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BREAST CANCER PREVENTION

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Breast cancer is by far the most dreaded disease for women. Breast cancer elicits fears related to loss of body image and sexuality, surgery, and death. As is the case for most cancers, the exact cause of breast cancer is not clearly known. Furthermore, there is currently no cure for advanced disease, and there is no definitive way of preventing it.

Our knowledge of how breast cancer develops is expanding rapidly. As a result, new medications are being developed to reduce the possibility of breast cancer amongst women with a high risk of contracting this disease. For the majority of women, lifestyle changes, a healthy diet, cautious use of selected antioxidants, exercise, and weight reduction can help shrink the chance of developing breast cancer. To date, the most important strategy in improving survival is still breast cancer screening and early detection. Breast cancer is the second leading cause of cancer deaths among women in the United States, the leading cause of death being lung cancer. One in every eight women in the United States developes breast cancer. The risk is even higher for women with previous breast cancer, those who have first-degree relatives with breast cancer, those with multiple family members with cancer, and those who have inherited “cancer genes”.

What are the biological causes of breast cancer?

Breast cancer, like all cancers, initially develops because of defects in the genetic material deoxyribonucleic acid (DNA) of a single cell. The human body is composed of trillions of cells. Inside the inner core (nucleus) of each cell is our DNA, located on chromosomes. Every human cell has two sets of 23 chromosomes. Each set is inherited from one parent. DNA exists as long, spiralled strands on these chromosomes. Different segments along the SNA strands contain information for various genes. Human DNA is thought to contain approximately 50,000 to 100,000 genes. Genes are blueprints that provide genetic instructions for the growth, development, and behaviour of every cell. Most genes carry instructions for the types and the amount of proteins, enzymes, and other substances produced by the cells. Genes also govern the size and the shape of the organs by controlling the rate of

cell division. During cell division, a cell makes a duplicate copy of its chromosomes and then divides into two cells. Some genes restrict cell division and limit tissue growth.

Defects on the DNA strands can lead to gene coding errors, which in turn can cause diseases. When genes that normally restrict cell growth and divisions are absent or defective, the affected cells can divide and multiply without restraint. The cells that divide and multiply without restraint enlarge (forming a tumour) and can also invade adjacent tissues and organs. These cells can further break away and migrate to distant parts of the body in a process called metastasis. The ability to multiply without restraint, the tendency to invade other organs, and the ability to metastasize to other parts of the body, are the key characteristics of cancers – characteristics that are due to DNA defects.

The cancer-causing DNA defects can be acquired at birth (inherited) or may develop during adult life. The inherited DNA defects are present in every cell of the body. On the other hand, DNA defects that develop during adult life are confined to the descendants (products of cell divisions) of the single affected cell. Generally, inherited DNA defects have a greater tendency to cause cancers and cancers that occur earlier in life, than DNA defects that develop during adult life.

Research has shown that 5% - 10% of breast cancers are associated with mutations (defects) in two genes known as breast cancer-associated (BRCA) genes, BRCA1 and BRCA2. These genes function to prevent abnormal cell growth that could lead to cancer. Every cell in the body has two BRCA1 or BRCA2 genes, one inherited from each parent. A woman who has received one defective BRCA1 or BRCA2 gene from one parent and a healthy gene from the other is called a carrier of the defective BRCA gene. Even though only one healthy BRCA1 or BRCA2 gene is needed to help prevent cancerous growth of cells, the one remaining healthy BRCA gene is vulnerable to dmaage during adult life by environmental factors such as toxins, radiation, and other chemicals such as free radicals. Therefore, women bearing the defective BRCA1 or BRCA2 gene are at an increased risk of developing breast, as well as ovarian cancers. Women carrying defective BRCA1 or BRCA2 genes also tend to develop these cancers earlier in life.

Other rare genetic mutations are also associated with an increased risk for the development of breast cancer, including mutations of the tumour suppressor gene p53, the CHEK-2 gene, and the ATM (ataxia-telangiectasia mutation) gene.

Since inherited DNA defects account for only 5%-10% of breast cancers, the majority of breast cancers are due to DNA damages that develop during adult life. Environmental factors that can cause DNA damage include free radicals, chemicals, radiation, and certain toxins, yet even among individuals without inherited cancer-causing DNA defects, their vulnerability to DNA damage, their ability to repair DNA damage, and their ability to destroy cells with DNA damage, are likely to be genetically inherited. This is probably why the risk of cancer is higher among first-degree relatives of breast cancer patients, even among families that to not carry the defective BRCA1 and BRCA2 tumour-suppressing genes.

Some of the errors in the normal control mechanisms allow the accumulation of additional errors in other parts of the system. These arrors may lead to gene silencing of critical control genes or the over activity of other growth-stimulating genes by activation of promoter sites adjacent to these otherwise normal genes.

Other substances such as oestrogen (a female hormone) and certain fatty acids may also increase the risk of breast cancer by stimulating the growth and division of cells of the breast tissue.

What are the risk factors for developing breast cancer?

The most significant risk factors for breast cancer are gender and age. Men can develop breast cancer, but it is 100 times more likely in women. Breast cancer is 400 times more common in women who are 50 years old compared to those who are 20 years old.

Family History

Another important risk factor is having first-degree relatives (mother, sister, or daughter) with breast cancer or male relatives with prostate cancer. The risk is especially higher if both the mother and sister have had breast cancers, if the cancers in first-degree relatives occurred early in life (before age 50), or if the cancers in these relatives were found in both breasts. Having a male relative with breast cancer, as well as having both relatives with breast and ovarian cancers also increases a woman's risk. Families which have multiple members with other cancers may have a genetic defect leading to a higher risk of breast cancer.

Women who have inherited defective BRCA1, BRCA2, p53, and DNA repair genes have an increased risk of developing breast cancer, sometimes at an early age, as discussed previously. But, even in the absence of one of the know predisposing genetic defects, a strong family hisotyr may signify an increased risk because of genetic or environmental factors that are sepcific to that particular family. For example, increased risk in families could be due to exposure to similar environmental toxins in some cases.

Previous Breast Cancer

A woman with a history of breast cancer can develop a recurrence of the same breast cancer years later if the cancer cells had already spread to the lymph nodes or other parts of the body. A woman with previous breast cancer also has a three- to fourfold greater chance of

developing breast cancer in the opposite breast. In women who have been treated for breast cancer with breast conservation therapy (BCT), recurrence of cancer within the reated breast may also occur.

Other Breast Conditions

Even though most women with fibrocystic breasts, and its related breast symptoms, do not have increased risk of developing breast cancer, although the lumpy texture and density of the breasts may hamper early cancer detection by breast examination or by mammography. Sometimes, women with fibrocystic breast changes have to undergo breast biopsies (obtaining small tissue samples from the breast for examination under a microscope) to make certain that palpable lumps are not cancerous.

Breast biopsies sometimes may reveal abnormal, though not yet cancerous, cell changes (called atypical hyperplasia). Women with atypical hyperplasia of the breast tissue have about a four- to five fold likelihood of developing breast cancer. Some other benign cell changes in breast tissue are also associated with a slight increase (one and a half to two times normal) in risk. These are termed hyperplasia of breast tissue without atypia, sclerosing adenosis, fibroadenoma with complex features, and solitary papilloma.

The common benign breast tumour, known as a firboadenoma, does not confer an increased cancer risk, unless it has unusual features under the microscope. Breast cancer risks can be additive. For example, women who have first-degree relatives with breast cancer, and who also have atypical hyperplasia of the breast tissue, are at a much higher risk.

Radiation Therapy

Women with a history of radiation therapy to the chest area as treatment for another cancer (such as Hodgkin's disease or non-Hodgkin's lymphoma) have a significantly increased risk for breast cancer, particularly if the radiation treatment was received at a young age.

Hormonal factors

Women who started their menstrual periods before age 12, those who have late menopause (after age 55), and those who had their first pregnancy after age 30, or who have never had children, have a mildly increased risk of developing breast cancer (less than two times the normal risk), due to an increase in the lifetime level of oestrogen exposure.

Studies have confirmed that long-term use (several years or more) of hormone therapy (HT) after menopause, particularly oestrogen and progesterone combined, leads to an increase in risk for development of breast cancer. This risk appears to return to normal if a woman has not used hormone therapy for five years or more. Similarly, some studies show birth control pills produce a small increase in risk, but this also returns to normal after 10 years of non-use. The decision whether to use hormone therapy or birth control pills involves, weighing the risks versus the benefits and should be individualised after consulting one's doctor.

Lifestyle factors

Dietary factors such as high-fat diets and alcohol consumption have also been implicated as factors that increase the risk. Cigarette smoking, caffeine intake, antiperspirant use, and stress do not appear to increase the risk of breast cancer. It is important to remember that 75% of women who develop breast cancer have no risk factors other than age. Thus, screening and early detection are imperative regardless of the presence of risk factors.

How frequently should women undergo mammography and breast examinations?

The Cancer Association of South Africa suggests a baseline mammogram for all women by age 40 and annual mammograms for women 40 and older for as long as they are in good health.

In women with "lumpy breasts" or breast symptoms, and also in women with a high risk of developing breast cancer, sometimes a baseline mammogram at 35 years of age is recommended. This recommendation is somewhat controversial, and there are other viewpoints.

Mammograms and young women

There is a special issue regarding mammograms in young women. Since young women have dense glandular breast tissue, routine mammograms may have difficulty "seeing through" the dense breast tissue. Therefore, mammograms may not be able to detect cancer in the breast as the dense tissue around the cancer obscures it. However, this problem can be partly offset by the use of a special breast ultrasound, which is now, an extremely important additional imaging technique, used to supplement mammography in difficult cases. Ultrasound can make visible a lump hidden within dense breast tissue. It may also detect lumps and early breast cancers when mammograms fail to identify a problem. Ultrasound can also help doctors locate specific areas in the breast for biopsy (obtain small samples of tissue to study under a microscope). Sometimes doctors also suggest the use of magnetic resonance imaging (MRI) screening (see below) in younger women with dense breast tissue.

Magnetic Resonance Imaging (MRI) scanning

Recent research has shown that MRI scanning may be a useful screening tool for breast cancer in certain high-risk populations. In 2004, a team of Dutch researchers published a study of over 1,900 women at high risk for breast cancer in the New England Journal of Medicine. These women underwent breast-cancer screening that included, physical exams every six months, along with yearly mammograms, and MRI scans of the breasts. While conventional mammography did detect many cancers

at an early stage, some tumours were identified by MRI not detected by mammography. Overall, MRI led to the identification of 32 tutors, of which 22 were not seen on the corresponding mammogram. Likewise, some tumours appeared on mammograms that were not visible on the MRI scan. Mammography detected a total of 18 tumours, of which eight were not identified by MRI.
The routine use of MRI, however, has many limitations. While it enabled the detection of some tumours in high-risk women, it also detected more noncancerous lesions (false-positives), which resulted in many more follow-up examinations and potentially unnecessary medical procedures. In fact, MRI led to twice as many unnecessary examinations and three times as many unneeded surgical biopsies of the breast than screening by mammography alone. MRI is also approximately 10 times more costly. These limitations have led experts to believe that screening with MRI is impractical for women who do not have an elevated risk of developing breast cancer. However, its benefits appear to outweigh its limitations in certain high-risk populations.

Breast Self-Examination And Breast Examinations By Your Doctor

- All women over age 20 should perform breast self-examination monthly.
- Those over age 40 should also have annual breast examinations by their doctors.
- Those younger than 40 years can have breast examinations by their doctors every three years.
- For women with a higher than normal risk, a good program would include monthly breast self-examination and twice-yearly focused physician examination. Any palpable changes in the breasts require further evaluation with mammography and ultrasound.

How To Perform A Breast Self-Examination

Breast self-examination is best performed when the hormone stimulation of the breast is the least. This typically occurs seven to 10 days after the start of a menstrual cycle (or three days after a period). At that point, the fluid retention of the breast and the cellular proliferation are the lowest. An ideal setting in which to conduct the exam is the bath or shower.

1. With the hand and breast wet with soap, begin with the fingers flat together and work sweeping from the outer part to the centre of the breast. It helps to mentally divide the area to be examined into quadrants and work around the quadrants sequentially. The upper outer quadrant should be mentally extended into the armpit along the chest wall. This area should be carefully included in the examination.
2. The process is repeated in the same sequence with the fingers moving in a fluttering motion. These different motions, flat fingered stroking and fluttering fingertips, allow detection of somewhat different tissue abnormalities.
3. This examination, by feeling the breast (palpation), should be accompanied by a brief visual exam. With the arms at the side looking in a mirror, note the symmetry. Then raise the arms slowly overhead, checking for any areas of pulling in of the skin or visible lumps or distortion.

The entire examination process can be done in a few minutes.

Any detected change from the usual appearance or feel should be reported to the doctor. If there are any areas of concern that can be felt (palpable) and the mammogram does not show an abnormality, then a specialised breast ultrasound can be extremely helpful.

For women who are concerned that they have lumpy breasts and can't make any sense of their exam, it is best to do a careful exam after a physician's examination. This serves as the baseline for normal "lumps." The exam should be repeated several days in a row, so that the findings are clearly recalled. Subsequently, if a new or progressive change develops, it is much more likely to be detected. The aim is to maintain an appropriate degree of alertness without creating continuous anxiety. Do the exam and put it aside mentally until the next time.