

# CASE REPORT

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## PRIMARY CAUDA EQUINA LYMPHOMA: CASE REPORT AND LITERATURE REVIEW

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### ABSTRACT

The central nervous system, in particular the spinal cord, is a rare site for primary lymphoma occurrence, with very few published cases. We report an extremely rare primary lymphoma in the cauda equina in a single case with literature review. An immunocompetent 59-year-old male, who complained of progressive low back and bilateral leg pain for 7 months, was studied. Magnetic resonance imaging (MRI) revealed an intradural space-occupying lesion from T12 to S1, poorly demarcated to the normal cauda equina. The intradural lesion showed T1 low intensity, T2 low isointensity, and marked homogeneous enhancement with gadolinium-diethylenetriaminepentaacetic acid on MRI. We performed spinal tap to obtain additional information about the intradural lesion. Large-sized atypical lymphoid cells were found during pathological examination. Fluorodeoxyglucose accumulation was found only in the lumbar area, which corresponded with the MRI findings, and the primary lymphoma site was defined as the cauda equina area. For further detailed pathological diagnosis, we performed surgical biopsy of the cauda equina. Morphological and immunohistochemical assessment made a diagnosis of diffuse large B-cell lymphoma of the cauda equina. The patient received radiotherapy to the lumbosacral area (50 Gy) and methotrexate (MTX) therapy after surgery. The patient was able to walk without help after the therapies. Follow-up MRI performed 1 year after biopsy showed remission of the lesion. MRI and spinal tap were effective tools for the early definitive diagnosis of cauda equina lymphoma. Combined treatment with radiotherapy and MTX should be performed as early as possible.

Key Words: primary lymphoma, cauda equina, B-cell lymphoma

### INTRODUCTION

Primary central nervous system (CNS) lymphoma (PCNSL) is a relatively rare tumor, accounting for 1%–7% of primary brain tumors and 1%–2% of all cases of non-Hodgkin lymphoma<sup>1</sup>. Primary lymphoma existing in the spinal cord is also rare, representing <1% of PCNSLs in adults<sup>2</sup>. In addition, primary lymphoma in the cauda equina is even more rare. We identified an extremely rare case of primary lymphoma in the whole cauda equina area, characterized by

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disappearance of the cauda equina nerves, using magnetic resonance imaging (MRI). The purpose of this report was to describe the clinical features and pathological findings of the case of cauda equina lymphoma, with a review of the literature.

### CASE REPORT

A 59-year-old immunocompetent man, with a 7-month history of severe low back and bilateral leg pain, was studied. Symptoms had gradually progressed after onset, and the patient could not walk because of severe leg pain. The patient's Eastern Cooperative Oncology Group perfor-



**Fig. 1** Magnetic resonance imaging — (a) preoperative T1-weighted sagittal image, (b) preoperative T2-weighted sagittal image, (c) preoperative T1-weighted sagittal image with gadolinium enhancement showing an intrathecal mass at the lesion and marked enhancement with gadolinium, (d) preoperative T2-weighted axial image at L4/5 level (e) postoperative T2-weighted axial image at L4/5 level. Swelling of the cauda equina was diminished (white arrow).

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mance status<sup>3)</sup> was 3 and previous history included hypertension, diabetes mellitus, and cerebral subarachnoid hemorrhage, for which surgery had been performed. Physical examination revealed bilateral absence of lower limb reflexes, numbness of both lower extremities, and mild motor weakness in bilateral iliopsoas and hamstring muscles. Routine hematological and biochemical tests, as well as human immunodeficiency virus serology, were normal. Serum interleukin-2 and serum lactate dehydrogenase (LDH) levels were normal at 458U/ml and 149 IU/l, respectively.

MRI of the lumbar spine revealed an intradural space-occupying lesion from T12 to S1, which was poorly demarcated to the normal cauda equina. The intradural lesion showed T1 low intensity, T2 low isointensity, and marked homogeneous enhancement with gadolinium (Gd)-diethylenetriaminepentaacetic acid on MRI (Figures 1a–d). No other region of the patient's brain or spine was found to be involved. Malignant lymphoma and metastatic lesion were the differential diagnosis of this lesion.

We attempted to collect a cerebrospinal fluid sample by spinal tap in order to obtain additional information about the intradural lesion. We performed spinal tap under fluoroscopy at the L3–4 level. Initially, no sample was obtained because of a lack of cerebrospinal fluid. We then administered 3 ml of normal saline into the spinal canal and collected the injected sample. Large-sized atypical lymphoid cells were identified by pathological examination, and the lumbar spinal lesion was diagnosed as malignant lymphoma. The cerebrospinal fluid protein level was found to be elevated at 0.48 g/dl.

We performed fludeoxyglucose (FDG)-positron emission tomography. FDG accumulation was found in the spinal intradural area (T12–S1), which corresponded with the MRI findings. FDG accumulation was not found in any other location. Moreover, whole-body computed tomography (CT) and bone marrow biopsy of the iliac bone did not show abnormalities. We diagnosed this patient with primary cauda equina lymphoma.

To obtain more detailed pathological information, we performed surgical open biopsy within the cauda equina area. After fenestration at the L3–4 left side and incision of the dural sac, the cauda equina was observed as extremely swollen with dull red tumors present. The tumors infiltrated extensively between the cauda equina and adhered strongly to the nerve root. We performed biopsy by cutting the nerve sheath of one of the cauda equina nerves. After surgery, the patient's severe leg pain did not worsen. A short course of methylprednisolone was administered,

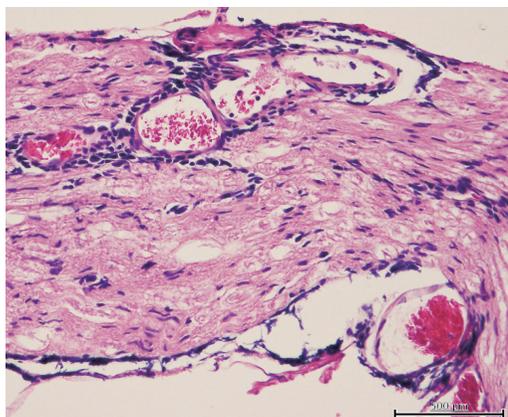


Fig. 2a

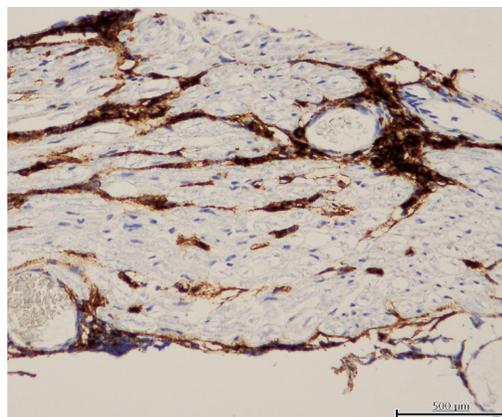


Fig. 2b

**Fig. 2** (a) Diffuse proliferation of lymphoma cells infiltrating in nerve tissue of cauda equina (hematoxylin-eosin stain). (b) Lymphoma cells are positive for CD20

with transient improvement in the immediate postoperative period.

A diagnosis of diffuse large B-cell lymphoma (DLBCL) of the cauda equina was made on the basis of morphological and immunohistochemical assessment. Histologically, atypical lymphoid cells infiltrate the nerve tissue. Tumor cells were positive for CD20 and BCL-2 and negative for CD3, CD5, CD10, BCL-6, MUM-1, and PAX5 (Figure 2). Lymphoma cells were observed to infiltrate into nerve tissues.

The patient received radiotherapy to the lumbosacral area with a dose of 50 Gy and methotrexate (MTX) after surgery. One year after surgery, lower leg pain was relieved and walking unaided was possible. MRI performed 1 year after surgery showed that swelling of the cauda equina was diminished (Figure 1e). Furthermore, metastasis was not found on radiographical examination.

## DISCUSSION

PCNSL is a form of extranodal lymphoma and accounts for 5%–7% of primary brain tumors<sup>4</sup>. Most PCNSLs (almost 90%) are diffuse large B-cell non-Hodgkin lymphomas<sup>5</sup> and account for 1%–2% of all cases of non-Hodgkin lymphoma<sup>4</sup>. PCNSLs are often associated with immunocompromized patients.

In the CNS, the spinal cord is the rarest site of involvement in patients with PCNSLs (<1% of PCNSLs)<sup>2</sup>. Moreover, among spinal cord lymphomas, cauda equina lesions are rare. To the best of our knowledge, only 15 cases of primary cauda equina lymphoma have been reported (Table 1)<sup>6–19,23</sup>. Moreover, there were no case resembling the present case, with primary lymphoma in the whole cauda equina area and the disappearance of the cauda equina nerves on MRI. Our patient had a long history (7 months) of clinical symptoms prior to diagnosis, which may be unusual in patients with PLML of the cauda equina (Table 1). This long clinical history might give the largest tumor extent. Examination of spinal MRI with intravenous Gd has been shown to be useful in detecting lymphoma in the cauda equina, and thickened cauda equina and nerve roots are detected after Gd enhancement. The differential diagnosis of intradural non-solid tumor in the cauda equina is metastasis, infections (tuberculosis, toxoplasmosis, and cryptococcal granulomas), and arachnoiditis<sup>19</sup>. Open biopsy is needed for definitive diagnosis, but some authors suggest the collection of cerebrospinal fluid for diagnosis<sup>6,20</sup>. In the present case, we also obtained cerebrospinal fluid before biopsy. If the cerebrospinal fluid test results identify a metastatic tumor, open biopsy should not be performed in order to reduce the risk of paralysis after cauda equina biopsy. Whole-body CT should therefore be used to identify the origin of the tumor. If the cerebrospinal fluid test results identify infection or arachnoiditis, there is no need for further biopsy.

With regard to treatment of PCNSL, there is consensus that combined chemoradiotherapy is superior to radiotherapy or chemotherapy alone<sup>21,22</sup>. MTX is known to be the single most effective chemotherapeutic agent for PCNSL<sup>21,22</sup>. Standard systemic chemotherapy for nodal lymphomas, such as CHOP (cyclophosphamide, doxorubicin, vincristine, and prednisone), is ineffective because of the difficulty of penetration of the blood–brain barrier by chemotherapeutic drugs<sup>21</sup>. Among other chemotherapeutic drugs, rituximab, a chimeric monoclonal antibody against the CD20 antigen, has been reported as a potential drug to increase survival when used for patients with systemic CD20 diffuse large B-cell non-Hodgkin lymphoma. However, its ability to prevent CNS dissemination of DLBCL remains low<sup>21</sup>. Although it has not been addressed in a phase 3 clinical trial to date, MTX combined with ara-C has the potential to be an effective chemotherapeutic approach for *de novo* PCNSL<sup>21</sup>. While intrathecal chemotherapy has been investigated for PCNSL, including the spine area (Table 1), its effectiveness remains controversial<sup>21</sup>.

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**Table 1** Literature review about primary lymphoma of cauda equina

Reference	Age/Sex	Interval (Onset-Diagnosis)	Pathology	Treatment	Outcome	Follow up
Mauney <sup>6)</sup>	68/F	1 wk	B cell lymphoma	RT	Alive	3 months
Toner <sup>7)</sup>	59/M	3 mo	B cell lymphoma	RT, CT (intrathecal and intravenous)	Alive	2 years
Klein <sup>8)</sup>	29/F	2 wk	B cell lymphoma	N.A.	Died	5 weeks
Knopp <sup>9)</sup>	69/F	3 wk	N.A.	N.A.	N.A.	N.A.
Ooi <sup>10)</sup>	16/M	3 wk	T-lymphoblastic lymphoma	RT, CT (intrathecal and intravenous)	Died	8 months
Giobbia <sup>11)</sup>	30/F	2 mo	B cell lymphoma	RT, CT (intrathecal)	Alive	1 year
Zagami <sup>12)</sup>	71/F	3 wk	B cell lymphoma	CT (intrathecal)	Died	16 months
Tajima <sup>13)</sup>	67/F	3 yr	B cell lymphoma	RT, CT (intrathecal)	Alive	3 years
Khong <sup>14)</sup>	16/M	6 wk	B cell lymphoma	RT, CT (intravenous)	Alive	1 year
Morita <sup>15)</sup>	67/M	2 mo	NK/T cell lymphoma	RT, CT (oral)	Died	14 months
Beitzke <sup>23)</sup>	69/M	1 yr	B cell lymphoma	CT	Died	Soon after diagnosis
Teo <sup>16)</sup>	58/M	2 mo	B cell lymphoma	RT, CT (intravenous)	Alive	2 years
Cugati <sup>17)</sup>	11/M	3 day	N.A.	RT, CT (intravenous)	Alive	1 year
Iwasaki <sup>18)</sup>	69/M	N.A.	B cell lymphoma	RT, CT (intravenous)	Died	1.5 years
Nishida <sup>19)</sup>	47/M	10 day	B cell lymphoma	RT, CT (intrathecal and intravenous)	Alive	1.5 years
Nakashima (this study)	59/M	7 mo	B cell lymphoma	RT, CT (intravenous)	Alive	1 year

N.A., not available; RT, radiation therapy; CT, chemotherapy

Radiation therapy alone is initially effective; however, the response is usually short-lived with median survival rates ranging from 10 to 18 months<sup>21,22)</sup>. A dose of 40–50 Gy has been suggested, resulting in a 19% complete remission rate in the brain<sup>21)</sup>. Doses of >50 Gy and the addition of a boost are associated with increased risk of neurotoxicity<sup>21)</sup>. Aggressive surgical tumor resection is not effective for the treatment of PCNSL lesions<sup>22)</sup>.

The International Extranodal Lymphoma Study Group presented prognostic scoring according to age, performance status, serum LDH level, cerebrospinal fluid protein level, and involvement of deep structures<sup>3)</sup>. Although it is difficult to adapt this prognostic scoring system to the cauda equina lymphoma in the present case, because of the difference in tumor site, 3 risk factors (low performance status, elevated cerebrospinal fluid protein level, and lymphoma invasion to deep site of the cauda equina) were identified in the present case. This patient was classified in the middle risk group with high dose MTX, and the 2-year overall survival was estimated as 57%  $\pm$  8%<sup>3)</sup>. The patient's performance status is currently high 1 year after biopsy; however, further long-term follow-up is needed.

Conflict of Interest: Nil

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