These results along with previous studies by the same group are relevant to the scientific community for several reasons. Three-dimensional echocardiography and software developments open a new field of research on cardiac physiology and pathological conditions previously limited to experimental animal models. Continuous development of new therapeutic surgical and interventional devices challenges non-invasive imaging techniques. This way, complete understanding of cardiac anatomy and physiology based on imaging, mainly echocardiography, plays a key role in the clinical arena. For the first time, non-invasive assessment of the MAC is feasible with reproducible and semiautomatic quantification of different parameters available. A first description of the MAC in the normal heart is performed as well as preliminary insight of its behaviour in valvular heart diseases and its change after intervention.

However, non-invasive MAC needs to be further evaluated in different cardiac conditions and different degrees of valvular heart diseases before and after intervention. This way, possible clinical applications, others than the physiological and anatomical evaluation, may be explored. Even though, TEE 3D echocardiography acquisition is straightforward, standardized software availability and expertise limits its applicability. In addition, this findings need to be reproduced by other groups before this type of analysis can be expanded to clinical decision-making.

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IMAGE FOCUS

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Aortic regurgitation during systolic-phase accompanied by mitral regurgitation in patients with continuous-flow left ventricular assist device

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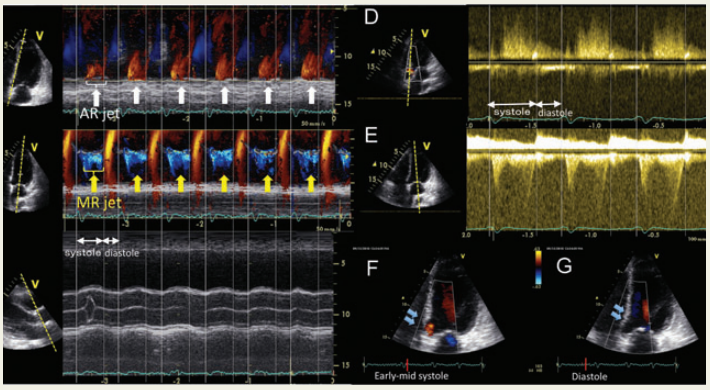

A 78-year-old male underwent continuous flow left ventricular assist device (LVAD) implantation due to ischaemic cardiomyopathy as a destination therapy. Routine echocardiogram performed 6 days after the surgery showed 'systolic-phase' aortic regurgitation (AR); the timing of regurgitation jet starting at the mid-systolic phase and ending at the early diastolic phase [*Panel A*, the colour Doppler M mode at the aortic valve (AV), white arrow]. The AR occurred slightly after the onset of mitral regurgitation (MR) (*Panel B*, the colour Doppler M mode at the mitral valve, yellow arrows), and both MR and AR timings were consistent with the systolic phase (See Supplementary data online, *Videos S1* and *S2*). No remarkable AR jet was documented during the diastolic phase. The AV was mostly closed throughout the cycles, which opens once every 8–10 beats (*Panel C*). The mean pressure gradients of the trans-AV and trans-mitral valve based on the continuous wave Doppler measurements of AR (*Panel D*) and MR flow (*Panel E*) were 3.7 mmHg and 24.3 mmHg, respectively. The morphology of AV annulus changes through the cycles irrespective of the AV opening, with the AV annulus abnormally distorted and dilated during early mid-systole (*Panel F*), whereas the septum wall as well as the AV annulus edge slightly pushed towards the left ventricle during diastole (*Panel G*). The morphological change of the AV annulus during the systolic phase under LVAD support may result in impaired co-aptation of AV leaflets leading systolic-phase-limited AR in this patient. Imbalanced contraction between left and right ventricles under LVAD support may affect the abnormal distortion of AV annulus during systole.

Supplementary data are available at *European Heart Journal – Cardiovascular Imaging* online.

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