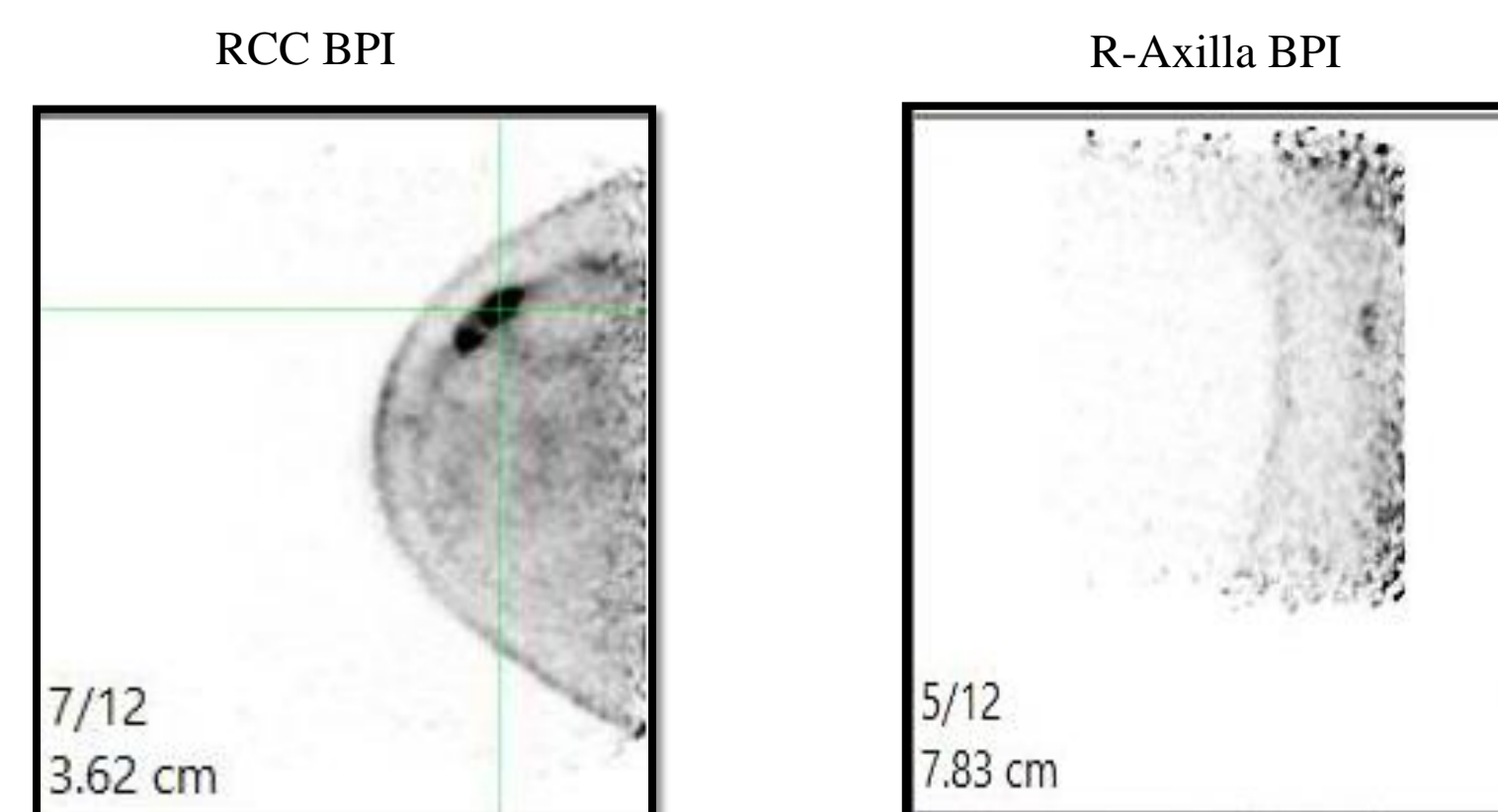
N-133 N ¹ -139	
Sensitivity	48.0%
Specificity	99.1%
PPV	92.8%
NPV	88.8%
FP Rate	0.89%

CASE IMAGES

52 y/o female, bilateral IDC
BPI Left: lesion w /3+ nodes
BPI Right: lesion w/0 + nodes
Left ALND: 3/13+
Right SLNB: 0/2 +



72 y/o female, unsuspected contralateral IDC w/+node
BPI Right: suspicious lesion and + node
Pathology: Multifocal IDC
SLNB & ALND: 1/8+



DISCUSSION

Surgical treatment, radiation therapy decisions and chemotherapy usage are greatly influenced by the presence or absence of nodal disease. The work presented here is part of our ongoing work directed at improving methods to inform and guide preoperative investigation of axillary lymph nodes, to include decisions regarding neoadjuvant chemotherapy and the use of sentinel lymph node biopsy (SLNB) and/or axillary lymph node dissection (ALND).

CONCLUSIONS

There are clear limitations in the ability to detect disease < 6mm, and further investigation is warranted. The spatial resolution in Breast PET imaging is not isotropic, thus the shape of the lesion and its spatial layout will also affect the resultant lesion detection. Nearly 25% of the undetected lesions were lobular cancers. Methods to improve detectability such as system geometry and post reconstruction algorithms are being investigated. With the current data showing a high specificity (99.1%) and low false positive rate (>1%), indications are that breast PET can play a crucial role in pre-surgical axillary assessment in patients diagnosed with breast cancer.

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