

## Factors influencing successful ictal SPECT injections during epilepsy presurgical evaluation

Chaichon LOCHARERNKUL, Nath PASUTHARNCHAT, Jintana PANJARAT,  
\*Suptaporn TEPMONGKOL, \*\*Tayard DEESUDCHIT

*Chulalongkorn Comprehensive Epilepsy Program (CCEP); Division of Neurology, \*Division of Nuclear Medicine, \*\*Division of Pediatric Neurology, King Chulalongkorn Memorial Hospital, Bangkok, Thailand.*

**Objective:** To study the factors determining successful ictal SPECT injection during epilepsy presurgical evaluation and to propose the suitable protocol for maximizing the success of the procedure.

**Methods:** We prospectively studied 59 patients with intractable localization related epilepsy, aged 11 to 52 years (average 32 years), who underwent ictal SPECT injections from January 2001 to December 2003. Tc-99m ECD<sup>1</sup> was arranged for injection from 10 to 14 hours weekdays during long-term video/EEG recordings until one successful injection was achieved (average 8.6 days). End of Tc-99m ECD injection within 30 seconds after clinical onset<sup>2</sup> was defined as a success. All possible factors influencing the successful injections were determined with the aid of video analyses. Pearson Chi-square, Fisher's exact test and binary logistic regression were used for statistical analysis.

**Results:** Successful injections were found in 40 out of 59 injections (68%). The average end of injection time was 21 seconds; the shortest 6 seconds. Age, gender, age of epilepsy onset, duration of epilepsy, types of epilepsy or seizures and baseline seizure frequency was not significantly correlated to successful injection. Early seizure detection was strongly correlated with successful injection ( $p < 0.001$ ). The factors for early seizure detection were experienced personnel and seizure with brief aura of <10 seconds prior to a seizure ( $p = 0.008$ ). Factors influencing rapid injection were qualified personnel who could read real-time ictal EEG, experience in SPECT injection and previously viewed the seizures ( $p = 0.039, 0.005$  and  $0.039$  respectively). Reanalysis adjusted for personnel factors found that seizure with report of aura and injection on the tonic arm was significantly associated with successful injection ( $p < 0.05$ , both). Subgroup analyses showed successful injection to be correlated with brief aura ( $p = 0.003$ ) and injection on tonic nonmoving arm ( $p = 0.005$ ). A brief aura resulted in prompt injection, whereas seizure with prolonged aura or an aura without seizure resulted in reluctance to injection. Tonic arms without movement were easier to be injected than arms in flexion, moving away or with massive movement causing kinking of vein or interrupting the procedure. Other factors such as seizure with vocalization (12/40 injections), dialeptic seizure (5/40), injection on the automotor arm (4/40), seizure during provocation (3/40) or complex partial seizure with preserved responsiveness (1/40) were not correlated with successful injection. Close observation by 2 to 3 personnel was significantly correlated with successful injection (32/40), but not observation by one or more than 3 personnel. Personnel dedicated only to ictal SPECT injection were not as important as their experience. Better success was found when using butterfly ("scalp vein") catheter (31/40), whereas heparin-locked and self-injection techniques were not as effective. Multivariate analysis showed that seizure with reported aura and personnel who previously viewed the seizures were independent factors to successful injection.

**Conclusions:** Experienced personnel and reported aura are factors to successful ictal SPECT injections. Protocol of ictal SPECT injection should include personnel who previously viewed the patients' seizures and had experience in the injection; injection on the tonic nonmoving arm, and use of butterfly catheter.

### References

1. Lancman ME, Morris HH 3rd, Raja S, Sullivan MJ, Saha G, Go R. Usefulness of ictal and interictal 99mTc ethyl cysteinate dimer single photon emission computed tomography in patients with refractory partial epilepsy. *Epilepsia* 1997; 38: 466-71.
2. Newton MR, Berkovic SF, Austin MC, Rowe CC, McKay WJ, Bladin PF. Ictal postictal and interictal single-photon emission tomography in the lateralization of temporal lobe epilepsy. *Eur J Nucl Med* 1994; 21: 1067-71.