COVID-19 AND OXYGEN

FC 085 CEREBRAL OXYGENATION DURING EXERCISE ACROSS DIFFERENT STAGES OF CHRONIC KIDNEY DISEASE

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BACKGROUND AND AIMS: Cognitive impairment and reduced exercise tolerance are common in patients with chronic kidney disease (CKD), in part due to reduced brain function. Proper brain function relies on sufficient blood flow and oxygen supply by the cerebral vasculature. A reduction in cerebral oxygenation of more than 10% may deteriorate brain function and influence the decision to continue exercise. This study aims to examine the cerebral oxygenation and blood volume during a mild physical stress as an index of brain activation in patients at different stages of CKD and controls without CKD.
METHOD: This is a preliminary analysis of an observational study enrolling patients with CKD stage 2–4 (matched for age and sex within the different stages) and controls without CKD. All participants underwent a 3-min intermittent handgrip exercise (HG) at 35% of their maximal voluntary contraction. Changes in prefrontal oxygenation (oxyhaemoglobin—O_2Hb) and deoxyhaemoglobin—HHb) and total blood volume (total hemoglobin—tHb) were continuously recorded during HG-exercise by near-infrared spectroscopy (NIRS).
RESULTS: A total of 59 participants are included in this preliminary analyses ($n = 11$ controls, $n = 15$ stage 2 CKD, $n = 18$ stage 3 CKD and $n = 15$ stage 4 CKD patients). During HG-exercise, O_2Hb significantly increased ($P < 0.001$) and HHb remained relatively unchanged in all groups compared to pre-exercise values. However, this O_2Hb increase was progressively lower with advancing CKD Stages (controls: 2.58 ± 1.43; stage 2: 1.51 ± 1.31; stage 3: 1.29 ± 0.97; stage 4: 0.95 ± 0.92; $P = 0.006$) (Figure). During HG, tHb (an index of microvascular blood volume) increased significantly in controls, stage 2 and stage 3 CKD patients ($P < 0.05$) but not in stage 4 CKD patients ($P = 0.100$). As before this tHb increase was progressively lower with advancing CKD stages ($P = 0.030$). Controlling for age differences between groups did not alter the above observations.
CONCLUSION: Brain activation/response during a mild physical task appears to decrease with advancing CKD as suggested by the smaller rise in cerebral oxygenation and blood volume. This may contribute both impaired cognitive function and reduced exercise tolerance with advancing CKD.

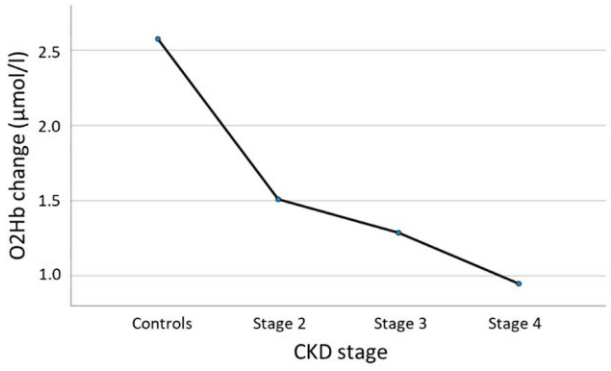

FIGURE: 1 Average response in O_2Hb during handgrip exercise.

FC 086 IMPROVED IMMUNOLOGIC RESPONSE TO COVID-19 VACCINE WITH PROLONGED DOSING INTERVAL IN HEMODIALYSIS PATIENTS

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BACKGROUND AND AIMS: Vaccination against coronavirus disease 2019 (COVID-19) can reduce disease incidence and severity. Dialysis patients demonstrate a delayed immunologic response to vaccines. We determined factors affecting the immunologic response to COVID-19 vaccines in hemodialysis patients.
METHOD: All patients within a Swedish hemodialysis network, vaccinated with two doses of COVID-19 vaccine 2–8 weeks before inclusion, were eligible for this cross-sectional study. Severe adult respiratory syndrome coronavirus 2 (SARS-CoV-2) spike protein antibody levels were determined by the EliA SARS-CoV-2-Sp1 IgG test (Thermo Fisher Scientific, Phadia AB) and related to clinical and demographic parameters. Eighty-nine patients were included.
RESULTS: Patients were vaccinated with two doses of Comirnaty (BNT162b2, 73%) or Spikevax (mRNA-1273, 23.6%). Three patients received combinations of different vaccines. Response rate (antibody titres >7 U/mL) was 89.9%, while 39.3% developed high antibody titres (>204 U/mL), 47 (43–50) days after the second dose. A previous COVID-19 infection associated with higher antibody titres [median (25th–75th percentile) 1558.5 (814.5–3763.8) U/mL versus 87 (26–268) U/mL; $P = 0.002$], while the time between vaccine doses did not differ between groups ($P = 0.7$). Increasing SARS-CoV-2 antibody titres were independently associated with increasing time between vaccine doses, decreasing serum calcium levels and previous COVID-19 (Table 1).
CONCLUSION: In conclusion, a longer interval between COVID-19 mRNA vaccine doses, lower calcium and a previous COVID-19 infection were independently associated with a stronger immunologic vaccination response in hemodialysis patients. While the response rate was good, only a minority developed high antibody titres 47 (43–50) days after the second vaccine dose.

Table 1. Multiple regression of predictors of SARS-CoV-2 spike IgG response to COVID-19 vaccines

	Regression coefficient (95% CI)	P
(Constant)	0.015 (−0.507 to 0.537)	0.95
Type of vaccine	−0.194 (−0.566 to 0.179)	0.30
Sodium (1 SD)	−0.154 (−0.309 to 0.001)	0.051
Calcium (1 SD)	−0.233 (−0.4 to −0.067)	0.007
Treatment time (1 SD)	−0.05 (−0.234 to 0.133)	0.586
Bodymass index (1 SD)	0.104 (−0.086 to 0.294)	0.279
IDBWG (1 SD)	0.118 (−0.042 to 0.278)	0.145
Kt/V (1 SD)	0.009 (−0.159 to 0.177)	0.915
Vaccine interval (1 SD)	0.241 (0.039 to 0.443)	0.02
Interval first dose to sample (1 SD)	0.027 (−0.142 to 0.197)	0.750
Previous COVID-19	1.078 (0.56 to 1.596)	<0.001

FC 087 EFFECTIVENESS OF COVID-19 VACCINES IN A LARGE EUROPEAN HAEMODIALYSIS COHORT

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BACKGROUND AND AIMS: To date, no large-scale study has evaluated the effectiveness of COVID-19 vaccines in hemodialysis patients. We sought to evaluate the effectiveness of vaccines against SARS-CoV-2 infections and death in

haemodialysis patients registered in the Fresenius Medical Care (FMC) Nephrocare network.

METHOD: In this historical, 1:1 matched cohort study, we analysed electronic health records (EHR) of individuals receiving in-center haemodialysis therapy in FMC European dialysis clinics from 1 December 2020, to 31 May 2021 (study period). For each vaccinated patient, an unvaccinated patient was selected among patients registered in the same country and attending a dialysis session within +/−3 days from the vaccination date. Matching without replacement was based on demographics, clinical characteristics, past COVID-19 infections and a risk score representing the local (dialysis centre) background risk of infection at each vaccination date. The infection risk score was calculated from an artificial Intelligence model predicting the risk of COVID-19 outbreak in each clinic over a 2-week prediction horizon. The infection risk score was based on trends in regional COVID-19 epidemic metrics, FMC COVID-19 reporting system and clinical practice patterns. The index date was the date of the first vaccination for the vaccinated and the matching treatment date for the unvaccinated controls. To overcome violation of the proportional hazard assumption, we estimated the effectiveness of the COVID-19 vaccines in preventing infection and mortality rates as 1—hazard ratio estimated from a time-dependent extended Cox regression stratified by country and vaccine type.

RESULTS: We included 44 458 patients, 22 229 vaccinated and matched 22 229 unvaccinated. Distribution of covariates was balanced across study arms after matching (Figure 1A). In the effectiveness analysis on mRNA vaccines, we observed 850 SARS-CoV-2 infections and 201 COVID19-related deaths among the 28 110 patients (14 055 vaccinated and 14 055 unvaccinated) during a mean follow up time of 44 ± 40 days. In the effectiveness analysis of viral-vector vaccines, we observed 297 SARS-CoV-2 infections and 64 COVID19-related deaths among 12 888 patients (6444 vaccinated and 6444 unvaccinated) during a mean a follow-up time of 48 ± 32 days (Figure 1B). We observed 18.5/100 patient-year and 8.5/100 patient-year fewer infections and 5.4/100 patient-year and 5.2/100 patient-year fewer COVID-19-related deaths among patients vaccinated with mRNA and viral-vector vaccines respectively, as compared to matched unvaccinated controls. The effectiveness of COVID-19 vaccines concerning both symptomatic infections and COVID-related death along the follow up period is shown in Figure 2.

CONCLUSION: In this matched, historical cohort study, we observed a strong reduction in both SARS-CoV-2 symptomatic infection and COVID-19-related death among dialysis patients receiving an mRNA vaccine. Despite seemingly less protective against symptomatic infections, we observed similar reduction in COVID-19 mortality rate among patients receiving a viral-carrier vaccine.

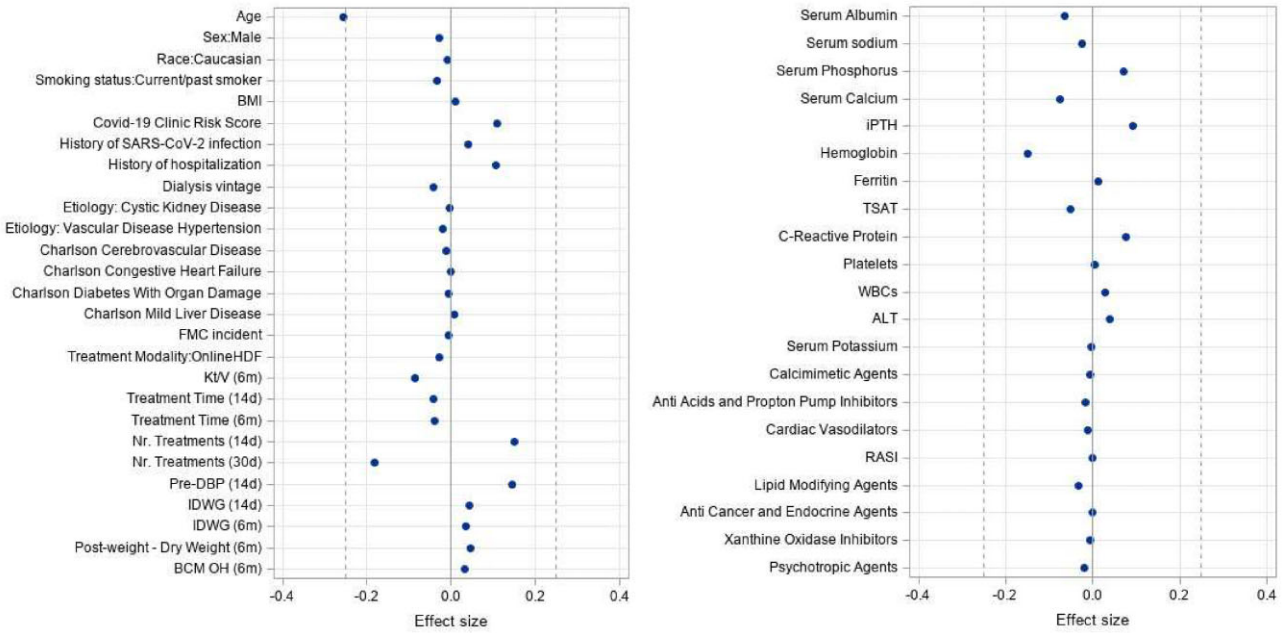

FIGURE 1A: Forest Plot demonstrating covariate distribution balance between exposure groups. Effect Sizes calculated as Cohen's d or Cromer's Negative coefficient indicates that mean or relative frequency was greater among vaccinated patients. Effect Size 0.12 negligible Effect Size-0.1-0.2: small.

	Sample Size	Vaccinated	Unvaccinated
	N (events)	*Events/100 person-years (95% CI)*	
COVID19 Infection			
Vaccine Type			
mRNA	28,110 (850)	17.1 (15.2-19.2)	35.6 (32.7-38.6)
Viral Carrier	12,888 (297)	13.6 (11.4-16.3)	22.1 (19.1-25.5)
COVID19-Related Death			
Vaccine Type			
mRNA	28,110 (201)	3.3 (2.5-4.2)	8.7 (7.4-10.2)
Viral Carrier	12,888 (64)	1.2 (0.6-2.2)	6.4 (4.9-8.4)

FIGURE 1B: Absolute frequency and incidence density (95% confidence intervall of events across exposure groups.

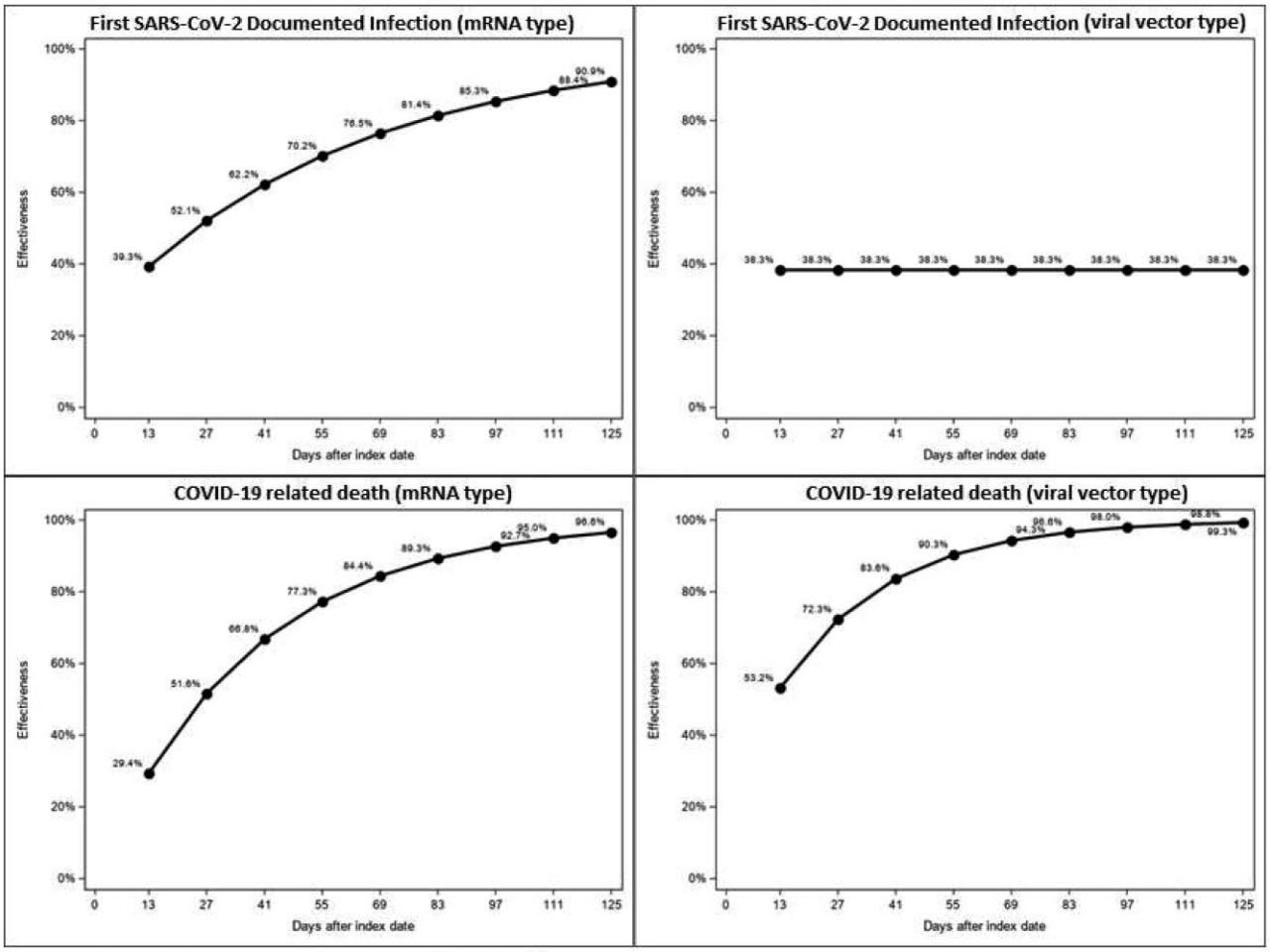

FIGURE 2: Effectiveness (1-HR) estimates by vaccine type concerning symptomatic, documented infection and COVID-19 related death. Estimates were obtained from extended, cox regression with time-varying covariate.