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PhD in Medical Sciences
2021-2022

INVITATION to the Public defence of

Toon VAN CAUTEREN

To obtain the academic degree of

'DOCTOR OF MEDICAL SCIENCES'

Impact of contrast media on image quality and radiation-induced DNA damage

The defence will take place on

Thursday, 31 March 2022 at 5:30 p.m.

In **Auditorium Vanden Driessche**

Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

Summary of the dissertation

Iodine-based contrast media are used in CT imaging to increase image contrast in blood vessels and well perfused organs. Considering the constant innovations in CT technology, the use of contrast media has to evolve as well. In the first part of the thesis, strategies to reduce contrast media were evaluated while maintaining the diagnostic image quality in a minipig model. Chapter I describes an iodine dose reduction can be achieved by combining a low tube voltage acquisition with iterative reconstruction. This was studied by comparing the image quality of a standard of care protocol with two low iodine dose protocols. Even the CT images of the lowest iodine dose protocol were observed to be of diagnostic quality. In chapter II, time enhancement curves of injection protocols with different iodine concentrations were compared, administered at constant iodine delivery rate and total iodine dose. The injection protocols with a reduced iodine concentration result in higher maximal enhancement and longer enhancement peak duration. In the second part of the thesis, the relationship between contrast media and radiation-induced DNA damage was studied. In chapter III, we evaluated the amount of DNA damage after coronary CT angiography scans with three different iodine dose levels, scanned at a constant radiation dose in a minipig model. The results showed that the presence of contrast media significantly increases DNA damage. Subsequently, the contrast media iodine dose-dependency of radiation-induced DNA damage was evaluated in a clinical study on coronary CT angiography patients in chapter IV. This study confirmed that contrast media iodine dose increases the level of DNA damage in a linear dose-dependent manner, meaning that the level of DNA damage can be reduced by lowering the administered iodine dose.

Curriculum Vitae

Toon Van Cauteren was born on 25th of January 1985 in the Universitair Ziekenhuis Brussel (UZ Brussel). In 2003 he finished his secondary school at Regina Caeli Lyceum in Dilbeek. He graduated as a Master in the Biomedical Sciences at the Katholieke Universiteit Leuven (KUL) in 2010 with a specialization in research. After a sabbatical year, travelling in Australia and Southeast Asia, he started working as a Vrije Universiteit Brussel (VUB) researcher on the radiology department of the UZ Brussel on a GE Healthcare funded research project in 2011. He has been a PhD researcher in medical sciences from 2014 investigating the use of contrast media in CT imaging. In 2017 he followed the course 'Laboratory animal science 3' at the VUB to obtain his FELASA C certificate and be recognized as a project manager for animal experiments. Since 2018, Toon has been added as a guest lecturer to the course of 'Laboratory animal science 3' and is a member of the animal welfare body of the VUB. In 2020, Toon started working as quality coordinator of the radiology department of the UZ Brussel and is following-up all technical projects. He is also first author and co-author of several peer-review articles.