Effects of patient characteristics and comorbidities on temporal trends of low-flow, low-gradient aortic stenosis phenotypes

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Funding Acknowledgement: Type of funding source: None

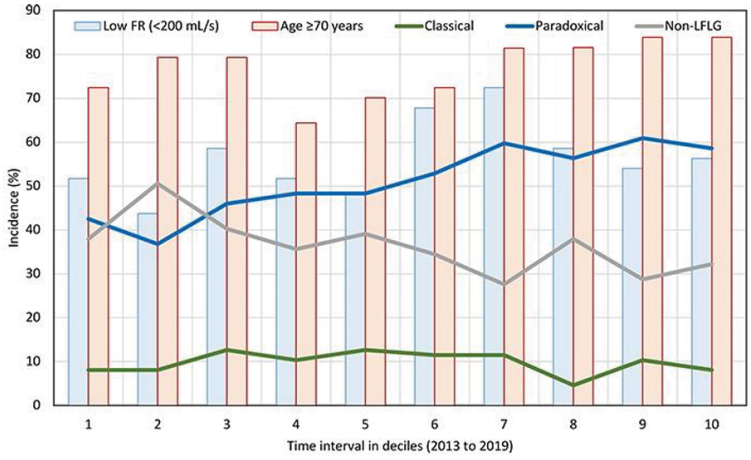
Background: Aortic stenosis (AS) is a common primary heart valve disease in the elderly. Low-flow, low-gradient (LFLG) AS is an increasingly important phenotype.

Purpose: To evaluate the temporal changes in incidence of severe AS phenotypes: paradoxical LFLG, classical LFLG and non-LFLG and explore risk factors that contribute to temporal trends.

Methods: We analyzed 25,507 consecutive transthoracic echocardiograms over 6½ years between 2013 and 2019 divided into deciles. LFLG-AS was defined as mean transvalvular pressure gradient <40 mmHg and stroke volume index (SVi) <35 mL/m^2, aortic valve area (AVA) <1 cm^2 or indexed AVA <0.6 cm^2/m^2, with either normal (paradoxical LFLG) or decreased (<40%; classical LFLG) left ventricular ejection fraction. Trends and associations with patients characteristics and comorbidities were assessed over time in deciles.

Results: Of 891 cases that fulfilled severe AS criteria, there were 536 cases of LFLG-AS (85 classical and 451 paradoxical LFLG-AS). There was a statistically significant increase in incidence of paradoxical LFLG-AS between each time interval (p<0.0001), while significant reduction in incidence of non-LFLG-AS (p=0.009) that was not seen with classical LFLG-AS (p=0.7) (Figure). More comprehensive echocardiographic assessment of relevant parameters over time assisted with identification of LFLG-AS cases. Intrinsic patient factors such as age and E/e' contributed towards the increasing trend of paradoxical LFLG-AS. There was a rising population aged over 70 years (p=0.01). Multivariate logistic regression analysis showed that age, sex, E/e', obesity, atrial fibrillation and heart rate were potential risk factors responsible for temporal trend towards rising paradoxical LFLG-AS incidence. There was also a gradual increase in number of patients with low transvalvular flow rate (<200mL/s) over time (p=0.04).

Conclusion: The incidence of paradoxical LFLG-AS is rising in a hospital echocardiogram service. The parallel increase in LV filling pressure and age in AS patients suggests the increment in LFLG-AS is related to changes to the LV myocardium.



Total severe AS, n	87	87	87	87	87	87	87	87	87	87	*p* value*
Classical, n (%)	7 (8.1)	7 (8.1)	11 (12.6)	9 (10.3)	11 (12.6)	10 (11.5)	10 (11.5)	4 (4.6)	9 (10.3)	7 (8.1)	0.7
Paradoxical, n (%)	37 (42.5)	32 (36.8)	40 (46.0)	42 (48.3)	42 (48.3)	46 (52.9)	52 (59.8)	49 (56.3)	53 (60.9)	51 (58.6)	<0.001
Non-LFLG, n (%)	33 (37.9)	44 (50.6)	35 (40.2)	31 (35.6)	34 (39.1)	30 (34.5)	24 (27.6)	33 (37.9)	25 (28.7)	28 (32.2)	0.009

*Cochran–Armitage test for trend. AS, aortic stenosis; FR, transvalvular flow rate; LFLG, low flow-low gradient.

Subtypes of aortic stenosis over time