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Academic article

Ancient schwannoma of the spine with thoracic cavity extension in an elderly patient after COVID-19: A case report

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Abstract

Ancient schwannoma is a variant of schwannoma that rarely affects the spine. Imaging and histological examinations that are not performed in conjunction with specific immunohistochemistry studies may result in misdiagnosis. During the global coronavirus disease 2019 (COVID-19) pandemic, we encountered many patients who underwent chest computed tomography (CT) for early diagnosis of COVID-19 pneumonia. In some of these cases, there were incidental findings of a mediastinal mass. Here, we report a case of ancient schwannoma of the spine with thoracic cavity extension mimicking a malignant mediastinal tumor, describe the magnetic resonance imaging (MRI) findings, and discuss the need for careful preoperative evaluation for initial diagnosis and the scheduling of surgery during the COVID-19 pandemic.

Keywords: ancient schwannoma, spinal tumor, post COVID-19 infection, mediastinal mass, thoracotomy

Introduction

Schwannomas are benign tumors originating from Schwann cells that account for one-third of all cells in primary tumors of the spinal cord[1, 2]. Ancient schwannoma (also known as degenerated schwannoma) is a schwannoma variant characterized by diffuse hypocellular areas of calcification, hyalinization, hemorrhage, and cystic degeneration[3, 4]. Schwannomas showing these degenerative changes can be misdiagnosed as malignant sarcomas or as other types of soft-tissue neoplasms owing to nuclear pleomorphism[5]. During the global coronavirus disease 2019 (COVID-19) pandemic, we encountered many patients who underwent chest computed tomography (CT) for early diagnosis of COVID-19 pneumonia. In some of these cases, there were incidental findings of a mediastinal mass[6]. Here, we report a case of ancient schwannoma of the spine with thoracic cavity extension mimicking a malignant mediastinal tumor, describe the magnetic resonance imaging (MRI) findings, and discuss the need for careful preoperative evaluation for initial diagnosis and the scheduling of surgery during the COVID-19 pandemic.

Case report

A 69-year-old man with a previous COVID-19 infection was referred to our clinic with the incidental finding of a large mediastinal mass, as revealed by a previous chest CT scan performed to detect COVID-19 pneumonia. His only symptom was non-specific mild back pain for a few years. During physical examination, manual muscle power testing confirmed grade 5 all, no loss of sensation, and no focal

neurological deficit. We observed an 8 × 8 cm area of well-demarcated brown skin in the right paramedian sector along the mid back.

Computed tomography of the chest revealed a partially calcified, right-sided 8.3 × 8.2 × 8.5 cm hypo-isodense mass in the posterior mediastinum. We also observed widening of the right neural foramen at the T10–T11 level in association with bone destruction of the right-sided body and transverse process of the T10 vertebra.

The MRI examination revealed right-sided heterogeneous marrow enhancement and mixed cystic-solid components in the pedicle and transverse process of T10 that protruded into the right-sided thoracic and spinal cavities, thereby causing right lateral thoracic thecal sac indentation and impending cord compression. Initially, extradural spinal tumors such as malignant sarcoma, malignant or benign peripheral nerve sheath tumor, spinal metastasis, and benign spinal tumor were included in the differential diagnosis.

Our patient was managed as an elective case in accordance with our hospital's policy during the COVID-19 pandemic. After 4 weeks, he did not have any respiratory symptoms or sequelae of the COVID-19 infection. We sent the patient for a complete preoperative assessment, including pulmonary function test, and the results indicated a low risk of postoperative medical complications. We implemented a two-stage surgical strategy because of uncertainty regarding the preliminary diagnosis. As the initial imaging modalities cannot differentiate between benign and malignant tumors, CT-guided needle biopsy was performed and was negative for malignancy.

After the imaging studies and biopsy, definitive surgery was performed, i.e., right thoracotomy for tumor resection in the right lateral decubitus position after one-lung anesthesia and right lung deflation. A rib spreader was applied between the right fifth and sixth ribs and complete en-bloc tumor resection was performed. We carefully resected tumor portions compressing the spinal cord at the T10 nerve

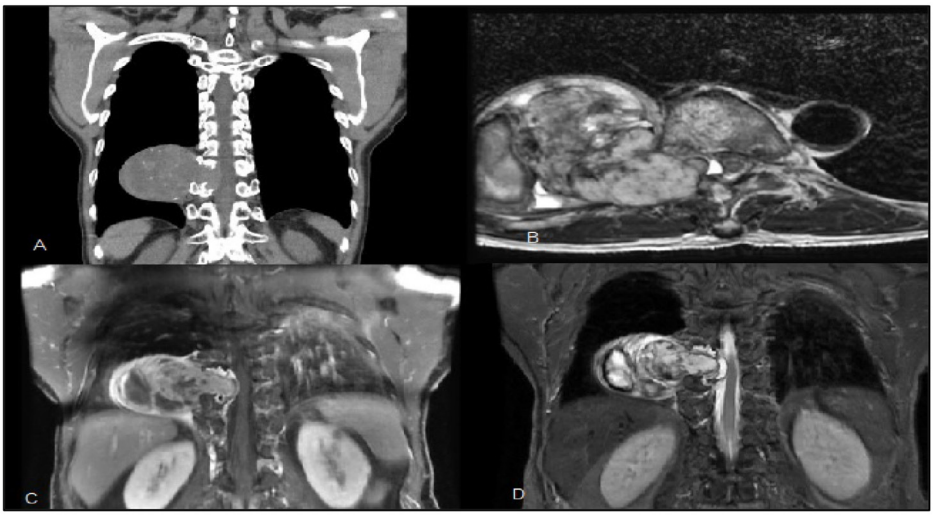

Figure 1. A: Coronal chest computed tomography scan revealed a right-sided, partially calcified hypo-isodense mass in the posterior mediastinum along with widening of the right neural foramen at the T10–T11 level. **B**: Gadolinium-enhanced axial T1 magnetic resonance imaging (MRI) showed a right-sided heterogeneous enhancing mass with mixed cystic-solid components in the pedicle and transverse process of T10, which protruded into the right-sided thoracic and spinal cavities. **C**: Gadolinium-enhanced coronal T1 MRI and **D**: coronal T2 MRI revealed a mass protruding into the spinal canal associated with cord compression.

root and intercostal nerve on the right side under a microscope. The tumor originated from the right side of the T10 nerve root and intercostal nerve. The tumor was completely removed, and bipolar coagulation of the right T10 thoracic spinal nerve root was achieved along with hemostasis (using thrombin). An intercostal drain was inserted into the right thoracic cavity to close the chest wall.

After placing the patient in the prone position, a right paramedian approach was made to the T10–T11 level under fluoroscopy guidance and right-sided laminotomy was performed for resection of the posterior part of the tumor. Percutaneous pedicular screw fixation was performed in a minimally invasive manner under fluoroscopy guidance at T8–T12 and L1, and right-sided posterolateral fusion at T10–T11 was achieved using hydroxyapatite bone graft substitutes for spinal stabilization. Intermittent opioid analgesia was used for postoperative pain control.

The encapsulated mass was bright red and measured 8 × 8 cm. The cut surface had bright red, multiseptated, mixed cystic-solid calcified and gelatinous components.

Histopathology examination revealed an encapsulated spindle cell tumor with areas of nuclear palisading admixed with loosely organized stroma, and an area with a microcyst-rich network of interconnected bland spindle cells. Myxoid stroma and hyalinized collagenous stroma were also noted. Immunohistochemicalexamination revealed that the mass was diffusely positive for S100 and positive for SOX10. Moreover, H3K27me3 and Ki67 were expressed in approximately 1%–2% of neoplastic cells. The final pathological diagnosis was confirmed as ancient schwannoma

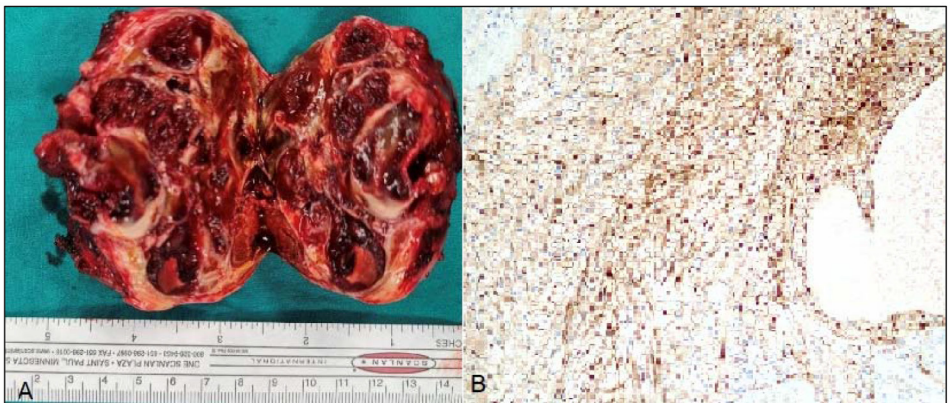

Figure 2. A: Gross appearance of the tumor. The mass was bright red and multiseptated, with solid and calcified gelatinous and cystic components. **B**: Immunohistochemical examination revealed that the mass was diffusely positive for S100.

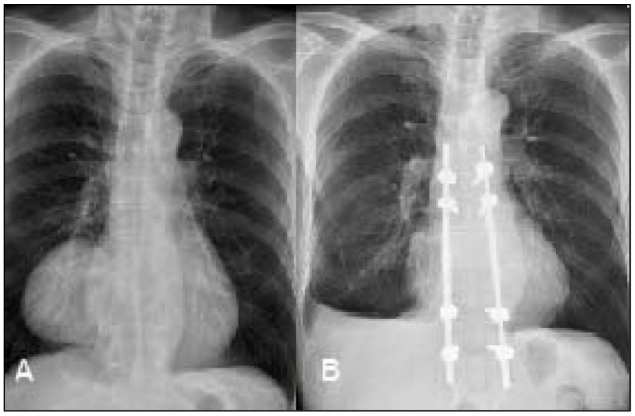

Figure 3. A: Preoperative chest X-ray showed a large mediastinal mass with right thoracic cavity extension. **B**: Postoperative chest X-ray showed no mediastinal mass and successful spinal fixation using percutaneous pedicular screws at T8–T12 and L1.

Early postoperative dysesthesia was found along the right T10 dermatome. Non-specific right-sided abdominal pain was controlled using 600 mg of gabapentin. There were no other medical or surgical complications. The intercostal drainage tube was removed on postoperative day 5 and the patient was discharged 1 week after surgery. At the 6-month follow-up, the postoperative dysesthesia along the right T10 dermatome had completely resolved. No tumor recurrence was seen on MRI and a plain film X-ray at the 6-month follow-up revealed no instrument failure. Thoracolumbar spine MRI with gadolinium was performed annually to detect recurrence.

Discussion

Schwannomas show a biphasic pattern, with areas of highly ordered cellularity (Antoni type A) and other, less cellular areas in which myxoid matrix predominate (Antoni type B). Ancient schwannoma is a variant of schwannoma characterized by degenerative and cystic changes including fibrous nodules, thickened vessels, and hyalinized areas with decreased connective tissue cellularity[7], as well as loss of Antoni type A areas and atypical nuclear features. The World Health Organization classification for soft tissue and bone tumors categorizes cases with degenerative nuclear atypia or extensive hyalinization as "ancient schwannoma"[7]. S-100 proteins have been found in tumors derived from Schwann cells via immunohistochemistry. Diffuse S-100 staining is rarely compatible with conventional malignant peripheral nerve sheath tumors[7]. SOX10 expression was seen in neural crest-derived cells, including Schwann cells[8], and retention of H3K27me3 expression indicated non-malignant peripheral nerve sheath tumor in another case[9].

In the spinal region, schwannomas have a predilection for sensory nerves and tend to arise from the dorsal roots; however, they occasionally arise from the ventral motor root[10, 11]. There are very few (non-specific) symptoms during the early stage of disease, which gives rise to a tendency to confuse ancient schwannoma with malignant tumors on imaging and histology[11].

The most useful imaging modality for preoperative diagnosis of schwannomas is MRI[12]. Typical findings of ordinary schwannomas include low signal intensity on T1-weighted images, high signal intensity on T2-weighted images, and strong enhancement by gadolinium contrast medium; this is characteristic of Antoni type A areas[12, 13]. In contrast, degenerative cyst formation, hemosiderin deposition, and calcifications are the most useful radiological clues for ancient schwannoma[14].

Preoperative needle biopsy can be performed for spinal schwannoma but definitive diagnosis may not be possible because of limited cellularity, and misdiagnosis as malignant neoplasm may occur due to degenerative tissue changes[3]. The treatment for spinal schwannoma is complete surgical resection and the recurrence rate is significantly lower among cases of total excision[15].

Conclusions

Accurate diagnosis and appropriate surgical treatment of ancient schwannoma of the spine are key for successful management. Surgical excision of the tumor is the gold standard for definitive diagnosis and treatment of these potentially resectable tumors. However, partial or subtotal tumor excision followed by spinal stabilization is mandatory for very large tumors that are unsuitable for complete excision. However, the recurrence rate is significantly lower for cases of total excision. Complete tumor removal has a curative effect, as revealed by long-term follow-up.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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