

## Case Report

### Clear Cell Ependymoma of Spinal Cord: A Case Report

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#### ABSTRACT

Clear cell variant of ependymoma is almost exclusively located in the supratentorial region. Only few cases of this tumor that located in the spinal cord have been reported. Here we report one case of intramedullary clear cell ependymoma of the lumbar spinal cord. In microscopic examination, the tumor cells were round to oval with moderate amounts of clear cytoplasm and centrally located large nuclei, resembling oligodendroglioma. Typical features of ependymoma, such as ependymal clefts, perivascular pseudorosettes, as well as nuclear pseudoinclusions and grooves were identified. Albeit being rare, clear cell ependymoma could be mentioned in differential diagnosis of clear cell tumors in this area.

**Keywords:** Clear Cell Ependymoma, Spinal Cord, Iran

#### Introduction

Clear cell ependymoma is almost recently accepted as a distinct variant of ependymoma including few diagnostic features of this tumor, such as ependymal rosettes (1). This variant of ependymoma has been practically restricted to supratentorial compartment (2) and it may be misdiagnosed as oligodendroglioma or central neurocytoma and even metastatic renal cell carcinoma (1, 3-5). Unlike the conventional ependymoma, it is rare for clear cell variant to be presented as a spinal cord lesion. According to

previous studies, only two and three cases of spinal cord clear cell ependymoma have been reported in the literature, respectively (1, 3,4, 6). The treatment of choice is surgical resection followed by radiation therapy to prevent local recurrence (1).

Due to differences in the predicted behavior of the tumor as well as the operation modality between this tumor and other clear cell tumors, especially astrocytic tumors, which are much more common in this region, making a correct diagnosis is important. Here we report one case of clear cell ependymoma arising in spinal cord, at L1-L2 level, with emphasizing on histologic and immunohistochemical findings.

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## Case report

A 57 year-old woman referred to the hospital with a two-week history of low back pain without radiation to lower limbs or sphincter problem. In neurologic evaluation muscle force was 5/5 and sensory examination was intact. Deep Tendon Reflex (DTR) detected 2+ in upper extremities and was absent in lower extremities, associated with downward plantar reflex and negative Hoffman test. Past medical history was unremarkable.

In radiologic studies, spine magnetic resonance imaging (MRI) revealed an intramedullary lesion with contrast enhancement, measuring 2 cm in diameter, located at L<sub>1</sub>-L<sub>2</sub> level (Fig. 1). A cystic lesion was also reported proximal to this lesion. Other portions of spinal cord and canal were normal except for multiple hemangiomas in vertebral bodies in different levels. Brain MRI was within normal limits.

The tumor was dissected and sent to surgical pathology lab. The postoperative recovery of the patient was unremarkable.

The excised tumor was fixed in 10% buffered formalin. Representative sections of the whole specimen embedded in paraffin blocks, processed

and stained with hematoxylin and eosin (H&E) and PAS for routine histological examination, also serial sections for immunohistochemical studies prepared.

Immunohistochemical stainings, using avidin-biotin peroxidase technique were performed with antibodies to the following antigens (Table 1).



**Fig. 1:** MR image of spinal cord showing intramedullary mass at L<sub>1</sub>-L<sub>2</sub> level.

The tumor mass received as some grayish, soft tissue fragments, which measured 2×2×1cm, in aggregate.

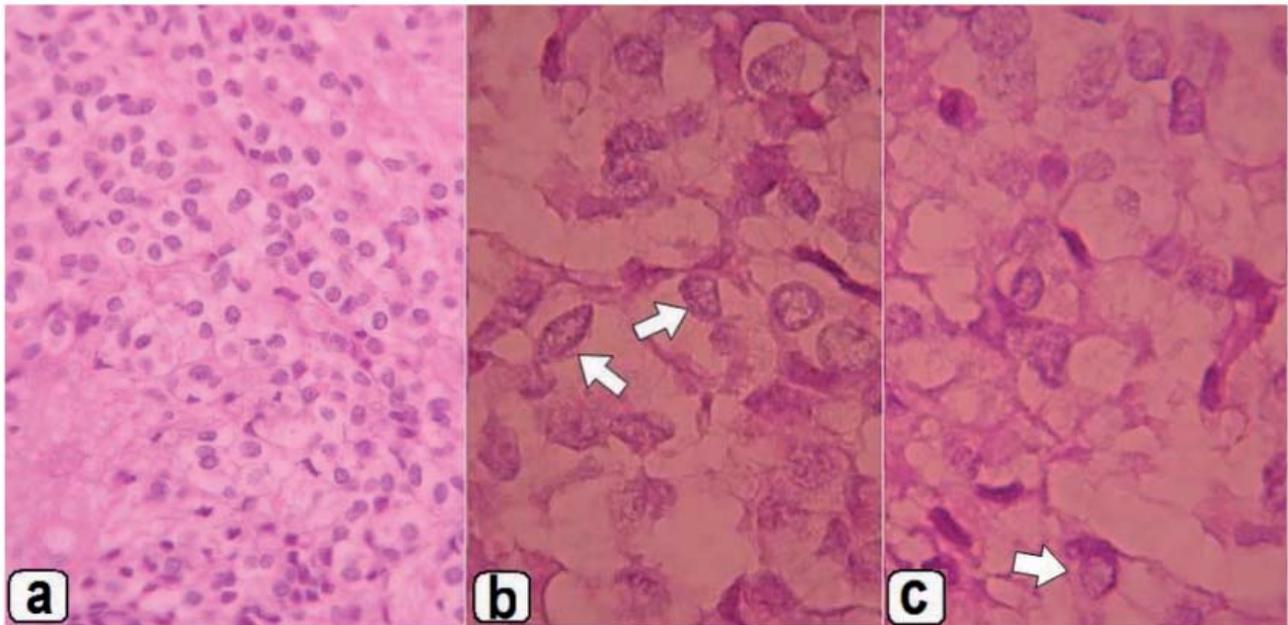
**Table 1:** Antibodies used for immunohistochemical studies

Target Protein	Clone	Dilution	Source
<b>S-100 Protein Code NP020</b>	Polyclonal	Prediluted (Stock 1/500)	Dako-Denmark
<b>GFAP * Code N1506</b>	Polyclonal	Prediluted	Dako-Denmark
<b>Desmin Code N1526</b>	Monoclonal (Clone: D33)	1/100	Dako-Denmark
<b>Pancytokeratin Code 1589</b>	Monoclonal (Clone: LP34 <sup>1</sup> , 34BE12 <sup>2</sup> 35BH11 <sup>2</sup> )	Prediluted	Dako-Denmark
<b>Synaptophysin Code N1566</b>	Polyclonal	Prediluted	Dako-Denmark
<b>ChromograninA Code N1535</b>	Polyclonal	Prediluted	Dako-Denmark
<b>NSE * Code N1557</b>	Monoclonal (Clone: BBS)	Prediluted	Dako-Denmark
<b>Vimentin Code No.M7020</b>	Monoclonal VIM3B4	1/100-1/200	Dako-Denmark
<b>EMA * Code NR.M0613</b>	Monoclonal (Clone: E29)	1/100	Dako-Denmark
<b>P53 Protein Code Nr.M7001</b>	Monoclonal (Clone: Do-7)	1/50	Dako-Denmark
<b>Ki-67 Code N1633</b>	Monoclonal (Clone:MIB-1)	Prediluted (Stock 1/500)	Dako-Denmark
<b>CytoKeratin7 Code N1626)</b>	Monoclonal (Clone: OV-TL 12/30)	Prediluted	Dako-Denmark

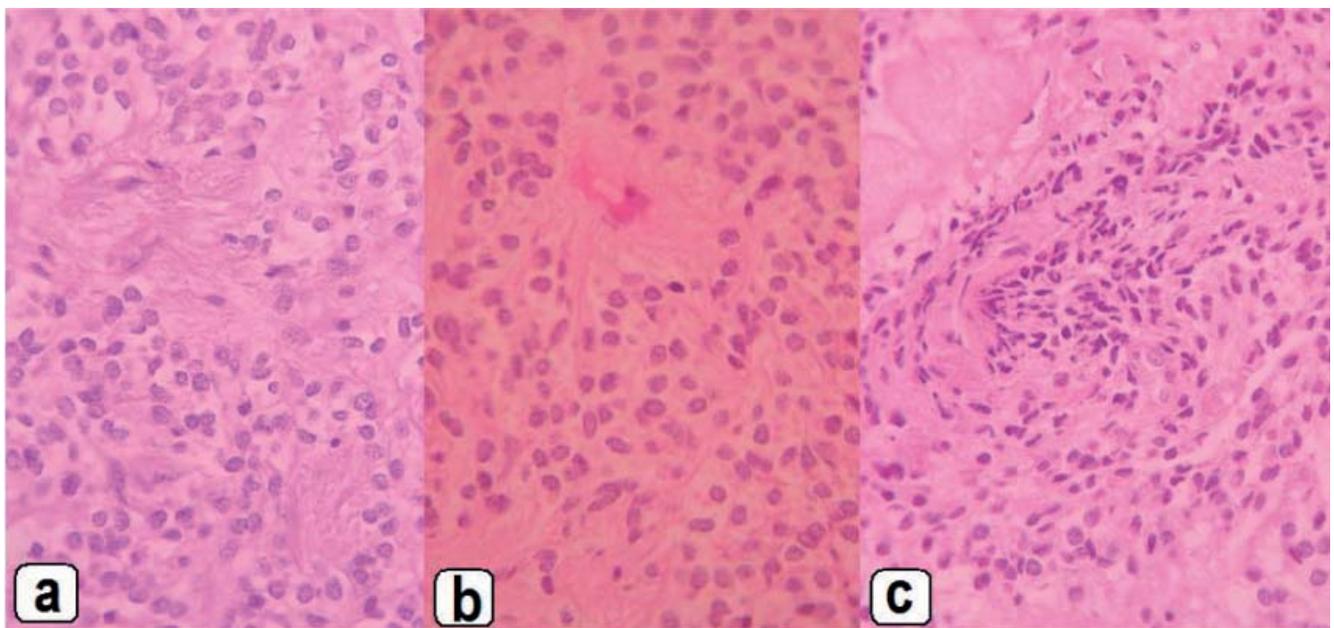
\*GFAP, glial fibrillary acidic protein; NSE, neuron specific enolase; EMA, epithelial membrane antigen.

Microscopically, the tumor was moderately cellular, composed of round to oval cells with large central nuclei and clear cytoplasm; without any atypical features (Fig. 2a). Diagnostic features such as nuclear grooves and intranuclear inclusions

were rarely found (Fig. 2b&c). The fibrillary background was easily found in different portions of tumor (Fig. 3a). Rare ependymal clefts and perivascular hyalinization and pseudorosettes were also identified (Fig. 3b&c).



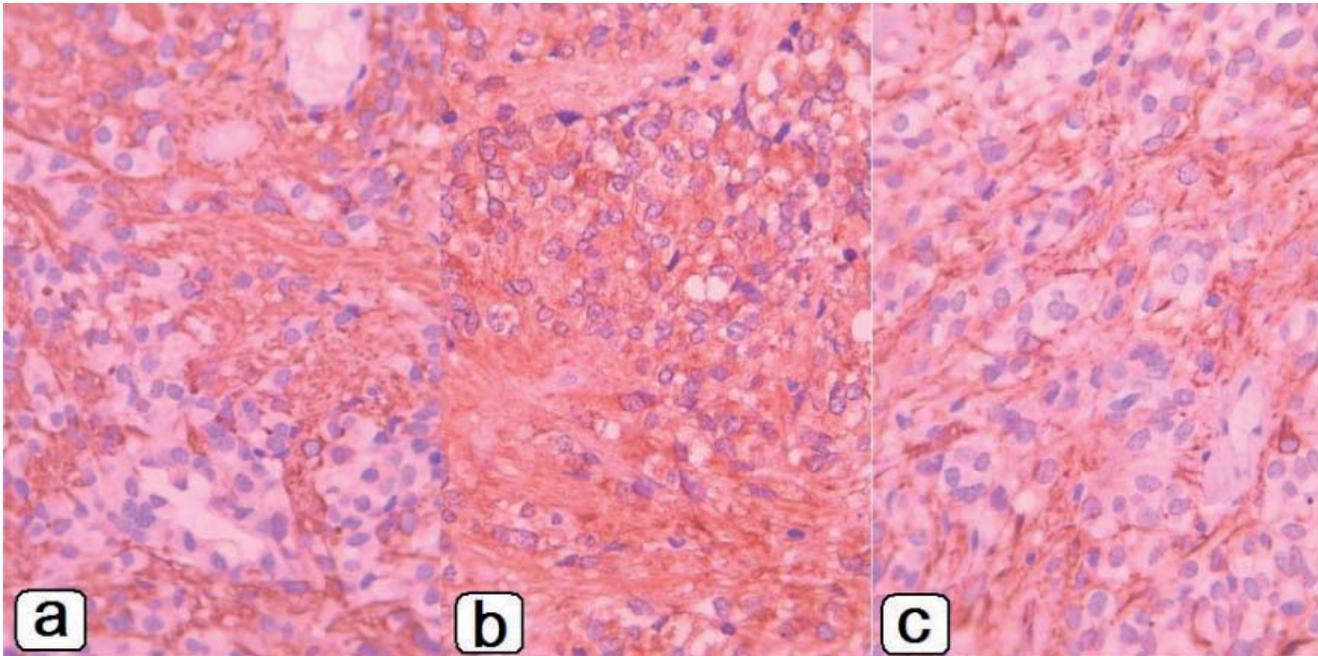
**Fig. 2:** Clear cell ependymoma. (a) clear cells with round centrally located nuclei and perinuclear halo, (H&E staining, ×100). (b) Nuclear grooves (arrows) (PAS staining, ×400). (c) Intranuclear inclusion (arrow) (H&E staining, ×400)



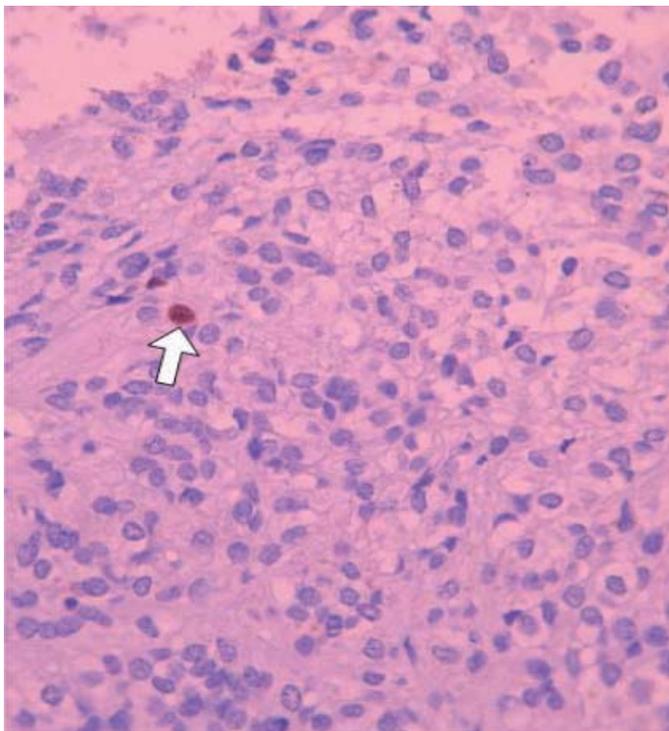
**Fig. 3:** Clear cell ependymoma. (a) fibrillary background, (H&E staining, ×100). (b) vascular pseudorosette (H&E staining, ×100). (c) ependymal cleft (H&E staining, ×100)

Immunohistochemistry assessments with antibodies against the antigens listed in Table 1 were done. The tumor cells were immunoreactive to S-100 protein, glial fibrillary acidic protein (GFAP), neuron specific enolase (NSE), and vimentin, but not for epithelial membrane antigen

(EMA), desmin, pancytokeratin, chromogranin, synaptophysin and P53 (Fig. 4). The proliferative index of tumor was assessed by immunoreactivity for Ki67, showing less than 1% proliferating index (Fig. 5).



**Fig. 4:** immunostaining of the tumor. (a) the fibrillary background of the tumor is strongly positive for GFAP ( $\times 100$ ). (b) the cytoplasm of tumor cells is positive for NSE ( $\times 100$ ). (c) vimentin is positive in cytoplasm of tumor cells ( $\times 100$ )



**Fig. 5:** immunostaining of the tumor for Ki67 shows positive staining in less than 1% tumor cells nuclei (arrow)

## Discussion

Ependymoma constitutes less than 10% of primary CNS tumors. Most of intracranial cases are seen in childhood (2, 7), whereas the intramedullary cases usually occur in adults. The spinal cord variants usually arise within the cervicothoracic segments. Ependymomas are well-circumscribed tumors with contrast enhancement on neuroradiologic studies. The intramedullary examples produce a fusiform widening of the involved segments (2).

The conventional ependymomas are composed of a dense meshwork of fibrillary cytoplasmic processes, if arranged around stromal vessels, known as perivascular pseudorosettes. Some cases have tendency to make canals or actual rosettes. Dysplastic calcification is found frequently and some cases show chondroid or osseous metaplasia (2). The tumor cells include intermediate filaments predominantly composed of vimentin and GFAP (8). Clear cell ependymoma, a recently accepted variant of ependymoma (1), has been practically restricted to supratentorial region (2) and takes the same biologic behavior as other ependymomas (9). On histologic examination this variant shows perinuclear cytoplasmic clearing, so could be misdiagnosed as oligodendroglioma or other potentially clear cell neoplasms including neurocytoma, astrocytoma or metastatic renal cell carcinoma (1,3-5). Among different cytologic and histologic features, nuclear groove seems to be more specific for ependymoma, which is not found in other differential diagnoses and could support the diagnosis of clear cell ependymoma, especially in touch smears (1,10). Rickert *et al.* reported some chromosomal imbalances found in clear cell ependymomas, of them the most common aberrations are +1q (38-63%) and -9(77-100%) (11).

Occasionally clear cell ependymoma do not show typical histologic features of conventional ependymoma such as nuclear groove, perivascular pseudorosette or true rosette. In such instances, distinguishing between rare spinal cord clear cell ependymoma and other differential diagnoses could be difficult. Immunohistochemical or ultrastructural studies can be helpful in such cases (1).

In the tumor we described, typical perivascular

pseudorosettes and few nuclear grooves have been seen on H&E staining, as well as rare intranuclear inclusions. Eosinophilic fibrillary background of the tumor was positive for GFAP and tumor cells cytoplasm show positive immunoreactivity for NSE. Synaptophysin and chromogranin were negative (positive reaction is in favor of central neurocytoma).

We concluded that although spinal cord clear cell ependymoma was rare but we should consider that the presence of histologic criteria especially perivascular pseudorosettes or nuclear grooves in a clear cell tumor will suggest the diagnosis of clear cell ependymoma. However immunohistochemical study can be helpful in more complicated cases.

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