

Clinical Paper  
Head and Neck Oncology

# Prognostic value of lymph node count from selective neck dissection in oral squamous cell carcinoma

**S. Lee, H. J. Kim, I.-H. Cha, W. Nam**  
Department of Oral and Maxillofacial Surgery,  
Yonsei University College of Dentistry,  
Seodaemun-gu, Seoul, Republic of Korea

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**Abstract.** Unlike the levels of anatomical exploration, there is no consensus on the extent of lymph node dissection, or lymph node count (LNC), during selective neck dissection (SND). The aim of this study was to validate the prognostic impact of LNC on survival and to determine an optimal LNC cut-off value for SND. A retrospective investigation identified 78 patients with a diagnosis of oral squamous cell carcinoma (OSCC) who underwent SND (levels I–III or levels I–IV). LNC and clinicopathological variables were analyzed for any association with survival in Cox proportional hazards models. Based on the receiver operating characteristic curve, a cut-off value of 19 lymph nodes was found to predict overall survival (OS) (area under the curve 0.732, sensitivity 67.8%, specificity 75.0%;  $P = 0.026$ ) and disease-specific survival (DSS) (area under the curve 0.762, sensitivity 68.1%, specificity 77.8%;  $P = 0.011$ ). On Cox regression, LNC ( $\geq 19$  vs.  $< 19$ ) was the only independent predictor of OS (hazard ratio 5.29, 95% confidence interval 1.39–20.05;  $P = 0.014$ ) and DSS (hazard ratio 6.76, 95% confidence interval 1.40–32.77;  $P = 0.018$ ). Similar results were obtained in the pathologically lymph node-negative subgroup ( $n = 66$ ). Based on the study findings, SND should include 19 or more lymph nodes for a survival benefit.

**Key words:** oral cavity cancer; squamous cell carcinoma; selective neck dissection; lymph node count.

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In the surgical management of head and neck cancer, regional metastasis to the cervical lymph nodes represents an important risk factor for disease control<sup>1</sup>. Consequently, many surgeons choose to perform a selective neck dissection (SND) even for clinically node-negative (cN0) patients in view of the

risk of occult metastasis. Guidelines on the levels of anatomical exploration during SND have been established based on knowledge of lymphatic drainage patterns<sup>2–4</sup>. Unfortunately, there is no consensus on the extent of lymph node dissection, or lymph node count (LNC).

The LNC, as an indicator of adequate lymphadenectomy, is a known prognostic factor for a number of solid organ malignancies, including breast<sup>5</sup>, colorectal<sup>6</sup>, and oesophageal cancers<sup>7</sup>. Specifically, a greater LNC is associated with better survival outcomes in these cancers, because a

greater LNC may correspond to more extensive elimination of occult disease. Recent studies have reported that LNC is also an independent predictor of survival in oral squamous cell carcinoma (OSCC) patients<sup>8–11</sup>. Although these investigators agreed on the prognostic impact of the LNC in OSCC, they disagreed on the node thresholds: while Kuo et al.<sup>9</sup> reported a LNC of <16 to be related to a worse prognosis, Divi et al.<sup>11</sup> and Ebrahimi et al.<sup>10</sup> suggested a LNC of <18 as the optimal cut-off.

This study was performed to validate the prognostic value of the LNC with regard to survival outcomes in an often under-represented Asian population. It was also aimed to determine the optimal cut-off value of LNC for patients undergoing SND.

## Materials and methods

### Study design and subjects

This was a single-centre, retrospective, longitudinal cohort study of all OSCC patients undergoing primary tumour resection with SND between January 2006 and December 2015. Adult patients defined as 18 years of age or older were included. Patients with metastatic disease, secondary primary cancer, perioperative mortality, a history of previous radiotherapy or/and chemotherapy, or a history of previous head and neck cancer were excluded. Initially, 147 patients were identified. After excluding 69 for insufficient data or meeting the exclusion criteria, a total of 78 patients were evaluated. Demographic, laboratory, and clinical data were collected, including but not limited to the primary cancer site, American Joint Committee on Cancer (AJCC) TNM staging, type and extent of neck dissection, and type of adjuvant therapy. In the case of bilateral neck dissection, the LNC for the ipsilateral neck dissection was included in the study. Information was collected on any comorbidity at the time of OSCC diagnosis and the Charlson comorbidity index (CCI) was calculated, including cancer<sup>12</sup>. A high comorbidity score was defined as a CCI of  $\geq 4$ . Data available up until February 2017 were used. Considering the discrepancy between clinical and pathological nodal status, the pathologically node-negative subgroup was also examined following calculation of the LNC cut-off value.

The study was conducted according to the dictates of the Declaration of Helsinki and was approved by the Ethics Review Board of Yonsei University Dental

Hospital Institutional Review Board (IRB No. 2-2017-0015). The need for informed consent was waived due to the retrospective nature of the study. All authors had access to the study data and reviewed and approved this study.

### Statistical analysis

A receiver operating characteristic (ROC) curve analysis was done in order to obtain a LNC cut-off value for overall survival

(OS), disease-specific survival (DSS), and disease-free survival (DFS). The survival curves for OS, DSS, and DFS were estimated using the Kaplan–Meier method and log-rank test. OS was calculated from the date of surgery to death from any cause. DSS was derived from the date of surgery to death due to OSCC. DFS was calculated from the date of surgery to the date of recurrence, or death from any cause. If the patient survived without an event, survival was censored at the latest

Table 1. Baseline characteristics of all patients and the pathologically node-negative (pN0) subgroup.

	All patients (n, %)	pN0 patients (n, %)
Total	78	66
Age (years)		
Median (range)	60 (30–82)	60 (30–82)
<60	37 (47.4)	33 (50)
$\geq 60$	41 (52.6)	33 (50)
Sex		
Female	30 (38.5)	25 (37.9)
Male	48 (61.5)	41 (62.1)
Smoking history		
Yes	31 (39.7)	40 (60.6)
No	47 (60.3)	26 (39.4)
Charlson comorbidity index (CCI)		
1–3 points	69 (88.5)	58 (87.9)
$\geq 4$ points	9 (11.5)	8 (12.1)
Primary tumour site		
Tongue	19 (24.4)	16 (24.2)
Floor of mouth	5 (6.4)	4 (6.1)
Retromolar trigone	3 (3.8)	1 (1.5)
Mandibular gingiva	32 (41.0)	28 (42.4)
Lip	1 (1.3)	1 (1.5)
Buccal cheek mucosa	16 (20.5)	15 (22.7)
Hard palate	2 (2.6)	1 (1.5)
AJCC clinical N categories <sup>a</sup>		
cN0	67 (85.9)	62 (93.9)
cN+	11 (14.1)	4 (6.1)
AJCC pathological T categories <sup>b</sup>		
pT1	15 (19.2)	13 (19.7)
pT2	30 (38.5)	27 (40.9)
pT3	6 (7.7)	5 (7.6)
pT4	27 (34.6)	21 (31.8)
Laterality of neck dissection		
Unilateral	71 (91.0)	60 (90.9)
Bilateral	7 (9.0)	6 (9.1)
Extent of neck dissection		
Levels I–III	66 (84.6)	58 (87.9)
Levels I–IV	12 (15.4)	8 (12.1)
AJCC pathological N categories <sup>c</sup>		
pN0	66 (84.6)	66 (100)
pN+	12 (15.4)	NA
Histological grade		
Poorly differentiated	15 (19.2)	11 (16.7)
Others	56 (71.8)	48 (72.7)
Unknown	7 (9.0)	7 (10.6)
Adjuvant therapy		
Radiotherapy alone	16 (20.5)	10 (15.1)
Concurrent chemoradiotherapy	11 (14.1)	5 (7.6)
None	51 (65.4)	51 (77.3)

AJCC, American Joint Committee on Cancer; NA, not applicable.

<sup>a</sup> cN0, clinically node-negative status; cN+, clinically node-positive status.

<sup>b</sup> pT, pathological primary tumour categories.

<sup>c</sup> pN, pathological regional lymph node categories: pN0, pathologically node-negative status; pN+, pathologically node-positive status.

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