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REVIEW ARTICLE

DIAGNOSTIC MEASURES OF CANCER AT DIFFERENT STAGE

Dr Joel Thomas[1]*, Dr Joshin Sara Cherian[1], Dr Juliyana Joseph[1], Dr Greeshma Paul[1], Dr Ashby Benny[1], Dr Megha Philip[2], Dr Vijay M C[3]

1. Department of Pharmacy Practice, Padmavathi College of Pharmacy, Dharmapuri, TN, India
2. Department of Pharmacy Practice, C L Baid Metha College of Pharmacy, Thoripakkam, Chennai, TN, India
3. Radiation Oncologist, Department of Oncology, Govt. Head Quarters Hospital, Krishnagiri, TN, India

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Correspondence
Dr. Joel Thomas, Pharm D
Padmavathi College of Pharmacy and Research Institute, Krishnagiri, Periyanahalli, Dharampuri, Tamilnadu, India.
joelthomas29101992@gmail.com

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ABSTRACT

Abnormal cell growth with the potential to spread or invade to different parts of the body is the primary symptom of cancer. These contrast with benign tumors, which do not spread to other parts of the body it is important to finding out how much cancer is in a person's body and what the location is? This process is called staging. In development of cancer it has different stages. Stage of cancer diagnosis may be expressed as numbers (I, II, III, and IV) or by terms such as localized, regional, and distant. The lower the number or the more localized the cancer, the better a person's chances of benefiting from treatment. Tracking the rates of late-stage (distant) cancers is a good way to monitor the impact of cancer screening. When more cancers are detected in early stages, fewer detected in late stages. In process to determine the amount of the cancer in the body, doctors first look at the primary tumor for its size, location, and whether it has grown into nearby areas. Different types tests are performed to figure out a cancer's stage, Depending on location of the cancer, the physical exam may give indications. Imaging tests like x-rays, CT scans, MRIs, ultrasound, and PET scans may also give information about how much and where cancer is in the body. A biopsy is needed to confirm a cancer diagnosis.

INTRODUCTION

To offer the best possible treatment to patient accurate determination of diagnosis and stage of the cancer is important but the process is often complex. The complexity is augmented by the need to consider the fitness of the patient which itself may influence both diagnostic and treatment decisions and may require a change to the diagnostic and staging pathway. It is axiomatic that minimizing the number of individual steps in the diagnosis and staging pathway and completing them quickly will reduce delays. Investigations that provide both diagnostic and staging information will reduce the number of steps required (1). The risks of tests need to be considered, and be proportionate to the potential benefits. Where appropriate, pathways need to be flexible enough to allow management of patients to proceed with minimal diagnostic and staging information. The challenge is to design a pathway that is both accurate and flexible enough to allow patients to choose the most appropriate treatment for them without delay (2).

TYPES OF STAGING

Before any treatment patient is diagnosed than staging is done for further procedure. Mainly two types of staging are followed

Clinical staging

This is an estimate of the extent of the cancer based on results of physical exams, imaging tests (x-rays, CT scans, etc.), and tumor biopsies. For some cancers, the results of other tests, such as blood tests, are also used in staging. The clinical stage is a key part of deciding the best treatment to use. It's also the baseline used for comparison when looking at how the cancer responds to treatment (3).

Pathologic staging

If surgery is being done, doctors can also determine the pathologic stage (also called the surgical stage) of the cancer. The pathologic stage relies on the results of the exams and tests mentioned before, as well as what is learned about the cancer during surgery (04). Often this is surgery to remove the cancer and nearby lymph nodes, but sometimes surgery may be done to just look at how much cancer is in the body and take out tissue samples. Sometimes, the pathologic stage is different from the clinical stage (for instance, if the surgery shows the cancer has spread more than was thought). The pathologic stage gives the health care team more precise information that can be used to predict treatment response and outcomes (prognosis) (05).

STAGING SYSTEM

There are different types of staging systems, but the most common and useful staging system for most types of cancers is the TNM system (06).

The TNM system

The American Joint Committee on Cancer (AJCC) and the International Union for Cancer Control (UICC) maintain the *TNM classification system* as a tool for doctors to stage different types of cancer based on certain standards. It's updated every 6 to 8 years to include advances in our understanding of cancer.

In the TNM system, each cancer is assigned a letter or number to describe the tumor, node, and metastases (07).

- **T** stands for the original (primary) **tumor**.
- **N** stands for **nodes**. It tells whether the cancer has spread to the nearby lymph nodes
- **M** stands for **metastasis**. It tells whether the cancer has spread to distant parts of the body.

The **T** category gives information about aspects of the original (primary) tumor, such as its size, how deeply it has grown into the organ it started in, and whether it has grown into nearby tissues.

- **TX** means the tumor can't be measured.
- **T0** means there is no evidence of a primary tumor (it cannot be found).
- This means that the cancer cells are only growing in the most superficial layer of tissue, without growing into deeper tissues. This may also be called in situ cancer or pre-cancer.
- Numbers after the T (such as **T1, T2, T3, and T4**) might describe the tumor size and/or amount of spread into nearby structures. The higher the T number, the larger the tumor and/or the more it has grown into nearby tissues (08).

The **N** category describes whether the cancer has spread into nearby lymph nodes.

- **NX** means the nearby lymph nodes cannot be evaluated.
- **N0** means nearby lymph nodes do not contain cancer.
- Numbers after the N (such as **N1, N2, and N3**) might describe the size, location, and/or the number of nearby lymph nodes affected by cancer. The higher the N number, the greater the cancer spread to nearby lymph nodes (09).

The **M** category tells whether the cancer has spread (metastasized) to distant parts of body).

- **M0** means that no distant cancer spread was found.

- **M1** means that the cancer has spread to distant organs or tissues (distant metastases were found) (09).

Most cancer types have their own version of this classification system, so letters and numbers don't always mean the same thing for every kind of cancer. For example, in some types of cancer, the T categories describe the size of the main tumor, while in others they describe how deeply the tumor has grown in to the organ it started in, or whether the tumor has grown into nearby structures (10).

Some cancer types also have special groupings that are different from other cancer types. For instance, for some cancers, classifications may have subcategories, such as T3a and T3b, while others may not have an N3 category (11).

DIAGNOSISD

1. Cervical Cancer Screening

A screening technique called the Pap test (or Pap smear) allows early detection of cancer of the cervix, the narrow portion of the uterus that extends down into the upper part of the vagina. In this procedure, a doctor uses a small brush or wooden scraper to remove a sample of cells from the cervix and upper vagina (12). The cells are placed on a slide and sent to a laboratory, where a microscope is used to check for abnormalities. Since the 1930s, early detection using the Pap test has helped lower the death rate from cervical cancer more than 75%. CCS should abnormalities be found, an additional test may be necessary (13). There are now 13 high-risk types of human papillomaviruses (HPV) recognized as the major causes of cervical cancer. The U.S. Food and Drug Administration have approved an HPV test that can identify their presence in a tissue sample. This test can detect the viruses even before there are any conclusive visible changes to the cervical cells (15).

2. Breast Cancer Screening

Breast cancer can sometimes be detected in it is early stages using a mammogram, an X-ray of the breast. Mammography is most beneficial for women as their age and undergo menopause (16). Mammography is a screening tool that can detect the possible presence of an abnormal tissue mass. By itself, it is not accurate enough to provide definitive proof of either the presence or the absence of breast cancer. If a mammogram indicates the presence of an abnormality, further tests must be done to determine whether breast cancer actually is present (17).

3. Prostate and Ovarian Cancer Screening

The U.S. Food and Drug Administration have approved the PSA test along with a digital rectal exam to help detect prostate cancer in men age 50 and older. Doctors often use the PSA test and DRE as prostate cancer screening tests; together, these tests can help doctors detect prostate cancer in men who have no symptoms of the disease (18). Most men with an elevated PSA test, though, turn out not to have cancer; only 25 to 30% of men who have a biopsy due to elevated PSA levels actually have prostate cancer, so researchers are working hard to find new clues. Experts are trying to develop better blood tests that might alert people to malignancies while cancers are still in their early stages. For example, several new blood tests for ovarian or prostate cancer are under development (19).

4. Colon Cancer Screening

A procedure called a faecal occult blood test (FOBT) detects invisible amounts of blood in the faeces, a possible sign of several disorders, including colon cancer. The test is painless and can be done at home or in the doctor's office along with a rectal exam (20). With an application stick, a dab of a stool specimen is smeared on a chemically treated card, which is tested in a laboratory for evidence of blood. If blood is confirmed in the stool, more elaborate tests may be performed to find the source of the bleeding. Some other options include sigmoidoscopy and colonoscopy (21). The former exam uses a lighted instrument called a sigmoidoscopy to find precancerous or cancerous growths in the rectum and lower colon. The latter exam uses a lighted instrument called a colonoscopy to find precancerous or cancerous growth throughout the colon, including the upper part (22).

5. Biopsy

To diagnose the presence of cancer, a doctor must look at a sample of the affected tissue under the microscope. Hence, when preliminary symptoms, Pap test, Mammogram, PSA test, FOBT, or colonoscopy indicate the possible existence of cancer, a doctor must then perform a biopsy, which is the surgical removal of a small piece of tissue for microscopic examination (For leukemia, a small blood sample serves the same purpose) (23). This microscopic examination will tell the doctor whether a tumor is actually present and, if so, whether it is malignant (i.e., cancer) or benign. In addition, microarrays may be

used to determine which genes are turned on or off in the sample, or proteomic profiles may be collected for an analysis of protein activity (24). This information will help doctors to make a more accurate diagnosis and may even help to inform treatment planning.

CONCLUSION

The importance of regular screening to improve early diagnosis of malignancies is important. All over the world, there has been a call for early detection in at-risk populations to decrease the morbidity and mortality associated with cancer visual detection is a well-established and accurate diagnostic method for all types of cancer. Recent advances have shown that the risk of malignant transformation is associated with chromosomal aberrations. These adjuncts for detection and diagnosis have the potential to assist in early detection, leading to early diagnosis and improved treatment outcomes. In this paper, various methods to detect cancers are analyzed. The proposed work will identify cancer at an earlier stage which helps doctors to provide medications and other treatments necessary for the particular cancer type. The proposed work will explore different enhancement techniques to improve the quality of images capturing devices like Ultra – Sonography (US), Positron Emission Tomography (PET), Single photon Emission Computed Tomography (SPECT), Optical Imaging (OI), Computed Tomography (CT), X ray, Ultrasound and MRI. This will benefit the patients suffering from oral cancer (25).

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