

SARS CoV-2 adenovirus and RNA based vaccines potential autoimmune complications: could we lower the chances?

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Perspective

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Abstract:

Two clinical trials of SARS CoV-2 adenovirus-based vaccines have been temporarily halted due to autoimmune complications concerns in some participants. Similarly, though the innovative SARS CoV-2 RNA based vaccines when approved to combat the current COVID-19 pandemic would be considered first of their kind, they also possess potential risks including development of autoimmune diseases. The techniques used in development of these types of vaccines should focus on the methods to decrease their potential autoimmunity. Smokers, obese and diabetic individuals are more liable groups to develop autoimmune diseases and we recommend a personalized risk benefit ratio to be evaluated before vaccination waiting for the post marketing surveillance. Further, quitting smoking, loss of overweight and control of blood glucose levels might help to lower their probabilities.

Keywords: COVID-19, SARS CoV-2 adenovirus vaccine, SARS CoV-2 mRNA vaccine, autoimmune diseases.

Highlights:

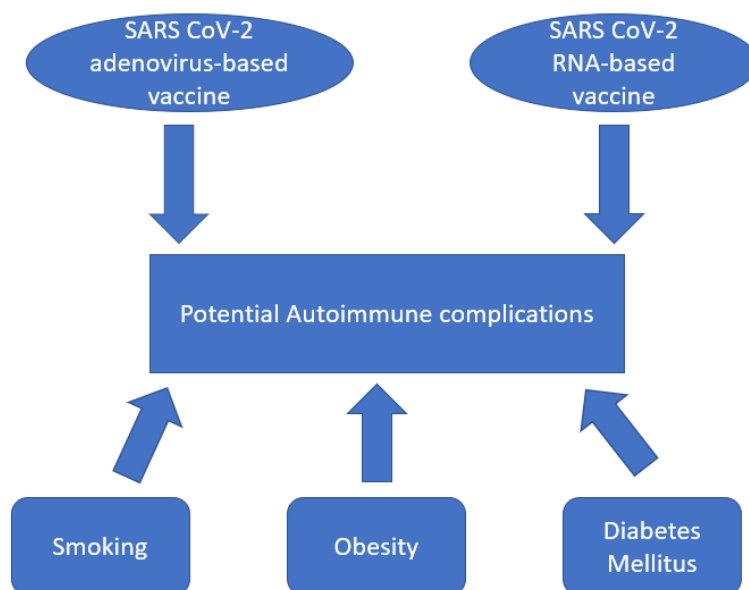
Adenovirus and RNA based SARS CoV-2 vaccines possess a potential risk to induce auto-immune diseases

RNA based SARS CoV-2 vaccines would be a first of their kind when approved to combat COVID-19 and potential autoimmune complications might be revealed only post marketing

Smokers, obese and diabetic individuals are in general more liable to develop auto-immune diseases and an individualized risk benefit ratio should be considered before vaccination

An advice to quit smoking, lose overweight and control of blood glucose level might prove beneficial to lower the incidence of these potential complications

Graphical abstract



Smokers, obese individuals and diabetic patients are considered more vulnerable to develop autoimmune diseases which are also considered as potential adverse effects of SARS CoV-2 adenovirus and RNA-based vaccines.

Introduction

COVID-19 vaccines are considered of utmost importance to stem SARS CoV-2 current pandemic, with 48 candidates in clinical evaluation, including seven adenovirus, five messenger RNA (mRNA) and one self-amplifying RNA based vaccines encoding spike protein of SARS CoV-2 as declared by the WHO on the 12th of November 2020[1, 2]. However, the unprecedented accelerated timelines to develop some of COVID-19 vaccines have necessitated a call for active pre and post-licensure safety surveillance systems to properly investigate potential adverse effects or toxicities [1, 3]. Importantly, two adenovirus-based SARS CoV-2 vaccine global phase III clinical trials were temporarily paused due to reports of serious adverse medical events of autoimmune complications including multiple sclerosis and transverse myelitis which were ultimately deemed to be unrelated to the SARS CoV-2 vaccine. However, lack of transparency concerns have been raised as some companies declined the release of the thorough details of these serious adverse events claiming privacy issues [4-7].

RNA based vaccines potential hazards

On the other hand, RNA based vaccines, anticipated to be approved soon for COVID-19 as a first ever approval for this type of vaccination [8], possess multiple theoretical and manufacturing advantages over traditional subunit, live attenuated and killed virus vaccines[9-11]. However, in practice the results of two previous clinical trials using mRNA vaccines to prevent H10N8, H7N9 influenza viruses and rabies have been lower than what was expected when compared to those of their preclinical studies[10]. Similarly, though mRNA vaccines encoding HIV and CMV antigens elicited antigen-specific CD4+ and CD8+ T cell immune responses; no reduction in viral load was observed[9].

Similar to adenovirus-based vaccines, potential risks of mRNA and saRNA based vaccines also include risk of potential autoimmunity with possible development of autoreactive antibodies of any non-native nucleotides

and delivery system components [10, 12, 13]. Notably, the identification of individuals at an increased risk of autoimmune reactions before mRNA vaccination was advised[10]. The search to improve methods that help to develop vaccines with minimal autoimmune potential risk should continue and till this goal is achieved we would like to explore some groups of individuals who are potentially more vulnerable to autoimmune diseases, aiming to recommend a personalized risk benefit ratio to be considered before a decision to be immunized by adenovirus and RNA based SARS CoV-2 vaccine until encouraging post marketing safety data are revealed for all SARS CoV-2 types of vaccines.

Could high risk groups lower the chances to develop autoimmune diseases?

The first group are smokers; cigarette smoke has been reported to lead to an enhanced risk of inflammatory and autoimmune diseases[14]. Smokers are more likely to develop critical COVID-19 requiring mechanical ventilation [15] that might lead to a higher mortality rate [16, 17]. Interestingly, alarms about the danger of misreading non-significant or inconclusive frequentist results containing several possible biases of a contradictory hypotheses have been raised [18, 19].

Two other groups include obese and diabetic individuals; obesity was suggested to be a major environmental factor contributing to the onset and progression of autoimmune diseases[20] and a concomitant autoimmune disease was encountered as 1 in 4 of 179,248 people diagnosed with type 1 diabetes[21]. Notably, a meta-analysis has showed diabetes, but not obesity, to be linked to a higher COVID-19 mortality[22]. However, increasing risks of COVID-19 hospital death were noticed to be associated with increasing levels of obesity (BMI >40 fully adjusted HR 2.27, 95% CI 1.99-2.58)[23].

Interestingly, quitting smoking at diagnosis was recently shown to decrease the risk of death in cancer patients[24], and quitting smoking was suggested to alleviate its impact in patients with pneumonia and other COVID-19 associated infections[17, 19, 25], thus a beneficial advice to quit smoking together with another to lose overweight and to control the blood glucose levels might also help to lower the chances of SARS CoV-2 adenovirus and RNA-based vaccine potential autoimmunity in those individuals. Most importantly, we would like to recommend considering an individualized risk benefit ratio for those groups of patients until post marketing safety data are revealed.

Conflict of interests

the author declares he has no conflict of interest

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