

The usefulness of ^{99m}Tc -hexamethylpropyleneamineoxime white blood cell scintigraphy in a patient with eosinophilic gastroenteritis

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White blood cell (WBC) ^{99m}Tc -hexamethylpropyleneamineoxime (HMPAO) scintigraphy was performed in a patient with eosinophilic gastroenteritis. WBC accumulation was detected in the terminal ileum to descending colon, and pathological studies demonstrated eosinophilic infiltration at the same region. ^{99m}Tc -HMPAO-WBC scintigraphy was proved to be a useful tool for the detection of eosinophilic infiltration in eosinophilic gastroenteritis.

Key words: eosinophilic gastroenteritis, ^{99m}Tc -hexamethylpropyleneamineoxime (HMPAO), WBC

INTRODUCTION

EOSINOPHILIC GASTROENTERITIS was first reported by Kaijser et al.¹ The characteristic pathological finding of this disease is infiltration of eosinophils in the mucosal, muscular, and subserosal layers of the intestinal walls.^{2–7} The involvement can occur at any part of the gastrointestinal tract.^{2–7} The clinical features are variable: diarrhea, intestinal bleeding and malabsorption caused by mucosal involvement, obstructive symptoms caused by muscular layer involvement, and eosinophilic ascites caused by subserosal disease.^{6,7} Even though elevated IgE level and/or allergen specific antibodies are usually observed and indicate an allergic origin, the etiology of this disease remains unclear. For diagnosis, it is necessary to detect infiltration of eosinophils from a biopsy specimen using endoscopy;^{5,8} however, false-negative results are unavoidable with biopsy, when the lesions are distributed in a patchy manner or are too small.^{6,8}

^{99m}Tc -hexamethylpropyleneamineoxime (^{99m}Tc -HMPAO) mainly combines with eosinophils and neutrophils.⁹ ^{99m}Tc -HMPAO labeled white blood cell (WBC) scintigraphy is used for *in vivo* detection of inflammation.^{9–12} Theoretically, ^{99m}Tc -HMPAO labeled WBC can

accumulate in lesions in eosinophilic gastroenteritis. However, only one paper has reported the usefulness of ^{99m}Tc -HMPAO-WBC scintigraphy for the diagnosis of this disease.⁸ We report an additional case in which ^{99m}Tc -HMPAO-WBC scintigraphy detected eosinophil infiltration in eosinophilic gastroenteritis.

CASE REPORT

A 23-year-old man with a history of bronchial asthma visited our hospital complaining of melena. The laboratory data showed high blood WBC count of 11,100/ μl (stab cells 2%, lymphocytes 52%, monocytes 4%, eosinophils 17%) and high IgE concentration of 692 IU/ml (normal; under 165 IU/ml). Colonoscopy, ^{99m}Tc -HMPAO-WBC scintigraphy and CT were performed within a period of 14 days.

For the preparation of ^{99m}Tc -HMPAO WBC scintigraphy, we separated, purified and labeled WBC in accordance with the standard nuclear medicine imaging protocol of the Japanese Isotope Society.¹³ Fifty milliliters of the patient's whole blood to which 1,000 IU of heparin (Shimizu-Takeda Pharmacy Co. Ltd., Osaka, Japan) was added and 1/5 volume of 6% concentration of Dextran T-500 (Amersham Pharmacia Biotech Co. Ltd., Tokyo, Japan) was shaken, and kept up side down for sixty minutes. The serum portion was separated and centrifuged (450 g, 5 minutes). The WBC component was separated and re-centrifuged (450 g, 5 minutes) with saline. Then, 1.85 GBq (50 mCi) of ^{99m}Tc -HMPAO

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Fig. 1 Biopsy specimen from ascending colon (Hematoxylin and eosin staining: $\times 50$). A large number of inflammatory cell which corresponds to eosinophil are seen within the mucosal and submucosal layers.



Fig. 2 ^{99m}Tc -HMPAO-WBC scintigraphy

(Nihon Medi-Physics Co. Ltd., Nisinoimiya, Japan) was added and incubated for 10 minutes. After incubation, labeled WBC was washed with saline.

An anterior planar image was obtained with STARCAM 3000 (General Electronic Co. Ltd., Milwaukee, USA) equipped with LEGP collimator (General Electronic Co. Ltd., Milwaukee, USA), 60 minutes after the injection of 10 ml of labeled WBC. Scan conditions were as follows: photopeak of $140 \text{ keV} \pm 10\%$, matrix of 256×256 , scan time of 2 minutes.

Biopsy samples were taken with colonoscopy at 8 points from the terminal ileum to rectum referring to the findings of ^{99m}Tc -HMPAO-WBC scintigraphy. Pathologic examination showed infiltration of eosinophils in



Fig. 3 CT scan.

the mucosal and muscular layers from the terminal ileum to rectum (Fig. 1). ^{99m}Tc -HMPAO-WBC scintigraphy demonstrated abnormal accumulation in the ileum to descending colon (Fig. 2). CT showed thickening of the walls of the small intestine (Fig. 3). The clinical symptoms disappeared after steroid administration for 3 months.

DISCUSSION

Barium study and endoscopy are used as imaging modalities for the diagnosis of eosinophilic gastroenteritis;²⁻⁶ however these modalities provide information limited to the mucosal layer and cannot show changes of the muscular and subserosal layers. Furthermore, endoscopy is not suitable for the small intestine. Biopsy with endoscopy is essential for diagnosis. But endoscopic biopsy sometimes gives a false-negative result when the eosinophilic infiltration occurs in a patchy distribution or infiltrated areas are small.^{6,8}

^{99m}Tc -HMPAO was developed for brain blood-flow scintigraphy in 1985.¹⁴ Recently, it is reported that ^{99m}Tc -HMPAO can label WBC,¹⁵ and it has been used for the detection of inflammation.⁹⁻¹² Lee et al. reported that ^{99m}Tc -HMPAO-WBC scintigraphy had a sensitivity of 94% and specificity of 100% in the detection of active inflammation.⁸ It is also used in inflammatory bowel diseases including appendicitis,¹⁰ ulcerative colitis,¹¹ and Crohn's disease.¹²

We used an hour image to avoid normal bowel activity completely.¹⁶ No images taken with a longer interval from the tracer injection were considered because Saitoh et al. reported that false-negatives originating from single use of an hour image are very rare.¹⁷

In this patient, accumulation of ^{99m}Tc -HMPAO-WBC a little weaker than that in the bone marrow was demonstrated corresponding to the small intestine and whole colon. Biopsy specimens obtained from the terminal ileum to rectum showed infiltration of the eosinophils. This result proved the usefulness of ^{99m}Tc -HMPAO-

WBC scintigraphy for the diagnosis of eosinophilic gastroenteritis.

This case also suggested that ^{99m}Tc -HMPAO-WBC scintigraphy can help to avoid a false-negative result of biopsy and that it is useful in deciding the sampling position. An accumulation of ^{99m}Tc -HMPAO labeled WBC was detected in the small intestine including the terminal ileum and biopsy proven infiltration of eosinophils in the terminal ileum. These results indicated the value of ^{99m}Tc -HMPAO-WBC scintigraphy for detection of eosinophilic infiltration of the small intestine where endoscopic examination cannot be used.

In our patient, accumulation in the sigmoid colon and/or rectum and hepatic and splenic flexure was difficult to judge, since accumulation in the bone marrow, liver and spleen was seen at the same area. As is reported in sternal infection by Quirce et al.,¹⁸ use of SPECT also can improve the sensitivity for detection of intestinal inflammation at these sites.

^{99m}Tc -HMPAO-WBC scintigraphy may be suitable for the follow up of eosinophilic gastroenteritis, since it is less invasive and can be used sequentially. To examine whether this scintigraphy can be used for an activity index of eosinophilic gastroenteritis, further study is needed to evaluate the relation between the intensity of accumulation in ^{99m}Tc -HMPAO-WBC scintigraphy and the degree of eosinophilic infiltration.

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