

Evaluation of visual field defects in neuro- ophthalmology

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Abstract

Aim: The aim of the study is to evaluate the visual field defects in neuro-ophththamology and in patients with lesions involving the visual pathway.

Introduction: Visual field testing is done with Standard automated perimetry. This helps in the early diagnosis of visual field defects in brain tumours, localization, differential diagnosis, monitoring progression and recurrences and helps in diagnosing hidden visual loss.

Materials and Methods: 100 cases were included in the study. These cases had intracranial tumours, pituitary tumours and pailloedema. All the cases were referred for visual fields examination from neurology and neurosurgery departments. Standard automated perimetry was done in all cases.

Results: Out of 100 cases, 31 cases had pituitary tumours, 33 patients had papilloedema and 36 patients had other intracranial tumours. Normal visual fields were noted in 36 cases and visual field defects were noted in 64 cases. Bitemporal hemianopia was noted in 18 cases, homonymous hemianopia in 16 cases, enlargement of blind spot in 15 cases, generalized constriction of fields in 5 cases, quadrantanopia in 6 cases and field defects involving three quadrants was noted in 4 cases.

Conclusion: Complete Ophthalmological examination including perimetry should be done in patients with intracranial tumors involving visual pathway. Some patients are visually asymptomatic even when they have visual field defects. Automated perimetry is the most sensitive and specific for diagnosing the visual field defects in neuro-ophthalmology cases. Perimetry is useful in localizing the tumors and should be repeated after surgery to monitor for resolution or recurrence. Patients with visual field defects have difficulty in doing their daily activities and affect the quality of life. Rehabilitation should be considered in these cases.

Keywords: Bitemporal hemianopia, Homonymous hemianopia, Papilloedema, Pituitary tumors, Visual field defects.

Introduction

Visual field examination is done by Confrontation, Tangent screen, Goldman perimetry and automated perimetry. Confrontation is done in patients as a preliminary testing and also in patients who are bedridden and weak to perform perimetry. Experienced technicians are needed to perform Goldmans perimetry. Standard Automated Perimetry is the commonly used technique. It is less time taking and easy to perform.¹

Patients with brain tumours sometimes present to the Ophthalmology department with complaints of defective vision. By testing visual fields these conditions can be diagnosed and treated early. Some patients may not have any visual symptoms but when perimetry was done had field defects due to compression of the visual pathways. Patients may not present with vision loss until central vision is affected by compression of macular fibres.

The arrangement of retinal nerve fibres in the visual pathway is the cause for the characteristic visual field defects. These visual field defects are caused by the compression, inflammation, demyelination, ischemia or infiltration of visual pathway. Each visual field defect has a localizing value. The type of field defect shows the presence of a tumour and helps to localize it. Pattern of progression of the visual field defect indicates a rapidly progressing tumour. Neurological fields respect the vertical midline.

Suprasellar extension of the pituitary tumor causes compression of the optic chiasma and leads to visual field defects. Microadenomas are the tumours less than 10mm and Macroadenomas are the tumours larger than 10mm.

Visual field defects are caused by macroadenomas. Visual field defect depends on the location and direction of compression by an enlarging tumour and also depends upon the anatomical variations of the position of the chiasma. Chiasma can be central, prefixed or post fixed. Bitemporal superior quadrantanopia is seen in pituitary tumours due to compression of lower nasal fibres. Later this progresses into Bitemporal hemianopia. Craniopharyngioma arising above the chiasma compresses the upper nasal fibres cause inferotemporal quadrantanopias.²

Pituitary adenoma in a post fixed chiasma leads to Junctional scotoma showing ipsilateral central scotoma and contralateral superotemporal defect due to compression of Wilbrands knee. Involvement of the optic tracts by a posterior tumour in a prefixed chiasm causes Homonymous hemianopia.²

Retrochiasmal lesions cause homonymous hemianopias. If the same side is involved in both eyes it is called homonymous hemianopia, if opposite sides are involved it is called Heteronymous hemianopia as seen in bitemporal hemianopia. If both eyes have identical defects it is called congruous while mismatching defects are called incongruous. Visual field defects in lesions involving optic tracts, lateral geniculate body produces incongruous hemianopias. Lesions involving the posterior optic radiations cause congruous hemianopias.²

Parietal lobe tumours causes inferior homonymous quadrantanopia (Pie on the floor). Temporal lobe tumours causes superior homonymous quadrantanopia (Pie in the sky).²

Enlargement of blind spot is the most common visual field defect seen in papilloedema and in Idiopathic intracranial hypertension (IIH). This is due to swelling of the optic nerve head. Some patients lose their vision in IIH if not treated in time. Hence it is important to monitor the visual field defects in cases with papilloedema and IIH.¹

Patients with visual field defects may have difficulty in doing daily activities like driving and reading. This affects the quality of life. Rehabilitation should be advised in these cases.^{1,3,4}

Type of Study

Retrospective observational study.

Materials and Methods

100 cases were evaluated for the study. All the cases were referred for visual fields examination from neurology and neurosurgery departments.

Complete ophthalmological examination was done in all cases, which consisted of taking history, testing visual acuity, colour vision, extra ocular movements, pupillary reactions, anterior segment examination with slit lamp, fundus examination with 90 D lens. Perimetry was done with Humphrey Field Analyser with 30-2 threshold test.

Inclusion Criteria

1. Patients with confirmed radiological diagnosis.
2. Fields that fulfilled the reliability criteria were included in the study.

Exclusion Criteria

1. Patients with Co-existing cataracts or glaucoma.
2. Patients with very low visual acuity of less than 6/60.
3. Patients who are too ill and who are not able to perform visual field examination.
4. Too young children who cannot cooperate for visual field examination.

Perimetry

Computerized Standard Automated Perimetry (SAP) was done in all the cases. SITA Fast (Swedish Interactive Threshold Algorithm) testing has less test time and is most useful in testing visual fields in Neuro-ophthalmology cases. Central 30 pattern and fast threshold strategy was used. Total 82 points were tested. Reliability criteria are, fixation losses less than 20%, false positives and false negatives less than 33%.

Results

Table 1

Type of Visual Field Defects	No of Cases
Bitemporal hemianopia	18
Homonymous hemianopia	16
Enlargement of blind spot	15
Quadrantopia	6
Generalized constriction of fields	5
Field defects involving three quadrants	4
Total	64

Table 2

Type of Visual Fields in Pituitary Tumours	No of Cases
Normal visual fields	12
Bitemporal Hemianopia	9
Homonymous Hemianopia	6
Field Defect involving three Quadrants	4
Total	31

Table 3

Causes of Papilloedema	No of cases
Idiopathic Intracranial Hypertension.	12
Cavernous sinus thrombosis	5
Grade 4 hypertensive retinopathy	6
TB Meningitis	3
Meningo-encephalitis	2
Septicemia	2
Subdural hematoma	3
Total	33

Table 4

Visual Fields in Papilloedema	No of Cases
Normal visual fields	19
Enlargement of Blind Spot	12
Generalized Constriction of Fields	2
Total	33

Table 5

Causes of Intracranial tumours	No of cases
Craniopharyngioma	9
Glioma	4
Arachnoid cyst	9
Meningioma	7
Posterior fossa tumours	7
Total	36

Table 6

Visual Feilds in Intracranial Space occupying lesions	No of Cases
Normal visual fields	5
Homonymous Hemianopia	10
Bitemporal Hemianopia	9
Quadrantopia	6
Enlargement of Blind Spot	3
Generalized constriction of fields	3
Total	36

Discussion

Out of 100 cases, 57 were females and 43 were males. Ages range from 13yrs to 72yrs. Out of 100 cases, 31 patients had pituitary tumours, 33 patients had papilloedema and 36 patients had other intracranial tumours. Normal fields were noted in 36 patients and visual field defects were noted in 64 cases. The different types of visual field defects noted in the total 100 cases are shown in the Table 1.

Pituitary Tumours

In pituitary tumours (31 cases) 20 patients had macroadenomas 11 patients had microadenomas. Normal fields were noted in 12 cases and field defects were noted in 19 cases. Visual field defects seen in patients with Pituitary tumours are shown in Table 2.

Bitemporal hemianopia is the most common field defect seen in pituitary tumours in other studies done by Alexander Poon⁵ and S. Ananth Bhandary.⁶ Similar results are seen in our study. Other field defects like homonymous hemianopia and quadrantanopias are also noted in our study as described by Dr Ravi Thomas⁷ and Lee⁸ et al.

Kerrison JB, Lynn MJ et al has described the improvement in visual fields after pituitary tumour resection. The pattern of vision improvement is triphasic. First early fast phase is seen after surgery to one week. Second slow phase is from one month to four months after surgery. The third late phase is from 6 months to 3 years after surgery.⁹

Pinaki Dutta and et al have analysed the visual outcome in 2000 eyes following microscopic transsphenoidal surgery for pituitary adenomas. They have stated that surgery should be done even in the patients who are visually impaired for years as there will be visual improvement.¹⁰

Papilloedema

33 Cases had papilloedema. The etiology of Papilloedema in these cases is shown in Table 3. Normal fields were noted in 19 cases. 14 cases had visual field defects. These are shown in Table 4. Enlargement of blind spot is due to the swelling of the optic nerve head. It is the most common field defect seen in papilloedma cases in the present series. Similar results are noted in studies done by Corbett JJ, Jacobson DM and other studies.^{11,12}

Intracranial Tumours

36 patients had intra cranial tumours. Types of intracranial tumours are noted in the Table 5. Out of 36 Cases, normal fields were noted in 5 cases. Visual field defects noted in 31 patients with intracranial tumours, these are shown in Table 6. Studies done by Kedar S and Zhang Lynn had similar results.¹³

Limitations of the Study

Small sample size is the limitation of the study. Ideally fields should be examined before and after the surgery. The general condition of the patients and fatigue due to repeated testing influence the results.

Conclusion

Complete ophthalmological examination including perimetry should be done in patients with intracranial tumors involving visual pathway. Some patients are visually asymptomatic even when they have visual field defects. Automated perimetry is the most sensitive and specific for diagnosing the visual field defects in neuro-ophthalmology cases. Perimetry is useful in localizing the tumors and should be repeated after surgery to monitor for resolution or

recurrence. Patients with visual field defects have difficulty in doing their daily activities and affect the quality of life. Rehabilitation should be considered in these cases.

Conflict of Interest: None.

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