rCBF BRAIN SPECT - ADVANCES IN TECHNIQUE AND CLINICAL APPLICATIONS

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INTRODUCTION: rCBF brain SPECT scanning is a quarter century old technique and in next decade it is likely to be largely replaced by functional MRI modalities, perfusion and diffusion MRI. In scientific applications it had been largely replaced by PET due to its better repeatability and better spatial resolution. Its clinical applications, however, still are wide and the presentation overviews advances in this method.

ACQUISITION AND ANALYSIS: today, in acquisition a combined (hybrid) diagnostic PET/CT or SPECT CT becomes a routine practice, although image fusion utilising two separate devices is also applicable and easier for brain scanning in contrary to thoracic or abdominal images, due to the lack of respiratory movements. In analysis outlining the regions of interest (ROIs) in a manual or semiautomatic mode and computing ratios between target and reference regions are largely replaced by process of transforming the images into a three-dimensional (3D) space, where each space element (voxel) corresponds to the same anatomical entity in all images under consideration, denoted as spatial standardization. By standardizing each scan to an age-related rCBF database of control subjects it is possible, by means of subtractions images and/or statistical comparisons, to precisely identify the regions with abnormal flow.

CLINICAL APPLICATIONS: in cerebrovascular diseases a promising application is qualification and monitoring of acute local intra-arterial fibrinolysis (LIF) using tissue plasminogen activator; in remaining areas there is a shift from imaging large areas of brain ischaemia towards subclinical brain damage; from neurology towards psychiatry. The presentation discusses an the usefulness of rCBF brain scanning in aphasiology, Parkinsonism, head trauma, collagen tissue diseases, differential diagnosis of dementia and behavioural disorders. As separate entities are discussed forensic and veterinary medicine rCBF SPECT scanning applications.