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SARS-CoV-2 Antibody Responses in Solid Organ Transplant Recipients

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A. BACKGROUND

- Early reports of coronavirus disease 2019 (COVID-19) suggest increased risk of mortality among adult solid organ transplant (SOT) recipients.[1]
- Understanding humoral and cell mediated immune responses following COVID-19 may inform risk of reinfection and development of safe and effective vaccines.
- Data regarding antibody responses after COVID-19 in organ transplant recipients are very limited.[2,3]
- We conducted a cohort study to investigate the rate of seroconversion for SARS-CoV-2 IgG at a minimum of 2 weeks post-diagnosis and identify potential correlates of seroconversion.

B. METHODS

Study Design:

- We conducted a prospective cohort study at the NYU Langone Transplant Institute.
- **Study period:** March 1st- June 5th 2020.
- We evaluated all adult SOT recipients who were diagnosed with COVID-19 and underwent serum **SARS-CoV-2 IgG ELISA testing (Abbott Laboratories, Abbott Park, IL)** as per routine clinical care at our transplant center.
- The Abbott IgG testing became available at our institution on May 15th 2020.
- For patients with initial negative antibody testing, our practice guidelines recommended repeat antibody testing at 2-week intervals to assess for delayed seroconversion.

Outcomes of interest:

- Primary **outcome of interest:** the **percentage of SOT recipients that developed detectable IgG antibodies to SARS-CoV-2** after positive SARS-CoV-2 PCR from nasopharyngeal swab.
- Secondary objective was to investigate potential associations between seroconversion and clinical variables including:
  - Age ≥65 years
  - Gender
  - Nadir absolute lymphocyte count during symptomatic illness <1,000cells/μL
  - Use of antimetabolite or belatacept as maintenance immunosuppression
  - Use of high dose steroids (≥5mg per day of prednisone equivalent) as maintenance immunosuppression or during COVID-19 infection.

C. RESULTS

Patient Cohort:

- **89 SOT recipients** were **diagnosed** with COVID-19 during the study period.
- 16 patients (18.0%) died prior to availability of antibody testing at our institution, **leaving 62 patients who were included in the final analysis**.
- **24** of 62 patients **(38.7%) were diagnosed with COVID-19 within the first year after transplantation**.
- **52** patients (83.9%) required **hospitalization** for COVID-19, and **10** were managed in the **outpatient** setting.
- Initial **SARS-CoV-2 IgG testing performed** at a **median of 54 days** (IQR 44-64) from first positive SARS-CoV-2 PCR.

Maintenance Immunosuppression:

- All patients were on maintenance immunosuppression.
- The **most frequent immunosuppressive regimen** was **tacrolimus plus mycophenolate plus prednisone** in **38** patients (61.4%).
- **6 patients** (9.7%) were on **belatacept-based regimens**.

Table 1. Patient Characteristics

Patient Characteristics	No. (%) or Median (IQR)
Age (years)	58 (51-67)
Gender	
Female	25 (40.3%)
Male	37 (59.7%)
Race	
White	11 (17.7%)
African American/Black	22 (35.5%)
Asian	3 (4.8%)
Other/Unknown	26 (42.0%)
Ethnicity	
Hispanic	18 (29.0%)
Non-hispanic	24 (38.7%)
Other/Unknown	20 (32.3%)
Transplanted Organ	
Kidney	44 (71.0%)
Heart	7 (11.3%)
Liver	6 (9.7%)
Lung	3 (4.8%)
Combined Heart and Kidney	2 (3.2%)
Years from Transplantation	2 (1-2)

Table 2. Results of univariate and multivariate analyses regarding risk factors for SARS-CoV-2 IgG Seroconversion.

Footnote: IQR=Interquartile Range, **No.**=Number

Patient Characteristics		Univariate Analysis (OR; p value)	Multivariate Analysis (OR; p value)
Age (years)	<65 ≥65	Ref. 1.13 (0.87)	
Gender	Female Male	Ref. 0.58 (0.47)	
Nadir ALC (cells/μL)	<1,000 ≥1,000	Ref. 1.03 (0.96)	
Antimetabolite Use	No Yes	Ref. 2.76 (0.21)	Ref. 3.04 (0.19)
High-dose steroids	No Yes	Ref. 1.74 (0.45)	
Belatacept use	No **Yes**	Ref. **0.14 (0.03)**	Ref. **0.13 (0.03)**

Footnote: ALC=absolute lymphocyte count, **OR**=odds ratio, **Ref.**=reference

52 of 62 patients (83.9%) had detectable SARS-CoV-2 IgG responses, whereas 10 (16.1%) did not seroconvert.

C. RESULTS

- **Six (60%) of 10 seronegative patients remained seronegative up to 17 weeks post-diagnosis** on serial SARS-CoV-2 IgG testing.
- None had received induction immunosuppression within the prior 90 days but one had received methylprednisolone, thymoglobulin and plasmapheresis within the prior 90 days for acute cellular rejection, and one was on eculizumab for chronic rejection.

D. CONCLUSIONS

- The **majority** of patients with confirmed COVID-19 in our cohort of immunosuppressed SOT recipients **developed a detectable SARS-CoV-2 IgG response**.
- All patients tested within the first 4 weeks from COVID-19 illness and 85.7% of those tested within the first 6 weeks were seropositive.
- Belatacept use was the only risk factor significantly associated with lack of development of IgG antibodies to SARS-CoV-2. This finding warrants further study in a larger cohort of SOT recipients.
- Further longitudinal studies of the durability of antibody responses and whether seropositivity confers immunity to SARS-CoV-2 reinfection in immunocompromised patients are needed.

E. REFERENCES

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F. ACKNOWLEDGEMENTS

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