RSNA Press Release

Study Examines Heart Inflammation after COVID Vaccine

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OAK BROOK, Ill. (March 9, 2023) — Researchers found evidence of heart muscle inflammation in a small number of patients with acute myocarditis after COVID-19 vaccination, but not in patients without acute myocarditis, according to a study published in Radiology: Cardiothoracic Imaging, a journal of the Radiological Society of North America (RSNA).

Kate Hanneman, M.D., M.P.H.

“To our knowledge, this is the first prospective study to report comprehensive cardiac investigations and imaging in both symptomatic and asymptomatic patients after COVID-19 vaccination,” said the study’s senior author Kate Hanneman, M.D., M.P.H., associate professor in the Department of Medical Imaging and director of cardiac imaging research at the University of Toronto in Toronto, Canada.

Billions of people worldwide have received at least one dose of a COVID-19 vaccine. Some instances of myocarditis (non-ischemic inflammation of the heart muscle) have been reported following administration of mRNA-based COVID-19 vaccines. Myocarditis can
affect the heart’s rhythm and ability to pump blood and may leave behind lasting damage in
the form of scarring of the heart muscle.

Most instances of myocarditis after COVID-19 vaccination have occurred in adolescent and
young adult males. However, the overall risk is very low.

Some patients may experience cardiac symptoms after vaccination, including shortness of
breath, palpitations, and chest pain, yet do not meet diagnostic criteria for acute myocarditis.

“We know that some patients are at risk of myocarditis following mRNA-based
COVID-19,” Dr. Hanneman said. “However, there are limited data on potential myocardial
tissue changes in patients who are asymptomatic after COVID-19 vaccination. Similarly, we
have very limited data to date on patients who present with new symptoms after vaccination
but do not meet diagnostic criteria for acute myocarditis.”

Cardiac MRI plays an important role in the assessment of acute myocarditis with
unparalleled ability for noninvasive characterization of myocardial tissue. Cardiac fluorine
18 (18F) fluorodeoxyglucose (FDG) PET allows for assessment of changes in myocardial
metabolism.

For this prospective study, Dr. Hanneman and a multi-disciplinary team of radiology,
cardiology and vascular biology researchers set out to investigate cardiac effects of
COVID-19 vaccination at two-month follow-up and relate cardiac symptoms to myocardial
tissue changes on FDG PET/MRI, blood biomarkers, health-related quality of life and
adverse outcomes.

Fifty-four participants were evaluated a median of 72 days after COVID-19 vaccination.
Seventeen were symptomatic with myocarditis, 17 were symptomatic without myocarditis,
and 20 were asymptomatic.

No participants in the symptomatic without myocarditis or asymptomatic groups had focal
FDG uptake, myocardial edema or impaired ventricular function. Two participants with
symptomatic myocarditis had focal FDG uptake. Health-related quality of life was lower in
the symptomatic myocarditis group than the asymptomatic group. There were no adverse
cardiac events beyond myocarditis in any participant.

“All of the symptomatic participants in our study who did not meet diagnostic criteria for
acute myocarditis had elevated troponin levels, impaired left ventricular function, or
detectable cardiac inflammation two months after COVID-19 vaccination,” Dr. Hanneman
said. “This suggests that symptoms alone are a poor indicator of myocardial injury after
vaccination.”

The results also suggested that subclinical myocardial injury is not common after
COVID-19 vaccination, based on normal cardiac PET, ECG, and blood biomarker findings
in the asymptomatic patient group. The researchers hope these findings reassure patients
who did not experience symptoms after COVID-19 vaccination but worry about the
possibility of subclinical cardiac disease.

Dr. Hanneman cautioned that further study is needed to investigate non-cardiovascular
causes of symptoms after vaccination in individuals who do not meet diagnostic criteria for
acute myocarditis.
“Myocardial Inflammation on FDG PET/MRI and Clinical Outcomes in Symptomatic and Asymptomatic Participants after COVID-19 Vaccination.” Collaborating with Dr. Hanneman were Constantin Arndt Marschner, M.D., Paaladinesh Thavendiranathan, M.D., S.M., Dakota Gustafson, B.Sc., Kathryn L. Howe M.D., Ph.D., Jason E. Fish, Ph.D., Robert M. Iwanochko, M.D., Rachel M. Wald, M.D., Husam Abdel-Qadir, M.D., Slava Epelman, M.D., Ph.D., Angela M. Cheung, M.D., Ph.D., and Rachel Hong, B.Sc.

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