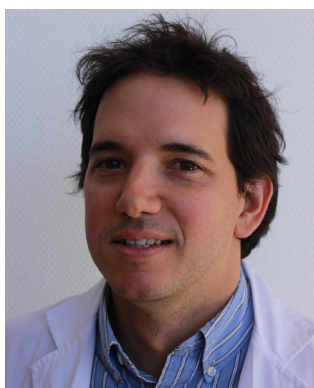# Novel developments of CT: myocardial perfusion, hemodynamic assessment derived from anatomy, infarct characterization, and role of microvascular function

Cardiac computed tomography (CT) has grown mainly based on the ability to offer a noninvasive alternative for the assessment of coronary artery stenosis, with an excellent negative predictive value for ruling out obstructive coronary artery disease (CAD). Thereafter, the technique has dramatically evolved to evaluate almost every aspect of the broad CAD spectra. Interestingly, understanding of the pathophysiology of coronary atherosclerosis has simultaneously progressed during the past decades, and CT coronary angiography (CTCA) has played a role in such development. Particularly, CTCA has contributed to change longstanding paradigms beyond ischemia detection: from a simple discrimination between patients with or without obstructive CAD; to a relatively more complex scenario consisting of patients with or without coronary atherosclerosis, patients with nonobstructive extensive/non-extensive CAD, or patients with obstructive extensive/non-extensive CAD. Furthermore, following the leading seminal role of PET-CT, dynamic perfusion CT shows promise to assess myocardial perfusion reserve comparably, being this increasingly relevant among symptomatic patients without evidence of epicardial disease.

In parallel, cardiac CT has also achieved major developments aimed at the assessment of the hemodynamic significance of coronary lesions, formerly the Achilles heel of the technique. The present focus issue attempts to discuss the emerging role of cardiac CT in the assessment of the hemodynamic impact of coronary lesions, and in the characterization of myocardial infarction.

For this purpose, we have summoned a group of prestigious colleagues with the singularity of having most of them experience in both cardiac CT imaging and invasive coronary angiography, thus providing a translational approach on the topic. In brief, the focus issue comprises state of the art reviews regarding all aspects of myocardial CT perfusion: acquisition protocols, stress and rest imaging, static (Carrascosa *et al.*) and dynamic CT perfusion (Cademartiri *et al.*), single and dual energy imaging, and available clinical evidence. Furthermore, two articles discuss the ability to extract data regarding the functional significance of lesions out of CTCA datasets, including atherosclerotic plaque characteristics and plaque burden (de Araújo Gonçalves *et al.*), and the determination of fractional flow reserve derived from CTCA (Collet *et al.*). Besides, by virtue of the similar kinetics between gadolinium and iodinated based contrast agents and built upon a large number of studies demonstrating the prognostic value of the presence and extent of myocardial delayed enhancement in diverse etiologies, two manuscripts (Rodriguez-Granillo and La Grutta *et al.*) discuss the role of CT in this regard, as a potential alternative for patients not suitable for magnetic resonance imaging. The significance and prognostic value of endothelial dysfunction and coronary flow reserve assessed by PET-CT, as well as the potential of CT in this regard, is discussed in two additional manuscripts (Campisi *et al.* and Ziadi), one of them making a timely focus in women. And finally, the manuscript of van Mieghem *et al.* aims to convey a potential translational approach from CT to the cath lab. Two "Imaging in cardiology" articles further illustrate the potential of CT in the context of myocardial infarction characterization, underscoring the role of functional assessment (de Zan *et al.* and Sierra-Galan *et al.*).

Overall, cardiac CT has become the noninvasive technique with the highest likelihood to achieve the highly pursued objective of a comprehensive one-stop-shop CAD diagnostic tool. We hope that the readers of the journal enjoy this collection of articles regarding cutting edge cardiac CT applications, likely to be applied in clinical practice in the near future.

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