Patterns of Lateral Neck Metastasis in Papillary Thyroid Carcinoma

Michael E. Kupferman, MD; Michael Patterson, BS; Susan J. Mandel, MD, MPH; Virginia LiVolsi, MD; Randal S. Weber, MD

Background: Although lymphatic metastasis does not affect overall survival for patients with differentiated thyroid carcinoma, locoregional control can be improved with cervical lymphadenectomy. The major morbidity of neck dissection (ND) for the management of regional metastases is spinal accessory (cranial nerve XI) dysfunction. To avoid this complication, some surgeons have advocated a limited ND.

Objective: To establish the patterns of lateral cervical metastases in differentiated thyroid carcinoma and the role of comprehensive ND, we performed a review of our experience with comprehensive ND.

Study Design: Retrospective chart review.

Patients and Methods: Between 1997 and 2002, a total of 39 consecutive patients (31 women and 8 men) underwent 44 NDs for the management of lateral cervical metastases. Preoperative cytologic analysis revealed papillary carcinoma in all 39 patients (100%). All specimens were labeled and mapped by the operating surgeon to identify each level. The incidence of positive disease was determined in relation to the extent of lymphadenectomy for all dissected levels.

Results: All patients underwent ND at levels II through V; 7 (17%) of the 44 ND specimens included level I nodes. The incidence of metastatic disease in level II nodes was 52% (23/44 specimens). Similarly, 25 specimens (57%) contained histologic metastases at level III. Metastatic disease was noted in 18 level IV nodes (41%) and 9 level V nodes (21%). One (14%) of the 7 specimens with level I nodes contained tumor.

Conclusions: Cervical metastases from papillary thyroid carcinoma occur in predictable patterns, with disease commonly present at levels II through V. We believe that a comprehensive ND, including removal of transverse cervical and spinal accessory nodes, is necessary for the complete clearance of lateral metastases.


Lymphatic metastasis develops in approximately 30% to 80% of patients with papillary thyroid carcinoma (PTC). The role of elective neck dissection (ND) for patients with PTC has not been clearly defined. Clinically evident pathologic nodes have been treated traditionally with a therapeutic ND, an en bloc resection of the cervical lymphatics. The reasons for performing a therapeutic ND in this setting include (1) regional control, (2) improved efficacy of radioactive iodine ablation of microscopic disease, and (3) the ability to monitor posttreatment serum thyroglobulin levels. It is debatable whether surgical treatment of lateral neck metastases increases overall survival.

The extent of surgical resection that is necessary for adequate removal of metastatic disease is controversial. Various procedures have been proposed for the treatment of malignant lymphadenopathy, including radical ND, modified radical ND, sentinel node biopsy, and selective lymph node excision. Bilateral NDs have also been advocated by some surgeons. There is no clear consensus regarding the appropriate levels of the neck that must be removed. Most surgeons recommend a modified radical ND, sparing the internal jugular vein, spinal accessory nerve (cranial nerve XI), and the sternocleidomastoid muscle. However, there are few data supporting this practice for the treatment of metastatic thyroid carcinoma.

Decisions regarding the extent of lymphadenectomy that is necessary for the treatment of regional metastasis from PTC should be made based on predictable drainage patterns. Although clinically relevant patterns of spread to lateral cervi-
Surgery was performed in all patients with PTC that had metastasized to the lateral neck lymph nodes. All patients were identified as having pathologic lymph nodes by either preoperative fine-needle aspiration or prior neck surgery. A total of 44 NDs were performed on 39 patients. Five patients required bilateral NDs. In 22 patients (56%), the pathologic analysis of the primary tumor revealed PTC. Eleven patients (28%) had the tall-cell variant of PTC, and 6 patients (15%) demonstrated the follicular variant of PTC (\textit{Figure 1}).

Previous treatment by another surgeon was common (51%). Thirteen patients (33%) underwent total thyroidectomy by another surgeon before ND. Neck dissection with thyroidectomy was previously performed in another 6 patients (15%), and ND alone was performed in 1 patient before presentation at our institution. Central ND and superior mediastinal dissection were simultaneously performed in 24 (62%) and 16 (41%) patients, respectively. Comprehensive ND, with removal of levels II through V, was performed in all patients. A review of the complications of ND among these patients will be published in a separate article.

An average of 44 lymph nodes were removed with each ND specimen, with a range of 19 to 92 nodes. The incidence of PTC metastases to lateral neck nodes was highest in level III, with 25 neck specimens (57%) demonstrating carcinoma at this nodal station (\textit{Figure 2}). Nodes at levels II and IV were also frequently involved with disease. Twenty-three pathologic specimens at level II (52%) and 18 pathologic specimens at level IV (41%) had metastatic foci. Although the lateral neck nodes frequently contained disease at all levels, only a small subset of all nodes removed were actually involved with disease. At level III, which demonstrated the highest incidence of metastasis, only 17% of the nodes contained foci of carcinoma. At other levels, the yield of metastatic nodes was even lower (\textit{Figure 3}).

Fourteen neck specimens (32%) contained disease at only 1 level; 2 were from patients who underwent bilateral NDs. There was an overall uniform distribution of involved levels among patients with single-level disease: level II, 5 specimens; level III, 3 specimens; level IV, 3 specimens; and level V, 3 specimens. Also, the ND specimens from 4 patients did not contain metastatic PTC on pathologic examination. One patient with central compartment disease was noted to have a primary cervical cyst excision before ND that demonstrated metastatic PTC on pathologic examination. One patient with central compartment disease was noted to have a
biopsy-proved metastatic 1-cm lymph node at the junction of levels IV and VI, with multiple subcentimeter nodes in the upper neck area that appeared suggestive of carcinoma on ultrasound. On pathologic examination, only the junctional node, which anatomically was in level VI, contained tumor. The remaining pathologically N0 neck specimens were from patients who had previously been treated for PTC with multiple surgical procedures and who had enlarging lateral cervical lymph nodes and central compartment nodes that harbored disease. One of these patients had a small node that was positive for cancer on fine-needle aspiration but was not found in the ND specimen; postoperative radioactive iodine therapy was administered, and the patient is currently free of disease.

**COMMENT**

It has been previously established that regional metastasis from PTC is most commonly found in the central compartment. These nodes are commonly treated with radioactive iodine when they are subclinical and by central compartment dissection when they are palpable. However, the management of lateral neck metastasis remains controversial.

There is ongoing debate about the appropriate management in cases involving nodal disease in patients with PTC. Data are contradictory regarding the prognostic significance of regional spread of disease to cervical and mediastinal lymph nodes. When the decision is made to treat regional metastases from PTC with surgery, there is no clear consensus on the appropriate surgical procedure to perform. The operations that have been advocated for this disease range from bilateral NDs to selective nodal excisions. The lack of adequate data in the literature on the patterns of spread of PTC to the cervical lymph nodes makes treatment decisions difficult for both the surgeon and the patient.

Sivanandan and Soo were the first to describe the lateral neck levels that are commonly involved in PTC. In their review of 75 patients with PTC who underwent therapeutic ND, level III nodes were the most common site for metastatic disease. Similar to our data, the jugular nodal stations (levels II-IV) were most commonly involved with disease. Posterior triangle nodes were also found to harbor pathologic nodes in a significant number of specimens. Pingpank et al reinforced the necessity of thoroughly dissecting all levels of the neck that may potentially be involved when cervical disease is present. In their recent review of 44 patients with lateral metastases from PTC, the most frequently involved nodal station was level III. Disease in the “submuscular recess” was present in a significant number of patients, a location in which many surgeons avoid dissection because of potential injury to the spinal accessory nerve. Although we do not make this distinction for our pathologists, we routinely dissect this region, as it can be a frequent site of disease.

We found a significant percentage of patients with single-level metastatic disease. While selective nodal excision may be considered by some surgeons to be an appropriate treatment for these patients, multilevel disease is encountered in most patients and must be addressed with comprehensive ND. Furthermore, most clinical or radiologic characteristics cannot detect the presence or absence of cervical metastases in thyroid carcinoma with absolute sensitivity and specificity before surgery. Thus, despite a high prevalence of metastases at a single level in our series, we do not advocate selective nodal excision for treatment in these cases.

**CONCLUSIONS**

Although many issues surrounding the management of metastatic thyroid carcinoma remain unresolved, this and other studies demonstrate the extent of surgery that is necessary to eradicate disease in the lateral neck area. Cervical metastases from PTC occur in predictable patterns, with disease commonly present at levels II through V. We believe that a comprehensive ND, including removal of transverse cervical and spinal accessory nodes, is necessary for the complete clearance of metastases.
REFERENCES