

Research on Cellular Immune Targeted Drug Therapy for Breast Cancer based on Bioinformatics

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Abstract: Targeted therapy, because of its precise location, high efficiency and low toxicity, has become an important tumor treatment method besides traditional treatments such as surgery, radiotherapy and chemotherapy. Targeted drugs can deliver therapeutic drugs to target organs to the maximum extent, but have little effect on non-target organs, thus achieving high-efficiency and low-toxicity therapeutic effects, especially for treating diseases such as cancer. At the cellular and molecular level, molecular targeting means that drugs enter the body and specifically bind with carcinogenic sites on tumor cells, resulting in the death of tumor cells, but it does not affect the surrounding normal tissues and cells. Studying the pathogenesis and related genes of breast cancer plays an active role in the early diagnosis and treatment of breast cancer, and effectively relieves the current status of clinical breast cancer treatment. In-depth study on molecular typing of breast cancer can provide further reference for the selection of clinical treatment schemes more effectively. This paper discusses the cellular immune targeted drug therapy for breast cancer from the perspective of bioinformatics.

Keywords: Breast Cancer; Targeted Therapy; Tumour Cell.

1. Introduction

Breast cancer is one of the most common malignant tumors endangering women's health. The incidence rate of breast cancer is increasing all over the world. In many western countries, it has occupied the first place in gynecological tumors [1]. Due to the lack of typical and specific clinical symptoms and signs in the early stages of its onset, most patients have progressed to the mid to late stages of clinical diagnosis, becoming the largest cause of death in female BC [2]. The treatment method and prognosis of breast cancer are affected by regional differences, breast cancer types, stages, detection methods and other factors. In the past, surgery, radiotherapy and chemotherapy were used to treat the disease, but the treatment effect was not ideal [3]. Traditional drug development is a complex and lengthy process that requires a lot of manpower and resources to find effective candidate drugs. At the cellular and molecular level, molecular targeting means that drugs enter the body and specifically combine with the carcinogenic sites on tumor cells to cause tumor cell death, but do not affect the surrounding normal histiocyte [4]. Targeted treatment of breast cancer refers to the study of targeted therapeutic drugs at the cellular and molecular level, targeting the targets of breast cancer regulatory molecular pathways, combining with regulatory molecules or receptors, to regulate the activation of downstream genes and the expression of related receptors, so as to wither tumor cells, inhibit growth or inhibit tumor neovascularization [5].

About 70%~80% of early breast cancer patients can be cured, but some treatment methods for breast cancer do not improve the survival rate due to the invasiveness of tumor cells, but bring psychological pressure to patients. During radiotherapy, while killing tumor cells, it will also interfere with the survival of normal cells, causing secondary damage to patients [6]. Compared with traditional chemotherapy, molecular targeted therapy has strong specificity, significant effects, and minimal toxic side effects. A variety of molecular targeted drugs have been developed and used in clinic. Molecular targeted drugs for breast cancer may become

another new drug after hormone drugs and chemotherapy drugs [7]. Molecular targeted drug therapy has become a new treatment mode in addition to the three traditional treatment methods of surgery, radiotherapy, and chemotherapy [8]. With the rapid development of molecular biology, new targeted anticancer drugs are gradually becoming a hot research topic for clinical scholars. Studying the pathogenesis of breast cancer and breast cancer related genes plays an active role in the early diagnosis and treatment of breast cancer, effectively alleviating the current status of clinical breast cancer treatment. Understanding the mechanism of cellular immune targeting drug therapy for breast cancer will help promote the research progress of rational use of targeted drugs for breast cancer.

2. Molecular Targeted Therapy

Molecular targeted therapy has become a new biological therapy mode following the three traditional modes of surgery, radiotherapy and chemotherapy, and it is also a hot research topic in the field of breast cancer treatment. Its mechanism of action is to control changes in cell gene expression by blocking signal transduction in tumor cells or related cells, thereby producing an inhibitory or killing effect on tumor cells [9]. With the deepening of molecular biology research, molecular targets and targeted drug therapy have become hot topics in anti-tumor research at present. In recent years, anti-tumor scholars have developed a series of new molecular targeted drugs, such as lapatinib and trastuzumab, according to the targets of breast cancer drugs. After being put into the market, they have achieved good results, and anti-tumor treatment has entered a new stage [10-11]. Molecular targeted drugs are widely used in signal transduction inhibitors, tumor angiogenesis inhibitors, monoclonal antibodies, gene therapy, anti-tumor vaccines, etc. The difference between molecular targeted therapy and conventional chemotherapy is that chemotherapy is aimed at the characteristic that the proliferation rate of tumor cells is higher than that of normal cells, and kills tumor cells with active proliferation by acting on DNA synthesis, repair and mitosis [12]. The specificity

and specificity of its action are poor, and inevitably it will have a killing effect on normal cells. HER2, a drug targeting HER2, is widely present in tissues such as the respiratory tract, stomach, breast, and intestines. It is a transmembrane receptor glycoprotein with tyrosinase activity and can form heterodimers with other members of the vascular endothelial growth factor family, activate downstream signaling pathways, and overexpression can promote cell proliferation, which is closely related to the production and development of tumors [13]. Patuzumab is a synthetic recombinant human monoclonal antibody, which can combine with the extracellular domain of HER2, block the dimerization of HER2 and its family members, inhibit the activation of mitogen activated protein kinase and phosphatidylinositol 3-kinase signaling pathway, and promote cancer cell apoptosis. It is commonly used in combination with trastuzumab and docetaxel, with good efficacy [14]. Figure 1 shows the mechanism of targeted therapy for breast cancer.

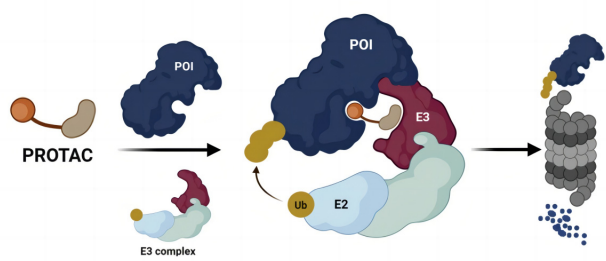


Figure 1. Mechanism of targeted therapy for breast cancer

The probability of brain metastasis in breast cancer patients was 10%~16%. However, in recent years, studies have shown that overexpression of HER-2 significantly increases the probability of brain metastasis (35%), with approximately 50% of patients dying from severe central nervous system diseases [15]. Lapatinib is a small molecule inhibitor of the tyrosine kinase receptor, which can simultaneously inhibit the epithelial growth factor receptor and HER2. Its pharmacological effect is to inhibit its own phosphorylation by combining with the epithelial growth factor and the adenosine triphosphate domain in HER2 cells, thereby preventing the activation of mitogen activated protein kinase and phosphatidylinositol 3-kinase signaling pathways, impeding cell proliferation and promoting cell apoptosis [16]. Lenatinib is a multi-target ubi Erb-B receptor tyrosine kinase inhibitor of HER2 and HER1, which has good curative effect on HER2 positive breast cancer patients resistant to trastuzumab, and the treatment effect of combined drugs on breast cancer patients sensitive to or resistant to trastuzumab is significantly better than that of single drugs [17]. The main advantage of monoclonal antibodies in the treatment of tumors is their excellent targeting, which means that these therapeutic drugs only aggregate at the affected area and selectively kill target cells, thereby reducing drug dosage and reducing toxic side effects. T-DM1 is a new targeting drug that is coupled with microtubule inhibitor Metaxin DM1 and trastuzumab. It not only has the targeting effect of trastuzumab and the anti-tumor effect of cytotoxics, but also can promote the combination of HER2 surface receptor and cytotoxic drugs, improve the lethality to tumor cells and reduce adverse reactions [18]. The drugs targeting the process of angiogenesis mainly include bevacizumab, a recombinant humanized monoclonal antibody, which can inhibit the mitosis of endothelial cells, reduce the formation of tumor

neovascularization and achieve the effect of inhibiting tumor growth by competitively binding with VEGF receptor and blocking the biological activity mediated by VEGF. Compared with natural ligands, monoclonal antibodies against EGFR have a higher affinity when binding to EGFR, thus blocking EGFR mediated intercellular interactions is a highly specific way of action. And EGFR targeted therapeutic drugs can also inhibit angiogenesis, as many growth factor receptor channels also affect vascular endothelial growth factor.

3. Endocrine Targeted Therapy

Tumor neovascularization is an important factor for tumor cell growth, invasion and metastasis, and the main factor for tumor neovascularization is VEGF, so the key to tumor anti-angiogenesis is the treatment of VEGF, which can be used as an important strategy for targeted treatment of breast cancer [19]. Endocrine therapy is one of the main means of systemic therapy for breast cancer (as shown in Figure 2). The vast majority of breast cancer are hormone dependent tumors. Endocrine therapy involves removing hormone dependence or administering certain hormone inhibitor drugs to inhibit tumor growth, with the target located within tumor cells [20].

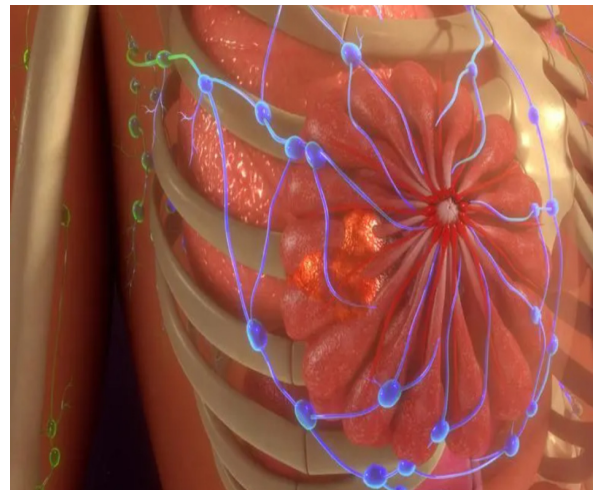


Figure 2. Endocrine targeted therapy

Bevacumab is the world's first recombinant DNA monoclonal antibody targeting the VEGF-A subtype. It can selectively bind VEGF to inhibit its biological activity, thereby preventing the formation of new blood vessels and tumor growth. It is commonly used in breast cancer, colorectal cancer, non-small cell lung cancer and other diseases, and has good curative effects. Sunitinib is a multi-target tyrosine kinase inhibitor that can inhibit platelet growth factor receptors and vascular endothelial growth factor receptors [21]. At the same time, it can also inhibit the Fms like tyrosine kinase receptor. Combined with bevacizumab, it can significantly prolong the progression free survival period and improve the prognosis of breast cancer patients. However, the feasibility of sunitinib in the treatment of advanced metastatic breast cancer still needs more clinical trials to further confirm [22]. Remolunab is a fully humanized monoclonal antibody against vascular endothelial growth factor 2. It has been confirmed that Remolunab alone or in combination with other chemotherapy drugs has good efficacy in the treatment of non-small cell lung cancer or gastric cancer. Combining it with docetaxel in the treatment of metastatic breast cancer can significantly improve the

progression free survival period and survival rate of patients. Through certain methods, traditional chemotherapy drugs can be concentrated in tumor tissue, which can greatly improve the specificity of chemotherapy drugs for tumor, thus reducing the damage to normal histiocyte.

4. Conclusion

Since the 21st century, with the development of molecular biology and genomics, global precision medicine has ushered in a new era of precise tumor treatment. Molecular targeted therapy for breast cancer is the most active field in the research of breast cancer treatment, and has also made remarkable achievements. With the rapid development of modern molecular biology, immunology and other disciplines, the discovery of targets related to the occurrence of pancreatic cancer, such as metastasis suppressor genes of breast cancer and other unknown targets, multi targeted drugs and new targeted drugs will certainly replace single targeted drugs with drug tolerance and toxic effects. Therefore, in-depth understanding of targeted drugs will greatly target the efficacy of drug therapy for breast cancer and the quality of life of breast cancer patients. Compared to traditional tumor treatment methods such as radiotherapy and chemotherapy, molecular targeted therapy has advantages such as strong specificity, low drug dosage, small toxic side effects, and good human tolerance. However, the high cost, low overall efficiency, and drug resistance of targeted drugs cannot be ignored. In the future, we need to continue to develop and research more accurate, efficient and reverse drug resistance new drugs, and at the same time, carry out more prospective research to determine the efficacy prediction indicators, optimize the beneficiaries, and further study the effectiveness, safety and economy of targeted drugs and chemotherapy drugs or the combination of targeted drugs, so as to maximize the efficacy of targeted treatment of breast cancer.

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