Coronary physiology and imaging - ongoing projects in CORE

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Abstract

Cardiovascular disease can be manifested in several ways. Coronary artery disease (CAD), for instance, may be diagnosed in a stable phase or in an acute coronary syndrome. For each situation, the best treatment option may be different and in the past few years several tools have been developed to aid in diagnosis and optimize personalized treatment. Regarding CAD, two areas deserve further explanation: coronary physiology tests and intracoronary imaging, both of which are subject of active research worldwide and also in our centre in Évora, in a collaboration between the Hospital do Espírito Santo - Évora, the University of Évora and the Instituto Superior Técnico.

Coronary physiology tests refers to a group of invasive techniques based on pressure or flow measurements, mostly used to evaluate the true importance of a given coronary stenosis that appears intermediate on angiography. Most of these indices are pressure-based, have been improved over time and have now a great body of clinical evidence ? generically, patients are better treated when decisions are based on coronary physiology. Every technique has its advantages and disadvantages. We are developing a software which can integrate all relevant pressure-based index in an easy-to-use way and incorporates a new algorithm to evaluate pressure wave contour (rather than the absolute pressure itself) and automatically analyze contrast hyperemia, which has the potential of being more informative and reproducible than the classic methods.

Intracoronary imaging consists mainly in two complimentary techniques: IVUS (IntraVasular Ultra-Sound) and OCT (Optical Coherence Tomography). Again, both have their advantages and disadvantages. OCT has the lead in what regards imaging definition, making possible to obtain detailed pictures of atherosclerotic plaques, stents and even make precise 3D reconstructions. We have a large database of OCT pictures from

real patients, with a lot of data to analyze. We are starting a project to develop OCT picture analysis, with automatic border detection, quantitative and qualitative analysis and 3D reconstruction.

Besides CAD, there are many other pathologies very relevant in cardiology, and currently very hot in the world of research. The scientific advances enabled the possibility of implanting heart valves (mostly aortic) without the need of an open surgery -TAVI (Transcatheter Aortic Valve Implantation). The indications for this technique are increasing, as new, safer and easier-to-use devices are developed. The long term results, however, have not yet been fully appreciated. There are great controversies regarding the hemodynamic profiles created by different devices/techniques and late clinical outcome. It is also our objective to conduct a project directed to this theme, which encompasses Computed Tomography 3D reconstruction and flow distribution analysis and respective correlation to clinical outcome.

All our projects are underway but not only they are in a young phase of development, but they are also generating other potential projects. For these reasons we welcome and challenge the interested audience to get in touch with us if there is an interest in knowing better our group and projects and to collaborate with us.