Echocardiographic phenotype and prognostic value of relative apical sparing of longitudinal strain pattern in severe aortic stenosis with and without cardiac amyloidosis. The AMYTAVI study

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Introduction: It is estimated that 15% of patients with AS have concomitant cardiac amyloidosis (CA). Left ventricular (LV) longitudinal strain (LS) pattern with relative apical sparing (RELAPS>1), shown as bright red in the apical segments on the polar map, has been strongly associated with CA. Its presence and its significance in AS is yet to be determined.

Purpose: To determine the prevalence of the RELAPS>1 pattern in patients with severe AS with and without concomitant CA, and to analyze the echocardiographic phenotype associated with this strain pattern and its prognostic value.

Methods: Patients with severe symptomatic AS undergoing TAVI were prospectively and consecutively included between Jan-19 and Dec-20. Pre-procedure, a complete echocardiogram was performed that included deformation parameters using Speckle-Tracking. Strain derived Indices accepted for CA screening were calculated: RELAPS: relative apical LS (average apical LS/average basal+mid LS); SAB: (apical-septal/basal-septal LS); EFSR: (LVEF/GLS). After TAVI, a 99Tc-PYP scintigraphy and a proteinogram were performed to screen for CA.

Results: 324 patients were included. The mean age was 81 yo, 52% women. Strain analysis could be performed in 243 patients due to acoustic window and covid19 pandemic restrictions. Among those, 111 (46%) presented relative apical sparing (RELAPS>1).

There were no differences in clinical characteristics between patients with RELAPS <1 and >1: similar age, sex, cardiovascular risk factors and funcional class, renal function or NT-proBNP. Among patients with RELAPS>1 there was more frecuently CA with uptake grade 2 and 3 on scintigraphy (15% vs. 4.5%, P=0.006) (Figure 1). RELAPS>1 group showed greater LV hypertrophic remodeling: thicker myocardial wall with smaller ventricular cavity, especially concentric hypertrophy; LVEF and GLS was similar, however, MAPSE and myocardial contraction fraction (MCF) were worse in RELAPS >1 group, and EFSR was significantly higher (4.2 vs 3.9, p=0.002). RELAPS >1 group had smaller aortic valve area (AVA: 0.6 vs 0.7 cm^2, p=0.045), but similar transvalvular gradients due to lower stroke volume. It had larger atria and less left atrial (LA) fractional emptying, as well as higher prevalence of atrial fibrillation (AF: 41% vs 27%, p=0.03). Right ventricle (RV) size were similar, however, RV function was worse in RELAPS >1 group (TAPSE: 19 vs 21 mm, p=0.003; free Wall LS: –24 vs –27%, p=0.008).

There was no difference in all-cause mortality at 1 year of follow-up between groups (6.4% vs. 6.3%, p=1).

Figure 2 represents the morphological characteristics according to the LS phenotype.

Conclusions: In severe AS, RELAPS >1 is present in almost half of the patients. It is associated with worse cardiac remodeling, as well as higher prevalence of AF. However, it wasn't associated with higher mortality at 1 year. 1 in 7 patients with AS and RELAPS >1 have concomitant ATTR CA grade 2/3.

	RELAPS <1 (n= 132)	RELAPS >1 (n= 111)	p
Uptake on scintigraphy			
Grade 0 Grade 1 Grade 2/3	116 (87,9%) 10 (7,6%) 6 (4,5%)	91 (82%) 3 (2,7%) 17 (15,3%)	**0,006**
Left ventricular and auricular remodeling			
IVSd, mm	14,1 ± 2,4	15,5 ± 2,8	**0,000**
PWd, mm	12,5 ± 2,1	13,4 ± 2,0	**0,001**
LV mass index, gr/m2	175,15 ± 48,6	186,7 ± 44,8	**0,058**
LVEDV, ml	110,1 ± 44,1	90,8 ± 31,2	**0,000**
LVESV, ml	53,4 ± 39,3	39,5 ± 25	**0,002**
Eccentricity index	1,14 ± 0,17	1,16 ± 0,19	0,296
Concentric hypertrophy, n (%)	94 (71,2 %)	91 (82 %)	0,069
MWT, mm	14,1 ± 2,6	15,5 ± 2,8	**0,000**
RWT, mm	0,49 ± 0,11	0,55 ± 0,13	**0,000**
Pericardial effusion, n (%)	11 (8,4 %)	13 (11,7%)	0,399
PSAP, mmHg	42,1 ± 15,6	42,1 ± 16,8	0,976
LA vol index, ml/m2	55,1 ± 17,7	60,8 ± 23,7	**0,035**
LA fraccional empting, %	35,5 ± 16,9	30,6 ± 16,5	**0,028**
Atrial septum, mm	6,32 ± 2,5	6,6 ± 2,5	0,371
Left ventricular systolic and diastolic function			
LVEF, %	55,7 ± 16	59,1 ± 13,3	**0,074**
MAPSE, mm	11,6 ± 3,1	10,5 ± 2,8	**0,005**
GLS, %	-15,1 ± 5,2	-14,3 ± 3,7	0,197
EFSR	3,84 ± 0,87	4,22 ± 0,88	**0,001**
SVi, ml/m2	33,1 ± 9,9	30,1 ± 8,3	**0,013**
E/A ratio	1,07 ± 0,66	1,05 ± 0,75	0,819
E/E´ ratio	19,5 ± 7,4	19,9 ± 9,2	0,662
E-wave deceleration time, ms	258,8 ± 121,1	269,9 ± 118,6	0,502
Aortic valve disease			
AVA, cm2	0,66 ± 0,15	0,62 ± 0,17	**0,045**
AV Vmax, m/s	4,5 ± 0,6	4,6 ± 0,7	0,302
AV max gradient, mmHg	83,4 ± 21,2	86,3 ± 24,9	0,338
AV med gradient, mmHg	50,02 ± 14	52,14 ± 15,8	0,272
TEA, ms	334,9 ± 41,2	319,4 ± 35,3	**0,003**
RV morphological and functional parameters			
RV thickness	6,1 ± 1,8	6,6 ± 2,5	0,371
RV basal EDD, mm	37,9 ± 7,1	36,9 ± 6,4	0,246
TAPSE, mm	21,3 ± 4,7	19,4 ± 4,8	**0,003**
Tricuspid S´, cm/s	12,7 ± 3,3	12,6 ± 4,0	0,909
RV free wall LS, %	-26,7 ± 7,1	-24,3 ± 6,3	**0,008**

Figure 1. Echocardiographic characteristics

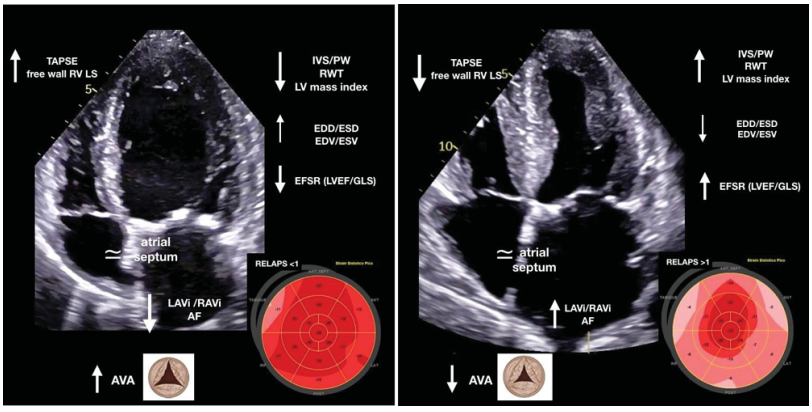

Figure 2. Echo phenotypes according to RELAPS