Cancer immunotherapy

Immunotherapy also called biologic therapy, is a type of cancer treatment that boosts the body's natural defenses to fight cancer. It uses substances made by the body or in a laboratory to improve or restore immune system function.

Several Phase II and III clinical trials have demonstrated that immunotherapy can induce objective responses in otherwise refractory malignancies in tumors outside the central nervous system. In large part, effector T cells mediate much of the antitumor efficacy in these trials, and potent antitumor T cells can be generated through vaccination, immune checkpoint blockade, adoptive cell transfer, and genetic engineering.

The last decades of basic research in virology, oncology, and immunology can be considered a success story. Based on discoveries in these research areas, translational research and clinical studies have changed the way of treatment of cancer by introducing and including immunotherapy [1)].

Cancer immunotherapy (sometimes called immuno-oncology) is the stimulation of the immune system to treat cancer, improving the immune system's natural ability to fight the disease. It is an application of the fundamental research of cancer immunology and a growing subspecialty of oncology.

With the advent of cancer immunotherapy, there has been a major improvement in patients' quality of life and survival. The growth of cancer immunotherapy has dramatically changed our understanding of the basics of cancer biology and has altered the standards of care (surgery, radiotherapy, and chemotherapy) for patients. Cancer immunotherapy has generated significant excitement with the success of chimeric antigen receptor (CAR) T cell therapy in particular. Clinical results using CAR-T for hematological malignancies have led to the approval of four CD19-targeted and one B-cell maturation antigen (BCMA)-targeted cell therapy products by the US Food and Drug Administration (FDA). Also, immune checkpoint inhibitors such as antibodies against Programmed Cell Death-1 (PD-1), Programmed Cell Death Ligand-1 (PD-L1), and Cytotoxic T-Lymphocyte-Associated Antigen 4 (CTLA-4) have shown promising therapeutic outcomes and long-lasting clinical effect in several tumor types and patients who are refractory to other treatments. Despite these promising results, the success of cancer immunotherapy in solid tumors have been limited due to several barriers, which include immunosuppressive tumor microenvironment (TME), inefficient trafficking, and heterogeneity of tumor antigens. This is further compounded by the high intra-tumoral pressure of solid tumors, which presents an additional challenge to successfully delivering treatments to solid tumors [2)].

Due to its high anti-tumor efficacy has attracted considerable attention globally from experts in

various fields. However, immunotherapy could be severely toxic; not all patients may respond, thus requiring combination therapy. Therefore, a reasonable selection strategy for early treatment is urgently needed. It is vital to capture the dynamic, heterogeneous, and complex tumor behavior considering the absence of ideal companion biomarkers. Since tumor immune response involves tumor cells, several other cell types, and molecules in the tumor microenvironment, detection is very complex and variable. However, the molecular imaging technology, namely the non-invasive whole-body molecular imaging by positron emission tomography and single-photon emission computed tomography, has shown considerable promise in tumor detection and cancer immunotherapy response. Identification of potential novel imaging biomarkers will allow a personalized treatment plan for every patient. Future imaging strategies for these molecules used alone or in combination or continuously, might help stratify patients before or during the early stages of immunotherapy, and might address the immunotherapy challenges encountered by the oncologists [3].

Immunotherapy may work by:

Stopping or slowing the growth of cancer cells

Stopping cancer from spreading to other parts of the body

Helping the immune system work better at destroying cancer cells

There are several types of immunotherapy, including:

Monoclonal antibodies

Non-specific immunotherapies

Oncolytic virus therapy

T-cell therapy

Cancer vaccines

The introduction of immunotherapy with immune checkpoint receptor blockade has changed the treatment of advanced cancers, at times inducing prolonged remission.

Emerging as the newest pillar of cancer treatment, with the potential to assume a place alongside surgical debulking, radiotherapy and chemotherapy. Early experiences with antitumor vaccines demonstrated the feasibility and potential efficacy of this approach and newer agents, such as immune checkpoint blocking antibodies and modern vaccine platforms, have ushered in a new era.

see Gene mediated cytotoxic immunotherapy.

see Monoclonal antibody therapy

Indications

Immunotherapy Indications

T-cell immunotherapy

T-cell immunotherapy

Resistance

Immunotherapy resistance

Immunomodulation

Immunomodulation.

Solid Tumor Immunotherapy

Solid Tumor Immunotherapy.

1)
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