INTRODUCTION

Proliferating trichilemmal tumor (PTT), also referred to as proliferating trichilemmal cyst or pilar tumor, is an uncommon neoplasm that originates from the outer root sheath of a hair follicle. It occurs commonly on the scalp in elderly women (1). PTT is usually considered as a benign skin appendageal tumor, biologically; however, malignant PTT with recurrence/metastasis has been reported recently (2-5).

The principle of F-18 fluorodeoxyglucose positron emission tomography (F-18 FDG PET) scan is based on the modified glucose metabolism of the tumor cell. The proliferative tumor cell has enhanced activity of glycolytic enzyme (e.g., hexokinase) and increased glucose transporter on cell membrane; thus, the glucose utilization of proliferative tumor cell is higher than that of normal cell. FDG, glucose analogue, is rapidly transported into the tumor cell and phosphorylated into FDG-6-phosphate by hexokinase. In contrast to normal glucose, metabolism of FDG is terminated in the production of FDG-6-phosphate that remains trapped within the cell (6, 7).

To date, the diagnostic usefulness of F-18 FDG PET in PTT has not been assessed due to its rarity. Herein, we reported our experience of a rare case of recurrent malignant PTT on scalp that showed increased FDG uptake.

CASE REPORT

A 49-year-old man was admitted to our hospital with a palpable scalp mass on the right occipital area. Physical examination revealed an approximately 3 cm-sized, hard, and fixed mass.
His medical history indicated that the mass was first noted on the right occipital area in 2003 and subsequently, the mass recurred twice on the identical site of scalp.

These masses were confirmed as PTT on excisional biopsies. However, although the current mass was highly suggestive of recurrent PTT, the clinical physicians conducted MRI and F-18 FDG PET/CT to exclude the possibility of malignant change of PTT and evaluate metastasis due to frequent tumor recurrence.

MRI showed an approximately 3 cm-sized, well-defined soft tissue mass on the right occipital scalp with infiltration of the cutaneous and subcutaneous layers. The mass showed hetero-

Fig. 1. A 3 cm-sized fixed mass with discrete margin (arrows) on the scalp of right occipital area.

Fig. 2. MRI of a 49-year-old male with scalp mass.
A, B. Axial T1-weighted and T2-weighted MR image shows an approximately 3 cm-sized, well-defined soft tissue mass with low signal intensity on the right occipital scalp.
C, D. Axial (C) and sagittal (D) enhanced T1-weighted MR image shows heterogeneously enhanced, soft tissue mass (arrow) on the right occipital scalp.
geneous enhancement on the enhanced T1-weighted images (Fig. 2).

On the PET images, focal FDG uptake (maximum standardized uptake value = 8.18) was noted in the mass of right occipital area and there was no abnormal FDG uptake representing metastasis to the other site (Fig. 3).

Mass excision was performed and the tumor showed proliferating lobules with accompanying trichilemmal keratinization throughout dermis and subcutaneous tissue. It was composed of small basal cells and large keratinocytes with eosinophilic cytoplasm. Tumor cells showed stromal invasion with sclerosis and fibrosis. These findings were consistent with malignant trichilemmal tumor (Fig. 4).

**DISCUSSION**

PTT is a rare neoplasm that originates from the outer root sheath of a hair follicle; furthermore, malignant transformation of PTT is a very unusual finding. Almost 90% of PTT occurred on the scalp and the residual cases occurred mainly on the back (1, 2). PTT shows proliferating lobules of squamous epithelium with trichilemmal keratinization. Ye et al. (8) divide PTT into 3 groups histologically, i.e., 1) benign, 2) locally aggressive, and 3) malignant group.

PTT is usually considered as a benign lesion. However, there are a few reports on the aggressive course of PTT with local recurrence or metastasis. The known sites of metastasis are regional lymph nodes (cervical, pre-auricular, axillary etc.), lung, medi-
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astinum and liver. Some authors also reported cases of the malignant PTT with metastasis, which developed after recurrence (2-5). Therefore, malignant potential and possibility of metastasis cannot be excluded in patients with PTT, especially recurrent tumor, and appropriate evaluation is necessary.

F-18 FDG PET/CT plays an increasingly important role in the initial diagnosis, staging, and monitoring of treatment response in cancer patients. The PET/CT can acquire whole-body images and hence, is useful for the detection of regional and distant metastasis, as well as the primary tumor. Jung et al. (9) and Leyendecker et al. (10) reported that malignant PTT and its metastatic lesion showed increased FDG uptake. However, there are few case reports on F-18 FDG PET finding of PTT.

We reported a case of recurrent PTT, which developed to malignant change with increased FDG uptake. Although more cases of this tumor are required for assessing the usefulness of F-18 FDG PET/CT, we suggest that F-18 FDG PET/CT might be a helpful diagnostic tool for evaluation of PTT, especially recurrent tumor, because of its unpredictable tumor behavior that can present malignant change and metastasis with FDG avidity.

REFERENCES

악성변화를 보인 재발성 증식성 모낭종양의 F-18 Fluorodeoxyglucose Positron Emission Tomography/Computed Tomography 스캔 소견

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F-18 fluorodeoxyglucose positron emission tomography/computed tomography (이하 F-18 FDG PET/CT) 스캔은 현재까지 다양한 종류의 암종의 진단, 치료반응평가 및 추적관찰에 이용되어 왔다. 증식성 모낭종양(proliferating trichilemmal tumor)은 모낭 말단부위의 외근모초에서 기원하는 드문 종양으로, 이 종양은 예측하기 어려운 생물학적 또는 임상적 양상을 보이기 때문에 전이 및 재발에 대한 장기간의 추적관찰을 시행하는 것이 필요하다. 저자들은 F-18 FDG PET/CT 스캔에서 FDG 섭취증가를 보인, 재발성 악성 증식성 모낭종양에 대한 드문 예가 있어 이를 보고하고자 한다.

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