VAC_01 - Humoral and cellular responses to SARS-CoV-2 variants after AstraZeneca/ COVISHIELD vaccination in the primary protocol and follow-up

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Introduction: SARS-CoV-2 is one of the most important respiratory viruses, responsible for the current pandemic and over 2.5 million deaths. Their high R0 and mutation rate enables SARS-CoV-2 to escape immunity by antigenic drift, mainly in the spike protein, their main antigen, with the development of new variants. In this scenario, vaccines were approved in a fast-tracked manner and were released in Brazil by the time the first variants of concern started to be detected.

Objectives: We sought to evaluate the humoral and cellular response to the AstraZeneca adenovirus and spike- based vaccine in a healthy adult population, focusing on the immunity to variants in the primary two-dose protocol and evaluation of long-term immunity with the following boosters.

Methodology: From January to August 2021, we recruited volunteers infected or uninfected prior to vaccination, and evaluated their vaccine response using Plaque Reduction Neutralization Tests (PRNT), anti-Spike/S1 IgG Chemiluminescent Immunoassay and Activation Induced Markers (AIM) by flow cytometry. Blood was collected at pre-vaccination (S1), 30 days after dose 1 (S2), 30 days after dose 2 (S3), 6 months after dose 1 (S4), 30 days after dose 3 (S5), 1 year after dose 1 and/or pre-dose 4 (S6), 30 days after dose 4 (S7) and 2 years after dose 1 (S8).

Results: A total of 116 individuals were recruited. In PRNT, we observed that 21% (S1) and 65% (S3) were seropositive (SP) for the Wuhan parental vaccine strain (WU) and 26% (S1) and 65% (S3) for Delta (DE), with significant increases for both. Seroconversions (SC) were 57% and 59% for WU and DE. Despite higher S1 titers for WU, no differences were seen in S3, with significant increases for both. The vaccine induced an increase of anti-Spike IgG at S2, S3, peaking at S5, and significant reductions were seen at S4 and S6. Seroprotection was 100% after the primary 2-dose protocol. AIM assays showed, at S3, a reduction in spike-specific CD4 OX40+CD137+ T cells for DE and CD8 CD69+CD137+ T cells for DE, Beta and Gamma. Immunity before vaccination had no impact on cellular responses, but the previously exposed subjects presented higher S1 and S3 PRNT titers against WU and DE and higher titers for IgG at some time points. Age and Body Mass Index did not impact vaccine-induced immune response.

Conclusion: An adequate humoral immune response showcasing the importance of boosters was observed in all groups and variants. However, a reduced cellular response to some variants reinforces the need for updated vaccines. Vaccine evaluation should be continuous in order to improve and monitor vaccine efficacy in the population.

Keywords: SARS-CoV-2 Vaccine, immunity, flow cytometry