Clinical applications and procedures of PET in cardiology

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Myocardial perfusion imaging with conventional tracers is an established clinical tool for functional assessment of myocardium primarily in ischaemic heart disease (IHD) as well as some further indications. In the past decades, positron emission tomography (PET) was mainly used as a research tool providing standard of reference for comparison to myocardial perfusion scintigraphy with conventional tracers in diagnosis, prognosis and follow-up of ischaemic heart disease, assessment of left ventricular function (LV) and myocardial viability.

While fluorodeoxyglucose (^{18}FDG) was the first PET tracer to gain significant clinical use for assessment of myocardial viability due to its availability, PET perfusion tracers (^{15}O-H_2O, $^{13}NH_3$) were limited to institutions with cyclotron facilities and mainly for research purposes. ^{18}FDG is the most sensitive radionuclide method for assessment of myocardial viability. While clinical advantages of ^{18}FDG over conventional tracers are still debated, it remains the most sensitive method for prediction of recovery after revascularization. Recently, generator-produced PET perfusion tracer, ^{82}Rb, has seen considerable growth in use at first in the United States and more recently also in Europe. PET perfusion tracers were shown to be more accurate in diagnosis and prognosis of IHD than conventional tracers and useful in assessment of LV functional changes induced by IHD with prognostic implications. Moreover, absolute quantification of myocardial perfusion allows for assessment of myocardial flow reserve (MFR) in preclinical CAD or balanced/multi-vessel disease, as well as some non-IHD diseases in which MFR is also affected. Finally, PET perfusion tracers were found to reduce cost of patient management in comparison to conventional tracers.

PET provides a set of clinical imaging tools in cardiac disease which is expected to grow in use and indications. New PET tracers in development will likely lead to its more widespread, logistically acceptable implementation in clinical practice.

Resources/Further Reading

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