

A detail study of corona vaccine effect on cancer patients

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SUMMARY

Severe acute respiratory syndrome coronavirus2 (SARS-CoV-2) is highly communicable and pathogenic coronavirus that came out in December 2019 and has caused a pandemic of acute respiratory disease, named 'coronavirus disease 2019' (COVID 19), which intimidate public health and safety. According to World Health Organization (WHO), infection is known as COVID-19. With the start of the COVID-19 pandemic, 10 vaccines against SARS-CoV-2 have been approved for at least limited use, with over sixty others in clinical trials. This swift achievement has generated excitement and arrives at a time of great need, as the number of COVID-19 cases worldwide continues to rapidly increase. Two vaccines are currently approved for full use, both built on mRNA and lipid nanotechnology platforms, a success story of mRNA technology 20 years for making.

For cancer patients, questions put up for the safety and efficacy of these vaccines in the setting of immune alterations engendered by their therapies. We discuss in this article on leading COVID-19 vaccine candidates and vaccination of patients

Key words: COVID-19, SARS-CoV-2, pandemic, vaccine, virus, treatment, medication, cancer patient

INTRODUCTION

Infection with SARS-CoV-2 know covid-19 disease is initially identified in Wuhan, China in 2019 and declared a pandemic in early 2020. According to CCC-19 registry which is the Covid-19 and cancer consortium initial report at 2020 they first recorded the data of 928 patient of cancer infected with covid-19 and reported a death rate of 13% [1-5].

There are very less Cancer patients represented in clinical trial of covid-19 vaccines. It hasn't been clear how well this vaccine working on cancer patients. However, researchers studied about the production of anti-SARS-CoV-2 antibodies and memory B-cell and T-cell levels after vaccination in cancer patients. After research we get to know that most of the patients with solid tumor produce antibodies and mount cellular responses. However, there are some patients who fail to respond or less response compare to a healthy person. Furthermore, patients with hematologic malignancies appear less likely than those with solid tumor to have observable immune responses. The studies also suggested that patients receiving certain anticancer therapies, chemotherapy, may have a higher risk of any disability of specific kind after vaccination.

Immunization

Immunization or vaccination is an effective way to protect people against harmful diseases. It makes our immune system stronger and prepare our body to fight with that specific infection. Vaccines are made up of dead cells or weekend form of virus and injected into our body. Weekend or dead cells trained our immune system to create antibodies and dead cells do not cause disease or any type complications to the person.

Our immune system is designed to remember. Once you get vaccinated then you are protected from that disease to lifetime. Therefore, vaccination is the safest way to produce an immune response to body without causing an illness. Pain, fever, swelling at the injection site, tiredness are some side effects of the vaccines which are for 1-2 days.

Today we have two approved covid-19 vaccines in India. One is COVAXIN which is made by India and another one is COVISHIELD. COVAXIN is an inactivated vaccine. In inactivated vaccine a virus is produced in a lab and treated with chemicals to inactivate it. And then this virus is used in an inactivated vaccine. This is how COVAXIN made. COVISHIELD is a viral vector vaccine. It is made with chimpanzee adenovirus, scientist replace genetic material of this virus with genetic code of SARS-CoV-2 [6-9].

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Is vaccination safer for cancer patients?

Some vaccine contains changed version of the live virus that cause the diseases. These types of vaccines are not suggested to cancer patients. However, the covid-19 vaccines do not contain these types of live virus so they are safe for cancer patients. But there are many types of cancer which spread to nearby lymph node. This can be the cause for nodes to become enlarged. And corona vaccine also works in our nodes so it might be harmful to that type of cancer patients. So, I advise you to before getting yourself vaccinated, concern once to your doctor.

Side effects of covid-19 vaccines

There are some uncommon but serious side effects of covid-19 vaccine.

Blood clots: In European countries researcher found many cases of blood clotting after taking the vaccine. Mainly this blood is clotting in Brain and then they named it Brain Venous Thrombosis. The blood clotting is maintained by platelets and after taking the vaccine, platelets become activated and become the cause of clotting. In scientific term it is known as Thrombocytopenia in this platelets low down to 25%.

Inflammation of heart: After taking mRNA covid-19 vaccine VAERS (Vaccine Adverse Event Reporting System) have reported almost thousands of cases of inflammation of heart (known myocarditis and pericarditis). Poor oxygen level in hearts and lungs is one of the causes of inflammation. The person already dealing with heart problems and faces a sudden death due to covid-19 caused by arrhythmia then it can be the consequences of their heart problems.

Guillain-Barre Syndrome (GBS): Guillain-Barre syndrome rarely seen in the people who have taken JONSHON AND JONSHON vaccine. GBS is a neurological disorder in which immune system attacks nerves located outside the nervous system. Symptoms of GBS are weakness in Limbs, chest problems in bowel function and bladder control. If you seek symptoms of GBS after taking covid-19 then you should do immediate concern to your doctor.

Insinuation for cancer patients

Coronavirus (COVID-19) risk for cancer patients. The patients with cancer have a higher risk of contracting Coronavirus (COVID-19) or having worse outcomes. During a study in U.S.A we get to know that approximate 273000 patients diagnosed with cancer in which 16,570 patients recorded covid-19 positive. This shows that the patients with cancer have great chances to infect with SARS-COV-2 virus. And the chances of infection become higher to the patients who are detected with leukemia, non-Hodgkin's lymphoma and lung cancer. Patients with both covid-19 and cancer have high mortality rate compare to those who are only corona positive [10-12].

Threat of adverse COVID-19 outcomes

A person with cancer has more chances to die from covid-19? The answer is a person with both cancer and covid-19 are more

chances to die with covid-19 rather than covid-19. Because in cancer our immunity is already low. So, these patients should take the vaccine timely without making any delay. But there are many of therapies used in the cancer treatment. Therefore, a cancer patients should enquiry about all the things nicely before taking covid vaccine. Like if you have surgery in upcoming 2 to 3 days then you should not take vaccine or if it's possible schedule your surgery after 7-8 days of taking vaccine.

Consideration for patients treated with radiation

Radiotherapy is a cancer treatment to treat patient diagnosis with malignancies both in curative and palliative settings. Though there are three types of radiation therapy external radiation, internal radiation and systematic radiation. But three of them has nothing to do with immune system so in this case it is safe to take vaccine. But the main concern is about total body radiation in this patient followed by the stem cell or a bone marrow transplant. Therefore, patient treated with radiation should generate immunity response to covid-19 vaccine [13-15].

Consideration for patients treated with targeted therapies

Targeted therapy is a type of cancer treatment it targets protein. Protein control how cancer cell grows, divided and spread. Targeted therapies include hormone therapy inhibitors, inducers, immunotherapies, gene expressions modulators, apoptosis inducers and toxic delivery molecule. In hormone therapy tamoxifen letrozole or exemestane does not affect to your immune system. In this case it is safe to take vaccine. But in case of AstraZeneca vaccine there are seen some cases of blood clots. However, there are many patients of hormone therapy who have taken AstraZeneca vaccine but they are totally fine. Then, researcher resume that blood clot can be a side effect of tamoxifen. Although it is not clear how effective will be covid-19 vaccine for the patients having targeted cancer therapy but still it can offer some protection against virus.

Consideration for patients treated with lymphodepleting or plasma cell depleting therapies

Lymphodepleting and plasma cell depleting therapies include antibodies like Anti CD20 and Anti CD38 monoclonal antibodies, which are used for treating Hematologic Malignancies and autoimmune diseases and in treatment of multiple myeloma respectively. Due to Anti CD20 treatments peripheral B cells are depleted for at least four months and during this period impaired immune responses to vaccination including those against influenza, streptococcus pneumoniae and haemophilus influenza and reduce pool of antigen presenting B- cells may result in reduction of T- cells.

Adaptive cellular immunotherapy target B cells for treating hematologic malignancies include CAR-T cells against covid-19 which is almost expressed by all b-cells. And in anti-COVID-19 therapy B cells are deplete, which increases susceptibility to severe diseases from covid-19 and decreases antibody responses to vaccination. Though there is less data about the safety of vaccination after covid-19 targeted CAR-T

cell therapy. But expert committee of National Comprehensive Cancer Network (NCCN) suggest that it is good to delay vaccination for at least 3 months post hematopoietic cell transplant or cellular therapy.

Consideration for patients treated with cytotoxic chemotherapies

The most common approaches for treatment of Cancer surgery, radiation therapy and chemotherapy. Chemotherapy is used to destroy the cancer cell cancer cell loss the property of contact inhibition which result in uncontrolled growth of cell. Chemotherapy is often given for a specific time of 6 month or a year. It can be given in different ways such as intravenous chemotherapy, oral chemotherapy, injected chemotherapy, tropical chemotherapy and so on. Majority of drugs used in chemotherapy have side effects like hair loss, anemia, etc. Cancer also weak the immune system by spreading into the bone marrow which helps to make blood cells to fight from infection this happens most in case of leukaemia and lymphoma but it can also happen with other cancers too. Vaccines trains the immune system to find and kill the harmful cell.

Every person has different level of resistance and disease fighting power. The patient with lymphoblastic leukaemia in which the immune system is affected by disease or treatment can still generate responses towards vaccine. Near about 10 and 27% of patient immunized with hepatitis B and meningococcal subunit vaccines respectively. 100% of patients get vaccinated with diphtheria and tetanus toxoid vaccines. Large responses are seen in patients with chemotherapy near about 78% in lung cancer patient, 81% of breast cancer patient, etc. But some precaution should be taken by the cancer patients like the patient who have undergone stem cell therapy taken within three months of an autologous stem cell transplant, allogeneic stem cell transplant or CART cell therapy should time their vaccination. Basically, the chemotherapy patients should take a well time gap between there chemotherapy and being vaccinated [12].

Overall, with the exception of during periods of chemotherapy the patient undergoing chemotherapy are expected to safeguard with covid-19 vaccination.

CANCER AND COVID-19

Complications faced by cancer patients during COVID-19

Cancer is one of the fatal diseases being a major cause of death all over the World. More than a million Indian suffer from cancer and a large number of them die from it annually. Cancer patients are caught between the devil and the Deep Blue Sea because of the ongoing global pandemic covid-19. Cancer patients who are on active treatment they have certainly a higher risk of developing infection or infection of covid-19. On the other hand, the government announced the lockdown end the restriction for the citizens.

Most cancer patients can ill-afford to wait out a crisis of this length at home or on teleconsultation alone. Cancer treatment

requires surgery, chemotherapy and radiation therapy which are time consuming and must be delivered rapidly in clinical settings. Cancer can be curable only at the early stages. Ignoring it and its symptoms is dangerous, with serious long-term consequences or can also lead to death. Due to lock down the patient can't visit to hospital on the daily basis so early detection becomes difficult which leads to many complications and the patients who are undergoing, screening radiotherapy, MRI or routine checkup had to minimize their visit to hospital. During pandemic cancer caring chain is more attentive towards their patients during pandemic. So, you can keep in touch with them via call or messages or through video calls. Doctors are making sure to actively trigger patients who may have coronavirus or may have fever for the causes such as active treatment of cancer or a variety of infection that a cancer patient get exposed to more commonly.

The forbidding reality in India is that majority of cases are diagnosed in advance status which causes complication to their life. The responses of oncology centers to the pandemic and intercession implemented were reported on a limited scale by different centers [15].

Vaccine mechanism of action in SARS-COV-2

The response of our immune to SARS-COV-2 is same as seen in influenza virus. It involves innate immune activation antigen-specific responses of B and T cells. Protection induced by currently available vaccines against virus is primarily based on virus neutralizing antibodies. These antibodies usually block the interaction of the virus with its cellular receptor. The cell entry strategy of SARS-COV-2 virus is same as that of SARS-COV-1 virus. It attaches to the host cell via binding of the viral s-protein to the Angiotensin Converting Enzyme 2 (ACE 2). Proteases of the host cell primed the s-protein by the furin and the serine proteases TMPRSS 2 and TMPRSS 4, which enables the fusion between the viral and the cellular membranes and result in entry of viral RNA into the host cell.

SARS-COV-2, the spike(S) protein and its Receptor Binding Domain (RBD). Coronaviruses have prominent S protein (yellow/green) which interact directly with the host cell. Due to which they are named after. As it is most divergent protein between different coronaviruses particularly in its Receptor Binding Domain (RBD, green). The spike in protein interact with ACE 2 and remains on a particular domain with the S protein called the Receptor Binding Domain (RBD). RBD is glycosylated and methylated which make which it difficult for the introduction of neutralizing antibodies. Many antibodies which are capable of neutralizing coronavirus are directed against RBD. Therefore, the main strategy used for covid-19 vaccine is inducing antibodies against RBD.

CONCLUSION

An initiative is needed to promote active collaboration between different registry to improve the quality and consistency of information. Patients with cancer and covid-19 have exceptionally high mortality rate which have been collaborated by national and international studies. Older age receipt of chemotherapy

either alone or a combination with immunotherapy same to that doctor can safely manage their patients and delivered timely increase risk. Risk benefit ratio should be carefully considered so care for cancer to their patients.

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