

Tumor Markers for Early Detection of Cancer

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Summary

According to an estimate a 100 different types of cancer are known to human today. Although advances in this field have made the treatment much better, cancer still remains the second most common disease responsible for death in the world. Probability for the treatment of disease increases if disease is diagnosed in its early stage. Among different methods used for diagnosis and prognosis of this disease, one is the use of tumor markers. A number of different tumor markers are being used for the detection of various types of cancer, e.g., Afamin is used for the diagnosis of ovarian cancer, α -methylacyl coenzyme A racemase (*AMACR*) is used for the diagnosis of prostate cancer, CA 15-3, c-erbB-2 and E-cadherin adhesion molecule are the biomarkers used for the diagnosis of breast cancer. In addition some other methods can be used for the diagnosis of tumors, such as, the appraisal of genotype of cancerous cells by circulatory proteome, molecular imaging of cancerous cell by positron emission tomography. In this article all the tumor markers for various types of cancer are put together.

Key words: Tumor markers, Cancer

Introduction

Tumor is an uncontrolled or abnormal growth of cells. Tumors are: Cancerous tumors (malignant) and Non-cancerous tumors (benign). Cancerous tumors have the ability to intrude other tissues via blood or lymph system. The malignant tumors are capable of metastasis i.e., spread of disease throughout the body. So we can say that cancer can not be regarded as just one disease; actually it is a group of diseases. Benign tumors are not actually cancer. They do not intrude other body organs and usually when removed they do not come back. Tumor markers are the substances that can be detected in body fluids, such as, blood, urine, or other body tissues of patients, in higher-than-normal amounts, with a specific cancer. A tumor marker may either be made by a tumor itself or by the body in reaction to the tumor. Although no tumor marker gives a 100 percent accurate result, it is still considered as a major diagnostic tool for the detection of various kinds of cancer. Some of the tumor markers used for the diagnosis of different types of cancer is given below:

Ovarian cancer

In a recent research, it is described that by using proteomic patterns in serum to diagnose ovarian and prostate cancers, accurate diagnostic predisposition and specificity can be attained. Proteomic pattern means a higher dimensioned study of proteins, specially their structures and functions^[1]. In another experiment Comparative proteomics can key out the vitamin E-binding plasma protein, afamin, as an effective diagnostic tumor marker for ovarian cancer.^{[2][3]} In addition Plasma LPA (Lysophosphatidic Acid) levels may typify a potential biomarker for ovarian cancer and other gynecologic cancers^{[4][5]}. Another research carried out by Steven J. Skates and Toshimitsu Uede showed that there is some sort of relationship between between levels of certain biomarker, osteopontin, and ovarian cancer^{[5][6]} CA 125 is also a useful tumor marker for the detection of ovarian cancer.^[7]

Prostrate cancer

The best biomarker for the diagnosis of prostrate cancer is the one which determines the exact value of prostate-specific antigen (PSA). A high level of α -methylacyl coenzyme A racemase (*AMACR*) is shown in the pathological condition of prostrate cancer.^[8] SELDI-TOF-MS technology has facilitated the discovery of prognostic biomarkers in serum that can successfully discriminate aggressive from indolent PCa and also differentiate between recurrence groups.^[9] One of the upcoming researches suggests that by supervising the noncoding RNA transcript *PCA3* in urine, it may be useful in sleuthing prostate cancer in patients with high PSA levels. The researchers have succeeded to prepare the model for the preparation of highly honed, multiplex urine biomarker tests for more precise diagnosis of prostate cancer^[10]. Another research has revealed that the concentrations of PSA below 1.0 ng/ml almost precluded a prostate cancer diagnosis at the end of the test. Thus there is a need of additional biomarkers for early detection of prostate cancer before the introduction of population based analysis for prostate cancer.^[11]

Breast cancer

Among multiple serum-based tumor markers that have been used for breast cancer, like CA 15-3, BR 27.29 (CA27.29), carcinoembryonic antigen (CEA), tissue polypeptide antigen, tissue polypeptide specific antigen, and HER-2, the most commonly used biomarkers for breast cancer are CA 15-3 and CEA.^[12] CA 15-3 is considered to be the first independent circulating diagnostic marker set forth for breast cancer. The use of estrogen (ER) and progesterone receptors (PgR), c-erbB-2 oncogene, p53 tumor suppressor gene and E-cadherin adhesion molecule in combination is a good tumor marker for breast cancer.^[13]

Lung cancer

According to a research made by Steven A. Belinsky and Kristen J. Nikula The *p16^{INK4a}* (*p16*) tumor suppressor gene can be discharged by promoter region hypermethylation in many types of tumor including lung cancer^[14]. According to another research, it is appraised that the presence of CEA, CK-19 and c-met mRNAs in body fluids, especially in blood provides a worthful and precious tool for molecular diagnosis of non-small cell lung cancer^{[15] [16]}. Another research has revealed that the micro metastases observed by the technique of RT-PCR for CEA mRNA in patients with eviscerated pN0 NSCLC.^[17]

Gastric cancer

Patients with advance gastric cancer usually have high level of CEA and some other markers, such as, CA19-9 and CA125.^{[18] [19]} although tumor markers are useful for the detection of malignant and benign tumors, physicians should also consider other pathological conditions due to which the level of certain tumor markers is increased.^[20] Another research has revealed that the CA19-9 is an effective tumor marker for the diagnosis of gastric cancer.^{[21][22]}

Hematological malignancy (blood cancer)

Higher level of CEA, CA19-9 is an indication of hematological malignancy. It also helps to distinguish hematological malignancy and skeletal metastases.^[23]

Kidney cancer

Decreased level of apolipoprotein A-IV (apoA-IV) in plasma in patients with kidney cancer is a diagnostic marker^[24]. Promoter hypermethylation can be detected in urine in patients with all types of renal cancer.^[25]

Colon cancer

SBT (schistosomal bladder tumor) and NSBT (non-schistosomal bladder tumor) are very prominent tumor markers for tumor markers.^[26] According to another research carried out by the researchers from shanghai, 2-D DIGE can act as a promising tumor marker for colorectal tumors.^[27]

Molecular imaging of cancer

Another technique introduced to diagnose cancer is Molecular imaging of cancer with positron emission tomography. Positron emission tomography (PET) is considered to be one of the super sensitive and non-invasive techniques which are ideally suited for tomography of cancer biology.^[28]

The biomarkers discussed above are very helpful to diagnose the diseases and early detection of cancer can save ones life.

Conclusion

Early detection of cancer may help physicians in the recovery of the disease. This can be done by adopting simple and effective methods such as tumor markers. ^[29]

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