



Breast cancer (malignant breast neoplasm) is cancer originating from breast tissue, most commonly from the inner lining of milk ducts or the lobules that supply the ducts with milk. Cancers originating from ducts are known as ductal carcinomas; those originating from lobules are known as lobular carcinomas.

The size, stage, rate of growth, and other characteristics of the tumor determine the kinds of treatment. Treatment may include surgery, drugs (hormonal therapy and chemotherapy), radiation and/or immunotherapy. Surgical removal of the tumor provides the single largest benefit, with surgery alone being capable of producing a cure in many cases. To somewhat increase the likelihood of long-term disease-free survival, several chemotherapy regimens are commonly given in addition to surgery. Most forms of chemotherapy kill cells that are dividing rapidly anywhere in the body, and as a result cause temporary hair loss and digestive disturbances. Radiation may be added to kill any cancer cells in the breast that were missed by the surgery, which usually extends survival somewhat, although radiation exposure to the heart may cause heart failure in the future. Some breast cancers are sensitive to hormones such as estrogen and/or progesterone, which makes it possible to treat them by blocking the effects of these hormones.

Prognosis and survival rate varies greatly depending on cancer type and staging. With best treatment and dependent on staging, 5-year relative survival varies from 98% to 23, with an overall survival rate of 85%.

Worldwide, breast cancer comprises 22.9% of all non-melanoma skin cancers in women.¹ In 2008, breast cancer caused 458,503 deaths worldwide (13.7% of cancer deaths in women). Breast cancer is more than 100 times more common in women than breast cancer in men, although males tend to have poorer outcomes due to delays in diagnosis.

The first noticeable symptom of breast cancer is typically a lump that feels different from the rest of the breast tissue. More than 80% of breast cancer cases are discovered when the woman feels a lump. The earliest breast cancers are detected by a mammogram. Lumps found in lymph nodes located in the armpits can also indicate breast cancer.

Indications of breast cancer other than a lump may include changes in breast size or shape, skin dimpling, nipple inversion, or spontaneous single-nipple discharge. Pain ("mastodynia") is an unreliable tool in determining the presence or absence of breast cancer, but may be indicative of other breast health issues.

Inflammatory breast cancer is a special type of breast cancer which can pose a substantial diagnostic challenge. Symptoms may resemble a breast inflammation and may include pain, swelling, nipple inversion, warmth and redness throughout the breast, as well as an orange-peel texture to the skin referred to as *peau d'orange*.

Occasionally, breast cancer presents as metastatic disease, that is, cancer that has spread beyond the original organ. Metastatic breast cancer will cause symptoms that depend on the location of metastasis. Common sites of metastasis include bone, liver, lung and brain.^[16] Unexplained weight loss can occasionally herald an occult breast cancer, as can symptoms of fevers or chills. Bone or joint pains can sometimes be manifestations of metastatic breast cancer, as can jaundice or neurological symptoms. These symptoms are "non-specific", meaning they can also be manifestations of many other illnesses. Most symptoms of breast disorder do not turn out to represent underlying breast cancer. Benign breast diseases such as mastitis and fibroadenoma of the breast are more common causes of breast disorder symptoms. The appearance of a new symptom should

be taken seriously by both patients and their doctors, because of the possibility of an underlying breast cancer at almost any age

The primary risk factors for breast cancer are sex, age, lack of childbearing or breastfeeding,¹ higher hormone levels, race, economic status and dietary iodine deficiency.

Most cases of breast cancer cannot be prevented through any action on the part of the affected person. The World Cancer Research Fund estimated that 38% of breast cancer cases in the US are preventable through reducing alcohol intake, increasing physical activity levels and maintaining a healthy weight. It also estimated that 42% of breast cancer cases in the UK could be prevented in this way, as well as 28% in Brazil and 20% in China.

Smoking tobacco also increases the risk of breast cancer with the greater the amount smoking and the earlier in life smoking begins the higher the risk. In a study of attributable risk and epidemiological factors published in 1995, later age at first birth and not having children accounted for 29.5% of U.S. breast cancer cases, family history of breast cancer accounted for 9.1% and factors correlated with higher income contributed 18.9% of cases. Attempts to explain the increased incidence (but lower mortality) correlated with higher income include epidemiologic observations such as lower birth rates correlated with higher income and better education, possible overdiagnosis and overtreatment because of better access to breast cancer screening, and the postulation of as yet unexplained lifestyle and dietary factors correlated with higher income. One such factor may be past hormone replacement therapy, which was typically more widespread in higher income groups.

The genes associated with hereditary breast-ovarian cancer syndromes usually increase the risk slightly or moderately; the exception is women and men who are carriers of BRCA mutations. These people have a very high lifetime risk for breast and ovarian cancer, depending on the portion of the proteins where the mutation occurs. Instead of a 12 percent lifetime risk of breast cancer, women with one of these genes have a risk of approximately 60 percent.

In more recent years, research has indicated the impact of diet and other behaviors on breast cancer. These additional risk factors include a high-fat diet,¹ alcohol intake, obesity, and environmental factors such as tobacco use, radiation,¹ endocrine disruptors and shiftwork. Although the radiation from mammography is a low dose, the

cumulative effect can cause cancer. In addition to the risk factors specified above, demographic and medical risk factors include:

- Personal history of breast cancer: A woman who had breast cancer in one breast has an increased risk of getting a second breast cancer.
- Family history: A woman's risk of breast cancer is higher if her mother, sister, or daughter had breast cancer, the risk becomes significant if at least two close relatives had breast or ovarian cancer. The risk is higher if her family member got breast cancer before age 40. An Australian study found that having other relatives with breast cancer (in either her mother's or father's family) may also increase a woman's risk of breast cancer and other forms of cancer, including brain and lung cancers. Certain breast changes: Atypical hyperplasia and lobular carcinoma in situ found in benign breast conditions such as fibrocystic breast changes are correlated with an increased breast cancer risk.

Those with a normal body mass index at age 20 who gained weight as they aged had nearly double the risk of developing breast cancer after menopause in comparison to women who maintained their weight. The average 60-year-old woman's risk of developing breast cancer by age 65 is about 2 percent; her lifetime risk is 13 percent.

Prevention

Exercise may decrease breast cancer risk. Also avoiding alcohol and obesity. Prophylactic bilateral mastectomy may be considered in patients with BRCA1 and BRCA2 mutations. A 2007 report concluded that women can somewhat reduce their risk by maintaining a healthy weight, drinking less alcohol, being physically active and breastfeeding their children.

Breast cancer, like other cancers, occurs because of an interaction between the environment and a defective gene. Normal cells divide as many times as needed and stop. They attach to other cells and stay in place in tissues. Cells become cancerous when mutations destroy their ability to stop dividing, to attach to other cells and to stay where they belong. When cells divide, their DNA is normally copied with many mistakes. Error-correcting proteins fix those mistakes. The mutations known to cause cancer, such as p53, BRCA1 and BRCA2, occur in the error-correcting mechanisms. These mutations are either inherited or acquired after birth. Presumably, they allow the other mutations, which allow uncontrolled division, lack of attachment, and metastasis

to distant organs. Normal cells will commit cell suicide (apoptosis) when they are no longer needed. Until then, they are protected from cell suicide by several protein clusters and pathways. One of the protective pathways is the PI3K/AKT pathway; another is the RAS/MEK/ERK pathway. Sometimes the genes along these protective pathways are mutated in a way that turns them permanently "on", rendering the cell incapable of committing suicide when it is no longer needed. This is one of the steps that causes cancer in combination with other mutations. Normally, the PTEN protein turns off the PI3K/AKT pathway when the cell is ready for cell suicide. In some breast cancers, the gene for the PTEN protein is mutated, so the PI3K/AKT pathway is stuck in the "on" position, and the cancer cell does not commit suicide.

Mutations that can lead to breast cancer have been experimentally linked to estrogen exposure. Failure of immune surveillance, the removal of malignant cells throughout one's life by the immune system.

Abnormal growth factor signaling in the interaction between stromal cells and epithelial cells can facilitate malignant cell growth.

In the United States, 10 to 20 percent of patients with breast cancer and patients with ovarian cancer have a first- or second-degree relative with one of these diseases. Mutations in either of two major susceptibility genes, breast cancer susceptibility gene 1 (BRCA1) and breast cancer susceptibility gene 2 (BRCA2), confer a lifetime risk of breast cancer of between 60 and 85 percent and a lifetime risk of ovarian cancer of between 15 and 40 percent. However, mutations in these genes account for only 2 to 3 percent of all breast cancers.

Breast cancer screening refers to testing otherwise-healthy women for breast cancer in an attempt to achieve an earlier diagnosis. The assumption is that early detection will improve outcomes. A number of screening tests have been employed including: clinical and self breast exams, mammography, genetic screening, ultrasound, and magnetic resonance imaging.

A clinical or self breast exam involves feeling the breast for lumps or other abnormalities. Research evidence does not support the effectiveness of either type of breast exam, because by the time a lump is large enough to be found it is likely to have been growing for several years and will soon be large enough to be found without an

exam. Mammographic screening for breast cancer uses x-rays to examine the breast for any uncharacteristic masses or lumps. The

For the average woman, the U.S. Preventive Services Task Force recommends mammography every two years in women between the ages of 50 and 74. The Task Force points out that in addition to unnecessary surgery and anxiety, the risks of more frequent mammograms include a small but significant increase in breast cancer induced by radiation.

In women at high risk, such as those with a strong family history of cancer, mammography screening is recommended at an earlier age and additional testing may include genetic screening that tests for the BRCA genes and / or magnetic resonance imaging. Molecular breast imaging is currently under study and may also be an alternative. (Wikipedia)

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