

Minimum Lymph Node Yield in the Elective Level I-III Neck Dissection

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ABSTRACT

Objective: Unlike lymphadenectomy at other sites, there is no discrete lymph node count defining an adequate neck dissection. The purpose of this study is to determine the minimum lymph node yield (LNY) of an elective level I-III neck dissection required to reliably capture any positive nodes present in these nodal basins.

Study design: Retrospective single institution analysis

Level of evidence: 4

Methods: All patients with the diagnosis of head and neck squamous cell carcinoma who underwent elective level I-III neck dissection between 2004-2015 at our institution were analyzed. Preoperatively, patients had no clinical or radiographic evidence of lymphadenopathy. Patients with unknown number of lymph nodes on pathology report were excluded. Age, gender, race, history of radiation, tumor subsite, stage, surgeon, LNY and number of positive nodes were recorded; bilateral neck dissections were reported separately.

Results: One hundred eighteen level I-III neck dissections met criteria and were included in the study. Mean lymph node yield was 21.15, and metastatic disease was present in 24.5% of cases with 8.4% of cases being N2. The highest portion of positive lymph nodes was present in the group with 18-24 lymph nodes (36%) which was significantly higher than the group with less than 18 (14.89%) ($p=0.044$).

Conclusion: Although there is no accepted minimum for LNY in the level I-III neck dissection, at least 18 nodes may be considered an adequate LNY. Such a yield reliably allows for capture of occult disease within these nodal basins.

INTRODUCTION

Presence of metastatic lymph nodes is an important prognostic factor in head and neck SCCA, decreasing survival by up to 50%¹. The modified radical neck dissection is generally indicated for clinically positive lymphadenopathy in head and neck SCCA². The elective neck dissection is indicated in the clinically node negative (cN0) neck for those with 15-20% risk of cervical metastasis^{3,4}. Elective level I-III (supraomohyoid) neck dissection is indicated for the majority of oral cavity SCCA, and select cutaneous SCCA with high-risk features due to the significant risk of occult nodal disease^{5,6}.

Extent of lymphadenectomy has been analyzed in other areas including colorectal, breast, bladder, penile, gastric and esophageal cancer, and a minimum LNY has been established which correlates with improved survival. Currently, there is no discrete lymph node count defining an adequate level I-III neck dissection; however, interest in LNY has recently increased in the field of otolaryngology. Our study focuses on patients with cN0 SCCA of the head and neck who underwent specifically elective level I-III neck dissection. The purpose of this study is to determine the minimum lymph node yield (LNY) of an elective level I-III neck dissection required to reliably capture any positive nodes present in these nodal basins.

METHODS AND MATERIALS

All patients with the diagnosis of head and neck squamous cell carcinoma who underwent cervical lymph node dissection between 2004-2015 with the Otolaryngology, Head and Neck Surgery department at the Ochsner Clinic Foundation where analyzed. Patient gender, race, age at time of procedure, date of procedure, prior radiation therapy, primary surgeon, and concurrent procedure performed were documented. The pathology reports were reviewed, and the levels dissected, the number of lymph nodes removed and the number of positive nodes were documented. Bilateral neck dissections were recorded separately.

Cases with unknown number of lymph nodes on the pathology report were excluded. Cases of primary squamous cell carcinoma of the paranasal sinuses or nasal cavity were also excluded from the study. Patients with clinically or radiographically positive lymphadenopathy preoperatively were excluded from the study. Only neck dissections of levels I-III were analyzed, which included patients with cutaneous, parotid, oral cavity and oropharyngeal SCCA. Lymph nodes removed from other basins (i.e. parotid) were not included in the LNY. All cases were restaged with the 2010 AJCC criteria, and tumor subsite was recorded.

The histopathological lymph node analysis technique remained the same over the length of the study. Every lymph node identified in the specimen was cut into a single section and analyzed with light microscopy after hematoxylin and eosin (H&E) staining. The shortest diameter of every node was measured. Multiple sections were analyzed for all lymph nodes greater than 4 mm in the shortest diameter. This is the standard H&E histopathological technique performed at our institution.

Specimens were stratified into LNY groups 1-9, 10-17, 18-25, 26-35 and greater than 35. Proportion of N0, N1, and N2 specimens were compared among the groups (Figure 1). Proportion of specimens with positive versus negative lymph nodes was then compared among the groups (Figure 2). Proportions of positive lymph nodes among groups were analyzed with two-tailed z-score tests.

RESULTS

One hundred eighteen level I-III neck dissections met criteria and were included in the study from 98 total patients. These patients were clinically N0 based on physical exam and preoperative CT scan. Twenty patients in the study underwent bilateral level I-III elective neck dissection. The mean (SD) lymph node yield was 21.15 (12.9), and metastatic disease was present in 23.73% of cases (28 specimens) with 10.17% of cases being N2 (12 specimens). Baseline data were comparable (Table 1); however, non-white race had a significantly higher percentage of positive lymph nodes and N2 disease ($p = 0.044$ and $p = 0.009$, respectively).

Patients with LNY greater than 35 had the highest percentage of N2 disease (21.05%); however, this was not significantly different from group with LNY 26-35 ($p = 0.478$). The highest proportion of positive lymph nodes was present in the group with 18-25 lymph nodes (36%) which was significantly higher than the two groups combined with less than 18 (14.89%) ($p=0.044$). Specimens with 18 or more lymph nodes had a significantly higher proportion of positive nodes compared to those with less than 18 ($p = 0.032$). LNY greater than 25 did not yield in a higher proportion of positive lymph nodes (Figure 2).

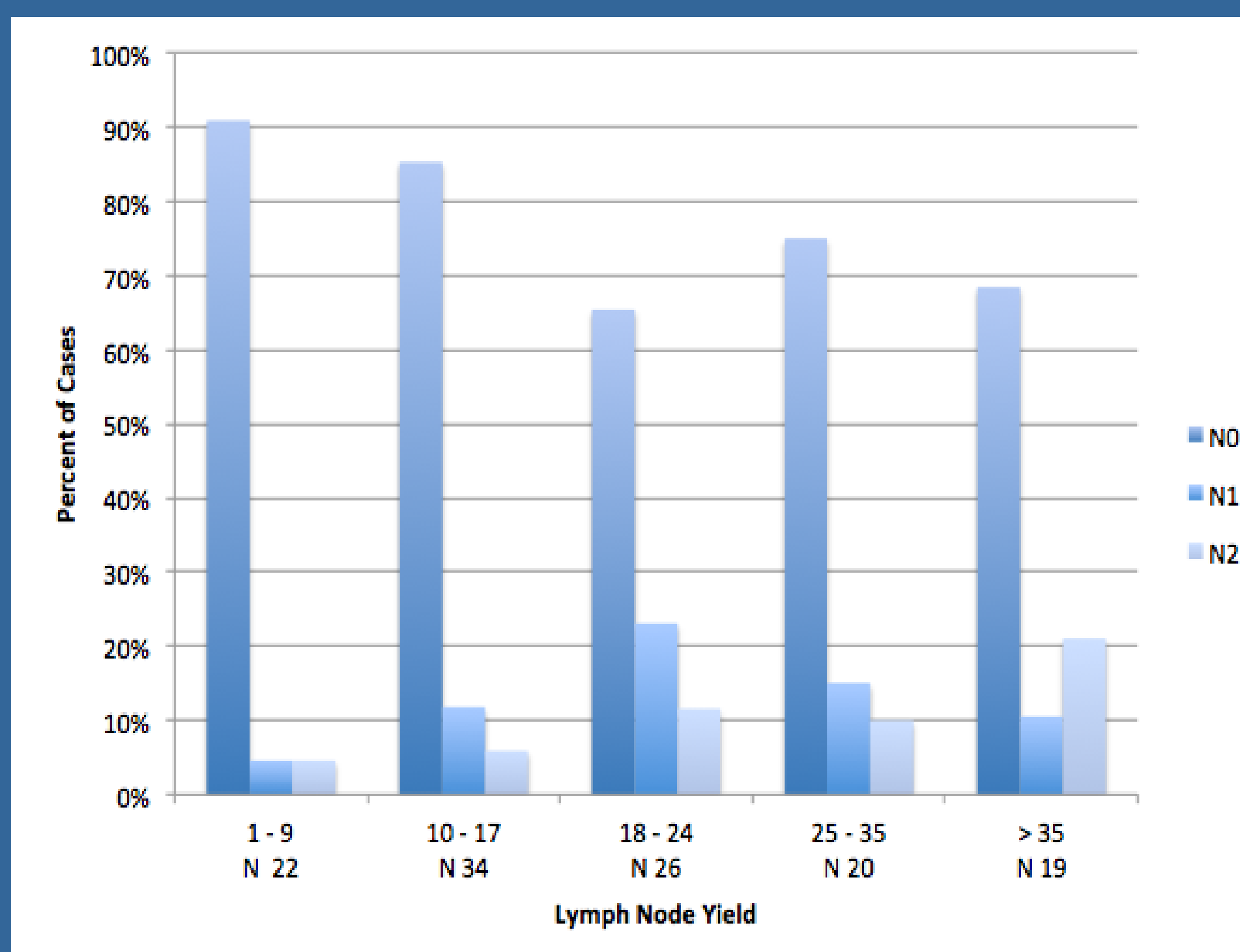


Figure 1. N stage by extent of nodal sampling in cN0 level I-III neck dissection

DISCUSSION

Lymph node metastasis is a crucial prognostic factor in patients with head and neck SCCA¹. Despite advances in diagnostic imaging, currently there are no imaging modalities capable of accurately detecting occult disease in the cN0 neck⁷. Cervical lymphadenectomy remains the gold standard for nodal staging in cN0 patients with high-risk head and neck SCCA^{3,4}. The accuracy of surgical staging in the cN0 neck depends on the number of lymph nodes removed and the sensitivity of the pathological methods for detecting occult metastatic disease⁶.

This is the first study to specifically analyze LNY in the level I-III neck dissection in cases of cN0 head and neck SCCA. A significantly higher proportion of occult metastatic disease was detected by our institution's standard microscopic histological analysis among specimens with 18 or more lymph nodes compared to those with less than 18 ($p = 0.033$). This demonstrates that LNY less than 18 in level I-III neck dissections may fail to capture occult metastatic disease, leading to understaging and, possibly, underutilization of crucial adjuvant treatment modalities. The proportion of positive disease did not increase with higher LNY groups, thus supporting the minimum nodal yield of 18, as proposed by recent investigators, to deem a level I-III lymphadenectomy adequate.

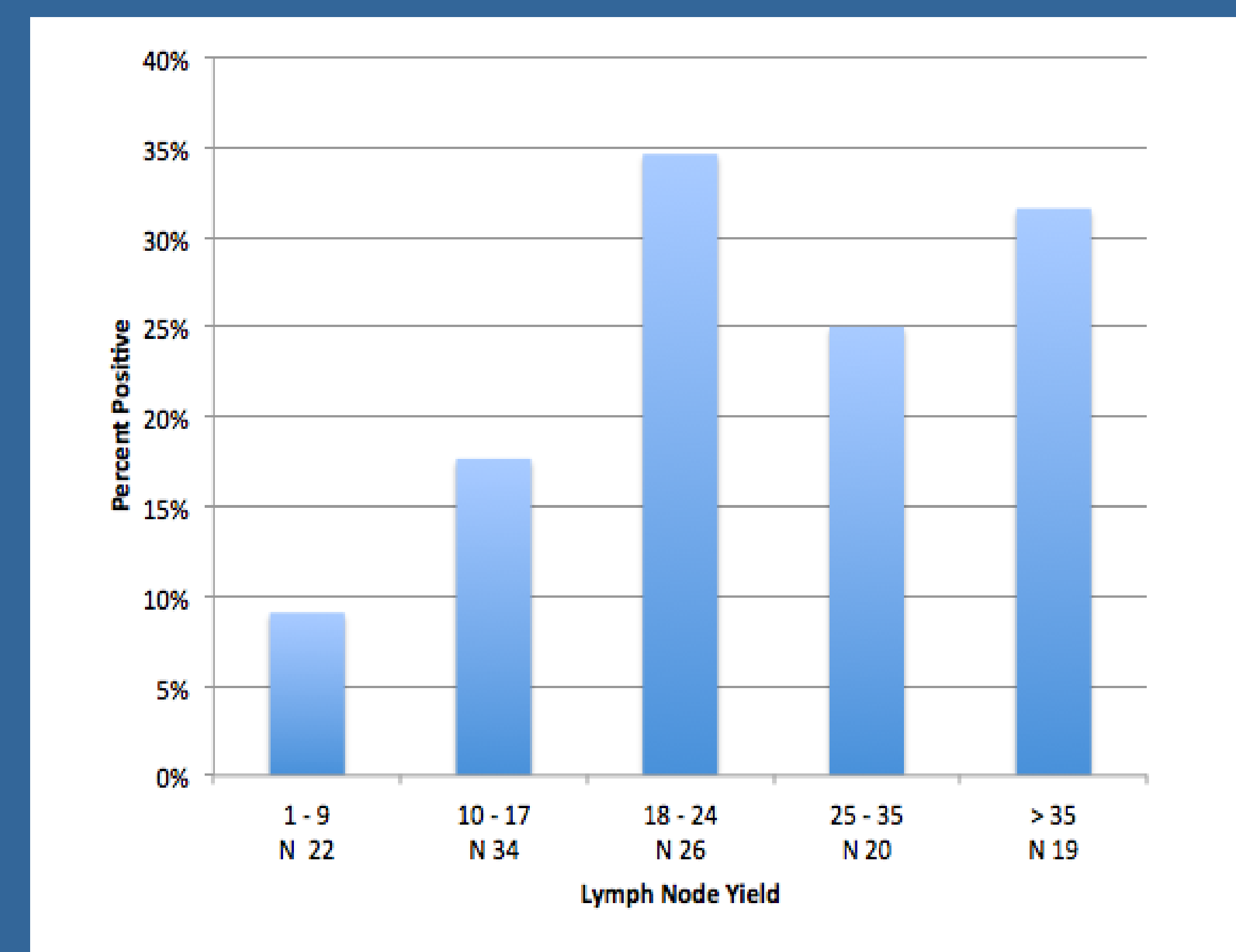


Figure 2. Proportion of N+ disease by number of nodes retrieved in cN0 level I-III neck dissection

Table 1. Baseline Data

	LNY	p value	N	N+ (percent)	p value	N2 (percent)	p value
Female	19.24	0.208	42	12 (28.57%)	0.358	4 (9.52%)	0.865
Male	22.37		76	16 (21.05%)		8 (10.53%)	
White	21.35	0.815	105	22 (20.95%)	0.044	8 (7.62%)	0.009
Non-white	20.46		13	6 (46.15%)		4 (30.77%)	
Age >55	20.43	0.160	95	22 (23.16%)	0.764	9 (9.47%)	0.61
Age <= 55	24.65		23	6 (26.09%)		3 (13.04%)	
Prior XRT	17.92	0.146	25	8 (32.00%)	0.271	4 (16.00%)	0.276
No XRT	22.15		93	20 (21.51%)		8 (8.6%)	
Oral cavity	21.06	0.528	85	19 (22.35%)	0.541	10 (11.76%)	0.324
Oropharynx	16.5		6	2 (33.33%)		1 (16.67%)	
Cutaneous	22.93		27	7 (25.93%)		1 (3.70%)	
T1	22.59	0.586	29	8 (27.59%)	0.231	3 (10.34%)	0.273
T2	20.04		53	10 (18.87%)		5 (9.43%)	
T3	19.68		22	6 (27.27%)		3 (13.64%)	
T4	26.36		11	3 (27.27%)		1 (9.09%)	
Tx	22.67		3	1 (33.33%)		0 (0%)	

CONCLUSIONS

Although there is no accepted minimum for LNY in the elective level I-III neck dissection, at least 18 nodes may be considered an adequate LNY. Such a yield reliably allows for capture of occult disease within these nodal basins. Further investigation is necessary to establish if incorporation of a minimum LNY in the level I-III lymphadenectomy will improve clinical outcomes.

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