Left atrial function: the HbA1c for the cardiologist and even more

Short title : Need for Left atrial function

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Conflict of interest:

There are no commercial products involved in this study.

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The left atrium (LA) plays an important role in facilitating left ventricular (LV) filling by acting as a reservoir, passive conduit, and active booster pump, as well as a regulator of blood volume. Since the 90's epidemiological data have shown consistently the prognostic importance of LA size even by using simple linear measurements(1). At present, several parameters are readily obtainable by echocardiography for the quantification of LA function. These include, LA volumes, EF, expansion index, LA reservoir strain, and booster strain(2, 3).

Should we move forward for a combination of LA volume and function in every single echocardiography report? From a pathophysiological standpoint these 2 are tightly coupled and describe the progression of LA cardiomyopathy(4).

Indeed, increasing number of studies provide evidence in favor of using many of these metrics as an integral part of the echo report. Impairment of LA reservoir strain is the earliest abnormality that can be detected by echocardiography in the spectrum of atrial cardiomyopathy (3, 5-7). It is easy to measure, reproducible and clearly associated with the risk of major clinical end-points like cardio-vascular hospitalization.

The study by Andersen (8) is underscoring LA minimal volume (LAVI min) as a predictor of HF development. LA minimal volume (LAVI min) is a simple parameter to obtain by manual measurement or by automated contouring (also required for the speckle tracking analysis mentioned below) from most patients seen in the echo-labs. Olsen recently published the changes in left atrial size over a decade about Copenhagen City Heart Study with an excellent reproducibility of the measurements(5). Others have demonstrated that LAVI min is correlated with capillary wedge pressure and with the occurrence of dyspnea. The large cohorts like the one of Anderson et al are worth being highlighted (8). It has not always been so clear how an imaging tool could be used as a relevant biomarker for risk prediction in the

general population. In 347 patients with heart failure with preserved ejection fraction, Shin et al. recently reported that LAVI min was more predictive of cardiovascular outcome than indexed maximal LAV (9). LAVI min is supposed to better reflect left ventricular filling pressures. E/e' which is a widely adopted parameter in clinical practice**,** is considered as a "competitor" to LAVI min. Their respective prognostic value was close.

We would like to thank deeply Authors for the presented results from a large epidemiological data, The Copenhagen City Heart Study, which is a tremendous contribution demonstrating that LA size and function are fundamental parameters in the assessment of clinical outcomes (8). LAVI min has been proposed previously as an important parameter for assessing LV filling pressure and clinical outcomes, yet its use has not been included in the guidelines so far as an indicator for these purposes. The relationship between LAVI min and the prognosis is linear. It is difficult to set a single cut-off value because the cut-off is changing as far as the goal is a moving target including the prediction of atrial fibrillation development, success of ablation, embolic stroke, heart failure development and mortality. From this perspective it could be more appropriate to think about the continuum of LA remodeling process and place LAVI min to its due position in the process (figure 1).

LA strain has been reported as a "biomarker" for predicting the global cardiovascular risk and also for predicting the risk of atrial fibrillation and the risk of thrombo-embolic stroke (3, 10-12). There are very demonstrative studies about the value of LA strain and the risk of developing atrial arrhythmias' (13). Others are not less demonstrative about the value of LA strain in regard to the characterization of diastolic function. Recent EACVI consensus document about heart failure with preserved ejection fraction is advocating the use LA strain(14). Thus, LA strain is not anymore limited to the research ground, it is an integral part

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of assessing myocardial mechanics and hemodynamics. LA strain has been reported to correlate better with the capillary wedge pressure than the classical E/e' as mentioned above (15) (figure 1).

How these evidences fit in our clinical practice? The measurement of LA strain has been the object of the EACVI-ASE consensus paper(10). The measurement is easy to perform but mainly on the most advanced echo-machines. But it could be still a challenge and a matter of time for most practitioners who are busy making a lot of measurements. Could we move forward for a systematic and measurement of LA strain as well as volumes by means of artificial intelligence that is progressively penetrating in our daily clinical practice. Probably yes, because we need to report on the left ventricular ejection fraction and also on left ventricular global longitudinal strain. Softwares that are used for LV and LA are about the same and the speckle tracking technology is becoming mature enough on most echo-machines for automated or semi-automatedquantification (16-18). Still the operator should be able to control the computer but most of the work could be undertaken automatically by the machine. So, the future of LA quantification is bright. The value of assessing LA has been demonstrated in large populations consistently as in the study of Andersen at al(8), and we have tools that are becoming robust enough to integrate the data into clinical practice.

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Figure 1: our vision of the value of left atrial function assessment

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