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Medial posterior choroidal artery territory infarction associated with tumor removal in the pineal/tectum/thalamus region through the occipital transtentorial approach

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ABSTRACT

Object: Damage to the deep venous system, occipital lobe, and/or corpus callosum is well known to cause complications associated with the occipital transtentorial approach (OTA), but ischemic complications are not well documented. The authors investigated the high incidences of ischemic complications associated with removal of pineal/tectal/thalamic tumors through the OTA.
Methods: Clinical records of 29 patients who underwent 31 surgeries using the OTA from December 2001 to May 2011 were retrospectively studied. Tumor locations were the pineal/tectal/thalamic region for 19, cerebellum for 7, and medial temporal lobe for 3.
Results: Postoperative diffusion-weighted magnetic resonance images obtained within 72 h after surgery detected infarction in the tectal/splenial/thalamic region, presumably representing the medial posterior choroidal artery (MPChA) territory, in 10 patients. All these patients had tumor in the pineal/tectal/thalamic region. Deteriorated or newly developed eye symptoms including vertical gaze palsy tended to persist in these patients compared to those without ischemic complications.
Conclusions: A relatively high incidence of MPChA territory infarction was associated with removal of tumors in the pineal/tectal/thalamic region through the OTA. Eye symptoms often occurred post-surgery and tended to persist in these patients. Neurosurgeons must be aware of the possibility of MPChA territory infarction to further increase the safety of the OTA.

1. Introduction

Dandy reported extensive animal studies extirpating the pineal body in 1915 [1], and described the interhemispheric-transcallosal approach establishing a corridor between the falx and the hemispheres along the parieto-occipital junction in 1921 [2]. Krause first described the infratentorial-supracerebellar approach in 1926 [3]. However, these techniques were abandoned for many years because of unacceptable morbidity caused by damage to the deep venous systems, central brain edema, and other sequelae [4]. After microsurgery was developed, the infratentorial-supracerebellar approach was successfully reintroduced by Stein in 1971 [5]. The occipital-transtentorial approach (OTA) was first described by Jamieson in 1971 [6]. Since then, methods of neuroradiological diagnosis and neuroanesthesia, and many surgery assisting systems have been developed, so surgery for pineal region tumors has become a routine surgical procedure performed in many neurosurgical units [4,7,8].

The OTA requires especial attention to the deep venous systems, occipital lobe, and corpus callosum, but associated morbidity has decreased to an acceptable level, so the OTA is now adopted not only for pineal/tectal/thalamic tumors, but also medial temporal lobe and cerebellar tumors [9,10]. However, we have found that surgical intervention for pineal/tectal/thalamic tumors through this approach might be associated with a relatively high incidence of ischemic complications, especially in the territory of the medial posterior choroidal artery (MPChA), as detected by magnetic resonance (MR) imaging immediately after surgery. Here we discuss this less well documented risk of ischemic complications associated with the OTA.

2. Methods

We retrospectively studied 29 consecutive patients treated using the OTA by the senior author (T.K.) from December

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Table 1
Summary of the patients' characteristics.

Location of the tumor	Case	Age/sex	Diagnosis	Year & month of surgery	Extent of removal	Ischemic complication at thalamus, tectum, splenium	Eye symptoms immediately after surgery	Consequences of eye symptoms 6 M after surgery	PFS	OS	KPS
Pineal/thalamus/tectum											
Pineal–thalamus	1-1	0/F	Immature teratoma	2005 January	Subtotal	Not evaluable	None	None			
Pineal–thalamus	1-2	1/F	Teratoma	2005 September	Total	None	None	None	74	74	80
Tectum	2	22/M	Pilocytic astrocytoma	2005 February	Total	None	Transient blindness	Recovered	81	81	100
Pineal	3	9/M	Teratoma	2005 May	Total	None	Peduncular hallucinosis	Recovered	78	78	100
Pineal	4	43/M	PTPR	2006 August	Total	None	None	None	63	63	100
Tectum	5	62/M	Anaplastic astrocytoma	2008 September	Subtotal	None	Upward gaze palsy, mild diplopia	Upward gaze palsy remained	17	35	0
Pineal	6	9/F	Pineal cyst	2009 December	Total	None	None	None	23	23	100
Pineal	7	8/M	Pineoblastoma	2010 February	Total	None	Transient diplopia	Recovered	21	21	100
Pineal	8	12/M	Teratoma & germinoma	2010 August	Total	None	Upward gaze palsy	Recovered	15	15	100
Pineal	9	19/F	Malignant glioneuronal tumor	2005 September	Partial	Not evaluable	lt homonymous hemianopsia, upward gaze palsy	Upward gaze palsy remained	0	9	0
Pineal	10	7/F	Teratoma	2004 August	Total	Yes	Upward gaze palsy in lt eye	Recovered	87	87	100
Thalamus	11	39/F	Pilocytic astrocytoma	2004 September	Total	Yes	None	None	86	86	90
Pineal	12	14/M	Pineoblastoma	2004 November	Subtotal	Yes	Vertical gaze palsy, lt upper quadrant anopsia	Recovered	1	46	0
Pineal	13	23/M	Teratoma	2006 February	Total	Yes	Deterioration of vertical gaze palsy	Vertical gaze palsy remained	69	69	90
Pineal	14	40/F	Pineocytoma	2007 November	Total	Yes	Mild rt abducens nerve palsy	Recovered	48	48	100
Pineal-tectum	15	1/M	AT/RT	2008 June	Total	Yes	Upward gaze palsy	Recovered	4	10	0
Pineal	16	10/M	Immature teratoma	2008 August	Total	Yes	blt abducens nerve palsy, vertical gaze palsy, blt sluggish light reflex	blt sluggish light reflex remained	39	39	100
Pineal	17	12/M	Teratoma with germinoma	2008 October	Total	Yes	Deterioration of vertical gaze palsy, mild dilation of blt pupil	blt sluggish light reflex remained	13	13	100
Pineal	18	15/M	Yolk sac tumor, teratoma	2010 March	Total	Yes	None	None	20	20	100
Pineal–tectum	19-1	49/M	Pilocytic astrocytoma	2011 April	Subtotal	Yes	Deterioration of vertical gaze palsy	Vertical gaze palsy remained			
Pineal–tectum	19-2	49/M	Pilocytic astrocytoma	2011 May	Total	None	Transient right hemianopsia	Recovered	6	6	90
Cerebellum	20	30/M	Anaplastic astrocytoma	2001 December	Total	None			6	15	0
	21	69/M	Glioblastoma	2004 March	Subtotal	None			1	12	0
	22	25/F	Medulloblastoma	2005 May	Total	None			78	78	100
	23	23/M	Pilocytic astrocytoma	2005 July	Total	None			76	76	100
	24	2/M	Yolk sac tumor	2007 October	Total	None			5	23	0
	25	21/M	Anaplastic astrocytoma	2009 January	Subtotal	None			14	19	0
	26	71/M	Metastatic brain tumor	2009 January	Total	None			6	6	LFF
Medial temporal	27	60/M	Diffuse astrocytoma	2010 February	Partial	None			8	21	80
	28	31/F	Pilocytic astrocytoma	2010 November	Total	None			12	12	70
	29	28/M	Anaplastic astrocytoma	2011 March	Subtotal	None			8	8	90

M, male; F, female; PTPR, papillary tumor of the pineal region; AT/RT, atypical teratoid/rhabdoid tumor; lt, left; rt, right; blt, bilateral; PFS, progression free survival; OS, overall survival; KPS, Karnofsky performance status score; LFF, lost for follow-up.