Ductal Carcinoma in Situ: A Case Report

Abstract

Breast ductal carcinoma in situ (DCIS) is a preinvasive form of breast cancer and is the most common type of in situ breast cancer found in women. There are many different risk factors for breast cancer as well as many different methods of detection and treatment. While DCIS most often presents as microcalcifications lining the breast ducts on a radiographic mammogram, it can also present atypically as recurrent mastitis without any significant suspicious imaging features. A case report of a 61-year-old woman with DCIS disguised as mastitis demonstrates the importance of further investigating clinical suspicions because atypical presentations of breast cancer can occur.

Introduction

Breast cancer is uncontrolled cellular growth that occurs within the breast. Following lung cancer, breast cancer is the second leading cause of cancer death in women. Although there are many different forms of breast cancer, the most common type of breast cancer found in women is called ductal carcinoma in situ (DCIS).\textsuperscript{1} DCIS is a noninvasive form of breast cancer where malignant cells arise and proliferate within the breast ducts without invasion of the basement membrane.\textsuperscript{2-7} DCIS is a precursor for invasive ductal carcinoma. Therefore, if left untreated, the malignant cells located in the ducts of the breast can break through the epithelial membrane and invade the surrounding tissues of the breast to become an invasive, infiltrating type of breast cancer.\textsuperscript{1} Invasive ductal carcinoma may develop in 30% to 50% of DCIS cases.\textsuperscript{3}

Anatomy of the Female Breast

The female breast is composed of different types of tissues, including fatty tissue, connective tissue, and lymphatic tissue.\textsuperscript{1,8-9} Collectively, lymphatic and connective tissues are referred to as fibroglandular tissue. When breasts are considered dense, they contain less fatty tissue and more fibroglandular tissue. Dense breast tissue poses a significant problem for detecting and diagnosing cancer of the breasts because the dense fibroglandular tissue more easily obscures existing breast tumors during a radiographic imaging exam than does fatty tissue.
tissue. Fatty tissue is radiographically lucent and appears dark on a mammogram. Dense breast tissue appears as a white density on a screening mammogram. Both benign and cancerous lesions appear white on an x-ray image as well. Individuals with dense breast tissue are also at a much higher risk for developing breast cancer. Not only has breast density shown to be a strong independent factor for the development of cancer, but the increased risk is also partly due to the difficulties that result in detecting cancerous lesions in the dense tissue. According to the American College of Radiology, about 10% of the women in the United States have almost entirely fatty breasts, 80% have heterogeneously dense breasts or spots of heterogeneously dense tissue, while the other 10% of women have extremely dense breasts. While breast density is largely influenced by inherited genetic factors, density may decrease with increasing age. However, there is little, if any change in most women. Other components of the female breast include the ducts and the lobules. The milk-producing glands located in the breasts are called the lobules. The ducts of the breast are the connection and transport system from the lobules to the nipple. Cancer is capable of forming in any location or part of the breast, but is most commonly formed in the cells that line the milk-carrying ducts of the breasts. This results in the formation of DCIS.

**Signs and Symptoms of Breast Cancer**

Breast cancer does not typically produce any signs or symptoms in its earliest stages when tumors are most treatable. DCIS is no exception and is typically asymptomatic. This is the reason it is most important for annual screenings to detect breast abnormalities as early as possible before any symptoms develop. However, the most common signs of breast cancer are a lump or palpable mass detected during clinical examination or a suspicious lesion visualized during a medical imaging screening. Other concerning clinical indications of breast cancer can include dimpling or swelling of the breast, skin irritation, areas of breast pain, redness or scaliness of the breast skin or nipple, nipple inversion, or any type of nipple discharge, other than breast milk.

**Breast Cancer Risk Factors**

During the years of 2004 to 2008, the median age in women for breast cancer diagnosis was 61 years of age, while 97% of the total number of breast cancer deaths occur in women that
are 40 years of age or older. While age is one primary risk factor for developing breast cancer, other important factors include:

- Personal or family history of breast cancer.
- Obesity.
- Gender.
- Physical inactivity.
- Increased period of time between menarche and menopause.
- Alcohol consumption.
- Race or ethnicity; rates are higher for non-Hispanic white women.
- Dense breasts.
- Long-term use of estrogen and progestin hormones.

While risk factors such as family history, early menarche, late menopause, gender, and age are not modifiable risk factors, other risk factors associated with an increased risk for breast cancer like obesity, physical inactivity, and alcohol consumption, are modifiable lifestyle choices that can affect an individual’s chances of getting breast cancer in their lifetime.

**Clinical and Mammographic Presentation of DCIS**

In previous years, before the widespread use of screening mammograms, most cases of DCIS presented as a palpable mass. Today, less than 10% of the disease is palpable; therefore, most cases of DCIS are found radiographically. Patients presenting with a palpable mass have a significantly higher potential for developing invasive ductal carcinoma and local recurrence than those who present with nonpalpable breast lesions. Nipple discharge is also another form of presentation that can aid in the detection of DCIS. This preinvasive type of breast cancer could also be found incidentally during a biopsy performed to diagnose or treat another breast abnormality. On a mammogram, DCIS commonly appears as a group of clustered microcalcifications (see Figure 1). These calcifications vary in density, form, and size, and are grouped together in linear or segmental arrangements reflecting their presence in the milk ducts of the breast. It is very common for other calcifications associated with a benign disease to be found in the breasts. Benign calcifications tend to be more rounded and uniform in density when displayed mammographically.
DCIS Detection and Diagnoses

Because the majority of DCIS cases do not present in a patient as a palpable mass that can be felt during clinical breast self-exams, many different imaging modalities are available and may be necessary for detection and treatment planning of the disease. Today, the most commonly utilized imaging modalities for breast cancer screening and detection include mammography, ultrasonography, and magnetic resonance imaging (MRI). These different imaging techniques can be used in conjunction with one another to increase the number of breast cancer detections.10

Mammography

Conventional mammography is the gold standard modality used for annual breast cancer screening to detect breast calcifications as well as any soft tissue abnormalities.1,10 Mammography is capable of displaying changes in breast tissue several years before physical symptoms appear or before any abnormal masses can be palpated.1,9-10 Early detection capabilities allow for diagnosis of breast cancer in its earliest stages, before metastasis, when the cancer is the most curable. During screening mammography, each breast is imaged separately using radiolucent compression paddles to image each breast in craniocaudal and mediolateral-oblique projections. Breast compression is important because it spreads out the breast tissue to allow for more tissue to be examined, to decrease blurring due to overlapping tissue, and to decrease the amount of scatter radiation produced that could degrade image quality.1,10 Diagnostic mammography is indicated in women who are symptomatic or when a screening examination reveals suspicious findings. Diagnostic examination may use spot compression views and magnification views to evaluate the exact location and size of abnormal breast lesions so the correct treatment can be planned.1 DCIS constitutes 30% to 40% of all breast cancer cases diagnosed mammographically, and constitutes 20% of all newly diagnosed cases of breast cancer. Most cases of DCIS are found unilaterally as only 10% to 20% of DCIS cases are seen bilaterally.5

Ultrasonography

Ultrasonography is another imaging modality commonly used to evaluate the breasts. It is useful for imaging palpable masses, ruling out suspected malignancies, detecting
microcalcifications, and further evaluating equivocal mammographic findings. The major value of ultrasonography is its ability to distinguish between cysts and solid lesions. Ultrasonography is especially useful when imaging breasts containing heterogeneously or highly dense fibroglandular tissue. In women with dense breast tissue, a number of cases of breast cancer may go undetected when using mammography alone for detection due to the difficult to image dense tissue. This could result in false-negative readings and a false sense of security for the patient. Utilizing ultrasonography in conjunction with mammography is a highly sensitive technique that can increase the number of detections of breast cancer anywhere from 40% to 81%.

**Magnetic Resonance Imaging**

MRI also can be used as an adjunct modality with mammography, especially for high-risk patients. MRI breast imaging is becoming more prevalent due to the high-quality contrast anatomical imaging of breast abnormalities with physiologic data. Intravenous contrast agents can aid in the diagnosis and detection of malignant tumors by differentiating different breast tissues and vascularization of lesions. Another advantage of MRI is the ability to show the whole breast maximally with greater comfort for the patient. However, some disadvantages include high cost and high false-positive rates. The sensitivity of MRI detection for DCIS ranges from 40% to 80%.

**Digital Breast Tomosynthesis**

“Mammography is an effective imaging tool for detecting breast cancer at an early stage and is the only screening modality proved to reduce mortality from breast cancer.” However, overlap of tissues on a mammogram may present obstacles in detecting and diagnosing breast abnormalities. Digital breast tomosynthesis (DBT) is the latest technology for breast imaging. DBT technology uses a conventional mammographic x-ray tube and digital detectors. The digital detectors travel in an arced fashion over the breast to create a series of image slices. This process produces a near 3-D image of the breast tissue. The use of this technology eliminates any problems that arise from superimposition of breast tissue and provides a greater window for diagnosis (see Figure 2). DBT could be a strong adjunct modality if paired with screening or diagnostic mammography.
While clinical assessment and findings from breast imaging may be strongly suggestive of a cancer diagnosis, microscopic analysis of breast tissue is sometimes necessary for a definite diagnosis and to determine whether the cancer is in situ or invasive. Tissue samples for analysis can be obtained via a needle biopsy or a surgical biopsy. Another option to aid in breast cancer diagnosis is utilizing physiologic imaging modalities. Physiologic imaging modalities include scintimammography, positron emission tomography, and positron emission mammography that can provide data at the molecular level indicative of malignancy.

Case Report

A 61-year-old postmenopausal woman presented with pain in her right outer breast. She was also suffering from redness and swelling of the breast for a 3 day period. She first underwent a mammogram that appeared essentially normal. Next, an ultrasound imaging of her right breast revealed no abnormal masses. However, there was increased echogenicity and skin thickening in the outer half of her breast, possibly due to tissue inflammation (see Figure 3). The clinical impression indicated mastitis of the right breast. She was treated with oral antibiotics for 1 week that resulted in a resolution of her symptoms. A follow-up ultrasound was performed 1 month after her symptoms first appeared. Improvement of the inflammatory changes was noted. The patient then presented 8 months later with another similar episode of right breast mastitis in the previously affected area. An ultrasound again showed skin thickening in the right outer breast margin with underlying inflammation. And again, no collection or nodule was seen. The patient was given another dose of antibiotics to reduce the swelling and redness of the breast. After 6 months, the patient returned once again presenting with another similar episode with redness, inflammation, and pain. The physical examination revealed right nipple retraction. An ultrasound was again performed due to the inflammatory changes. Although the patient’s condition improved with antibiotics each time an episode of inflammation occurred, an underlying breast malignancy needed to be ruled out because of the new episode of nipple retraction.

The patient’s condition was thought to be inflammatory breast cancer. Inflammatory breast cancer accounts for approximately 2.5% of all breast cancer cases. Skin thickening without a mass has been reported to be the most common radiographic finding of inflammatory
breast cancer on an ultrasound or mammogram. The diagnosis of inflammatory breast cancer often occurs based on the clinical appearance of the breasts.\(^7\)

A skin punch biopsy and a core biopsy were carried out to examine the inflamed breast tissue in the patient. The skin biopsy revealed mild superficial dermatitis. The core biopsy showed DCIS with focal chronic mastitis. A total right mastectomy was performed, along with a sentinel lymph node biopsy. Final histology of the breast showed a 75 mm high-grade DCIS with areas of necrosis. Up to 50% of the involved milk ducts in the patient’s right breast demonstrated features of cystic hypersecretory DCIS, characterized by cystically dilated ducts containing thyroid colloid-like eosinophilic secretions. There was no indication of membrane invasion and no lymph node involvement. The patient’s post-operative recovery was uneventful and no further treatment was required.\(^7\)

The pathophysiology of DCIS manifesting itself as mastitis is unclear and also extremely rare. In this patient study, it remains unclear whether the DCIS was the cause of the mastitis or if the mastitis was the cause of the DCIS.\(^7\) One possible explanation of DCIS presenting as mastitis suggested by Damiani et al,\(^{13}\) is that high-grade DCIS has been associated with damage of the basement membrane and myoepithelial cell layer surrounding the ductal lumens. Damage of the basement membrane tissue could possibly result in dead ductal tissue that acts as a source of infection in the breast. Therefore, any recurrent infections of the necrotic areas of breast tissue could have possibly resulted in the atypical manifestation of the DCIS as mastitis. This case report demonstrates the importance of proper and thorough investigation of atypical breast conditions because the true and more life-threatening condition could be disguised.

**Treatments**

The treatment for DCIS should focus on eliminating the cancer, limiting the risk of cancer recurrence, and preventing progression from a noninvasive cancer to an invasive disease. DCIS has traditionally been treated surgically with simple mastectomy with very high success rates. While simple mastectomy remains one of the treatment options for DCIS, other options include lumpectomy and radiation therapy.\(^5\) Mastectomy is a more extreme procedure than lumpectomy and radiation therapy in regards to breast preservation, however, due to the recurring episodes of mastitis, mastectomy was most likely the best treatment option for the patient in the study.
**Mastectomy**

Mastectomy is a surgical procedure in which the entire breast is removed, but not the muscle tissue beneath the breast or the lymph nodes under the arm, unless invasion has occurred. Simple mastectomy is used to treat multifocal DCIS. In multifocal DCIS, the cancer appears in many places within the breast. Higher grades of DCIS may require sentinel node biopsies to assess those lymph nodes where the cancer is most likely to first spread. Mastectomy is the only treatment recommended for extensive DCIS, multifocal DCIS, or DCIS that has recurred after radiation therapy treatments or lumpectomy. Cosmetic reconstructive surgeries can be performed to recreate the appearance of a real breast after the breast has been removed. The chance of recurrence of DCIS or invasive cancer after a simple mastectomy is 1% to 2% of the patients treated. Although mastectomy results in cure rates that are approaching 100%, mastectomy may be overtreatment for many individuals with DCIS.  

**Lumpectomy and Radiation Therapy**

Lumpectomy is a breast-conserving surgery performed when localized DCIS lesions limited to one specific area in the breast have been detected on a mammogram. Therefore, a lumpectomy procedure conserves breast tissue by only removing the area containing abnormal tissue. Although the entire breast is not removed during a breast-conserving surgery, the procedure must still be extensive enough to reduce the probability of recurrence. After a lumpectomy procedure, the breast is usually treated with radiation to minimize the chance of DCIS recurrence. Radiation therapy destroys any cancer cells that may have been left behind in the breast tissue or in the chest wall. Radiation treatments can be used for treatment purposes alone, but they most often follow a breast-conserving surgery. The radiation treatments generally last for 6 to 7 weeks. The two types of radiation therapy used are external beam radiation therapy or internal radiation therapy. External beam radiation uses a focused beam of radiation to treat the breast. Internal radiation therapy, also known as brachytherapy, uses a radioactive source that is sealed in seeds, wires, needles, or catheters that are inserted in the breast near the site of the cancer. The method of therapy depends on the type, stage, and localization of the cancer being treated. Side effects of radiation therapy can include breast swelling, redness of the skin, and fatigue. The chance of recurrence after a lumpectomy followed by radiation therapy is
8% to 10% of those treated. No matter the treatment, whether lumpectomy or mastectomy, the prognosis for a complete recovery is excellent.\textsuperscript{14}

**Conclusion**

While DCIS is a noninvasive form of breast cancer, a significant number of DCIS cases evolve into an invasive and more deadly disease if left untreated. In most cases, DCIS presents mammographically as a group of microcalcifications lined in a linear or segmental pattern. However, the case study demonstrates that DCIS may present atypically as mastitis and the more serious, underlying condition is disguised. No matter the presentation of the breast cancer, proper detection and diagnosis is essential for the prevention of an invasive type of cancer. Consistent pathologic evaluation of breast tissue is important for optimizing diagnosis and treatment, especially in atypical presentations of breast cancer. While breast cancer is a daunting reality for many women, with early detection it is a very treatable disease.
References


Figure 2. DCIS in a 65-year-old woman. A. A digital mammogram showing a primary mass of DCIS (black arrows). B. DBT more clearly depicts the border of the mass (black arrows) and the adjacent ductal extensions (white arrow). Image courtesy of: Park JM, Franken EA, Jr., Garg M, Fajardo LL, Niklason LT. Breast tomosynthesis: present considerations and future applications. Radiographics. 2007;27(1):S231-240. doi: 10.1148/rg.27si075511.