MOLECULAR IMAGING IN ISCHEMIC HEART DISEASE: WHAT IS IN IT FOR A PHARMACOLOGIST?

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Ischemic heart disease is associated with a number of changes in the heart. They relate to not only atherosclerosis and associated plaque rupture as a major cause of cardiac ischemia, but also to apoptosis as a primary and neovascualrization as a secondary consequence. Underlying these cellular changes are molecular processes. Molecular imaging allows (non-invasive) visualisation of these molecular processes. In Maastricht we have set out to develop methodologies to allow such monitoring employing imaging techniques that range from microscopy to ultrasound and magnetic resonance imaging. Each of these techniques has its own pros and cons.
Molecular imaging offers the pharmacologist a number of challenges as well as possibilities. Typically, molecular imaging depends upon interaction between a biomarker molecule and a specific ligand. This poses a classic pharmacological problem, where the pharmacologist may contribute to the design of appropriate probes. But pharmacology may not only have input in the development of molecular imaging; it may also profit from it. Thus, it may allow monitoring the effects of pharmacological interventions at the cellular level or, even more, at a molecular level. Amongst others, we have developed techniques that allow us to monitor apoptosis in intact animals and humans to dissociate vulnerable from stable atherosclerotic plaques, or to monitor effectiveness of anti-tumor therapies in cancer. Also we have gained experience with monitoring of adhesion-molecule expression as an indicator of angiogenesis both in ischemic heart disease and in tumor growth.
But molecular imaging may also be used to monitor enzymatic activities and changes therein, allowing visualization of drug effects very directly.
In this presentation, the different aspects of molecular imaging and some of its possible applications in pharmacology will be discussed.