CASE REPORT

Intrathoracic Paraspinal Malignant Peripheral Nerve Sheath Tumor

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Schwannoma is the most common nerve sheath tumor in the posterior mediastinum, whereas intrathoracic paraspinal malignant peripheral nerve sheath tumor (MPNST) is quite rare. Both benign and malignant nerve sheath tumors may be symptomatic, rendering clinical differentiation of limited utility. On radiographic imaging, erosion of the ribs and vertebral bodies, irregularity in contour, and inhomogeneity in attenuation are not sufficiently reliable for diagnosis of MPNST. Histologically, MPNSTs reveal hypercellularity, nuclear atypia, and mitotic activity. Surgical resection is the main modality of treatment. Postoperative radiation therapy for MPNST has led to a significant reduction in local recurrence. The prognosis is unfavorable. Herein, we present an unusual case of a posterior mediastinal mass in a 50-year-old female with delayed diagnosis of 2 years. After surgical intervention, the histologic finding was MPNST. Postoperative radiation therapy was applied because of incomplete resection. The follow-up chest computed tomography 5 months later revealed a residual soft tissue mass with significant reduction in size over the parathoracic spine area. No neurologic sequelae were identified after surgery. [*J Chin Med Assoc* 2006;69(1):37–41]

Key Words: malignant peripheral nerve sheath tumor, neurogenic tumor, posterior mediastinal tumor

Introduction

Neurogenic tumors may arise from peripheral nerves or nerve sheaths, or from sympathetic ganglions. In varying proportions, neurogenic tumors may also be malignant. These tumors are variously termed malignant schwannoma, neurogenic sarcoma, or neurofibrosarcoma, but malignant peripheral nerve sheath tumor (MPNST) is the preferred designation. The majority of MPNSTs[1,2] are derived from neurofibroma or arise *de novo* in normal peripheral nerves. Large and medium-sized nerves are more often involved than small nerves. Schwannoma is the most common nerve sheath tumor in the posterior mediastinum, whereas intrathoracic paraspinal MPNST is quite rare. Both clinical symptoms and radiographic images are not sufficiently reliable for diagnosis of MPNST. Surgical resection is the main modality of treatment. Herein, we present an unusual case of intrathoracic paraspinal MPNST in a 50-year-old female and review the literature.

Case Report

The patient, a 50-year-old female, had complained of back pain for about 2 years. No neurologic symptoms, including paresthesia or motor weakness over lower limbs, were found. Initially, she took medication for relief of symptoms without any roentgenographic

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examination. Physical examination revealed mild local tenderness over the back of the chest. No skin lesions could be identified. The chest radiographs (Figure 1) showed a well-defined mass over the left posterior mediastinum. Computed tomography (CT) of the chest (Figure 2) revealed a heterogeneous parathoracic spinal mass, from T7 through T9, which was characterized by a large size (7 cm) chest wall invasion and destruction of ribs and T8 pedicle. No calcification or mediastinal lymph node enlargement could be identified. Magnetic resonance imaging (MRI) (Figure 2) also showed compression and displacement of the spinal cord by the posterior-lateral epidural mass. The mass manifested heterogeneous isointensity on T1-weighted images (T1-WI), heterogeneous high-signal intensity on T2-WI, and heterogeneous strong contrast enhancement. The initial impression was neurogenic tumor with chest wall and rib invasion.

The patient underwent surgical intervention with laminectomy of T8 and tumor resection over the

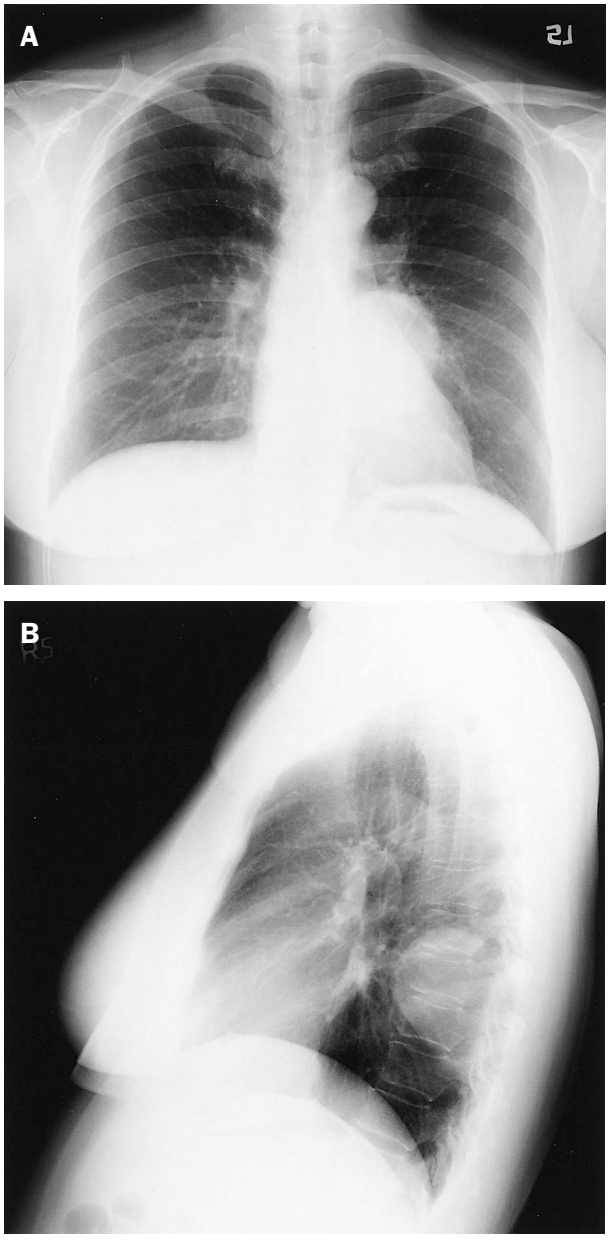

Figure 1. The chest radiographs revealed a sharply marginated round mass over the left lower chest field. (A) PA view. (B) Lateral view.

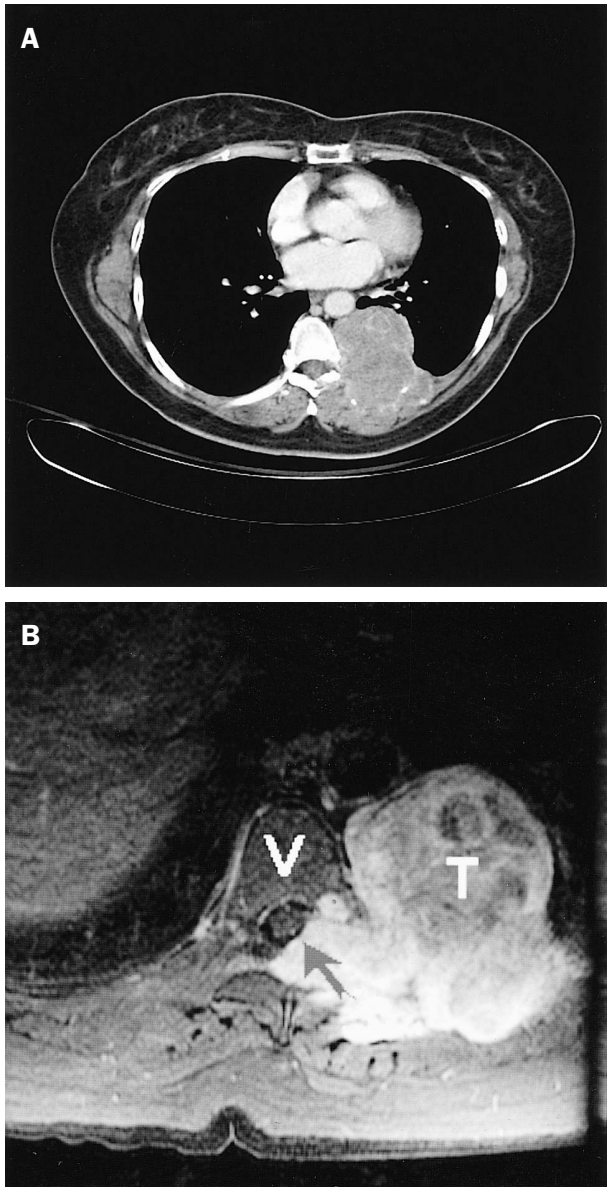

Figure 2. (A) The chest CT imaging revealed a big heterogeneous paraspinal mass, with rib, T-spine vertebral body destruction, and chest wall invasion. (B) On MRI T1-WI imaging, the mass manifested heterogeneous postcontrast enhancement and compression and displacement of spinal cord (arrow). V = vertebral body; T = tumor.

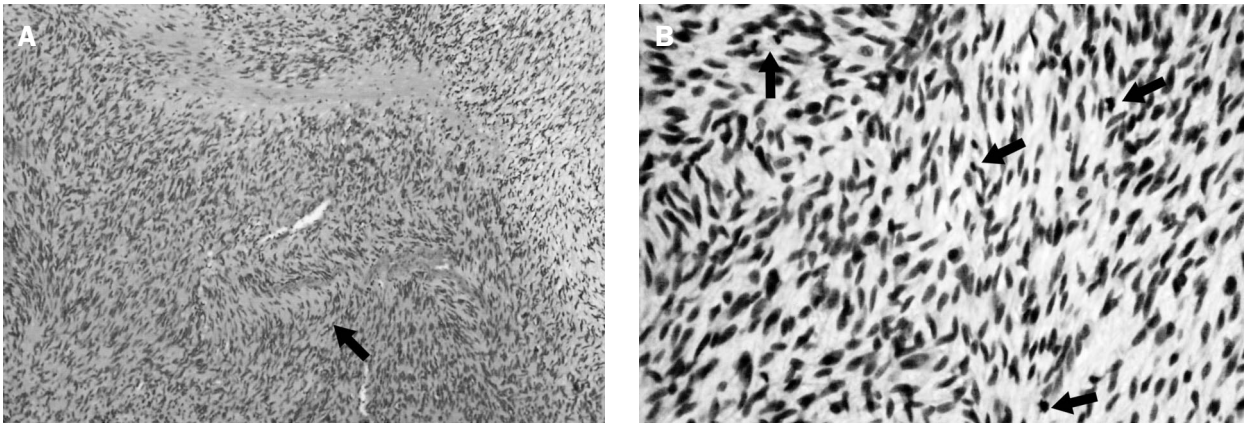

Figure 3. (A) Microscopically, the tumor showed densely cellular fascicles alternating with hypocellular zone (right side) and subtle nuclears palisading (arrow) were seen (hematoxylin and eosin, × 150). (B) Frequent mitoses (arrows) were present (hematoxylin and eosin, × 400).

parathoracic vertebral area. Microscopically, the tumor showed fasciculated growth of tightly packed, hyperchromatic spindle cells. The fibrosarcoma-like fascicles were focally alternating with hypocellular myxoid zones creating a marbleized appearance (Figure 3). Focal subtle nuclear palisading and waving nuclei were present. Moderate cellular atypism, high mitotic activity (18/10 HPF) (Figure 3), and foci of necrosis were also noted. In the immunohistochemical studies, the tumor cells were positive for S-100 stain, and negative for cytokeratin, desmin, and CD34 stains. Positive p53 immunoreactivity was noted in 10% of tumor cells. The pathologic diagnosis was MPNST. No postoperative complication was found. Adjuvant radiation therapy was applied because of resection of the tumor. The follow-up chest CT 5 months later revealed residual soft tissue mass with significant reduction in size over the parathoracic spine area. Close follow-up was recommended.

Discussion

Neurogenic tumors account for about 10–20% of primary mediastinal masses in adults and 30–50% in children. They are almost exclusively located in the posterior mediastinum.[3] The tumors may arise from peripheral nerves or nerve sheaths, including neurofibroma, neurilemoma (schwannoma), and malignant nerve sheath tumors (neurogenic sarcoma) or from sympathetic ganglions, such as ganglioneuroma, ganglioneuroblastoma, or neuroblastoma. Nearly 85% of tumors in children are ganglion in origin,[4] while, in adults, more than 75% are nerve sheath tumors. Schwannoma is the most common nerve sheath tumor in the posterior mediastinum, and the vast majority arise from one of the intercostal nerves. It may also be seen rarely in the middle or anterior mediastinum, occurring in relation to the vagus, phrenic, or recurrent laryngeal nerves. Most cases are presented as a single nodule; however, multiple schwannomas are often associated with von Recklinghausen disease.

Clinically, peripheral nerve sheath tumors usually do not cause symptoms and are discovered on a screening chest roentgenogram.[5] In a minority of patients, compression of intercostal nerves or major airways gives rise to pain or dyspnea. On plain radiographs, nerve sheath tumors typically appear as sharply marginated round, elliptical, or lobulated paraspinal masses. Erosion of the ribs and vertebral bodies sometimes is evident. On CT scan, schwannoma has been shown to have a mixed attenuation, attributable to a confluent area of hypocellularity adjacent to dense cellularity, or xanthomatous change, or regions of cystic degeneration.[6] Variable enhancement of the tumor may be seen following contrast infusion. Calcification (about 5–10%) may be present with either benign or malignant tumors,[7] but is not a reliable sign of benignancy. On MRI, nerve sheath tumors typically have slightly greater signal intensity than muscle on T1-WI and markedly increased signal intensity on T2-WI or contrast-enhanced images, although often in an inhomogeneous fashion. The overall sensitivity and specificity of CT as well as MRI in the detection of mediastinal lymph node metastasis are 70–90% and 60–90%, respectively.[8] Surgical interventions, such as mediastinoscopy, mediastinotomy, video-assisted thoracoscopic surgery (VATS) or thoracotomy remain the gold standard for a definite diagnosis.

Most nerve sheath tumors are encapsulated, roughly spherical masses in gross examination. Histologically, schwannomas are composed of spindle cells densely packed together (Antoni A pattern) or organized more loosely in association with a myxoid sarcoma (Antoni B pattern); areas of infarction are common. S-100 usually can be demonstrated in the immunohistochemical stain. Provided complete surgical excision can be achieved, the prognosis of benign peripheral nerve tumors of the mediastinum is excellent. Malignant transformation is almost nonexistent, and the patients can be observed clinically even when the tumor is incompletely removed because of its location, such as nerve roots.

In varying proportions, neurogenic tumors may also be malignant. The malignant nerve sheath tumors are confined to the cells intrinsic to the peripheral nerve sheath, including the perineurium and endoneurium. They are generally regarded as being of Schwann cell origin[9] in that most of them usually exhibit some evidence of Schwann cell differentiation and the small minority have the features of fibroblast or perineurial cells. These tumors are variously termed malignant schwannoma, neurogenic sarcoma, or neurofibrosarcoma, but malignant peripheral nerve sheath tumor (MPNST) is the preferred designation. The majority of MPNSTs[1,2] are derived from neurofibroma or arise *de novo* in normal peripheral nerves. There were only very rare cases arising in malignant transformation of benign schwannoma[10] or sympathetic ganglion tumors.[11] Large and medium-sized nerves are more often involved than small nerves. Common sites of origin include the sciatic nerve, brachial plexus, and upper arm. MPNSTs of cranial and visceral nerves are uncommon. It is also rare in the mediastinum. Kourea et al[12] have reviewed their 35 years of data at a cancer center in New York; only 7 intrathoracic MPNSTs were identified.

Clinically, MPNSTs affect young to middle-aged adults, with a slight female predominance. Neurofibromatosis type 1 (NF1) predisposes to the development of MPNSTs. About 50–60% of MPNSTs occur in patients with NF1.[1,2,12] In addition to hereditary factors, exposure to ionizing radiation may also play a role in the development of MPNSTs.[13] MPNSTs are usually larger and cause symptoms due to invasion of intrathoracic organs and the thoracic wall at the time of diagnosis. Because the symptoms may be presented in both benign and malignant lesions, it renders clinical differentiation of limited utility. On imaging, MPNSTs tend to be large, infiltrating, irregular in contour, and inhomogeneous in attenuation, although these findings are not sufficiently reliable for diagnosis. Histologically, MPNSTs are usually more hypercellular with spindle cell proliferation. The tumor cells often show hyperchromatic nuclei and are mitotically active.[14]

Although malignant neoplasms are usually aggressive, surgical resection is the mainstay of therapy for MPNST. Wide en bloc resection is the treatment of choice for tumors involving soft tissue.[2] Local recurrence rate varied from 40% to 68%.[1,2,12] Postoperative radiation therapy of MPNST has led to a significant reduction of local recurrence.[15] To date, no chemotherapeutic regimen has proved effective in the treatment of MPNSTs. Neoadjuvant therapy is rarely applied in that it is not easy to differentiate benign from malignant neurogenic tumors by imaging preoperatively.

The prognosis of patients with MPNST is unfavorable. In 2 major studies with long-term follow-up, reported overall 5-year survival rates were 34–52%.[1,2] The factors that appear to affect the prognosis of patients with MPNST are tumor location, size, histologic subtype, tumor grade, molecular genetics, completeness of resection, recurrence, metastasis, and presence of NF1.

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