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Incidental accumulation of Technetium-99m pertechnetate in subacute cerebral infarction: A case report

Han YH *et al.* Incidental accumulation of Technetium-99m pertechnetate

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Abstract

BACKGROUND

When interpreting nuclear medicine images, unexpected findings are sometimes encountered. Recognizing these findings and determining the mechanism of their occurrence could have a significant impact on early diagnosis of critical diseases and the appropriate management of patients.

CASE SUMMARY

A 59-year-old man was admitted to the emergency room due to left hemiparesis, left hemifacial palsy, and mild dysarthria. After 2 weeks of hospitalization, the patient complained of dry eyes and mouth. Thus, salivary scintigraphy was performed to evaluate the functional status of his salivary glands. Incidental accumulation in the right frontoparietal area was found on salivary scintigraphy. Fluid-attenuated inversion recovery phase magnetic resonance (FLAIR phase MR) image showed diffuse high signal intensity in the same area. Anterior and posterior horns of the right lateral ventricle were obliterated and the midline was slightly shifted to the left side due to right frontoparietal swelling. On salivary scintigraphy, Tc-99m pertechnetate was incidentally accumulated in a subacute cerebral infarction lesion. Two years after the diagnosis of acute infarction, the second series of salivary scintigraphy showed no abnormal activity in the brain. FLAIR phase MR image also demonstrated markedly decreased high signal intensity in the previous infarction lesion without evidence of swelling indicating chronic cerebral infarction.

CONCLUSION

This case highlights that Tc-99m pertechnetate could accumulate in a subacute cerebral infarction lesion. The mechanism of an unexpected uptake of Tc-99m pertechnetate in unusual sites should be evaluated and kept in mind for better interpretation.

Key Words: cerebral infarction; Tc-99m pertechnetate; salivary scintigraphy

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Core Tip: Tc-99m pertechnetate is a truly carrier-free radiotracer transported by sodium iodide symporter. Salivary scintigraphy using Tc-99m pertechnetate is frequently performed for diagnosing salivary gland diseases such Sjogren's syndrome. Here, we present a rare case of Tc-99m pertechnetate accumulation in the subacute cerebral infarction lesion. The reason for Tc-99m pertechnetate accumulation is thought to be due to ingrowth and proliferation of new capillaries with enhanced permeability in the subacute cerebral infarction lesion. The present case highlights that Tc-99m pertechnetate could accumulate in a subacute cerebral infarction lesion. The mechanisms of an unexpected uptake of Tc-99m pertechnetate in unusual sites should be evaluated and kept in mind for better interpretation.

INTRODUCTION

When interpreting nuclear medicine images, unexpected findings are sometimes encountered. Recognizing these findings and determining the mechanism of their occurrence could have a great impact on early diagnosis of critical disease and appropriate management of patients. Tc-99m pertechnetate is one of the most common and widely used radiotracers in the nuclear medicine department. Although it is mostly used in combination with other pharmaceuticals, free Tc-99m pertechnetate itself is also used to evaluate thyroid and salivary gland function and to detect ectopic gastric mucosa in Meckel's diverticulum. Salivary scintigraphy using Tc-99m pertechnetate provides a series of processes in which saliva is produced and excreted. Therefore, it can evaluate saliva production and excretory functions of major salivary glands such as the parotid and submandibular glands in various salivary gland diseases such as radiation sialoadenitis and Sjogren's syndrome. Here, we present the first case of a subacute cerebral infarction demonstrating an unexpected uptake of Tc-99m pertechnetate on salivary scintigraphy.

CASE PRESENTATION

Chief complaints

A 59-year-old man was admitted to the emergency room because of left hemiparesis, left hemifacial palsy, and mild dysarthria.

History of present illness

After 2 wk of hospitalization, patient's symptoms of dry eyes and mouth started and had been worsened.

History of past illness

The patient had a free previous medical history.

Personal and family history

There was no specific family history.

Physical examination

The patient's body temperature was 36.1 °C, heart rate was 54 bpm, respiratory rate was 18 breaths per minute, blood pressure was 101/61 mmHg and oxygen saturation in room air was 97%. His mental status was light drowsy. The clinical neurological examination revealed left hemiparesis, left hemifacial palsy, mild dysarthria, and asomatognosia. Our first clinical consideration was an acute cerebral infarction.

Laboratory examinations

Blood analysis revealed normal leukocyte count 7.7×10^9 /L, with normal hematocrit and platelet count. Prothrombin and partial thromboplastin times were normal, and d-dimers were increased at 2.38 µg/mL. Serum C-reactive protein was within normal range and erythrocyte sedimentation rate at 10 mm/h. The blood biochemistries, as well as urine analysis were normal. Electrocardiogram, chest X-ray, and arterial blood gas analysis were also normal. After 2 wk of hospitalization, the patient complained of dry eyes and mouth, so further studies were performed. Anti-Ro and anti-La antibodies, which are associated with Sjogren's syndrome, were positive and his Schirmer's test showed a possible shortage of tears.

Imaging examinations

On computed tomography (CT) angiography, total obstruction of the right common carotid artery and the M1 portion of the right middle cerebral artery was noted. There was a large acute infarction in the right frontoparietal area on the MR image. After 2 wk of hospitalization, salivary scintigraphy was performed to evaluate the functional status of the salivary glands. It demonstrated the markedly decreased excretory function of the bilateral parotid and submandibular glands, while the uptake ability was relatively preserved. On salivary scintigraphy, an unexpected accumulation of Tc-99m pertechnetate in the right frontoparietal area was also detected (Figure 1) . We

correlated it with the brain MR image. The FLAIR phase MR image showed diffuse high signal intensity in the same area (Figure 1). The anterior and posterior horns of the right lateral ventricle were obliterated and the midline was slightly shifted to the left side due to right frontoparietal swelling.

MULTIDISCIPLINARY EXPERT CONSULTATION

Hyun Goo Kang, MD, PhD, Associate Professor, Department of Neurology, Jeonbuk National University Medical School and Hospital

The patient should undergo immediate transcatheter endovascular thrombectomy of the right common carotid artery with thrombolytic agent as a treatment of acute cerebral infarction.

Yeon-Hee Han, MD, PhD, Fund Professor, Department of Nuclear Medicine, Research Institute of Clinical Medicine of Jeonbuk National University-Biomedical Research Institute of Jeonbuk National University Hospital, Jeonbuk National University Medical School and Hospital

For evaluation of the dry eyes and mouth, Anti-Ro and anti-La antibodies, Schirmer's test, and salivary scintigraphy using Tc-99m pertechnetate are necessary.

Hwan-Jeong Jeong, Seok Tae Lim, MD, PhD, Professor, Department of Nuclear Medicine, Research Institute of Clinical Medicine of Jeonbuk National University-Biomedical Research Institute of Jeonbuk National University Hospital. Jeonbuk National University Medical School and Hospital

An unexpected accumulation of Tc-99m pertechnetate in the right frontoparietal area was detected. Markedly decreased excretory function of the bilateral parotid and submandibular glands was noticed which suggested Sjogren's syndrome.

FINAL DIAGNOSIS

The final diagnosis of the presented case is cerebral infarction with unexpected accumulation of Tc-99m pertechnetate in the subacute phase.

TREATMENT

Immediate transcarotid endovascular thrombectomy of the right common carotid artery was performed and a thrombolytic agent was started. The National Institutes of Health (NIH) stroke scale score improved from 12 to 6 points after thrombectomy and decreased to 3 points after 8 days. After proper management for acute infarction using aspirin, clopidogrel, and mannitol, the patient could walk without the assistance of other people and was independent in most basic activities of daily living but might need help with more complex tasks (modified Rankin scale, 3). His eye and mouth dryness were also gradually improved after taking pilocarpine, a muscarinic cholinergic agonist. He was discharged after 15 days of hospitalization and regular check-ups were performed in the departments of neurology and rheumatology.

OUTCOME AND FOLLOW-UP

Two years after the diagnosis of acute infarction, the second series of salivary scintigraphy and brain MR were performed for follow-up evaluation. On salivary scintigraphy, there was no abnormal radioactivity in the brain (Figure 2). The FLAIR phase MR image also demonstrated markedly decreased high signal intensity in the previous infarction lesion without evidence of swelling (Figure 2). Informed consent for publication of clinical data were obtained from the patient.

DISCUSSION

Tc-99m pertechnetate is a truly carrier-free radiotracer and ³transported by the sodium iodide symporter. Therefore, Tc-99m pertechnetate scintigraphy is a powerful imaging modality for assessing sodium iodide symporter activity in various organs ¹. It is widely used to evaluate the function of the ³thyroid and salivary glands and to detect ectopic gastric mucosa in Meckel's diverticulum ².

Salivary scintigraphy using Tc-99m pertechnetate provides a series of processes in which saliva is produced and excreted. Therefore, it is used for salivary gland diseases such as radiation sialoadenitis and Sjogren's syndrome to evaluate the saliva production and excretory functions of major salivary glands such as the parotid and submandibular glands.

Attempts were made to localize brain tumors using Tc-99m pertechnetate and Tc-99m labeled phosphate compound from the 1960s to the 1980s [3-4], but there is currently no case used for this purpose. There are some reports of the unusual uptake of Tc-99m pertechnetate in pediatric Burkitt's lymphoma and the unilateral breast used predominantly in breastfeeding [5-6]. The uptake mechanisms are thought to be an increased blood pool and the functional overexpression of sodium iodide symporter, respectively.

The mechanism of radiotracer localization in a brain lesion was related to a variety of factors, including increased vascularity, abnormal vascular permeability, edema, and selective cellular metabolism.³ The underlying mechanism may differ among the chemical compounds of the radiotracer and the pathologic types of lesions. In our case, the ingrowth and proliferation of new capillaries with enhanced permeability in a subacute cerebral infarction might be the main reason for the accumulation of Tc-99m pertechnetate.

Not many nuclear physicians know that Tc-99m pertechnetate can be taken up by subacute cerebral infarctions. To our knowledge, this is the first report to demonstrate Tc-99m pertechnetate uptake in a subacute cerebral infarction on salivary scintigraphy.

Recognizing these findings and determining the mechanism of their occurrence could make a great impact on the early diagnosis of critical disease and the appropriate management of patients.

CONCLUSION

This case highlights that Tc-99m pertechnetate could accumulate in a subacute cerebral infarction lesion. The mechanisms of an unexpected uptake of Tc-99m pertechnetate in unusual sites should be evaluated and kept in mind for better interpretation.

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