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Evaluation of imaging findings differentiating extranodal non-Hodgkin's lymphoma from squamous cell carcinoma in naso- and oropharynx

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ABSTRACT

Objective: To reveal morphological differences between extranodal non-Hodgkin's lymphoma (NHL) and squamous cell carcinoma of the naso- and oropharynx, and to evaluate the usefulness of diffusion-weighted (DW) and ^{18}F-fluorodeoxyglucose PET/CT imaging. **Methods:** Imaging findings, signal intensities, apparent diffusion coefficients (ADCs), and maximum standardized uptake values (SUVmax) were assessed. **Results:** Wall-thickening type, bilateral symmetry, and absence of nodal necrosis were more frequently seen with NHL. In NHL, signal intensities on DW images were higher, and ADCs was lower. No significant difference in SUVmax was found. **Conclusion:** Only magnetic resonance imaging including DW imaging produced helpful data, eliminating the need for multimodality imaging.

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1. Introduction

Malignant lymphoma is the most common nonepithelial head and neck malignancy. Although it often presents as enlarged cervical lymph nodes, extranodal manifestations of lymphoma are well recognized and occur in 20% to 30% of patients [1]. Head and neck is the second most common site of extranodal lymphoma after the gastrointestinal tract [2]. Although the extranodal areas predisposed to develop lymphoma are those areas normally rich in lymphoid tissue such as Waldeyer's ring [3], extranodal head and neck lymphoma also occurs in paranasal sinuses, nasal cavity, larynx, oral cavity, salivary glands, thyroid, and orbit. Lymphomas are usually divided into two main subgroups, Hodgkin's disease and non-Hodgkin's lymphoma (NHL). Extranodal NHL in the head and neck regions is usually revealed as a submucosal tumor, instead of ulcerative like squamous cell carcinoma (SCC). However, the presenting symptoms of the two malignancies are quite similar. Patients with nasopharyngeal NHL may present with nasal obstruction or unilateral serous otitis media [4], whereas patients with oropharyngeal NHL complain of unilateral sore thoat, dysphagia, or other obstructive symptoms [5]. Cervical nodal involvement is frequently present in patients with NHL who present with extranodal primary lesions.

Computed tomographic (CT) and magnetic resonance (MR) imaging findings of naso- and oropharyngeal NHL have been reported [4–6], and the differentiation between nasopharyngeal NHL and SCC in the light of morphological findings of primary tumors or cervical lymphadenopathy has been discussed [6]. On the other hand, it is well-known that diffusion-weighted (DW) imaging is useful in the differentiation between NHL and SCC [7–10]. The purpose of this study was to reveal morphological differences between extranodal NHL and SCC of the naso- and oropharynx, and to evaluate the usefulness of DW and ^{18}F-fluorodeoxyglucose (FDG) positron emission tomography (PET)/CT imaging in distinguishing extranodal NHL from SCC.

2. Materials and methods

2.1. Patients

The study was approved by the human research committee of our institutional review board, and complied with the guidelines of the Health Insurance Portability and Accountability Act. The requirement for informed consent was waived due to the retrospective nature of this study. We searched the electronic medical chart system of Gifu University hospital for patients with histopathologically-proven naso- and oropharyngeal tumors between June 2004 and July 2011, and found 51 consecutive patients with NHL (age range, 10–87 years; mean 63.5 years; 34 men and 17 women; nasopharyngeal lesion in 16 patients,

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oropharyngeal in 24, and both in 11; B-cell type in 41 patients and T-cell type in 10) and 43 with SCC (age range, 48–91 years; mean 64.4 years; 34 men and 9 women; nasopharyngeal lesion in 13 patients, oropharyngeal in 24, and both in 6; well- differentiated tumor in 5 patients, moderately- in 15, and poorly- in 23). Because the tumors in 11 of the 51 patients with NHL and 6 of 43 with SCC extended in both naso- and oropharynx, we decided between the two sites on the basis of the opinion of the reader. CT was performed in all patients, MR imaging including DW imaging in 12 with NHL and 33 with SCC, and ^{18}F- FDG PET/CT in 36 with NHL and 24 with SCC. 10 patients with NHL and 17 patients with SCC underwent all three modalities. In every included patient, these radiological examinations were performed within 2 months.

2.2. CT imaging

CT was obtained in all 94 patients. An 8-slice CT (LightSpeed Ultra, GE Healthcare, Milwaukee, WI, USA) was used in 59 patients and a 64-slice CT (Aquilion 64 TSX-101A/EI, Toshiba Medical Systems, Tokyo, Japan) in 19, and for these, transverse CT images were reconstructed with 2.5-mm section thickness and no overlap. In 67 patients, contrast-enhanced CT images were obtained 45 seconds after initiating IV bolus injection of 100 mL of nonionic iodine contrast material containing 300-mg iodine per mL (Omnipaque300, Daiichi Sankyo, Tokyo, Japan) at an injection rate of 2 mL per second. In the remaining 16 patients, unenhanced CT images obtained by PET/CT were used for evaluation.

2.3. MR imaging

Forty-five patients including 12 with NHL and 33 with SCC were examined using a 1.5-T MR imaging system (Intera Achieva 1.5 T Pulsar, Philips Medical Systems, Netherlands). All images were obtained in the transverse plane using the parallel imaging technique at a section thickness of 4 mm with a 1-mm intersection gap. T1-weighted spin-echo (TR/TE, 690-827/9–15 msec; imaging matrices, 512×512; field of view, 20×20 cm) and T2-weighted fast spin-echo (TR/TE, 3318–5710/

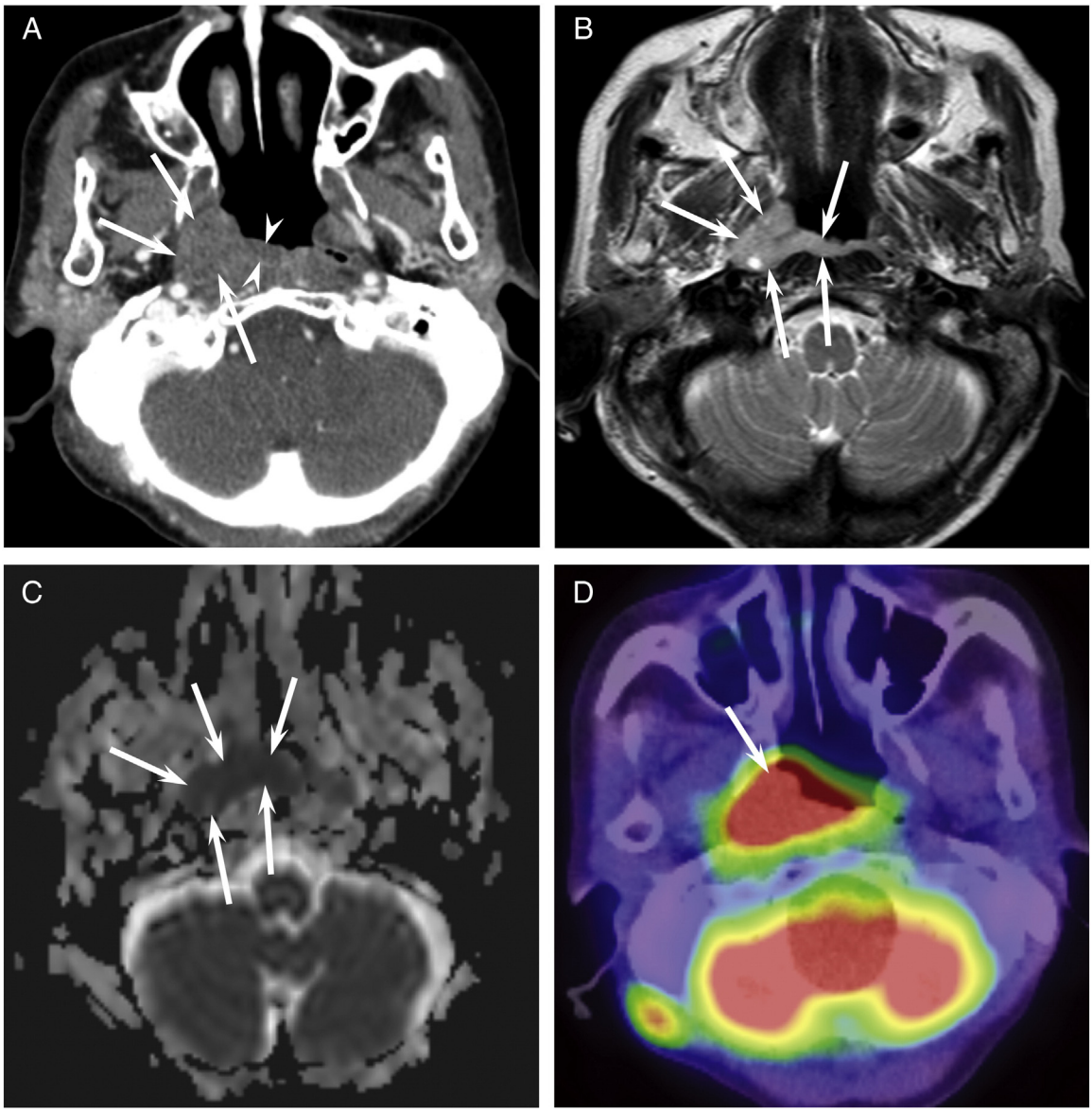

Fig. 1. A 72-year-old woman with a nasopharyngeal peripheral T-cell lymphoma. A, Contrast-enhanced CT image showing a right nasopharyngeal asymmetric lesion (arrows) with extension along pharyngeal mucosa (arrow heads). B, T2-weighted fast spin-echo MR image (TR/TE, 4,100/90 ms) showing a wall-thickening and asymmetric lesion with homogeneously mild hyperintensity (arrows). C, ADC map showing a nasopharyngeal tumor (arrows) with extremely low ADC value (0.57 [$\times 10^{-3}$ mm^2/s]). D, FDG-PET/CT fusion image showing a nasopharyngeal tumor (arrow) with intense FDG accumulation (SUVmax 20.8).

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