Distribution of Metastatic Lymph Nodes in Oropharyngeal Carcinoma and Its Implications for the Elective Treatment of the Neck

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Objectives: To analyze the distribution of lymph node metastases in patients with oropharyngeal squamous cell carcinoma and improve the rationale for elective treatment of the neck.

Design and Setting: Retrospective cohort study of patients evaluated from 1990 to 1998 in a tertiary cancer care center.

Patients: The 81 consecutive patients who were identified from the hospital database. Patients were eligible for the study if they had a previously untreated squamous cell carcinoma of the oropharynx and histopathologically diagnosed lymph node metastases without a second primary tumor treated by an en bloc resection.

Main Outcome Measures: We analyzed the anatomic distribution of lymph node metastases.

Results: The clinical neck cancer stages were N0 in 22 cases, N1 in 22, N2a in 8, N2b in 14, N2c in 4, and N3 in 11. The most common sites for the metastases detected clinically as well as histopathologically were at levels II and III. Histologically, level I alone was involved in 5 cases and level IV alone was involved in none. Sixteen patients with N0 neck cancer stage underwent a radical neck dissection. There were 2 cases of metastases at level I and no level IV involvement.

Conclusions: Pathological lymph nodes in oropharyngeal squamous cell carcinoma are more frequent at level I than at level IV. This finding suggests that elective neck dissection for patients with oropharyngeal carcinoma should be a supraomohyoid neck dissection (levels I, II, and III) rather than a lateral neck dissection (levels II, III, and IV).


The presence of cervical lymph node metastases is the most significant prognostic factor in patients with squamous cell carcinoma of the upper aerodigestive tract. The 5-year survival rate in patients with neck metastases decreases according to the number and level of the nodes involved, and if capsular rupture is present. These findings confirm that the histologic status of lymph nodes correlates with long-term survival rates, and that treatment of the neck is crucial in the management of these patients.

Since Crile’s first publication on this topic in 1906, radical classic neck dissection has been the standard procedure at most institutions in the treatment of neck metastases from head and neck cancer. Since the 1950s, several modifications of this procedure have been introduced. They aim at achieving the same oncologic results as radical neck dissection while reducing morbidity, mainly in patients with minimal neck disease or with microscopic metastases and a clinically negative (cN0) neck. A large number of clinical series describe the preferred lymphatic drainage on the site of primary tumors and selective neck dissection in these patients. Unfortunately, since the usual treatment at several institutions is radiotherapy, recent histopathologic information about oropharyngeal carcinoma is not clear. The most significant information today being the series published by Lindberg in 1972, controversies still exist regarding the best elective neck dissection for the treatment of patients with oropharyngeal carcinoma and a cN0 neck who undergo initial surgical treatment. Shah, studying the patterns of lymphatic spread of head and neck tumors, suggests that a lateral dissection (neck levels II-IV, following the Memorial Sloan Kettering Cancer Center classification) should be the treatment option for these patients. On the other hand, Spiro et al and Byers et al recommend elective su-

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praomohyoid dissection (neck levels I-III) in patients with cN0 involvement who have oral and oropharyngeal tumors.

The main objective of this retrospective study was to analyze the distribution of lymph node metastases in oropharyngeal carcinoma to improve the rationale for elective neck dissection.

**METHODS**

This retrospective cohort study analyzed 81 consecutive patients identified from the database of a tertiary cancer care center—Hospital do Câncer A. C. Camargo in São Paulo, Brazil—from 1990 to 1998. Patients were eligible for the study if they had a previously untreated squamous cell carcinoma of the oropharynx with histologically confirmed lymph node metastases, but never had a second primary tumor treated by an en bloc resection.

Of the elective ipsilateral neck dissections performed in patients with cN0 involvement, 3 were supraomohyoid dissections, 3 were extended supraomohyoid dissections (level IV), and 16 were classic or modified radical dissections. Of the ipsilateral therapeutic neck dissections performed in patients with a clinically positive (cN+) neck, 24 were classic radical dissections, 25 were modified radical dissections, 9 were extended radical dissections, and 1 was an extended supraomohyoid dissection (level IV). Of the 19 contralateral neck dissections performed, 15 were elective (11 supraomohyoid dissections, 3 modified radical dissections, and 1 lateral dissection) and 4 were therapeutic (4 modified radical dissections). The pathologist dissected the lymph nodes prior to fixation, and lymph nodes were classified according to their distribution levels (levels I-V). Analysis of the distribution of the lymph node metastases was performed, and correlation of distribution and clinical and histopathologic status was established.

A total of 81 patients were selected, of whom 74 (91%) were men and 7 (9%) women, with a median age of 58 years (range, 27-78 years). The primary tumor sites were the tonsils (55 cases [68%]); base of the tongue (16 [20%]); vallecula (7 [9%]); and soft palate (3 [4%]). The T stages were as follows: T1 in 2 patients (2%), T2 in 21 patients (26%), T3 in 36 patients (44%), and T4 in 21 patients (26%). In 1 patient (1%) the stage was recorded as Tx because he had an excisional biopsy before initial consultation at the institution. The N stages were as follows: N0 in 22 patients (27%), N1 in 22 patients (27%), N2a in 8 patients (10%), N2b in 14 patients (17%), N2c in 4 patients (5%), and N3 in 11 patients (14%).

Regarding the metastatic distribution, there were 5 cases of clinically detected ipsilateral neck lymph nodes at level I, 55 at level II, 14 at level III, 2 at level IV, and none at level V. On clinical examination there were 2 cases of single neck level involvement at level I, 40 at level II, 2 at level III, and none at levels IV and V. Contralateral nodes were detected in 4 patients (3 at level II and 1 at levels II, III, and IV) (Table 1).

Histopathologic analysis revealed 9 cases of ipsilateral metastatic lymph nodes at level I, 73 at level II, 10 at level III, 9 at level IV, and 4 at level V. There were 5 cases of single neck involvement at level I, 59 at level II, and none at levels III, IV, and V. There were 7 contra-lateral metastatic lymph nodes at level II and 1 each at level III. Data and distribution according to the primary site are shown in Table 2. Patients with tonsil tumors presented metastatic lymph nodes predominantly at level II, but metastases were present at all other levels. In the 16 patients with base of tongue tumors, levels I to III were the sites of metastatic spread. Seven patients with vallecula tumors presented dissemination to lower levels of the neck, but none to level IV only. The 3 patients with soft palate tumors had metastatic lymph nodes involved at levels I and II only.

Histopathologic evaluation of the 22 patients with a cN0 neck showed that 4 patients (18%) had level I lymph node involvement and level I only, 16 patients (73%) had level II involvement, 1 patient (4%) had level II and III involvement simultaneously, and 1 patient (4%) had level III and IV involvement simultaneously. Histopathologic results showed that no patients had lymph node involvement at level V. In this same group 16 patients underwent a radical neck dissection, 3 patients underwent a supraomohyoid dissection that included levels I to III, and 3 patients underwent an extended supraomohyoid dissection that included levels I to IV. In the group of patients with a cN0 neck who underwent a radical neck dissection, level II was the most frequent site of metastatic spread. In 2 cases level I was the only one involved, and there were no cases of level IV or level V involvement. Of the 22 patients with a cN0 neck, 16 received postoperative radiotherapy. At the end of these patients' follow-up period, which ranged from 1 to 109 months (median, 26 months), 3 ipsilateral recurrences were diagnosed at level II and 1 at levels III and IV. These 4 patients who experienced metastatic recurrences were all in the group of patients with a cN0 neck who had had radical neck dissection, and 3 of them, including the patient with failure at levels III and IV, had received postoperative radiation therapy. No recurrences of metasta-
Table 2. Distribution of Pathological Lymph Node Metastases in Patients With Oropharyngeal Cancer and Its Relation With the Primary Site

<table>
<thead>
<tr>
<th>Metastatic Status and Levels</th>
<th>Tonsil</th>
<th>Tongue</th>
<th>Vallecule</th>
<th>Soft Palate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ipsilateral</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>5 (6)</td>
<td>3 (4)</td>
<td>1 (1)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>II</td>
<td>59 (73)</td>
<td>41 (51)</td>
<td>13 (16)</td>
<td>3 (4)</td>
</tr>
<tr>
<td>I+II</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II+III</td>
<td>4 (5)</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>II+IV</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III+IV</td>
<td>3 (4)</td>
<td>1 (1)</td>
<td>2 (2)</td>
<td>1 (1)</td>
</tr>
<tr>
<td>I+II+IV</td>
<td>2 (2)</td>
<td>1 (1)</td>
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<td></td>
</tr>
<tr>
<td>I+II+V</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II+III+IV</td>
<td>2 (2)</td>
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<td></td>
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<tr>
<td>II+III+V</td>
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</tr>
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<td>Total</td>
<td>81 (100)</td>
<td>55 (68)</td>
<td>16 (20)</td>
<td>7 (9)</td>
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<table>
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<th>Contralateral</th>
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<tr>
<td>N0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>7 (9)</td>
<td>2 (2)</td>
<td>3 (4)</td>
<td>2 (2)</td>
</tr>
<tr>
<td>II</td>
<td>1 (1)</td>
<td>1 (1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>III</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Total</td>
<td>81 (100)</td>
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</table>

It is now accepted that understanding the metastatic patterns of the neck lymph node in head and neck cancer is of paramount importance. It allows to choose the proper neck dissection, to indicate or not adjuvant radiotherapy, and to better envisage the prognosis of the patient.1-4,13 Unfortunately, most data available on oropharyngeal cancer are based on anatomic studies17 or on clinical series of patients with squamous cell carcinoma.12

Spiro,1 Ali,18 Kowalski,19 and their coworkers reported that the results of clinical neck evaluation are approximately 10% to 30% false-positive or false-negative. This emphasizes the need to better determine clinical neck cancer stages preoperatively, with more sensitive diagnostic tools such as computed tomographic scans, magnetic resonance imaging, or cytologic exploration by ultrasound-guided fine-needle aspiration. Shoaib et al4 reported that computed tomographic scans and magnetic resonance imaging provide an accuracy of approximately 70%; this is not markedly superior to the efficacy of clinical evaluation, and cannot be used to contraindicate elective neck treatment. In recent years, reports from Europe have shown that cytologic examination by ultrasound-guided fine-needle aspiration is the most sensitive method of detection of occult metastatic cancer in the neck (with a sensitivity of 76%, a specificity of 100%, and an accuracy of 89%).20 The main objection to the use of this method is that it requires expertise, experience, and personal involvement, which cannot be available worldwide. The identification of sentinel lymph nodes is still under investigation and most results are controversial.2,21 Thus, the gold standard for the identification of lymph node metastasis in the neck is still a selective neck lymph node dissection.2,4,22

The classic dissection of neck levels I to V as proposed by Crile,7 or the modifications preserving the accessory nerve, internal jugular vein, and/or sternomastoid muscle, have been the clinical treatments of choice for metastatic neck disease. In our study, this therapeutic neck dissection was also the first option in patients with a cN0 neck in whom a probability of occult neck metastasis was higher than 20%; over the last 30 years, however, a selective neck dissection has been considered the standard procedure. Contrary to classic or modified radical neck dissections, selective neck dissections preserve all nonlymphatic structures as well as I or more of the lymphatic groups of the neck. Radiotherapy of the neck in patients with cN0 involvement is also an option, especially when it is the selected treatment for the primary tumor. The “wait and watch” policy could be another possibility, but the results of salvage treatment after diagnosis of a regional recurrence are then usually poorer than those of the elective options.23-25

It is well established that oropharyngeal carcinomas have a high probability (up to 50%) to disseminate to the neck.4,22 There is almost no controversy regarding the treatment options of clinically evident neck metastases: they are classic or modified radical neck dissection, and postoperative radiotherapy. The reported rate of occult metastases in patients with a cN0 neck is approximately 35%, independent of the initial clinical stage of the tumor.9,13,18 These findings strongly suggest that all patients with oropharyngeal carcinoma should undergo treatment of the neck, but there is no consensus in the literature about the type of dissection that should be used. In their published studies about the patterns, detected histopathologically, of metastatic spread from head and neck cancer, Byers et al,9 Candela et al,11 and Shah1 show a preferential dissemination of oropharyngeal cancer to levels II to IV. This suggests that the selective dissection should be of the lateral or jugular nodes, which are located at levels II to IV. On the other hand, Spiro et al17 and Byers et al,16 analyzing patients who underwent supraomohyoid neck dissections, which included levels I to III, showed that this is a valid procedure for the treatment of patients with a cN0 neck and oral or oropharyngeal cancer.

The guidelines of the American Head and Neck Society suggest that neck dissection or neck irradiation should be performed in patients with oropharyngeal carcinoma, but they do not clearly define the exact type of neck dissection.26 Nor do guidelines from the US National Cancer Institute define which type of selective neck dissection would be the best option in the different cases because of a lack of consensus.27 In contrast, it is well established in the literature that in patients with a cN0 neck and oral squamous cell carcinoma, the surgical selective treatment of choice is the supraomohyoid dissection, either as a diagnostic or as a therapeutic proce-


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dure. A recent study also suggests that the supraomohyoid dissection could be safely indicated for patients with oral tumors and neck metastases staged cN1 at level I.

In the present study, single metastatic lymph nodes in specimens of neck dissections were found at levels I or II, but none at level IV. The 9 patients with metastasis at level IV also presented nodes at upper levels (Table 2). It is necessary to emphasize that metastases at level I, either isolated or in combination with metastases at other levels, were diagnosed in 9 cases. The involvement of levels I or IV were seen in tumors of the tonsil, the base of tongue, and the vallecula. If a lateral neck dissection (levels II-IV) had been performed in the 4 patients with a cN0 neck and single metastatic lymph node at level I, the precise staging would not have been achieved. On the contrary, if a supraomohyoid neck dissection had been performed, all cancers would have been correctly staged. Of course, the incidence of metastases at level IV was high and possibly should be have been included, and there were suspected or confirmed metastases at levels I to III. Besides, patients with a cN0 neck presented with isolated metastases at level IV. The only patient with a cN0 neck who had a metastatic lymph node at level IV also had a metastasis at level III. It is relevant to mention that if a supraomohyoid neck dissection had been performed, it would have allowed the identification of this lymph node and the micrometastatic disease could have been controlled with adjuvant radiotherapy.

Byers et al reported a regional recurrence rate of 1.9% in patients with pN0 involvement who were treated with a supraomohyoid neck dissection for oral and oropharyngeal carcinoma. Among patients with N1 and N2b necks the rates of regional recurrences were 5.6% and 8.3%, respectively, for those who had adjuvant radiotherapy, and 35.7% and 14.0%, respectively, for those who had surgery alone. These findings suggest that a selective neck dissection associated with adjuvant radiotherapy in oropharynx cancer patients with ipsilateral metastatic neck lymph nodes could be a sound therapeutic procedure that allowed for satisfactory staging. Although the retropharyngeal nodes are considered important echelons in the drainage of pharyngeal wall tumors, in our study we had no evidence of disease or recurrence at this site. Moreover, in patients who have adjuvant radiotherapy, the retropharyngeal nodes chain is routinely included in the radiation field.

Even if our results are based on a small cohort, they suggest that patients with base of the tongue carcinoma should have a supraomohyoid dissection, which includes neck levels I, II, and III, rather than a lateral dissection, which includes neck levels II, III, and IV. They also show that the extension of the dissection to level I could improve the pathologic staging of tonsil and vallecula tumors.

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REFERENCES