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Multimodality imaging in patients with valvular heart disease and systemic diseases

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CHAPTER 8

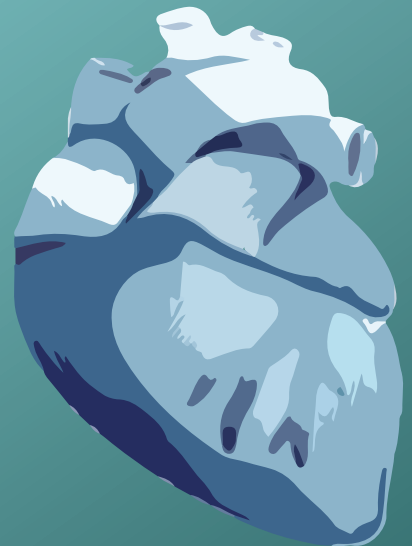
Summary, Conclusions
and Future perspectives

Samenvatting, Conclusies
en Toekomstperspectieven

List of Publications

Dankwoord

Curriculum vitae



SUMMARY

The thesis underlines the role of multimodality imaging in the evaluation and risk stratification of patients with valvular heart disease and with systemic diseases.

Part I

This part of the thesis summarizes the role of the assessment of thoracic aorta calcification burden in the risk stratification of patients with aortic stenosis, showing that the highest burden of calcium score in thoracic aorta was associated with increased all-cause mortality in patients after TAVI, each 1000 HU increment in thoracic aorta calcification burden was significantly associated with increased all-cause mortality after adjusting for age, renal function, chronic obstructive pulmonary disease, previous cerebrovascular accident, pulmonary pressure, aortic valve mean gradient and mitral regurgitation grade (**chapter 2**) and **Chapter 3** underlines, that after TAVI, LVEF and LV GLS improve and LV mass index reduces significantly at 3-6 and 12 months follow-up and these changes are more pronounced among patients with the lowest burden of thoracic aorta calcification. Both groups of patients with preserved and reduced ejection fraction showed significant changes in LV systolic function and LV mass index during follow-up, however, patients with a reduced LVEF at baseline showed a higher magnitude of improvement in LVEF and LV GLS as compared with patients with preserved LVEF at baseline. In addition, patients with reduced LVEF at baseline had the lowest values of LV mass index at 1 year of follow-up. The influence of thoracic aorta calcification on changes in LV systolic function and LV mass index was similar in patients with preserved and reduced LVEF and similar to those observed in the overall population.

Part II

This part evaluates feasibility of feature tracking MDCT-derived LV GLS and shows its agreement with echocardiographic derived LV GLS in patients with aortic stenosis (**chapter 4**). Correlation of measurements between feature tracking MDCT-derived LV GLS and echocardiographic LV GLS demonstrated a large effect size, as well as the correlation between MDCT-derived LVEF and echocardiographic LVEF. Compared to speckle tracking echocardiography, feature tracking MDCT underestimates the value of LV GLS. **Chapter 5** proves that impaired FT MDCT-derived LV GLS is independently associated with all-cause mortality in patients treated with TAVI and besides aortic valve area and calcification, FT MDCT-derived LV GLS is an important prognostic marker. When investigating the incremental prognostic value of FT MDCT-derived LV GLS over clinical variables and echocardiographic findings, we observed, that after the addition of LVEF to the clinical model (age, presence of coronary artery disease, and kidney function), the predictive value of the model increased, but the increase was more prominent when adding FT MDCT-derived LV GLS to the model including clinical and echocardiographic findings.

Part III

This part of the thesis shows, that in SLE patients, LV systolic function as measured by LV GLS is significantly impaired and is associated with cardiovascular events (**chapter 6**), survival analysis showed that patients with SLE with more impaired LV GLS (on the basis of the median value of -15%) experienced higher cumulative rates of cardiovascular events compared with patients with less impaired LV GLS. LV GLS demonstrated a significant and independent association with cardiovascular events, conversely LVEF was not significantly associated with cardiovascular events in the SLE population, nor the parameters of LV diastolic function. Importantly, there was no significant association between the severity of disease (based, for example, on the SLEDAI or on the diagnosis of neuropsychiatric SLE) and cardiovascular events. **Chapter 7** underlines sex specific differences in clinical and echocardiographic parameters in SSc patients showing that LV GLS is more affected in men as compared to women and is strongly associated with all-cause mortality and cardiovascular hospitalizations in overall group along with age, interstitial lung fibrosis, DLCO-SB and NT-proBNP. Men SSc patients were characterised by larger LV indexed volumes and lower LVEF. In turn, there were no significant differences between men and women in terms of LV diastolic function parameters. Survival analysis showed that men experienced higher cumulative rates of cardiovascular events-hospitalization/death as compared to women even after matching the groups according to the clinical characteristics. In addition, LV GLS showed an association with outcomes in the overall group and no interaction between sex and LV GLS was detected, indicating an equally high prognostic role of LV GLS for both sexes in the SSc population.

Conclusions and Future perspectives

Multimodality imaging and particularly MDCT improves risk stratification of patients undergoing TAVI. Thoracic aorta calcification burden-TAC is significantly associated with all-cause mortality in patients undergoing transcatheter aortic valve implantation, patients with highest calcification burden of thoracic aorta have higher cumulative rates of all-cause mortality as compared to patients with lower TAC, each 1000 HU increment in TAC is significantly associated with increased all-cause mortality and moreover changes in LV functional recovery (LV mass, LVEF, LV GLS) is associated with TAC. The influence of thoracic aorta calcification on changes in LV systolic function and LV mass index is similar in patients with preserved and reduced LVEF. Patients with the highest calcification burden of thoracic aorta and most deteriorated LV GLS show the worst survival. Present study provides additional evidence on the importance of measurements of vascular load to optimize management of severe aortic stenosis patients. TAC burden as a surrogate of aortic stiffness can predict outcomes after the TAVI, further studies can warranty to include TAC burden in the decision-making process and selecting candidates for TAVI.

A novel FT MDCT derived LV GLS is feasible tool, shows perfect agreement with echocardiographic derived LV GLS. Correlation of measurements between feature tracking MDCT-derived LV GLS and echocardiographic LV GLS demonstrates a large effect size and

shows prognostic implication: impaired FT MDCT-derived LV GLS is independently associated with all-cause mortality in patients treated with TAVI. Besides aortic valve area and calcification, FT MDCT-derived LV GLS is an important prognostic marker. Implementation of FT MDCT derived LV GLS measurement in TAVI patients, especially in those where echocardiographic derived LV GLS is not feasible can improve risk assessment.

In patients with SLE, LV systolic function as measured by LV GLS is significantly impaired and is associated with cardiovascular events, potentially representing a new tool to improve risk stratification in these patients. In SSc patients, LV GLS is more affected in men as compared to women and is strongly associated with all-cause mortality and cardiovascular hospitalizations in overall group along with age, interstitial lung fibrosis, DLCO-SB and NT-proBNP. In particular, using LV GLS for early assessment of myocardial involvement may improve risk stratification and therefore improve surveillance in SSc patients. Further research that aims at elucidating the cause of LV GLS impairment in SSc and SLE is highly recommended, as this might lead to improved and targeted treatment strategies.