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New Approaches of COVID -19 Vaccines Side Effects

Ataie A[1] and Ataee R[2]*

[1]Department of Toxicology and Pharmacology, Babol University of Medical Science, Iran

[2]Pharmaceutical Sciences Research Center, Mazandaran University of Medical Sciences, Iran

***Corresponding author:** Ramin Ataee, Pharmaceutical Sciences Research Center, Hemoglobinopathy Institute, Mazandaran University of Medical Sciences, Sari, Iran, Tel: +989113232804; Email: raminataee1349@gmail.com

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Abstract

COVID -19 infections is a global problems and many efforts for its eradication has been done. Also eradication of COVID -19 after vaccination is possible. Vaccination is the first choice to eradicate COVID-19. Also some side effects after second vaccination occurred and vector vaccines have more side effects than inactivated virus vaccines. Some side effects of COVID-19 vaccines is cardiovascular side effects for example myocarditis and pericarditis also vascular side effects including thrombosis. The mechanism of COVID-19 side effects is unknown but auto immune responses and inflammation may be intervened in this processes and believed that the role of ACE2 receptors in this process. .In this paper we try to explain some critical side effects of COVID-19 vaccines.

Keywords: COVID-19; Vaccination; Thrombosis; Side Effect; Myocarditis

Abbreviations: TTS: Thrombocytopenia Syndrome; NETs: Neutrophil Extracellular Traps.

Introduction

COVID-19 infection is a pandemic infection that affects the most countries of the world. Many strategies for prevention and treatment have been developed. Some efforts for discovery of vaccination and eradication of the COVID-19 have been done. Vaccination is the best way and first choice for virus eradication. But COVID-19 vaccination has some rare critical side effects and many studies have been done to find new side effects. More side effects have been seen after seconds and third vaccination. The most adverse effects are related to inflammation and auto-immune responses for example cardiovascular and coagulation pathways.

Myocarditis

Myocarditis and pericarditis were seen after COVID-19 vaccination. In some younger patients, myocarditis was occurred and in older patients pericarditis was produced [1,2]. The side effects of some vaccines are myocarditis. Also the adverse effects of some mRNA vaccines are myocarditis [3-5]. It has been seen that in younger male patients after the second vaccination it was occurred in 5 cases per 1 million [6]. On the other hands, pericarditis may be more common than myocarditis among older patients. Myocarditis was seen within 4 days after vaccination and was occurred after the second dose of mRNA COVID-19 vaccine [1]. Electrocardiogram showed sinus tachycardia with a narrow QRS complex and diffuse ST-segment elevation also troponin T levels is increased (139 ng/L) [6]. On the other hand, anti-inflammatory treatment should be administered (5.6). It is possible the relationship between SARS-CoV-2 infection and the onset of auto immune diseases [4]. Also in patient with asthma, autoimmune hypothyroidism, and chronic atrophic gastritis, it was suggested that the vaccine induce an autoimmune reaction lead to acute myocarditis [4,6-10]. Vaccine-induced myocarditis also has been seen in the smallpox vaccination [11,12]. They had severe chest pain and biomarkers of myocardial injury were increased and they were hospitalized [7]. It was suggested a possible relation

between mRNA vaccines and myocarditis after the second vaccination, at an incidence of about 4.8 cases per 1 million [13]. Therefore an innate immune response to vaccines occurs after RNA- based COVID- 19 vaccines [13].

Cancers

Tumor regression may occur after immune- inflammatory response. Regression of metastatic salivary gland myo-epithelial carcinoma following vaccination was occurred [14]. In lung, immune cell infiltration, including CD4+ T cells, CD8+ T cells, natural killer cells, B cells, and dendritic cells are induced [14]. Reactogenicity represents the inflammatory response to vaccination and pain, redness, swelling also fever, myalgia, or headache was reported [14]. On the other hands, the pre vaccination samples have higher M2 macrophages and neutrophils [14]. Also the percentage of T cells expressing the inhibitory receptor T- cell immunoglobulin after vaccination and suggest an anticancer immune response after vaccination [14]. Tumor molecular study indicated that the primary tumor was poorly immunogenic, which poorly responses to cancer immunotherapy also in some patients systemic adverse effects occurred after the second dose of the COVID- 19 vaccine, an intense inflammatory host response stimulated by the vaccine., including increases in CD8+ and CD4+ T cell tumor infiltration and granzyme B+ cytolytic cells, are associated with immune cell activation [14]. Also it was found a decrease in tumor cells and the fraction of cells proliferating, indicating an effective anti- cancer response [14]. The safety of COVID-19 vaccines in patients with cancer is controversial, although the benefits outweigh the risks of vaccine side effects [14].

Thrombosis

Thrombosis is one of the most severe side effects of vaccines. Thrombosis with thrombocytopenia syndrome (TTS) described rarely in persons who received COVID-19 vaccines [15]. It is shown by cerebral venous thrombosis or venous thromboembolism with thrombocytopenia, although arterial thrombosis occurs in a minority of cases and treatment with non-heparin anticoagulation and intravenous immunoglobulin in these patients [16]. New findings indicated that thrombosis is related to a soluble adenoviral protein spike variant, originating from splicing events, which cause important endothelial inflammatory events, and binding to endothelial cells expressing ACE2 [16]. It is believed the role of the innate immune system in causing thrombotic events in COVID-19 infections [17]. Dysregulation of Neutrophils phagocytosis is related to the pro coagulant state and the subsequent alveolar damage in patients [18]. Neutrophil extracellular traps (NETs), such as cell DNA, histones, and tissue factor (III) can activate the coagulation. The histones stimulate activation of platelets and endothelium interacting with TLR2 and TLR4 [19,20]; Also, platelets induce NETs' production through P-selectin [20]. The NETs increases adhesion and further activation of platelets leading to a self-perpetuating process. Finally, the deposition of fibrin, secondary to NETs, traps cells and platelets and red blood cells, and promote clot formation [20].

Discussion

Second COVID-19 vaccination has some side effects and some of them are critical. Relationship between cancer and vaccination is controversial and more studies must be needed for decision about vaccination in cancerous patients. It is possible the relationship between SARS-CoV-2 infection and the onset of auto immune diseases [4]. Also in patient with asthma, autoimmune hypothyroidism, and chronic atrophic gastritis, it was suggested that the vaccine induce an autoimmune reaction lead to acute myocarditis. The safety of COVID-19 vaccines in patients with cancer is controversial, although the benefits outweigh the risks of vaccine side effects [14]. Regression of metastatic tumors in salivary glands and lungs has been reported and inflammatory pathways may be related to this effect. Thrombosis is one of the most severe side effects of vaccines. Thrombosis with thrombocytopenia syndrome (TTS) described rarely in persons who received COVID-19 vaccines. Dysregulation of Neutrophils phagocytosis is related to the pro coagulant state and the subsequent alveolar damage in patients [18]. Neutrophil extracellular traps (NETs), such as cell DNA, histones, and tissue factor (III) can activate the coagulation and treatment with non-heparin anticoagulation such as Rivaroxaban and intravenous immunoglobulin in these patients [16].

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