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Case Report
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Concurrent Schwannoma and Meningioma in Thoracic Spine: Case Report and Review of Literature

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Abstract

In this study, we report a rare case of primary concurrent schwannomas and meningiomas arising at the level of T_{11} and T_8, respectively. A 39-year-old female was admitted in our department for both lower limb weaknesses. The medical history of patient revealed progressive weakness in both lower limbs and right lower limb intermittent claudication for about a half year, the symptoms worsened in recent one month that presented with flaccid paralysis of both lower limbs. MR images demonstrated the level of T_{11} and T_8 intraspinal occupying lesions. Resection of the mass effectively decompressed the spinal cord. Histopathological examination showed that extradural mass at the level of T_{11} was schwannoma and intradural mass highly attached to dura matter was meningioma at T_8.

Introduction

Concurrent primary spinal tumors are rare, except for in genetic disorders, such as neurofibromatosis and von Hippel-Lindau disease [1-4]. Furthermore, concurrent tumors with different histological types arising in the same spinal level are markedly rarer, with only six cases reported to date [1-6]. In this study, we report a rare case of primary concurrent schwannoma and meningioma arising at the level of T_{11} and T_8 in thoracic spine, respectively.

Case Presentation

A 39-year-old female was admitted in our department for both lower limb weakness. The medical history of patient revealed progressive weakness in both lower limbs and right lower limb intermittent claudication for about a half year, the symptoms worsened in recent one month that presented with flaccid paralysis of both lower limbs. Patient denied any neurofibromatosis type 2 related family histories. The neurological examination revealed normal muscle tone, iii-level myodynamia, decreased pain and temperature sensation in lower limbs, bilateral knee clonuses and Babinski signs are suspiciously positive. MR images demonstrated the level of T_{11} and T_8 intraspinal occupying lesions in extra and intra-dural extramedullary region, respectively. From the appearance of MRI, we demonstrated the extradural mass at the T_{11} level was considered as schwannoma, and the intradural extramedullary mass at the T_8 level was considered as meningioma (Figure 1). We suspected this case was extremely likely to be a rare concurrent schwannoma and meningioma arising in the thoracic spine. Surgical resection *via* laminectomy of the level of T_{11} to T_{12} revealed that the right sided extradural well- vascularized mass was derived from T_{11} nerve root and from T_{11} to T_{12} foramen towards dural sac. After intracapsular resection of tumor, the residual mass was detached from T_{11} nerve root at the foramen region, and was removed together with partial nerve rootlets. By contrast, the laminectomy of T_8 to T_9 revealed that the intradural well-vascularized reddish mass was highly attached to the dura matter and also partially attached to the nerve rootlets. Piecemeal resection was performed within the mass, and then the residual mass was detached from spinal cord, and dura matter along the boundary between the tumor membrane and the dura matter, respectively. At last, the cauterization to the dura matter involved by the mass, and the resection of inner layer of the dura matter was performed, in order to prevent the recurrence of tumor. Resection of the mass made the spinal cord is decompressed effectively. Histopathological examination showed that extradural mass at the level of T_{11} was schwannoma and intradural mass highly attached to dura matter at the level of T_8 was meningioma. Immunohistochemically, schwannoma cells showed: S-100(+), Vimentin(+), EMA(-), GFAP(partially+), PR(partially+), Ki-67(for about 2%+); meningioma cells showed: Vimentin(+), EMA(+), S-100(-), GFAP(-), Ki-67(for about 3%+) (Figure 2). Post-operation, the patient showed good recovery and was discharged from

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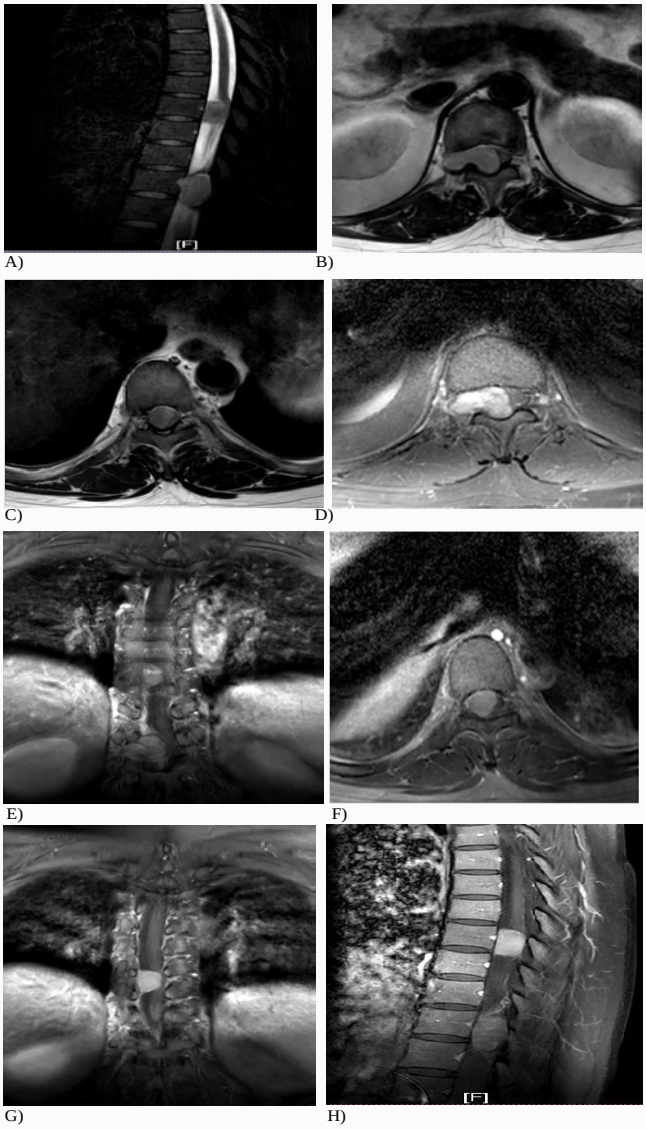

Figure 1: Magnetic Resonance (MR) images of the thoracic spine showing extradural and intradural extramedullary mass. (A): Sagittal T2-weighted MR image showing 2 intraspinal lesions located at the different levels. (B) and (C): Axial T2-weighted MR image depicting the extradural mass as mixed signal intensity at the level of T_{11} (B) and the intradural lesion as low signal intensity at T_8 (C-G): Axial and Coronal view of postcontrast T_1-weighted MR image showing distortion of the thoracic cord with compression from both of mass towards left side in the different levels. (D,E) at T_{11}, (F,G) at T_8. (D-H) Axial, coronal and sagittal view of postcontrast T_1-weighted MR revealed that both portions were heterogeneously enhanced after Gd-DTPA administration.

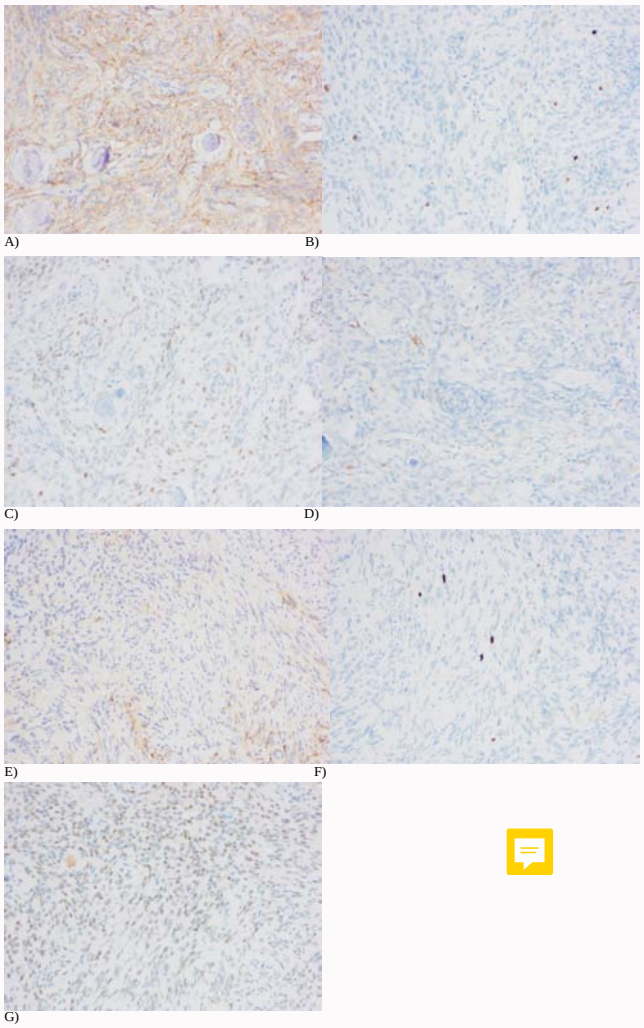

Figure 2: (A) Histopathological examination of the extradural tumor via H&E staining showed compactly arranged proliferation of spindle cells with occasional nuclear palisading and loosely arranged cells with round to oval hyperchromatic nuclei. (B) Immunohistochemical study showed that the tumor cells were diffusely positive for S-100 protein, Vimentin, GFAP (partially), PR (partially), Ki-67 (for about 2%), but negative for EMA. These findings were consistent with histological characteristics of schwannomas. C) Histopathological examination of the intradural tumor via H&E staining showed that it consists of the nest of meningothelial cells and psammoma bodies. (D) Immunohistochemically, the tumor cells were positive for EMA, Vimentin, Ki-67 (for about 3% +), but negative for S-100, GFAP. These histological features were in accordance with the histopathological characteristic of meningioma.

hospital 2 weeks later.

Discussion

Schwannomas and meningiomas are relatively common spinal tumors, comprising 30% and 25% of all spinal cord tumors, respectively [3-5]. Approximately, 75% of schwannomas arise in the intradural extramedullary region. A total of 15% of the lesions are found exclusively in the extradural area, and the rest have both intra- and extradural components [7]. Regarding tumor origin, 70% of schwannomas are derived from the sensory nerve rootlets, 20% from the motor nerve rootlets, and the rest are derived from both sensory and motor rootlets [7-8]. Schwannomas are more frequently found in the high cervical region, i.e., C_1-C_3 levels, than in other spinal levels. Among the tumors arising in the high cervical spine, those arising from the C_2 nerve root are the most common, comprising 15% of all spinal schwannomas [7]. Meanwhile, spinal meningiomas account for 12% of all meningiomas and 25% of all spinal cord tumors. Approximately, 80% of meningiomas are found in the thoracic spine and 15% are in the cervical spine; meanwhile, tumors rarely develop in the lumbosacral region [4,9].

Radiological diagnosis of schwannoma and meningioma is very necessary, i.e. MR images. Schwannomas are typically well-circumscribed tumors derived from the peripheral nerve [3]. Schwannomas are usually depicted as iso- or hypo signal intensity on T1-weighted MR images and hyper- or mixed-signal intensity on T2-weighted MR images [1,3,10]. In contrast-enhanced MR images

Table 1: Manchester criteria [1] for clinical diagnosis of NF2 according to primary finding.

	Additional findings needed for diagnosis
Bilateral vestibular schwannomas	None
Family history	Unilateral vestibular schwannoma or two NF2-associated lesions (meningioma, glioma, neurofibroma, schwannoma or cataract)
Unilateral vestibular schwannoma	Two NF2-associated lesions associated with the disorder (meningioma, glioma, neurofibroma, schwannoma or cataract)
Multiple meningiomas	Unilateral vestibular schwannoma or two NF2-associated lesions (glioma, neurofibroma, schwannoma or cataract)

(T_1+C), the tumor is well enhanced but often shows ring-like or irregular enhancement depending on the degenerative changes within the tumor [1,10-12]. Meanwhile, meningiomas tend to be small, single tumors and are typically found in the intradural extramedullary region [1,3]. Approximately 10% of spinal meningiomas coexist with other tumors in the intra- and extradural location, and a few cases located in the extradural space have been reported as well. Meningiomas appear as iso- to slight hypo-signal intensity on T_1-weighted MR images, and iso- to slight hyper-signal intensity on T_2-weighted MR images [1,3]. The tumor is homogeneously enhanced on post-contrast T_1-weighted MR images and may be accompanied with dural tail sign [10,12]. In arising region, Meningiomas often arise posterolateral to the spinal cord in the thoracic spine and anterolateral to the cervical cord. By contrast, schwannomas generally originate from the dorsal rootlets and are usually found in the dorsal or dorsolateral side to the spinal cord [13]. In our case, enhanced contrast in T_1-weighted MR images accompanied with dural tail sign was detected in the T_8 level and the tumor arises from, anterolateral to the spinal cord. By contrast, ring-like enhancement inT_1-weighted MR images contrast was detected as an extradural lesion adjacent to the right foramen extending to dorsolateral side to the spinal cord in the T_{11} level. Therefore, we primarily anticipated this case is extremely likely to be a rare concurrent schwannoma and meningioma arising at the thoracic spine in the different levels.

Schwannomas and meningiomas are relatively common spinal tumors, but concurrent spinal tumors consisting of schwannoma and meningioma are extremely rare. Multiple primary spinal cord tumors are rare, and only 1.2% to 9.5% of such tumors arise in patients with neurofibromatosis [2]. They have been reported in literature as genetic disease, particularly Neurofibromatosis type 2 (NF2), which is clinically diagnosed by Manchester criteria [14]. Apparently, this case does not conform to the criteria and should be considered as a case of primary concurrent schwannomas and meningiomas arising at the different thoracic level. Excluding the cases with neurofibromatosis, only six cases of concurrent spinal cord tumors with different histology in the same spinal level have been reported in the literature. In our report, we demonstrated the additional one case of such rare instance (Table 1).

The diagnoses of our case were difficult according to clinical manifestation, because clinical features were common characteristics of spine tumors and lack of specificities. Contrast-enhanced MRI was significantly helpful to diagnosis and differentiates tumor pathological types by determination of tumor location, enhancement features and relationship to dura matter and/or nerve rootlets. Therefore, MR imaging became the best examination. In-operation, "from simple to difficult" principle should be followed, thus the functions of spinal cord and nerve rootlets could be protected in the maximum extent [15]. Histological examination was still gold standard to diagnoses, our case showed the presence of discrete tumors at the different thoracic spinal level. Surgical intervention is still the most suitable strategy to this case.

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