PW015

The role of cardiac Iodine-123-Metaiodobenzylguanidine scintigraphy in the early diagnosis of Lewy body diseases in patients with mild extrapyramidal symptoms

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Aim: Parkinson's disease (PD), dementia with Lewy bodies (DLB) and pure autonomic failure share clinical and neuropathological features. Lewy body diseases (LBD) has thus become a general term for all three diseases. Decreased cardiac uptake of radiolabelled MIBG has been reported in early stages of LBD; this finding suggests that degeneration of cardiac sympathetic nerve begins in the early phase of these diseases. According to the clinical criteria, it might be difficult to prove the diagnosis of LBD in patients with mild symptoms and, in these cases, MIBG scintigraphy may contribute to the early diagnosis. We report our preliminary experience about the role of MIBG scintigraphy in the early diagnosis of LBD in patients with mild extrapyramidal disturbances. **Materials & methods**: 20 patients (12 males; mean age 69 y.o.) with mild extrapyramidal symptoms underwent MIBG scintigraphy. Exclusion criteria were cardiac diseases and previous cardiotoxic therapy. In 6 cases there was a clinical suspicion of DLB; in 14 cases the examination was performed to differentiate a PD from a parkinsonian syndrome after a scintigraphic finding of nigro-striatal dopaminergic dysfunction revealed by I-123-Ioflupane scintigraphy. MIBG scintigraphy was performed 4h after i.v. injection of 111MBq of I-123-MIBG. Planar images of thoracic region were used for visual and semi-quantitative analysis of cardiac MIBG uptake. Regions of interest (ROI) were set in the heart (H) and the mediastinum (M), after which the H/M mean count ratio is calculated; a H/M ratio >1.7 was considered as normal. **Results**: MIBG scintigraphy showed a markedly decreased cardiac uptake of radiopharmaceutical in all patients with suspected DLB confirming the clinical suspicion (H/M ratio was <1.35 in all cases). In 5/14 patients examined to differentiate a PD from a parkinsonian syndrome, a normal cardiac MIBG uptake was reported, orienting the clinician to exclude a PD; in 8/14 patients a decreased MIBG cardiac uptake was reported (H/M ratio <1.5), orienting the clinician to confirm a PD. In one case H/M ratio had a borderline value, not allowing an univocal interpretation of the scintigraphic findings._ **Conclusion**: MIBG scintigraphy may be a very useful tool for early diagnosis of LBD. Particularly in patients with DLB we report a marked decrease of I-123-MIBG cardiac uptake. Furthermore MIBG scintigraphy allowed a good differential diagnosis between PD and parkinsonian syndromes in patients with scintigraphic evidence of nigrostriatal dopaminergic dysfunction. However further studies with more patients and an accurate follow-up period is needed to clarify these findings.

PW016

Attentional, neurological and autistic components of Asperger disorder. A 11C-butanol PET/CT study

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Background: The term Autistic spectrum disorders (ASD), including Asperger disorder, is used to describe a group of developmental disorders that share a triad of impairment in social interaction, communication and imagination and whose behaviour is typically described as restricted and repetitive. Functional studies have shown localized focal changes and abnormalities in the anatomo-functional connectivity of the limbic-striatal "social" brain. Moreover, ASD can present neurological symptoms and can show comorbidity with attention-deficit/hyperactivity disorder (ADHD). The aim of this study was to investigate at rest in both subjects with ASD and healthy controls (HC) the impact on regional cerebral blood flow (rCBF) of the scores of three symptoms related scales. Methods: Thirteen normal intelligence patients with ASD and ten HC underwent PET/CT using [1-11C]-butanol, a perfusion tracer produced from [11C]carbon dioxide. The whole examination time was less than 10 minutes. All subjects were administered the Adult ADHD Self-Report Scale (ASRS) Symptom Checklist, the Neurological Evaluation Scale (NES) and the Ritvo Autism and Asperger's Diagnostic Scale (RAADS). CBF was compared by SPM (statistical thresholds p=0.05 at voxel height, pcorrected<0.001 at cluster level and puncorrected < 0.001 at voxel level) between ASD and HC and the scores of the three scales were introduced two at the time as covariates into the experimental design in order to obtain group differences specific for ADHD, neurological and Asperger symptoms, purified by the effects of the other two components. Results: In both cases in which RAADS was introduced as covariant, along with either NES or ASRS, the significant CBF group differences specific for ADHD and neurological symptoms, respectively, were mostly found in right parahippocampal (BAs 28, 30,35), limbic (BAs13, 23) and temporal (BAs 21, 37, 38, 39) cortices, putamen, caudatus and thalamus. When ASRS and NEO were used as covariants, the group differences specific for ASD were found in all the above regions with the addition of the right visual cortex (BAs 17, 18, 19) and the left putamen, caudatus and thalamus. Conclusions: Using state-of-the-art neuroimaging methodologies, reduced considerably the examination time resulting in minimal stress to patient. ASD was found to have an increased CBF as compared to healthy controls and a high grade of comorbidity with ADHD and neurological symptoms, all such conditions affecting the right limbic and temporal regions. The central structure bilaterally and the right visual cortex showed a CBF increase more specific for ASD.

PW017

Automated injection system for ictal SPECT in epilepsia

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Aim: To evaluate the clinical usefulness of an automated injector system (AIS) for administration of ictal SPECT doses to reduce injection time/time lag and to improve SPECT localisation of the seizure focus. Material and Method: We developed an AIS that takes into account the radioactive decay rate of technetium, calculating the volume to be injected (25 mCi of ^{99m}Tc-HMPAO) over 6 hours and performing an automated injection to the patient. The study consisted of 41 patients with drug-resistant complex partial seizures who were undergoing presurgical evaluation. Tracer injection for ictal SPECT was performed using the AIS in 20 patients (mean age 36 years, 10 males and 10 females) and with manual standard injection (Manual) in the remaining 21 patients (mean age 34 years, 9 males and 12 females). Injection time using AIS was measured in seconds (s) from seizure onset to the start and to the end of volume injection. Ictal and interictal SPECT were acquired using an ECAM gammacamera (SIEMENS) and followed by subtraction ictal SPECT coregistered to MRI (SISCOM) methodology for SF localisation. The definition of seizure focus was made by review of video-electroencefalogram monitoring (V-EEG), clinical data and MRI. Results: Injection time with Manual was 37 s, with a range of 17-102 s. while with AIS it was 25 s with a range of 17 to 38 s. These differences were statistically significant (P<0.05). Moreover, using the AIS, time lag from seizure onset to start of injection was only 10 s, with a range of 4-24 s. Ictal SPECT and SISCOM demonstrated hyperperfusion that localised seizure focus in 14 of the 20 patients (70%) by AIS and in 10 of the 21 patients (48%) by Manual, although these differences were not statistically significant (P=0.14). Injected dose with AIS was 25 mCi in all patients, while with Manual, due to the hurry to inject, the dosage is not so accurate. Furthermore, the AIS was more convenient than Manual method for nursing staff. Conclusion: The AIS improves the quality of work of the nursing staff in the neurology ward and allows a finer adjustment of the ^{99m}Tc-HMPAO dose injection. Early results are promising in reducing injection time and improving SPECT accuracy using an AIS.

PW018

FocusDET: A software tool to locate epileptogenic foci in intractable partial epilepsy

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Purpose: Accurate localization of epileptogenic foci in intractable partial epilepsy is essential for assessing the possibility of surgery as a treatment. A specific software package was developed to locate the epileptogenic focus using Ictal and Inter-ictal SPECT images and MRI employing the SISCOM methodology. **Materials & Methods:** FocusDET was developed using GIMIAS facilities. GIMIAS (**G**raphical **I**nterface for Medical Image **A**nalysis and Simulation), which is used as the prototype tool in the VPHTk (Virtual Physiological Human Toolkit) CIBER-BBN project, is an integrative tool for fast prototyping of medical applications. VPHTk allows us to develop tools for the creation and customization of models based on the European standards of VPH being defined in the context of the European project VPHNoE (Virtual Physiological Human Network of Excelence). The application is object-oriented programming in C++ language. **Results:** The work-flow of the program consists of the following steps: 1) Exploration and visualization of medical image files in DICOM and Analyze formats including orientation control, 2) Generation of masks for SPECT studies to avoid extra cerebral activity and thus, improve the robustness of the register, 3) Registration of Ictal and Inter-ictal SPECT studies using a Local Correlation Coefficient as a penalty function, 4) Subtraction and normalization of Ictal and Inter-ictal SPECT files, 5) Co-registration of SPECT and MRI studies using Mattes Mutual Information from ITK (open-source library acronym of *Insight Segmentation and Registration Toolkit*), 6) Fusion of foci information with MRI, 7) Storing the results in a PACS Server or their transfer to the *Neuronavigator* for subsequent use by the surgeon. Each step of the program must be validated by the user, thus providing a good quality control. **Conclusions:** A new tool to locate epileptogenic foci using SPECT and MRI studies was developed. The package is reliable and suitable for clinical routine.

PW019

99mTc-HMPAO brain scintigraphy as a confirmatory test in patients with clinical diagnosis of brain death

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For the purpose of explanting donor organs current Spanish law, decree-law 2070/99, considers the brain scintigraphy using perfusion tracers as a confirmatory test for the diagnosis of brain death. **Material and Methods:** From January 2000 to December 2008 we performed 262 brain scans using 99mTc-HMPAO, associated or not with transcranial Doppler ultrasound, in 244 patients, 91 females and 153 males, who were in brain-death by clinical examination criteria. Brain death was the result of vascular cerebral disorder in 139 (hemorrhagic in 114, ischemic in 25), head trauma in 79, brain tumor surgery in 6, anoxic encephalopathy in 5, other causes in 13 and unknown cause in 2 patients. In all cases single doses of 10.6-13.2 MBq/kg 99mTc-HMPAO was administrated intravenously, using central venous catheter. Immediately after tracer injection dynamic study(60 images of 1 s. duration)and static images, anterior and lateral views(90-120 seconds acquisition)were obtained. 99mTc-HMPAO lipophilic fraction was >90% in all cases. We have established a scintigraphic diagnosis of brain death when non brain perfusion was detected in the dynamic study, and a complete absence of supra- and infratentorial tracer uptake was observed in the static images. **Results:** Brain scintigraphy confirmed the diagnosis of brain death in 225 patients. In the remaining 26 patients brain perfusion was observed: supra- and infratentorial in 13,supratentorial in 6 and infratentorial in 7. In 18 of these patients,a definitive diagnosis was performed by control scintigraphy or transcranial Doppler ultrasound,16-48 hours after the first study;16 patients had a diagnosis of brain death;in 2 patients brain perfusion remained: one patient died soon after and the other one remained in an anoxic encephalopathy. In the others 8 patients with no control brain scintigraphy: 6 died soon after, one patient was transferred to his original hospital in a chronic vegetative status; and one patient was discharged from hospital two months after the study. When brain death diagnosis was established, in 60 patients intensive care was discontinued, and in 158 patients family consent for donation was obtained.**Conclusions:** 99mTc-HMPAO brain scintigraphy is a reliable method, superior to the clinical evaluation, in the diagnosis of brain death. It is specially useful in order to take a decision in hospitals with organ transplantation programme, since brain scintigraphy completes the previous clinical evaluation, confirms the global loss of encephalic function (cerebral, cerebellum and brainstem), supports the irreversibility of the process, and reduces the waiting time for a firm diagnosis of brain death.