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Case Report

Primary Spinal Cord Melanoma

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Primary central nervous system (CNS) melanoma is a rare condition that accounts for only 1% of all melanomas. A 34-year-old Korean female presented with a two-month history of progressive weakness in both legs. Spinal magnetic resonance image (MRI) revealed a spinal cord tumor at the level of T4, which was hyperintense on T1-weighted imaging and hypointense on T2-weighted imaging. The intradural and extramedullary tumor was completely resected and diagnosed as melanoma. There were no metastatic lesions. At three years after surgery, the patient is still alive, with no evidence of tumor recurrence. We present the details of this case along with a comprehensive review of spinal cord melanoma.

KEY WORDS : Melanoma · Spinal neoplasm · Surgical treatment · Prognosis.

INTRODUCTION

Although metastatic melanoma is the third most common cause of central nervous system (CNS) metastases, primary CNS melanoma is rare and accounts for only 1% of all melanomas[4,10]. Primary spinal cord melanoma is even rarer, but has been reported previously[4,10]. We found 38 relevant articles on primary spinal cord melanoma using Medline search and found 3 Korean articles reported domestically. However, none of these reports studied a large number of patients. The largest series addressed only 5 cases[11]. Therefore, the precise incidence, treatment, and prognosis are still unclear. The purpose of this study was to present a comprehensive review of all relevant articles along with our case.

CASE REPORT

A 34-year-old Korean woman was admitted for truncal numbness and progressive weakness in both legs. She had suffered from numbness in her right leg in the past and had been medicated for twelve months prior to admission. Her past medical history was unremarkable. She underwent a lumbar magnetic resonance image (MRI) scan at another hospital six months after symptoms began. The MRI scan revealed no abnormality, but her symptoms became progressively worse. She developed weakness in both legs and truncal numbness below the T4 level two months before admission. Thoracic MRI scan revealed a solid intramedullary lesion at the T4 level (Fig. 1), which showed slightly increased signal intensity on T1-weighted imaging, hypointense on T2-weighted imaging, and homogenously enhancing following gadolinium injection. Neurological examination revealed grade 3/5 strength in the right leg and grade 4/5 strength in the left leg associated with hypesthesia below the T4 level. Deep tendon reflexes were normal and sphincter function was intact. Absence of a primary origin outside the spinal cord was confirmed after dermatological, ophthalmological, and gastrointestinal examinations and positron emission tomography scanning. The patient underwent T4 laminectomy. After dural incision, a dark-pigmented mass was noted on the surface of the spinal cord. The mass was dissected along a cleavage plane and was completely resected. The mass was black-colored, well-demarcated, and soft. Pathological examination revealed epitheloid tumor cell proliferation with dense deposition of melanin granules (Fig. 2). Nuclear pleomorphism and mitoses were also noted. The patient's postoperative course was uneventful, and no adjuvant therapy was performed. She was followed in our outpatient clinic on a frequent

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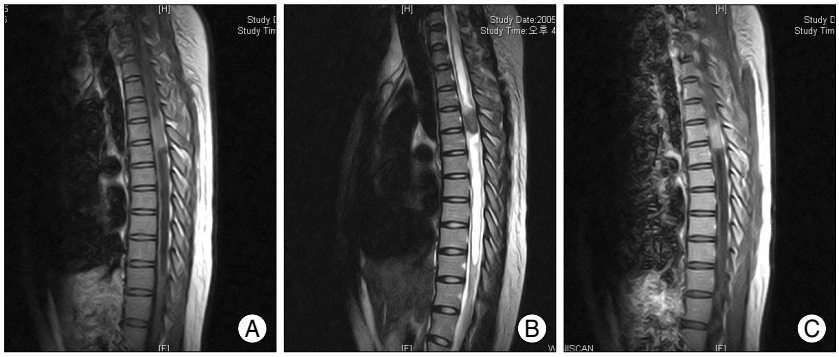

Fig. 1. Sagittal magnetic resonance images (MRI) of thoracic area. A : T1-weighted MRI shows the spinal cord tumor at the level of T4, which has high signal intensity relative to that of the cord and combined syrinx. B : T2-weighted MRI shows homogenous signal hypointensity relative to that of the cord. C : Contrast-enhanced T1-weighted MRI image shows homogenous enhancement.

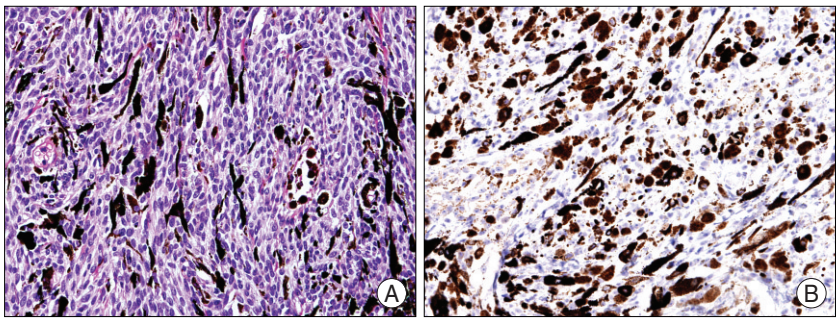

Fig. 2. Microscopic finding. A : Photomicrograph shows atypical, bizarre cells with large pleomorphic nuclei, macronucleoli, and mitoses (H & E, × 1250). B : Immunohistochemical stains for human melanoma black-45 (HMB-45) reveals cytoplasmic reactivity (H & E, × 1250).

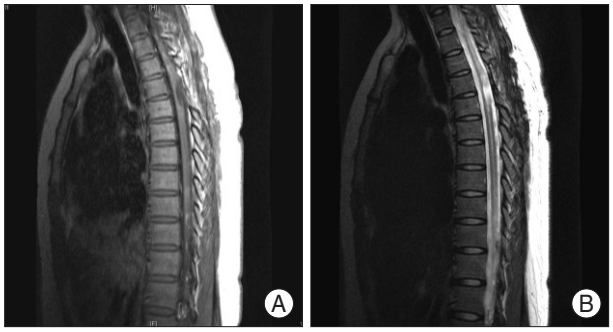

Fig. 3. Magnetic resonance images (MRI) obtained 3 years after surgery showed no residual enhancing lesion in Gadolilium-enhanced T1-weighted sagittal (A) and T2-weighed sagittal (B) view. Syrinx cavity was disappeared.

basis, and she improved to walking status without assistance. At three years after surgery, the patient was free of clinical signs of metastasis, and postoperative MRI showed no recurrence (Fig. 3).

DISCUSSION

Incidence

Primary melanoma of the CNS is rare, accounting for only 1% of all melanoma cases[4,10]. The incidence of primary spinal cord melanoma cannot be found in the literature, but it would be extremely rare. All published surgical cases are summarized in Table 1. The characteristics of cases described in unavailable articles are described through reference to other articles that reviewed the relevant cases. Sex ratio was 1 : 1 (male : female). The mean age was 54 years and ranged from 20 to 80 years. Thoracic cases were most common (42.3%) followed by cervical cases (34.6%), thoracolumbar cases (11.5%), cervicothoracic cases (7.7%), and lumbar cases (3.8%). Exophytosis was present in 50% of reviewed cases. It appears that primary spinal cord melanoma usually arises from the leptomeninges, regardless of its precise cellular origin. It is believed that primary melanoma of the spinal cord arises either from leptomeningeal melanoblasts or from neuroectodermal congenital rests[15,22]. Leptomeningeal melanoblasts penetrate the spinal cord with the vascular bundles[5]. Epidermal melanoblasts reach the leptomeninges when the neural crest is formed.

Diagnosis

The clinical symptoms are non-specific[10]. Progressive weakness seen in the present case is the most common symptom. The mean symptom duration in previous cases was 15 months and ranged from 0.3 to 96 months. At the present time, MRI is the best method for diagnosing spinal cord tumors. However, distinction of tumor type based on MRI findings remains difficult. The differential diagnosis includes melanocytoma, intermediategrade melanocytic tumor, and melanotic schwannoma[3,4]. Melanomas characteristically show hyperintesity on T1-weighted images, hypointensity on T2-weighted images, and homogeneous enhancement on T1-contrast-enhanced images[4]. The paramagnetic properties of melanin or intratumoral hemorrhage probably lead to these findings[4]. However, these are also observable in other melanocytic tumors. Thus, the ultimate diagnosis can only be made on the basis of histopathological examination. Melanocytoma is immunoreactive for HMB-45 and S-100 protein. In addition, the most specific feature of melanocytoma is the formation of tight nests surrounded by well differentiated melonocytes with cytoplasm rich in melanin[3]. Such disposition is absent in melanomas and in intermediate grade-lesions. Intermediate-grade melanocytic tumors are

Table 1. Summary of primary intramedullary spinal cord melanoma. Unobtainable data are left as blank

No	Study	Pub year	Sex/Age	Site	Dr (m)	Exo	Op	Adj	Sv	Last state
1	Bell[7]	1930		C7-T1		Yes	TR	No		
2	Da Costa[16]	1939		T6			TR	No		
3	Woods[16]	1944	F/62	T9	18		TR	No	8	Dead
4	Roca[16]	1954		L-S			TR	No		
5	Gros[16]	1956		T12-L1			TR	No		
6	Hirano and Carton[7]	1959	M/42	T8-10	4	Yes	TR	RT (60Gy)	6.5	Dead
7	Kiel et al.[9]	1961	F/33	C4-6	6	Yes	STR	No	25	Dead
8	Jung et al.[8]	1974	F/62	C2-5	3	Yes	TR	No		
9	Larson et al.[11]	1987	M/73	T6-8	6	Yes	STR	RT (50Gy)	84	Alive
10	Larson et al.[11]	1987	M/63	T2-9	96	No	STR	RT (60Gy)	156	Dead
11	Larson et al.[11]	1987	F/67	T9-11	18	No	STR	RT (45Gy)		
12	Larson et al.[11]	1987	F/57	C1-3	3	Yes	STR	RT (50Gy)	30	Dead
13	Larson et al.[11]	1987	F/69	T9-10	24	No	STR	No	44	Dead
14	Yoo et al.[23]	1987	F/20	C7-T1	0.25	Yes	STR	No	17	Alive
15	Yamasaki et al.[22]	1989	M/31	T6	6	Yes	STR	RT (50Gy) CT (DTIC)	12	Alive
16	Bae et al.[1]	1996	M/41	C3-5		Yes	STR	RT (50Gy) CT (VBC)	14	Alive
17	Magni et al.[12]	1996	M/64	T8		Yes	TR	No	18	Alive
18	Francois et al.[5]	1998	M/62	T7-9	18	No	TR	No	28	Alive
19	Salame et al.[17]	1998	F/76	T12-L2	6	No	STR	RT (30Gy)	15	Alive
20	Brat et al.[3]	1999	F/71	T10			TR	No	14	Alive
21	Brat et al.[3]	1999	M/52	C1			STR	RT (40Gy)	16	Alive
22	Brat et al.[3]	1999	F/20	C4			STR	No	20	Alive
23	Brat et al.[3]	1999	F/57	C4			STR	RT (54Gy)	8	Dead
24	Bidzinski	2000	M/36	C6-7	8	Yes	TR	RT (30Gy)	48	Alive
25	Farrokh et al.[4]	2001	F/80	T12-L1		Yes	STR	No	9	Alive
26	Kounin et al.[10]	2005	F/41	C2-4	9	Yes	TR	No	3	Alive

Adj : adjuvant therapy, CT : chemotherapy, DTIC : dacarbazine [5 (or 4)-(dimethyltriazeno) imidazole-4 (or 5)-carboxamide], Dr : duration, E : cauda equine, Exo : exophytosis, IFN : interferon, Op : operation, Pub : published, RT : radiation therapy, STR : subtotal removal, Sv : survival duration, TR : total removal, VBC : vincristine, bleomycin and cisplatin

differentiated from melanomas in the degree of hypercellularity, cytologic atypia, and mitotic activity[3]. Melanotic schwannomas show strong pericellular immunoreactivity for collagen type IV, whereas melanocytomas typically show perilobular and perivascular staining[3]. If the diagnosis of spinal cord melanoma is made, differentiation of primary melanoma from a metastatic lesion should be undertaken. Whereas life expectancy is less than one year in patients with metastatic melanoma to the CNS, a number of patients with primary CNS melanoma experience long-term survival and even cure[3,11,17,19,20]. This is the main reason why distinction between primary and metastatic melanoma is important. Primary spinal cord melanoma is diagnosed when the following criteria, proposed by Hayward, are met : 1) there is no malignant melanoma outside the central nervous system, and 2) the lesion is confirmed pathologically[6]. The present case satisfied these criteria.

Treatment

Surgical resection has traditionally been the standard treatment for primary spinal cord melanoma[3,4,10]. In the literature, operation was performed in 26 patients. Complete resection was achieved in 12 cases (46.2%), and subtotal resection was achieved in 14 cases (53.8%). The efficacy of radiotherapy and chemotherapy is still controversial[5,7,14]. Radiotherapy was performed in 11 of 26 patients. The mean radiation dose was 47 Gy and ranged from 30 to 60 Gy. While radiation therapy has been performed by many authors, the radiosensitivity of malignant melanoma is questionable[5]. Stereotactic radiosurgery may be an alternative treatment for this lesion[2,18], but it needs further studies to define its role. Two patients underwent intravenous chemotherapy. One patient was treated with dacarbazine (DTIC)[22], and the other was treated with vincrisine, bleomycin, and cisplatin[1]. They both lived at least one year. However, data on the response to chemotherapy were not available in these two case reports. Biotherapy-including interferon-α, interferon-γ, interleukin-2, and lymphokine-activated killer (LAK) cells--has been attempted in other melanomas and can be tried in primary CNS melanoma[21]. At the present time there is no data concerning the effect of radiotherapy or chemotherapy on survival. Fifteen patients received no adjuvant therapy.

Among them, seven patients survived more than one year, and three patients survived more than two years. However, long-term follow-up data were not available for them.

Prognosis

Although the survival rate for CNS melanoma has not yet been determined, the overall prognosis seems to be better than that of cutaneous melanoma, which is usually fatal within six months because of systemic involvement[3,11,17,19,20]. The clinical course of CNS melanoma is unpredictable. Larson et al.[11] reported an average life expectancy of approximately seven years after surgery with radiotherapy. The mean survival duration was 28.8 months and ranged from 3 to 156 months. Seventeen patients died during follow-up, and the mean duration to death was 40 months and ranged from 8 to 156 months (Table 1). The characteristics of the CNS might contribute to the indolent nature of this disease. In contrast to cutaneous melanoma, lymphatic spread would be difficult because there are no lymphatics in the spinal cord. The blood-brain barrier of the spinal cord might also prevent hematogenous spread. The variable clinical course of primary spinal cord melanoma resembles primary uveal melanoma[3]. While the natural history and prognostic parameters for primary uveal melanoma are well delineated[21], those for primary spinal cord melanoma are not. The rarity of primary spinal cord melanoma might be one reason for this. The known prognostic parameters for primary uveal melanoma are tumor diameter, patient age and gender, histological features, and tumor location[21]. Older patients of male sex have worse prognosis, as do patients with larger tumors of the choroid and ciliary body. In 1931, Callender first classified uveal melanomas into the following groups according to the shape and differentiation status of the cells : spindle A cells (fine chromatin and no distinct nucleoli), spindle B cells (plumper nuclei, more nucleoli and coarser chromatin), and epithelioid cells (pleomorphic)[3]. McLean reported that the best prognosis was seen in pure spindle cell tumors, regardless of type. A worse prognosis was seen in mixed tumors, and the worst prognosis was seen in epithelioid cell tumors[13]. Brat reported that CNS melanocytic neoplasms probably share these features[3]. According to this classification system, our case was in the spindle A cell classification, which has the best prognosis. Retrospective review of histopathological features was impossible, because histopathological photomicrographs were not available in many reports.

Follow-up

Because primary spinal cord melanoma has an unpredictable clinical course, annual follow-up visits and MRI follow-up are recommended for an extended period[22].

CONCLUSION

Primary spinal cord melanoma is distinct from cutaneous melanoma, and its clinical course is unpredictable. Long-term study in a large series is necessary to delineate the natural history, prognostic parameters, and treatment modalities for primary spinal cord melanoma. The present case shows that complete resection alone, without any adjuvant therapy, may result in a favorable outcome for primary spinal cord melanoma of pure spindle cell type.

References

1. Bae BC, Song GS, Cha SH, Park DJ, Choi CH, Lee YW : Primary spinal malignant melanoma in the cervical spinal cord : Case report. **J Korean Neurosurg Soc 25** : 1929-1934, 1996
2. Benzil DL, Saboori M, Mogilner AY, Rocchio R, Moorthy CR : Safety and efficacy of stereotactic radiosurgery for tumors of the spine. **J Neurosurg 101** : 413-418, 2004
3. Brat DJ, Giannini C, Scheithauer BW, Burger PC : Primary melanocytic neoplasms of the central nervous systems. **Am J Surg Pathol 23** : 745-754, 1999
4. Farrokh D, Fransen P, Faverly D : Mr findings of a primary intramedullary malignant melanoma : case report and literature review. **Am J Neuroradiol 22** : 1864-1866, 2001
5. François P, Lioret E, Jan M : Primary spinal melanoma : case report. **Br J Neurosurg 12** : 179-182, 1998
6. Hayward RD : Malignant melanoma and the central nervous system. A guide for classification based on the clinical findings. **J Neurol Neurosurg Psychiatry 39** : 526-530, 1976
7. Hirano A, Carton CA : Primary malignant melanoma of the spinal cord. **J Neurosurg 17** : 935-944, 1960
8. Jung HH, Kim SH, Chung SS, Lee HJ : Malignant melanoma in the spinal cord : report of a case. **J Korean Neurosurg Soc 3** : 59-62, 1974
9. Kiel FW, Starr LB, Hansen JL : Primary melanoma of the spinal cord. **J Neurosurg 18** : 616-629, 1961
10. Kounin GK, Romansky KV, Traykov LD, Shotekov PM, Stoilova DZ : Primary spinal melanoma with bilateral papilledema. **Clin Neurol Neurosurg 107** : 525-527, 2005
11. Larson TC 3rd, Houser OW, Onofrio BM, Piepgras DG : Primary spinal melanoma. **J Neurosurg 66** : 47-49, 1987
12. Magni C, Yapo P, Mocaer J, Renjard L, Sonier CB, Cottier JP, et al. : [Primary intramedullary melanoma. Apropos of a case.] **J Neuroradiol 23** : 41-45, 1996
13. McLean IW, Saraiva VS, Burnier MN Jr : Pathological and prognostic features of uveal melanomas. **Can J Ophthalmol 39** : 343-350, 2004
14. Narayan RK, Rosner MJ, Povlishock JT, Girevendulis A, Becker DP : Primary dural melanoma : a clinical and morphological study. **Neurosurgery 9** : 710-717, 1981
15. Ozden B, Barlas O, Hacihanefioğlu U : Primary dural melanomas : report of two cases and review of the literature. **Neurosurgery 15** : 104-107, 1984
16. Pappenheim E, Bhattacharji SK : Primary melanoma of the central nervous system. Clinical-pathological report of a case, with survey and discussion of the literature. **Arch Neurol 7** : 101-113, 1962
17. Salame K, Merimsky O, Yosipov J, Reider-Groswasser I, Chaitchik S, Ouaknine GE : Primary intramedullary spinal melanoma : diagnostic and treatment problems. **J Neurooncol 36** : 79-83, 1998
18. Shin DA, Huh R, Chung SS, Rock J, Ryu S : Stereotactic spine radiosurgery for intradural and intramedullary metastasis **Neurosurg Focus 27** : E10, 2009
19. Skarli SO, Wolf AL, Kristt DA, Numaguchi Y : Melanoma arising in a

cervical spinal nerve root : report of a case with a benign course and malignant features. **Neurosurgery 34** : 533-537; discussion 637, 1994
20. Vaquero J, de Prado F, Pedrosa M : Primary intraparenchymatous spinal cord melanoma. **Spinal Cord 36** : 363-365, 1998
21. Wöll E, Bedikian A, Legha SS : Uveal melanoma : natural history and treatment options for metastatic disease. **Melanoma Res 9** : 575-581, 1999
22. Yamasaki T, Kikuchi H, Yamashita J, Asato R, Fujita M : Primary spinal intramedullary malignant melanoma : case report. **Neurosurgery 25** : 117-121, 1989
23. Yoo KH, Rim CS, Lee KC, Chu JW : A case of primary melanoma in the spinal cord. **J Korean Neurosurg Soc 16** : 523-528, 1987