Annals of Nuclear Medicine Vol. 13, No. 4, 277–279, 1999

Two cases of chronic tonsillitis studied by FDG-PET

Joji KAWABE,* Terue OKAMURA,** Miyuki SHAKUDO,** Koichi KOYAMA,** Hideki WANIBUCHI,***
Hirokazu SAKAMOTO,**** Miki MATSUDA,**** Kenji KISHIMOTO,**
Hironobu OCHI* and Ryusaku YAMADA**

*Division of Nuclear Medicine, **Department of Radiology, ***First Department of Pathology, and ****Department of Otorhinolaryngology, Osaka City University Medical School

We report two cases of chronic tonsillitis studied by FDG-PET. Symmetrical high FDG uptake by the tonsils was observed in both cases. On histopathologic examination of the resected tonsils, follicular hyperplasia was observed with proliferation of lymphocytes in the germinal centers. Increased glucose metabolism in active inflammation involving lymphocyte proliferation was thought to be a cause of high FDG uptake by tonsils in chronic tonsillitis.

Key words: fluorine-18-fluorodeoxyglucose (FDG), positron emission tomography (PET), tonsil, lymphocyte, inflammation

INTRODUCTION

IN CLINICAL fluorine-18-fluorodeoxyglucose (FDG) positron emission tomography (PET) studies of the head and neck region, symmetrical high FDG uptake is sometimes observed in the palatine tonsils.[1–3] In order to determine the reason for this type of FDG uptake, we performed FDG-PET studies of two patients with chronic tonsillitis who were intended for tonsillectomy, and compared FDG uptake with the histopathologic findings of the tonsils.

CASE REPORTS

Patient 1

A 38-year-old woman complained of dysphagia and sore throat. She had suffered from repeated episodes of tonsillitis two or three times per year since childhood, and was intended for tonsillectomy. On admission, she had dysphagia and sore throat, and her C-reactive protein (CRP) level was 4.5 mg/d*l* (normal range 0–0.4 mg/d*l* in our hospital).

Received January 25, 1999, revision accepted May 6, 1999.

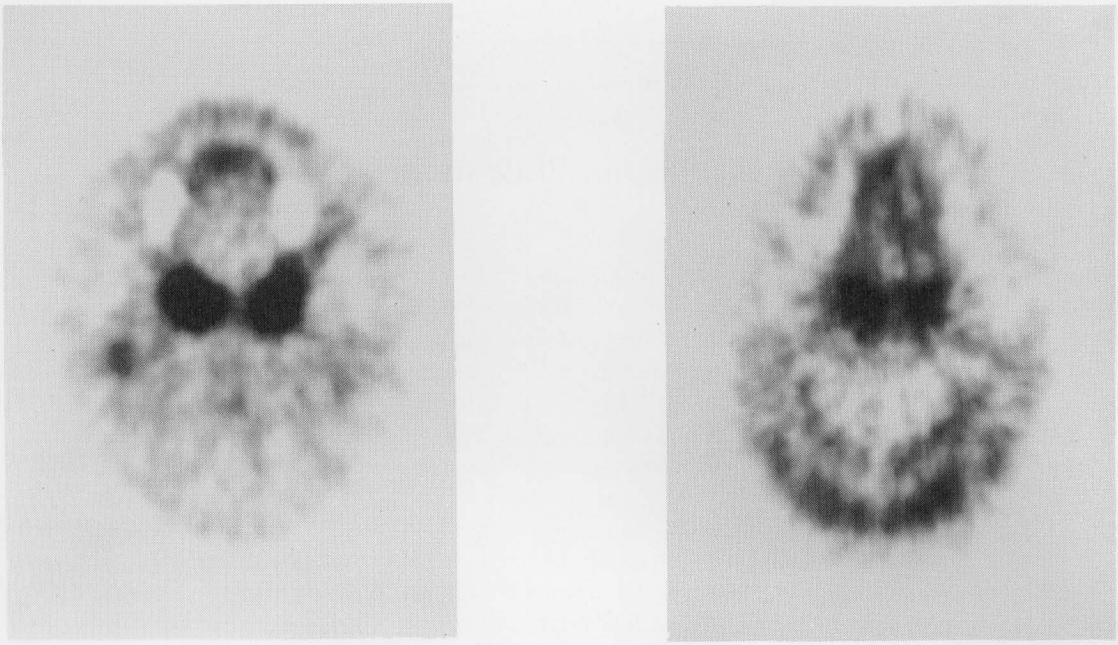
For reprint contact: Joji Kawabe, M.D., Division of Nuclear Medicine, Osaka City University, 1–5–7 Asahimachi, Abeno-ku, Osaka 545–8586, JAPAN.

E-mail: kawabe@msic.med.osaka-cu.ac.jp

Patient 2

An 18-year-old man complained of fever, dysphagia and sore throat. He had suffered from repeated episodes of tonsillitis several times per year since childhood, and was intended for tonsillectomy. On admission for tonsillectomy, he had no complaint and his CRP level was 0.4 mg/d*l*.

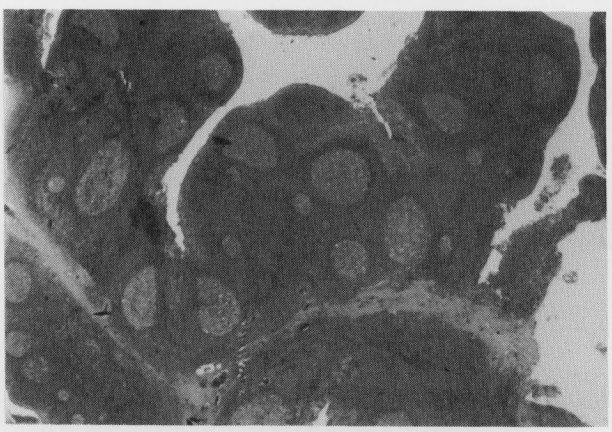
We obtained informed consent from both patients and FDG-PET studies of the head and neck region were performed. FDG was produced with a NKK-Oxford superconducting cyclotron and NKK synthesis system. A HEADTOME IV SET-1400W-10 (Shimadzu Corp., Japan), which has 4 detector rings providing 7 contiguous slices at 13 mm intervals, was employed for the PET study. Images were obtained from 40 to 55 minutes after intravenous injection of 185 MBq FDG while fasting. In both patients, symmetrical high FDG uptake by the tonsils was observed (Fig. 1a: Patient 1, 1b: Patient 2). Blood sugar levels in the PET studies were 54 mg/d*l* and 79 mg/d*l*, respectively. Regions of interest (ROIs: circles 3 pixels in diameter) were placed on the tonsils. The mean standardized uptake values (SUVs; cpm per g tissue/cpm injected per g body weight) of ROIs were measured. SUVs of tonsils were right: 7.4, left: 6.7 (Patient 1) and right: 4.4, left: 4.3 (Patient 2). One week after the FDG-PET studies, they underwent tonsillectomy. On histopathologic examination, follicular hyperplasias were observed in both patients with proliferation of lymphocytes in the germinal centers. The size of the follicles in patient



a b

Fig. 1 FDG-PET (a: Patient 1, b: Patient 2). Symmetrical high FDG uptake was observed in the tonsils in both cases. SUVs of tonsils were right: 7.4, left: 6.7 (Patient 1) and right: 4.4, left : 4.3 (Patient 2).

2a



2b

Fig. 2 Photomicrograph of the resected tonsils with high FDG uptake (a: Patient 1, b: Patient 2) (hematoxylin-eosin stain; original magnification, × 5). In figure 2a, 2b, follicular hyperplasias were observed in both patients with proliferation of lymphocytes which was found in the germinal centers. The size of the follicles in patient 1 tended to be approximately larger that in patient 2.

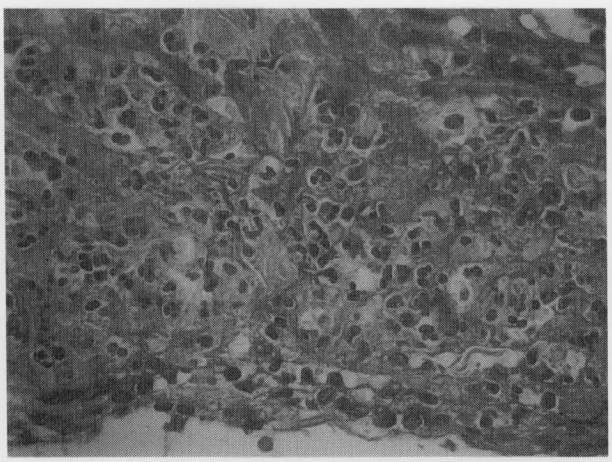


Fig. 3 Photomicrograph of the resected tonsils with high FDG uptake of patient 1 (hematoxylin-eosin stain; original magnification, × 100). Many neutrophils were found in the peripheral epithelium of the tonsils of patient 1.

1 tended to be larger than those in patient 2 (Fig. 2a: Patient 1, 2b: Patient 2). Many neutrophils (Fig. 3) were found in the peripheral epithelium of the tonsils of patient 1, but few neutrophils were found the peripheral epithelium of the tonsils of patient 2.

DISCUSSION

The palatine tonsils are located at the gateway of the respiratory and alimentary tracts, where they are continually directly exposed to antigens. In the tonsils, antigens are continuously present on the crypt epithelium, resulting in lymphocyte activation, so that a certain amount of inflammation is physiological.[4] In our patients with chronic tonsillitis, symmetrical high FDG uptake by the tonsils was observed. The SUVs for the tonsils of patient 1 with some complaints and a high CRP level were higher than those for patient 2 with no complaints and a normal CRP level. The differences in SUVs were therefore thought to reflect the differences between the 2 patients in the activity of inflammation. Histopathologically, follicular hyperplasias were seen in both patients, but the size of the follicles in patient 1 tended to be larger than those in patient 2. Many neutrophils were found in the peripheral epithelium of the tonsils of patient 1, but few neutrophils were found in the peripheral epithelium of patient 2. These indicated that the tonsils of patient 1 were in a more active state of inflammation than those of patient 2.[5]

In these two cases follicular hyperplasias with proliferation of lymphocytes in the germinal centers were observed, Dong et al.[6] found that the rate of glucose metabolism of lymphocytes obtained from rats infected by *Pseudomonas aeruginosa* was about 1.6 times as high as that for rats without infection. In other region, Kato et al.[7] found very high FDG uptake (SUV = 7.93) in lesions in mass-forming pancreatitis which exhibited marked lymphocytic infiltration. Kubota et al.[8] found that in secondary inflammatory reactions after radiotherapy, high FDG uptake was observed in macrophages and fibroblasts but not in scar. It has been suggested that inflammatory cells, such as the lymphocytes in our patients, highly concentrate FDG for their high glucose metabolism. But in patients who did not presented with tonsillitis, high FDG uptake by tonsils was often found.[1–3] FDG-PET is not able to distinguish active inflammation from physiological inflammation. The existence of remarkably high FDG uptake in the tonsils may indicate the existence of active inflammation.

ACKNOWLEDGMENT

The authors thank Dr. Kazuo Kubota (Tohoku University, Japan) for his kind advice.

REFERENCES

1. Kawabe J, Okamura T, Shakudo M, Koyama K, Kitayama H, Sakamoto H, et al. FDG uptake in the tonsils [abstract]. *J Nucl Med* 39: 256P, 1998.
2. Jabour BA, Choi Y, Hoh CK, Rege SD, Soong JC, Lufkin RB, et al. Extracranial head and neck: PET imaging with 2-[F-18]Fluoro-2-D-glucose and MR imaging correlation. *Radiology* 186: 27–35, 1993.
3. Uematsu H, Sadato N, Yonekura Y, Tsuchida T, Nakamura S, Sugimoto K, et al. Coregistration of FDG PET and MRI of the head and neck using normal distribution of FDG. *J Nucl Med* 39: 2121–2127, 1998.
4. Scadding GK. Immunology of the tonsil: a review. *J R Soc Med* 83: 104–107, 1990.
5. Awaya K. The aging of the secondary nodules in relation to the postnatal development and involution of the human palatine tonsils. *Acta Haem Jpn* 32: 127–134, 1969.
6. Dong YL, Yan T, Herndon DN, Waymack JP. Alterations in intracellular lymphocyte metabolism induced by infection and injury. *J Surg Res* 53: 293–297, 1992.
7. Kato T, Fukatsu H, Ito K, Tadokoro M, Ota T, Ikeda M, et al. Fluorodeoxyglucose positron emission tomography in pancreatic cancer: an unsolved problem. *Eur J Nucl Med* 22: 32–39, 1995.
8. Kubota K, Kubota R, Yamada S. FDG accumulation in tumor tissue [editorial comment]. *J Nucl Med* 34: 419–421, 1993.