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Original contributions

Transcervical elective superior mediastinal dissection for thyroid carcinoma

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Abstract

Objectives: To review our results with elective superior mediastinal dissections for thyroid carcinomas.
Study design: Retrospective review.
Methods: We searched operative case logs for all patients with thyroid carcinoma treated with an elective superior mediastinal dissection by the senior author (Y.D.) during a 6-year period. Charts were reviewed for demographic information and pathologic results. Elective superior mediastinal dissections were performed when the frozen section was consistent with anaplastic or medullary carcinoma or with a well-differentiated carcinoma when there was fixation of the primary tumor to the laryngotracheal complex, there was overt clinically evident paratracheal and/or cervical adenopathy, or the primary tumor measured greater than 2.0 cm in dimension.
Results: Thirty-one patients meeting the above criteria were reviewed, and superior mediastinal disease was present in 19 patients (61.3%). Superior mediastinal nodes were positive in 13 (65%) of 20 patients with papillary carcinoma, 0 of 4 with follicular thyroid carcinoma, 4 of 5 patients with medullary thyroid carcinoma, and 2 of 2 patients with anaplastic thyroid carcinoma. Patients with follicular carcinoma had a lower incidence of mediastinal disease (0%) compared with nonfollicular thyroid carcinoma (70.4%), $P = .02$. Patients with cervical metastasis had an increased incidence of superior mediastinal disease (100% vs 53.3%).
Conclusions: Elective transcervical superior mediastinal dissection was commonly positive in patients with papillary, medullary, and anaplastic thyroid carcinomas. A transcervical approach may be safely performed without sternotomy to the level of the brachiocephalic vein. Further studies are required to determine if performing elective superior mediastinal lymph node dissections will have an impact on survival.

1. Introduction

Papillary and medullary thyroid carcinomas commonly develop regional lymphatic metastases. Nodal disease is associated with an increased risk of persistence of disease and recurrence with papillary thyroid carcinoma (PTC) that can significantly affect quality of life secondary to the need for further operations. There is conflicting data regarding the impact of regional metastases on survival with PTC [1-3]. However, with medullary thyroid cancer (MTC), nodal disease is clearly associated with a decreased prognosis [4-6].

The indications and extent of lymphatic dissection with thyroid carcinoma are not clearly defined. For differentiated thyroid carcinoma, Shaha [7] recommended dissection in clinically involved nodal levels. More aggressive guidelines have been reported by others in an effort to decrease local recurrence. Machens et al [8] recommended total thyroidectomy with dissection of level 6 and the ipsilateral lateral cervical compartments for papillary and medullary cancers greater than 10 mm without evidence of nodal disease. For reoperative cases, they also recommend contralateral neck

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dissections. A sternotomy and mediastinal dissection is performed for T4 MTC and for any clinical or radiographic mediastinal disease.

Regional metastases with thyroid carcinoma most commonly involve pre- and paratracheal lymph nodes (level 6) and lower jugular nodes [8,9]. Level 6 is defined laterally by the common carotid arteries, superiorly by the inferior border of the hyoid bone, and inferiorly by the superior sternal border [10]. Lymphatic tissue in the inferior portion of level 6 is in continuity with the superior mediastinum.

The goal of this study is to review our series of elective transcervical superior mediastinal dissections in patients with thyroid malignancies and no overt mediastinal adenopathy to evaluate the incidence of superior mediastinal disease.

2. Methods

We performed a retrospective review of patients with thyroid carcinomas who underwent elective transcervical superior mediastinal dissection in the setting of no overt mediastinal disease. Patients with a minimum follow-up of 6 months who were treated by the senior author (Y.D.) from March 1998 to October 2004 were reviewed for demographic data, histologies of the primary tumor, incidence of mediastinal nodal metastasis, and postoperative complications. Data were analyzed with SPSS 11.0 software (Statistical Package for the Social Sciences; SPSS Inc, Chicago, IL). This study was approved by the institutional review board (020408.003e).

All patients underwent total thyroidectomy and dissection of level 6 paratracheal lymphatic tissue. Lateral neck dissections were performed in patients with clinical or radiographic lymphadenopathy. Superior mediastinal dissections were performed transcervically without sternotomy in all patients. The boundaries of the dissection were the sternal notch superiorly, the common carotid arteries and brachiocephalic artery laterally, and the left brachiocephalic vein inferiorly. The superior mediastinal lymphatic tissue was excised en bloc and sent separately for pathologic evaluation. Elective superior mediastinal lymph node dissections were performed when the primary tumor appeared clinically fixed to the laryngotracheal complex, frozen section was consistent with medullary or anaplastic carcinoma, primary well-differentiated carcinoma was greater than 2.0 cm in dimension, and there was clinical evidence of overt cervical or paratracheal adenopathy.

3. Results

Thirty-one patients meeting the above criteria underwent elective transcervical superior mediastinal dissection that included 20 patients with papillary carcinoma, 4 with follicular carcinoma, 5 with medullary carcinoma, and 2 with anaplastic thyroid carcinoma. The mean age of patients was 53.4 years (median, 56.0 years; SD, 16.5; and range, 22–84 years). Twenty-one patients were women (67.7%), and 10 were men (32.3%).

Overall, superior mediastinal disease was present in 19 (61.3%) of 31 patients. Mediastinal disease was found in 13 (65%) of 20 patients with papillary carcinoma, 0 of 4 with follicular carcinoma, 4 of 5 patients with medullary carcinoma, and 2 of 2 patients with anaplastic thyroid carcinoma. Patients with follicular carcinoma had a significant lower incidence of superior mediastinal disease (0 [0%] of 4 patients) compared with the other carcinomas (19 [70.4%] of 27 patients; $P = .02$; Fisher exact test). There were no major or minor complications that occurred during the superior mediastinal dissections such as injury to major vessels or recurrent laryngeal nerves or pneumothorax.

Cervical lymphatic metastasis were present in 9 (29%) of 31 patients including 5 (25%) of 20 with papillary cancer, 0 (0%) of 4 with follicular cancer, 3 (60%) of 5 with medullary cancer, and 1 (50%) of 2 with anaplastic cancer. Patients with positive cervical nodes had a significantly higher incidence of superior mediastinal disease (11 [84.6%] of 13 patients) compared with patients without cervical metastases (8 [44.4%] of 15 patients; $P = .05$; Fisher exact test).

Extracapsular extension was present in 15 (48.4%) of 31 patients including 8 (40%) of 20 with papillary cancer, 2 (50%) of 4 with follicular cancer, 3 (60%) of 5 with medullary cancer, and 2 (100%) of 2 with anaplastic cancer. Patients with extracapsular extension had a higher incidence of superior mediastinal disease compared with patients without extracapsular extension, but it did not meet statistical significance.

The mean follow-up was 2.86 years (range, 6 months to 6 years). Twenty-seven (87.1%) of 31 patients have no evidence of disease at last follow-up. The patient with unresectable anaplastic carcinoma is currently alive with presumed disease involving the carotid sheath. One patient with medullary thyroid carcinoma with multiple cervical and mediastinal metastases has elevation of his calcitonin level 2.5 years postoperatively. Clinical examination and radiographic studies including computed tomography, magnetic resonance imaging, and positron emission tomography have been negative for recurrent tumor. One (3.2%) of 31 patients developed a regional recurrence. A 55-year-old man with PTC with positive cervical and superior mediastinal disease treated with postoperative radioactive iodine developed a recurrence in level 2, two years after treatment. The patient was treated with salvage neck dissection and radioactive iodine and has had no evidence of disease at follow-up of 1 year. There were no instances of new vocal cord paralysis postoperatively. Two patients had preoperative paralysis due to carcinoma. There were 2 patients with temporary hypocalcemia requiring supplementation. There were no instances of long-term hypocalcemia at 2 months postoperatively. Pathology review demonstrated a single parathyroid gland in the resected specimen in a total of 4 patients. Interestingly,

only one of these patients had temporary hypocalcemia. The other patient with temporary hypocalcemia had no parathyroids in the resected specimen.

4. Discussion

Lymph node metastases are common with papillary and MTC. Nodal disease was present in 90% of patients with papillary thyroid cancers in 1 series [9] and is present in 21% to 82% of clinically negative necks treated electively [11]. Lymphatic disease has been reported to be present in 55% of patients with MTC [8].

In our series, patients with cervical disease were found to have a significantly increased rate of mediastinal disease compared with patients with pathologically N0 necks. However, most series have reported a higher incidence of nodal disease in the central cervical compartment and lateral neck than in the mediastinum [8,9]. In a series of 21 patients with advanced thyroid cancer, Sugenoya et al [12] reported a 48.1% incidence of mediastinal disease. A partial sternotomy was performed to allow dissection to the level of the aortic arch. All 10 patients with mediastinal disease were found to have contralateral cervical disease compared with only 2 (18%) of 11 patients without mediastinal disease. They proposed that mediastinal metastases develop secondary to bilateral cervical disease that leads to downward lymphatic drainage into the upper mediastinum. However, skip metastases to the lateral neck or mediastinum with no nodal disease in the central compartment has been reported in 19.7% of PTC and 21.3% of MTC [13].

Several series have demonstrated that clinical and radiological evaluation of patients with thyroid cancer has a low sensitivity for detecting nodal disease. Sugenoya et al [12] evaluated patients preoperatively with computed tomography and T1-chloride scintigraphy and only identified 3 of 10 patients with mediastinal disease. Most positive mediastinal nodes were less than 1 cm. Noguchi et al [9] reported an overall 90% incidence of nodal disease in a series of 71 patients with PTC. Nodal disease was found for 82% of patients with no clinical evidence of lymphatic metastases. Most positive nodes (57%) were less than 3 mm. In our experience, most of the patients with ultimately positive elective superior mediastinal lymph node dissections had no overtly pathologic adenopathy noted in this compartment at the time of the dissection.

There is disagreement between centers on the approach to cervical lymphatics with differentiated thyroid cancer. Shaha [7] recommended neck dissection only for obvious or suspicious nodal disease. Despite the high incidence of occult nodal disease, he reported that occult metastasis does not affect prognosis and generally fails to grow. Hughes et al [2] also used Memorial Sloan-Kettering Cancer Center data to perform a matched pair analysis evaluating the impact of lateral node metastasis with differentiated thyroid cancer. Overall, there was no difference in overall 20-year survival with respect to node-positive and node-negative patients. However, in patients older than 45 years, nodal disease was associated with a lower survival rate of 79% compared with 90% for node-negative patients ($P = .056$) and a significantly increased risk of locoregional recurrence.

In contrast, Machens et al [8] routinely performed elective nodal dissection in a series of 296 patients with PTC or MTC. They followed guidelines proposed by the German Society of Surgery that recommend total thyroidectomy and elective dissection of the cervicocentral compartment for thyroid cancer, except for T1a N0 M0 stage cancers. The cervicocentral compartment (C1) includes paratracheal and paraesophageal lymphatic tissue from the level of the submandibular glands to the brachiocephalic vein. Cervicocentral nodes were positive in patients treated primarily in 32% of papillary cancers and 34% of medullary cancers. Nodal disease was found to correlate with an increased risk of recurrence for both PTC and MTC. They believe that elective dissection of the central compartment improves locoregional control and quality of life.

For MTC, it is widely accepted that elective nodal dissection is indicated, and the presence of lymph node metastases is the most important prognostic factor [4-6]. Shaha [7] recommended a thorough central compartment neck dissection with MTC extended to include levels 2 to 5 if lateral jugular nodes are enlarged. Dralle et al [5] reported improved biochemical cure rates in a series of 82 patients with MTC. By treating patients primarily with a compartment-oriented microdissection technique instead of selective lymphadenectomy, normalization of pentagastrin-stimulated calcitonin levels increased from 14% to 40%. The compartment-oriented microdissection technique involves en bloc removal of lymph node compartments with the use of magnification and was shown to improve survival in node-positive patients compared with selective lymphadenectomy.

In our series, elective transcervical superior mediastinal dissection was performed to the level of the brachiocephalic vein in 31 patients without complications. Given that elective superior mediastinal dissection yielded positive nodes in most patients with clinically aggressive carcinomas, it has the potential to decrease local recurrence. The procedure may be performed without sternotomy and routinely takes less than 15 minutes. In our series, none of the patients developed recurrent disease in the mediastinum. Long-term follow-up is necessary to determine whether elective superior mediastinal dissection has an impact on recurrence and survival with nonfollicular thyroid cancer.

5. Conclusions

Elective transcervical superior mediastinal dissection can be performed safely to the level of the left brachiocephalic vein without a sternotomy. Most clinically aggressive (because of size greater than 2.0 cm, fixation to laryngotracheal complex, overt cervical or paratracheal lymphadenopathy, or anaplastic

and medullary histology) nonfollicular thyroid carcinomas had superior mediastinal disease. Elective dissection of the superior mediastinum may help decrease locoregional recurrences. Further study is necessary to determine whether elective superior mediastinal dissection impacts long-term locoregional control and survival for nonfollicular thyroid cancers.

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