

LETTERS TO THE EDITOR

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Left atrial mechanics: new echocardiographic techniques for function evaluation: our reply

We have read with interest the letter by Teixeira *et al.* We thank them for their thoughtful reading of our paper.

We are in absolute agreement with them about standard methodology to evaluate the left atrium by deformation imaging. Our review¹ was an attempt to summarize the literature, and we would urge the societies to consider standards beyond the currently published document.² It is a 'call to action' to multiple imaging societies.

References

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Bijoy K. Khandheria*

Aurora Cardiovascular Services,
2801 W. Kinnickinnic River Parkway,
#840, Milwaukee, WI 53215, USA

*Corresponding author. Tel: +1 414 649 3909,
fax: +1 414 649 3551.

Email: publishing22@aurora.org

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Left atrial reservoir phase: deformation analysis

We have read with enthusiasm the paper by Todaro *et al.*¹ recently published in *European Heart Journal of Cardiovascular Imaging* regarding the evaluation of left atrial (LA) mechanics. Two-dimensional speckle-tracking echocardiography allows a non-invasive assessment of global LA function and regional deformation from which various LA mechanical indices can be obtained, providing a direct assessment of LA endocardial contractility and passive deformation.²

Todaro *et al.* described the three components of LA function, the contractile, reservoir, and conduction phases during the cardiac cycle in accordance to the literature.³ Focusing in the reservoir phase it comprehends an early and late phase. The early phase starts with a mitral valve closure, ends with aortic valve opening and corresponds to the left ventricular isovolumic contraction phase. The late phase corresponds to the left ventricular ejection period and isovolumic relaxation phase.³ In the early reservoir phase, the LA strain (ϵ) curve (with a P-wave trigger) is clearly still below zero. In this way we believe the calculation of the longitudinal atrial deformation that is associated with the reservoir function is not as Todaro *et al.*¹ noted in figures 6 and 12 of their manuscript. The authors represented the reservoir phase as the first positive peak in the LA strain curve. In agreement with previous authors,² we believe that the reservoir phase is represented in the LA strain curve as the sum between the absolute values of the first (negative) peak, and the second (positive) peak in the LA deformation curve, a so-called total LA strain—Figure 1. This means that the positive value the authors point in the picture probably under represent the reservoir

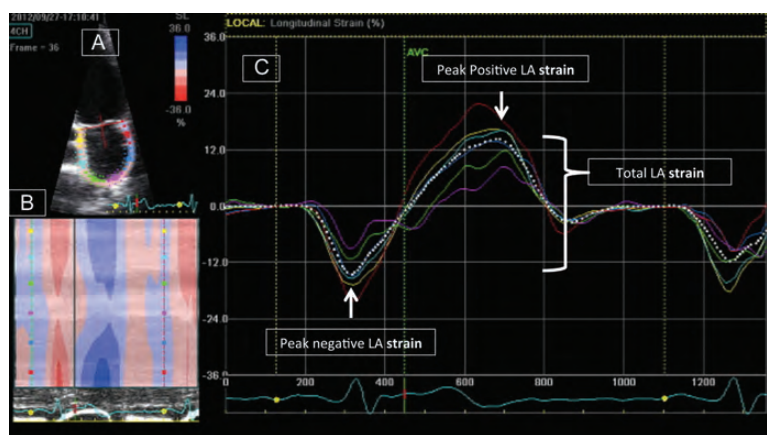


Figure 1 Two-dimensional LA speckle-tracking. (A) Four-chamber views depicting the region of interest created by the speckle-tracking software. (B) Colour M-mode of LA deformation of all regions throughout the cardiac cycle. (C) The left atrium strain curve of the global deformation (dashed line) obtained after averaging the six curves. The reference point was placed at the onset of the P-wave. The peak negative LA strain corresponds to the contractile function. The peak positive LA strain corresponds to the conduit function. The sum of the absolute values of the positive and negative peaks corresponds to the total LA strain—the reservoir phase.

phase. Nevertheless, the positive peak would represent the entire reservoir phase if the electrocardiographic trigger would be in the QRS and not in the P-wave. The QRS is not the preferred method for electrocardiographic triggering but is the one used in the presence of atrial fibrillation. Nomenclature becomes confusing, when LA strain and measurements are often labelled according to events of the left ventricle (LV), rather than events of the LA, because of resemblance with other Doppler parameters. LA reservoir function should be represented by the total strain that is the sum of strain components when the LA fills from the minimum LA volume to the maximum LA volume.⁴ Total LA deformation is, therefore, in normalcy the higher absolute value of LA deformation.⁵ LA total deformation is considered to be determined by LA relaxation and by the LV base descent during ventricular systole. According to Saraiva *et al.*, both total and positive LA strain correlated

with LV relaxation indexes, but total LA deformation ($r = -0.33$, $P = 0.008$) had a higher negative correlation with an LA maximum volume index (a marker of the reservoir phase) than the positive LA strain ($r = -0.26$, $P < 0.04$).⁵

We believe that methodological standardization is essential to boost LA deformation analysis in the clinical investigational setting.

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Rogério Teixeira^{1,2,*}

Maria João Vieira²

Lino Gonçalves^{1,2}

¹Serviço de Cardiologia, Centro Hospitalar e Universitário de Coimbra, Av. Bissaya Barreto - Praceta Prof. Mota Pinto, 3000–075 Coimbra, Portugal

²Faculdade de Medicina, Universidade de Coimbra, Coimbra, Portugal

*Corresponding author. Tel: +35 1936740242,

Email: rogeriopteixeira@gmail.com