

The relevance of interictal rCBF brain SPECT in temporal lobe epilepsy: Diagnostical value and effects of spatial resolution

Christian MENZEL,* Andreas HUFNAGEL,** Frank GRÜNWARD,* Laszlo PAVICS,***,†
Karl REICHMANN,* Christian E. ELGER** and Hans J. BIERSACK*

**Department of Nuclear Medicine, University of Bonn, Germany*

***Department of Epileptology, University of Bonn, Germany*

****Department of Nuclear Medicine, University of Szeged, Hungary*

Interictal rCBF-SPECT is frequently being used as an adjunctive method for localization of an epileptogenic area during presurgical evaluation of patients suffering from medically refractory temporal lobe epilepsy. This study retrospectively evaluates interictal rCBF-SPECT using Tc-99m-HMPAO in comparison to the results of MRI. The final results of surface EEG and ECoG and the post-surgical clinical results as to seizure frequency were used as a 'gold-standard' for the evaluation of both imaging procedures.

As spatial resolution is discussed to be the major reason for higher sensitivity of F-18-DG-PET compared to rCBF-SPECT, special attention has been paid to the spatial resolution of the different SPECT systems being used in this study. In 55 patients the complete data set could be obtained retrospectively, 36 of them being evaluated using SPECT systems with relatively low spatial resolution (Picker Dyna 2000, Elscint Helix) and 19 pt. being evaluated using moderate- to high-resolution SPECT systems (ADAC Genesys, DSI Ceraspect). Overall sensitivity of the interictal rCBF-SPECT was 75%, with 69% for low-resolution systems and 84% for high-resolution systems. Approximately at the same time when our institution installed the ADAC Genesys, the MRI equipment was changed from the 1.5 T Philips Gyroscan S15 to the 1.5 T Philips Gyroscan ACS II, the latter allowing superior imaging opportunities. Overall sensitivity of MRI was 60%, with 56%, for the Gyroscan S15 and 68% for the Gyroscan ACS II. The overall positive predictive value (PPV) was 87% for the interictal rCBF-SPECT and 87% for the MRI. Due to the lack of true negative studies in this population specificity was not calculated. False lateralization using rCBF-SPECT occurred in 5 pt. (9%), however in 3 pt. the area of hypoperfusion correlated with a detectable MRI pathology, yet EEG/ECoG revealed the epileptogenic focus to be elsewhere. In conclusion, the interictal rCBF-SPECT revealed reasonable sensitivity and PPV in pt. suffering from focal temporal lobe epilepsy and modern SPECT systems showed significantly improved results. Since there is a variety of possible reasons for regional cortical hypoperfusion, the interictal SPECT could add significant information prior to the application of ECoG. This specially appeared to be useful in patients with a normal MRI scan. Furthermore, in patients presenting with a clear pathology on MRI and a corresponding EEG focus, ECoG could be avoided if the interictal rCBF-SPECT additionally showed localized and singular involvement of the affected temporal lobe. ECoG was mainly applied in those patients with relatively wide-spread hypoperfusion additionally involving frontal or parietal cortical areas.

Key words: rCBF-brain SPECT, epilepsy, Tc-99m-HMPAO