

Joint Symposium between the EuroPCR and the Working group of Computers in Cardiology

Joint symposia being organized at congresses outside the annual ESC congress are an excellent platform to show the activities being deployed within the different working groups. After some successful joint symposiums being held during the EurEcho meetings, for the first time the working group of Computers in Cardiology (WG CIC), in joint collaboration with the board of directors of the EuroPCR a joint symposium was organized at the recent EuroPCR 2009 meeting in Barcelona.

Prof. J.R.T.C. Roelandt, former chairman of the Thoraxcenter in Rotterdam, The Netherlands, being an expert in echocardiography imaging, chaired the session entitled: “**New frontiers in quantitative imaging**”.

After an introduction of the objectives and aims of our WG and encouraging attendees to explore our website and to consider possible future membership. **Prof J.H.C. Reiber** started the first lecture about: “2- and 3D-quantitative coronary angiography (QCA), how do they work”. Prof. Reiber, who is the inventor of quantitative coronary angiography, gave a very comprehensive overview of the recent developments in 3D QCA, which has become very popular recently due to the developments of bifurcation stents and consequently the treatment of bifurcation lesions. Furthermore, the rapid developments of 3D angiography (e.g. rotational angiography) could possibly trigger a larger demand for 3D analyses. As these techniques are often complicated, using a lot of mathematics and models, it is mandatory that a good explanation is given to end-users and possible new users of these kinds of analysis systems as in many cases important treatment decisions are often based on the results generated by this software. The 3D QCA software showed good results and is being used to evaluate the new generations of bifurcation stents.

In parallel with these 3D developments within the cathlab's, the past couple of year's non-invasive coronary imaging by multi-sliced computed tomography (MSCT-CA) has gained large interest. One of the pioneers in this field **dr. F. Cademartiri**, presented his experiences and views of the use of MSCT-CA to be to quantify coronary artery dimensions. This difficult task, as the technology is changing every few months, was not easy to be addressed. Most of the validation studies performed using new developments of quantitative MSCT-CA (QMSCT-CA) software are comparison studies between MSCT-CA and intravascular ultrasound (IVUS) which is used as reference method due to the lack of a true golden standard. Both quantitative methods are suffering from possible inter- and intra-observer variability. Furthermore, they have complete different ranges of image resolution. This resulted in validation studies in mixed results ranging from moderate to poor comparability with respect to the measurements of plaque volumes. However, the good news is that QMSCT-CA has a good reproducibility, which could make this technology to be considered to be applied within longitudinal studies.

As described above, intravascular ultrasound is the current reference method to quantify coronary artery dimensions and its quantitative results (quantitative coronary ultrasound (QCU)) is often being used as endpoints in trials evaluating new interventional therapies (for both pharmaceutical as device studies). **Dr. N. Bruining**, an expert in quantitative cardiovascular image analysis and the

developer of ECG-gated QCU analysis, presented in his lecture the possible pitfalls of quantitative intravascular coronary imaging. Although, the advantages using ECG-gated acquisition and analysis have been described already more than a decade ago, still most studies using QCU are being performed by ignoring the artifacts introduced by the catheter motion and dimensional changes of the coronary vessel during the cardiac cycle. QCA is a gated analysis, e.g. one selects a frame where the coronary is relatively “sharp” on the image which means that it relatively moves slowly and coronary MSCT would not have even been possible without gating. Having said this, dr. Bruining showed that ECG-gating can have a significant impact on the quantitative results and is therefore recommended to be used. These motion artifacts are also visible when applying optical coherence tomography (OCT). This recently introduced imaging method gained a huge interest in a relatively short time period as it is able to visualize coronary artery structures in details previously only possible to be shown by using histopathology. However, the penetration depth is currently limited prohibiting visualizing thick coronary plaques. Therefore, quantification is at the current moment restricted to lumen area measurements only, however, since the lumen-intima boundary is so well defined within the images the lumen areas can be fully automated detected as recently presented by the Thoraxcenter during the American College of Cardiology meeting and will be published soon.

The final speaker, **Prof. R. Erbel**, the expert in all cardiovascular imaging modalities, which is rarely found, presented the use of echocardiography to be used to aid interventions with respect to percutaneous valve replacements. As prof. Erbel showed, it is key to measure the valve area very accurately to select the appropriate stent size. Inappropriate sizing can result in stents not being fixed with the original aortic valve or irritating the septum or closure of the coronary arteries. A lot of research is currently undertaken to investigate which imaging modality could deliver the most accurate quantifications. Non-invasive MSCT is obviously popular, however not available during the cathlab procedure. Angiography only produces 2D images at the moment, making it difficult to get a comprehensive 3D oversight. However, 3D echocardiography, in real-time, is able to visualize the aortic valve and surrounding areas in 3D. According to Prof. Erbel, 3D echocardiography is currently his method of choice to help him executing these kinds of procedures and he advises the developers of quantitative imaging methods to concentrate on 3D echocardiography to help to improve these procedures.

After each presentation there were lively and good discussions. Furthermore, the attendance was relatively large, indicating a good and fair interest for this topic within the scope of visitors to the EuroPCR. Based on this, we as working group hope to be able to continue this cooperation with the EuroPCR and if members of the working group have ideas and/or are interested in participating in this initiative they can email the chairman of the WG.

On behalf of the Working Group Computers in Cardiology,

A handwritten signature in blue ink, appearing to be 'NB' followed by a stylized flourish.

Nico Bruining (chairman)