Accuracy of Computed Tomography in Determining the Presence or Absence of Metastatic Retropharyngeal Adenopathy

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Objective: To decide the accuracy of computed tomography in determining the presence or absence of metastatic retropharyngeal adenopathy in patients with squamous cell carcinoma of the head and neck.

Design: A comparison of the results of retrospective blinded review of preoperative computed tomographic scans with the histologic findings of retropharyngeal node dissection at the time of surgery.

Setting: Academic tertiary care center.

Patients: Twenty-six patients with advanced stage squamous cell carcinoma of the head and neck.

Main Outcome Measures: Computed tomographic findings and histologic results of retropharyngeal node dissection.

Results: The retropharyngeal nodes were pathologically positive for metastasis in 6 (23%) of the 26 patients. The radiologist (J.M.T.) correctly read the scan in 3 of 6 patients with histologically proved metastasis, and in 14 of 20 patients with histologic features negative for metastasis. The sensitivity of the radiologist reading was 50%, and the specificity was 70%. The positive predictive value was 33%, and the negative predictive value was 82%.

Conclusion: The presence of retropharyngeal node metastasis cannot be determined by computed tomographic imaging alone.

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PATIENTS AND METHODS

From October 1996 through February 1999, all patients with squamous cell carcinoma of the upper aerodigestive tract seen at the Head and Neck Clinic at Oregon Health Sciences University or the Portland Veterans Administration Medical Center, Portland, Ore, were considered eligible for this study. Patients who underwent preoperative CT scanning (with contrast) and subsequent excision of the cancer by a surgical approach that allowed for and included excision of the ipsilateral RPNs were enrolled in the study.

Information evaluated included age, sex, primary site of the cancer, clinical stage of the cancer, histologic features, prior history of cancer, prior therapeutic intervention, and pathologic findings. Preoperative neck CT scans were reviewed in a blinded fashion by a single radiologist specializing in head and neck imaging (J.M.T.).

TECHNIQUE OF RPN DISSECTION

Retropharyngeal lymph node excision is generally undertaken at the completion of the neck dissection and primary resection. With the exposure afforded by the neck dissection combined with mandibular osteotomy or mandibulectomy, the retropharyngeal plane is entered above the level of the posterior belly of the digastric and styloid muscle complex, hypoglossal nerve, and lingual artery. Division of these muscles and inferior displacement of the nerve and artery, while not mandatory, can facilitate the dissection. The retropharyngeal space is then progressively opened in a superior direction toward the base of the skull by division of the middle layer of the deep cervical fascia. There are usually several pharyngeal veins that cross this space, and these must be cauterized and divided. The pharyngeal wall is retracted medially, and the position of the internal carotid artery, which forms the lateral limit of the dissection, is identified by palpation. Opening of the fascia that sits between these 2 structures will identify a pad of lympho-fatty tissue that contains the RPNs. Excision of this pad begins inferiorly at the level of the root of tongue and progresses superiorly, taking advantage of the progressive downward retraction this affords. This technique also avoids accidental excision of the superior sympathetic ganglion that sits on the lateral aspect of this pad (and medial to the internal carotid). The ganglion is a fusiform swelling that tapers into the sympathetic chain inferiorly, whereas the RPN chain/pad tapers out at the level of the root of tongue. The internal carotid artery is closest to the retropharyngeal pad at the base of the skull, and care must be taken to ascertain its position as the highest cuts are made.

While mandibulotomy or mandibulectomy affords an exposure that allows this dissection most easily, it can also be accomplished in the case of pharyngectomy alone by division of the posterior belly of the digastric and styloid complex of musculature as well as the lingual artery. In this case, the hypoglossal nerve is retracted superolaterally and the superior laryngeal nerve inferiorly.

While there was no perioperative morbidity or increased dysphagia-associated RPN dissection in this series, the approach does necessitate division of a portion of the pharyngeal plexus and, therefore, should be applied bilaterally with great caution. Although not relevant to this series, in the rare instance in which bilateral RPN removal has been necessary, the second side is dissected by either a direct incision of the posterior pharyngeal wall overlying the nodes or using the lateral approach, where the internal carotid artery (and pharyngeal plexus) is retracted forward to expose the nodes. These approaches spare the pharyngeal plexus; however, both require more experience, as the exposure is more limited and the landmarks normally used to avoid injury to the internal carotid artery and sympathetic plexus are more difficult to find.

RADIOLOGIC EVALUATION OF RPNs

The CT scans used in this study were axial CT scans, with contrast taken at 5-mm intervals from the base of the skull to the clavicle. Where dental artifact was a problem, the area in question was rescanned with the CT gantry reoriented to minimize interference. Retropharyngeal lymph nodes were evaluated using criteria similar to those used elsewhere in the neck. A node was considered positive for metastatic disease if it was larger than 8 mm, contained abnormal density or enhancement (Figure), or was significantly asymmetric with respect to the contralateral side.7

RESULTS

Thirty-seven patients underwent RPN sampling during the study.

Eight patients had a history of head and neck squamous cell carcinoma, 6 were being treated for a second primary tumor, and 2 had recurrence of their disease. Ten patients had a history of head and neck radiation therapy. One patient underwent a magnetic resonance imaging scan rather than a CT scan and was excluded from the study. Seven CT scans were unavailable for review by the radiologist, leaving 29 patients in the study group. The mean patient age was 59.8 years (range, 31–84 years). Six patients (21%) were women, and 23 (79%) were men.

Retropharyngeal node tissue was confirmed histologically in 25 of these 29 patients. The average number of nodes obtained was 1.4 (range, 0–4 nodes). The number of nodes recovered in patients with a history of radiation therapy was similar to the number recovered in those without a history. The specimens from those without lymphatic tissue contained only fibroadipose tissue in 3 cases and nerve ganglion in 1. The ganglion tissue may have been a segment of the superior sympathetic ganglion removed inadvertently. The absence of nodal tissue was not considered a failure of the RPN operation, as in each case the entire area containing the RPN chain/pad had been dissected and the tissue removed. Rather, the absence of nodal tissue in some cases is believed to be consistent with the regression of RPNs that has been reported in some adults.7
Of these 29 patients, 3 had CT scans that were not interpretable by the radiologist due to technical factors, 2 because of excessive dental artifact and 1 because of a lack of intravenous contrast. The remaining 26 patients formed the final study group.

The locations of the primary tumors are as follows:

<table>
<thead>
<tr>
<th>Primary Tumor Site</th>
<th>No. (%) of Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonsil</td>
<td>11 (42)</td>
</tr>
<tr>
<td>Root of tongue</td>
<td>7 (27)</td>
</tr>
<tr>
<td>Posterior floor of mouth</td>
<td>3 (12)</td>
</tr>
<tr>
<td>Posterior oral tongue</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Soft palate</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Retromolar trigonum</td>
<td>1 (4)</td>
</tr>
<tr>
<td>Piriform fossa</td>
<td>2 (8)</td>
</tr>
</tbody>
</table>

*Percentages may not total 100 because of rounding.

Most tumors (19 [73%]) were located in the oropharynx, 5 (19%) were located in the posterior aspect of the oral cavity, and 2 (8%) were arising from the laryngopharynx. The clinical staging of these tumors is shown in Table 1. Most patients had stage IV disease. The surgical approaches used included mandibular osteotomy in 17 patients (65%), composite resection in 7 (27%), and laryngopharyngectomy in 2 (8%).

Six patients (23%) were found to have metastatic spread of squamous cell carcinoma to the RPNs. The primary site was the oropharynx in 5 patients and the oral cavity (retromolar trigonum) in 1. The staging of the tumors in these patients was T2 in 1, T3 in 1, and T4 in the remaining 4. Of the 6 patients, 5 had N2a or N2b neck disease and the last was clinically N0; the RPN positive for metastasis was the only metastatic node identified. The staging of those patients without an RPN positive for metastasis was similar, with 80% having stage T3 or T4 disease compared with 83% of those with an RPN positive for metastasis.

Contralateral neck dissection was performed in 9 patients, and in 2 ipsilateral RPN metastases were present. Four of the contralateral-level dissections contained metastatic tumor. One of the patients with RPNs positive for metastasis had contralateral neck disease (level 2), and one did not. Table 2 lists the comparative findings of the pathologic features and the radiologist's reading. The sensitivity for the radiologist's interpretation was found to be 50%, and the specificity was 70%. The positive predictive value was 33%, and the negative predictive value was 82%. Overall accuracy was 65%.

<table>
<thead>
<tr>
<th>Radiologic Findings</th>
<th>Positive for Metastasis</th>
<th>Negative for Metastasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive for metastasis</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Negative for metastasis</td>
<td>3</td>
<td>14</td>
</tr>
</tbody>
</table>

Four of the contralateral-level dissections contained metastatic tumor. One of the patients with RPNs positive for metastasis had contralateral neck disease (level 2), and one did not. Table 2 lists the comparative findings of the pathologic features and the radiologist's reading. The sensitivity for the radiologist's interpretation was found to be 50%, and the specificity was 70%. The positive predictive value was 33%, and the negative predictive value was 82%. Overall accuracy was 65%.

**COMMENT**

Little information exists in the literature regarding RPN metastasis. However, given the results of previous studies, which showed histologic evidence of RPN metastasis in 44% to 50% of patients with pharyngeal wall cancer and a poorer prognosis if it is present, it is clear that answers must be sought regarding the best way to detect and treat this group of nodes.

Metastasis to the RPNs is difficult to determine clinically. Unfortunately, suspicion of the presence of RPNs based on CT scan alone also does not appear to be particularly helpful, given a sensitivity of 50% and a positive predictive value of only 33%. If the CT scan does not show any evidence of RPN adenopathy, it is less likely that metastatic disease is present, given the specificity of 70% and the negative predictive value of 82%. This, however, is still a large margin for error. Whether magnetic resonance imaging or different CT criteria for nodal positivity in this location can improve radiologic detection of metastasis in this location remains to be seen and is the focus of an ongoing study.

While the available literature has suggested that patients with retropharyngeal metastasis may have a worse prognosis, radiologic criteria were used exclusively for the detection of metastases in that study. Retropharyngeal lymph nodes, even when positive for metastasis, are generally small (<1.5 cm) and perhaps for this reason escape radiologic detection in most cases. Data that link...
prognosis to RPN involvement based on radiologic criteria must, therefore, be interpreted with caution.

There is no convincing evidence to date that surgery (RPN dissection) improves survival or regional control vs the results achieved with radiation therapy alone, which is not surprising given the data that suggest a high rate of tumor control for small nodes (N0 and N1) with radiation therapy alone. Certainly for pharyngeal wall lesions, for which surgery is the primary treatment modality and adjuvant radiation therapy is not possible, these nodes need to be addressed, as the incidence of involvement is high and neither clinical nor radiologic criteria can be relied on to rule out involvement.

Although modern imaging techniques have significantly improved our ability to detect occult nodal disease in the cervical region, the results of this study would suggest that CT imaging is not effective in determining the presence of RPN metastasis.

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REFERENCES