



Commentary

What is the immunological response to BNT162b2 mRNA vaccine in immunocompromised patients?

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In this article of EBioMedicine, Bergman et al. [1] have investigated the efficacy and safety of the two doses of the BNT162b2 mRNA vaccine in immunocompromised patients. Despite the established efficacy of the BNT162b2 mRNA vaccine, there has been a need to address the effectiveness and safety of the BNT162b2 mRNA vaccine in immunocompromised patients.

The T-cell-mediated immune responses can eliminate the infected cells, paving the way for recovery in most affected patients. However, some patients have implicated the dysregulated immune response in developing severe coronavirus disease 2019 (COVID-19). Indeed, dysregulated immune responses can lead to the development of acute respiratory distress syndrome (ARDS) [2].

BNT162b2 mRNA vaccine has offered acceptable safety and efficiency against COVID-19 [3,4]. However, recent findings have indicated that the antibodies against the receptor-binding domain of the S1 subunit of the spike protein of SARS-CoV-2 can be decreased after 3 months of the second dose of the BNT162b2 mRNA vaccine in non-immunocompromised individuals [5]. Since immunocompromised patients have not been included in SARS-CoV-2 mRNA vaccine studies, Schramm et al. have investigated the efficacy of the two-dose of the BNT162b2 vaccine in cardiothoracic transplant individuals. Their results have demonstrated that three weeks after the second dose of BNT162b2, the humoral and T-cell immune responses are substantially inferior in immunocompromised patients compared to the control group [6]. Shroff et al. have shown that the first dose of BNT162b2 mRNA vaccine can detect neutralizing antibodies in 67% of patients with solid cancers, and the second dose of the BNT162b2 mRNA vaccine can lead to a threefold increase in their median titers. Besides, the third dose can lead to a threefold increase in neutralizing antibody responses without improvement in T-cell response in 80%

of patients with malignancy after one week of the third dose of BNT162b2 mRNA [7].

Bergman et al. have been investigated the seroconversion to the SARS-CoV-2 spike glycoprotein two weeks after the second dose of BNT162b2 mRNA vaccine. Besides, the study showed the safety of the BNT162b2 mRNA vaccine and the occurrence and severity of SARS-CoV-2 infection in the mentioned groups. Their results have indicated that the BNT162b2 mRNA vaccine is generally safe, and 72.2% of these immunocompromised patients have been seroconverted. Immunocompromised patients have demonstrated decreased systematic reactivity compared to the healthy group. Although the non-reactogenicity-related adverse events have been more frequent in the immunocompromised patients, the infection has been the main culprit, which might not be related to vaccination.

Nevertheless, two patients, who have undergone hematopoietic stem cell transplantation, have experienced graft versus host disease and altered liver function tests following the first dose of the BNT162b2 mRNA vaccine. Additionally, two patients have developed graft versus host disease after the second dose of the BNT162b2 mRNA vaccine. In severe adverse events, 5 cases of febrile neutropenia, vasovagal reaction, syncope, rejection, and lung failure have been documented in these immunocompromised patients.

In the study by Bergman et al. 72.2% of the immunocompromised patients have seroconverted two weeks after administering the second dose of the BNT162b2 mRNA vaccine. The highest and lowest rate of seroconversion failure has been observed in solid organ recipients and patients living with the human immunodeficiency virus. The solid organ recipients receiving mycophenolate mofetil have demonstrated a lower seroconversion rate compared to the control group. In line with this, Peled et al. have reported that the lower use of mycophenolate and higher use of Everolimus can be associated with positive antibody response in heart transplant recipients vaccinated with BNT162b2 [8]. Based on the results of Bergman et al. study, chronic lymphocytic leukemia patients receiving ibrutinib have shown a substantially low rate of seroconversion. In patients with primary immunodeficiency, patients with common variable immunodeficiency have demonstrated a remarkably low rate of seroconversion. In patients with hematopoietic stem cell transplantation, two patients who have received CD19-CAR T cells have failed to develop any spike-specific antibodies. Ultimately, the seroconversion of patients living with the human immunodeficiency virus has not been significantly different from the healthy control.

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The current study results have furthered our knowledge of the safety and efficacy of the BNT162b2 mRNA vaccine in immunocompromised patients. Nevertheless, further studies are needed to study the efficacy and safety of the BNT162b2 mRNA vaccine and other WHO-authorized vaccines with a long follow-up period. Although the study by Shroff et al. has investigated the BNT162b2 mRNA vaccine in solid cancer patients after its first, second, and third doses, more studies are needed to investigate the efficacy and safety of the BNT162b2 mRNA vaccine in patients with solid cancers. Besides, it is better to be specifically studied in patients with specific solid cancer. Finally, considering the promising results of immunotherapeutic approaches and their combination with novel and conventional anti-cancer therapies, investigating the efficacy and safety of the BNT162b2 mRNA vaccine should be considered in these patients as well.

Contributors

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Declaration of Competing Interest

The author declares no conflict of interest.

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