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PhD in Medical Sciences  
2016-2017

INVITATION to the Public defence of

**Kris GILLIS**

To obtain the academic degree of '**DOCTOR IN MEDICAL SCIENCES**'

**Quantification of aortic valve calcifications by echocardiography**

**Monday 26 June 2017**

Auditorium **Piet Brouwer**, 18:00

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

How to reach the campus Jette:

<http://www.vub.ac.be/english/infoabout/campuses>

## Summary of the dissertation

Calcific aortic valve disease (CAVD) is one of the most important heart valve diseases in the western world. Aortic valve (AV) calcification is an important predictor of adverse outcome in CAVD and is associated with an increased disease progression. The amount and localization of calcification is important when grading AV stenosis (AS) severity or when planning an intervention. The accurate quantification of AV calcifications is therefore mandatory, but can currently only be assessed by computed tomography (CT) scan, which is an ionizing technique not suited for serial follow-up of patients. Echocardiography is the preferred technique to determine AS severity, but it provides only a subjective visual calcium scoring.

In this thesis we investigated the use of echocardiography as a non-ionizing technique to quantify AV calcifications. We first demonstrated that calibrated integrated backscatter (cIB) of ultrasound can be used to differentiate between AV calcifications and AV thickening in rats. Secondly, we showed that it enables follow-up of progression and regression of AV calcifications in rats. Thirdly, we showed in rats that renal failure induces AV calcifications which are not further increased by dyslipidaemia, and that cIB can be used to quantify those calcifications, no matter where the calcifications are localized. Furthermore, we developed a phantom with calcifications, and showed that the exact amount of calcium can be measured with ultrasound. Finally, we performed a clinical study in patients with CAVD, showing that an echocardiographic global calcium score can be calculated that correlates well with the CT Agatston score for AV calcification quantification.

## Curriculum Vitae

Kris Gillis was born on the 15th of September 1986 in Kapellen. In 2012 he obtained his medical degree at the Vrije Universiteit Brussel, magna cum laude. He started his internship in Internal Medicine in 2012 at the Vrije Universiteit Brussel and performed his first year of clinical training in Centre Hospitalier Universitaire Brugmann. After one year of internship in Internal Medicine, he interrupted his clinical training to start his PhD on the quantification of aortic valve calcifications by echocardiography in the In Vivo Cellular and Molecular Imaging Laboratory (ICMI) at the Vrije Universiteit Brussel. During the first year of his research he obtained a research grant OZR mandate from the Vrije Universiteit Brussel. During the first two years of his research he collaborated with Centre Hospitalier Régional Universitaire de Lille for the development of animal models of calcific aortic valve disease. From 2014 to 2017 he was fully committed to the further research on echographic quantification of aortic valve calcifications. In April 2017 he resumed his internship in Internal Medicine at the Intensive Care Unit of UZ Brussel. In August 2017 he will start his internship in Cardiology.