Spinal Cord Subependymoma
- A Case Report and Review of the Literature -

Yoko Fukuzumi, M.D., Satoshi Tani, M.D., Akira Isoshima, M.D.,
Hiroyasu Nagashima, M.D., Toshiaki Abe, M.D., Junko Fujigasaki, M.D.*

Department of Neurosurgery, The Jikei University School of Medicine, Tokyo, Japan
Department of Neuropathology*, The Jikei University School of Medicine, Tokyo, Japan

Abstract

Subependymoma is considered a relatively slow growing benign tumor that is usually found at autopsy. It is difficult to differentiate from astrocytoma or ependymoma on the basis of morphologic or radiographic findings. 33-year-old female patient presented with a 16-year history of left lower extremity pain followed by numbness of the same area as well as both upper extremities. Spinal MRI revealed an enhanced abnormal intra-medullary mass extending from Th3 to Th7 and accompanied by a cystic mass lesion. No specific findings were apparent to differentiate this tumor from astrocytoma or ependymoma. The patient underwent total resection, resulting in good neurologic recovery. Histopathologic analysis demonstrated findings typical of subependymoma. Clinical course, pathological features, treatment and prognosis of 41 published cases are reviewed in the discussion.

Key words: slow growing spinal tumor, subependymoma

Spinal Surgery 20 (4) : 245～251, 2006

Introduction

In 1945, Scheinker described seven cases of unusual intra-cranial tumor, terming this lesion subependymoma [23]. A relatively slow growing benign tumor that is usually found at autopsy. Subependymoma is a tumor of the central nervous system, generally affecting the ventricle. It rarely develops in the spinal cord, and is difficult to differentiate from astrocytoma or ependymoma on the basis of clinical and radiologic findings. We encountered a 33-year-old woman in whom spinal subependymoma was diagnosed after a 17-year history of sensory disturbance. As the tumor was difficult to diagnose from clinical, radiologic or rapid frozen section findings, total resection was determined to be the most appropriate treatment. Histopathologic and ultrastructural analysis confirmed a diagnosis of subependymoma. As management of this tumor is rather unfamiliar, we conducted a literature review of 41 published cases [1-26]. Clinical course, pathological features, treatment and prognosis are reviewed in the discussion.

Case Report

A 33-year-old woman reported having noticed pain of the left lower extremity since the age of 16 years. Numbness of the same area and of both upper
Spinal MRI revealed an abnormal mass lesion from Th3 to Th7, accompanied by a cystic mass lesion. The lesion exhibited low intensity on T1WI and high intensity on T2WI. The lesion enhanced heterogeneously with contrast media, with the exception of cystic components located above and below the mass.

A cystic lesion that did not enhance with contrast media was located at the level of C2.
extremities had developed in recent years. No weakness was reported.

1: Neurologic findings at presentation

No abnormal findings were apparent in the central nervous system (CNS). Muscle power of both upper and lower extremities was normal. Superficial sensory loss in addition to deep sensory loss was evident bilaterally below the level of L1. No sensory abnormalities of the upper extremities were apparent on admission.

2: Radiological findings

Spinal MRI revealed an abnormal mass lesion from Th3 to Th7, accompanied by a cystic mass lesion (Fig.1). The mass exhibited low intensity on T1WI (T1 weighted image) and high intensity on T2WI (T2 weighted image). It enhanced heterogeneously with contrast media, with the exception of non-enhancing cystic areas from C2 to the upper end of the mass and from the lower end of the mass to L2 (Fig.2). At the level of T3, the enhanced lesion was located unilaterally to the right side of the intramedullary lesion. From the patient’s history, clinical features, and radiologic appearances, we considered the mass to be a spinal tumor exhibiting characteristics of astrocytoma or ependymoma. Consequently, the patient was scheduled for surgery.

3: Surgery

The patient was placed on the operating table in the prone position. An osteoplastic laminotomy was created from T3 to T8, after which the dura was opened and the arachnoid was incised. Adhesion of the subarachnoid space was minimal and the spinal cord was exposed. Part of the mass that extended toward subarachnoid space was removed immediately and sent for frozen section analysis. Myelotomy was performed through the postero-lateral sulcus to access the mass, which was soft and yellowish and originated from the intra-axial tissue. The mass was removed piecemeal in order to minimize bleeding and cystic lesions containing colorless clear fluid were punctured during the procedure. Histopathologic analysis of the frozen section yielded a presumptive diagnosis of astrocytoma. Throughout the resection, the tumor appeared well demarcated and the mass was completely removed macroscopically.

4: Pathologic findings

<Light microscopy>

The tumor consisted of cells with fine processes and round to ovoid nuclei, which were arranged in clusters within fibrous or occasionally micro-cystic backgrounds. Perivascular or ependymal rosette formation was unclear. No morphologic features of malignancy, such as cellular anaplasia, necrosis, or increased mitoses were apparent (Fig.3a).

<Immunohistochemistry>

The cytoplasm of tumor cells was diffusely positive for GFAP (glial fibrillary acidic protein) (Fig.3c) and S-100 protein. Immunostaining for EMA (Epithelial membrane antigen) (Fig.3d) and CAM 5.2 (anti-cytokeratin antibody) was negative. MIB-1 labeling index were less than 2% (Fig.3b).

5: Postoperative course

The patient experienced bilateral weakness of the lower extremities early in the postoperative course. This improved spontaneously over two weeks. There was no sign of posterior funiculus. The patient was discharged with full strength of all extremities.

Discussion

Spinal subependymoma is an extremely rare tumor, with 41 cases having been reported to date including the present case. We conducted a retrospective review of these cases [1-25] in an attempt to find clues for differential diagnosis, and noted the following points.

1. Age of onset ranged from 6 to 76 years (mean, 39 years).

2. Time from tumor formation to onset of symptoms ranged between 3 months and 17 years. Mean period until onset of symptoms was 5.9 years. Hence this is tumor generally has a benign course and symptoms do not appear until relatively late.
Fig. 3: Pathologic findings

a) Light microscopy: The specimen showed round to ovoid cells that were clustered in a fibrous and microcystic background. We did not observe necrosis, mitoses, or perivascular pseudorossetes.

b) MIB-1 index: MIB-1 labeling index was less than 2%.

c) GFAP: Tumor cells were diffusely positive for GFAP (Glial fibrillary acidic protein).

d) EMA: Staining for EMA (Epithelial membrane antigen) was negative.
Post-operative thoracic MRI showed that the tumor had been removed and that the cystic masses were diminished.

3. No gender difference was apparent, with men and women affected in roughly equal numbers.

4. Masses were mostly located at the cervicothoracic level and were rarely found at the lumbar level [6,10]. In most cases, tumors grew longitudinally over the cervical and thoracic spinal cord.

5. Accompanying cystic lesions were comparatively rarer than in astrocytoma or ependymoma.

6. The tumor was difficult to differentiate from astrocytoma or ependymoma on the basis of clinical and radiological findings; hence surgical excision is required for diagnosis. Moreover, as rapid frozen section is not always accurate in this lesion, total resection should be the first aim.

7. The majority of spinal subependymoma originated from intra-axial tissue and were located within the subpial space. The literature contains a report of spinal subependymoma that exhibited exophytic growth or originated from extramedullary tissue [14].

8. Total removal of the tumor is required to achieve complete cure. In the majority of cases, at least subtotal resection was performed.

9. On histopathologic analysis, typical findings were round to ovoid cells clustered in a fibrous and microcystic background. Necrosis and mitosis were rare and these tumors were relatively hypovascular. Immunohistochemical studies did not reveal evidence of malignancy. Overall, malignant potential of the tumor can be considered low.

10. Isolated case was exceptional in that postoperative radiation therapy was performed [6]. Chemotherapy
has not been reported as a post surgical adjuvant therapy in this tumor.

11. No tumor re-growth was reported, supporting the conception that this is a benign tumor with very slow growth and no reported mortality.

12. Long-term survival is considered to be good, such that spinal subependymoma can be found incidentally at autopsy. The present patient has also remained stable, with no signs of recurrence on observation.

**Conclusion**

We encountered a case of long-standing spinal subependymoma. The patient underwent total surgical resection resulting in good neurological recovery. Review of the literature showed that spinal subependymoma is difficult to differentiate from astrocytoma or ependymoma on the basis of clinical course or radiologic findings. Surgery should therefore be performed for diagnosis. Moreover, when results of rapidfrozen section are not typical for a certain tumor, clinicians should bear the diagnosis of subependymoma in mind and attempt total resection, as patients with this tumor tend to exhibit prolonged survival without adjuvant therapy.

**References**

280, 1992


Reviewer's comment: Kim Phyo, M.D.
Department of Neurosurgery, Dokkyo Medical University, Tochigi, Japan

The authors described their experience of a spinal cord subependymoma. The clinicopathological characteristics of the relatively rare entity of intramedullary tumor is well described in the paper. Results of their literature survey is summarized and would be helpful to the readership.

Reviewer's comment: Tomokazu Goya, M.D.
Department of Neurosurgery, Junwakai Memorial Hospital, Miyazaki, Japan

This article is a case report of subependymoma, which is a rare intramedullary spinal cord tumor. The authors state that it is difficult to know subependymoma preoperatively from neurological and radiological findings. The authors confirmed subependymoma by surgical findings, light microscopic and immunohistochemical analyses. Spinal surgeons have to recognize that this rare tumor is observed even in the spinal cord.

Finally, postoperative MRI is beautiful and I congratulate successful removal of the huge intramedullary spinal cord tumor without significant neurological deficit.