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Efficacy and Response of SARS-CoV-2 Vaccine in Transplant Patients of Solid Organs

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ABSTRACT

Despite the fact that the Coronavirus Severe Acute Respiratory Syndrome (SARS-CoV-2) pandemic has exposed many shortcomings to our health system and society, there have been remarkable scientific achievements: we are now in 2019. Vaccines that cause severe Coronavirus disease can be given to effectively prevent it. Within a year of the outbreak of a pandemic (COVID-19). The outbreak of Coronavirus has a major impact on Solid Organ Transplantation (SOT). Because of the on-going treatment to suppress the immune system of the transplant patients and other medical conditions prevailing in them, SOT patients are at a greater risk and have increase chances of developing COVID-19. SOT recipients have reported mortality rates of over 13% to 30%. The SARS-CoV-2 vaccine has been developed at an unparalleled rate for the COVID-19 pandemic; also 14 SARS-CoV-2 vaccines are currently approved. Solid Organ Transplant recipients (SOTs) are likely to have COVID-19 related problems, so SARS-CoV-2 vaccination is a top priority. With the availability and availability of the Coronavirus Disease 2019 (COVID-19) vaccine, recipients of Solid Organ Transplants are looking forward to a pandemic (SOTR). Antibody responses to Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) were seen in general population 1 in early clinical trials. However, it is unclear if and when SOTR will elicit an antibody response to the COVID-19 vaccine. The COVID-19 vaccine response is diminished in therapeutically immunosuppressed transplant recipients. To understand the immune changes that detected inadequate vaccination responses, use longitudinal serological responses to SARS-CoV-2 mRNA vaccination in transplant recipients at baseline levels of circulating T cells and B cell subsets to determine. You have to choose.

Preliminary data indicate that SARS-CoV-2 vaccination is safe in SOT patients (the incidence of adverse events is noted for transplant patients versus general population), but antibody response is low in this group. It is not yet known whether a double dose of the COVID-19 vaccine is sufficient to elicit an immune response in Solid Organ Transplant (SOT) recipients.

Methodology: For the review article, the data has been searched from various sites like PubMed, Science Direct, Google, and other websites involving searches for the following keywords.

Key words: Corona virus, COVID-19, Recepient of transplanted organs, Antibody, Vaccination, Immunization

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INTRODUCTION

SARS COVID (Severe Acute Respiratory Syndrome) the Coronavirus, the cause which has led to the COVID illness in the year 2019 (COVID-19), which then drastically turned into pandemic which is a global crisis. The very first instance was discovered in the Chinese city of Wuhan [1,2]. Our understanding of the virus's normal course and variables that increase the likelihood of horrible consequences is continuously growing [3].

Unfortunately, there's still limited information on the frequency of COVID-19 in transplant patients, as well as its progression and prognosis.

Numerous research and case research has been reported since the outbreak began, demonstrating the significant occurrence of adverse consequences among this population of patients.

The adverse results shown in indigenous human COVID virus susceptible hosts and patients with SOT can induce a more aggressive course after transplantation. COVID-19 (latest variant of Coronavirus infection, on the other hand, long term immunosuppression has been established as a means of reducing the hyper inflammatory condition caused by SARS cytokine-CoV-2 storm syndrome, which is associated with the majority of COVID-19 related mortality. Coronavirus (SARS-CoV) (Severe Acute

Respiratory Syndrome) Pandemic Reveals Severe Coronavirus Disease Within 2019, despite many defects in healthcare systems and society revealed it is now possible to administer a vaccine. Outbreak of pandemic (COVID-19). These vaccines are rapidly becoming available thanks to a wide range of previous vaccine developments for diseases such as, MERS (Middle East Respiratory Syndrome), SARS (Severe Acute Respiratory Syndrome) and Ebola infection. In addition, capabilities to properly create, distribute and deliver goods have declined over the past century [4].

A supply of sufficient vaccines, affordability and availability, a safe cold chain for storing vaccines, and perhaps most importantly, public confidence in the efficacy and safety of vaccines is a pandemic. Is an important factor in achieving and preventing pandemics? As doctors concern about the patients with chronic diseases and with transplantation of some organ, we have an important position as the most important and first-hand information provider for patients. As advocated by various transplant committees such as the, the American society of transplantation, American society of transplant surgeons and the international society of Heart and lung transplantation, have patients promote vaccination as soon as vaccination becomes available. I think that is important. In the face of intensifying conflicts, rising misinformation from social media, and pandemics characterized by general distrust of science, it is important that we encourage patients to promote vaccination as often as possible. I believe there are [5].

LITERATURE REVIEW

Coronaviruses and COVID-19 disease reaction: Coronavirus has already been linked to both animals and humans illnesses.

Just upper respiratory tract infection and minor signs are considered to be caused by the 4 human Coronaviruses that are oc43, 229e, hku1 and nl63.

All three viruses, MERS Coronavirus that is MERSCOV, SARS Coronavirus-1 that is SARS-CoV-1, and SARS Coronavirus-2 that is SARS-CoV-2 can grow with in inner respiratory system and cause infection like pneumonia.

A Spiking (S) protein, which would be made up of many components, is expressed on the cell surface of the virions and provides it an appearance of crown COVID-19 attacks the cells having angiotensin conversion enzymes 2 and TMPRSS2 receptor at their surfaces. Innate immune cells to produce inflammatory markers, that stop the infection from replicating, boost the immune system response and recruit additional inflammatory responses towards the infected area [6,7]. Infected and suicidal cells are phagocytised by pulmonary monocytes/ macrophages and neutralising autoantibodies may inhibit viral replication. Dendritic cell that have been stimulated give microbe antigen towards naive T Helper cell that triggers an immune system response which destroys pathogenic microorganisms even before infection spreads. T and B cell reactions to SARS-CoV-2 are verified with in circulation around 1 week since the onset of corona virus manifestations' [8]. CD_8+T cell being necessary to kill diseased cells directly, while CD_{4+}T cells stimulate both CD_8+TT and B cells and generate cytokines that mobilise additional immune system. It is necessary to manufacture. NK cells (natural killer) destroy disease infected cells by inflammatory mediators, receptor regulated death of the cells, and antibody specific cell cytotoxicity [9]. Lastly, the complement system aids inflammatory responses in attracting, activating and destroying viruses. Such initial immune response allows this infection to be cleared with minimum pulmonary injury and rehabilitation.

The COVID-19 vaccine: Approximately 80 candidates of vaccine are currently in various medical trials or have already been accepted for use in some countries mRNA, replication-deficient Adenovirus vector, inactivated SARS-CoV-2 virus, and SARS-CoV-2 protein component are one of the innovative and classical methods of action [5]. The interaction of the spike protein of the virus and domain that bind to its receptor, with the human angiotensin converting enzyme 2 receptor is the pathway of the entry of the virus into epithelial cells of the human and is the primary target of most vaccines [10]. B cell and T cell responses are stimulated by presently accepted vaccines that activate both humoral and cell mediated immune pathways.

Minor unfavourable events were common and primarily included of reactions at the injection site, but generalised effects such as pyrexia, headache, and tiredness were also observed, usually in 1-2 days. It has been resolved. These side effects are similar to other vaccinations that are regularly used for respiratory infections. The frequency and severity of injection site reactions and systemic side effects from COVID-19 vaccination were lower in people over the age of 55. In three published studies, 0.5-1.5% of participants experienced serious adverse events, showing same incidence in the vaccinated people and control group. The latest clinical trials, including a subset of patients who were baseline seropositive for SARS-CoV-2 and patients who acquired COVID-19 in the vaccine group, found no evidence of vaccine exacerbating disease [5].

Effect of vaccine in solid organ transplant patients: Since recipient of transplanted organs have not been considered from SARS-CoV-2 vaccine studies, there is no information on efficacy, endurance, or safety in this patient population. Following the discovery of SARS-CoV-2, vaccine development began swiftly and has progressed at a rapid pace. According to the World Health Organization, there are more than 169 vaccines in research, with 26 of them now in human trials. In phase 1/2 and phase 2 studies, several vaccine candidates showed good safety and immunogenicity [11,12]. Large scale phase 3 trials are currently taking place all over the world. While live attenuated immunizations are not recommended for transplant recipients, most of the current phase III trials use mRNA or a no replicating viral vector as a mode of action, which poses no known danger to immune compromised patients. However, more

research on the safety and efficacy of these vaccinations in transplant recipients is needed. Live attenuated virus vaccination is usually not indicated due to the risk of spread of the infection, but transplant community has extensive experience in vaccination of stable transplant recipients. The potential contraindications for live attenuated vaccines are not relevant to SARS-CoV-2, as the SARS-CoV-2 vaccine platform using live attenuated vaccines is not currently acceptable for use or in third phase of trials. However, if manufactured and accepted, it can be a viable option for candidates who have not yet undergone transplantation and are stable on the waiting list and are not immune compromised. Other concerns about the SARS-CoV-2 vaccine include no evidence of safety in a longer run, loss of efficacy in immune compromised patients, sustained response, and vaccine related allogeneic transplant non acceptance increase. However, the COVID-19 vaccine can be inferred from the experience of vaccine for influenza and vaccine of herpes zoster. First, no adverse effects of vaccine related allogeneic grafts have been shown, and the vaccine has been successfully delivered to stable transplant recipients. Second, allogeneic graft rejection is not associated with either influenza vaccine or adjuvant recombinant herpes zoster vaccine [13,14]. Influenza vaccination ultimately exhibits sub optimal immunogenicity but adjuvant recombinant herpes zoster vaccination in renal transplant recipients is adequate immunization it responded and had no significant side effects such as rejection. The reason that the mRNA SARS-CoV-2 vaccination is recently approved, has caused fear and false information amplified by media. Synthetic form of mRNA for vaccines is recent approach that allows lipid nanoparticles to transportation of the mRNA into cells and ribosomes to convert mRNA to SARS-CoV-2 spike protein [12]. However, you don't have to worry about genetic engineering because mRNA is not replicated, integrated inside the genome of the humans, and is not destroyed after translation. Concerns about viral vector vaccines have focused on the risk of uncontrolled spread of viral infections, especially in immune compromised hosts. These fears are also unfounded. Modern Adenovirus vaccines contain non-replicating viruses. This platform has been used for decades in genetic basis of treatment for uncommon diseases and cancers, but only recently has been approved for use in immunization. Virus in inactivated form and protein subunit vaccines are currently being studied. These vaccines are useful in transplant patients with a various illness such as hepatitis A and B viruses, whooping cough, and human Papillomavirus. Rather than letting patients interpret often suspicious material on social media, patients should be educated on key benefits of the vaccine based on principles and the results of studies. Vaccine intake can be improved by addressing individual concerns and questions by providing easily accessible materials, virtual seminars, and face to face meetings with patients and their families. Once the vaccination was approved, the transplant community began discussing who should be vaccinated and when specialized medical institutions such as the American Society of Transplantation (AST) have recommended that transplant patients be vaccinated when the COVID-19 vaccine is available, but transplant recipients need further research at the end of the year. I also recognize that there is experts say more data on the safety of vaccination in transplant recipients is needed, but how they work can lead to episodes of rejection and unexpected or serious side effects. Does not suggest that is high [15].

Healthy controls showed a clear anti RBD IgG response 8-30 days after vaccination, while transplant recipients showed little increase in response. A similar lack of effect was seen with pseudo virus neutralization. In contrast, 3 in 4 (75%) transplant recipients previously infected with COVID-19 showed significant responses at levels comparable to controls. The ability to establish a response was essentially predicted by baseline levels of activated PD1+HLADR+CXCR5 CD_4+T cells (also known as peripheral helper T cells TPH) and CD_4+T cells. In a study of the humoral response of solid organ transplant recipients to two doses of the mRNA SARS-CoV-2 vaccine, those who did not respond after the first dose had relatively low levels of antibody, but the majority had a second dose. A later detectable antibody response was shown. The use of antimetabolite immunosuppression has been consistently associated with reduced humoral response. Anti-spiked IgG titters were significantly lower in subjects who developed the antibody compared to controls. Our results are consistent with previous studies that were generally SOT recipients and found a low vaccine response after a single dose of SARS-CoV-2 vaccine. Previous vaccination attempts at SOT recipients showed that treatment with MMF or high dose steroids had a significant effect on immunogenicity in the year prior to vaccination. Older age and decreased EGFR were also associated with decreased serological response. This is consistent with other recent early data on the effects of old age on the response to COVID-19 vaccination [16,17]. There were no serious complications or transplant rejection. Defensive immunity thresholds have not been identified, but antibody levels were much lower than immune competent vaccines. The lack of immune competent controls, the lack of evaluation of SARS-CoV-2 after vaccination, and the lack of investigation of B or T memory responses are all the limits of this study. Glucocorticoid (used by 87% of patients), calcinuline inhibitor (used by 79% of patients), mycophenolic acid (used by 63% of patients), mammalian target of rapamycin inhibitor (used by 30% of patients) and Belatacept (used by 30% of patients 30% of patients) all contributed to immunosuppression (12% of patients) [18].

After a single dose of the COVID-19 mRNA vaccine, most transplant recipients or those on immunosuppression were unable to establish an early antibody response. In contrast, all of the no immunosuppressed ESRD patients on the waitlist were able to show an antibody response. Our data imply that the COVID-19 vaccine's reduced reaction may be linked to the immunosuppressed state of transplant recipients, as it has been reported with other

vaccines. Continued antibody surveillance and an assessment of the impact of immunosuppression on vaccine response are among the on-going investigations. The administration of an additional dose after the second dose of the BNT162b2 vaccination for the solid organ transplant recipients enhanced immune response to the vaccine dramatically, with negligible occurrences of COVID-19 recorded in any of the patients, according to studies. However, a significant number of people are still at risk for COVID-19 [19]. Measures to create barriers should be maintained and family of the transplant patients should be encouraged to be vaccinated.

Management of immune suppression: As can be seen from the discussion above, the reduced vaccination response of transplant patients may be due to the use of immune suppressants. As a result, it is recommended that some immunosuppressive drugs be reduced in transplant patients in order to increase the antibody response of the vaccine [20]. Most published articles have considered reducing or eliminating calcineurin inhibitors, mycophenolate mofetil, mycophenolic acid, azathioprine, or MTOR inhibitors (mammalian rapamycin targets). However, in the absence of anti-inflammatory drugs, complete cessation of suppression of the immune system or a major decrease in immunosuppression can theoretically increase inflammation [9]. On the other hand, continued immunosuppressive treatment may reduce the likelihood of developing an antibody response to COVID-19, especially in kidney transplant recipients with low T cell counts due to lymphopenia. Immunosuppression should decrease or stop at some point as clinical deterioration progresses.

DISCUSSION

Within a year of the outbreak of a pandemic (COVID-19), the outbreak of Coronavirus has a major impact on Solid Organ Transplantation (SOT). Because of the on-going treatment to suppress the immune system of the transplant patients and other medical conditions prevailing in them, SOT patients are at a greater risk and have increase chances of developing COVID-19. Preliminary data indicate that SARS-CoV-2 vaccination is safe in SOT patients (the incidence of adverse events is noted for transplant patients versus general population), but antibody response is low in this group. It is not yet known whether a double dose of the COVID-19 vaccine is sufficient to elicit an immune response in Solid Organ Transplant (SOT) recipients. As doctors concern about the patients with chronic diseases and with transplantation of some organ, we have an important position as the most important and first-hand information provider for patients. As advocated by various transplant committees such as the, the American society of transplantation, American society of transplant surgeons and the international society of heart and lung transplantation, have patients promote vaccination as soon as vaccination becomes available. I think that is important. In the face of intensifying conflicts, rising misinformation from social media, and pandemics characterized by general distrust of science, it is important that we encourage patients to promote vaccination as often as possible. I believe there are [5]. Recent interim results of the COVID-19 vaccine study, which involved more than 80,000 people from around the world, show exceptional efficacy and low levels of significant side effects. We believe that the COVID-19 vaccine provides potential benefits with minimal risk, based on the experience of other vaccines in transplant patients and knowledge of the risk of severe COVID-19 disease in this population. We strongly support and encourage transplant patients to be vaccinated against COVID-19.

CONCLUSION

Despite the fact that transplant recipients have not yet been evaluated in Phase 3 trials of SARS-CoV-2 vaccination, the rewards for candidate without any transplantation are as obvious as the danger faced by recipients of transplanted organ with COVID-19. A new study found that people who have undergone transplantation of COVID-19 had a 30% more chances of death or requirement of the ventilation compared to comparable controls. Fifteen SARS-CoV-2 vaccinations is currently being studied and previous studies with vaccines in transplant recipients who were stable, has shown that the COVID-19 vaccine is not dangerous and has been efficacious in transplant recipients as well. Transplant recipients have observed cases, studies, and medical trials to measure the immune response of the vaccine, as well as the duration of cell mediated and humoral immune responses, and the side effects of the vaccine such as rejection and allogeneic sensitization. You need to enroll in the exam. What we understand today will also assist us address the next global clinical crisis. Until and unless we get more information, we have to stick to that the SARS-CoV-2 vaccine will give benefits and negligible risk to transplant recipients who are stable, especially as this global crisis intensifies in other areas of the world. Although life threatening immunization is not recommended for transplant recipients, most recent third phase of the trials use mRNA or vectors of non-replicating virus as a non-hazardous pathway known to immune compromised patients doing. However, more study is needed on the protection and effectiveness of these vaccinations in transplant recipients in conclusion, Serum IgG responses in immunized transplant patients were significantly lower than in healthy controls. Plasma from immunized heart and lung transplant recipients had significantly lower neutralizing activity than healthy controls. Strong serological reactions and neutralizing activity are associated with previous or concomitant COVID-19 infections. By the end of 2021, the arsenal of COVID-19 vaccine will be increased and effective. Recent interim results of the COVID-19 vaccine study, which involved more than 80,000 people from around the world, show exceptional efficacy and low levels of significant side effects. We believe that the COVID-19 vaccine provides potential benefits with minimal risk, based on the experience of other vaccines in transplant patients and knowledge of the risk of severe COVID-19 disease in this

population. We strongly support and encourage transplant patients to be vaccinated against COVID-19.

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