



A quick glance at selected topics in this issue

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“A quick glance at selected topics in this issue” aims to highlight contents of the *Journal* and provide a quick review to the readers. Every issue of the journal has multiple entries with differing objectives. We realize that many of you do not have time to read all journals or attend all national meetings. For that reason, JNC includes two types of literature reviews: one summarizing recent key nuclear cardiology articles that have been published in journals other than ours (<https://doi.org/10.1007/s12350-020-02405-9>), while the second outlines select publications in the general cardiovascular disease literature that have relevance to our field (<https://doi.org/10.1007/s12350-020-02402-y>). Another entry is the historical corner that in the current issue looks at the career and scientific contributions of an eminent Nuclear Physicist and powerhouse Ernest V. Garcia, PhD (Born 1948) (10.1007/s12350-020-02352-5). The Molecular Imaging Corner article discusses the current state of molecular imaging in cardiovascular medicine including the challenges, opportunities, and the path from diagnosis to prognosis to personalized medicine (<https://doi.org/10.1007/s12350-020-02319-6>). The Fellows’ Corner looks at a Canadian resident’s perspective on COVID-19 (<https://doi.org/10.1007/s12350-020-02222-0>). These manuscripts are complimented by a great selection of original articles with accompanying

editorials, brief reports, ‘What is this Image’ and ‘Images that Teach’ and a CME review paper, which currently is on ‘Hybrid PET/MR imaging in myocardial inflammation post-myocardial infarction’ by Wilk et al. (<https://doi.org/10.1007/s12350-019-01973-9>). Many of the original articles also have accompanying PowerPoint slides. The abstract of the lead original article ‘SPECT/CT imaging of lower extremity perfusion reserve: A non-invasive correlate to exercise tolerance and cardiovascular fitness in patients undergoing clinically indicated myocardial perfusion imaging’ by Chou et al. has also been translated into Spanish, Chinese, and French in keeping with the growing international readership. PowerPoint slides from this paper can be found by searching (<https://doi.org/10.1007/s12350-019-01954-y>).

Our comments on a few selected papers noted below are therefore only the tip of the iceberg. These manuscripts were selected at random and we sincerely believe all original articles serve a purpose, provide great value, and have undergone an intense peer review.

Chou et al. (<https://doi.org/10.1007/s12350-019-01954-y>) demonstrate the utility of lower extremity exercise stress/rest SPECT/CT perfusion imaging done in the same sitting as exercise stress/rest SPECT/CT MPI as a non-invasive correlate to lower extremity functional capacity and cardiovascular fitness. Peak metabolic equivalents (METs) were significantly associated with perfusion reserve of tibialis anterior, soleus, and gastrocnemius. Thus, regional assessment of calf skeletal muscle perfusion reserve in conjunction with clinically indicated exercise MPI is doable without the need for additional radiotracer injections.

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Pulmonary vein isolation is the cornerstone technique for treating patients with symptomatic paroxysmal atrial fibrillation resistant to standard pharmacological therapies. Catheter ablation of ganglionated plexi as an add-on to pulmonary vein isolation or even in isolation in patients with atrial fibrillation has been reported to improve clinical outcomes. Localization of ganglionated plexi has been done by invasive multi-site testing with high-frequency stimulation. Stirrup et al. (<https://doi.org/10.1007/s12350-018-01535-5>) show that left atrial innervation imaging with solid-state ^{123}I -mIBG SPECT/CT with cardiorespiratory gating is feasible, accurate, and reproducibly identifies ganglionated plexi verified by high-frequency stimulation.

The utility of stress MPI in asymptomatic patients within 5 years of surgical revascularization is rarely appropriate. Ortiz et al. (<https://doi.org/10.1007/s12350-018-01469-y>) study the prognostic value of stress MPI 1-year post-CABG. They show that stress-induced defect size, exercise capacity, and LVEF, obtained during stress SPECT MPI 1 year following CABG surgery, were important predictors of death and heart failure over the following 10 years, in an unselected cohort of 84 patients. The findings were additive and strongest among patients who underwent exercise stress testing.

Flores et al. from Columbia University Medical Center, New York (<https://doi.org/10.1007/s12350-018-01504-y>) utilize standardized uptake value (SUV) quantitation and localization on FDG PET/CT to identify patients with cardiac sarcoidosis at increased risk of cardiac events (ventricular tachycardia, AICD placement, complete heart block, pacemaker placement, atrial fibrillation, heart failure, and cardiac-related hospital admissions). Their findings reveal that max SUV, mean SUV, LVEF, and involvement of the basal region of the heart at time of cardiac sarcoidosis diagnosis were significantly associated with total cardiac events.

Left ventricular dysfunction is an important prognostic factor in heart failure. Plateau et al. from Clermont-Ferrand, France (<https://doi.org/10.1007/s12350-018-01493-y>) compare the performance of four MPI CZT-SPECT software packages, Quantitative gated SPECT, Myometrix, Corridor 4DM, and Emory Toolbox vs the gold standard, cardiac magnetic resonance (CMR) for the quantitation of LV function [LVEF, end diastolic volume (EDV), and end systolic volume (ESV)] in 48 patients with recent STEMI. Quantitative gated SPECT and Myometrix were the most efficient of the four cardiac imaging packages for determination of LVEF vs CMR, although the results were satisfactory for all four softwares. The available software packages are not interchangeable which is very relevant in serial evaluations.

Abele et al. from Canada (<https://doi.org/10.1007/s12350-018-01516-8>) evaluate differences in myocardial blood flow in end-stage liver disease/pre-liver transplant patients with vasodilator stress or dobutamine-stress using ^{82}Rb -PET MPI. 27 patients with normal MPI (normal perfusion, normal LV function, and normal LV volumes) and absent CT coronary artery calcium were included. Blood flow quantification demonstrated an attenuated vasodilation response to dipyridamole in liver failure patients, which is moderately correlated with severity of liver failure. This effect is related to a combination of increased resting blood flow as well as a reduced stress response. Dobutamine did not show this effect and thus may be the preferred agent for pharmacologic stress MPI in end-stage liver disease patients.

Exercise stress electrocardiography (ECG) alone is underutilized due to poor diagnostic accuracy. Balfour et al. (<https://doi.org/10.1007/s12350-018-01530-w>) prospectively demonstrate that exercise stress ECG with high-frequency QRS analysis identified any and substantial ischemia as identified by SPECT MPI with high diagnostic accuracy and may allow more than half of referred patients to safely avoid imaging.

Seong-Jang et al. from South Korea (<https://doi.org/10.1007/s12350-018-01582-y>) perform a systematic review and meta-analysis across 17 studies (891 patients) to study the diagnostic performance of F-18 FDG PET or PET/CT for detection of cardiac sarcoidosis (CS). Results showed a moderate sensitivity and specificity of F-18 FDG PET for diagnosis of CS that could be improved by performing combined myocardial perfusion imaging. The pooled sensitivity was 0.84 (95%CI 0.71-0.91) and a pooled specificity of 0.83 (95%CI 0.74-0.89).

In this pilot study (n=10), Wisenberg et al. from Canada (<https://doi.org/10.1007/s12350-018-01578-8>) demonstrate a similar diagnostic performance of same day 18F-FDG PET/CT and PET/MR for imaging cardiac sarcoidosis. Concurrent acquisition of MR images provided further insight into the disease process. PET/MRI provided high-quality images and potentially could be the diagnostic test of choice for evaluating patients with known or suspected cardiac inflammation.

Omote et al. from Japan (<https://doi.org/10.1007/s12350-018-01541-7>) study whether RV 18F-FDG uptake can predict positive findings of endomyocardial biopsy (EMB) in 28 patients with cardiac sarcoidosis (CS). The authors find that patients with positive RV FDG uptake had a significantly higher frequency of positive EMB than those without (42% vs. 6%, $P = 0.024$). On the other hand, there was no EMB-predictive value for the FDG uptakes in the other five segments (left ventricle anterior, septal, lateral, inferior, and apex).

CS patients with RV FDG uptake also had significantly greater Cardiac Metabolic Volume, Total Lesion Glycolysis, LV SUVmax, and LV involvement than those without.

Jahae et al. from Chonnam National University Hospital, South Korea (<https://doi.org/10.1007/s12350-019-01617-y>) investigate the predictive capabilities of 18F-FDG myocardial uptake and cancer therapy-induced cardiotoxicity in breast cancer patients who underwent anthracycline or trastuzumab treatments. The presence of RV wall uptake and the increase in the SUV of RV wall on post-therapy PET/CT were associated with cardiotoxicity in patients who received anthracycline or trastuzumab therapies. Thus, oncologic FDG PET/CT may provide information on cancer therapy-induced cardiotoxicity as well as tumor response.

Doxorubicin (DXR) is a commonly used chemotherapeutic agent. Its clinical use can be limited by serious side effects including cardiotoxicity. Although underlying mechanisms are largely unknown, oxidative stress has been implicated in the derangement of cardiomyocyte metabolism after Doxorubicin exposure. Bauckneht et al. from Genoa, Italy (<https://doi.org/10.1007/s12350-019-01618-x>) show a direct correlation between cardiac FDG uptake and oxidative stress indices in a murine model, supporting the potential role of FDG-PET as an early biomarker of Doxorubicin-related oxidative damage.

Goldman et al. from Montefiore Medical Center, Bronx, NY (<https://doi.org/10.1007/s12350-019-01647-6>) study the effect of incidental findings seen on coronary computed tomography angiography (CCTA) or radionuclide MPI in acute chest pain patients. 386 incidental findings were identified among 187 CCTA

studies. No extra-cardiac incidental findings were seen in the MPI arm (control group). There was a significantly higher frequency of incidental non-coronary inpatient medical workups after randomization in CCTA patients compared to the MPI group. CCTA patients also underwent significantly more non-contrast CT thorax exams within one year following randomization. Thus, incidental findings from CCTA significantly affect both inpatient and outpatient management in acute chest pain patients.

Persistent hepatic activity can interfere in the assessment of the inferior and infero-septal myocardium during 99mTc-MIBI SPECT/CT MPI for the evaluation of CAD patients. Ursodeoxycholic acid facilitates hepatobiliary clearance of bile and radiotracer through the same pathway. Sood et al. from PGIMER, Chandigarh, India (<https://doi.org/10.1007/s12350-019-01597-z>) in a placebo-controlled trial show the effectiveness of pre-treatment with oral Ursodeoxycholic acid for rapid hepatic tracer clearance in comparison to placebo, leading to easier and better image interpretation and earlier imaging in patients undergoing 99mTc-MIBI adenosine stress MPI or viability MPI.

We encourage the readers to look at the several other articles in the Journal with accompanying scholarly and informative editorials that not only put the findings in perspectives but also outline future directions. We would like to hear your comments as we strive to gain knowledge and, in the process, improve patient care.

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