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Precision medicine in cancer treatment

Medicina de precisión en el tratamiento del cáncer

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Mr. Editor:

Precision medicine is an individualized therapeutic modality that takes into account the genetic variability of patients, the environment in which they live and lifestyles, in order to draw up strategies for the prevention, diagnosis and treatment of diseases [1,2].

Cancer is a very heterogeneous disease, characterized by the development and accumulation of genetic alterations in the tumor cell throughout the development of the disease. However, few of these alterations are common; what has been shown with increasing evidence is that, each person expresses their own genetic profile of cancer [2].

An evidence of the previous approach is breast cancer. Several years ago it was shown that there were different molecular types of breast cancer, and that these subtypes had differences in their biological behavior and could each be treated in a particular way. This discovery led to the division into molecular subtypes according to receptors that were expressed on their surface. Those that express hormone receptors are candidates for hormonal treatment, those that express HER-2 receptors are candidates for treatment with monoclonal antibodies (mAbs) directed against this receptor [3].

This example shows how two tumors from the same location vary in their biological behavior and treatment due to genetic-molecular alterations specific to each patient.

In recent years, many advances have been made in understanding cancer cell genetic alterations and its molecular signaling pathways, but how have these advances been incorporated into clinical practice for the use of cancer cells? of more precise diagnostic-therapeutic strategies?

Due to the understanding of the role that certain genes play in the neoplastic process, screening can now be carried out to detect patients at high risk of developing specific neoplasms. Taking into account theabove example constitutes the detection of mutations in the BRCA1 and BRCA2 genes in patients at risk of breast and ovarian cancer[4,5].

The detection of mutations in these genes makes it possible to establish therapeutic actions that range from the performance of more frequent checkups for early detection to the performance of preventive surgical therapies. The study of mutations in the MLH1 and MLH2 genes makes it possible to identify patients with a higher risk of developing colon cancer, therefore, in these patients the decision can be made to accomplish annual colonoscopies for early detection and take therapeutic behaviors even when they present preneoplastic lesions[4,5].

In families where a hereditary cancer syndrome is suspected, testing for mutations in new generations can facilitate prevention and early diagnosis [4,5].

Another advance in precision medicine has been the change from the traditional classification system for tumors. The classical method uses a histological classification, which provides reduced information on the prognosis of the patient and the possibilities of responding to treatment.

As it explained above, two tumors of the same histological type identified by conventional morphological methods may present different molecular alterations that cause variation in their prognosis and treatment[3,6].

Molecular analysis of tumor proteins, DNA, RNA and micro-RNA has allowed subclassification of many types of tumors which may have the same histological origin. This subclassification allows establishing different prognoses and treatments[3,6].

Many molecular alterations have also been identified which can serve as targets for specific treatments directed against them. Therefore, the presence of these alterations serves as predictive markers of response to treatment[3,6].

Example of this, is non-small cell lung carcinoma; it has been shown that patients with this type of carcinoma, expressing the EGFR receptor, respond to therapies with tyrosine kinase inhibitors. Another example is colon cancer. Patients with KRAS mutations are resistant to treatments with the mAbs cetuximab and panitumumab, while those who do not have this mutation respond satisfactorily [3,6].

In Cuba, have been produced mAbs and other medicines that constitute a clear example of precision medicine. An example of this is the mAb nimotuzumab, which is used in numerous tumors with overexpression of the EGFR 7 receptor.

More and more drugs in clinical practice are used following the principle of precision medicine. In general, whe-

never the molecular characteristics of the patient's tumor are studied and medications directed against the targets presented in it. It is being donethe use of precision medicine.

The use of pharmacogenetics in treatment planning is another example of the use of precision medicine. The genetic variability of individuals can modify the response to certain drugs. Variations in the genes that encode the enzymes responsible for metabolism and transport, as well as, the location of action can compromise the efficacy and safety of treatment.

An example of this are the patients who present polymorphisms in the cytochrome P450 (CYP) enzyme, which results in alterations in the pharmacokinetics and distribution of drugs that are processed by this direction. Breast cancer patients with genetic variations of P450 2D6 (CYP2D6) have been shown to show poor tamoxifen metabolism status, reducing their survival. The detection of these polymorphisms and alterations makes it possible to identify patients who may benefit from certain medications, besides helps to establish optimal therapeutic doses, reduce associated costs, increase the efficacy of treatment, and avoid adverse events [1].

Undoubtedly, the use of precision medicine in cancer patients improves therapeutic results and helps to achieve a greater survival. With this approach, the traditional vision of the disease of a particular organ is changed to a focus with greater importance in molecular disease, where instead of using the maximum possible strategies to fight; the minimum necessary is used according to its own characteristics of the patient, guided by a model where decisions are made by individual molecular attributes.

AUTHORSHIP

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