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Asymptomatic vaccinated participants have higher myocardial 18F-FDG uptake than unvaccinated participants up to 6 months after their second anti-SARS-CoV-2 mRNA vaccination (PET/CT study) | 1

The authors from Japan investigated whether myocardial changes on positron emission tomography (PET)/ computed tomography (CT) occurred in asymptomatic individuals who had been vaccinated with anti-SARS-CoV-2 mRNA vaccine, and underwent imaging for reasons unrelated to myocarditis. Results showed increased myocardial 18Fluorine-fluorodeoxyglucose (18F-FDG) uptake on images in asymptomatic vaccinated subjects who underwent PET/CT within a period of 1-180 days after their second vaccination, compared with unvaccinated group. However, this increase was not seen in subjects who underwent imaging more than 180 days after vaccination. Also, it was observed that 18F-FDG uptake in the liver and spleen was higher in the vaccinated group than in the unvaccinated group.

Cardiac magnetic resonance imaging (MRI) and 18F-FDG PET/CT imaging have been routinely employed for the noninvasive diagnosis of myocardial inflammation of diverse origin. PET-CT, compared to cardiac MRI, can provide information about inflammation for the whole body. The myocarditis is one of the side effects associated with the mRNA vaccines. The results of previous 18F-FDG PET/MRI studies identified myocardial inflammation following COVID-19.

<https://discovermednews.com/pet-and-mri-myocardial-sequelae-myocarditis-after-anti-sars-cov-2-vaccination/>

However, it is not known whether higher 18F-FDG uptake occurs in asymptomatic individuals following anti-SARS-CoV-2 vaccination.



About the study

This retrospective study included vaccinated and unvaccinated individuals who underwent 18F-FDG PET/CT for reasons unrelated to myocarditis. The first group of participants received one or two doses of anti-SARS-CoV-2 mRNA vaccine (BNT162b2 mRNA, Pfizer-BioNTech, or mRNA-1273, Moderna) with clear vaccine documentation, whereas the second



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group of participants did not receive anti-SARS-CoV-2 vaccine. The median interval between the first vaccination and PET imaging was 13 days, whereas median interval from the second vaccination to PET imaging was 88 days. Individuals were categorized into seven groups based on the interval of time between vaccination and imaging: unvaccinated, imaging after the first dose, and imaging ≤ 30 days, 31-60 days, 61-120 days, 121-180 days, and >180 days after the second dose.

The exclusion criteria were: a blood glucose level greater than 100 mg/dl at the time of 18F-FDG injection, fasting of less than 12 hours, hematologic diseases such as lymphoma and leukemia, cardiac sarcoidosis, thyroid disease, cardiac surgery, chemotherapy that may result in cardiac dysfunction, chest irradiation in past 6 months, treatment with anti-inflammatory drugs, and a history of SARS-CoV-2 infection.

The myocardial 18F-FDG uptake and the 18F-FDG uptake in the axilla, liver, and spleen were quantitatively assessed using the maximum standardized uptake value (SUVmax). The following scale was used to measure myocardial visual score: 0 (minimal uptake), 1 (mostly minimal or mild uptake), 2 (mostly intense or moderate uptake), and 3 (homogeneously uptake).

Results

The study included 1003 subjects, of whom 303 were unvaccinated (157 women, 146 men) and 700 were vaccinated (356 men, 344 women). Of the 700 vaccinated participants, 40 received one vaccine dose, while 660 received two vaccine doses at the time of PET/CT imaging. Vaccinated participants were older (mean age, 56.8 years \pm 13.7) than unvaccinated participants (mean age, 52.9 years \pm 14.9). 372/700 (53.1%) of vaccinated participants and 150/303 (49.5%) of unvaccinated participants were not diagnosed with cancer.

Results showed that vaccinated participants had higher myocardial 18F-FDG uptake (SUVmax) compared to unvaccinated participants (median, 4.8 vs 3.3). When subjects were categorized by gender, myocardial 18F-FDG uptake was higher in vaccinated men (median SUVmax, 4.9) compared to unvaccinated men (median SUVmax, 3.9), as it was in vaccinated women (median SUVmax, 4.7) compared with unvaccinated women (median SUVmax, 3.2). Axillary uptake was also significantly higher in vaccinated men and women compared with unvaccinated participants of both sexes.

When participants were divided by age into three groups, <40 , 41-60, and >60 years of age, the results showed that the 18F-FDG uptake of the axilla and myocardium for each age

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group was higher in vaccinated (median SUVmax ranges, 4.7-5.6) than unvaccinated subjects (median SUVmax ranges, 3.3-3.3).

Additionally, myocardial 18F-FDG uptake was assessed in relation to the time interval between vaccination and PET/CT. The myocardial 18F-FDG uptake was higher in participants who underwent imaging 1-180 days after the second vaccination (median SUVmax range 4.6-5.1) than in unvaccinated group (median SUVmax, 3.1). However, this increase was not seen in subjects who underwent imaging more than 180 days after vaccination. The authors stated that despite the observed increase in myocardial 18F-FDG uptake on PET/CT up to 180 days after vaccination, this could be the result of relatively minor inflammation and may not represent severe myocardial abnormalities.

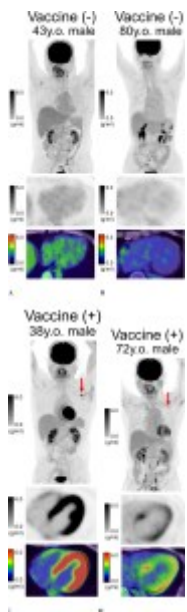


Image from the original article by Nakahara T et al, Radiology 2023.

The vaccinated group also showed higher 18F-FDG uptake in liver and spleen compared with the unvaccinated group. 18F-FDG uptake in the axilla was also significantly higher in participants who underwent imaging 1-120 days after the second vaccination (median SUVmax range, 1.5-2.0) than in the unvaccinated participants (median SUVmax, 1.2). However, this was not observed in subjects who underwent imaging more than 120 days after the second vaccination.

In participants without cancer, 372 vaccinated subjects showed significantly higher median myocardial 18F-FDG uptake and SUVmax compared to 150 unvaccinated subjects.

The researchers also examined the association between myocardial 18F-FDG uptake and the



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type of mRNA vaccine. The majority of the vaccinated individuals (77.6%) received BNT162b2 mRNA (Pfizer-BioNTech), followed by mRNA-1273 (21%). The myocardial SUVmax was higher in both vaccinated groups than in the unvaccinated group. There was no difference in 18F-FDG uptake between BNT162b2 mRNA vaccine types. The axillary SUVmax for both vaccine groups (BNT162b2 mRNA or mRNA-1273) was also higher than for the unvaccinated group.

In conclusion, results showed increased myocardial 18Fluorine-fluorodeoxyglucose (18F-FDG) uptake on images in asymptomatic vaccinated subjects who underwent PET/CT within a period of 1-180 days after their second vaccination, compared with unvaccinated group. Individuals who had been vaccinated showed higher myocardial 18F-FDG uptake on PET/CT in comparison to those who had not been vaccinated regardless of gender, age, or type of mRNA vaccine received. The authors suggested that future research should validate these findings, and compare them with cardiac enzymes, cardiac function and non-mRNA vaccination.

This article was published in Radiology.

Journal Reference

Nakahara T et al. Assessment of Myocardial 18F-FDG Uptake at PET/CT in Asymptomatic SARS-CoV-2-vaccinated and Nonvaccinated individuals. Radiology, Vol 308, No 3, Published Online Sep 19 2023. <https://pubs.rsna.org/doi/10.1148/radiol.230743>