

15570

**Adaptive immunity to SARS-CoV-2 infection and vaccination in cancer patients: The CAPTURE study**

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**Background**

Patients with cancer are at increased risk of severe outcomes from COVID-19. Understanding the impact of SARS-CoV-2 infection and vaccination induced-immunity is an area of unmet need.

**Methods**

CAPTURE (NCT03226886) is a prospective longitudinal cohort study of COVID-19 vaccine or SARS-CoV-2 infection-induced immunity. SARS-CoV-2 infections were confirmed by RT-PCR and ELISA. Neutralising antibody titres (NAbT) against wild-type (WT) SARS-CoV-2 and variants of concern (VOC; Alpha, Beta, Delta) and SARS-CoV-2 specific T-cells (SsT-cells) were quantified.

**Results**

118 patients (89% solid malignancy, [SM]) were SARS-CoV-2-positive (median follow-up: 154 days). 85% patients were symptomatic; 2 died of COVID-19. 82% had S1-reactive antibodies, of whom 89% had neutralising antibodies (NAbT); NAbT were lower against all VOCs. While S1-reactive antibody levels declined over time, NAbT remained stable up to 329 days. Most patients had detectable SsT-cells (76% CD4+, 52% CD8+). Haematological malignancy (HM) patients had impaired immune responses that were disease and treatment-specific (anti-CD20), but with evidence suggestive of compensation from T-cells. 585 patients were evaluated following 2 doses of BNT162b2 or AZD1222 vaccines, administered 12 weeks apart. Seroconversion rates after 2 doses were 85% and 54% in patients with SM and HM, respectively. A lower proportion of patients had detectable NAbT against SARS-CoV-2 VOC (Alpha 62%, Beta 54%, Delta 49%) vs WT (84%), with corresponding significantly lower NAbT. Patients with HM were more likely to have an undetectable NAb and had lower NAbT vs solid malignancies to both WT and VOCs. Seroconversion showed poor concordance with NAbTs against VOCs. Prior SARS-CoV-2 infection boosted NAbT including against VOCs. Anti-CD20 treatment was associated with severely diminished NAbTs. Vaccine-induced T-cell responses were detected in 80% of patients, with no differences between vaccines or cancer types.

**Conclusions**

Patients with HM had blunted humoral responses to infection and vaccination, particularly against VOCs, but preserved cellular responses might contribute to protection. Our results lend support to prioritisation of all cancer patients for further booster vaccination.

**Clinical trial identification**

NCT03226886.

**Legal entity responsible for the study**

The Royal Marsden NHS Foundation Trust.

**Funding**

The Royal Marsden Charity; The National Institute for Health Research (NIHR) Biomedical Research Centre (BRC) at the Royal Marsden Hospital and Institute for Cancer Research (ICR).

**Disclosure**

All authors have declared no conflicts of interest.

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