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Lower extremity paralysis: A unique manifestation of metastatic follicular thyroid cancer

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Abstract
Follicular thyroid carcinoma is the second most common thyroid cancer, accounting for 10-15% of all thyroid cancers. Patients with follicular thyroid carcinoma most often present with enlargement of the thyroid gland and undergo further investigation via ultrasound (US) imaging and FNA, with surgery and subsequent pathology examination revealing the final diagnosis. In this case report, we describe a unique and unexpected presentation of follicular thyroid carcinoma in a middle-aged male patient who presented first with lower extremity progressive paralysis [1].

Keywords: Follicular thyroid carcinoma, metastatic follicular thyroid carcinoma, spinal metastasis, progressive paralysis

Introduction
The follicle is the functional and structural unit of the thyroid gland. Follicular thyroid carcinoma is the second most common thyroid cancer, accounting for 10-15% of all thyroid cancers. It is a differentiated cancer of the epithelial cells that line the thyroid follicles, and risk factors include radiation exposure, iodine intake, diabetes, obesity, and Hashimoto's thyroiditis. Patients with follicular thyroid carcinoma most often present with enlargement of the thyroid gland and undergo further investigation via ultrasound imaging and FNA, with surgery and subsequent pathology examination revealing the final diagnosis [1]. Early stage follicular thyroid carcinoma with minimally invasive characteristics is most often treated with lobectomy and isthmusectomy, but more invasive cases are treated with total thyroidectomy, radioiodine ablation, and thyroid suppressing medications. Patients who present with distant metastasis, such as bones or soft tissue, will also often undergo radiotherapy or chemotherapy after total thyroidectomy [2-4].
Follicular thyroid cancer has a worse prognosis compared to the most common type of thyroid cancer, papillary thyroid cancer, due to its higher incidence of distant metastasis, and patients more frequently present with more advanced stage disease [5]. Metastasis is most common to the bones, lungs, and lymph nodes, and the incidence of distant metastasis in follicular thyroid carcinoma is estimated to be 6-20% [6].

Case Report
A 55 year old male with a past medical history of obesity, prediabetes, hypertension presented to the emergency room with 6 months of gradual onset bilateral lower extremity numbness and weakness. He denied a history of trauma. At the time of evaluation, he was experiencing numbness from his belt line to his feet, leading him to require a walker for ambulation. He underwent MRIs of his cervical, thoracic, and lumbar spine which were notable for a pathological T_4 compression deformity involving the T_4 vertebral body with what appeared to be extra osseous soft tissue compromising the spinal canal causing severe stenosis and cord compression (Figure 1).
Two days after this finding, the patient went to the operating room with the neurosurgery team for T_3-5 laminectomy with resection of epidural mass, T_4 partial corpectomy, T_2-6 posterior pedicle screw and rod fixation, and T_2-6 posterolateral arthrodesis. Intraoperatively, a frozen section was sent of the mass, with pathology noted to be consistent with possible neoplasm of thyroid origin. Final surgical pathology resulted as thyroid tissue, compatible with metastasis, possible metastatic follicular carcinoma (Figure 2).
While hospitalized, the patient underwent thyroid ultrasound notable for 3.5 cm right lobe nodule classified as thyroid imaging reporting and data system 5 (TR5) (Figure 3), and a fine

needle aspiration (FNA) was performed that was suspicious for follicular neoplasm. The patient was discharged to inpatient rehabilitation following this hospitalization, to continue to regain his lower extremity strength. After discharge, he followed up with radiation oncology for thoracic spine external beam radiation, endocrine surgery to schedule total thyroidectomy, and endocrinology for post-operative radioactive iodine (RAI) therapy planning.

He ultimately underwent a total thyroidectomy with nerve integrity monitoring (NIM) tube with plans for post-operative RAI treatment. Intraoperatively, a rock-hard 3 cm mass was palpated at the posterior aspect of the superior pole of the right thyroid lobe. There was no evidence for extra thyroidal extension or lymphadenopathy. There was no Delphian adenopathy. The entire thyroid gland was easily excised and sent for pathology. Final pathology resulted as 2.5 cm widely invasive $pT_2pNxpM1$ follicular thyroid carcinoma with negative margins (Figure 4).

The next step in the patient's care includes radioiodine ablation therapy, planned for 6-8 weeks post-surgery plus thyroid hormone suppression.

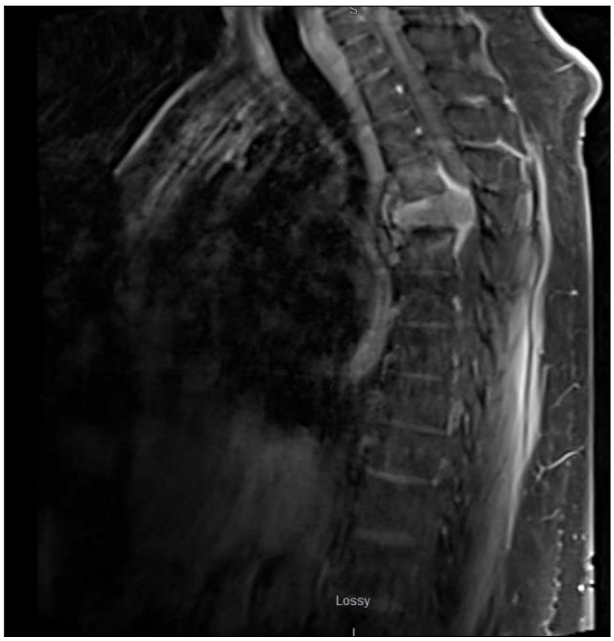

Fig 1: MRI thoracic spine showing abnormal marrow involving the T_4 vertebral body, which is compressed. Also shown is extraosseous soft tissue encroaching the spinal canal, causing severe spinal canal stenosis and cord compression.

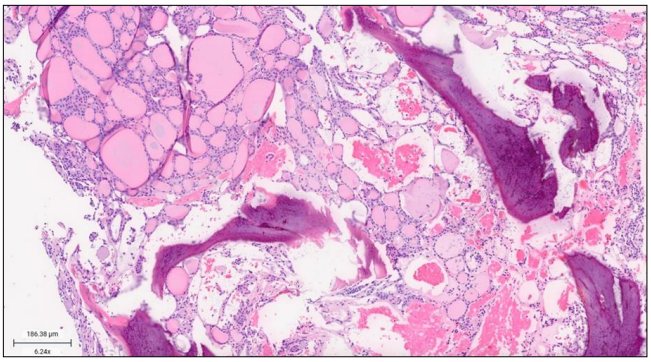

Fig 2: Surgical pathology side showing abnormal thyroid follicular tissue amongst normal spinal bone tissue. Per surgical pathologist review, this is consistent with bone invasion of the bone by thyroid tumor.

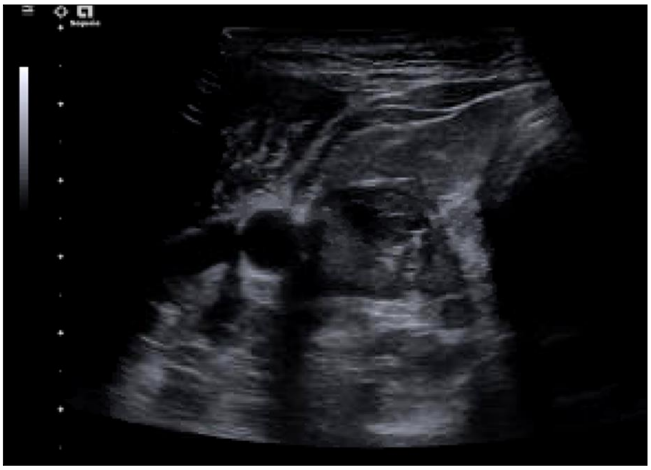

Fig 3: Thyroid ultrasound showing right thyroid lobe and 3.5cm nodule suspicious for malignancy

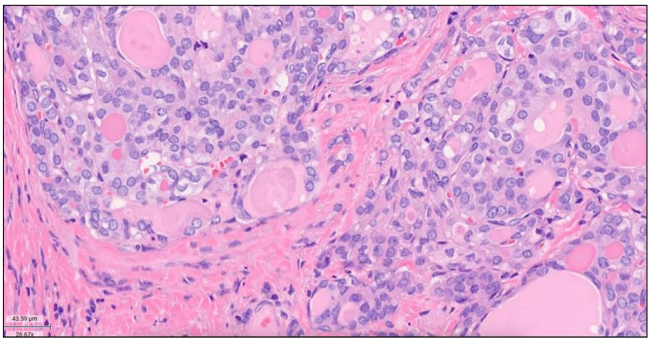

Fig 4: Surgical pathology side showing irregular growth of thyroid follicles with invasive appearance. Per surgical pathologist review, this is consistent with follicular carcinoma.

Discussion

Thyroid carcinoma is one of the most common endocrine tumors and can be classified into differentiated (papillary and follicular) and undifferentiated (anaplastic and medullary) subtypes. Within these subtypes, papillary thyroid carcinoma is the most prevalent with an incidence of 70-80% and follicular thyroid carcinoma is the second most prevalent, accounting for 10-15% of all thyroid cancers [1]. Follicular thyroid cancer has a worse prognosis compared to papillary thyroid cancer due to its higher incidence of distant metastasis and patients more frequently presenting with more advanced stage disease [5]. Still, distant metastasis at presentation are rare in well differentiated thyroid cancers [7].

When a patient is diagnosed with follicular thyroid cancer, first steps include thyroid and neck ultrasound including the central and lateral cervical nodal compartments as well as possible CT/MRI to assess for local advanced disease. Ultimately, the primary therapy for follicular thyroid cancer is operative management. The initial operative approach depends on if the patient has extrathyroidal extension or metastasis. In the absence of both, with a small sized tumor, a thyroid lobectomy can be performed and the patient can be monitored post operatively with thyroid stimulating hormone (TSH) monitoring and neck US at 6-12 months. [8].

If the patient has concern for extrathyroidal extension or metastasis based on radiographic evidence or intraoperative findings, a total thyroidectomy would be performed with therapeutic neck dissection of any involved compartments for clinically apparent or biopsy proven disease (frozen

sections of suspicious nodes can be sent for pathologic evaluation intraoperatively to help assess this). Post operatively, these patients can be considered for RAI therapy to improve survival based on their clinicopathologic factors. It is generally recommended in patients with differentiated high grade carcinoma, gross extrathyroidal extension, greater than or equal to 4 foci of vascular invasion, or bulky (greater than 5) positive lymph nodes. RAI is selectively recommended in those with large primary tumor size (generally greater than 4cm), minor vascular invasion (less than 4 foci), cervical lymph node metastasis, or microscopic positive margins. Patients with known distant metastases at presentation are always recommended to undergo RAI therapy, which generally takes place 6-12 weeks after surgery. Post RAI therapy, patients will be monitored with TSH levels, thyroglobulin and thyroglobulin antibody levels, and neck US at 6-12 months post treatment. [8].

The incidence of distant metastasis in follicular thyroid carcinoma has been reported between 6-20%, with the bones and lungs being the most frequent site of distant metastasis, and the spine being the most common site of bony metastasis [9]. Roughly 3% of patients with well differentiated thyroid cancers will develop bone metastasis, and nearly half of these patients develop vertebral metastases [9]. Patients often present with symptoms related to vertebral body instability, back pain, radicular pain, and spinal cord compression, depending on the tumor infiltrative pattern. Patients with spinal metastasis from thyroid cancer generally have more favorable outcomes compared to other spinal metastatic cancers (average of 33.1 months compared to 7 months), and thyroid cancer patients with isolated bony metastases (such as isolated spinal lesions) tend to have a better 5 year survival rate than those with solid organ metastasis. Furthermore, patients manifesting their thyroid cancer diagnosis via symptoms from their spinal metastasis have a better prognosis than those who develop spinal metastasis after thyroid cancer diagnosis [9, 10].

A study by Kushchayeva *et al*. was done which highlighted the different treatment modalities for spinal metastasis in thyroid cancer [9], including RAI therapy, selective embolization therapy, pharmacologic therapy, radiotherapy with external beam radiotherapy (EBRT), spine stereotactic radiosurgery, vertebroplasty, percutaneous spinal tumor ablation, and open surgery. Treatment strategy included assessment of pain, neurologic status, and general performance. Those who were asymptomatic with metastasis identified on imaging were more likely to have a more minimally invasive approach to their disease (RAI or EBRT) whereas those with symptomatic disease, such as our patient, underwent more invasive open surgery as first line with addition of other therapies post operatively. Pharmacotherapies with as bisphosphonates were further adjuncts used to prevent further bone destruction or vertebral fracture development.

Spinal metastasis is an uncommon presentation of the more often indolent well differentiated thyroid cancer, but a more common presentation of bony metastatic thyroid cancer. Treatment of these patients involves a multidisciplinary approach, including input from neurosurgery, endocrine surgery, endocrinology, and radiation oncology teams, however when diagnosed in a timely fashion and with appropriate treatment, these patients can have favorable outcomes ranging from improved 10 year survival to complete cure of their disease.

This case report highlights an interesting case of hematogenous spread of follicular thyroid carcinoma that presented with lower extremity paralysis, an unexpected presentation of the primary site of disease. In summary, follicular thyroid carcinoma is the second most common type of thyroid cancer and tends to have a worse prognosis compared to papillary thyroid cancer due to its higher incidence of distant metastasis, and patients more frequently presenting with more advanced staged disease. It is important to recognize that the most common location of metastasis with follicular thyroid carcinoma is the bone, and that metastatic presentation of this cancer requires total thyroidectomy with post-operative radioactive iodine. Refractory cases may also require chemoradiation therapy. Overall, if treated early, follicular thyroid cancer can have a favorable prognosis, so timely identification and definitive management of disease is of utmost importance.

Conflict of Interest
Not available.

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