

Follicular thyroid carcinoma presenting as acute cord compression due to thoracic vertebral metastasis

Michael F. McNeeley, MD; Annette Sabath, MD; and Ken F. Linnau, MD

Thyroid carcinoma is uncommon but accounts for roughly 95% of all cancers of the endocrine system (1). The “well-differentiated” thyroid tumors include the papillary, follicular, and Hurthle cell subtypes. Although the management of these tumor types generally is similar, important diagnostic and clinical differences do exist (2). We present a case of follicular thyroid carcinoma with spinal metastasis, illustrate its imaging features on CT and MR imaging with histologic correlations, and discuss how vertebral osseous metastasis may influence clinical management of patients with differentiated thyroid cancer.

Case report

An 88-year-old female presented to the Emergency Department complaining of acute-on-chronic back pain and progressive, bilateral, lower-extremity numbness and weakness for approximately three weeks. The patient endorsed a history of hypertension, osteoporosis, and long-standing compression fractures involving multiple thoracolumbar vertebrae. The patient had been in her usual state of health, ambulating with a walker and living independently, but over the 2 to 3 weeks before presentation began experiencing episodes of radicular pain radiating down both legs, with multiple falls from standing. When her weakness increased to the point where she was no longer able to walk, she was compelled to seek medical attention.

On physical examination, she was alert and oriented. She had full motor strength in her upper extremities. However, she could flex her lower extremities only against gravity, not



Figure 1. 88-year-old female with follicular thyroid carcinoma. Contrast-enhanced sagittal CT shows a rounded soft-tissue lesion (arrow) of the midthoracic spine with destruction of the T9 vertebral body and associated focal kyphosis. The T8 and T10 vertebrae demonstrate severe height loss and sclerosis.

against added resistance. Sensation was intact at all points tested.

She was fitted with a thoracolumbar sacral orthosis (TLSO) brace, and intravenous corticosteroids were administered.

CT of the thoracolumbar spine revealed a large (7.0 x 5.5 x 3.0 cm) enhancing lesion involving the T8, T9, and T10 vertebral bodies (Fig. 1). The T9 vertebral body was largely destroyed, with only the spinous process remaining. The T8 vertebral body showed greater than 70% height loss, and T10 approximately 10% height loss. Fracture kyphosis of 47 degrees was measured at T9-10. Subsequent gadolinium-enhanced MR imaging demonstrated extensive

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Drs. McNeeley and Linnau are in the Department of Radiology at the University of Washington and Harborview Medical Center, and Dr. Sabath is in Pathology at Group Health Cooperative, all in Seattle WA. Contact Dr. McNeeley at mcneeley@u.washington.edu.

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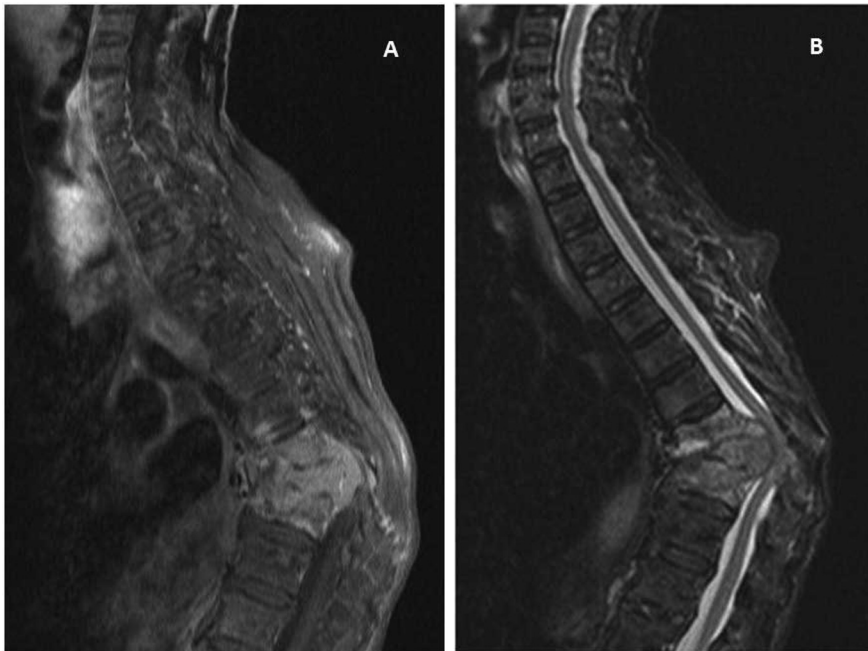


Figure 2. 88-year-old female with follicular thyroid carcinoma. Sagittal T1WI sequence with fat suppression and gadolinium contrast (A) demonstrates enhancement of the destructive lesion involving the T8 through T10 vertebrae. Sagittal STIR sequence (B) shows severe effacement of the central canal with posterior displacement of the spinal cord. No definite cord signal abnormality is identified.

vertebral marrow infiltration by enhancing tumor (Fig. 2). There was severe effacement of the central canal and of both neuroforamina at T9-10, with marked displacement but no significant cord flattening or signal abnormality (Fig. 2).

Accompanying contrast-enhanced CT of the chest, abdomen, and pelvis revealed a 1.1-cm pulmonary nodule in the right lower lobe, with smaller nodules scattered

throughout both lungs. Also present was a complex, multiseptated nodule arising from the inferior aspect of the left thyroid lobe measuring 2.8 x 2.8 x 3.0 cm (Fig. 3).

The patient was evaluated emergently by the orthopedic and neurosurgical services. Due to her advanced age and comorbidities, she was felt to be a poor candidate for neurosurgical decompression/stabilization. To guide nonoperative management, a CT-guided biopsy of the vertebral lesion was performed under conscious sedation.

The needle-core biopsy consisted of micro- and normofollicular tissue with follicles containing homogeneous material, histologically indistinguishable from that of an adenoma or a non-neoplastic thyroid (Fig. 4). The tissue's expression of Thyroid Transcription Factor 1 and Thyroglobulin (Figs. 5 and 6, respectively) confirmed its thyroid immunophenotype, sealing the diagnosis of metastatic thyroid follicular carcinoma. A serum thyroglobulin level measured 8388.5 ng/mL.

The radiation oncology service was consulted, and the patient underwent hypofractionated external-beam radiotherapy for palliative intent. The T7-

T11 spine levels were treated using a single 18MV postero-anterior field. CT-based planning and multileaf collimators were used to shape the beam. She received a dose of 2000 cGy, delivered in 5 fractions over 5 days. She was treated prone due to discomfort when lying on her back. She also was maintained on oral dexamethasone, which was tapered prior to discharge. She tolerated this therapeutic process without significant adverse sequelae.

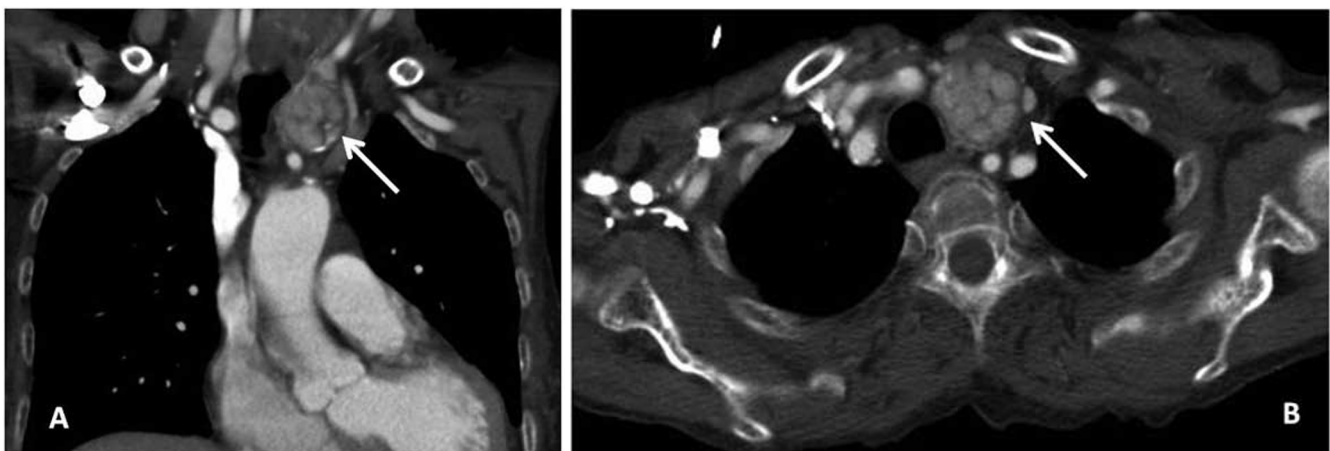


Figure 3. 88-year-old female with follicular thyroid carcinoma. Coronal (A) and axial (B) contrast-enhanced CT demonstrates a complex, multiseptated nodule (arrows) arising from the inferior aspect of the left lobe of the thyroid gland.

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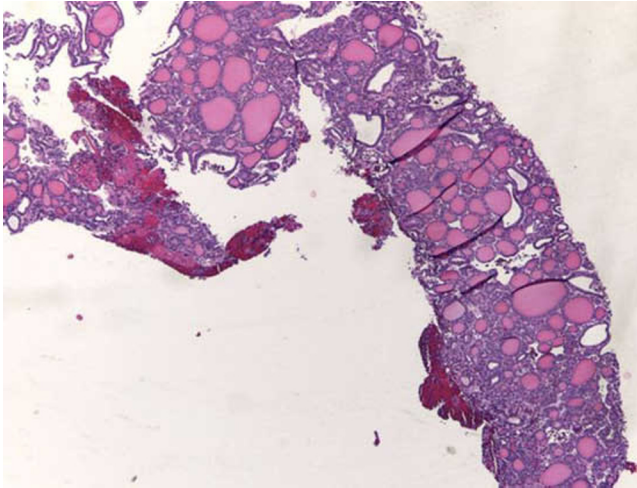


Figure 4. 88-year-old female with follicular thyroid carcinoma. Follicular carcinoma metastatic to the vertebral body, medium-power view, H&E stained section. The biopsy consists of well-defined follicular tissue with variable-sized follicles containing homogeneous acellular material (colloid). The degree of differentiation results in a micro- and normo-follicular appearance indistinguishable from that of a thyroid adenoma or a non-neoplastic thyroid condition.

The patient was referred to a multidisciplinary tumor board to evaluate options for further management. Thyroidectomy was considered, for debulking of her tumor and to facilitate radioiodine therapy, but because of her tenuous

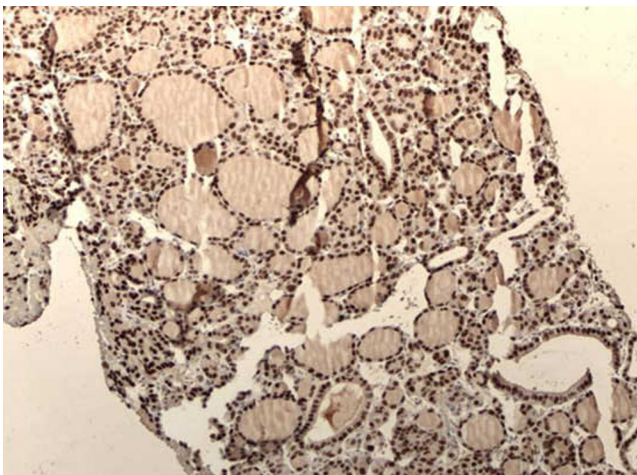


Figure 5. 88-year-old female with follicular thyroid carcinoma. Follicular carcinoma metastatic to the vertebral body, high-power view, thyroid transcription factor (TTF-1) immunostain. The carcinoma follicular epithelium demonstrates strong nuclear TTF-1 positivity consistent with thyroid immunophenotype. However, in this patient with pulmonary nodules, broncho-pulmonary tumor of primary origin enters the histologic differential diagnosis. The thyroglobulin expression (Fig. 6) resolved this issue.

performance status and medical comorbidities, her surgical candidacy was deferred. One option discussed was recombinant, TSH-driven, radioiodine ablation of the thyroid followed by a second, higher-dose radioiodine regimen to target her metastatic disease. These procedures could not

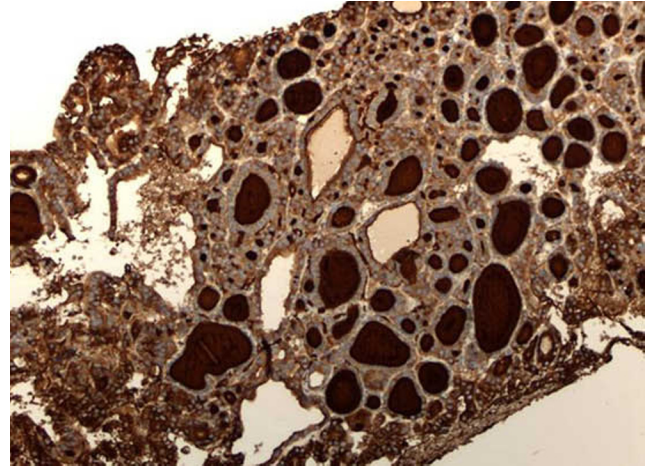


Figure 6. 88-year-old female with follicular thyroid carcinoma. Follicular carcinoma metastatic to the vertebral body, high-power view, thyroglobulin immunostain. The carcinoma demonstrates diagnostic primary thyroid immunophenotype with strong thyroglobulin expression, especially within colloid pools.

be performed in the near term, given the patient's exposure to iodinated contrast during her initial diagnostic workup. And ultimately, it was decided that although her well-differentiated thyroid cancer likely would respond to systemic radioiodine therapy, there probably would not be significant debulking or stabilization of the T8-T10 lesion.

Instead, it was recommended that the patient undergo thyroxin supplementation and TSH suppression, as tolerated, with intent to reduce the impetus for further tumor growth. The patient agreed to this course of action and, at the time of this report, is continuing her outpatient therapy. Although there have been no clinical signs of worsening, she has not regained significant function in her lower extremities.

Discussion

Follicular thyroid carcinoma (FTC) accounts for 15-30% of all malignant thyroid neoplasms (3). In the majority of cases, FTC presents as a solitary thyroid nodule (4); such localized cases are associated with favorable outcomes, with an 85% overall 10-year relative survival (2). Although FTC is less common than papillary carcinoma (2), it tends to be more aggressive, with distant metastasis present in roughly 10 to 25% of newly diagnosed cases (5-8), and with higher likelihood of subsequent development of metastatic disease (9, 10).

Follicular thyroid carcinoma presenting as acute cord compression due to thoracic vertebral metastasis

While local nodal involvement by differentiated thyroid cancer is not considered to be of prognostic significance (5), distant metastases are associated with generally poor outcomes (9, 11, 12) and represent the primary cause of death in these patients (13). While papillary thyroid cancer spreads through lymphatics, follicular thyroid tumors have a tendency to spread hematogenously to locations such as the bones, lungs, brain, liver, and adrenals, with skeletal involvement being most common (8, 14).

Skeletal metastases from follicular thyroid cancer frequently involve the vertebrae, pelvis, sternum, long bones, and ribs (15). In a review of 780 patients with differentiated thyroid cancer, Marcocci found that of the 18 patients presenting with skeletal metastases, all had either pain or pathologic fracture (16). The vertebrae were involved in 27% of these cases (16). These bone metastases can feature follicular structures so well differentiated as to closely simulate those of non-neoplastic thyroid. This is the source for the picturesque but incorrect and deservedly obsolete expression "benign metastasizing goiter" (17). The high degree of differentiation is also demonstrated by the ability of the follicular structures to incorporate radioactive iodine, a feature that is exploited for diagnostic and therapeutic purposes.

As with any malignancy, vertebral involvement of thyroid metastases commonly requires surgical attention. Such patients may present with intractable pain and spinal instability with or without central canal compromise; any of these conditions may warrant surgical intervention, particularly when the spinal lesions have proven resistant to nonsurgical therapies such as radioiodine or external radiotherapy (18, 19). External-beam radiotherapy often is considered a palliative intervention due to the relative radioresistance of thyroid carcinoma (18, 20). Bisphosphonate therapy may be effective in preventing fractures, spinal cord compression, and hypercalcemia secondary to skeletal thyroid metastases (21).

References

1. *Cancer Facts and Figures 2009*. American Cancer Society.
2. Hundahl SA, Fleming ID, Fremgen AM, Menck HR. A National Cancer Data Base report on 53,856 cases of thyroid carcinoma treated in the U.S., 1985-1995. *Cancer* 1998; 83:2638-2648. [PubMed]
3. JA N, B L, RT J. Cancer of the endocrine system. In: HS D, SA R, eds. *Cancer—Principles and practice of oncology*. Philadelphia: JB Lippincott, 1993:1333-1350
4. Emerick GT, Duh QY, Siperstein AE, Burrow GN, Clark OH. Diagnosis, treatment, and outcome of follicular thyroid carcinoma. *Cancer* 1993; 72:3287-3295. [PubMed]
5. Shaha AR, Shah JP, Loree TR. Differentiated thyroid cancer presenting initially with distant metastasis. *Am J Surg* 1997; 174:474-476. [PubMed]
6. Lin JD, Huang MJ, Juang JH, et al. Factors related to the survival of papillary and follicular thyroid carcinoma patients with distant metastases. *Thyroid* 1999; 9:1227-1235. [PubMed]
7. Eichhorn W, Tabler H, Lippold R, Lochmann M, Schreckenberger M, Bartenstein P. Prognostic factors determining long-term survival in well-differentiated thyroid cancer: an analysis of four hundred eighty-four patients undergoing therapy and aftercare at the same institution. *Thyroid* 2003; 13:949-958. [PubMed]
8. Girelli ME, Casara D, Rubello D, et al. Metastatic thyroid carcinoma of the adrenal gland. *J Endocrinol Invest* 1993; 16:139-141. [PubMed]
9. Ruegamer JJ, Hay ID, Bergstralh EJ, Ryan JJ, Offord KP, Gorman CA. Distant metastases in differentiated thyroid carcinoma: a multivariate analysis of prognostic variables. *J Clin Endocrinol Metab* 1988; 67:501-508. [PubMed]
10. Lin KD, Lin JD, Huang MJ, et al. Clinical presentations and predictive variables of thyroid microcarcinoma with distant metastasis. *Int Surg* 1997; 82:378-381. [PubMed]
11. Mizukami Y, Michigishi T, Nonomura A, et al. Distant metastases in differentiated thyroid carcinomas: a clinical and pathologic study. *Hum Pathol* 1990; 21:283-290. [PubMed]
12. Samaan NA, Schultz PN, Hickey RC, et al. The results of various modalities of treatment of well differentiated thyroid carcinomas: a retrospective review of 1599 patients. *J Clin Endocrinol Metab* 1992; 75:714-720 [PubMed]
13. Sevinc A, Buyukberber S, Sari R, Baysal T, Mizrak B. Follicular thyroid cancer presenting initially with soft tissue metastasis. *Jpn J Clin Oncol* 2000; 30:27-29 [PubMed]
14. Pomorski L, Bartos M. Metastasis as the first sign of thyroid cancer. *Neoplasma* 1999; 46:309-312. [PubMed]
15. Paksoy N, Altiner M, Tüzüner S, Oztürk H. Metastatic follicular carcinoma of the thyroid simulating sarcoma of the limb. *Pathologica* 1994; 86:314-315. [PubMed]
16. Marcocci C, Pacini F, Elisei R, et al. Clinical and biologic behavior of bone metastases from differentiated thyroid carcinoma. *Surgery* 1989; 106:960-966. [PubMed]
17. Rosai J, Carcangiu ML, DeLellis RA. Tumors of the thyroid gland. In: *Atlas of tumor pathology: AFIP*, 1992.
18. Muresan MM, Olivier P, Leclère J, et al. Bone metastases from differentiated thyroid carcinoma. *Endocr Relat Cancer* 2008; 15:37-49. [PubMed]
19. Demura S, Kawahara N, Murakami H, et al. Total en bloc spondylectomy for spinal metastases in thyroid carcinoma. *J Neurosurg Spine* 2011; 14:172-176. [PubMed]
20. Simpson WJ. Radioiodine and radiotherapy in the management of thyroid cancers. *Otolaryngol Clin North Am* 1990; 23:509-521. [PubMed]
21. Orita Y, Sugitani I, Toda K, Manabe J, Fujimoto Y. Zoledronic acid in the treatment of bone metastases from differentiated thyroid carcinoma. *Thyroid* 2011; 21:31-35. [PubMed]