Immunological Disorders and Immunotherapy

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Opinion Article

Osteosarcoma Immunotherapy: Potential Objectives

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DESCRIPTION

Osteosarcoma, the most common primary malignancy of bone, is thought to originate from mesenchymal stem cells. More than 85% of osteosarcomas metastasize to the lung and bone. The prognosis for people with osteosarcoma was inadequate before the development of chemotherapy, and the survival rate for these individuals was less than 20% before the 1970s. The survival rate was raised to 60%-70% by performance a surgical resection with sufficient surgical margins and neoadjuvant chemotherapy with methotrexate, doxorubicin, cisplatin, and ifosfamide. However, the prognosis for individuals with recurring, metastatic, or incurable osteosarcomas remains impecunious. Patients with osteosarcoma have a long-term survival rate of about 65%, compared to less than 20% for those with metastatic osteosarcomas.

However, over the past three decades, there have been no appreciable advancements, and persistent or metastatic osteosarcomas are often resistant to the current course of care. The effectiveness of the drugs for treating patients with osteosarcoma is still unknown, despite the fact that there are an increasing number of systemic therapeutic options for advanced sarcoma, such as pazopanib, trabectedin, and eribulin.

In an attempt to more effectively treat osteosarcomas, new therapeutic strategies for advanced sarcomas have been searched for. In addition to other accessory cells, the immune system, a complex structure of immune cells and mediators, functions to protect the body against numerous diseases like viruses and bacteria. Dendritic Cells (DCs), macrophages, Natural Killer (NK) cells, neutrophils, basophils, and eosinophils make up the innate immune system.

Mast cells and macrophages release cytokines that interact with other immune cells to start the inflammatory response. Strong antigen-presenting cells called DCs are involved in presenting foreign antigens for identification by adaptive immune cells. B lymphocytes, CD4-positive T helper lymphocytes, and CD8-positive cytotoxic T lymphocytes make up the adoptive immune cells. These cells require direct antigen presentation from antigen-presenting cells in order to activate. Through presentation and activation, antigen-specific T cells and B lymphocytes are produced. In addition, infections and damaged cells are removed by innate and adaptive cells. Recognition of tumor-specific antigens, such as those produced by mutant genes, overexpressed normal genes, or genes producing viral proteins, is necessary for immunosurveillance for cancer.

In normal conditions, NK cells are activated, interferons are secreted, and then DCs are activated in order to recognize and destroy tumour cells. The loss of tumour antigens, the suppression of the Major Histocompatibility Complex (MHC) from the surface, the recruitment of regulatory T cells, myeloid-derived suppressor cells, and tumor-associated macrophages, as well as the upregulation of inhibitory receptors on T cells and inhibitory ligands on tumour cells are just a few of the mechanisms by which some tumour cells can escape and survive this immune system changes.

Bacterial infections or vaccinations have been known to stimulate anti-cancer immune responses. According to Coley's 1891 study, 10% of patients with bone and soft tissue sarcomas experienced a complete remission after receiving heat-inactivated Streptococcus pyogenes and Serratia marcescens (Coley's toxin) injections. In a recent study, it was discovered that surgery site infection had a favorable impact on survival in dogs with osteosarcoma. In addition, individuals with infections had an (85%) 10-year survival rate compared to 63% for patients without infections.

In the study, injection of living tumour cells significantly by injection of irradiated tumour cells significantly reduced the incidence of tumours, whereas injection of BCG had no significant effect on osteosarcoma. The bacterial vaccine elevated levels of immunoregulatory cytokines such as Interleukin (IL)-6, Tumour Necrosis Factor (TNF)-α, IFN- γ, and IL1- β, which may be responsible for causing tumour regression. These findings suggest that combining inactivated tumour cells with a bacterial vaccine can induce an anticancer immune response.

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