3D ECHO volumetry of the left atrium:

Normal values of healthy volunteers

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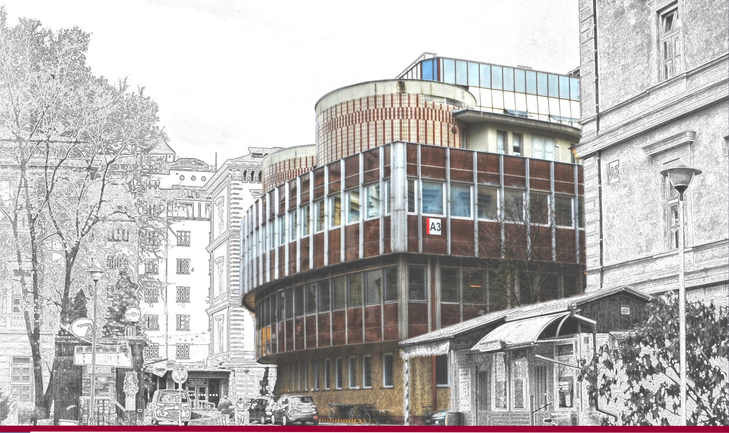


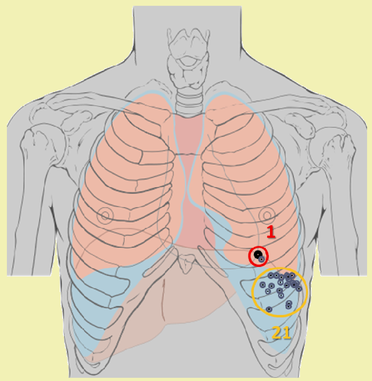
■ Introduction

A great discrepancy between left atrial volume (LAV) and left atrial volume index (LAVI) by 2D ECHO versus MRI or CT has been reported.

MRI / MDCT	Maceira 2010	N= 120	Φ= 40
	Bank 2013	N= 244	Φ= 40
	Stojanovska 2011	N= 74	Φ= 41
2D AL (2D Simp)	Lang R 2005	N= nx100	Φ= 22
	D´Andrea 2010	N= 245	Φ= 26,4
	D´Andrea 2013	N= 1480	Φ= 29,5

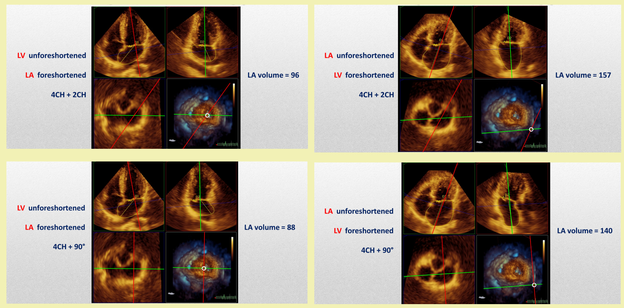
In our previous study (EUROECHO Istanbul 2013) we documented the main sources of 2D ECHO underestimation of LAV:

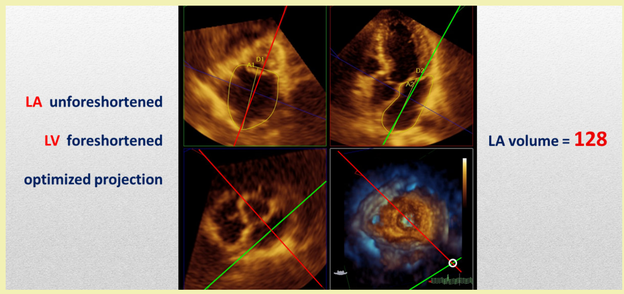
1) No optimal apical window for 2D imaging of the LA exists in majority of patients



2) The result of 2D LA volumetry is unpredictable mixture of under- and overestimation (prevailing underestimation) caused by foreshortened and misaligned views.

Typical example





	A1	A2	L1	L2	Volume
4CH+2CH - LV (foreshortened LA)	23,89	20,36	5,86	4,31	**96**
4CH+90°- LV (foreshortened LA)	24,07	19,39	5,82	4,52	**88**
„4CH+2CH"-LA (misalignment)	37,59	33,35	6,72	7,01	**157**
„4CH+90°"-LA (misalignment)	37,59	29,43	6,72	7,14	**140**
Optimal LA cross-section	41,66	27,56	8,08	7,60	**128**

■ Aim of the study

To compare results of LAV and LAVI by transthoracic 3D volumetry and those of conventional 2D volumetry derived from the same 3D datasets using biplane Simpson method in both settings.

■ Method

Sixty seven (**67**) healthy volunteers 9 – 72 years old were subject of the study (42 males).

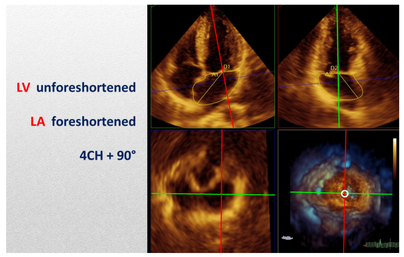
2D echocardiography was within normal limits in all individuals.

3D Full-volume data acquisition from the apical window was done using iE33 Philips system and X5-1 probe. Both left ventricle and left atrium were included in the same 3D data set.

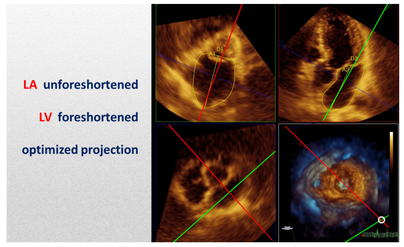
Q-lab program was used for post-processing and measurements.

Measurements included LAV_{max} and LAV_{min}. Two different settings for LAV measurement were used:

A: 2D cross-sections were derived from 3D datasets and optimized for left ventricular apical 4CH and 2CH views (unforeshortened LV but foreshortened and misaligned LA),



B: 3D volumetry in optimized LA cross-sections using MPR modality with unforeshortened and optimally aligned LA.



LAV was measured using biplane Simpson method in both settings and values were indexed for BSA.

■ Results

Average **$LAVI_{max}$** in **3D** setting was **35.7 ml**, while **2D** model yielded only **28 ml**. The difference was statistically significant with p<0.001. Results of 3D ECHO volumetry were much closer to those of MRI or CT (40 ml) to compare with 2D analysis.

MRI, CT (gold standard)	**40 ml**	
Our 3D-MPR study	35.7 ml	-11%
Our „2D" A-L study	28 ml	-30%
D´Andrea 2013 2D A-L	29.5 ml	-26%
R. Lang (guidelines 2005)	22 ml	-45%

Also results of $LAVI_{min}$ in 3D setting were significantly higher than those in 2D setting (17.2 vs 14.1 and p<0.001).

■ Conclusion

- **The average LAVI by 3D volumetry was close to that reported in MRI or CT studies, while 2D model underestimated signifikantly.**
- **Conventional 2D LA volumetry recommended by guidelines is unreliable and should be replaced by RT-3D transthoracic volumetry.**

No conflict of interests.

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