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Case Report Open Access

Follicular Thyroid Carcinoma with Intramedullary Spinal Cord Metastasis: A Case Report

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Abstract

Metastatic carcinomas are more prevalent in the vertebrae and epidural spaces than in the intradural and intramedullary spinal cord. Although thyroid carcinomas seldom induce intramedullary spinal cord metastases, no evidence has been presented to prove that pure follicular thyroid carcinomas can generate these metastases. In this case, a man in his late 30s who had undergone lymphadenectomy, thyroidectomy, and radioactive iodine therapy developed spastic paraparesis and urine retention. Owing to the patient's aggressive clinical presentation with intramedullary metastasis, an initial tumor biopsy was performed to determine the histology of the tumor. Following an unexpectedly negative first biopsy, the patient underwent thorough tumor excision, the histopathology of which revealed a metastatic pure thyroid follicular carcinoma. Hence, it is imperative that all patients with pure follicular thyroid cancer who have developed acute neurological symptoms, regardless of how long they have been in remission, be immediately evaluated for intramedullary spinal cord metastases.

Keywords: Thyroid neoplasms • Spinal cord neoplasms • Laminectomy • Follicular thyroid

Introduction

Three percent of cancer patients develop bone metastases that affect the spine, while 0.9%-2.1% develops intramedullary spinal cord lesions. A rare form of metastatic proliferation into the spinal cord and intramedullary spinal cord metastasis (ISCM) occurs in fewer than three percent of intramedullary spinal cord tumours. However, the incidence of ISCM is expected to rise as MRI becomes more widely available as a diagnostic tool and cancer survival rates improve [1-3].

In general, most of these metastases originate in the lungs, particularly small cell carcinomas, followed by breast cancer, kidney cancer, melanoma, and lymphoma [4]. However, it has been found that they may be a highly uncommon manifestation of thyroid cancer metastases [5]. Regarding thyroid cancer, the most common source of thyroid-based ISCM is papillary thyroid carcinoma, whereas there have been no reports of ISCM compatible with pure follicular thyroid cancer [6]. Generally, follicular thyroid carcinomas spread to the lungs, lymph nodes, and bones. In addition, pathologic compression fractures and instability in the spine can be caused by the spread of thyroid cancer spreading to the spine. In comparison, the progressive onset of neurological symptoms is characteristic of ISCM, including weakness, sensory loss, pain, and bowel or bladder dysfunction [6-8].

This case report describes a patient who experienced increasing spastic lower limb paraparesis and intermittent urinary retention due to ISCM resulting from follicular thyroid malignancy.

Significance statement

These findings will aid physicians in diagnosing intramedullary spinal cord lesions as rare manifestations of pure follicular thyroid cancer metastasis without concomitant metastases after a long period of complete remission. Surgical resection may be advantageous in cases of solitary intramedullary lesions, especially in individuals with limited systemic metastatic disease or when the underlying tumor is unlikely to spread to the spinal cord parenchyma, such as thyroid cancer. It is necessary to commence surgery immediately to ensure longer life expectancy, minimize the risk of severe consequences, and enhance the patient's functional status. Due to its intramedullary location, spinal tumor removal requires surgical expertise.

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Case Presentation

A man in his late 30s who presented to our emergency room with bilateral progressive paraparesis of the lower extremities, intermittent urinary retention, and dysesthesia extending from the nipple to the lower limbs was diagnosed with thyroid follicular carcinoma in 2015. Following total thyroidectomy and cervical lymphadenectomy, 150 millicuries of radioactive iodine were administered. One year after the initial diagnosis, post-therapeutic follow-up scans revealed lung involvement. Three cycles of radioactive iodine were administered with approximately 200 millicuries per cycle. On neurological examination, the power in both the proximal and distal muscles of the lower extremities was diminished to MRC grade 3/5, accompanied by hyperreflexia and a spastic gate.

Additionally, whole-spine MRI revealed an intramedullary spinal cord mass located in the thoracic spinal cord between segments T3 and T6. T1-and T2-weighted MRIs of the thoracic spine revealed a sizable intramedullary mass as a hypo-isointense lesion to the spinal cord on T1 and hyperintense on T2, associated with extensive intramedullary swelling from T2 to T6, consisting of an intramedullary cystic area. It was also noted that a significant avid enhancement had developed following gadolinium based contrast agent injection (Figure 1). However, concomitant metastasis was not found in other investigations, such as MRI of the lumbar spine or brain.

After hospitalization, biopsy was performed to ascertain the origin of the intramedullary lesion in the spinal cord. However, the histological results were negative. As erroneous biopsy results are thought to occur in approximately 1%-2% of surgical pathology cases, we postulated that sampling error might be the cause.

It was decided within five days to schedule laminectomy from T3 to T6 and total microscopic ISCM tumor removal using a posterior approach with neuro-monitoring. As part of the surgery, a midline dural incision was made

following laminectomy under C-arm fluoroscopic monitoring to remove the tumor. Subsequently, the arachnoid membrane was opened. Subsequently, an 8 cm long posterior myelotomy excision was performed via the midline posterior sulcus, precisely above the area of spinal cord protrusion within the T3 to T6 zone. After gentle dissection, a grayish, roughly firm, lobulated, and slightly hemorrhagic mass was separated anteriorly and laterally from the intact, distinguishable surrounding cord to evaluate the pathological features. Subsequently, pial repair along the myelotomy level was performed after surgical bed hemostasis. Finally, the operation was ended by repairing the dura using a 6-0 prolene suture.

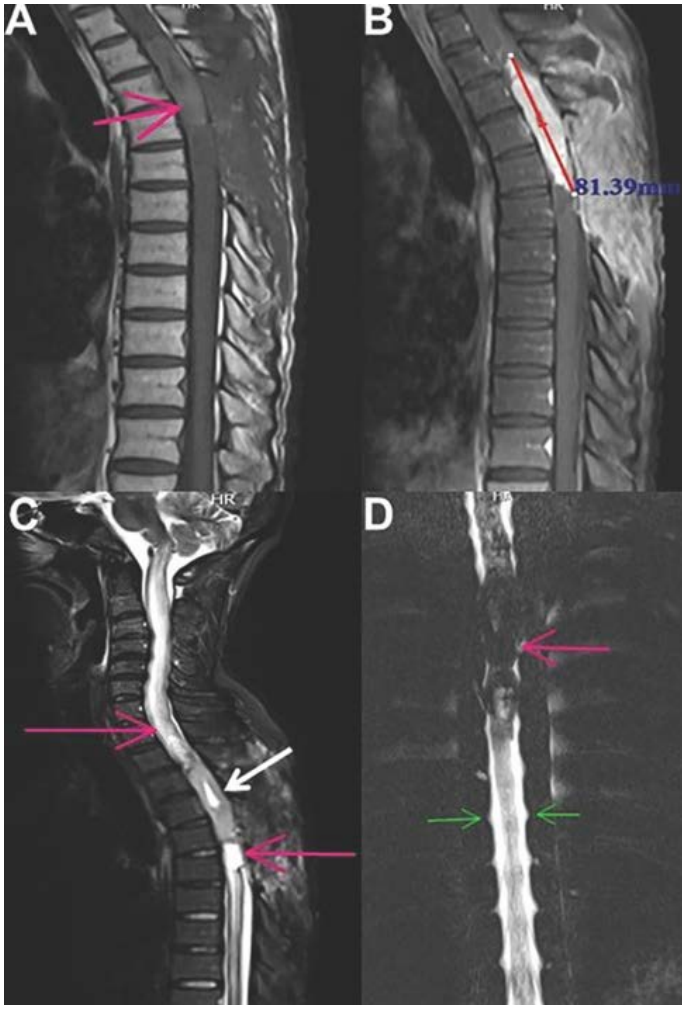

Figure 1. The pre-operation MRI scan of the thoracic spinal cord. Sagittal T1-weighted images show: A solitary (A) hypo-iso intense mass in the intramedullary spinal cord at T3-T6 level (Pink arrow) The lesion (B) showed an avid enhancement with a length of about 8 cm following intravenous gadolinium contrast injection. Sagittal T2-weighted images show: A small (C), sharply well-defined, and hypersignal lesion surrounded by an outer low-signal indicates a cyst due to the degeneration of a tumor cell (white arrow). A fluid-filled cyst (syrinx) within the spinal cord because of a central canal block extending into the cervical cord (Pink arrows). Thoracic myelogram, anteroposterior view: pre-operative myelogram (D) shows a filling defect between T3 and T6 due to an intradural, intramedullary lesion (pink arrows). Exiting nerve roots (green arrows)

The procedure was completed with no significant complications, and no new neurological deficits were reported after surgery (Figures 2A and 2B). Histological evidence was consistent with the diagnosis of metastatic follicular thyroid carcinoma (Figures 2C and 2D).

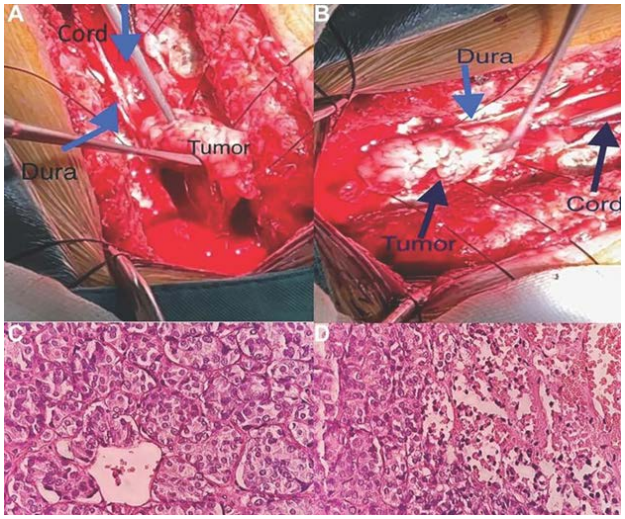

Figure 2. Under the operating microscope, these pictures show the operative situation: (A) after durotomy and (B) the grayish, roughly firm, lobulated, and slightly hemorrhagic mass. Histopathology and immunohistochemistry of intraoperative specimen: High magnification (C, 400x). This image displays a neoplastic lesion composed of relatively uniform cells with ample eosinophilic cytoplasm and a nested arrangement. High magnification (D, 400x). This image shows the neoplastic lesion with tumor necrosis (right side). The tumor cells are immunopositive in immunostain with Thyroglobulin and TTF1.

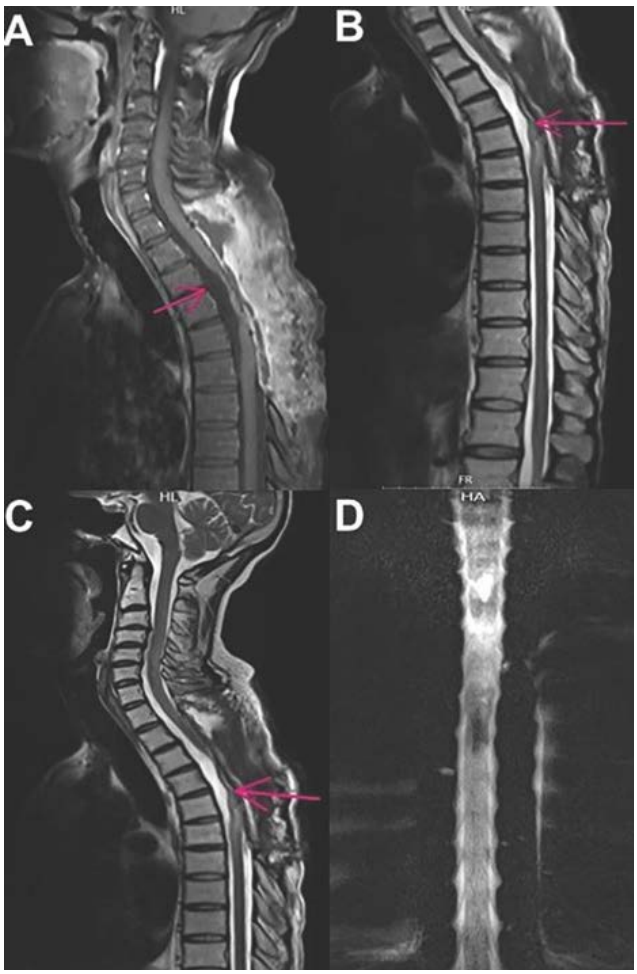

Figure 3. The post-operation MRI scan of the thoracic spinal cord. Sagittal (A) T1-weighted image. The Sagittal (B, C) T2-weighted image shows the disappearance of the mass mentioned above following surgery (Pink arrows). Thoracic myelogram, anteroposterior view: post-operative myelogram (D)

Follow up

Postoperative MRI revealed that the previously documented ISCM had disappeared, although the muscular strength remained the same (Figure 3). The patient was discharged from the hospital three days after surgery with a physiotherapy plan of care to improve lower extremity muscle strength. In addition, conventional spinal radiation has also been suggested. Although the patient survived nine months after the surgery, and his neurological symptoms did not worsen or relapse, muscle wasting prevented him from returning to work.

Discussion

Spinal cord metastases typically affect the vertebral column or extradural space, whereas intramedullary metastases are uncommon and are typically associated with advanced and invasive systemic cancers. Consequently, ISCM is a rare clinical diagnosis, and clinicians frequently overlook the underlying cause owing to a lack of awareness and research. Multiple studies have discovered that ISCM accounts for only 4.2%-8.5% of central nervous system metastases, less than 5% of spinal metastases, 1%-3% of intramedullary tumours, and 0.6% of spinal cord tumours. On the other hand, astrocytoma and ependymomas are the most common intramedullary lesions [1,9-13].

According to previous research [6], lung cancer (42.4%), breast cancer (15.5%), melanoma (7.2%), and renal carcinoma (6.7%) are the most prevalent causes of ISCM. Papillary thyroid carcinoma is the primary source of ISCM among thyroid malignancies, followed by mixed papillary and follicular thyroid carcinomas, anaplastic thyroid carcinomas and undifferentiated thyroid carcinomas [5,14-21].

To the best of our knowledge, this is the first report of an association between ISCM and pure thyroid follicular carcinoma. They are low-grade tumors with limited metastatic potential owing to their favorable prognosis, high survival rate, and high cure rate. Nevertheless, it can spread infrequently. In this case, it can spread via direct invasion, spinal fluid, hematogenous, lymphatic, or retrograde endoneurial pathways, with the lungs and bones being involved in most cases [22].

ISCMs can be challenging to diagnose because their MRI characteristics are comparable to those of astrocytomas and ependymomas: Isointense to hypointense on T1-weighted imaging and hyperintense on T2-weighted imaging. Post radiation myelitis may also manifest comparably. Although there are some similarities in contrast enhancement patterns, there can be some differences, such as intense homogenous enhancement in ISCMs, patchy enhancement in astrocytoma, inhomogeneous enhancement in ependymomas, and focal homogeneous enhancement in post-radiation myelitis [23]. Therefore, histopathology is the gold standard for diagnosis. The following conditions should be considered when evaluating the hazards of biopsy: When MRI reveals a tumour; the primary objective is total resection. If MRI reveals a non-neoplastic condition, systemic symptoms or disease progression may serve as diagnostic markers [24].

Based on MRI data, we initially suspected astrocytoma and ependymomas because intrathoracic spinal cord intramedullary lesions are less likely to be metastatic. In the absence of active disease or metastases, astrocytomas and ependymomas account for >90% of intramedullary spinal cord malignancies. In addition, since most ependymomas are amenable to surgical removal, they differ significantly from astrocytoma [1,25,26]. Previous research has indicated that ependymomas may elicit similar symptoms in individuals aged >30 years with well-defined central spinal cord masses. Consequently, we investigated ependymomas as possible initial diagnoses [23,27,28].

In the present case, pure thyroid follicular cancer induced ISCM. Given the absence of bone or brain involvement, cancer must have progressed hematogenously or retrogradely through the endoneurium, rather than locally from the vertebrae or spinal fluid. It took approximately five years in our case for ISCM to be diagnosed, although most cases of ISCM were diagnosed within one year after the detection of the underlying malignancy. Therefore, clinicians should be aware that ISCM may be present in patients with cancer with typical neurological deficits and MRI findings. In addition, the literature has shown a long latency between primary malignancy and ISCM in the thoracic and thoracolumbar regions, e.g., up to ten years, for ISCM in the thoracic and thoracolumbar regions [13].

O'Neill et al. noted that ISCM usually manifests as weakness, sensory impairment, and bowel or bladder dysfunction, which is consistent with our case. Nevertheless, Brown-Sequard syndrome is a rare symptom of ISCM [6].

Previously, only 5% of these cancers were diagnosed before death. Although cancer survival rates have increased owing to improved diagnostic and treatment methods, the incidence of ISCM has increased in recent years. Since the development of ISCM is generally accompanied by dramatic deterioration in brain function and catastrophic results prompt identification and treatment are crucial [29].

Before intraoperative imaging guidance and microsurgery, surgical treatment had no noticeable effect on the survival of patients with ISCM. Their prognosis consisted of a median survival rate of four months. Surgical therapies can now extend survival owing to breakthroughs in surgery and technology. According to Kalita et al., surgical patients may live beyond 9.4 months. Individuals with radioresistant primary tumours or solitary intramedullary lesions may benefit from surgical excision if they are diagnosed with cancer in the early stages accompanied by rapidly growing neurological impairment. When a single ISCM lesion with limited systemic metastases is present, surgical intervention may be beneficial to rule out other pathologies, such as primary intramedullary tumours, or when the primary tumour is unlikely to spread to the spinal cord parenchyma (such as thyroid, prostate, or esophageal cancer) [13,30]. As shown in the literature, since neurological status prior to the intervention is the most significant indicator of a favourable functional outcome, early detection and intervention play a crucial role in reducing mortality and morbidity.

Conclusion

The diagnosis of ISCM should be carefully considered for patients with sudden onset neurological symptoms, particularly those diagnosed with cancer. This report presents a rare and unique case of pure follicular thyroid cancer with intramedullary spinal cord metastasis. Furthermore, our research seeks to raise awareness that metastatic follicular thyroid cancer may be a differential diagnosis for individuals with myelopathy. Therefore, to maximize recovery and life expectancy, it is necessary to detect and treat metastatic thyroid cancer of the spine immediately.

Consent for publication

The patient's informed consent was acquired, and a copy of this document is available for inspection at any time upon request by the editor.

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Conflicts of Interest

The authors declare no commercial or financial relationships that could be construed as potential conflicts of interest.

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