University of Medicine and Pharmacy Tîrgu Mureș

School of Doctoral Studies

Summary of PhD Thesis:

CORRELATIONS BETWEEN ANGIO CT ASSESSMENT OF CORONARY CIRCULATION AND EVOLUTION PATTERN IN NON-ATHEROSCLEROTIC CORONARY ARTERY DISEASES

PhD candidate: Suciu Zsuzsanna

Scientific coordinator: Prof. Dr. Benedek Theodora, Habil

Coronary artery anomalies are a diverse group of congenital disorders, presenting a high variability in terms of manifestations and pathophysiological mechanisms. They are present at birth, but relatively few of them are symptomatic. Although generally benign in character, some coronary artery anomalies are associated with significant clinical manifestations, such as different severity of angina pectoris, congestive heart failure, arrhythmia, myocardial infarction, syncope or even sudden death. Coronary artery anomalies include abnormalities in the origin, course or structure of the epicardial coronary arteries.

Angio Computed Tomography (Angio CT) is a recently introduced imaging technique, being used increasingly as a tool for three-dimensional assessment of the coronary arteries. The method provides high definition images based on 2D and 3D image reconstructions, extremely useful for evaluation of coronary artery disease, similar with those obtained by coronary angiography, however in a noninvasive way. This study aimed to demonstrate that Angio CT can represent an useful tool form complex assessment of the coronary artery anomalies and their particularities.

In our retrospective study were analized 4153 **cardiac computed tomography angiographies**, recorded between december 2009 - 1 september 2014 in Cardiomed Medical Center Targu-Mures (Center of Advanced Research in Multimodality Imaging). Cardiac computed tomography was performed with a 64-row scanner (Somatom Sensation multislice 64 equipment, Siemens) after intravenous administration of non-ionic contrast material, craniocaudal scan direction; with a dual phase administration of contrast media. In all cases electrocardiographic gated tube current modulation was applied. After scan

completion, multiphasic reconstruction of MSCT scans were performed at 40, 50, 60, 70 and 80% of the R-to-R interval. All MSCT images were evaluated on 3D image analysis workstation. The post-processing image reconstruction algorithms used for interpretation included two-dimensional (2D) axial, or three-dimensional (3D) maximal intensity projection (MIP), multiplanar reconstructions (MPR), curved multiplanar (cMPR) analysis and volume rendered technique (VRT).

We identified 421 cases with coronary artery anomalies in patients with symptoms of angina and ECG modifications (at rest or during exercise), out of which **25 cases** (incidence of 0,601 %), **presented coronary anomalies** from which 17 anomalies of origin and course, 2 coronary fistulae, 4 coronary aneurysms, 1 coronary artery hypoplasia, 1 coronary artery anomaly asocciated with great artery transposition. In the same time we identified **396 cases** (incidence of 9,53%) **with myocardial bridge**.

In the first part of our study we evaluated noninvasively the incidence, location, morphology of coronary anomalies, and we developped a clinical and paraclinical algorithm for diagnosis and treatment of ischemic disease with non-atherosclerotic etiology. In the second part of the study we evaluated the relationship between particularities of myocardial bridges identified by Angio CT (the real incidence, location, morphology, length, thickness of the bridge, clinical association and the functional significance which can be assessed by 3D polar mapping method).

The average lenght of myocardial bridges was 2,76 cm+/- 1.62 (2.416-3,106). We recorded a shorter length (<1 cm) in 20% of cases, 36% had a length between 1 and 2 cm, while 44% were longer bridges, with a length >2 cm.

Ejection fraction was significantly lower in cases with high calcium score (>400) (53.42 +/- 5.65, 95% CI 48.20-58.65), as compared to those cases with lower calcium score <100 (57.11+/- 4.16, 95% CI 55.73- 58.51), p=0.04.

Angio CT post-processing allowed graphical representation of segmental contractility based on polar maps of ventricular contraction, which showed a good correlation between the location of the myocardial bridge on LAD artery and the location of myocardial ischaemia, as expressed by an area of contraction abnormality on the Angio CT 3D polar map of ventricular contraction (p=0.0159).

In **conclusion**, myocardial bridges represent a common form of non-atherosclerotic coronary artery disease that can be easily identified with Angio CT. Angio CT allows a complex assessment of the functional significance of the myocardial bridges, identifying the areas with contractility disorder based on complex 3D polar maps of ventricular contractility, which has been proved to be well correlated with the location and severity of the myocardial bridges.