

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. (*J Nucl Cardiol* 2019;26:21–3.)

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Abbreviations	
CAD	Coronary artery disease
MPI	Myocardial perfusion imaging
SPECT	Single-Photon emission computed tomography
PET	Positron emission tomography
LV	Left ventricle
RV	Right ventricle
LVEF	Left ventricle ejection fraction

“A quick glance at selected topics in this issue” aims to highlight contents of the *Journal* and provide a quick review to the readers. We realize that many of you do not have time to read all journals or attend all national meetings. For that reason, every issue of the JNC includes 2 types of literature reviews. One summarizes recent key nuclear cardiology articles that have been published in journals other than ours (<https://doi.org/10.1007/s12350-018-01572-0>) while the second outlines select publications in the general cardiovascular disease literature that have relevance to our field (<https://doi.org/10.1007/s12350-018-01518-6>).

Another entry is the historical corner that looks at the career and scientific contributions of a pioneer in positron imaging and the inventor of clinical PET imaging, Dr. Michael E. Phelps, PhD, (<https://doi.org/10.1007/s12350-018-01492-z>). 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 by Giannopoulos et al from University Hospital Zurich, Zurich, Switzerland (<https://doi.org/10.1007/s12350-017-0982-0>) on ‘Imaging the event-prone coronary artery plaque.’ Many of the original articles also have PowerPoint slides. The abstract of the lead original article ‘Infections in patients using ventricular-assist devices: Comparison of the diagnostic performance of ¹⁸F-FDG PET/CT scan and leukocyte-labeled scintigraphy’ by Vaugelade and colleagues from CHU de Bordeaux, Pessac, France, has also been translated into Spanish, Chinese, and French in response to requests from the international readership. PowerPoint slides from this paper can be found by searching <https://doi.org/10.1007/s12350-018-1323-7>. The current issue roster also includes Guidelines in review: Comparison of ESC and AHA guidance for the diagnosis and management of infective endocarditis in adults and is accompanied by the American (<https://doi.org/10.1007/s12350-018-1398-1>) and European (<https://doi.org/10.1007/s12350-018-1414-5>) perspectives.

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The issue also features a special series of theme and review articles penned by experts on 'Infiltrative Cardiomyopathies' including Sarcoidosis and Amyloidosis. Topics covered include 'Molecular Phenotyping of Infiltrative Cardiomyopathies' (<https://doi.org/10.1007/s12350-018-01550-6>), 'State of the Art Radionuclide Imaging in Cardiac Transthyretin Amyloidosis' (<https://doi.org/10.1007/s12350-018-01552-4>), Imaging Cardiac Innervation in Amyloidosis (<https://doi.org/10.1007/s12350-017-1059-9>), Advanced Cardiovascular Imaging for the Evaluation of Cardiac Sarcoidosis (<https://doi.org/10.1007/s12350-018-01488-9>), Microvascular Dysfunction in Infiltrative Cardiomyopathies (<https://doi.org/10.1007/s12350-017-0991-z>), Emerging Imaging Targets for Infiltrative Cardiomyopathy (<https://doi.org/10.1007/s12350-018-1356-y>), and Patient pages on Cardiac Amyloidosis (<https://doi.org/10.1007/s12350-018-01551-5>) and Sarcoidosis (<https://doi.org/10.1007/s12350-017-1100-z>) Imaging. Additionally, Delgado and colleagues (<https://doi.org/10.1007/s12350-018-01517-7>) provide highlights of multimodality imaging abstracts from The European Society of Cardiology Congress 2018 held in Munich, Germany, August 25-29, 2018.

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.

The utilization of left ventricular assist devices (LVAD) as a bridge-to-heart transplantation is increasing in patients with advanced heart failure. However, device-related infections are a challenge to recognize and to treat, with associated significant morbidity and mortality. Vaugelade and colleagues from CHU de Bordeaux, Pessac, France (<https://doi.org/10.1007/s12350-018-1323-7>), compare the diagnostic performance of ^{18}F -FDG PET/CT and radiolabeled $^{99\text{m}}\text{Tc}$ -HMPAO leukocyte scintigraphy for the diagnosis of infections in 24 patients with a continuous-flow LVAD. The authors find that ^{18}F -FDG PET/CT shows better sensitivity than leucocyte scintigraphy for detecting LVAD infections; however, leucocyte scintigraphy had higher specificity. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were 95.2%, 66.7%, 95.2%, 66.7%, and 91.6%, respectively, for ^{18}F -FDG PET; and 71.4%, 100%, 100%, 33.3%, and 75%, respectively, for leucocyte scintigraphy. Thus, in patients with suspected LVAD infection, the investigators propose that ^{18}F -FDG PET/CT be the first-line diagnostic nuclear imaging procedure with leucocyte scintigraphy reserved for equivocal cases.

Lee and colleagues from South Korea (<https://doi.org/10.1007/s12350-018-1406-5>), perform a systematic review and meta-analysis on the assessment of disease activity of

large vessel vasculitis with ^{18}F FDG PET. The meta-analysis included a total of 439 ^{18}F FDG PET or PET/CT scans from 298 patients in nine studies. The authors find evidence that ^{18}F FDG PET or PET/CT has good performance for the detection of active disease status in large vessel vasculitis patients (pooled sensitivity of 88%, pooled specificity of 81%, and area under the curve of 0.91). They conclude that ^{18}F FDG PET can serve as a reliable biomarker for assessment of disease activity of large vessel vasculitis during or after immunosuppressive therapy.

Christopoulos et al from Mayo Clinic, Rochester, MN (<https://doi.org/10.1007/s12350-017-0910-3>) examine if the addition of cardiopulmonary exercise testing (CPET) to SPECT MPI altered clinical decision-making in 415 patients. The majority of patients were referred for the evaluation of dyspnea (51%) or chest pain (31%). Of the 269 patients that had normal MPI, 206 (77%) had abnormal CPET. Patients with abnormal CPET and normal MPI, compared with patients that had normal CPET and normal MPI, were more frequently diagnosed with pulmonary disease (11.7% vs 3.2%, $P = .04$) and deconditioning (33.5% vs 17.4%, $P = .01$). Of the 146 patients that had an abnormal MPI, 128 (88%) had abnormal CPET. In these patients, the clinical decision-making was directed toward treatment of myocardial ischemia, whereas management of pulmonary issues and deconditioning was less frequent. The authors make a case for combined testing should be considered in patients where ischemia is not the most likely diagnosis, but needs to be ruled out.

Right ventricular (RV) dysfunction is an independent predictor of mortality in patients with chronic heart failure. While the effects of cardiac resynchronization therapy (CRT) on left ventricular (LV) function and dyssynchrony have been widely investigated, data on the impact of CRT on RV structure and contractility are relatively scarce. Also previous findings have highlighted an ambiguous/mixed association between baseline RV dysfunction and response to CRT in terms of LV reverse remodeling and function improvement (LVEF). Valzania and colleagues from Italy (<https://doi.org/10.1007/s12350-017-0971-3>), prospectively investigated the effects of CRT on (i) RV function and dyssynchrony, as assessed by $\text{Tc}99\text{m}$ radionuclide angiography, at rest and during exercise, and (ii) the neurohormonal response, as expressed by N-terminal pro-brain natriuretic peptide (NT-proBNP), in 36 heart failure patients stratified by baseline RVEF. Baseline RVEF was impaired (< 35%) in 14 patients, preserved (> 35%) in 22. At 3 months, RVEF improved during rest and exercise ($P = .02$) in patients with impaired RV function, while remaining unchanged in patients with preserved RV function. Rest and exercise RV dyssynchrony decreased in both groups at follow-up ($P < .05$).

A similar mid-term improvement in LV function and NT-proBNP was observed in patients with impaired and preserved RVEF. Thus, RV dysfunction should not per se be a primary criterion for excluding candidacy to CRT in heart failure patients.

Chronic kidney disease (CKD) is a known prognostic predictor of major adverse cardiac events (MACE, including sudden cardiac death, fatal arrhythmias, and acute coronary syndrome requiring urgent revascularization). Also CKD and SPECT MPI have additive value in risk-stratifying patients with suspected coronary artery disease. Mori et al from Nagoya University Graduate School of Medicine, Nagoya, Japan (<https://doi.org/10.1007/s12350-017-0889-9>) investigate whether indices of LV dyssynchrony derived from gated SPECT MPI are useful to predict prognosis in CKD patients with normal myocardial perfusion and scores. 167 CKD patients with normal perfusion defect scores on adenosine-stress ²⁰¹Thallium gated SPECT MPI and no previous history of overt heart disease were enrolled. Phase standard deviation (PSD) and bandwidth (BW) were automatically calculated from gated SPECT MPI. The MACEs occurred in 12 patients (7.1%) and patients who experienced MACEs showed significantly higher PSD and wider BW than those who did not. Kaplan–Meier event-free survival analysis revealed a higher event rate in CKD patients with high-PSD and wide-BW than in those with low-PSD and narrow-BW. Thus, the authors conclude that gated SPECT MPI-derived LV dyssynchrony indices may be novel prognostic predictors in CKD patients with normal perfusion defect scores.

Other than patients with pulmonary hypertension, who often exhibit prominent right ventricle (RV) uptake due to the hypertrophied RV myocardium, the RV is often not well visualized during SPECT MPI regardless of the type of stress. This is likely due to lower myocardial blood flow in the RV myocardium related to its lower muscle mass, lower demand compared to the LV myocardium and partial volume effects. Farag et al from the USA (<https://doi.org/10.1007/s12350-017-0954-4>) in a proof of principle study demonstrate that reversible RV perfusion defects suggestive of ischemia can be detected in some patients with LV inferior myocardial ischemia by visual analysis of SPECT MPI and can also be quantitated by automated programs that were specifically designed to include the RV. RV reversible perfusion defects were visible using both filtered back projection and iterative reconstruction processing algorithms in all patients.

Obesity is known to be an independent risk factor for cardiovascular disease with an increasing prevalence of all classes of obesity and a disproportionate increase in extreme obesity (BMI ≥ 40 kg/m²). The diagnosis of CAD in patients with extreme obesity can be challenging. Harnett and colleagues from University of Ottawa

Heart Institute, Canada (<https://doi.org/10.1007/s12350-017-0855-6>) examine the performance of stress MPI SPECT with Tc99 m-labeled tetrofosmin and rubidium-82 positron emission tomography MPI in patients with extreme obesity. 108 patients with extreme obesity who underwent coronary angiography in and either stress SPECT or PET MPI within the previous 6 months were included. The authors find that Rb-82 PET allowed more definitive scan interpretation with fewer artifacts relative to standard Tc-99 m SPECT and provided higher diagnostic accuracy and specificity in the detection of obstructive CAD. Scan interpretation was classified as definitely normal or abnormal in 83.3% of PET and 60.5% of SPECT scans, respectively ($P < .01$). Similar findings were observed using angiogram-derived stenosis cut-offs of $\geq 50\%$ and $\geq 70\%$.

Octogenarians have a significant prevalence and mortality from CAD. Furthermore, because of their limited exercise capacity and susceptibility to complications during invasive imaging, pharmacologic stress testing is the most frequently used method for cardiac risk stratification. Katsikis and colleagues from Athens, Greece (<https://doi.org/10.1007/s12350-017-0893-0>) demonstrate the tolerability, safety, and prognostic ability of adenosine-stress SPECT MPI in 370 octogenarians. Prospective follow-up was performed to document all-cause death (ACD), cardiac death (CD), myocardial infarction (MI), and late revascularizations. No deaths or MIs were observed during or the short-term post-adenosine infusion period. 86% of patients were able to tolerate the 6-minute infusion and 99% of patients were able to tolerate at least 3 minutes of adenosine infusion. All side effects terminated spontaneously after infusion cessation, except for one case of pulmonary edema. After 9.3 years, there were 124 ACDs, 62 CDs, 16 MIs, and 35 revascularizations. Summed stress score (SSS) and LVEF were independent predictors of all end points ($P \leq .01$) and lung uptake of cardiac end points. Hemodynamic response variables, SSS, and lung uptake provided incremental prognostic value over pre-test data for ACD and CD.

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.

Disclosure

There are no COI with this work.

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