

Cancer Vaccines: Contemporary Approach of Cancer Treatment

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Review Article

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ABSTRACT

Adaptive immunotherapy or vaccines has been tried as a therapeutic option against cancer in the past decade. It is necessary for patients in advanced stage malignancy to have an efficient treatment. By taking in consideration that cancer vaccines are presenting effective results primarily in prophylactic settings, it is significant to develop therapeutic vaccines against cancer. On the contrary to the infectious diseases, cancers ascends from own body cells, to which immune system gets tolerized. Hence, to develop active immune response against cancer is more challenging compared to the infectious diseases.

MODES OF CANCER TREATMENT

Cancer can be defined as uncontrolled cell proliferation where non-characterized cells have ability to colonies in adjacent body parts [1-8]. Cancer which originates in breast tissue or other related part is called as breast cancer [8-19]. It is the most common type of cancer found in India and according to recent statistics, breast cancer accounts for 27% of overall cancers in women in India. As per the data, there are 1, 44,937 cases register of breast cancer and 70,218 deaths were reported. Hence, by following these numbers we can state that success rate of cancer treatment is very poor [20-32].

Current cancer treatment includes mainly three aspects: Surgery—where the specific cancer causing tissue or tumor is removed, Chemotherapy—where different drugs are given to reduce the tumor growth and Radiotherapy—where radiation is used to control metastatic tumor [33-41]. Even though these treatments are being used widely, there is necessity of new treatment methods due to high mortality rate. The following Figure shows increase in breast cancer cases in India in 2015 compared to last 25 years [42-51].

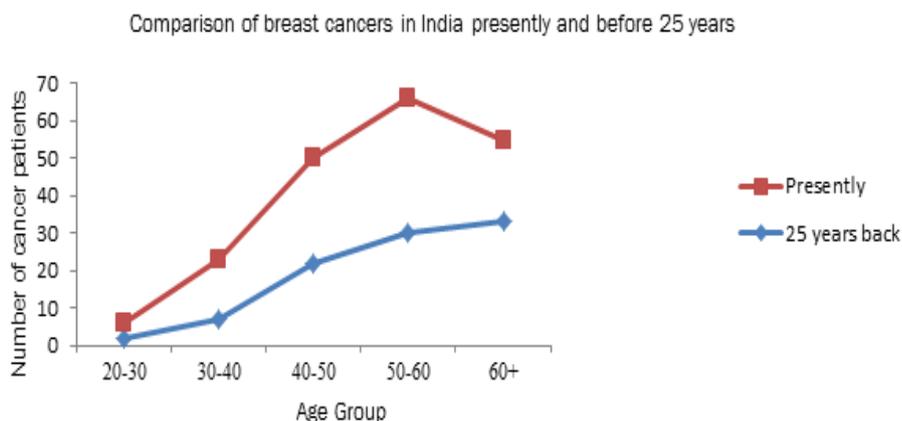


Figure 1. Comparison of breast cancers in India presently and before 25 years.

The modern approach in cancer treatment includes many different methods where cancer vaccines, use of m-RNA and Nano drugs are showing very promising results and it can be considered as the future of cancer treatment [52-59].

Cancer Vaccine

Cancer vaccines or therapeutic cancer vaccines are the newer attempt to treat cancer, where it is used to treat existing cancer or to avoid development of cancer [60-69]. Research is going on cancer vaccines mainly against breast, lung, colon, skin, kidney and prostate cancers [70].

There are different approaches of mechanism of cancer vaccines. One style is to separate proteins from cancer cells and to immunize patients against those proteins. These proteins act as the antigens and stimulate the immune system to kill cancer cells [71-76]. Another method involves generation of an immune response in patients by using oncolytic viruses. This is considered as the better option as it provides ‘patient specific vaccine’ where viruses are engineered to selectively replicate in tumor tissue hence they can express the immune stimulatory protein [77-79]. Basically cancer vaccines work by delivering target antigen to dendritic cells. These cells exist in antigen processing site. Dendritic cells get activated by adjuvants which are present in the vaccines [80-83]. Immune system reacts to this by increasing number of T-cells and transferring to lymph node. Followed by this, activated DCs provide antigen to T-cells; which identifies its associated antigen and gets activated [84]. This allows production of cytokines from CD4+ cells which triggers full maturation of CD4 cells. Subsequently CD8+ multiplies and circulates extensively all over the body [85-87]. When a cell containing target antigen of this activated T-cell comes in range, it results in lysis of that cell which gives antitumor response (Figure 2). Currently cervical, oropharyngeal cancer (against HPV) and liver cancer vaccines (against Hepatitis B virus) are approved in the world [88,89].

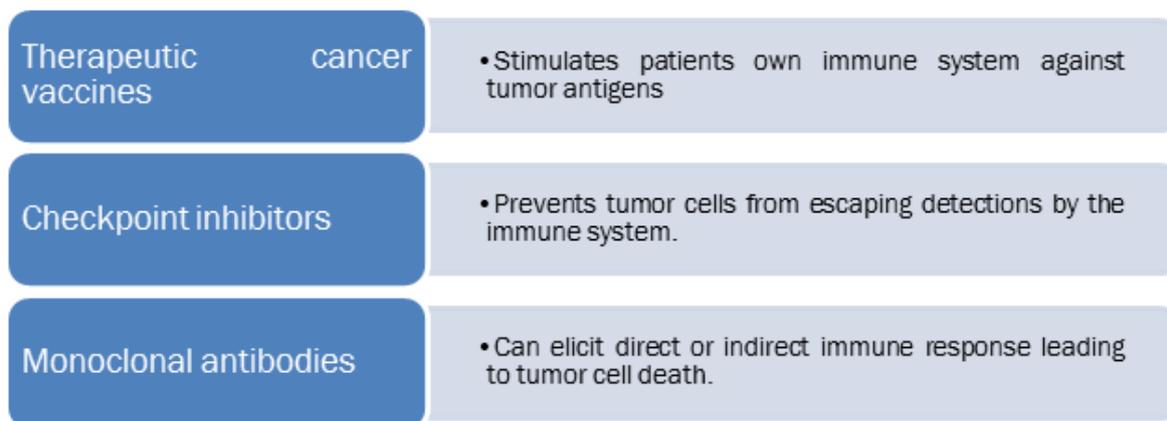


Figure 2. Major features of cancer vaccines.

CONCLUSION

Hence, in conclusion, cancer vaccines are emerging as long lasting, appealing method for antitumor immunity [90]. As first anti-tumor cancer vaccine has got approval, it will give next generation of vaccines with improved antitumor action which can be used for the patients who are having high risk of recurrence. Improved research on host-tumor interactions and tumor immune escape mechanisms is required for conversion of cancer vaccines into clinically accessible medications with wide range of applications [91-93]. The cancer vaccine therapy can also be improvised by recognition of distinctive tumor gene or protein product which causes alteration of normal cells into tumor cells and leads to cancer progression. Better quality clinical outcomes can be obtained by blending vaccine strategies with supplementary mediators which synergistically add to antitumor immunity [94-100].

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