

Case Report

Atypical teratoid/rhabdoid tumor in sellar turcica in an adult: A case report and review of the literature

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Abstract

Background: Atypical teratoid/rhabdoid tumor (AT/RT) is a rare central nervous system tumor composed of primitive rhabdoid cells that may differentiate along neuroectodermal, mesenchymal and epithelial lineages. AT/RT in adults is rare but not completely exceptional. It generally arises from the posterior fossa of infants, but the broad majority of the reported AT/RT in adults manifested supratentorially with the exception of four cases that arose in the cerebellum and two that arose in the spinal cord.

Case Description: A 44-year-old female complained of visual disturbance. We performed craniotomies twice and removed partially for each time, but any malignant cells were not found in the specimens. Finally, we determined histological diagnosis from the extended lesion. She died of respiratory failure 17 months after the initial treatment.

Conclusion: AT/RT should be considered in the differential diagnosis of a sellar lesion in adult patients. However AT/RT is rare in adults, the appropriate immunohistochemical evaluation should be performed to diagnose this rare entity.

Key Words: Adult, atypical teratoid/rhabdoid tumor, sellar turcica

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INTRODUCTION

Atypical teratoid/rhabdoid tumor (AT/RT) is predominantly a childhood tumor and has only been rarely reported in adults.

The exact incidence of AT/RT is unknown. It occurs predominantly in infants less than 3 years of age.^[28,32] It is believed that AT/RT accounts for 1-2% of pediatric brain tumors and over 10% of central nervous system (CNS) tumors in infants, with a male preponderance up to the age of 3, which then seems to disappear.^[32,38] Adult cases are rare and, as far as we

are aware, only 42 cases have been reported to date [Table 1].^[2-5,9-18,21,23-27,29-31,33-37,39,41] Furthermore, there are only seven adult cases arising in the sellar turcica described in the literature.^[2,24,25,30,34]

Here we present a case of a 44-year-old female with a AT/RT in sellar turcica who complained of visual disturbance. We performed craniotomies twice and removed partially for each time, but any malignant cells were not found in the specimens. Finally, we determined histological diagnosis from the extended lesion. It is the first case that AT/RT was diagnosed from the extended lesion and we detailed our case with a thorough literature review.

Table 1: Adult patients with atypical teratoid/rhabdoid tumor in the central nervous system

Author (year)	Age (years)/sex	Tumor location	Positive immunostains	INI1 analysis	Survival (mos)
Balaton (1987) ^[5]	59 M	Paravertebral	CK Vim	NE	0.5
Horn (1992) ^[17]	21 M	Lt temporal	EMA Vim	NE	72
Cossu (1993) ^[13]	18 M	Lt frontal	CK EMA Vim	NE	18
Fisher (1996) ^[15]	32 M	Lt frontal	CK EMA GFAP S100 Vim	NE	1
Ashraf (1997) ^[4]	34 M	Lt parietal	Vim	NE	6
Byram (1999) ^[10]	35 M	Lt temporal	CK EMA Vim	NM	60
Kuge (2000) ^[24]	32 F	Supracellar	CK EMA SMA Vim	NE	20+
Arrazola (2000) ^[3]	20 M	Lt parietal	CK EMA S100 Vim	NE	24+
Lutterbach (2001) ^[26]	30 F	Cerebellum	CK EMA NFP S100 Vim	NE	11
Bruch (2001) ^[9]	21 F	Spinal cord	CK EMA Vim	NE	6
	34 F	Parietal	CK EMA GFAP Vim	NE	6
Pimentel (2003) ^[29]	31 F	Rt parietal	NFP S100 Vim	NE	6
Kachhara (2003) ^[21]	35 M	Thalamus	Vim	Negative	NM
Kawaguchi (2004) ^[23]	22 M	Lt cerebellum	CK EMA NFP NSE SMA Vim	NE	24+
Raisanen (2005) ^[30]	20 F	Sellar	CK EMA SMA Vim	Negative	28+
	31 F	Sellar	CK EMA Vim	Negative	9
	45 M	Rt cerebellum	CK EMA SMA S100 Vim	Negative	15+
Erickson (2005) ^[14]	20 F	Rt occipital	EMA GFAP SMA Vim	Negative	NM
Chen (2006) ^[12]	19 M	Posterior fossa	CK EMA SMA	NM	56.5
Ingold (2006) ^[18]	45 F	Pineal	CK EMA SMA Vim	Negative	7
Rezanko (2006) ^[31]	27 M	Rt frontal	EMA S100 Vim	NE	4
Chacko (2007) ^[11]	23 M	Rt frontal	EMA SMA Vim	Negative	1.5
Zarovnaya (2007) ^[41]	43 F	Spinal cord	EMA	Negative	30
Makuria (2008) ^[27]	23 M	Lt temporal	CK EMA NFP SMA Syn Vim	Negative	30+
	25 F	Rt frontal	SMA Syn Vim	Negative	204+
	37 M	Rt frontoparietal	Vim	Negative	NM
	42 M	Rt frontoparietal	CK EMA Vim	Negative	18+
Arita (2008) ^[2]	56 F	Sellar region	EMA Vim	Negative	23
Samaras (2009) ^[33]	18 M	Rt frontotemporal	EMA GFAP SMA Vim	Negative	4
Las Heras (2010) ^[25]	46 F	Sellar	CD34 SMA Vim	Negative	NM
Takei (2010) ^[37]	33 F	Pineal region	CK EMA GFAP NFP Vim	Negative	13+
Shonka (2011) ^[35]	33 F	Pineal region	EMA SMA	Negative	18+
Han (2011) ^[16]	24 M	Rt temporo-occipital	NM	NE	10
	25 M	Lt parieto-occipital	NM	NE	25
	32 M	Rt frontal	NM	NE	32+
	35 F	Rt frontal	NM	NE	20
	50 F	Rt temporal	NM	NE	13
Umredkar (2010) ^[39]	32 M	Lt frontal	EMA GFAP Vim	NE	6+
Takahashi (2011) ^[36]	27 F	Lt parietal	EMA MGMT Vim	Negative	108+
Schneiderhan (2011) ^[34]	57 F	Sellar	CK EMA SMA S100	Negative	6+
	61 F	Sellar	GFAP S100	Negative	3
Our case	44 F	Sellar	EMA MGMT S100	Negative	17

CK: Cytokeratin, EMA: Epithelial membrane antigen, GFAP: Glial fibrillary acid protein, MGMT: O-6 methylguanine DNA methyltransferase, NE: Not examined, NFP: Neurofilament protein, NM: Not mentioned, NSE: Neuron-specific enolase, SMA: Smooth muscle actin, Syn: Synaptophysin, Vim: Vimentin, mos: months, +: Over (e.g., 24+ means over 24 months.)

CASE REPORT

A previously healthy 44-year-old female presented with a 2-month history of visual disturbance. Magnetic resonance imaging (MRI) revealed a heterogeneously enhancing mass within suprasellar and intrasellar lesions [Figure 1]. She underwent a partial resection, mainly caudal part

of the tumor, via translabial transsphenoidal approach [Figure 2]. As the pathological examination could not find any malignant cells, histological diagnosis from this operation was lymphocytic hypophysitis.

Steroid pulse therapy was performed, but 2 months after the first operation, bilateral abducens paralysis was noticed. The second partial resection was performed,

mainly ventral and rostral part of the tumor, via a basal interhemispheric approach [Figure 3], and malignant cells were not found from the surgical specimen [Figure 4]. Despite the aggressive therapies with immunosuppressant and radiotherapy for the lesion, she lost her vision in the left eye within a few months. MRI demonstrated the expansion of the lesion to the left cavernous sinus, the left orbital fossa and the left forehead with no regrowth in the sellar region [Figure 5]. Furthermore, intracranial dissemination and distant metastasis were found in the right cerebellar hemisphere, vermis, spinal cord, and lung [Figure 6]. Biopsies were performed at the left orbital fossa and the left forehead and histological

diagnosis was AT/RT. Three drug chemotherapies were performed at 3-week intervals for a total of five cycles. Each cycle consisted of ifosfamide, cisplatin, and etoposide administered on days 1-5. Radiotherapy was given. She died of respiratory failure 17 months after the initial treatment.

Histopathological findings

The tumor was composed of polygonal cells with a relatively high nuclear/cytoplasm ratio and the rhabdoid cells had medium, round, single or double nuclei, and eosinophilic cytoplasmic inclusions. The

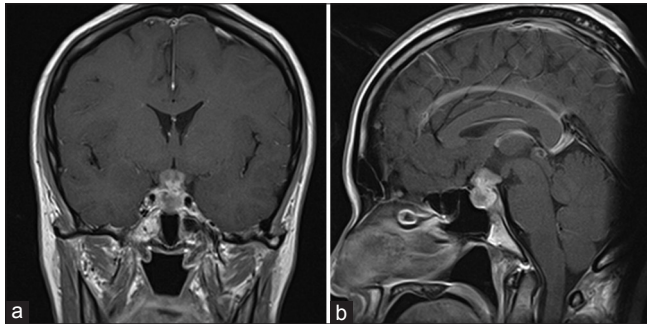


Figure 1: T1-weighted MRI coronal (a) and sagittal (b) images clearly show inhomogeneously gadolinium enhancing mass in sellar turcica extending into suprasellar lesion

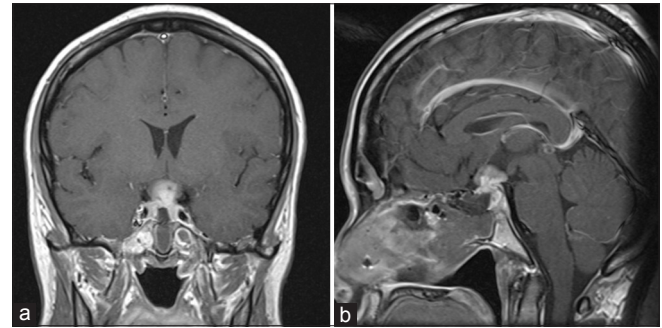


Figure 2: T1-weighted MR coronal (a) and sagittal (b) images show a partial removal of the tumor after the first operation via translabial transsphenoidal approach

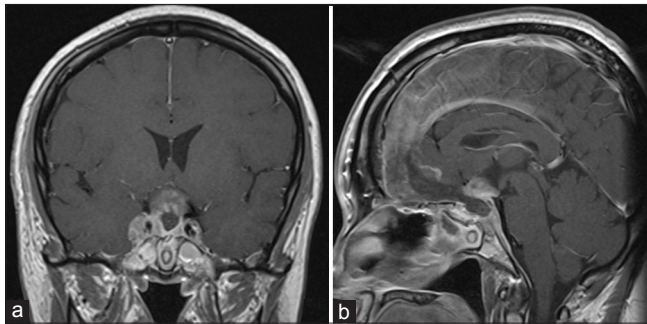


Figure 3: T1-weighted MR coronal (a) and sagittal (b) images show a partial removal of the tumor after the second operation via basal interhemispheric approach

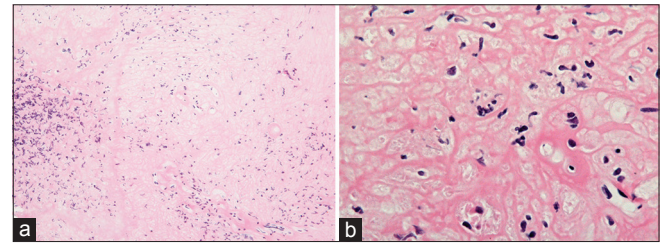


Figure 4: Photomicrographs of tumor specimens obtained in the patient from the first operation. There were no malignant cells. H and E. Original magnification $\times 100$ (a) and $\times 400$ (b)

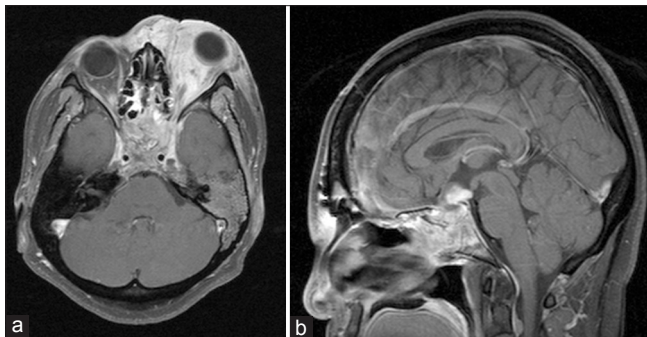


Figure 5: T1-weighted MR coronal (a) and sagittal (b) images show an aggressive extension to the left cavernous sinus, the left orbital fossa and the left forehead with no regrowth in the sellar region

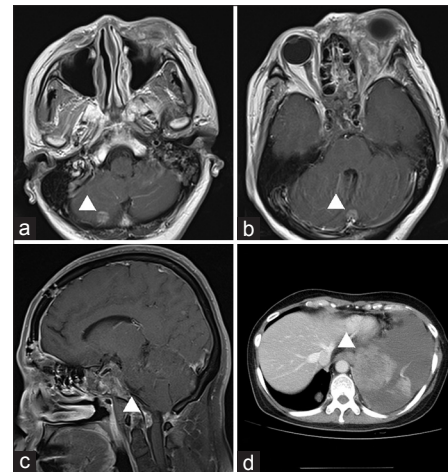


Figure 6: T1-weighted MR images (a-c) and contrast computed tomography image (d) show intracranial dissemination (arrow head) and distant metastasis in the lung (arrow head)

tumor cells showed strong immunoreactivity for O-6 methylguanine DNA methyltransferase (MGMT), Nestin and S100 protein, and focal positivity for epithelial membrane antigen (EMA) and Glypican-3. Desmin, oligodendrocyte transcription factor 2 (oligo2), placental alkaline phosphatase, myogenin and p63 were negative. Proliferative activity is high, and Ki-67/MIB-1 labeling index was more than 90%. Since the tumor cells lacked nuclear expression of INI1, the tumor was pathologically diagnosed as AT/RT [Figure 7].

DISCUSSION

In 1978, Beckwith and Palmer first documented the rhabdoid tumor, which occurred in the kidney, with the variant of the Wilm's tumor found in the kidneys of children.^[6] Rorke *et al.* first recognized this tumor in the CNSs under the term AT/RT to emphasize the variable combination of rhabdoid cells, epithelial cells, primitive neuroectodermal as well as mesenchymal components. Since they defined the clinical and pathological features of AT/RT in 1996, based on data from 52 infants and children, this unique neoplasm has been widely recognized and currently constitutes one of three major embryonal tumor entities according to the 2007 World Health Organization classification of CNS tumors.^[32]

It is more frequently seen in infants and young children and is rare in adults.^[28,32,38] Forty-one cases of adults with AT/RT have been published to date [Table 1]. The mean age of patients at diagnosis was 32.1 years, with a range of 18-61 years, and there were 21 males and 20 females. Thirty-four cases were supratentorial in location with 7 cases in the sellar region and 3 cases in the pineal region, 4 cases were infratentorial, and 3 cases were spinal cord. Clinical data and clinicopathological features of all adult cases and our case are summarized in Table 1. Occurrence of AT/RT in the sellar region is rare and all

seven adult patients with sellar AT/RT were female, with ages from 20 to 61 years. In contrast, the sellar region has never been reported to give rise to AT/RT in pediatric patients.

In immunohistochemical studies, rhabdoid cells are usually positive for vimentin, epithelial membrane antigen, cytokeratin, and smooth muscle actin. Markers for germ-cell tumors such as alpha-fetoprotein and placental alkaline phosphatase are consistently negative. Loss of expression of INI-1 correlates with mutation of the INI1 tumor suppressor gene (the hSNF5/INI1 gene), which maps to the 22q11.2 locus and is a sensitive and specific marker.^[1,7,22,37,40] Immunohistochemical study using antibody against the INI1 gene product or FISH to identify loss of the INI1 locus is the current routine workup for diagnostic confirmation of AT/RT.^[8,19,20,32] In our case, EMA was positive, and INI1 and desmin were negative. Pathological findings were consistent with those of AT/RT.

AT/RT is characterized by an aggressive clinical behavior in most pediatric patients, who usually die within approximately one year after the diagnosis despite aggressive therapy, while adult patients are reportedly better with some longer-term survivors.^[36] A recent report suggest that cerebral location of an AT/RT renders the tumor amenable to gross total resection as well as aggressive adjuvant chemoradiation therapy available in adults, which would not be tolerated by small children.^[35] Therefore, immunohistochemical verification of this entity is very important for a proper treatment and better prognosis and AT/RT must be considered in the diagnosis of a high-grade tumor regardless of age.

In this case, we could not find any malignant cell in surgical specimens taken at two operations. The histological diagnosis was finally made from the extended site. Although there is a discrepancy between histologies,

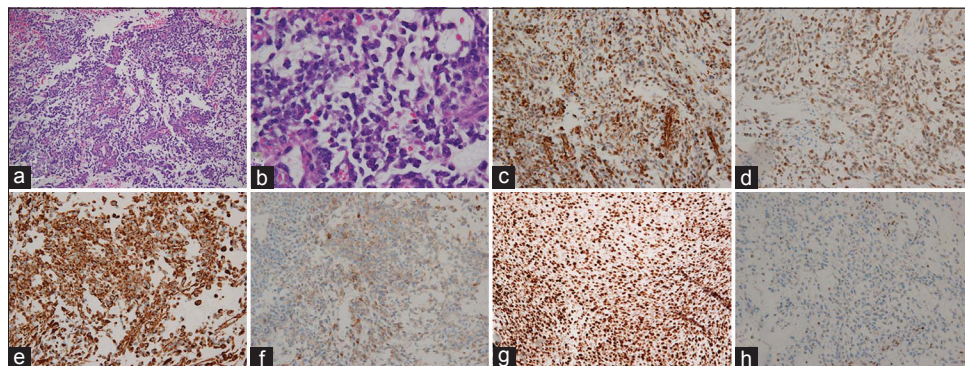


Figure 7: Histologically, the tumor tissue is mainly composed of hyperchromatic small cells with a relatively high nuclear/cytoplasm ratio and rhabdoid cells (H and E. Original magnification $\times 100$ (a) and $\times 400$ (b)). In immunohistochemical studies, Nestin (c), S-100 (d) and Vimentin (e) were positive and EMA (f) was focally positive. The proliferation index measured by Ki-67 was 85% in the areas of highest mitotic activity (g) and the tumor cells lack nuclear staining for the INI1 protein (h). Pathological findings were consistent with those of atypical teratoid/rhabdoid tumor

but it is natural that the lesions of left cavernous sinus, left orbital fossa and left forehead were consistently extended from the sellar turcica. This inference is confirmed by the fact that AT/RT show a greater tendency to disseminate intracranially and metastasize extracranially.^[28] Partial resection might make it possible to extend and metastasize. Takahashi *et al.* reported a case that the histological findings had changed during 9 years.^[36] However, it has never been reported that AT/RT was diagnosed from the extended lesion.

CONCLUSION

Although extremely rare and usually fatal, AT/RT should be considered in the differential diagnosis of an unclear malignant sellar lesion in adult patients. It is important to perform a total resection of such tumors followed by chemotherapy and radiation therapy to afford patients a better prognosis. However AT/RT is rare in adults, the appropriate immunohistochemical evaluation should be performed to diagnose this rare entity.

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