Intracranial Tumors Affecting Visual System: 5-Year Review in Prasat Neurological Institute

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Objectives: *To study the types of intracranial tumors with histological confirmation that impair visual system and to determine the neuro-ophthalmic manifestations in patients with intracranial tumors.*
Material and Method: *Retrospective review of patients with intracranial tumors who were pre-operatively examined by ophthalmologists in the neuro-ophthalmology unit, Prasat Neurological Institute. All patients had tissue pathology confirmation, and the authors excluded the patients with recurrence or post-operative status of intracranial tumors.*
Results: *Male to female ratio was 1:2.5 of 149 patients. The age onset was highest in the 4th to 5th decade. The three most common types of intracranial tumors were meningioma (45%), pituitary adenoma (32.9%), tumors of neuroepithelial tissues (6.7%) and craniopharyngioma (6.7%).Common neuro-ophthalmological symptoms were visual blur (88.6%) and proptosis (12.1%). In addition, common signs were visual field defect (80.5%), abnormal optic discs (69.7%), and relatively afferent pupillary defect (43.6%). Ninety percent of the patients had the visual difficulty symptom for less than 12 months, before the diagnosis of intracranial tumors. Fifty-nine percent of the patients presented with visual acuity 20/200 or worse, and 15.4% of the patients presented with no light perception (NLP).*
Conclusion: *From the study, meningioma is the most common tumor that impairs the visual pathway structures followed by pituitary adenoma. Furthermore, decreased visual acuity, visual field defects, abnormal optic discs, and relatively afferent pupillary defect are the common neuro-ophthalmic features that should be carefully examined to avoid late detection of intracranial tumors.*

Keywords: *Intracranial tumors, Visual impairment, Visual field defect, Optic disc*

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Intracranial tumors are one of the leading causes of morbidity and mortality in the patients suffering from neurological diseases. The common types of intracranial tumors are glioma, meningioma, and pituitary adenoma; however, there are no pathognomonic clinical features of these tumors[1,5]. The most important features of clinical presentation in these patients are the progressive nature of their symptoms, the common manifestations of intracranial tumors including headache, behavior or cognitive change, vomiting, seizure and visual difficulties[1-3]. The presenting neuro-ophthalmic manifestations may indicate the location of intracranial tumors. For instance, the bitemporal visual field defect suggests chiasmal compression; the ocular motor nerve palsy implies the lesion at the cavernous sinus. As a result, an awareness of the neuro-ophthalmic manifestations relating to the location of intracranial tumors threatening visual pathway is suggested to early locate and diagnose these tumors.

The present study was undertaken to determine the types of intracranial tumor that cause impairment of the visual system, the neuro-ophthalmic

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manifestations, and other clinical features presenting before the diagnosis of the tumors in Prasat Neurological Institute.

Material and Method

The authors retrospectively reviewed charts of the patients who were diagnosed with intracranial tumors and had histological confirmation, from January 2001 to December 2005, in neuro-ophthalmology unit, Prasat Neurological Institute. All patients were over the adolescent age without previous intracranial tumor surgery. These patients were examined preoperatively by neuro-ophthalmologists. The examination consisted of visual acuity (VA) by means of Snellen chart, general ophthalmic examination, relative afferent pupillary defect (RAPD), and optic disc appearance and visual field (VF) testing by Goldmann or automated perimetry. The patients with normal preoperative neuro-ophthalmic examination were excluded from the present analysis.

The recorded data included age, sex, histological diagnosis, duration of visual difficulty, visual problem, and neuro-ophthalmological signs before the operation of the intracranial tumors. Comparison of the presenting VA among various tumors was demonstrated with Mann Whitney test using SPSS 11.5 program.

Results

One hundred forty nine patients had intracranial tumors. The male to female ratio was 1:2.5. The mean age was 43.5years (20 to 74 years old) and the age range at the diagnosis peaked in the 4th to 5th decade of life. In addition, the most common tumor was meningioma which comprised 45% of all intracranial tumors. The second most common tumor was pituitary adenoma (32.9%). In order of decreasing frequency, the remaining tumors were craniopharyngioma (6.7%), tumors of neuroepithelial tissues (6.7%), other tumors (6%) consisting of chordoma (0.7%), schwannoma (2%), hemangiopericytoma (1.3%), germinoma (0.7%), plasmacytoma (0.7%) and epidermoid tumor (0.7%), moreover, there were central nervous system (CNS) lymphoma (2%), and metastasis from the thyroid carcinoma (0.7%).

Visual blur was the most common symptom (88.6%) with the median duration of 3 months (interquartile range, 1 to 12) followed by proptosis (12.1%), loss/blur of VF (10.7%), and diplopia (7.4%). Then, other common non-visual symptoms were headache, vomiting and behavioral change (Table 1). The most common sign was VF defect (80.5%) with 58.4% localized the corresponding lesions. The second most common sign was abnormal optic disc (69.7%) with 16.1% from papilledema; the others were VA 20/200 or worse in either eye (59%), RAPD (43.6%), ocular motor nerve palsy (14.8%) and abnormal gaze movement (1.3%), decreasingly (Table 2).

Considering 67patients with meningioma, the male to female ratio was 1:7.4, 47.8% of the patients

Table 1. Shows the presenting symptoms of the patients with intracranial tumors

Symptoms	Number of patients, n (%)
Visual blur	132 (88.6)
Proptosis	18 (12.1)
Loss/blur of visual field	16 (10.7)
Diplopia	11 (7.4)
Non-visual symptoms	
Headache	99 (66.4)
Vomiting	17 (11.4)
Behavior change	10 (6.7)
Sensory abnormality	7 (4.7)
Anosmia	4 (2.7)
Seizure	3 (2)

Table 2. Shows the presenting signs of the patients with intracranial tumors

Signs	Number of patients, n (%)
Visual field defect	120 (80.5)
Non-localizing (enlarged blind spot, constricted visual field)	33 (22.1)
Localizing	
Bitemporal hemianopia	25 (16.8)
Temporal hemianopia with optic nerve compression	25 (16.8)
Nerve fiber bundle defect	14 (9.4)
Homonymous hemianopia	12 (8.1)
Anterior chiasmal defect	11 (7.4)
Abnormal optic disc	104 (69.7)
Pale disc	78 (52.3)
Papilledema	24 (16.1)
Optic disc swelling	2 (1.3)
Visual acuity 20/200 or worse in either eye	88 (59)
No light perception	23 (15.4)
Relative afferent pupillary defect	65 (43.6)
Ocular motor nerve palsy	22 (14.8)
Third nerve palsy	11 (7.4)
Sixth nerve palsy	4 (2.7)
Total ophthalmoplegia	7 (4.7)
Abnormal gaze movement	2 (1.3)

were diagnosed at the age of 40-49 years (Table 3). Moreover, most of the patients (58 from 67) had benign tissue histology, only five patients had atypical and chordoid type. Four patients had unclassified tissue histology. The most common tumor location was at the sphenoid wing, of which 67% (12 from 18) of the patients presented with proptosis and 39% (7 from18) had papilledema. The planum sphnoidale was the second most common location, of which 87% (13 from15) had optic disc pallor in either eye. The third was located at the cavernous sinus, of which 58% (7 from12) presented with ocular motor nerve palsy that was the third nerve palsy with pupillary involvement, total ophthalmoplegia and the sixth nerve palsy.

Pituitary adenoma, the second most common tumor, the male to female ratio of 1:1.3 was diagnosed more at the older age, which peaked in the 5th and 6th decade. There were 73.5% of the patients having optic disc pallor, and all patients had visual field defects. Among these patients, 76% of them had bitemporal hemianopia, temporal hemianopia with optic nerve compression in the other eye and anterior chiasmal defect. Besides, there were 4 patients suffering from pituitary apoplexy with VA 20/200 or worse in either eye, three of the four patients presented with third nerve palsy.

Craniopharyngioma had bimodal age distribution with one peak at the age of the 2nd decade and another at the 6th decade, the male to female ratio was 1:1.5. Both bitemporal hemianopia and temporal hemianopia with optic nerve compression VF defect were presented in half of these patients. Considering

Table 3. Shows the gender and the age- specific evidence of each type of the intracranial tumors

Tumor types	Age range (years)										Total
	20-29		30-39		40-49		50-59		≥ 60		
	M	F	M	F	M	F	M	F	M	F	
Meningioma	2	1	3	14	1	31	2	12	-	1	67
Pituitary adenoma	4	4	6	2	2	10	4	11	5	1	49
Craniopharyngioma	2	2	1	1	-	-	1	2	-	1	10
Tumors of neuroepithelial tissue	2	2	1	1	1	1	-	1	1	-	10
CNS lymphoma	1	-	-	-	-	-	-	1	-	1	3
Metastasis	-	-	-	-	-	1	-	-	-	-	1
Other tumors	1	-	-	2	2	1	-	2	-	1	9
Total	12	9	11	20	6	44	7	29	6	5	149

CNS lymphoma = central nervous system lymphoma; M = male gender; F = female gender

Table 4. Shows the presenting visual acuity according to the types of the intracranial tumors

Tumor types	Presenting VA					
	20/20-20/30 n (%)	20/40-20/50 n (%)	20/70-20/100 n (%)	Unilateral 20/200 to NLP n (%)	Bilateral 20/200 to NLP n (%)	Total n (%)
Meningioma	15 (22.4)	3 (4.5)	7 (10.4)	32 (47.8)	10 (14.9)	67 (100)
Pituitary adenoma	4 (8.2)	6 (12.2)	9 (18.4)	22 (44.9)	8 (16.3)	49 (100)
Craniopharyngioma	0	1 (10)	3 (30)	3 (30)	3 (30)	10 (100)
Tumors of neuroepithelial tissue	1 (10)	1 (10)	1 (10)	1 (10)	6 (60)	10 (100)
CNS lymphoma	1 (33.3)	1 (33.3)	0	1 (33.3)	0	3 (100)
Metastasis	0	0	1 (100)	0	0	1 (100)
Other tumors	2 (22.2)	3 (33.3)	2 (22.2)	2 (22.2)	0	9 (100)

VA = visual acuity; NLP = no light perception; CNS lymphoma = central nervous system lymphoma

tumors of neuroepithelial tissues, the male to female ratio was 1:1. In addition, 5 out of 10 patients had papilledema with VA 20/200 to NLP in either eye.

Regarding presenting VA, 59%(88/149) of the patients had VA 20/200 or worse in either eye moreover one- fourth had NLP. In the case of meningioma, 62.7% of the patients had presenting VA 20/200 or worse in either eye, most of these patients had pale disc from compressive optic neuropathy and the tumor was detected at planum shenoidale and sphenoid wing. Then in pituitary adenoma, 61.2% of the patients had presenting VA 20/200 or worse in either eye, five-sixth of these patients had pale optic disc. Next, in the group of craniopharyngioma, 60% of the patients showed presenting VA 20/200 or worse in either eye. For the vision of the patients with tumors of neuroepithelial tissues, 70% of the patients had presenting VA 20/200 or worse in either eye and five out of seven patients had concurrent papilledema or pale optic disc (Table 4). Comparing the presenting VA among the meningioma, pituitary adenoma, craniopharyngioma and tumors of neuroepithelial tissues with Mann Whitney test, the result was not statistically significant.

Discussion

The present study showed that meningioma was the most common tumor affecting the visual system, followed by pituitary adenoma, tumors of neuroepithelial tissues and craniopharyngioma corresponding to some epidemiological studies[5,6]. Nevertheless in some previous epidemiological studies, astrocytoma was the most common tumor and meningioma was the second[1,2,7]. In the present study, most of the tumors were detected at the age of the 4th to 5th decade of life, which seemed earlier than the result of the previous studies that reported the peak at the age of the 6th decade and increasing with age[7]. The difference could come from the different method of the study as the retrospective study and smaller sample size. Moreover, intracranial tumors were previously thought to be more common in males than females[5,6] but in the present study the female was more common, the authors could explain that the reason came from nearly half of the patients being diagnosed with meningioma with significant female predominance.

Concerning symptoms and signs of the intracranial tumors, in the previous studies of primary intracranial tumor, the common symptoms and signs were headache, seizure, behavioral change, hemiparesis, cranial nerve palsies and papilledema[1,2,8]. However, the authors found that the common symptom was also visual blur as documented in a previous study of intracranial tumors of the visual pathway[4] and the common signs were VF defect, abnormal optic disc, RAPD and ocular motor nerve palsy. This could arise from the concentration of the present study focusing to detect the tumors impairing visual system, and the authors put a careful preoperative neuro-ophthalmic examination in these patients.

In meningioma, mostly benign histology, the clinical features and VF defect were varied by the tumor location, therefore the careful history taking and neuro-ophthalmic examination could assist the examiner to locate the tumors' position. Most of the patients with pituitary adenoma presented with the localizing VF defects that were corresponding to the optic nerve and chiasmal lesion so the VF testing was a sensitive method to detect compression from the tumor as the previous study[8].

About the presenting VA, although it was not statistically significant among the VA of the patients with meningioma, pituitary adenoma, craniopharyngioma and tumors of neuroepithelial tissues, the study showed that the patients with tumors of neuroepithelial tissues had bilateral visual impairment more than those with the other tumors. This could be caused by the greater aggressive histology and the location of the tumors which resulted in papilledema or optic disc pallor.

Conclusion

In the present study, meningioma with a benign histology is the most common intracranial tumor that impairs visual pathway followed by pituitary adenoma, craniopharyngioma, and tumors of neuroepithelial tissues respectively. The present study suggests that the progressive history of visual impairment along with a thorough examination of the visual field, optic disc, RAPD and extraocular eye movement should be observed and raised to determine the tumor and do early investigation.

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การศึกษาย้อนหลัง 5 ปีของผู้ป่วยเนื้องอกสมองที่ทำให้เกิดความผิดปกติทางจักษุประสาทในสถาบันประสาทวิทยา

พัชรพิมพ์ มัศยาอานนท์, จริง หล่อพัฒนเกษม

วัตถุประสงค์: *เพื่อศึกษาชนิดและผลพยาธิวิทยาของเนื้องอกสมอง ที่ทำให้เกิดความผิดปกติทางจักษุประสาท และศึกษาอาการและอาการแสดงทางจักษุประสาทที่เกิดขึ้นก่อนได้รับการวินิจฉัยโรคเนื้องอกสมอง*

วัสดุและวิธีการ: *ทำการศึกษาย้อนหลัง 5 ปี (มกราคม พ.ศ. 2544 – ธันวาคม พ.ศ. 2548) ในผู้ป่วยอายุตั้งแต่ 20 ปี ที่ได้รับการวินิจฉัยเป็นเนื้องอกสมองและได้รับการตรวจทางจักษุประสาทก่อนการผ่าตัดโดยจักษุแพทย์ สถาบันประสาทวิทยา ซึ่งการตรวจประกอบด้วย การตรวจระดับสายตา, เส้นประสาทตา, การตอบสนองต่อแสงของรูม่านตา, การเคลื่อนไหวของกล้ามเนื้อตา และการตรวจลานสายตา โดยผู้ป่วยทุกรายต้องมีรายงานผลพยาธิวิทยาของเนื้องอกสมองและคัดผู้ป่วยที่มีประวัติการผ่าตัดเนื้องอกสมองมาก่อน หรือ การตรวจทางจักษุประสาทให้ผลปกติก่อนการผ่าตัด ออกจากการศึกษา แล้วทำการเก็บรวบรวมข้อมูล อายุ, เพศของผู้ป่วย, ผลพยาธิวิทยาของเนื้องอกสมอง, อาการ และอาการแสดงทางจักษุประสาทที่ตรวจพบก่อนได้รับการผ่าตัดสมอง ทำการเปรียบเทียบระดับสายตาของผู้ป่วยก่อนผ่าตัด ที่เกิดจากเนื้องอกสมองชนิดต่าง ๆ โดยใช้สถิติ non-parametric*

ผลการศึกษา: *ผู้ป่วยที่เข้าเกณฑ์การวิจัยมีจำนวน 149 ราย อัตราส่วน ชาย:หญิง เป็น 1:2.5 ส่วนใหญ่มีอายุในช่วง 40-50 ปี เนื้องอกสมองที่พบบ่อยที่สุด คือ meningioma (45%) อันดับ 2 ได้แก่ pituitary adenoma อันดับ 3 ได้แก่ tumors of neuroepithelial tissues และ craniopharyngioma อาการที่พบบ่อย ได้แก่ อาการตามัว (88.6%), ตาโปน (12.1%) และอาการแสดงที่พบบ่อยได้แก่ ลานสายตาผิดปกติ (80.5%), เส้นประสาทตาผิดปกติ (69.7%), ความผิดปกติของรูม่านตา (43.6%) นอกจากนี้พบว่า 59% ของผู้ป่วยมีระดับสายตา 20/200 หรือ แย่กว่า โดย 15.4% ไม่เห็นแสงสว่างเลย*

สรุป: *Meningioma เป็นเนื้องอกสมองที่ทำให้เกิดความผิดปกติต่อระบบจักษุประสาทมากที่สุดการตรวจหา ความผิดปกติของระดับสายตาที่ลดลง, ลานสายตา, เส้นประสาทตา และรูม่านตาซึ่งเป็นอาการและอาการแสดงทางจักษุประสาทที่พบบ่อยและควรตระหนักถึง อาจช่วยหลีกเลี่ยงความล่าช้าในการวินิจฉัยโรคได้*