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A Breast Cancer Review: Through the Eyes of the Doctor, Nurse, and Patient

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A B S T R A C T

Breast cancer patients endure many challenges in their journey. During the course of their treatment, they interact with several multidisciplinary teams, including radiologists, breast surgeons, and oncologists, as well as nurses, genetic counselors, social workers, and psychologists. This article aims to provide a synoptic review, including the background, causes, screening, diagnosis, and treatment options of breast cancer, by exploring the perspectives of the physician, nurse, and patient. Understanding the complexities that patients with breast cancer encounter can help aid providers address their concerns and focus on providing a more comprehensive approach to care.

Introduction

Breast cancer is the most common noncutaneous cancer in US women, affecting one in eight women (PDQ Cancer Information Summaries, 2002). In 2017, an estimated 252,710 new cases of invasive breast cancer are expected, resulting in about 40,610 deaths (PDQ Cancer Information Summaries, 2002). It remains one of the most prevalent cancers in women, and the tumor's heterogeneity poses a constant challenge to its diagnosis and treatment. The early detection of breast cancer, through advances in imaging and screening, has the ability to decrease breast cancer mortality rates and the disease burden in the general population (Perry et al., 2008). It is important to understand the causes, types, diagnosis, and treatment options for breast cancer, as well as the multidisciplinary approach required for proper evaluation and management of the disease.

Causes

Breast cancer occurs when a malignant tumor develops in breast tissue, mainly the lobules and ducts responsible for milk production. The exact cause of breast cancer in most patients remains obscure, but several risk factors have been associated with its development, including increasing age, a family history, obesity, alcohol consumption, estrogen exposure, and inheritance of susceptibility genes, particularly *BRCA1* and *BRCA2*. Prolonged unopposed estrogen exposure may result from early menarche, late menopause, nulliparity, and exogenous estrogen exposure including hormone replacement therapy. As such, several protective interventions can be taken to reduce the risk of cancer development. In women of normal to moderate risk, these include maintenance of a normal weight and body mass index, regular exercise, early pregnancy, breastfeeding, and a low-fat diet. In high-risk women, pharmacologic interventions that block estrogen can lower the risk of subsequent breast cancer development. In women with an extremely high risk such as those with germ line BRCA1 or 2 mutations, prophylactic mastectomy and/or oophorectomy can be considered.

BRCA1 and *BRCA2* are large tumor suppressor genes located on chromosomes 17 and 13, respectively. They are inherited in an autosomal dominant fashion and are highly penetrant, causing an

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increased incidence of BRCA-associated cancers in affected families (Lee et al., 2017). The incidence is especially increased in families with an Ashkenazi Jewish descent. The mechanism behind tumor generation and progression is evident in damage to DNA repair (Simpson et al., 2000) with about 5% to 10% of women with breast cancer carrying this germ line. Possessing the BRCA mutation carries a 40% to 85% estimated lifetime risk of developing breast cancer, as well as ovarian cancer and other primary cancers. In a meta-analysis of 22 studies ($n = 500$), the cumulative risk for breast cancer development in a BRCA1 and BRCA2 carrier, by the age of 70, was 65% (95% confidence interval [95% CI], 51–75) and 45% (95% CI, 33–54), respectively (Antoniou et al., 2003).

Types of breast cancer

Most breast cancers are epithelial in origin and are classified as carcinomas. Although they are considered one disease, breast carcinomas comprise a wide array of cancer subtypes that differ in microscopic appearance and biologic behavior.

Ductal carcinoma in situ (DCIS) is the proliferation of malignant epithelial cells contained within the mammary ducts. They are distinguished by their cytologic features and growth pattern, not by their anatomic location in the mammary system (Hari et al., 2013). The key difference between DCIS and invasive ductal carcinoma (IDC) is the containment of malignant cells by the basement membrane of the ducts. It is designated Stage 0 in the American Joint Commission on Cancer (AJCC) staging of breast cancer. In situ means in place and refers to the fact that the abnormal cells have not invaded out of the mammary duct into the surrounding stromal tissues in the breast.

IDC (also known as infiltrating ductal carcinoma) remains the most prevalent type of invasive breast cancer, which comprises 70% to 80% of all cases (PDQ Cancer Information Summaries, 2002). In contrast to in situ carcinomas, IDC may invade throughout the breast tissue, blood vessels, and lymphatics of the breast and may therefore metastasize to regional lymph nodes or, in advanced cases, throughout the body. They are divided into three grades, grade 1 being well differentiated and grade 3 being poorly differentiated with solid nests of neoplastic cells, no gland formation, nuclear atypia, and a substantial amount of mitotic activity. Two-thirds of IDC express the estrogen receptor or progesterone receptor (PR) and are therefore sensitive to the respective hormones. Approximately 15% to 20% express a growth factor receptor known as HER2, which is associated with an aggressive behavior characteristic of these tumors.

Infiltrating lobular carcinoma (ILC) is the second most common type of invasive breast cancer and, in comparison with IDC, it has a higher frequency of bilaterality and multicentricity. It occurs more frequently in older women, is better differentiated, and is generally estrogen receptor (ER) positive. ILC is often found to metastasize to bone marrow, cerebrospinal fluid and leptomeninges, gastrointestinal tract, ovary, serosal surfaces, and uterus (resembles low-grade stromal sarcoma). Pathologically, lobular carcinomas are characterized by a lack of cellular cohesion because of alterations in E-cadherin, an adhesion molecule that is deleted or mutated. A distinguishing feature of ILC, which is often observed microscopically, is the single file pattern of cells, a direct result of its lack of cell-cell adhesion. ILC is often not well seen on mammograms and may be more extensive than clinically suspected.

There are several less prevalent histologic types of breast cancer, which include tubular carcinoma, invasive micropapillary carcinoma, metaplastic carcinoma, adenoid cystic carcinoma, mucinous carcinoma, medullary carcinoma, and others. Table 1 illustrates some of these additional carcinomas and their occurrence, qualities, prognosis, and metastatic pattern.

Screening

Currently, mammography is the most widely used modality for screening asymptomatic and at-risk women for breast cancer starting at age 40. Ultrasound is generally used in conjunction with mammography for further evaluation of suspicious lesions and in those patients who have a greater density of breast tissue. Magnetic resonance imaging (MRI), in addition with mammography, is generally reserved for screening high-risk patients (Peairs, Choi, Stewart, & Sateia, 2017). These are patients with a lifetime cumulative risk in excess of 20% to 25% for development of breast cancer.

Although highly advocated, clinical breast examinations have been found to lack the quality of evidence to support its efficacy in screening for breast cancer and have subsequently been removed from some screening recommendations. In a study based in the United States, clinical breast examinations found 0.0004% additional invasive cancers but with an additional 20.7 false-positive results, as opposed to mammography. Currently, there are no randomized controlled trials (RCTs) comparing breast examinations versus no breast examinations, which limit practitioners in implementing the use of breast examinations in routine screening (Oestreicher, Lehman, Seger, Buist, & White, 2005).

The optimal frequency of mammography for the screening of breast cancer is an area of debate with differing guidelines

Table 1
Histologic types of breast cancer

Invasive cancer	Occurrence	Tumor qualities	Prognosis/metastasis
IDC	50%–75%	• Hard tumor texture • Tumor appearance is irregular and spiculated • Cell features vary • DCIS often present	• Depends on stage and grade
ILC	15%–55%	• Normal, slightly firm, or hard tumor texture • Cells most often appear in single file order • Tumors are most often ER (+) and HER2 (−)	• Metastases different from IDC • Prognosis similar to IDC
Tubular carcinoma	1%–5%	• Tumor is small and not palpable • Forms tube-like structures and is usually HER2 (−) and ER (+)	• Rare metastasis to lymph nodes • Prognosis better than IDC
Medullary carcinoma	<1%	• Soft tumor with sheet-like cells • Tumors are usually triple negative	• Prevalent in younger women and BRCA1 mutation carriers
Colloidal carcinoma	<1%	• Usually soft and nonpalpable tumor with cells surrounded by excess mucin • Tumor often ER (+) and HER2 (−)	• Rarer in young women • Unlikely spread to lymph nodes • Good prognosis
Invasive papillary carcinoma	<1%	• Soft tumor with finger-like projections	• More common in postmenopausal women • Generally good prognosis

IDC = invasive ductal carcinoma; DCIS = ductal carcinoma in situ; ILC = infiltrating lobular carcinoma; ER = endoplasmic reticulum.
Bleiweiss, I. J., et al. Pathology of breast cancer (http://www.uptodate.com/contents/pathology-of-breast-cancer).