DETECTION OF ACUTE CEREBRAL ISCHEMIA WITH Tc-99m APCITIDE SCINTIGRAPHY

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ABSTRACT

The established indication of Tc-99m apcitide scintigraphy is to detect deep venous thrombosis. However, due to its mechanism of binding to GP IIb/IIIa receptor on activated platelet, imaging of acute cerebral thrombosis is possible. This is a case report of acute ischemic stroke patient with right leg swelling who was referred to have Tc-99m apcitide scintigraphy for diagnosis of deep venous thrombosis. The scan showed no abnormal uptake in both legs but, interestingly, uptake in the left parieto-occipital region. This corresponds to clinical and the computer tomographic finding of acute ischemic stroke in the same area. With the use of Tc-99m apcitide scintigraphy, the area of acute cerebral ischemia and its causes can be synchronously identified. Various causes of progressing stroke may also be differentiated at the same time as well.

Key Words : stroke, platelet membrane glycoprotein (complex IIB-IIIA), radionuclide imaging

INTRODUCTION

P280 is a synthetic peptide containing an arg-gly-asp (RGD) sequence, which enables the binding to the GP IIb/IIIa receptor expressed on the activated platelets.[1,2] It has been successfully used for the detection of acute deep venous thrombosis[3,4,5,6,7] for many years by mean of Tc-99m apcitide scintigraphy. There has not been any case report of application in acute cerebral ischemia.

CASE REPORT

A 64-year-old female patient with underlying diabetes mellitus and old cerebral infarction presented to the hospital with drowsiness and dysarthria for 2 days. Her general physical examination was unremarkable. The neurologic examination revealed sensory aphasia and jargon speech. Others were unremarkable. CT scan (Fig. 1) revealed very low density area involving gray and white matter at right temporo-occipital lobe adjacent to the occipital horn of the right lateral ventricle with adjacent volume loss consistent with old infarction. There was also a wedge shaped low-density lesion occupying the left parieto-occipital area. This was interpreted as a recent infarction. Then low molecular weight heparin 0.4 mL. was given subcutaneously every 12 hours. Two days afterward, the patient developed upper gastrointestinal hemorrhage. Gastroscopy revealed erosive gastritis. Low molecular weight heparin was withdrawn. One day later, the patient developed right leg edema. The patient was sent to nuclear medicine division to perform scintigraphy for diagnosis of deep venous thrombosis.

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MATERIAL AND METHOD

After informed consent was obtained from the patient, the whole body scintigraphy was done at 1 hour and 3 hours after 740 MBq (20 mCi) Tc-99m apcitide (Acutect – Diatide, Inc.) intravenous injection. The gamma camera used was a single-headed GE-CAMSTAR equipped with a low-energy, high resolution parallel hole collimator. Data were collected using 20% energy window centered at 140 keV in a 128x128 matrix. Static left lateral view was acquired using preset count of 300,000 counts. Then right lateral view using the same time required for left lateral view was acquired.

RESULT

The result of Tc-99m apcitide scintigraphy was negative for acute thrombosis at both lower extremities but, strikingly, an area of abnormal uptake was seen at the left parieto -occipital region on 1 and 3 hours images (Fig. 2) which was the same area as the recent infarction revealed on CT scan.

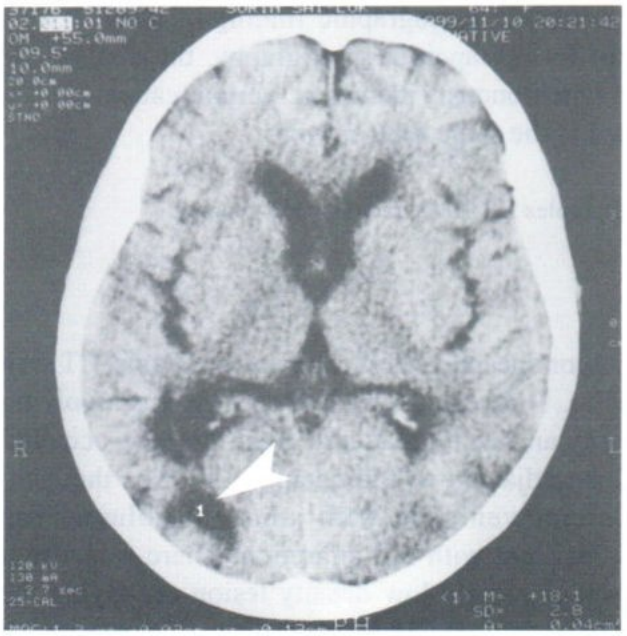

Fig. 1. Brain CT of the patient 2 days after stroke onset showing a wedge-shaped low density lesion occupying the left parieto -occipital area which was acute ischemic infarction and a very low density area involving gray and white matter at right temporo-occipital lobe with adjacent volume loss, consistent with an old infarction.

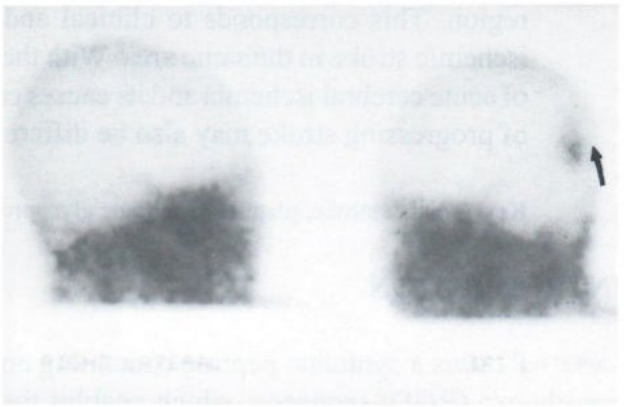

Fig. 2. Static right and left lateral views of the skull revealed a focus of abnormal uptake at the left parieto-occipital region (arrow).

DISCUSSION

Tc-99m apcitide is indicated for scintigraphic imaging of acute deep venous thrombosis due to its preferential binding to glycoprotein (GP) IIb/IIIa receptors found on activated platelets.[1,2,8] Though, this is a functional rather than morphologic imaging which theoretically could detect acute thrombosis anywhere in the body. For stroke, there were some studies using this agent to identify intra-arterial thrombi associated with carotid atherosclerosis.[9] There has not been any study reporting the clinical relevance of this agent for intracerebral stroke. The question arose whether this agent passes blood-brain-barrier or not. Imaging of the whole body did not show any uptake in the normal brain. There were some reports of brain tumor Tc-99m apcitide uptake.[10,11] Binding was proven to be due to receptor -mediated mechanism not the non-specific trappping or blood-brain-barrier leakage.

In this patient the diagnosis was Wernicke's aphasia. The CT scan showed a new infarcted area at the left parieto-occipital region and an old infarction at right temporo-occipital lobe. The Tc-99m apcitide scintigraphy which was performed 5 days after stroke onset showed uptake only at the area of recent infarction, not the old infarcted area. This can be explained by the fact that platelet aggregation increases significantly within 10 days after ischemic stroke or TIA but then returns to normal.[12] So that if the uptake is really due to binding to the receptor on activated platelets, like in brain tumors, identification of early (within 24 hours) acute ischemic stroke is possible. This may be the advantage over CT scan in this period. We may also pick up the patients with TIAs and differentiate it from other causes of acute focal neurologic deficits such as seizures or migraine. Thus it needs to be proven whether Tc-99m apcitide scan were positive or not in early stroke and TIA. Furthermore, we might be able to early differentiate progressive thrombosis[13] from progressive cerebral edema,[14] or hemorrhagic infarction,[15] all of which are causes of progressing stroke in cerebral ischemia. Simultaneously, carotid atherosclerosis[9] or mural thrombus[16] in myocardial infarction which are causes of ischemic stroke may be identified by imaging activated platelet as well.

Thus, scintigraphic imaging with ^{99m}Tc-apcitide should be a promising mean to evaluate patient with cerebrovascular disease in terms of diagnosis, not only for identifying the area of involvement but may also for exploring the causes. However, mechanism of uptake and time interval of optimal uptake in acute ischemic stroke needs to be clarified.

TIA = Transient Ischemic Attack

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