



# Ocular Manifestations of Intracranial Space Occupying Lesions – A Clinical Study

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## Abstract

### Aim

- ❖ To study the various ophthalmologic manifestations in intracranial space occupying lesions.
- ❖ To correlate the ocular manifestations and the site of the brain tumours.
- ❖ To study the visual field defects caused by space occupying lesions.

## Materials and methods

The study included fifty CT/MRI proven cases of intracranial space occupying lesions who underwent detailed ocular, neurological and systemic examination.

## Results

Female patients in the 40-50 yrs age group were commonly affected. **Headache** was the common symptom [63.3 %] followed by defective vision. **VII Cranial nerve** was most commonly involved. **Papilloedema** was the most common fundus finding. **Visual field defects** correlated with the site of tumour. Most common histological subtype was **neuroepithelial tumours**. **Cerebellopontine angle tumours** were most common according to the site of tumour.

**Keywords.** Ocular manifestations, intracranial space occupying lesions, visual field defects.

## Introduction

Ocular features sometimes form an early manifestation of intracranial space occupying lesion, which helps us to diagnose the condition earlier and decrease the morbidity and mortality of the patient. How far the ophthalmologist's effort can be useful to the neurologist can be judged from the extensive distance the optic pathways cover in the brain from pole to pole, and from the fact that six of the twelve cranial nerves with their

nuclei are associated with the eyes besides the vagus and the sympathetic. This research work covers the assessment of the incidence of ophthalmologic manifestations in intracranial space occupying lesions, and to correlate the ocular manifestations and the site of the brain tumours as well as the study of the visual field defects caused by space occupying lesions.

## Aim of the Study

To study the incidence of ophthalmologic

manifestations in intracranial space occupying lesions, to correlate the ocular manifestations and the site of the brain tumours and also to study the visual field defects caused by space occupying lesions.

## Methods

The materials for the study were collected from the patients who attended Regional Institute of Ophthalmology, Calicut Medical College, during one year period [May 2005 - May 2007]. Most of the patients were admitted in the Neurosurgery Department and the ophthalmologic evaluation was done in the preoperative period. Patients with CT or MRI proved intracranial space occupying lesions were taken up for the study. Those patients who were uncooperative on account of very young age, deteriorating general conditions or marked behavioural disorders were excluded from the study.

Fifty patients with brain tumours and eye manifestations were included in the study. In each case clinical evaluation was done after obtaining a detailed history. **Ophthalmologic assessment** included routine ocular examination with special reference to ocular movements, corneal sensation, pupillary abnormalities and nystagmus. Ocular fundus was examined in detail and visual fields charted in all cases. A complete examination of the central nervous system which included examination of the higher functions, cranial nerves, motor system, sensory system and cerebellar signs were made.

## Observation and Discussion

### 1) Age distribution [Table :1]

The age of patients ranged from 11- 65 years. The maximum incidence in the present study was in the age group between 40 to 50.<sup>1</sup> This is in accordance with other studies by Rao et al, which showed a 52 % incidence in the 3<sup>rd</sup> & 4<sup>th</sup> decade.

Table 1: Age distribution.

Age group	Percentage
<10	6 %
10 to 20	6 %
20 to 30	22 %
30 to 40	20 %
40 to 50	30 %
>50	16 %

### 2) Sex distribution:

The present study showed a female preponderance of 60 %.

### 3) Area of involvement of brain tumors and histopathological types of brain tumors.

#### [Table :2]

In the present study according to the site of tumor most common was cerebellopontine angle tumors [20 %]. According to the histology the most common tumor found in our study was neuroepithelial tumors [34 %] like astrocytoma, oligodendroglioma, ependymoma etc.

### 4) Presenting symptoms:.

In this series maximum no of patients presented with headache. Headache as initial symptom occurred in 30 % and along with other symptoms occurred in 63.3 %. S.Sood et al also made similar observation. Defective vision occurred during the course of the disease in 50 % of the patients. Seizures either generalized or focal occurred in 3.3 %. Behavioural and psychiatric changes were noted in patients with parietal, frontal & temporal lobe tumors. Other symptoms included vertigo, paresis, dysphasia, dementia, deafness, tinnitus ataxia, and diplopia etc.

### 5) Pupillary abnormalities

Among the 50 patients examined 6[12 %] had abnormal pupillary reaction. All of them had afferent pupillary defect due to optic atrophy. Although Wernicke pupil has no significance according to the literature one patient in this study with left parietal meningioma and homonymous hemianopia showed the defect.

### 6) Papilloedema

Uthoffs [1914] study of bilateral papilloedema showed the etiology in 71 % as brain tumors, 12 % cerebral syphilis, 3.6 % cerebral oxycephaly, brain abscess and meningitis 2.2 % each. In this study 56 % of the patients had papilloedema during presentation. Posterior fossa tumors presented with papilledema earlier where as cortical & pituitary tumors presented late. Optic nerve fibres are compressed by elevated cerebrospinal fluid pressure in the subarachnoid space of the intraorbital portion of the optic nerve. Subsequent swelling of axons and leakage of water, protein, and other axoplasmic

Table 2 : Area of Involvement &amp; Histopathological subtypes

Area of lesion	Histopathology	Percentage
Parietal lobe	Meningioma-2	
	Malignant Ependymoma-1	14 %
	Glioblastoma multiforme-1 Astrocytoma-2 Epidermoid cyst-1	
Fronto parietal	Astrocytoma-1	6 %
	Meningioma-2	
Frontal	Meningioma-3	
	Glioblastoma multiforme-2	12 %
	Abscess-1	
Fronto temporal	Astrocytoma-1	
	Oligodendroglioma-1	6 %
	Glioblastoma multiforme-1	
Temporal	Pilocytic astrocytoma-1	4 %
	Caver. Haemangioma-1	
CP angle tumour	Acoustic neuroma-7	20 %
	Meningioma-1	
	Glioma-2	
	Parieto occipital	
	Astrocytoma-1	
	Glioma-1	6 %
	Abscess-1	
Perichiasmatic	Pituitary tumours-3	
	Craniopharyngioma-5	18 %
	Tuberculum Sellae Meningioma-1	
Cerebellum	Medulloblastoma-1	4 %
	Glioma-1	
Ventricle	Colloid cyst-3	8 %
	Epidermoid-1	
Corpus callosum	Glioma-1	2 %

contents into the extra cellular space causes venous obstructions, nerve fibre hypoxia and vascular telangiectasis of the disc as secondary events. Therefore, papilledema is primarily mechanical rather than a vascular phenomenon. Normally the disc edema takes 1-4 days to develop after the increase of CSF pressure.

### 7) Cranial nerves [Table:3]

Expanding supratentorial mass lesions displaces cerebral tissues to compress the brainstem structures. During this process the nerves innervating the extraocular muscles are stretched resulting in false localizing sign.

VI nerve may be stretched over the petrous tip between its point of emergence from the brainstem and its dural attachment to the clivus. This is due to the downward descent of the brainstem and may occur with posterior

Table 3: Distribution of cranial nerve palsy

Cranial Nerve Palsy	Percentage
IIIrd nerve	3.12
VI nerve	21.86
VII nerve	31.2
VIII nerve	18.74
IX, X nerves	6.25
V nerve	18.74

fossa tumours. Bilateral palsy of VI nerve may be a false localizing sign. Cranial nerves were involved in 64 %. Cerebellopontine angle tumors were associated with cranial nerve involvement [5, 7, 8 cranial nerves involved in 100 % & 9, 10 cranial nerves involved in 6.25 %]

### 8) Hemiparesis

Pyramidal tract involvement with some form of hemiparesis was seen in seven patients.

### 9) Cerebellar signs

All cases of cerebellopontine angle tumors were associated with cerebellar signs.

### 10) Optic atrophy [Table:4]

Optic atrophy was seen in 9 patients. 3 patients had primary optic atrophy [all cases were craniopharyngiomas]. Post-neuritic optic atrophy following papilledema was seen in rest of the cases.

Table 4: Percentage of optic atrophy.

Optic Atrophy	Percentage
Primary optic atrophy	2
Secondary optic atrophy	12
Total	18

### 11) Visual field defects [Table:5]

Visual field testing helps in localizing and lateralizing the intracranial lesions. Most field defects of neurophthalmic significance are located in the central 30-degree field. 56 % of the patients in this study showed field defects. (a) Blind spot enlargement was the most common. (b) Bitemporal hemianopia - The partial decussation of nerve fibres in the optic chiasm

Table 5: Distribution of visual field defects

Field defect	Percentage	Cases
Bitemporal hemianopia	7.14	Craniopharyngioma, tuberculus sellae meningioma
Homonymous hemianopia	21.43	Parietal astrocytoma, Parietal epidermoid
Fronto parietal meningioma		Tem.pilocystic astrocytoma
Homo.superior quadrantanopia	3.57	Fronto temp.meningioma
		Haemangioblastoma cerebellum
Homo.inferior quadrantanopia	3.57	Glioblastoma multiforme
		Parietal lobe
Blind spot enlargement	53.57	
Peripheral constriction	28.57	

accounts for the characteristic visual field defect. It was seen in 2 cases of craniopharyngioma and one tuberculum sellae meningioma. (c) Homonymous hemianopia occurs in optic tract lesions due to tumors in temporal, frontal, parietal & occipital lobes. It was seen in 6 cases -2 parietal lobe lesions, 2 frontoparietal & 2 temporal lobe lesions. (d) Homonymous superior quadrantanopia was seen in one case of temperofrontal meningioma due to involvement of the inferior fibres in the optic radiation. (e) Homonymous inferior quadrantanopia was seen in one case of parietal tumour due to involvement of superior fibres in the optic radiation passing through the parietal lobe.

### Frontal lobe tumors

Patients with frontal lobe tumors showed behavioral abnormalities, dementia, seizures & urinary incontinence. Three out of the nine had convulsions. Gliomas were the most common tumors of the frontal lobe. 9 % of the frontal lobe tumors showed homonymous hemianopia and 50 % showed peripheral constriction of visual fields.

### Temporal lobe lesions

Temporal lobe involvement was seen in 6 out of the 50 patients. 20 % of the cases showed superior quadrantanopia & 25 % showed homonymous hemianopia.

### Cerebellopontine angle tumours

There were 10 cases with CP angle tumours. All of them had deafness, ataxia, impaired corneal sensation, papilledema and 7<sup>th</sup> and 8<sup>th</sup> nerve palsies. Other features

include gaze induced nystagmus, brun's nystagmus, tinnitus and dysphasia. In the present study the incidence of raised ICT as evidenced by papilledema was seen in 80 % of cases. Papilledema occurred secondary to hydrocephalus as a result of aqueductal obstruction by the tumour. Papilledema may sometimes result due to increased protein secretion by the tumour. Optic atrophy is secondary to papilledema. In the present study nystagmus is seen in 20 % of cases of CP angle tumours.

### Conclusion

Ocular manifestations occur very frequently in ICSOL, which in some cases helps us to diagnose the condition. Headache was the most common symptom followed by defective vision. Cranial nerve involvement was seen in many cases, most common of which was sixth nerve palsy. Papilledema was the most common fundus finding followed by optic atrophy. Visual field abnormality was seen in majority of cases out of which blindspot enlargement was most common followed by bitemporal hemianopia, homonymous hemianopia, superior and inferior quadrantanopia. Distribution of brain tumours showed CP angle tumours to be most common followed by parietal lobe, frontoparietal,

frontal, frontotemporal, temporal and parieto-occipital lobe. This study emphasizes the importance of ocular manifestations in the localization, extent of the lesion, prognosis for vision and life of the patient, in the case of brain tumours.

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