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HEAD-TO-HEAD COMPARISON OF ^{11}C-ACETATE AND $^{15}O_2$ PET FOR MYOCARDIAL OXYGEN UTILIZATION IN MAN.
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The myocardial clearance constant k_{mono} of ^{11}C-acetate (Ace) is used to estimate cardiac oxygen utilization ($MMRO_2$) with PET. Recently a kinetic method has been developed to measure $MMRO_2$ directly with inhaled $^{15}O_2$. We performed head to head comparison of the two methods in 13 patients with stable coronary artery disease and old myocardial infarction. Resting $C^{15}O$, $H_2^{15}O$ and $^{15}O_2$ studies were immediately followed by Ace study. The $^{15}O_2$-based kinetic studies yielded regional blood flow (rMBF, ml/min/g) and $rMMRO_2$ (ml/min/g) which was compared with k_{mono} on segmental basis. Segments with rMBF≥75% of maximal rMBF measured in the patient were considered as normal, segments with rMBF≥50% but <75% of maximum were considered as border segments and segments with rMBF <50% of maximum were considered as low-flow segments.
The $rMMRO_2$ was significantly different ($p<0.001$) in the normal (0.085±0.021 ml/min/g, mean±SD), in the border (0.065±0.021ml/min/g) and in the low-flow (0.044±0.014 ml/min/g) segments. Measured $rMMRO_2$ and k_{mono} correlated well when all the segments were analyzed ($r=0.79$, $p<0.001$). However, the ratio of $k_{mono}/rMMRO_2$ was significantly higher in the low-flow segments than in the border segments or in the normal segments (1.285±0.418 vs. 1.095±0.328 and 0.941±0.183, $p<0.001$, respectively).
We conclude that, $^{15}O_2$ PET was feasible and accurate for assessing absolute regional myocardial oxygen consumption both in non-infarcted and infarcted myocardium. Furthermore, k_{mono} of ^{11}C-acetate seems to overestimate myocardial oxygen consumption in low-perfusion areas.

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COMPARISON OF FACTOR ANALYSIS AND VISUAL IMAGE ANALYSIS FOR THE DETERMINATION OF CARDIAC OUTPUT USING POSITRON EMISSION TOMOGRAPHY (PET)
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Recently we showed that cardiac output (CO) can be accurately estimated with N-13 ammonia and PET from a factor analysis derived right ventricular input function and the amount of injected tracer (Stewart-Hamilton principle). In this study we evaluated a simplified approach calculating CO from a manually derived right ventricular input function. **Methods:** In 13 patients undergoing right sided cardiac catheterisation, the vigilance system (BaxterTM) for continuous cardiac output measurement was mounted. With this catheter in situ a N-13 ammonia PET scan was performed. During the scanning period, the cardiac output was continuously registered using the thermal filment pulse delievering system. Right ventricular input function was calculated using factor analysis and by manually assigning regions of interest (ROI) to the right ventricle. Subsequently the area under the input function was calculated for estimation of the CO. **Results:** The mean difference (± SD) for ROI vs. Baxter were 1.5 l/min ±1.5 l/min ($p<0.006$) and 0.004 l/min ±0.8 l/min (p=NS) for Factor analysis vs. Baxter. **Conclusion:** Cardiac output determination with PET and a simple ROI assigning approach appears to be biased. In addition, there is a considerable variability in the individual measurements.

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QUANTITATION OF CARDIAC VOLUMES USING GATED POSITRON EMISSION TOMOGRAPHY
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Quantitation of cardiac volumes from gated FDG positron emission tomography (PET) may provide additional diagnostic information in the assessment of myocardial viability. We therefore developed a new model-based tool for the calculation of cardiac volumes using gated PET and FDG. **Methods:** A semiautomatic computer algorithm based on profile analysis was developed to derive myocardial coordinates. The fitting algorithm was applied on 36 radial profiles for each plane. For each profile 5 parameters were estimated: The position of the endo- and pericardium, the blood pool, the myocardium and the extracardial background activity. Cardiac volumes were calculated using Simpsons rule. The performance of this model was first tested using a heart phantom, and subsequently tested using gated PET images from thirteen healthy subjects. The PET derived cardiac volumes were compared with cardiac volumes quantitated by gated MRI. **Results:** PET volume data were within 0.5% of the know phantom values. The mean difference (±SD) between PET and MRI was -2.4ml (±15ml) for diastolic volumes, -2.8ml (±10ml) for systolic volumes and 1% (±8%) for EF calculations. **Conclusion:** Using a model-based approach, measurement of cardiac dimensions with PET and FDG seems accurate and reliable in normal volunteers.

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PET MYOCARDIAL PERFUSION IMAGING WITH CU-62 BIS(THIOSEMICARBAZONE) AGENTS. JL Lacy, NG Haynes, N Nayak, CJ Mathias, MA Green. Proportional Technologies, Houston, USA.
The PET agent Cu62 PTSM produced by an automated Zn62/ Cu62 generator yields high quality rest/ dipyridamole(r/dipy) myocardial perfusion images, but exhibits a significantly lower stress/rest myocardial ratio(1.35) than N13 ammonia(1.65), and a high liver/ heart ratio of 2.0. This study explored the new agents Cu62 ETS and Cu62 nPrTS, designed to reduce albumin binding thought to attenuate high flow uptake. R/dipy PET studies were performed with generator-produced Cu62 ETS (n=5) and Cu62 nPrTS(n=2) in volunteers who previously had r/dipy Cu62 PTSM. The stress-rest myocardial ratios for PTSM and ETS were 1.35 ±0.16 and 1.58±0.11, respectively (p=0.03). N-PrTS showed a stress-rest ratio of 1.44 ±0.35 compared to 1.42±0.18 for PTSM (p=n.s.). Liver/heart ratios for both agents were ≤1.0. Thus, the new generator-produced agents provide greatly improved liver contrast and likely will provide defect contrast similar to that of N13 ammonia.