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The strength of association between pre-and post-booster BNT162b2 anti-SARS-CoV-2 antibodies levels depends on the immunoassay ☆,☆☆

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ABSTRACT

Objectives: Reliable evidence suggests that anticipating the humoral response to coronavirus disease 2019 (COVID-19) vaccines is essential for predicting their clinical effectiveness. In this work, we sought to determine the extent to which the response of anti-SARS-CoV-2 antibodies BNT162b2 booster measured with four different commercial immunoassays could be predicted after initial homologous vaccination.

Methods: This observational study enrolled 181 SARS-CoV-2 baseline seronegative healthcare workers (mean age 42±13 years; 59.7% females), who received two doses of the BNT162b2 vaccine. Antibodies levels were assessed with Roche Elecsys Anti-SARS-CoV-2 S, ACCESS SARS-CoV-2 IgG II, Snibe S-RBD IgG, and LIAISON SARS-CoV-2 TrimericS IgG. The correlation of anti-SARS-CoV-2 serum antibodies 21 days after the first vaccine dose and 30 days after the second dose was assessed with Pearson's test.

Results: A significant correlation was found between serum anti-SARS-CoV-2 antibodies levels after the first (T1) and second (T2) BNT162b2 vaccine dose with all immunoassays, though the strength of such association depended on the immunoassay. Briefly, the highest correlation was found for LIAISON SARS-CoV-2 TrimericS IgG (r=0.71), followed by ACCESS SARS-CoV-2 IgG II (r=0.65), Snibe S-RBD IgG (r=0.52), and then Roche Elecsys Anti-SARS-CoV-2 S (r=0.40).

Conclusion: The value of predicting post-booster values of anti-SARS-CoV-2 antibodies levels from pre-booster levels significantly depends on the immunoassay used.

Introduction

Reliable evidence suggests that anticipating a humoral response to coronavirus disease 2019 (COVID-19) vaccines is essential for predicting their clinical effectiveness. Bergwerk et al. conducted a study in the largest medical center in Israel, where healthcare workers who received the Pfizer mRNA COVID-19 BNT162b2 vaccine were followed up with molecular or antigen testing, serologic assays, and genomic sequencing (Bergwerk et al., 2021). Notably, the levels of anti-SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) neutralizing antibody and anti-SARS-CoV-2 IgG were found to be nearly 64% and 49% lower in infected subjects than in matched uninfected controls. More importantly, higher peri-infection values of anti-SARS-CoV-2 neutralizing antibodies were associated with lower viral load, thus supporting the conclusion that predicting the serological response to COVID-19 vaccines would be crucial for predicting breakthrough infections, thus optimizing vaccine efficiency. Similar evidence has been reported in another preliminary investigation by the Oxford COVID Vaccine Trial Group (Feng et al., 2021), where it was found that vaccine efficacy against primary symptomatic COVID-19 was directly related to the anti-SARS-CoV-2 level of anti-spike IgG, anti-SARS-CoV-2 receptor-binding domain (RBD) IgG and neutralizing antibodies levels achieved after vaccination with the AstraZeneca AZD1222 vaccine.

In a recent article, Perkmann et al. concluded that total anti-SARS-CoV-2 antibodies measured after the first BNT162b2 vaccine dose with Roche Elecsys SARS-CoV-2 S predicted humoral immunogenicity reached after the booster (Perkmann et al., 2021).

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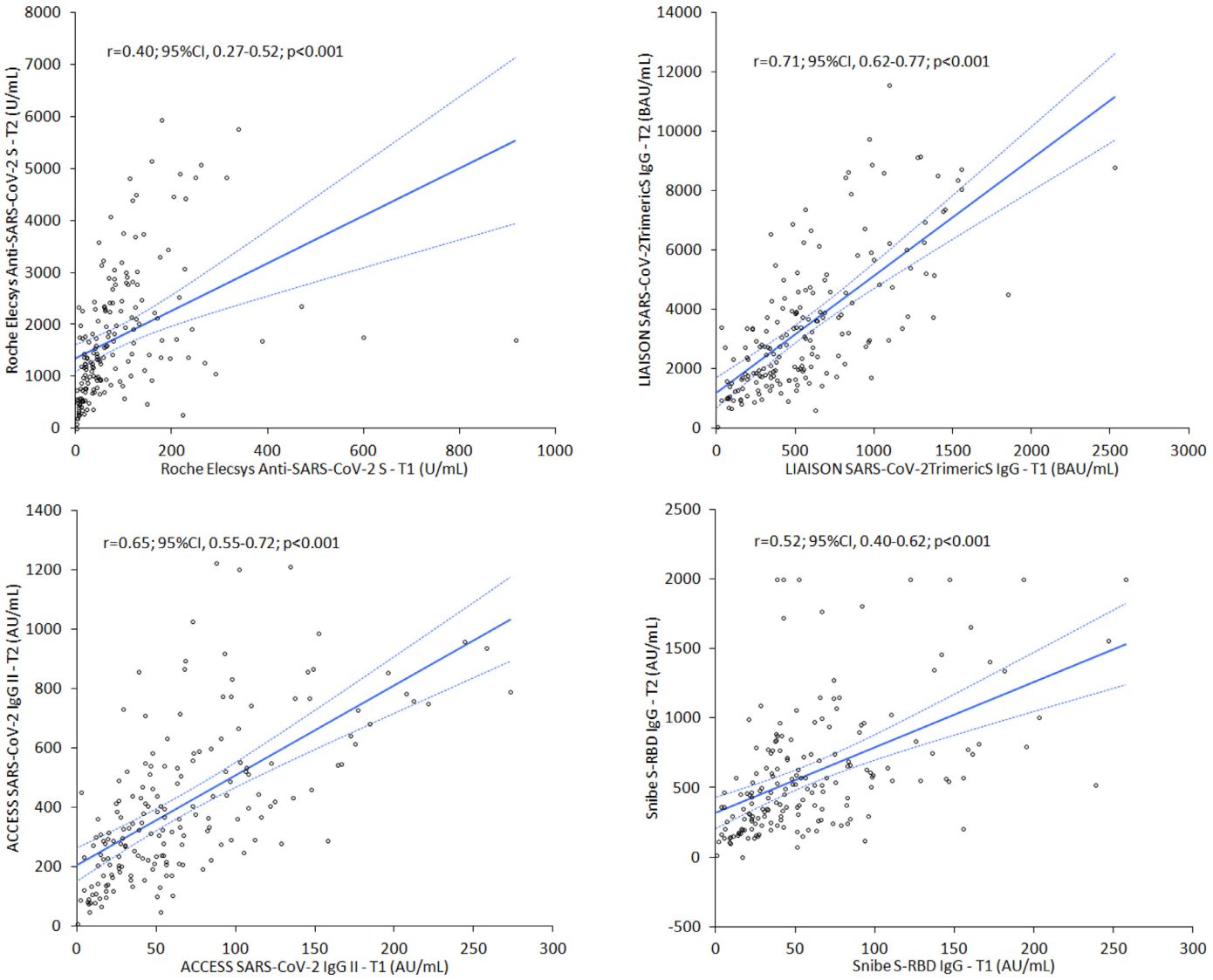

Figure 1. Correlation of serum anti-SARS-CoV-2 antibodies levels in 181 recipients of BNT162b2 vaccine measured after the first (T1) and second (T2) doses using different commercial immunoassays.

The evaluation of humoral response after coronavirus disease 2019 (COVID-19) vaccination based on different antibodies classes (e.g., total antibodies vs. Ig), different antigenic targets (e.g., trimeric spike protein vs. its RBD), and even with different immunoassays and analytical platforms has important clinical significance (Lippi et al., 2021), so that such correlation needs to be straightforwardly verified with different analytical techniques. In this work, we sought to determine the extent to which the response of anti-SARS-CoV-2 antibodies BNT162b2 booster measured with four different commercial immunoassays could be predicted after initial homologous vaccination.

Methods

Anti-SARS-CoV-2 antibodies were assayed in 181 SARS-CoV-2 baseline seronegative healthcare workers (mean age 42±13 years; 59.7% females) from the Pederzoli Hospital (Peschiera del Garda, Verona, Italy), who received two doses of BNT162b2 vaccine (Comirnaty; Pfizer-BioNTech, NY, USA), the second dose 21 days after the first one. Antibodies levels were assessed as total anti-SARS-CoV-2 RBD with Roche Elecsys Anti-SARS-CoV-2 S (Roche Diagnostics, Basel, Switzerland), as anti-SARS-CoV-2 RBD IG measured with both ACCESS SARS-CoV-2 IgG II (Beckman Coulter, Brea, CA, USA) and Snibe S-RBD IgG (New Industries Biomedical Engineering Co., Ltd [Snibe], Shenzhen, China), as well as anti-SARS-CoV-2 trimeric spike protein using LIAISON SARS-CoV-2 TrimericS IgG (DiaSorin, Saluggia, Italy).

Results

We found a significant correlation between serum anti-SARS-CoV-2 antibodies levels after the first (T1) and second (T2) BNT162b2 vaccine doses with all immunoassays (Figure 1), though the strength of such association depended on the immunoassay. Briefly, the highest correlation was found for LIAISON SARS-CoV-2 TrimericS IgG (r=0.71; 95%CI, 0.62-0.77; p<0.001), followed by ACCESS SARS-CoV-2 IgG II (r=0.65; 95%CI, 0.55-0.72; p<0.001), Snibe S-RBD IgG (r=0.52; 95%CI, 0.40-0.62; p<0.001), whilst Roche Elecsys Anti-SARS-CoV-2 S displayed the lowest but still significant correlation (r=0.40; 95%CI, 0.27-0.52; p<0.001).

Conclusions

These results suggest that, although we would agree with the conclusions of Perkmann et al. (2021) that pre-booster BNT162b2 anti-SARS-CoV-2 antibodies levels are associated with post-booster

values in baseline seronegative vaccine recipients, the strength of such association depends on the immunoassay used for their assessment. We also confirmed that the clinical information provided by different commercial anti-SARS-CoV-2 antibodies is not interchangeable, especially when different antibodies classes are quantified or different antigenic targets are used (Danese et al., 2021).

Authors' contribution

Study design: GL, GLS; Data Collection: GLS; Data analysis: GL, BMH; Writing: GL, BMH

Ethical approval

The study was cleared by the Ethics Committee of the Provinces of Verona and Rovigo (3246CESC).

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Conflict of interest

The authors declare no conflict of interest.

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