



A REVIEW ON THE DIAGNOSIS OF BREAST CANCER

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ABSTRACT :

The document provides insight into the increasing incidence of cancer, attributed to lifestyle changes, habits, and increased life expectancy. It defines cancer as the abnormal growth of cells, emphasizing the critical role of the immune system in identifying and destroying cancer cells. The multidisciplinary approach to cancer treatment involves surgery, chemotherapy, radiation therapy, and other techniques such as bone marrow transplantation and gene therapy. Early detection through screening tests is crucial for successful treatment outcomes, as cancers caught early are more manageable. Overall, while cancer is curable if detected early, its prevention and early detection remain paramount in combating the disease. The document underscores breast cancer as a significant global health concern, particularly affecting young women under 40 years of age. It highlights the higher histologic grade, unfavorable hormonal status, and overall higher death rate of breast cancer in young women compared to older women. The treatment approach for breast carcinoma is multimodal, involving surgical procedures, radiotherapy, and chemotherapy to ensure removal of malignancy and address issues like disease recurrence and distant metastases. Research efforts aim to confirm the higher malignant potential of breast cancer in young women and improve treatment outcomes in this population.

Keywords: - tumor, mammogram, chemotherapy, oncologist.

1.Introduction

Cell growth gone awry is cancer. Cancers are made up of microscopic cells that are unable to stop growing and can originate from any organ or part of the body. Cancer can occasionally be found "incidentally" during a regular radiological diagnostic or laboratory test, or for a completely unrelated cause. Generally speaking, cancer must grow to a size of 1 cm or include 1 million cells in order to be discovered. At this point, it might be called a tumor, a "nodule," a "lump," a "lesion," a "mass," or a "growth." Leukemias and lymphomas, which are cancers of the blood and bone marrow, are examples of exceptions to this general rule. Although they often do not generate a "mass," these tumors will be visible on laboratory testing.

Cancer is currently the second most common cause of mortality for both adults and children, seven decades after the first documented use of chemotherapy for the disease. Why do cancer success stories rarely appear in the headlines? One argument is that although malignancies may be classified somewhat easily, it is difficult to comprehend the underlying causes of cancer heterogeneity. We have gotten very good at classifying cancer based on epidemiology and pathology trends throughout the years. Every cancer is known to manifest at a specific age, to affect one sex over another more commonly, and to have a specific morphology, which typically resembles the original tissue. Thanks to developments in histology and imaging, we can now further categorize cancer diagnoses into discrete stages and grades that correspond to varied treatment outcomes and prognoses.

A global public health concern is breast cancer. It is the most prevalent cancer among women and the leading cause of death for women overall. Since breast cancer has more recovery potential and more surgical and oncologic treatment options available, it has been one of the most extensively studied cancers in the last two decades. Those under 40 are thought to be young women with breast cancer. Although the overall incidence of breast cancer cases is 6%, breast carcinoma is the most prevalent malignant disease in this population and has the highest death rate.

Types of breast cancer

The site categorises breast cancer into two types:

1.Invasive

2.noninvasive

1.Invasive: -

It develops when aberrant cells that were previously contained within the milk ducts or lobules separate and become near to the breast tissue. Cancer cells can travel through the breast and enter other areas of the body via the circulatory or immune systems. When the tumour is small, they may move early in its development; when it is large, they may move later. For females, invasive breast cancer is the most common type of general cancer.

Infiltrating lobular carcinoma (ILC): - The term "invasive lobular carcinoma" is also used to describe invasive lobular cancer. Although ILC starts in the breast's milk glands, or lobules, it frequently spreads to other parts of the body.

Infiltrating ductal carcinoma (IDC): - Another name for invasive ductal carcinoma is invasive ductal carcinoma. IDC begins in the breast's milk ducts and spreads to the duct wall, where it invades the fatty tissues of the breast and maybe other body areas.

Medullary carcinoma (MC): - An invasive breast cancer known as medullary carcinoma creates a distinct border between medullary and normal tissue.

Mucinous carcinoma (MC): - Mucinous carcinoma, also known as colloid carcinoma, is a rare kind of breast cancer caused by cancer cells that produce mucus. When it comes to their prognosis, girls with mucinous carcinoma typically fare better than those with other common types of invasive cancer.

Tubular carcinoma (TC): - L LCIT SCHOOL OF PHARMACY 31 One type of invasive breast cancer is called a tubular carcinoma. Compared to women with additional broad types of invasive carcinoma, women with tubular carcinoma typically have better prognoses.

2. Non-invasive breast cancer:

This malignancy has not spread beyond of the ducts or lobule in which it is located. Ductal carcinoma in situ is one type of non-invasive breast cancer that can occur. When atypical cells form inside the milk ducts but do not spread to nearby tissue or the outside, it is known as ductal carcinoma in situ. The definition of "in situ" is "in place." The atypical cells can develop into invasive breast cancer even when they haven't yet spread to tissues outside of the lobules or ducts. A biological knowledge of the material that is available is provided, along with a demonstration of each scientific unit's typical background. Since lobular carcinoma in-situ is only considered a somewhat dangerous precursor to the subsequent development of invasive cancer, more surgical participation is unnecessary once the diagnosis is known, and just sequential follow-up is advised.

Mechanisms of breast cancer metastasis: -

The procedures and processes that played out in the imagination of physicians treating patients with BC were based upon a mechanical/anatomic understanding of metastasis. In a sense, everything in the metastatic process could be related to 'tubes,' namely, blood vessels and lymphatics, and their connections in the breast, axilla, and the systemic circulation; tumor cells spread through those routes to other bodily organs, such as the liver, brain, lung, or bone, where they may infiltrate and create metastases. The patient would eventually pass away from the condition once essential organs had been destroyed by these invasive malignancies.

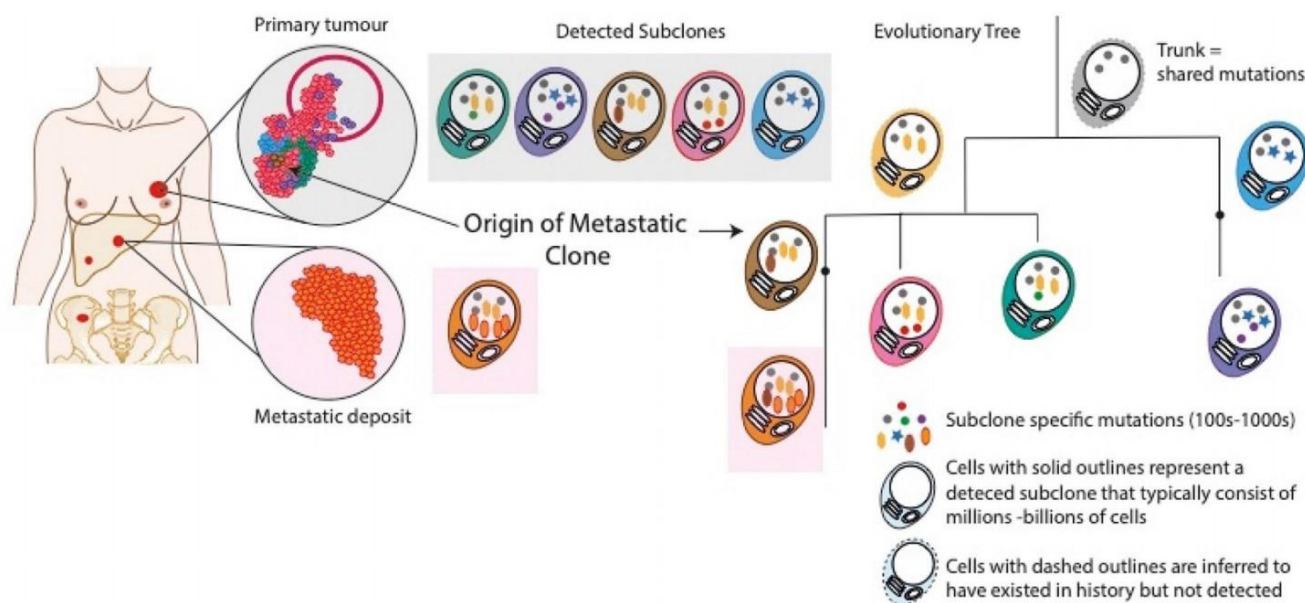
Chemotherapy and endocrine manipulation, which are part of systemic treatment for breast cancer, improved the management of breast cancer and were based on a growing understanding of the biology of cancer cells, including the mechanisms behind the proliferation of cancer cells. Although tumor cells that spread to other organs multiplied in the same way as they had in the breast, proliferation could not account for the tumor cells' ability to metastasis. These systemic therapies frequently targeted specific ailments, such bone pain.

The genomic evolution of breast cancer metastasis :-

Damage to DNA is the main cause of cancer. Somatic mutations are a group of genetic alterations that accumulate to cause a change in phenotypic from normal to malignant and from primary to metastatic BC. Through the application of evolutionary ideas to genomic sequence data, we have begun to identify the basic patterns that underlie BC metastasis.

Cancer subclones: -

Subclone composition can change over time (sequential samples) and space (inside the same tumor mass or across metastatic sites). Since they all descended from a single common ancestor, all subclones in a cancer are genetically connected to one another; nevertheless, individual subclones differ due to the presence of unique genetic alterations. Single-cell investigations allow for the direct observation of this, however because to technical limitations, they are still the most reliable method for assessing copy number variation as opposed to point mutations.



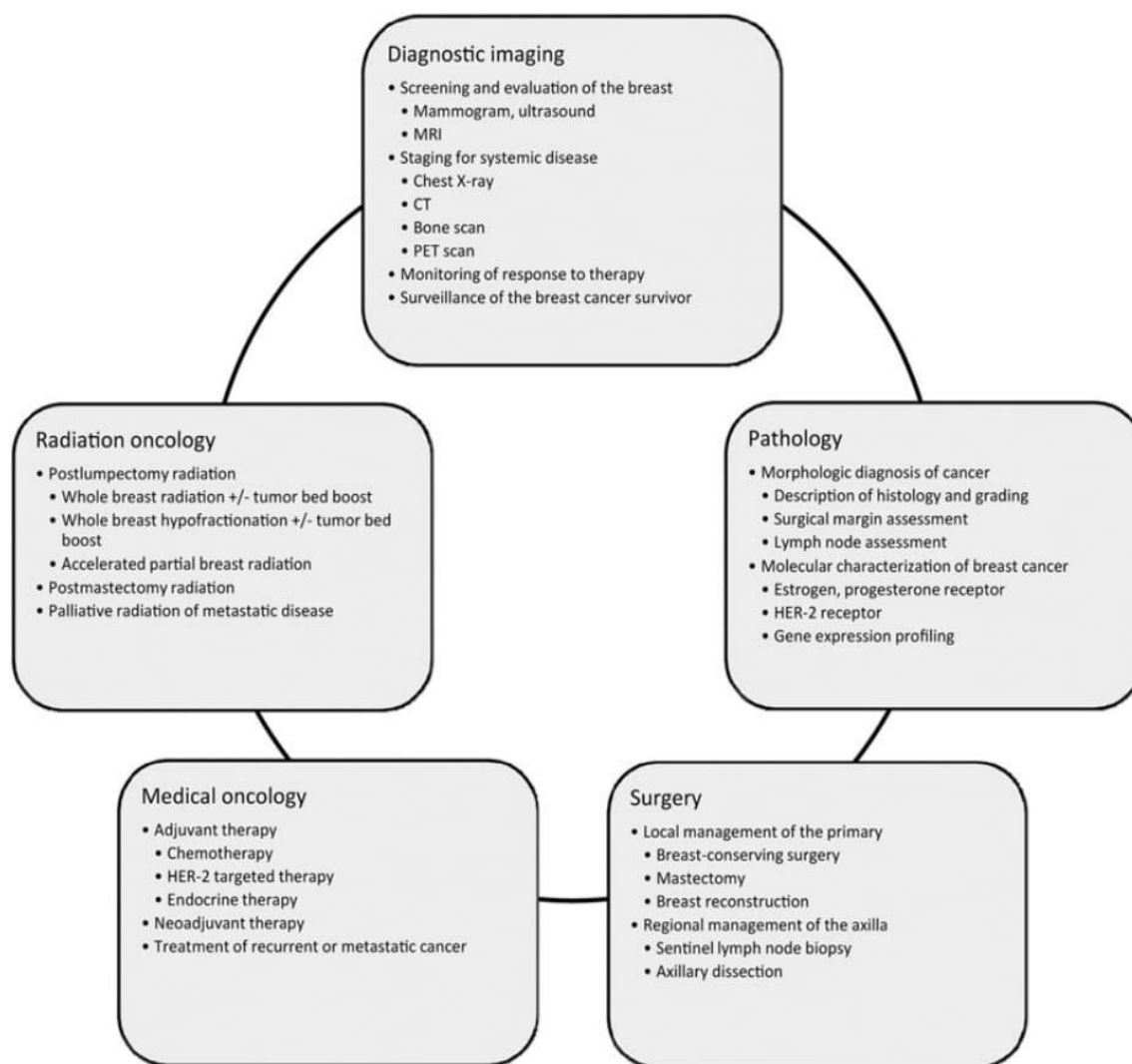
BREAST CANCER DIAGNOSIS: -

As soon as breast cancer is diagnosed, obesity affects its course. Obese and overweight women generally follow screening guidelines, including getting a mammogram, less frequently and with worse health practices. The association between body mass index (BMI) and mammography in women over 40 was examined in a meta-analysis of 16 studies, which revealed that women who were overweight had a lower likelihood of having had a mammogram in the previous two years than women who were normal weight. This was not the case for African American women, but it was for Caucasian and the highest BMI women. A Kaiser Permanente study that examined the obstacles to mammography screening among women aged 50–69 discovered that obese women were more likely to report non-compliance and that they were also twice as likely to blame the procedure's discomfort.

It is possible to speculate that obese women's breasts have more fatty tissue, which should reduce breast density and increase the visibility of a cancer on mammography. It has been demonstrated, however, that the sensitivity of mammography in both non-obese and obese women is comparable. Previous studies found that compared to normal- or low-weight women, obese women had 20% more false-positive results. [10]

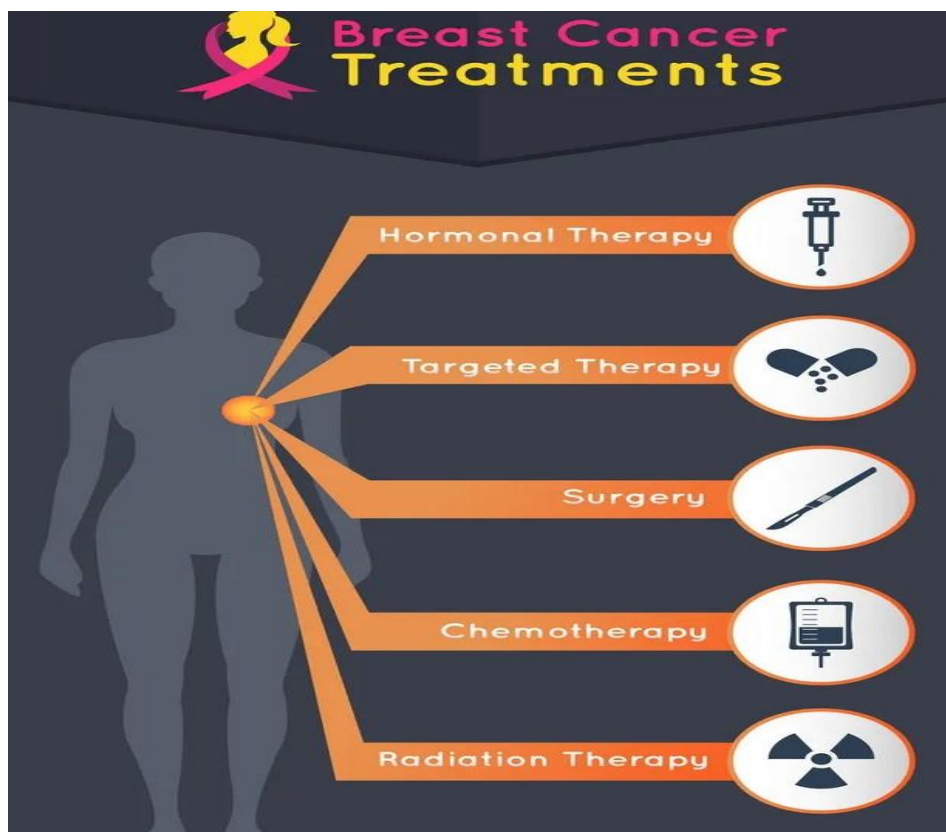
Screening: -

Usually, screening or a diagnostic examination brought on by a symptom (such discomfort or a palpable tumour) are used to detect breast cancer. It is possible to detect smaller, less likely to spread, more amenable to restricted axillary surgery and breast conservation, and less likely to require chemotherapy tumours when screening healthy women. This scenario may lead to decreased treatment-related morbidity and enhanced survival. Mammography is the only screening method that has been shown to lower mortality specifically related to breast cancer. Mammography screening reduces breast cancer mortality by 19% overall (3), with women in their 60s benefiting more (32%), and those in their 40s benefiting less (15%). Therefore, starting at age 45, or earlier based on personal preference, screening mammography is advised by the American Cancer Society. Potential drawbacks of screening mammography include radiation exposure, false-positive results, discomfort, anxiety, and other unfavourable psychological impacts. [9]



BREAST CANCER THERAPY: -

Breast cancer treatment is a multimodal approach that combines adjuvant chemotherapy, radiation, surgery for tumours that are operable, neoadjuvant chemotherapy, and/or endocrine therapy (Fig.). Neoadjuvant treatment is the standard therapeutic approach for BC that is locally progressed and incurable. Tumours that would normally be incurable may diminish with systemic neoadjuvant therapy. The Early Breast Cancer Trialists' Collaborative Group (EBCTG) conducted 17 randomised trials, and the data from a meta-analysis of the individual patient data (more than 10,000 women) in those trials demonstrated that adding radiation to BCS improved both long term overall survival and local regional control, reducing local recurrence. [17]Surgery for initial tumour removal in metastatic breast cancer (MBC) is often viewed as having a palliative rather than a survival advantage. For many years, the primary therapeutic approach for metastatic breast cancer used systemic chemotherapy in combination with cytotoxic drugs or endocrine therapy. This approach is still an essential part of treatment plans today. While some long-term survivors of metastatic breast cancer continue to experience complete remission following first therapy, metastatic breast cancer is generally regarded to be incurable with currently known medicines, unlike EBC.



Result and discussion

Breast cancer research has significantly advanced, leading to improved early detection, more effective treatments, and better survival rates, particularly for early-stage cancers. However, challenges remain, including disparities in cancer burden and the complexities of treating metastatic breast cancer. Advances in screening technologies like mammography, especially in older women and those with dense breasts, have led to earlier diagnoses and better outcomes.

Impact of Lifestyle Factors:

Research continues to explore the impact of lifestyle factors, such as diet, exercise, and alcohol consumption, on breast cancer risk and treatment outcomes.

Genetic Testing and Counseling:

Genetic testing and counseling can identify individuals at higher risk for breast cancer, allowing for personalized preventive measures and earlier detection.

Patient-Reported Outcomes:

Research also focuses on improving the quality of life for breast cancer survivors, addressing issues like chemotherapy-induced cognitive impairment ("chemo brain") and long-term side effects of treatment.

Conclusion

With the advancements in the chemotherapy for BC, the mortality rate from BC is decreasing in the last decade. Targeting ER has proved one of the most powerful treatment modalities against HR+ BC (95). Moreover, the success of the biological drugs such as anti-HER2 monoclonal antibody (96) also highlighted the feasibility and significance of the molecular targeting approach in BC therapy. However, metastasizing TNBC remains a deadly disease with limited treatment options. In recent years, the molecular mechanisms driving the heterogeneous treatment response in BC are better

elucidated. This has fueled the development of novel targeted agents, including inhibitors of PARP, CDK4/6, PI3K/AKT/mTOR, multiple kinases, or immune checkpoint, for the treatment of specific molecular subtypes of BC. Treatment options should be tailored to individual patient accordingly

REFERENCES:

1. Maughan KL, Lutterbie MA, Ham PS. Treatment of breast cancer. *American family physician*. 2010 Jun 1;81(11):1339–46.
2. Centers for Disease Control and Prevention. Breast cancer statistics. <http://www.cdc.gov/cancer/breast/statistics>. Accessed March 26, 2010
3. American Cancer Society. Cancer facts and figures 2009. Atlanta, Ga.: American Cancer Society; 2009.. Accessed March 26, 2010
4. Horner MJ, Ries LAG, Krapcho M, et al., eds. SEER cancer statistics review, 1975-2006. Bethesda, Md.: National Cancer Institute; 2009. Accessed March 26, 2010.
5. American Cancer Society. Overview: breast cancer. Survival rates for breast cancer. Accessed April 8, 2010.
6. Breast. In: Greene FL, Page DL, Fleming ID, et al., eds. *AJCC Cancer Staging Manual*. 6th ed. New York, NY: Springer-Verlag; 2002:223-240.
7. Tong CW, Wu M, Cho WC, To KK. Recent advances in the treatment of breast cancer. *Frontiers in oncology*. 2018 Jun 14;8:227.
8. Siegel RL, Miller KD, Jemal A. Cancer statistics, 2017. *CA Cancer J Clin* (2017) 67:7–30. doi:10.3322/caac.21387
9. Polyak K. Heterogeneity in breast cancer. *J Clin Invest* (2011) 121:3786–8. doi:10.1172/JCI60534
10. American Cancer Society. *Breast Cancer Facts & Figures 2017–18*. Atlanta: American Cancer Society, Inc. (2017).