Exhibit 396

Myocarditis not recovered in 80% at 6 months after vaccination

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Myocarditis Not Recovered in 80% at 6 Months after Vaccination

Worrisome Serial MRI Results in Adolescents after Primary mRNA Series

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MAY 10, 2023

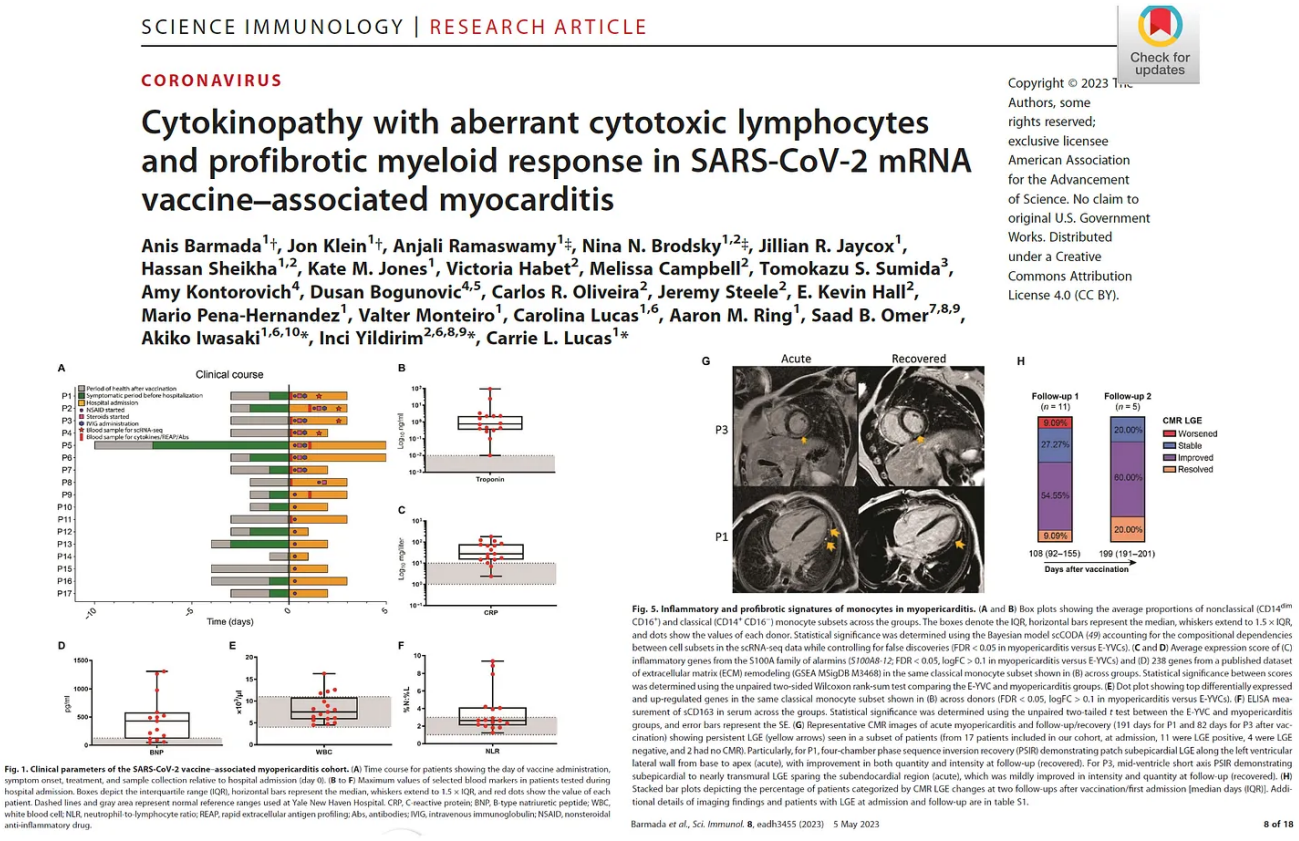
ARTICLE VOICEOVER

By Peter A. McCullough, MD, MPH

Every cardiology office in America should be recognizing COVID-19 vaccine-induced myocarditis presenting in young persons, 90% are male, with chest pain, effort intolerance, arrhythmias, and cardiac arrest after injections of mRNA vaccines. As I see these patients, the common question is “when is this over?”. While ECG and blood tests tend to normalize quickly, my concern is that ongoing inflammation is occurring due to continued production of Wuhan Spike protein coded by the long lasting Pfizer or Moderna mRNA vaccines. While blood tests can give inferences on inflammation, cardiologists also use cardiac magnetic resonance imaging (MRI) to visualize the inflammation, establish the diagnosis, and craft a prognosis. We would hope young teenagers would resolve their MRI results and go on with life. A recent report to the contrary caught my attention.

Barmada et al studied a clinical cohort consists of 23 patients hospitalized for vaccine-associated myocarditis and/or pericarditis. The cohort was predominately male (87%) with an average age of 16.9 ± 2.2 years (ranging from 13 to 21 years). Patients had largely noncontributory past medical histories and were generally healthy before vaccination. Most patients had symptom onset 1 to 4 days after the second dose of the BNT162b2 mRNA vaccine. Six patients either first experienced symptoms after a delay of >7 days

after vaccination or were incidentally positive for SARS-CoV-2 by polymerase chain reaction (PCR) testing upon hospital admission; these six patients were thus excluded from further analyses, although they potentially reflect the breadth of clinical presentations of vaccine-associated myopericarditis. The remaining cohort of 17 patients showed no evidence of recent prior SARS-CoV-2 infection, with antibodies to spike (S) protein but not to nucleocapsid (N) protein and negative nasopharyngeal swab reverse transcription quantitative PCR at hospital admission.



SCIENCE IMMUNOLOGY | RESEARCH ARTICLE

CORONAVIRUS

Cytokinopathy with aberrant cytotoxic lymphocytes and profibrotic myeloid response in SARS-CoV-2 mRNA vaccine–associated myocarditis

Anis Barmada[1]†, Jon Klein[1]†, Anjali Ramaswamy[1]‡, Nina N. Brodsky[1,2]‡, Jillian R. Jaycox[1], Hassan Sheikha[1,2], Kate M. Jones[1], Victoria Habet[2], Melissa Campbell[2], Tomokazu S. Sumida[3], Amy Kontorovich[4], Dusan Bogunovic[4,5], Carlos R. Oliveira[2], Jeremy Steele[2], E. Kevin Hall[2], Mario Pena-Hernandez[1], Valter Monteiro[1], Carolina Lucas[1,6], Aaron M. Ring[1], Saad B. Omer[7,8,9], Akiko Iwasaki[1,6,10]*, Inci Yildirim[2,6,8,9]*, Carrie L. Lucas[1]*

Fig. 1. Clinical parameters of the SARS-CoV-2 vaccine–associated myopericarditis cohort. (**A**) Time course for patients showing the day of vaccine administration, symptom onset, treatment, and sample collection relative to hospital admission (day 0). (**B** to **F**) Maximum values of selected blood markers in patients tested during hospital admission. Boxes depict the interquartile range (IQR), horizontal bars represent the median, whiskers extend to 1.5 × IQR, and red dots show the value of each patient. Dashed lines and gray area represent normal reference ranges used at Yale New Haven Hospital. CRP, C-reactive protein; BNP, B-type natriuretic peptide; WBC, white blood cell; NLR, neutrophil-to-lymphocyte ratio; REAP, rapid extracellular antigen profiling; Abs, antibodies; IVIG, intravenous immunoglobulin; NSAID, nonsteroidal anti-inflammatory drug.

Fig. 5. Inflammatory and profibrotic signatures of monocytes in myopericarditis. (**A** and **B**) Box plots showing the average proportions of nonclassical ($CD14^{dim}$ $CD16^{+}$) and classical ($CD14^{+}$ $CD16^{-}$) monocyte subsets across the groups. The boxes denote the IQR, horizontal bars represent the median, whiskers extend to 1.5 × IQR, and dots show the values of each donor. Statistical significance was determined using the Bayesian model scCODA (49) accounting for the compositional dependencies between cell subsets in the scRNA-seq data while controlling for false discoveries (FDR < 0.05 in myopericarditis versus E-YVCs). (**C** and **D**) Average expression score of (C) inflammatory genes from the S100A family of alarmins (*S100A8-12*; FDR < 0.05, logFC > 0.1 in myopericarditis versus E-YVCs) and (D) 238 genes from a published dataset of extracellular matrix (ECM) remodeling (GSEA MSigDB M3468) in the same classical monocyte subset shown in (B) across groups. Statistical significance between scores was determined using the unpaired two-sided Wilcoxon rank-sum test comparing the E-YVC and myopericarditis groups. (**E**) Dot plot showing top differentially expressed and up-regulated genes in the same classical monocyte subset shown in (B) across donors (FDR < 0.05, logFC > 0.1 in myopericarditis versus E-YVCs). (**F**) ELISA measurement of sCD163 in serum across the groups. Statistical significance was determined using the unpaired two-tailed *t* test between the E-YVC and myopericarditis groups, and error bars represent the SE. (**G**) Representative CMR images of acute myopericarditis and follow-up/recovery (191 days for P1 and 82 days for P3 after vaccination) showing persistent LGE (yellow arrows) seen in a subset of patients (from 17 patients included in our cohort, at admission, 11 were LGE positive, 4 were LGE negative, and 2 had no CMR). Particularly, for P1, four-chamber phase sequence inversion recovery (PSIR) demonstrating patch subepicardial LGE along the left ventricular lateral wall from base to apex (acute), with improvement in both quantity and intensity at follow-up (recovered). For P3, mid-ventricle short axis PSIR demonstrating subepicardial to nearly transmural LGE sparing the subendocardial region (acute), which was mildly improved in intensity and quantity at follow-up (recovered). (**H**) Stacked bar plots depicting the percentage of patients categorized by CMR LGE changes at two follow-ups after vaccination/first admission [median days (IQR)]. Additional details of imaging findings and patients with LGE at admission and follow-up are in table S1.

Barmada A, Klein J, Ramaswamy A, Brodsky NN, Jaycox JR, Sheikha H, Jones KM, Habet V, Campbell M, Sumida TS, Kontorovich A, Bogunovic D, Oliveira CR, Steele J, Hall EK, Pena-Hernandez M, Monteiro V, Lucas C, Ring AM, Omer SB, Iwasaki A, Yildirim I, Lucas CL. Cytokinopathy with aberrant cytotoxic lymphocytes and profibrotic myeloid response in SARS-CoV-2 mRNA vaccine-associated myocarditis. Sci Immunol. 2023 May 12;8(83):eadh3455. doi: 10.1126/sciimmunol.adh3455. Epub 2023 May 5. PMID: 37146127.

While the authors clearly show high levels of inflammatory markers, my attention was drawn to the follow-up MRI scans. As shown in the figure, only 20% had resolved their abnormalities (late gadolinium enhancement) at over six months (199 days). This paper

raises questions: 1) is there ongoing heart damage and inflammation at six months? 2) does the LGE in 80% represent a permanent "scar" putting these children at risk for future cardiac arrest? These data strongly call for large scale research into this emerging problem given the large number of potential young persons at risk.

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13 Comments

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Tareq I. Albaho, PhD 12 hr ago

I guess this is what the CDC calls "mild" myocarditis?

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Alan R 11 hr ago