FIELD TRIP

Visual fields in Neuro ophthalmology

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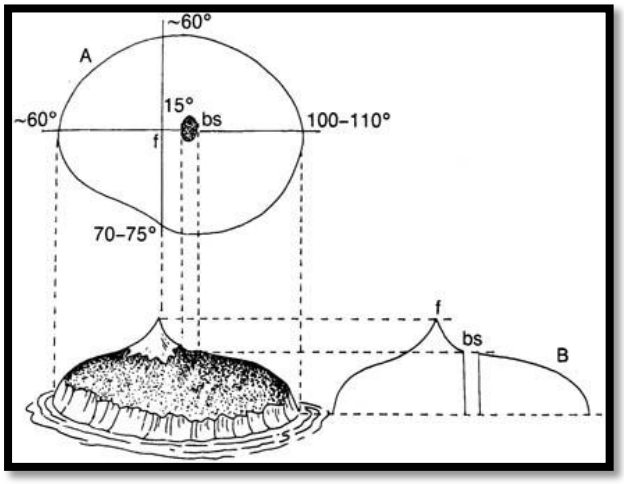
INTRODUCTION

The typical description of visual fields was given by Harry Moss Traquair (1875-1954) as “An island hill of vision in sea of darkness.”



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The island of vision is described as 3 dimensional graphic representation of differential light sensitivity at different position in space. A normal visual field extends 60 degree superiorly,60 degree nasally,80 degree inferiorly and 90 degree temporally. Blind spot is located temporally between 10 and 20 degree. Visual field analysis in neuro-ophthalmology is very essential as it helps in localizing the lesion, monitoring the course of the lesion involving the afferent visual pathway and also plan the rehabilitative measures in affected patients.

Visual field techniques:

There are different techniques by which we assess visual fields. Confrontation is a useful beside test done which is useful especially when there is profound vision loss and in bedridden patients. The other techniques are kinetic and automated static perimetry.

Confrontation: Confrontation technique is a rapid and simple bedside test to assess visual field. The sensitivity of confrontation is 20 % for glaucoma and 70 % for neuro ophthalmic condition when compared to goldman and automated perimetry. The method of confrontation technique includes :

Description of examiners face: Examiner sits at 1mt distance from patient and asks patient to close one eye and focus on examiners nose. Then asks patient if any parts of examiners face is missing and the patients response helps in detecting any central or altitudinal field defect.

Finger counting in 4 quadrants: Patient is asked to count static fingers in all 4 quadrants. The target fingers are usually 1, 2 or 5 to avoid confusion and are usually shown 20 degree eccentric to fixation. This helps in detecting altitudinal as well as homonymous defects.

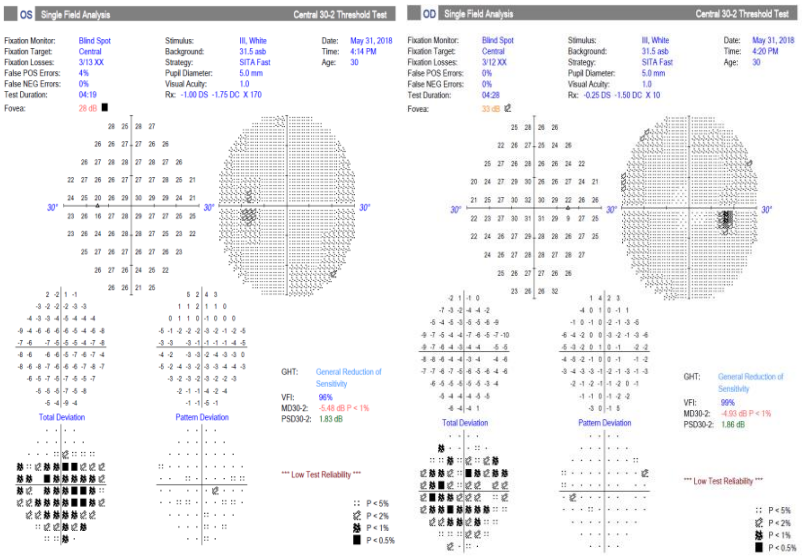
Kinetic test: A 5 mm target, usually a red colored target is moved inward from beyond the boundary of each quadrant. The patient is asked to say the first point when the patient perceives the target.

Extinction: Refers to inability to see a target in the affected hemifield when simultaneously stimulated. This visual neglect is classical in parietal lobe lesion.

Static automated perimetry (SAP): This is the gold standard technique for assessing visual field defects. The perimeter randomly projects stimuli in predetermined location .80% of the visual cortex has representation in central 24- 30 degree of the visual field to detect neuro ophthalmic visual field defects .It is vital to assess the foveal threshold as it estimates the central visual function. The main advantage of SAP is its standardized testing condition, improves the serial and inter institutional comparison of results .The test is less technician dependent with better sensitivity though it might have some difficulties while assessing older or inattentive patients .Typically size III stimulus ($4mm^2$)is used as the target for patients with better vision (better than 6/60 vision) and for patients with poor vision size V stimulus ($64mm^2$)is recommended to avoid errors.

<u>Tip</u>: To read a visual field, one has to make sure that the report of right eye is on your right side and the report of left eye is on your left side. (Fig 1)

Figure 1:Placement of a visual field printout for interpretation.



Localize the lesion in visual pathway: Understanding the pattern of visual field defect help in localizing the lesion in the visual pathway. We shall categorize the visual pathway as pre-chiasmal, chiasmal and retro-chiasmal and the pattern of visual loss noted in each of them is given in the table below.

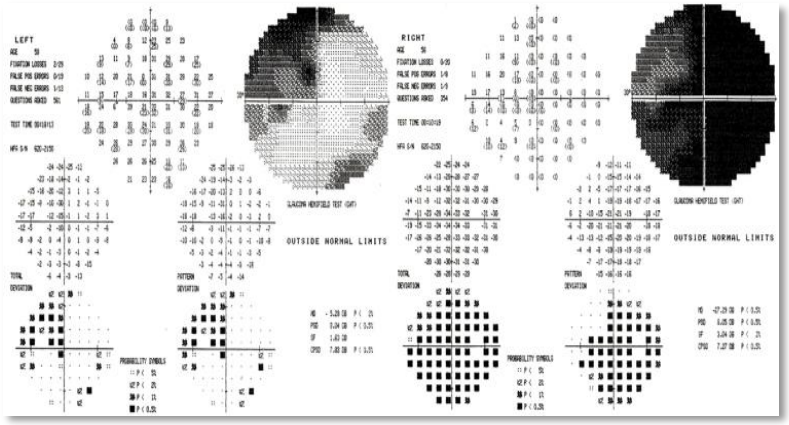
Location	Characteristics	Pattern of field loss
Pre Chiasmal	Mono ocular defects as there is no crossing over of the fibers	*Inferior altitudinal field loss- NAAION (most common) * Bilateral central or ceocentral defects - Toxic/Nutritional/LHON/Optic neuritis *Enlarged Blind Spot- Early papilledema/Optic disc drusen/Tilted disc
Chiasmal	Crossing over of the nasal fibers cause bilateral defects respecting vertical meridian.	*Bitemporal defects- Chiasmal lesion *Bitemporal superior defects progressing downwards - Pituitary mass *Bitemporal inferior defects progressing upwards- Suprasellar mass like craniopharyngioma
Retrochiasmal	The defects are on the same side termed as homonymous hemianopia. They are incongruous (asymmetrical) in more anterior lesion and as the lesion goes posterior the	*Homonymous hemianopia right or left side -contralateral retrochiasmal pathway lesion

	defects become congruous (symmetrical)	
Optic radiations	Lesion involving optic radiations in temporal lobe (meyer's loop) or parietal lobe	*Homonymous superior quadrantanopia (Pie on sky) - Contralateral temporal lobe lesion *Homonymous inferior quadrantanopia (Pie on floor) - Contralateral parietal lobe lesion
Occipital cortex	Dual vascular supply of the occipital poles, larger and bilateral representation of the maculae produces macular sparing field loss	*Homonymous hemianopia with macular sparing – Lesion of Occipital cortex or poles

Special scenarios: There are few rare types of visual field loss which again has specific localizing value.

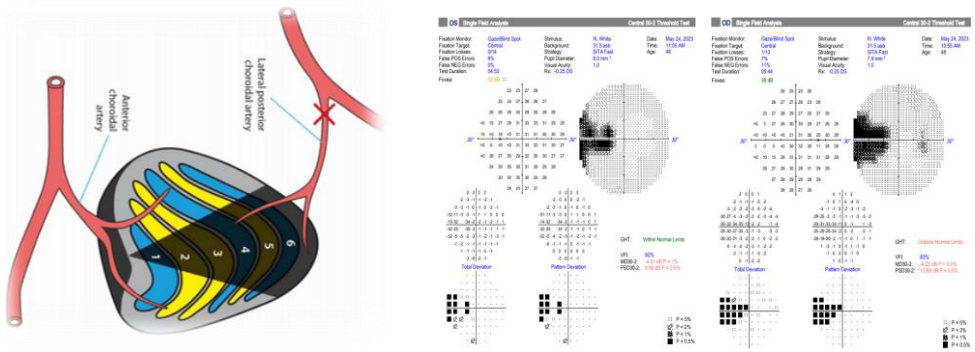
Junctional scotoma: Anterior chiasmal compression near the wilbrand's knee can produce unilateral optic neuropathy with field loss and contralateral superotemporal defects. (Fig2)

Figure 2: Right eye advanced field loss with superotemporal defects in left eye suggestive of junctional scotoma -Lesion involving anterior chiasm



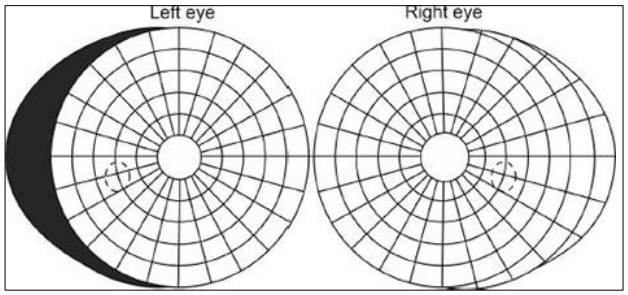
Sectoranopia: Lesions of lateral geniculate body (LGB) produces homonymous sectoranopia. More classically when the hilum of the LGB is involved it produces contralateral homonymous central wedge shaped sectoranopia due to involvement or occlusion of posterior choroidal artery. Homonymous quadruple sectoranopia preserving the central wedge is seen when there is lesion or involvement of the medial and lateral horn of LGB supplied by anterior choroidal artery. (Fig3)

Figure 3: Left homonymous sectoranopia- Lesion involving contralateral LGB



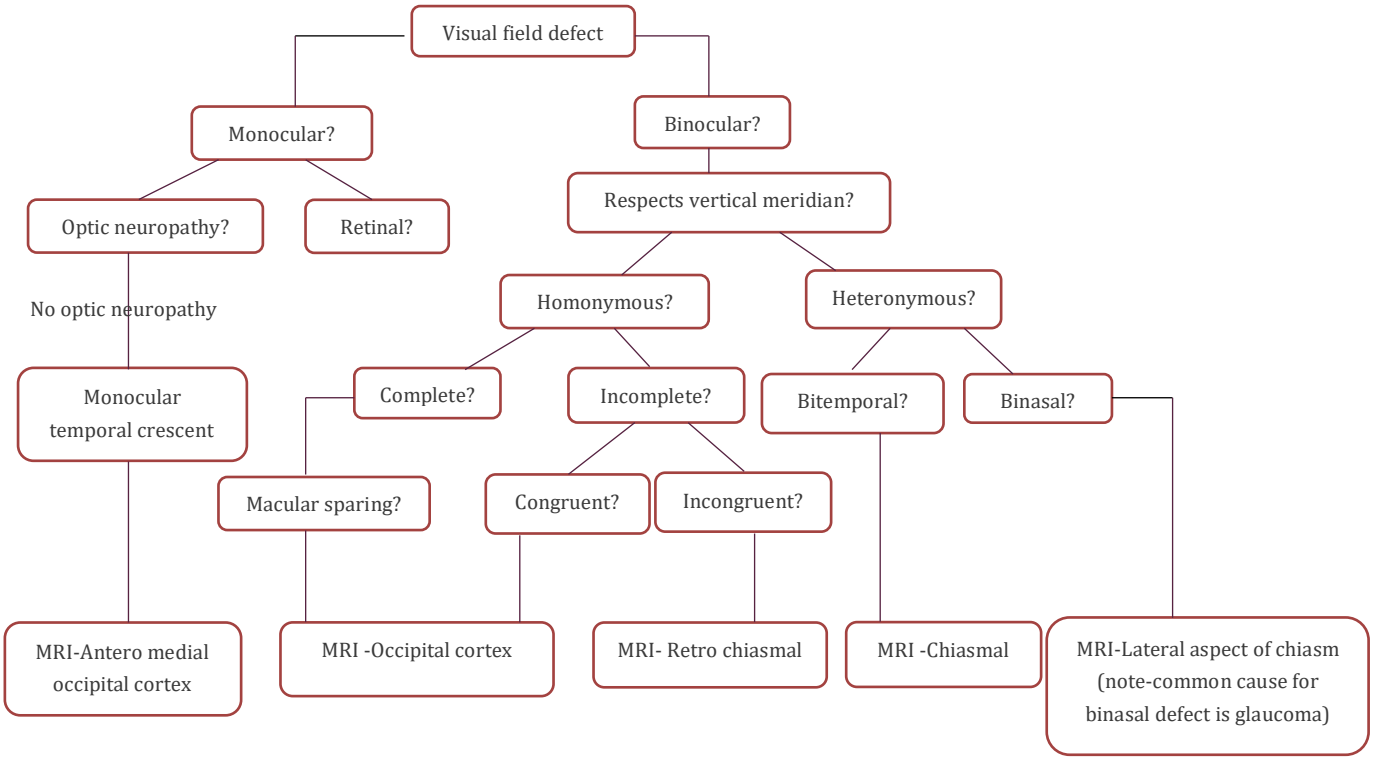
Monocular temporal crescent: The only monocular field loss noted in retrochiasmal lesion is monocular temporal crescent which corresponds to lesion of the most anteromedial part of the occipital cortex on the contralateral side, which has monoocular projection.

Figure 4: Monocular temporal crescent- Anteromedial part of visual cortex



Conclusion:

Visual field is a window to the eye and brain. Confrontation is a best bedside visual field testing method for neuro ophthalmic conditions. Static automated perimetry has become an essential tool in testing visual fields in patients with neuro ophthalmic conditions. The flow chart shown below can help one interpret a neuro ophthalmic visual field defect.



Study material:

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2.American Academy of Ophthalmology, Basic and Clinical Science Course, Section 5: Neuro ophthalmology, Patient with decreased vision: Evaluation - Examination Visual field Evaluation, Chapter 4, Page 91-5.2025-2026

3.Liu, Volpe and Galetta's Neuro ophthalmology: Diagnosis and Management,3rd Edition, Visual loss and Other Disorders of Afferent Visual Pathway, Chapter II.2018

4. Kedar S, Ghate D, Corbett JJ. Visual fields in neuro-ophthalmology. Indian J Ophthalmol. 2011 Mar-Apr;59(2):103-9