DISTRIBUTION OF CERVICAL LYMPH NODE METASTASES FROM SQUAMOUS CELL CARCINOMA OF THE UPPER RESPIRATORY AND DIGESTIVE TRACTS

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The records of 2,044 patients with previously untreated squamous cell carcinomas of the head and neck were reviewed in order to define the incidence and topographical distribution of lymph node metastasis on admission. The common regions of metastasis are presented for each of the seven individual head and neck sites selected for study. Knowledge of the preferred areas of spread and those that are almost never involved allows the design of more adequate plans to manage the individual lesions.

THE PURPOSE OF THIS REPORT IS TO DEFINE the incidence and topographical distribution of lymph node metastasis on admission in patients with squamous cell carcinomas of the major anatomical sites of the upper respiratory and digestive tracts.

CLINICAL MATERIAL

The records of 2,044 patients with previously untreated squamous cell carcinoma of the head and neck, seen from 1948 through 1965 at The University of Texas at Houston M. D. Anderson Hospital and Tumor Institute, were reviewed. Seven major head and neck regions were studied: oral tongue, floor of mouth, faucial arch, oropharynx proper, supraglottic larynx, hypopharynx, and nasopharynx. The nodal staging system (Table 1) has been used since the mid-1950's. A "clinically positive" lymph node is usually greater than 1 cm, spherical rather than a flat ovoid, and harder than the nonmetastatic lymph node.

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INCIDENCE OF NECK DISEASE BY ANATOMICAL SITE AND T STAGING

The incidence of cervical node metastasis on admission increases sharply as the size of the primary increases in lesions of the oral tongue, floor of mouth, retromolar trigone/anterior faucial pillar (RMT-AFP), and soft palate (Tables 2 and 3). The frequency of multiple unilateral as well as bilateral and/or fixed node metastases also increases with the size of the primary for the same sites. The incidence of multiple nodal metastases in lesions of the tonsillar fossa, base of tongue, supraglottic larynx, and hypopharynx is not strongly correlated with the staging of the primary. This lack of correlation reflects the aggressiveness of the primary lesions. In oropharyngeal wall lesions, even though the incidence of metastases relates well to the increasing T stage, the multiplicity of nodes is not as strongly related. The incidence of T_4N_0 lesions of the supraglottic larynx appears disproportionately high (Table 4). A lesion is classified T_4 because of the local extension, i.e., pre-epiglottic involvement. The bulk of

TABLE 1. Nodal Staging System

N_0	No clinically positive node.
N_1	Single clinically positive node $\leq$ 3 cm in diameter.
N_{2A}	Single clinically positive node $>$ 3 cm in diameter.
N_{2B}	Multiple clinically positive ipsilateral nodes.
N_{3A}	Unilateral fixed node (s) clinically positive.
N_{3B}	Clinically positive bilateral nodes, fixed or not fixed.

TABLE 2. Per cent of Nodal Metastasis by T Stage* Squamous Cell Carcinoma, 1948 through 1965

		N_0	N_1	N_{2-3}
Oral tongue	T_1	86	10	4
	T_2	70	19	11
	T_3	52.5	16.5	31
	T_4	23.5	10	66.5
Floor of mouth	T_1	89	8.7	2.3
	T_2	71	18.5	10.5
	T_3	56.5	20	23.5
	T_4	46.5	10.5	43

* T_1—Tumor measuring 2 cm or less in largest diameter.
T_2—Tumor measuring from 2 cm to 4 cm in largest diameter with or without minimal infiltration in depth or extension to adjacent structures.
T_3—Tumor measuring more than 4 cm in largest diameter. *Oral tongue:* up to one half of the tongue may be involved; *Floor of mouth:* fixation to the periosteum or pressure defect in bone.
T_4—More advanced than T_3. *Oral tongue*: involvement of more than one half of the tongue and/or massive extension into the floor of mouth, with or without involvement of the mandible; *Floor of mouth:* massive invasion of root of tongue.

cancer may be the same in T_3 and T_4 lesions, which explains the apparent discrepancy. In nasopharyngeal lesions, the percentage of patients with nodal metastasis is really the same for all stages of the primary lesion, again reflecting the aggressiveness of small primaries (Table 4).

TOPOGRAPHICAL DISTRIBUTION

Analysis of the 1,155 patients (57% of the 2,044) who presented with clinical evidence of cervical node metastasis on admission was undertaken to determine the topographical distribution of the nodal metastases. Each side of the neck is divided into nine nodal regions (Fig. 1):

1. Submental nodes are located in the triangle bounded by the anterior bellies of the digastric muscles and the hyoid bone.

2. Submaxillary triangle nodes lie along the lower border of the mandible in the submaxillary triangle and are divided into three groups—preglandular, prevascular, and retrovascular.

3. Subdigastric nodes are located below the posterior belly of the digastric muscle to the level of the greater cornu of the hyoid bone, and include the upper jugular nodes as well as the tonsillar node.

4. The midjugular node is usually a single node at the bifurcation of the common carotid just below the hyoid bone.

TABLE 3. Per cent of Nodal Metastasis by T Stage* Squamous Cell Carcinoma, 1948 through 1965

		N_0	N_1	N_{2-3}
RMT-AFP	T_1	88.5	2.5	9
	T_2	62.5	18	19.5
	T_3	46	21	33
	T_4	32.5	17.5	50
Soft palate	T_1	92	0	8
	T_2	63.5	12	24.5
	T_3	35	26	39
	T_4	33	11	56
Tonsillar fossa	T_1	29.5	41	29.5
	T_2	32.5	14	53.5
	T_3	30	18	52
	T_4	10.5	13	76.5
Base of tongue	T_1	30	15	55
	T_2	29	14.5	56.5
	T_3	25.5	23	51.5
	T_4	15.5	8.5	76
Oropharyngeal walls	T_1	75	0	25
	T_2	70	10	20
	T_3	33	22.5	44.5
	T_4	24	24	52

* Defined in: MacComb, W. S., and Fletcher, G. H.: Cancer of the Head and Neck. Baltimore, Williams and Wilkins, 1967; p. 185.

5. Low jugular nodes are located along the internal jugular vein just above the anterior belly of the omohyoid muscle.

6. Upper posterior cervical nodes lie at the upper end of the spinal accessory chain. The uppermost node is beneath the sternocleido-

TABLE 4. Per cent of Nodal Metastasis by T Stage Squamous Cell Carcinoma, 1948 through 1965

		N_0	N_1	N_{2-3}
Supraglottic larynx*	T_1	61	10	29
	T_2	58.5	16	25.5
	T_3	35.5	25	39.5
	T_4	41	18	41
Hypopharynx†	T_1	37	21	42
	T_2	30.5	20.5	49
	T_3	21	25.5	53.5
	T_4	26.5	15	58.5
Nasopharynx‡	T_1	7.5	11	81.5
	T_2	15.5	12.5	72
	T_3	11.5	9	79.5
	T_4	17.0	5.5	77.5

* T Stage defined in: Fletcher, G. H., Jesse, R. H., Lindberg, R. D., and Koons, C. R.: The place of radiotherapy in the management of the squamous cell carcinomas of the supraglottic larynx. *Am. J. Roentgen.* 108:19–26, 1970
† T Stage defined in: MacComb, W. S., and Fletcher, G. H.: Cancer of the Head and Neck. Baltimore, Williams and Wilkins, 1967; p. 232.
‡ T Stage defined in: Chen, K. Y., and Fletcher. G. H.: Malignant tumors of the nasopharynx. *Radiology* 99: 165–171, 1971.

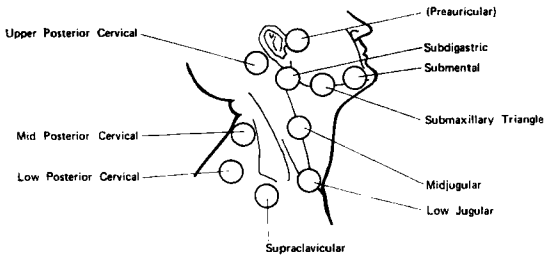


FIG. 1. Nodal regions of the neck.

mastoid muscle at the tip of the mastoid process.

7. Midposterior cervical nodes include those of the spinal accessory chain at the same level as the midjugular nodes.

8. Low posterior cervical nodes are located at the lower end of the spinal accessory chain.

9. Supraclavicular nodes are located just above the clavicle in the transverse lymphatic chain which connects the jugular and spinal accessory chains.

The nodal distribution and the N stage on admission are shown for oral tongue and floor of mouth (Fig. 2), retromolar trigone/anterior faucial pillar, soft palate, and tonsillar fossa (Fig. 3), base of tongue and oropharyngeal walls (Fig. 4), and supraglottic larynx, hypopharynx, and nasopharynx (Fig. 5).

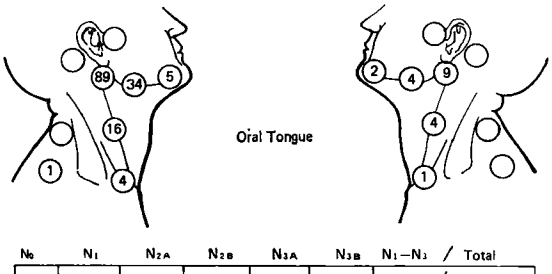
An analysis of the initial lymph node distribution shows the following:

1. *Oral tongue:* Subdigastric nodes are the most commonly involved. After the nodes of the submaxillary triangle, the midjugular nodes are next. Submental, low jugular, and posterior cervical nodes are seldom involved.

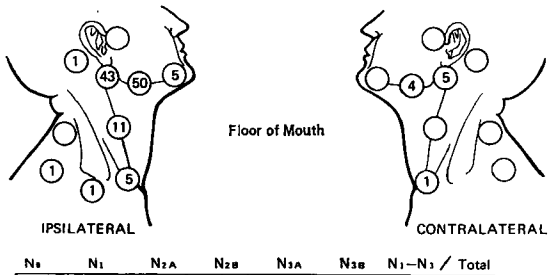
2. *Floor of mouth:* The nodes of the submaxillary triangle are most commonly involved because of the anterior location of the majority of lesions. Subdigastric nodes, however, are also frequently involved. Submental nodes are not frequently involved, in spite of the anterior location of the tumors. Low jugular and posterior cervical nodes are rarely involved.

3. *Oropharynx:* Metastases from primary lesions of the oropharynx have some common locales. Subdigastric nodes are most commonly involved in all sites. The nodes of the submaxillary are seldom involved, and clinically positive submental nodes are rare.

a. RMT-AFP. The most commonly affected node is the tonsillar node in the subdigastric group. Because of the anterior location of the

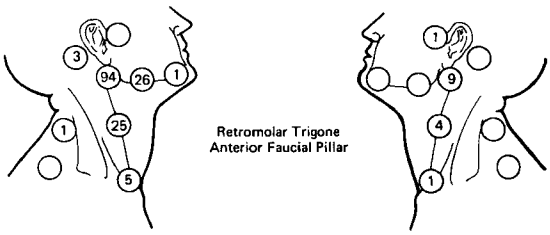


N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
197	40	9	32	8	16	105 / 302=35%

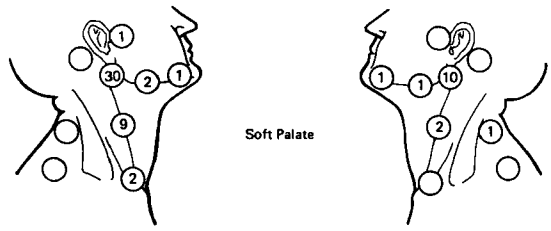


N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
179	38	4	17	9	11	79 / 258=30.5%

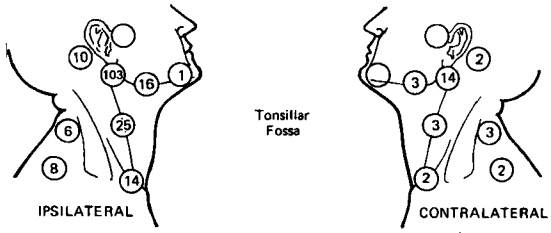
FIG. 2. Nodal distribution on admission, 1948 through 1965.



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
125	38	15	34	4	11	102 / 227 = 45%



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
45	12	2	4	4	13	35 / 80 = 44%



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
34	25	20	28	17	16	106 / 140 = 76%

FIG. 3. Nodal distribution on admission, 1948 through 1965.

RMT-AFP in the oropharynx, the incidence of metastasis in the submaxillary triangle is significant. Midjugular nodes are equally involved. Posterior cervical nodes are rarely involved.

b. Soft palate. Since this is a midline structure, the incidence of bilateral nodes is high. Upper jugular nodes are most frequently involved.

c. Tonsillar fossa. The tonsillar node of the subdigastric group is almost always the first one to be involved. The incidence of mid- and low jugular nodes is also significant. Metastasis to the posterior cervical nodes is common, both ipsi- and contralaterally.

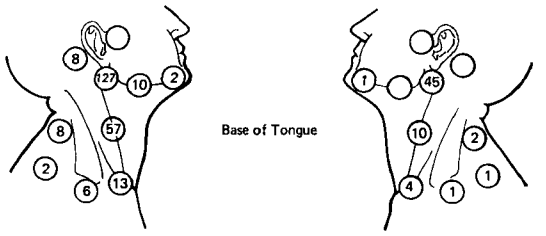
d. Base of tongue. Since the base of tongue is midline, bilateral metastases are quite common. After the subdigastric nodes, midjugular nodes are involved (bilaterally). A few patients present with posterior cervical nodes. Low jugular and supraclavicular nodes are rarely involved.

e. Oropharyngeal walls. The main spread is along the jugular chain bilaterally since the posterior pharyngeal wall is a midline structure. The upper jugular nodes in the subdigastric group are most commonly involved, followed by the midjugular nodes. The incidence of posterior cervical node involvement is high, whereas supraclavicular node involvement is rare.

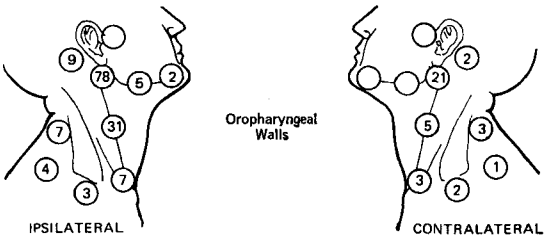
4. *Supraglottic larnyx:* Again, the main spread is along the jugular chain, and upper jugular nodes are most commonly affected, followed closely by midjugular nodes. Bilateral metastases are high from this midline structure. Posterior cervical nodes are seldom involved. Nodes of the submaxillary triangle and submental areas are almost never involved.

5. *Hypopharynx:* A large majority of metastases are to the jugular chain—upper, mid-, and lower, in decreasing frequency. Since most of these lesions arise in the pyriform sinus, the frequency of bilateral metastases is low. Ipsilateral posterior cervical nodes are occasionally involved. Submental and submaxillary triangle nodes are very rarely involved.

6. *Nasopharynx:* The most commonly involved ipsilateral and contralateral nodes are the upper jugular. Nasopharynx lesions have the highest incidence of bilateral metastases and posterior cervical chain involvement. The incidence of supraclavicular metastasis is significant. Submental and submaxillary nodes are rarely involved.

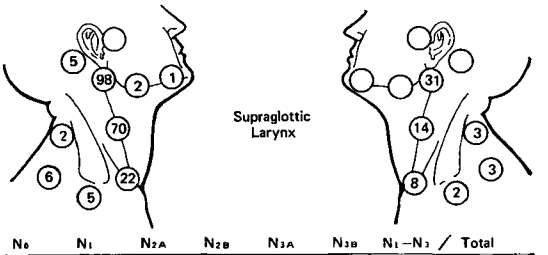


N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
41	30	21	26	14	53	144 / 185 = 78%

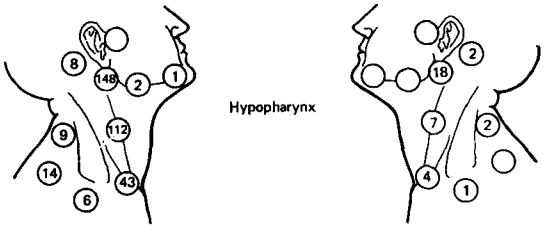


N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
61	27	5	23	8	25	88 / 149 = 59%

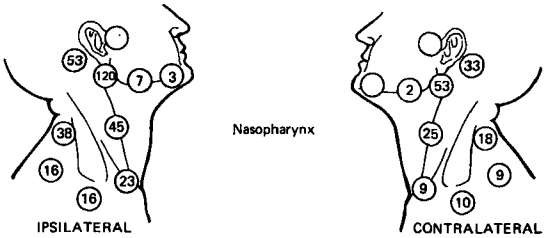
FIG. 4. Nodal distribution on admission, 1948 through 1965.



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
120	49	15	29	11	43	147 / 267 = 55%



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
65	51	27	45	51	28	202 / 267 = 75%



N_0	N_1	N_{2A}	N_{2B}	N_{3A}	N_{3B}	N_1–N_3 / Total
22	18	16	23	8	82	147 / 169 = 87%

FIG. 5. Nodal distribution on admission, 1948 through 1965.