EL14. Functional Imaging of Neurotransmission in Cardiology

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Cardiac neurotransmission is a complex process, inducing functional changes of myocardial cells through the release of neurotransmitters that interact specifically with myocardial receptors. Cardiac neurotransmission plays a key role in the pathophysiological processes involved in the evolution of head disease and is the major target of many new drugs.

The need to study cardiac neurotransmission is well recognized from a clinical standpoint. Functional modifications of cardiac innervation have been extensively reported, especially for the sympathetic system, for example in congestive heart failure, myocardial ischemia, primary hypertrophic cardiomyopathy, heart transplantation, cardiac diabetic neuropathy. . . A generalized adrenergic activation as well as a regional cardiac adrenergic activation are seen in patients with heart failure.

These alterations of cardiac neurotransmission have been shown from samples collected mainly during surgery or autopsy. Noninvasive scintigraphic evaluation of the pattern of the human heart is now possible with either ^{123}I-metaiodobenzylguanidine or ^{11}C-hydroxyephedrine, PET offers the unique possibility of determining noninvasively the number of receptor sites in humans. Ligands such as ^{11}C-CGP 12177 or ^{11}C-MQNB allow one to evaluate changes in beta-adrenergic receptors and muscarinic receptors. They can give information on changes in receptor number that are associated to different physiological and pathological processes: idiopathic dilated cardio-myopathy, cardiac denervation, primary hypertrophic cardiomyopathy.

SPECT and PET using appropriate ligands and quantitative methods have thus opened a large field for physiological research and clinical investigation of patients suffering from heart disease. Changes in norepinephrine release, presynaptic uptake-1 mechanism, beta-adrenergic receptor down-regulation and desensitization and cholinergic receptor alteration can be studied noninvasively in patients. The effects of treatment with vasodilators, ACE, beta-blockers or calcium channel inhibitors can also be evaluated with MIBG and SPECT or with PET.