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DISCUSSION FORUM

The future of the diastolic function assessment will take advantage of the past and of the automatization

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This commentary refers to 'Diastolic function assessment based on a semi-automated computing of strain–volume loops', by E.D. Pagourelias *et al.* doi:10.1093/ehjci/jeab004

Thanks for this letter. We also believe that it is of primary importance to be able to use echocardiography for best assessing filling pressure and/or diastolic function.

However, we do not agree with the idea that the works done in the 20 past years are significantly insufficient and that there is an empty ground of knowledge on how assessing these filling pressures and diastolic function. It is widely approved that e′, E/e′, and E/A, as well as pulmonary vein flow, are interesting but remain unperfected.[1] Despite their limitations, they have been used, and they are currently used for the evaluation of diastolic function, according to

Table 1

	Amyloidosis (n = 15)	Controls (n = 15)	*P*
-1- Global_mean(Esystole-Ediastole)	0.17 ± 0.95	0.01 ± 2.54	0.81
-2- Global_mean(abs(Esystole-Ediastole))	1.01 ± 0.50	2.23 ± 1.17	<0.001
- 3 - Global_100*mean(Esystole-Ediastole)/abs(Epeak)	1.2 ± 7.4	0.52 ± 12.5	0.84
-4- Global_100*mean(abs(Esystole-Ediastole))/abs(Epeak)	7.5 ± 4.2	11.0 ± 5.8	0.044
-5- Global_area strain/volume curve	36.5 ± 21.3	120.0 ± 54.2	<0.001
-1- EarlyDiastole_mean(Esystole-Ediastole)	0.25 ± 1.14	-0.14 ± 2.94	0.60
-2- EarlyDiastole_mean(abs(Esystole-Ediastole))	1.00 ± 0.67	2.55 ± 1.40	<0.001
-3- EarlyDiastole_100*mean(Esystole-Ediastole)/abs(Epeak)	2.03 ± 8.59	-0.17 ± 14.5	0.58
-4- EarlyDiastole_100*mean(abs(Esystole-Ediastole))/abs(Epeak)	7.50 ± 5.22	12.6 ± 6.8	0.016
-5- Early Diastole_area strain/volume curve	24.5 ± 18.0	91.2 ± 42.2	<0.001
-1- End Diastole_mean(Esystole-Ediastole)	0.00 ± 1.13	0.32 ± 1.8	0.52
-2- End Diastole_mean(abs(Esystole-Ediastole))	1.03 ± 0.56	1.59 ± 0.93	0.035
-3- endDiastole_100*mean(Esystole-Ediastole)/abs(Epeak)	2.03 ± 8.6	-.017 ± 14.5	0.58
-4- end-Diastole_100*mean(abs(Esystole-Ediastole))/abs(Epeak)	7.5 ± 5.2	12.6 ± 6.8	0.016
-5- End-Diastole_area strain/volume curve	12.0 ± 7.5	28.8 ± 16.5	<0.001
Slope	0.43 ± 0.20	0.36 ± 0.07	0.12
R^2	0.99 ± 0.02	0.99 ± 0.01	0.55

For features -1,2,3,4,5-, three different analysis: all cycle, only earlydiastole, only end-diastole.
-1- Mean difference between systole and diastole.
-2- Mean absolute difference between systole and diastole.
-3- Feature -1- rationalized by strain peak.
-4- Feature -2- rationalized by strain peak.
-5- Area of the curve.

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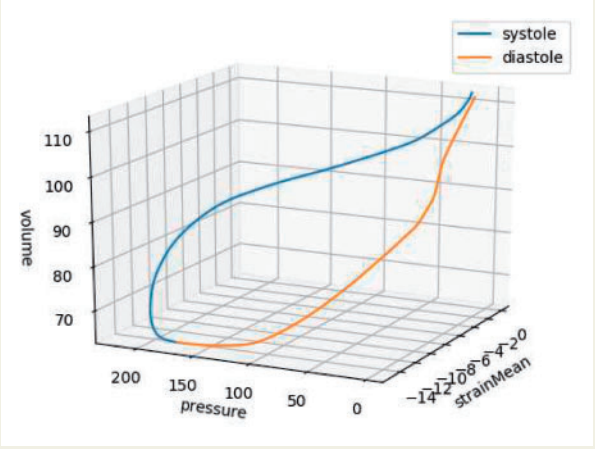

Figure 1 Semi-automated pressure/strain/volume loops obtained from a 2D echocardiography performed according to the routine practice.

recommendations.[2] They are useful but should be interpreted with cautions and expertise.

In the paper signed by Hubert *et al.*,[3] the goal is not to turn everything upside down but to describe and to test a semi-automated approach on a pilot study.

We have the feeling that the grail will be obtained by combining parameters and indices that could be easily obtained automatically or semi-automatically.

In *Table 1*, we present all indices previously tested in our 'pilot-population'. Area under the curves were clearly the most discriminative parameters. In the final study, area over the entire beat was better than early and late diastolic ones.

We thus explored the strain/volume loops because it could be measured semi-automatically with a robustness compatible with the clinical routine practice.

We acknowledge the fact that, as mentioned by Voigt *et al.*,[4] our approach has many limitations and is unperfect. But, clearly, the goal is not to obtain the grail just by this simple combination of strain and volumes data but to be able to integrate this promising new tool in a multiparametric approaches.

We can do much better, combining strain/volumes and pressure could be the next step (*Figure 1*). Other approaches are extremely promising and exciting but have also some limitations as the one we explore.[5]

The value of what we are investigating is that the physician or the sonographer will have to focus on the image quality, the measurement could be performed automatically, and averaged over several beats. It could improve the robustness but of course, we are at the beginning of a story concerning the philosophy for best using ultrasound in the 21st century.

We want to sincerely thank *Pagourelias et al.* and *Voigt et al.* for their great and instructive thoughts. They are encouraging all the researchers, like them, who believe in the future of echocardiography in that field!

Conflict of interest: none declared.

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