3-8-2022

NON-INVASIVE ASSESSMENT OF MYOCARDIAL ENERGETICS USING 11-C ACETATE POSITRON EMISSION TOMOGRAPHY: SYSTEMATIC REVIEW AND META-ANALYSIS

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ACC22
APRIL 2 - 4 | WASHINGTON, DC

1321
JACC March 8, 2022
Volume 79, Issue 9, suppl A

Multimodality Imaging

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Poster Contributions
For exact presentation time, refer to the online ACC.22 Program Planner at https://www.abstractsonline.com/pp8/#!/10461

Session Title: Multimodality Imaging Flatboard Poster Selections: Nuclear
Abstract Category: 29. Multimodality Imaging: Nuclear

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Background: 11-C acetate PET is a non-invasive imaging modality to assess myocardial oxygen consumption (MVO2), and external efficiency (MEE). We conducted a systematic review and meta-analysis of available literature on this topic.

Methods: We searched electronic databases from inception to September 15, 2021, for all studies using 11C-Acetate PET in humans and patients with CVD at rest. Data are presented as mean with 95% CI.

Results: 54 studies with 1,182 participants (337 healthy, 845 patients with any CVD) met our inclusion criteria. Mean MVO_2 and MEE in studies with healthy controls was 0.11 (0.09, 0.13, I^2=99.3%) ml $min^{-1}g^{-1}$ and 27% (22, 33 I^2=98.3%), respectively (Figure).

Mean MEE in HFrEF, HFpEF, AS and HCM was 15% (13, 18), 13% (12, 14), 23% (20, 25) and 19% (CI 17, 22), respectively.

In HFrEF, both mean MVO2 (difference -0.02,-0.03, -0.01) and MEE (difference -9%, [-13, -6]) were lower vs. healthy controls. In HFpEF, mean MVO2 was higher (difference 0.03, -0.01, 0.07), but mean MEE was similar. In aortic stenosis, mean MVO2 was higher (difference 0.03, [0.01, 0.05]) and mean MEE lower (difference -7%, [-16, 1]) vs. healthy controls. In HCM, mean MVO2 was higher (WMD 0.01, [0.00, 0.02]), and mean MEE was lower (difference -21%, [-33, -8]).

Conclusion: Assessment of myocardial energetics using 11-C acetate PET can help understand the pathophysiology of distinct CVD. There is significant heterogeneity in the current literature, and there is an unmet need to standardize protocols and reporting methods.

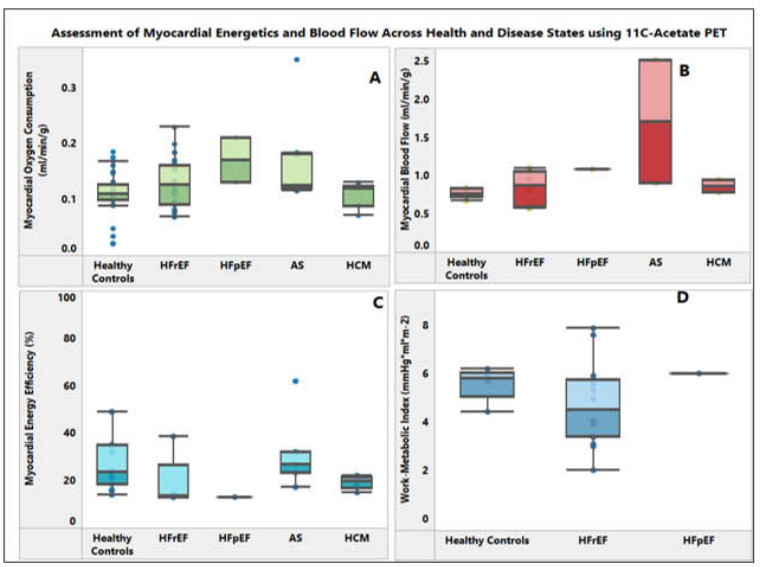

Figure: Box and whisker plot showing mean myocardial oxygen consumption (MVO_2), blood flow (MBF), external efficiency (MEE) and work-metabolic index across studies with healthy controls and patients with cardiovascular disease. Blue dots are mean values in each study. AS, aortic stenosis, HFrEF, heart failure with reduced ejection fraction, HFpEF, heart failure with preserved ejection fraction, HCM, hypertrophic cardiomyopathy