Correspondence

Letter by Guaricci et al Regarding Article, "Cardiovascular Magnetic Resonance to Predict Appropriate Implantable Cardioverter Defibrillator Therapy in Ischemic and Nonischemic Cardiomyopathy Patients Using Late Gadolinium Enhancement Border Zone: Comparison of Four Analysis Methods"

To the Editor:

We read with great interest the article written by Jablonowski et al[1] aiming to investigate the key role that late gadolinium enhancement (LGE) plays in risk stratification of patients with ischemic and nonischemic cardiomyopathy. During the last decade, the need for added prognostic factors of arrhythmic risk in patients affected by dilated cardiomyopathy has been growing because of suboptimal success of the current indications for primary-prevention implantable cardioverter-defibrillator therapy. Recently, multiparametric cardiac magnetic resonance has been shown to predict the occurrence of arrhythmic major adverse cardiac events.[2] The article of Jablonowski et al focused on a refined assessment of 4 LGE border-zone algorithms and highlighted the significant prognostic value of both LGE and LGE border-zone quantifications. However, some technical details of cardiac magnetic resonance acquisition should be mentioned. The acquisition of LGE using different schemes, as described by the authors, can be misleading and represents a limitation of the study. To overcome this issue, the authors cite prior work of the same group that showed a good agreement between 2-dimensional (2D) and 3-dimensional (3D) LGE acquisition in patients with ischemic cardiomyopathy.[3] However, in this article, LGE was quantified using 8 SDs from normal myocardial tissue and was reconstructed using 2D phase-sensitive inversion recovery (PSIR) and 3D inversion recovery. The recent article of Jablonowski et al[2] is not confined to 2D PSIR and 3D inversion recovery, and it is characterized by a more heterogeneous technique of LGE acquisition; therefore, the comparison of LGE quantification can be misleading.

Indeed, the reconstruction of images using PSIR and magnitude LGE is well known to have bias in terms of LGE quantification; thus, a normalization of PSIR is suggested.[4] In particular, magnitude LGE images are reconstructed using multichannel squares and consequently the areas of low signal-to-noise can produce signal. The latter effect can generate alterations of myocardial signal intensity that could be erroneously classified as scar. Conversely, in PSIR-LGE images, the normal distribution of signal noise is preserved, and it is more uncommon to mislead interpretation of the images.

Regarding image acquisition, quantification of LGE could be variable when evaluated on 2D- or 3D-LGE images. Therefore, differences of signal-to-noise ratio related to k-space ordering, signal gradients, and voxel size do not result in similar images. Rajchl et al[5] analyzed both the inter- and intrareader reproducibility of different LGE techniques of measurement in both 3D and 2D LGE. The authors found good reproducibility of full width at half maximum algorithm with a negative bias of 3D-LGE compared with 2D-LGE volumes.

Jablonowski et al should consider the aforementioned technical limitations and potential bias, which may have affected their results.

Disclosures

Dr Pontone has received institutional fees and grants from GE Healthcare, Bracco, Bayer, Medtronic, and HeartFlow outside the submitted work. The other authors report no conflicts.

Andrea I. Guaricci, MD, FESC
Department of Emergency and Organ Transplantation
Institute of Cardiovascular Disease
University Hospital Policlinico of Bari
Italy

Giuseppe Muscogiuri, MD
Gianluca Pontone, MD, PhD, FESC, FSCCT
Centro Cardiologico Monzino
IRCCS
Milan, Italy

References

1. Jablonowski R, Chaudhry U, van der Pals J, Engblom H, Arheden H, Heiberg E, Wu KC, Borgquist R, Carlsson M. Cardiovascular magnetic resonance to predict appropriate implantable cardioverter defibrillator therapy in ischemic and nonischemic cardiomyopathy patients using late gadolinium enhancement border zone: comparison of four analysis methods. *Circ Cardiovasc Imag*. 2017;10:e006105. doi: 10.1161/CIRCIMAGING.116.006105.
2. Pontone G, Guaricci AI, Andreini D, Solbiati A, Guglielmo M, Mushtaq S, Baggiano A, Beltrama V, Fusini L, Rota C, Segurini C, Conte E, Gripari P, Dello Russo A, Moltrasio M, Tundo F, Lombardi F, Muscogiuri G, Lorenzoni V, Tondo C, Agostoni P, Bartorelli AL, Pepi M. Prognostic benefit of cardiac magnetic resonance over transthoracic echocardiography for the assessment of ischemic and nonischemic dilated cardiomyopathy patients referred for the evaluation of primary prevention implantable cardioverter-defibrillator therapy. *Circ Cardiovasc Imag*. 2016;9:e004956. doi: 10.1161/CIRCIMAGING.115.004956.
3. Jablonowski R, Nordlund D, Kanski M, Ubachs J, Koul S, Heiberg E, Engblom H, Erlinge D, Arheden H, Carlsson M. Infarct quantification using 3D inversion recovery and 2D phase sensitive inversion recovery validation in patients and ex vivo. *BMC Cardiovasc Disord*. 2013;13:110. doi: 10.1186/1471-2261-13-110.
4. Stirrat J, Joncas SX, Salerno M, Drangova M, White JJ. Influence of phase correction of late gadolinium enhancement images on scar signal quantification in patients with ischemic and non-ischemic cardiomyopathy. *Cardiovasc Magn Reson*. 2015;17:66. doi: 10.1186/s12968-015-0163-8.
5. Rajchl M, Stirrat J, Goubran M, Yu J, Scholl D, Peters TM, White JA. Comparison of semi-automated scar quantification techniques using high-resolution, 3-dimensional late-gadolinium-enhancement magnetic resonance imaging. *Int J Cardiovasc Imaging*. 2015;31:349–357. doi: 10.1007/s10554-014-0553-2.

(*Circ Cardiovasc Imaging*. 2018;11:e007213. DOI: 10.1161/CIRCIMAGING.117.007213.)

Letter by Guaricci et al Regarding Article, ''Cardiovascular Magnetic Resonance to Predict Appropriate Implantable Cardioverter Defibrillator Therapy in Ischemic and Nonischemic Cardiomyopathy Patients Using Late Gadolinium Enhancement Border Zone: Comparison of Four Analysis Methods''

Andrea I. Guaricci, Giuseppe Muscogiuri and Gianluca Pontone

Circ Cardiovasc Imaging. 2018;11:
doi: 10.1161/CIRCIMAGING.117.007213
Circulation: Cardiovascular Imaging is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

Print ISSN: 1941-9651. Online ISSN: 1942-0080