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Alpha-Fetoprotein as a Biomarker Not Classfied Only for Pregnancy, but also Different Levels Might Show Problems in another Organ Systems

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1. Part 2

As mentioned before AFP plays crucial role in childhood cancers and genetic-related children's chronic diseases

2. Wilms Tumor

Wilms tumor is a rare kidney cancer that affects children age. It is also known as nephroblastoma, and causes kidney cancer in children most often in ages 3 to 4. It becomes much less common after age 5, but it can affect older children and even adults, but that is rare. Wilms tumor mostly occurs unilaterally, but sometimes it can affect both kidneys at the same time. Over the years, progress in the diagnosis and treatment of Wilms tumor has greatly improved the prognosis for children with this disease. With treatment, the outlook for most children with Wilms tumor is good.

3. Symptoms of Wilms Tumor

*A mass in the stomach area that can be palpated

*Swellling in the stomach area

*And also pain in stomach area

Symptoms can also include fever, blood in the urine, low red blood cell count (anemia), and/or high blood pressure in small children, which is very are and especially in those small children raises a red flag. It is not clear what causes this disease in children, it begins when cellls develop changes in their DNA, and the cells are told to grow and multiply much quicker than normal. The cancer cells liive while healthy cells die, but in Wilms tumor, the changes make extra cells in the kidney that form the tumor.

4. Risk Factors

*Black color of the skin – Asia-American children appear to have a lower risk than children of other races.

*Family history of having Wilms tumor

Risk Factors Connected to Conditions Present at Birth:

*Aniridia – the iris forms only in part of an eye or not at all

*Hemihypertrophy – one side of the body or a part of the body is larger than the other side

Wilms Tumor also Accurs as a Part of Other Syndromes:

*WAGR syndrome – Wilms tumor, Aniridia, Genital and Urinary system problems and Intellectual disabilities

*Denys-Drash syndrome – Wilms tumor, kidney disease and male pseudohermaphroditism

*Beckwith-Wiedemann syndrome – children with this syndrome are much larger than what is typical (macrosomic), which might cause organs in the stomach area to jut into the base of the umbilical cord, large tongue, internal organs and ears that are formed unusually. Wilms tumor cannot be prevented, just preventively screening by ultrasound may help find the disease at an early stage (1).

5. Respiratory System

Alpha-fetoprotein levels in the serum and broncho-alveoar lavage fluid in patients with lung cancer and other diseases of the respiratory system. Concentration of alpha-fetoprotein (AFP) may be increased in some type of lung cancer. In the study of Polish Clinic, the concentration of AFP was evaluated in serum and broncho-alveolar lavage fluid (BALF) in patients with lung cancer. The values of concentration were compared with results obtained from patients with other diseases of the respiratory tract. Examinations were performed in 14 patients with lung cancer, 12 with sarcoidosis, 23 with chronic obstructive bronchitis and 16 with acute bronchitis. Liver pathology was excluded according to biochemical analytical tests. In all patients bronchofibroscopy was performed and BALF was obtained in routine way. Concentration of AFP in serum and BALF was determined by immuno-assay technique. In performed examinations non-significant increase of AFP concentration was determined in serum and BALF of patients with lung cancer. However, obtained values were increased twice than in patients with acute bronchitis. Moreover, it was noticed that in patients with chronic obstructive bronchitis the AFP concentration was the highest, especially in the group treated by steroids. The study indicates that evaluation of AFP concentration is out of value in diagnosis and differentiation of lung cancer. It seems to be necessary to continue the examinations for explanation a role of steroids in inflammatory process and increase of AFP concentration (2).

6. Alpha Fetoprotein in Hepatocellular Carcinoma

Hepatocellular carcinoma (HCC) is one of the most common causes of cancer-related deatths globally, because most of the patients are diagnosed in advanced stage. Despite great diagnostic progress, there remains a high unmet need for new treatment options. HCC is characterized by so many pathogenic mechanisms, that is complicated to characterize it by one single biomarker. Still AFP remains the most widely used and accepted for over 60 years. Historically and currently is the AFP used for screening and surveillance, diagnosis and its utility as a prognostic and predictive biomarker and its role as a tumour antigen in HCC. The AFP gene is one of the four members of the albumin gene family localized in a tandem arrangement to form a multigene cluster and there are three major isoforms defined by their affinity for the lecitin Lens culinaris agglutinin that are found in varying amounts in different physiological or pathological conditions.

7. AFP as a Tumor Antigen in HCC

The relevance of the tumour microenvironment, and particularly the infiltrating immune cells, in HCC has been widely recognized. Recently, it has been shown that the immune contexture determines survival of HCC patients and that approximately 25% of HCCs belong to an immune-specific class defined by high expression levels of inflammatory response markers such as CD274 (programmed cell death ligand 1 [PD-L1]) and programmed cell death 1 (PD-1), among others. How best to select patients and any impact of treatment sequence therefore remain important questions for characterizing the role of immunotherapy in HCC. The effect of immunotherapy relies on the recognition of antigens expressed on cancer cells by the patient's immune system, which subsequently attacks and eliminates the malignant cells. It has long been proposed that AFP as an oncofetal antigen can become a target for immunotherapy because it features potentially immunogenic epitopes and is not expressed in healthy individuals after birth. In addition, AFP promotes the proliferation of liver cancer, which makes it an even more worthy immunotherapeutic target.

Naturally, the immune system is tolerant against AFP being a self-protein, and only low immunity is mounted against the protein in HCC patients despite high plasma levels. To overcome this tolerance, several AFP-based immune interventions have been tested in the past, which have, however, been mainly limited to animal models. Further studies are needed to demonstrate a benefit of AFP-based immunotherapies in HCC patients. Included patients will be treated with autologous genetically modified AFPc332 T cells that will specifically target the patient's own AFP-expressing HCC tumour cells.

8. Conclusions and Future Directions

Hepatocellular carcinoma is a complex disease with multiple pathogenic mechanisms caused by a variety of risk factors, making it difficult to characterize HCC with a single biomarker. Since its discovery more than 60 years ago, the use of AFP in clinical practice has evolved, and the knowledge of its role in HCC has expanded. Although AFP's performance as a screening, diagnostic and prognostic marker for HCC is not ideal, it is the most frequently used biomarker in the management of HCC. Despite its considerable age, there are still open questions regarding the utility of AFP in the context of HCC that should be addressed: e.g. What functional role, if any, does it play in tumour development? (3).

9. Discussion

As shown in the article, different levels of AFP can affect many body organs, especially important knowledge of this marker is n children age and its connection to genetics. In adults it is a marker not only cancerous, but also chronical inflammatory diseases, this all should be considered by clinicians in case of getting abnormal results of this biomarker.

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