



## The chest radiologist's role in invasive breast cancer detection

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### ABSTRACT

**Purpose:** To assess the ability of chest CT to identify patients needing further evaluation of the breasts.

**Methods:** IRB approval was obtained with a waiver of consent. Women with chest CT and mammogram within 12 months formed the cohort. A breast assessment and recommendation CT score (BARCS) analogous to mammographic BI-RADS was created and compared to the mammogram BI-RADS.

**Results:** BARCS and mammographic BI-RADS management recommendations were concordant for 77.1%. 11 invasive cancers were detected; all by mammogram while CT missed 2.

**Conclusion:** BARCS score should be studied in prospective trials. Chest CT might be the earliest opportunity to detect breast cancer.

### 1. Introduction

Breast cancer is the most common cancer other than non-melanoma skin cancer in Americans and other women living in the industrialized world [1]. Screening mammography decreases the stage at which breast cancer is diagnosed and has been shown to decrease the mortality from breast cancer [2–4]. Indeed, most of those dying from breast cancer have not had recent or regular breast cancer screening [4,5]. In 2017, the American Cancer Society expects 255,180 invasive breast cancers to be diagnosed in the USA. Of those cancers, 252,710 will be in women and 2470 in men. An additional 63,410 women are expected to be diagnosed with in situ breast cancer in 2017 [6].

Many will receive their diagnosis after an abnormal screening mammogram, screening breast ultrasound [7,8] or screening breast MRI [9]. Other breast cancers are not screen-detected and do not come to medical attention until they are palpable masses; this can happen when patients fail to have breast cancer screening or if the mass is not detected at screening [10]. These facts highlight the need for radiologists to exploit every opportunity to detect a clinically occult breast cancer.

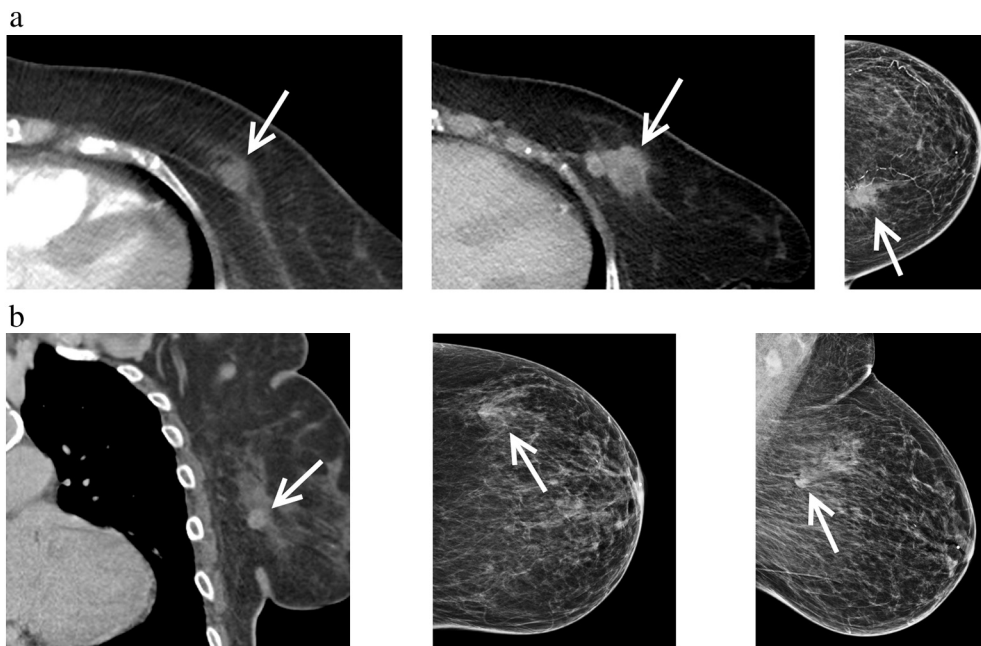
The opportunity to detect breast cancer on screening chest CT exists. While screening mammography rates are falling [11], chest CT rates are rising [12,13]. Low dose chest CT for lung cancer screening, for example, is increasingly offered. Some women may therefore have a chest CT, but not mammography or other breast screening. CT might be the only imaging modality that women undergo that includes the breasts and provide the only opportunity for the radiologist to potentially

identify an incidental “screen” detected cancer. This scenario may become increasingly prevalent in the era of the most recent American Cancer Society [14] and United Services Preventive Task Force (USPSTF) guidelines [11,15]. The ACS guidelines, for example, suggest that women have yearly mammography between the ages of 45 and 54, but only biennial mammography at age 55 and older. The USPSTF pushes the age to start screening mammography to age 50 and then recommends biennial mammography from age 50 to 74. This represents a shift from prior recommendations and differs from the American College of Radiology guidelines that recommend yearly mammography beginning at age 40. A woman in her 40s may therefore not have a mammogram, but might have a chest CT. Likewise an older woman might have a CT during the year when she does not have a mammogram. Chest CT scans offer the prospect of a limited evaluation of the breast parenchyma with no additional radiation, no additional patient time and no direct expense. Additionally, some portions of the breast such as the far medial aspect are difficult to visualize on mammography and might actually be better seen on CT.

Multiple studies have shown incidental breast cancers on chest CT [16–28] and abdominal MRI [29,30] and have described methods to allow general radiologists to assess breast masses detected on CT [20,24,31–35]. Studies of dedicated Breast CT have shown its ability to detect breast cancer [36–39]. Falling mammography rates combined with increased chest CT utilization amplify the importance of determining if it is possible and ultimately if there is a benefit to reporting breast findings on CT.

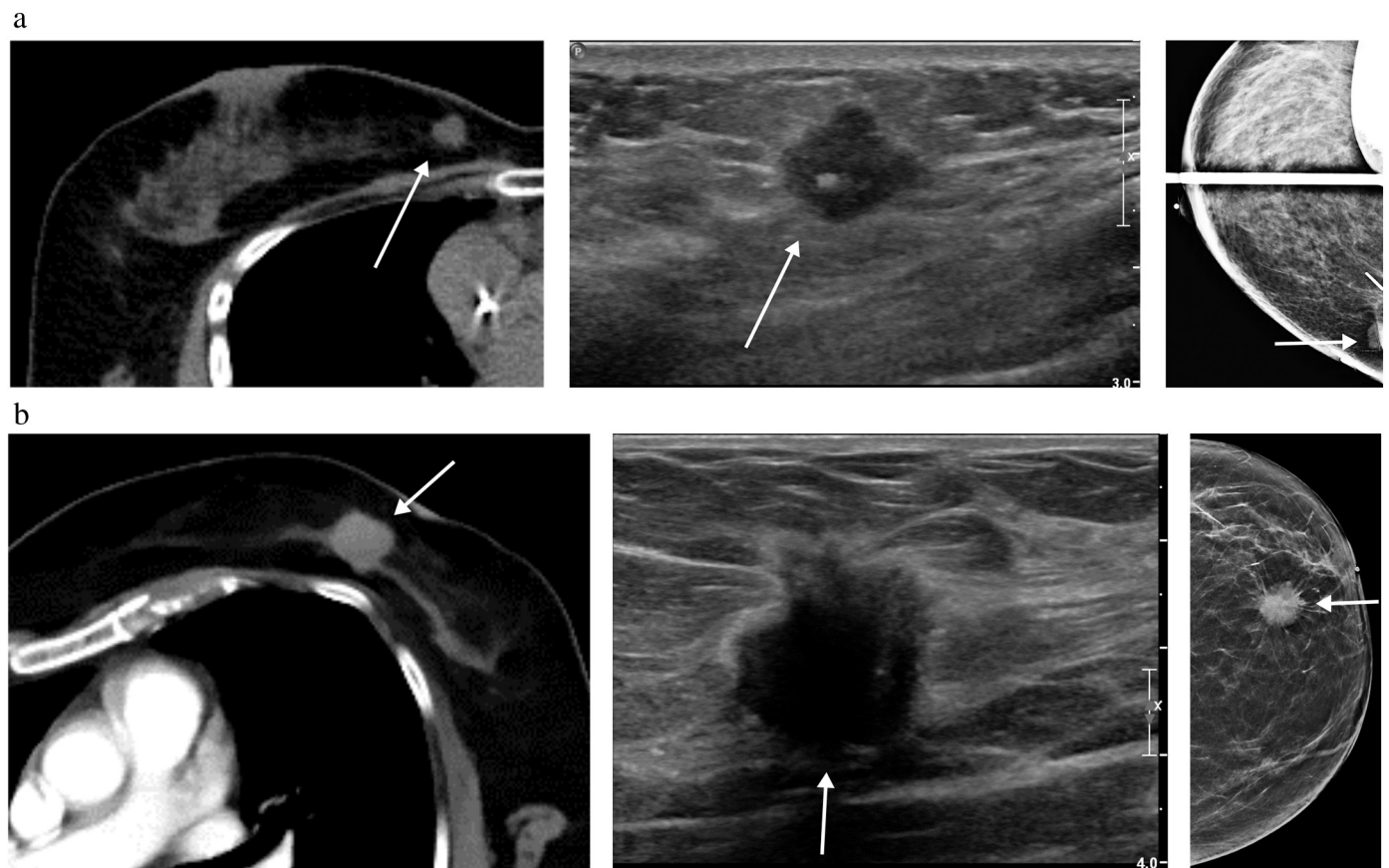
While some argue that it is standard of care to report all breast and

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**Fig. 1. a.** An 11-month delay in breast cancer diagnosis occurred in a 73-year-old patient who had a chest CT, but not a mammogram. Her last mammogram was 3 years prior to the CT scan shown in 1a. The patient presented to the emergency department with shortness of breath; no comment was made about the breast parenchyma on her CT scan although a breast mass was present. 11 months later a CT scan was performed and a left breast mass was reported prompting a mammogram and subsequent diagnosis of invasive ductal carcinoma.

**b.** The failure to report a breast mass seen on CT delayed the diagnosis of breast cancer in a 78-year-old patient who underwent CT scan as part of a metastatic work up. The mammogram was performed 2 weeks after the CT scan leading to the diagnosis of invasive ductal carcinoma.



**Fig. 2. a.** 37-Year-old patient with poorly differentiated Invasive ductal carcinoma. CT shows an irregular mass in the far medial right breast which is easily seen on ultrasound as a hypoechoic irregular mass, but is only able to be partially seen on mammography even when the technologist was able to place a marker on the palpable mass.

**b.** 77-Year-old patient underwent a CTA exam where an irregular mass was found on CT. Subsequent mammography and ultrasound confirmed the irregular hypoechoic mass on ultrasound and the dense spiculated mass on mammography. This was shown to be invasive ductal cancer.

other ancillary findings on a chest CT and others argue that this is always done, in our experience there are patients who have had invasive breast cancers missed on chest CT. The failure of chest CT to report breast masses has led to delay in breast cancer diagnosis. Two

representative cases are illustrated in Fig. 1. Additionally, Fig. 2a illustrates a case where a mass was much easier to see on CT than on mammography. It was not visible on standard CC and MLO images and seen only on supplemental diagnostic images.

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