Logistic Risk Model Predicting Significant Coronary Artery Disease In Patients With Degenerative Aortic Valve Disease

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Purpose
Contemporary research data affirm that degenerative aortic valve disease (DAVD) shares many features of active atherosclerosis-like process, but no study has linked yet coronary artery disease (CAD) and DAVD like two forms of systemic atherosclerosis. We aimed to develop a logistic regression model and a simple score system for the prediction of significant CAD in patients with DAVD.

Methods
A total of 1392 consecutive patients with DAVD (727 males (52%), mean age 73±8 years, range 45-89), who underwent routine coronary angiography (CAG) before aortic valve replacement between 2001 and 2012, was retrospectively analysed. A bootstrap refined logistic regression model was developed on the basis of preoperative clinical risk factors, and an additive model was derived from the former. Receiver operating characteristic (ROC) curves (c-statistic) were used to compare discrimination, and precision was quantified by the Hosmer-Lemeshow statistic. Significant coronary atherosclerosis was defined as 50% or more luminal narrowing in one or more major epicardial vessels by means of CAG.

Results
Five hundred eighty-eight (42%) patients had significant coronary atherosclerosis. Multivariate analysis revealed male gender, older age, dialysis for chronic renal failure, dyslipidemia, type II diabetes mellitus, family history of CAD, peripheral artery disease, previous acute myocardial infarction, and angina pectoris as independent predictors of significant CAD. There was the only protective factor for CAD – transvalvular aortic pressure gradient (Table 1). A logistic equation including the coefficients of the regression analysis accurately predicted individual patient's risk for the presence of significant CAD (area under the ROC curve: 0.815, 95% confidence interval 0.79-0.83). Similar discriminating ability was achieved by the simple additive model (area under ROC curve of 0.794). Goodness of fit tested by the Hosmer-Lemeshow statistic was satisfactory for both models (chi-square 4.157, p=0.843 and chi-square 4.431, p= 0.816) (Fig. 1).

Conclusions
Higher atherosclerotic burden is associated with the presence of significant CAD in patients with DAVD. Our logistic regression model may be used with simplicity and accuracy as a predictive scoring system to estimate the risk of significant CAD in patients with DAVD, based on the individual presentation of risk factors. `

Table 1. Multivariable logistic regression analysis results

Variable	Odds ratio	95% confidence interval for hazard ratio		P value
		Lower	Upper	
Male gender	2.09	1.548	2.816	0.0000
Age for every additional 5 years	1.361	1.156	1.60	0.0002
Dialysis for chronic renal failure	2.851	1.029	7.90	0.044
Dyslipidemia	1.354	1.024	1.792	0.033
Type II diabetes mellitus	1.853	1.365	2.514	0.0000
Family history of CAD	1.323	1.008	1.736	0.043
Peripheral artery disease	2.718	1.885	3.920	0.0000
Previous acute myocardial infarction	13.462	5.098	35.553	0.0000
Angina pectoris	4.763	3.579	6.338	0.0000
Transvalvular aortic pressure gradient	0.988	0.982	0.994	0.0000

Figure 1. Receiver operator curve.

ROC curve
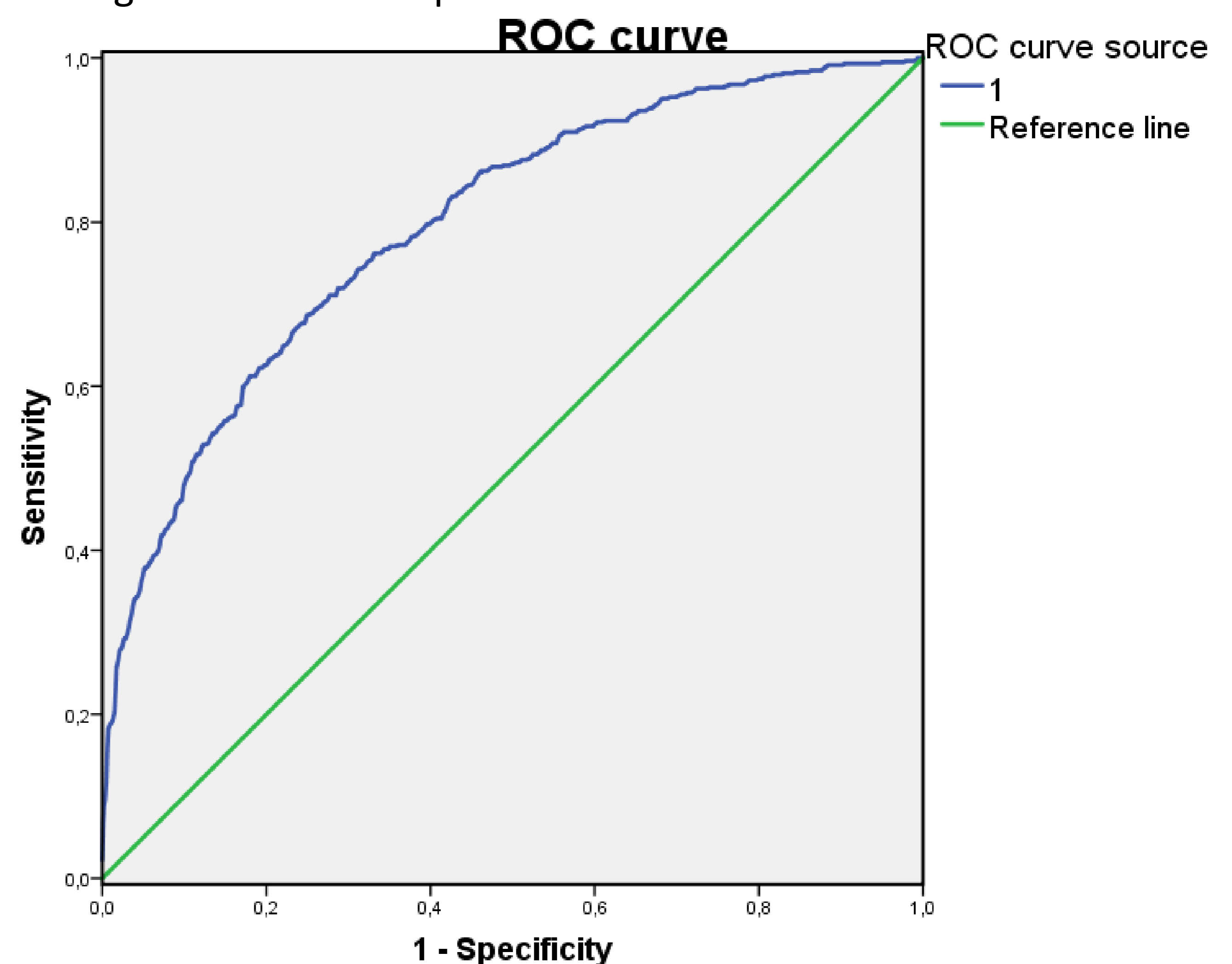
References
1. Mazzone A, Epistolato MC, Gianetti J, Castagnini M, Sassi C, Ceravolo R, Bevilacqua S, Glauber M, Biagini A, Tanganelli P. Biological features (inflammation and neoangiogenesis) and atherosclerotic risk factors in carotid plaques and calcified aortic valve stenosis: two different sites of the same disease? Am J Clin Pathol. 2006;126:494-502.
2. Mazzone A, Venneri L, Berti S. Aortic valve stenosis and coronary artery disease: pathophysiological and clinical links. J Cardiovasc Med (Hagerstown). 2007;8:983-9. Review.
3. Paradis JM, Fried J, Nazif T, Kirtane A, Harjai K, Khalique O, Grubb K, George I, Hahn R, Williams M, Leon MB, Kodali S.Aortic stenosis and coronary artery disease: what do we know? What don't we know? A comprehensive review of the literature with proposed treatment algorithms. Eur Heart J. 2014;35:2069-82.