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## Usefulness of sentinel node navigation surgery in the management of early tongue cancer

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### ABSTRACT

*Objective:* To determine the validity of sentinel node navigation surgery (SNNS) in early stage tongue cancer, the occurrence rate of postoperative cervical metastasis (POCM) after lead plate technique (LPT) introduction and survival rates in patients who underwent SNNS were analyzed.

*Methods:* SNNS was performed in 29 patients (stage I: 14, stage II: 15) from 2000 to 2007. Tc-labeled phytate was prepared as a radiotracer a day before SNNS. The sentinel node (SN) was then examined pathologically during surgery. For cases where metastasis in SN was positive, neck dissection was performed. Occurrence of POCM after LPT introduction was compared with that before LPT introduction. 'Wait and see' policy was performed in 52 patients (stage I: 27, stage II: 25) from 1987 to 1999 as a historical control. The observation period of SNNS cases and 'wait and see' policy cases ranged from 10 months to 165 months (median: 91 months) and from 7 months to 268 months (median: 87 months), respectively.

*Results:* Six of the 29 SNNS cases (21%) were proven metastatic SNs. Before LPT introduction, POCM occurred in 2 of the 15 cases, while we had no occurrences after LPT introduction. The 5-year overall survival rate of the 29 patients who underwent SNNS and the 52 patients with 'wait and see' policy were 96% and 84%, respectively, and there was statistical significance in the two groups ( $p < 0.05$ ).

*Conclusions:* As the survival rate of the patients with the SNNS tended to be better than that with the 'wait and see' policy in our cases, SNNS could avoid unnecessary neck dissection. SNNS provides useful information regarding decision-making for neck dissection in early stage tongue cancer.

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### 1. Introduction

The trend of minimally invasive surgery, which is now commonly used for various types of diseases, is motivated by the pursuit of fewer intra- and postoperative complications. Sentinel node navigation surgery (SNNS) is mainly used in patients with breast cancer and skin melanoma.

The sentinel node (SN) refers to the first lymph node draining from the primary region of a cancer, and SNNS aids in the detection of occult lymph node metastasis in early-stage cancer. SNNS allows the detection of clinically occult node metastases that cannot be detected clinically or by other conventional imaging means, and

when metastasis is not detected in SN, lymph node dissection is avoidable. The concept of SNNS has been extended to cancers other than breast cancer, including head and neck squamous cell carcinoma [1–3].

In our institution, before SNNS introduction we had performed partial glossectomy without elective neck dissection for early tongue cancer with 'wait and see' policy. Since 2000, SNNS has been used in decision-making regarding neck dissection [4]. In this study, the survival rate in patients who underwent SNNS was analyzed.

### 2. Patients and methods

Since 2000, SNNS has been used in our department as part of decision-making regarding neck dissection for early tongue cancer. SNNS was performed in 29 patients (stage I: 14, stage II: 15) from 2000 to 2007. Fifteen cases were male, 14 cases were female, and

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the ages of the patients at the time of surgery ranged from 31 to 82 years, with a median age of 66 years. Before SNNS introduction, 'wait and see' policy was performed in 52 patients (stage I: 27, stage II: 25) from 1987 to 1999. Their age at the time of surgery ranged from 20 to 88 years with a median age of 64 years. The observation period of SNNS cases and 'wait and see' policy cases ranged from 10 months to 165 months (median: 91 months) and from 7 months to 268 months (median: 87 months), respectively. The method of SNNS is as follows: in the afternoon of the day before surgery,  $^{99m}\text{Tc}$ -labeled phytate is prepared as a radiotracer. The radiation dose is set at about 100 MBq, and the total fluid volume of the radiotracer is 0.4 ml. Submucosal infusion is divided into four different directions around the tumor (Fig. 1a). Two hours after infusion, lymphoscintigraphy is obtained using a gamma camera (t.cam Signature, Toshiba Medical Systems Corporation, Tochigi, Japan) and the location of radioactive accumulation in the neck is identified (Fig. 1b). After lymphoscintigraphy, surgery including SNNS is performed. SNs are detected using a portable gamma ray detector (neo2000TM, Neoprobe, OH, USA), and SNs are removed. The residual radioactivity in the removed SN lesions is then measured (Fig. 1c). Specimens of harvested SNs prepared by frozen section procedure are stained with H&E and examined by pathologists intra-operatively. When metastasis in SN is positive, elective neck dissection is performed (SN biopsy-assisted END). When metastasis in SN is negative, neck dissection is not performed; however, the patient is closely monitored. Finally, for each SNNS, the identification and involvement rates of SN are measured.

SNNS was approved by the institutional review board at Fukushima Medical University. Informed consent was obtained from the patients included.

Since 2002, to reduce radiation exposure to the tongue, we have introduced the lead plate technique (LPT) when performing SNNS.

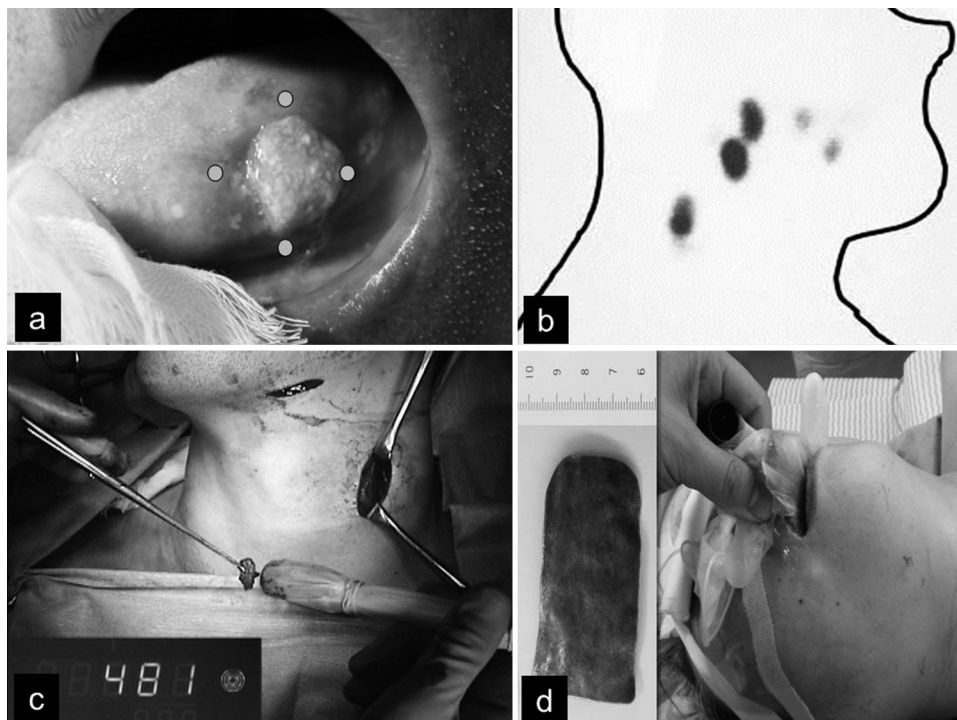
During the detection of level I SN (submental and submandibular, AJCC 6th) using Neoprobe, a lead plate is inserted into the floor of the mouth (Fig. 1d). In this study, the occurrence rate of POCM in patients before and after LPT introduction was compared.

In the SNNS cases compared to in 'wait and see' policy cases, Kaplan–Meier curves and the log-rank test were used for statistical analysis of overall and disease-specific survival rates.

### 3. Results

#### 3.1. Identification and involvement rate of SN

In all 29 cases, cervical SNs were detected using scintigraphy and a portable gamma ray detector. The number of SNs ranged from one to six per case, and the average was 3.1. Six of the 29 cases (21%) had SN with metastasis (positive SN). In three of the six positive SN cases, metastasis was detected in one node. Of the three positive SN cases, one case was localized in level IB, and two cases in level II. In each of the remaining three positive SN cases, metastases were detected in two nodes: one case in levels IB and IIA, another case in levels IB and III, and one case in levels IIA and III. In five of the six positive SN cases, SN biopsy-assisted END was performed, and no pathological metastases were found in the dissected cervical nodes, except in SNs. One positive SN patient refused a neck dissection, and instead received intra-arterial cisplatin injection chemotherapy. In our department, for primary surgical removal of a tongue tumor, partial glossectomy is selected for early stage cases, whereas a pull-through operation is selected for advanced cases to remove the lymphatic system between the primary tongue tumor and cervical lymph node. Of the five patients who underwent neck dissection, partial glossectomy was selected for four patients, and pull-through operation for one patient.



**Fig. 1.** Method of SNNS. (a) In the afternoon of the day before surgery,  $^{99m}\text{Tc}$ -labeled phytate was prepared as a radiotracer. (b) Two hours after infusion, the location of the radioactive accumulation in the neck was identified using a gamma camera. (c) Surgery including SN biopsy was performed. SNs were detected using a portable gamma ray detector, and they were removed. When metastasis in SN was positive, neck dissection was performed. (d) Lead plate technique (LPT): since 2002, we have been using LPT when performing SN biopsy. During the detection of level I SN, a lead plate was inserted into the floor of the mouth to reduce the radioactivity from the tongue and avoid postoperative cervical metastasis.

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