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Precision Medicine in Lung Cancer Treatment

Saptarshi Mukherjee[1] and Santanu Paul[2]*

[1]Department of Biotechnology, Maulana Abul Kalam Azad University of Technology, Kolkata, West Bengal, India

[2]Department of Biotechnology, School of Life Sciences, Swami Vivekananda University, Barrackpore, West Bengal, India

*Correspondence; email: paulsantanu24@gmail.com

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Abstract

Lung cancer is the leading cause of cancer-related deaths worldwide. Lung cancer remains the second most common cancer in men and women. Traditionally, chemotherapy has been the main Lung cancer is a leading cause of cancer mortality worldwide. The pivotal management for lung cancer progression is for better understanding of the molecular pathogenesis has led to rapid development in the field of targeted therapy and immunotherapy. This has led to significant improvement in survival of patients with lung cancer in initial and later stage carcinogenesis. Lung cancer has been traditionally classified by histology and immune chemistry technology. In tumors, the important role of different medicinal therapy. However, medicinal therapy with individuality gets better response than the tradition approaches. This individual medicine system termed as precision medicine, depends on the nature and prognosis of carcinogenesis in individual system of lung cancer progression. This review focuses on the application of precision medicine in lung cancer treatment and therapy.

Key words: Lung Cancer, Precision Medicine, Targeted therapy, Immunotherapy

Introduction

Lung cancer is one of the most common tumor in the world. In oncology, and especially in the treatment of non-small-cell lung cancer (NSCLC), dose optimization is often neglected in the part of precision medicine. Precision medicine is a type of medicine which uses information about the gene of a person, proteins and environment. Precision Medicine can prevent, diagnose

and treat various kind of disease. Advancement in precision medicine have not made it into the clinic because of the common challenges that is present in this particular field. Currently we are in the translational phase, and there is a lack of standard outcomes which can define the clinical benefit. In addition, there are many large clinical trials and due to lack of adequate comparators, the pace of development are out of date by the time the report is coming in the lab. A high competitive market from pharmaceutical companies is putting focus on the technological advancement rather than the health policy (Jacobs & Jafari, 2017).

Insufficient research into the implementation of precision medicine has resulted in a gap between the report and outcome of the patient treatment. As there are many new medical treatments available in the market, there is inequality in access between high-income and low-income countries. A more precise medicine, will minimize the adverse events while it will enhance the therapeutic impact. Precision medicine is playing an important role in various factors such as the condition of the patient, disease of the particular patient and the environment. Recently, the use of precision medicine has expanded and we have found out the treatment of solid tumors which includes breast, brain, and lung cancer. The objective of precision medicine is to find the right treatment for the specific patient at the specific dose and time interval, which is very much crucial in case of cancer therapy. One of the main problems of cancer treatments is a non-response to the drug therapy and the consequent metastatization of various types of diseases (Islami et al., 2018; Goldstraw et al., 2016).

Precision medicine is used to treat certain types of cancers. Precision Medicine is given in order to help, discover the type of tests and treatments that are suitable for the patients. Doctors can employ precision medicine in order to identify the patients who are having higher chances of having cancer and therefore we can prevent these certain types of cancer, for that early detection of cancer is very much crucial and important. After the detection of particular cancer type,we can perform specific cancer diagnosis in the various cancer research labs and institutes .We can select the suitable treatment options, perform and evaluate the efficacy of the treatment .Cancer care is much important and crucial than cancer treatment. Precision oncology will continue to deliver the advancement in the field of science, create meaningful change for patients, provide a huge amount of international collaboration research and then provide the holistic approach to the patient which is going beyond the lab that will be required in the upcoming future days (Walters et al., 2013).

Overview: Precision medicine is basically dependent on validated biomarkers which are used to classify the patients based on their probable risk of the disease, prognosis and their particular response to the particular treatment. Although there are suitable 'omics'-based technology approach, which can basically identify the putative biomarker. The validation of biomarkers is very low, it has a low statistical power and it produces poor reproduction of the results

Small Cell Lung Cancer

Almost all cases of small cell lung cancer are caused due to heavy amount of cigarette smoking. It is one of the fast-growing cancer and it is spreading rapidly than other types of lung cancer. There are mainly two different types of small cell lung cancer:

- Small cell carcinoma: These type of cancer is mainly found in the oat cell cancer; most small cell lung cancers are mainly of the oat cell type
- Combined small cell carcinoma: Surgery is most commonly used in non-small cell lung cancers and it is very much less frequent in small cell lung cancer, because it tends to spread more quickly to the other parts of the body. Chemotherapy is the most common treatment that is widely used in case of small cell lung cancer.

Non-small cell lung cancer (NSCLC)

About 80% to 85% of lung cancers are mainly found as Non small lung cancer. The main subtypes of Non-small lung cancer, are mainly found as adenocarcinoma, squamous cell carcinoma and large cell carcinoma. These subtypes, mainly start from different types of lung cells, they are grouped together as Non-small cell lung cancer because their treatment and prognosis look quite similar (Mok et al., 2017).

Adenocarcinoma: Adenocarcinomas mainly start in the cells which would normally secrete substances such as mucus. This type of lung cancer occurs mainly occurs to people who are mainly smoking or are having a habitat of smoking, but it also the most common type of lung cancer that is seen in people who are not even smoking. This type of lung cancer is more common in women than in men, and these type of lung cancer is more likely to affect the younger people. Adenocarcinoma is mainly found in the outer part of the lung and is more likely to be found before it is spreading. People with a type of adenocarcinoma are mainly called as adenocarcinoma. They are also called as bronchioloalveolar carcinoma because they tend to present a better outlook than those people who are having other symptoms and types of lung cancer.

Squamous cell carcinomas: It is mainly starting in the squamous cells, which are basically flattened cells that lines the inside airways in the lungs. They are often linked with a history of smoking and they are tend to be found in the central portion of the lungs near the main airway which is also called as bronchus.

Large cell (undifferentiated) carcinoma: Large cell carcinoma can appear in any portion of the lungs. It tends to grow quite fast, it is spreading very quickly and it is very much difficult to treat this carcinoma disease .A subtype of large cell carcinoma, which is also called as large cell neuroendocrine carcinoma, it is type of fast-growing cancer which is very much similar and common to the small cell lung cancer.

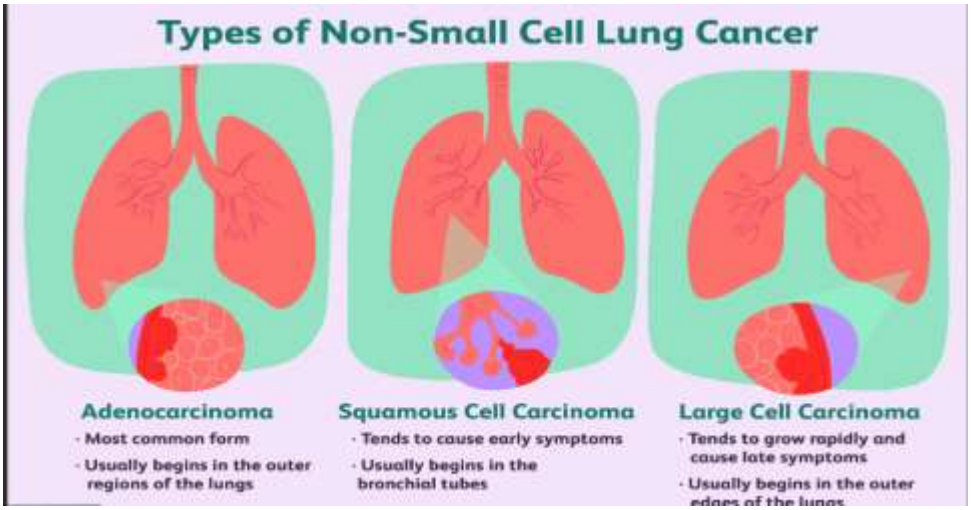


Figure 2: Non-small cell lung cancer (NSCLC)

Other subtypes: A few other subtypes of Non-small cell lung cancer, includes adenosquamous carcinoma and sarcomatoid carcinoma which are very less commonly found.

Lung carcinoid tumors: Carcinoid tumors accounts for 5% of the lung cancer tumors. Most of these Lung carcinoid tumors have a very low growth.

Other lung tumors: Other types of lung cancer include adenoid cystic carcinomas, lymphomas, and sarcomas. They are treated in a different way and they are the most common type of lung cancers.

Cancers that spread to the lungs: Cancers that mainly start in other organs such as the breast, pancreas, kidney or skin cancer can sometimes spread very fast (Paul et al., 2014). For example, cancer that mainly starts in the breast and spreads to the lungs is still called as breast cancer, it is not called as a lung cancer. Treatment for the metastatic cancer to the lungs is based on where the cancer has started. The primary site of the cancer has to be found out, then only we can detect the type of the cancer

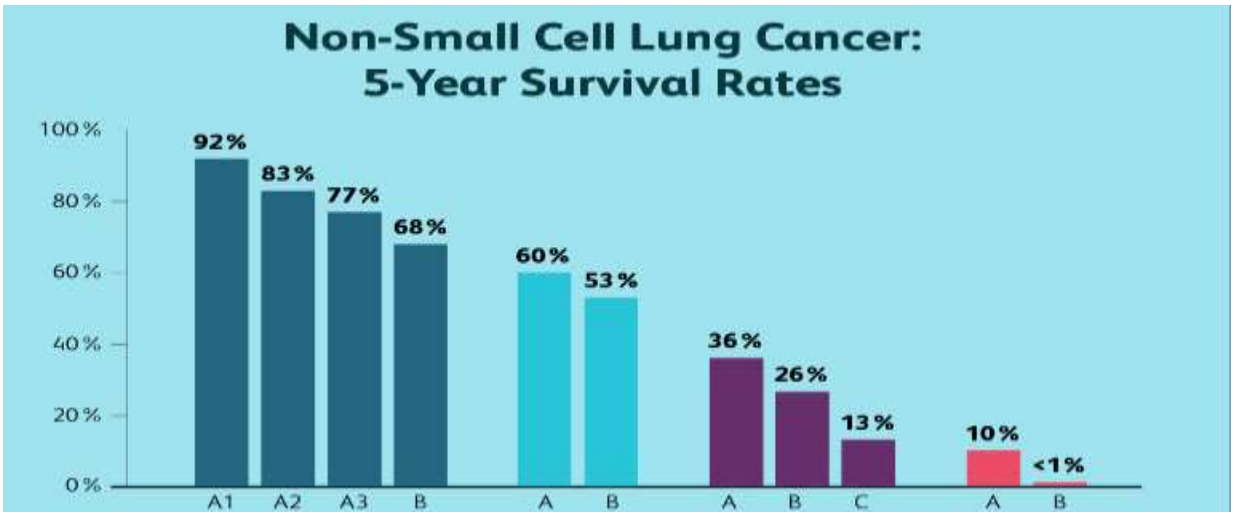


Figure 3: Statistical graph to demonstrate Lung non-small Lung cancer

Precision medicine in the improvement of lung cancer

Precision medicine is becoming the standard care in the treatment of anti-cancer. The personalized precision management of cancerous patients is highly dependent on the improvement of new technology in next generation sequencing and high-throughput big data processing which is required for large biological and radiographic information. (Basu et al., 2014).

The challenges for precision medicine in lung cancer treatment

Although the development of precision medicine is moving very rapidly, but it is facing both the opportunities as well as the challenges in the treatment section. There is inconsistency between the basic research, clinical practice, and the lower implementation rate which have become one of the main obstacles for the precision medicine therapy. In addition, there are uneven amount of development region and the medical institutions. Therefore, the genomic characteristics of lung cancer are very much important for the lower implementation rate. At present, there are few patients that are being dealt with small cell lung cancer and squamous cell carcinoma which can benefit the person from precision therapy based on Next Generation Sequencing. However since the evolution of individualized pharmacokinetics and the Patient Derived Xenograft model, it was found to be quite useful because tools are needed for expanding the range of the precision therapy technique. With targeted therapy and immunotherapy application, the treatment response evaluation criteria have taken a drastic change. The effective criteria is that now no longer it is depending on the degree of tumor shrinkage, the overall well-being of the patients, the immune-related reactions of the patients are also taken into account and considered. (Howlader et al., 2020; Gillies et al., 2016).

Another reason for the low implementation rate is the high cost rate of genomic sequence testing in the precision therapy system. Compared with no tumor profiling in patients with metastatic lung adenocarcinoma, tumor profiling is mainly improving the quality-adjusted survival, but it is seen that it is not much cost-effective, especially in the wild type sample and so there is chance of having a symptom of rare mutation. This situation could mainly be improved by expanding the coverage of the medical insurance, supplementary commercial insurance which can have a main effect on the target drugs and immunotherapy (Huang et al., 2019).

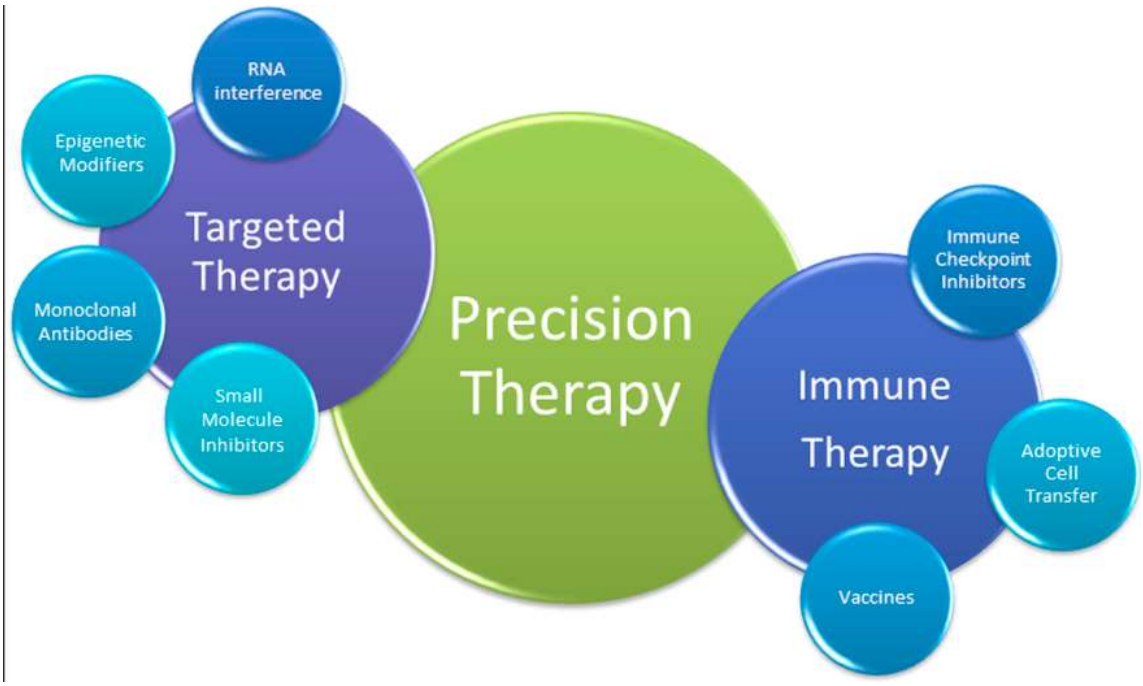


Figure 4:- The challenges for precision medicine in lung cancer treatment

Precision medicine in lung cancer is helping us to find the optimum treatment dose and time for the specific patient, it can advance the development stage in lung cancer .Personalized cancer medicine mainly comes from studies of the human genes and the genes that are found in different types of cancers. Precision medicine is a special model for the prevention, diagnosis, and treatment of diseases of individuals or specific groups which basically considers the individual differences among the patients. Precision medicine for lung cancer is specifically referring to the collection and integration of the genome, transcriptome and proteome of different patient groups. By the help of precision medicine we can find the metabolic, genetic and characteristics of the molecular biology. Therefore, for detailed understanding of the molecular mechanisms which is underlying the lung cancer, more drive genes are needed to be explored. At the same time, precision medicine concepts is also very crucial and important. Gene mutation biomarkers and feature maps should be combined with surgery, chemotherapy, radiation therapy, immunotherapy, for individual patients, and it is one of the most suitable model precision for the current lung cancer medicine.

Accurate diagnosis is very much crucial for the implementation of precision medicine. Precision medicine is able to provide the specific genetic maps for patients who are having elevated cancer risks and potentially revealing the gene mutations and thus calculating the likelihood of family members and developing a certain form of cancer. Finding a precise treatment for the patient could eradicate the potential problem of the variability of various treatment response which includes the resistance. Precision medicine is being applied to treat the certain cancers and by the help of precision medicine we can discover the type of tests and treatments that are found suitable in the accurate diagnosis.

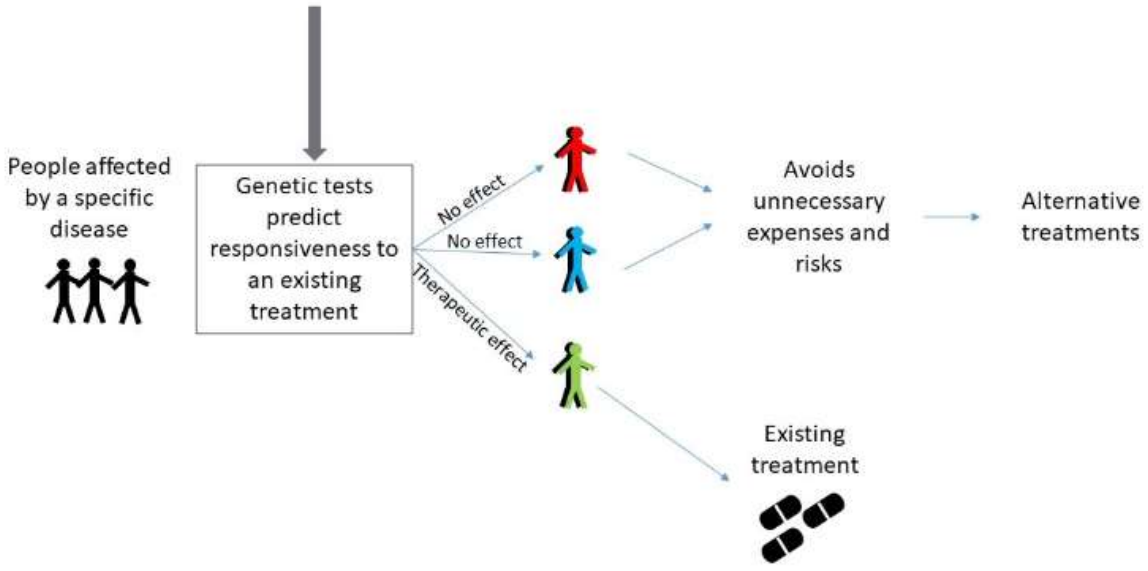
In addition, doctors could employ precision medicine to identify those patients who are having higher risk of having cancer, so that we can these prevent certain types of cancer, we can detect these types of cancer at a very early stage and make the specific cancer diagnosis using various advanced treatment techniques in diagnostic labs. We must select the best treatment option and we should provide the best treatment facility. Precision medicine is offering more personalized and targeted approach which is used for preventing various types of disease, as it considers patients unique genetic, biological and environmental factors, it is also taking account of the lifestyles of the patient, during the time of screening, provide the best diagnosis and the reliable treatment for the patient. (Duarte et al., 2016).

Risks of Precision medicine

However, precision medicine consists of the risk of placing too much emphasis on procedures and not taking the patient's complex background and needs, such as culture, values, types and preferences.

Future of Precision medicine

Precision medicine is indicating a future where health- related tasks of medical professionals and consumers are augmented with highly personalized medical diagnostic and therapeutic evidence. Precision medicine is proving to be an exciting reality, where it is seen that it is not only changing the medical routine but also creating a huge economic impacts for the search of the particular new treatment and medicine. Precision medicine is basically combining with the data that is already conventionally used for the diagnosis and treatment. After applying the concept of precision medicine we can easily find the signs and symptoms of the disease. The treatment view point, it is allowing us to have choice of drugs that is basically minimizing the adverse effects and producing the best results of the disease. It can potentially bring down the cost rate and it can be the delay the process of clinical trial. (Duarte et al., 2016).



Conclusion

Precision medicine has brought a tremendous progress in the treatment of the lung cancer. This has benefited the lung cancer patients in many ways and it has achieved a higher success rate. However, due to the complex and heterogenic of the lung cancer development, it was found out that it is just the tip of the iceberg in terms of the work that has been seen. There is a lot of research work which needs to be done yet. The development and popularization of precision medicine still have a long way to achieve, it will take enormous amount of effort .Furthermore there are recent challenges and it seems that in the future directions it is trying to improve organoid technologies regarding the treatment of the lung cancer..

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