*Original Research Article*

# AN ANALYSIS OF VISUAL FIELD DEFECTS IN ~~PITUTIARY~~ PITUITARY MACROADENOMAS: A PROSPECTIVE STUDY


**Abstract :**

Pituitary Adenomas are common benign Intracranial tumours which cause visual field defects by anterior visual pathway compression after ~~supresellar~~ suprasellar extension of pituitary macroadenomas. After fulfilling the inclusion criteria, 31 patients with pituitary macroadenomas were evaluated for visual field defects using Humphrey Goldmann's perimeter.Thirteen patients had normal visual fields and 18 patients had abnormal visual fields. Bitemporal hemianopia was the most common visual field defect seen on the perimeter. Also, there was a positive correlation between the tumour size and the visual field defects.



**Keywords:** Pituitary Macroadenoma, Visual field defects, Goldmann Perimetry




## Introduction:

Pituitary adenomas are common benign intracranial tumours. They make up around 12% of intracranial tumours that cause clinical symptoms (1). Depending on whether their size is less than or greater than one centimetre, they are classified as either microadenomas or macroadenomas. A variety of visual field defects may arise from anterior visual pathway compression caused by suprasellar extension of pituitary macroadenomas. The amount of visual field defect depends on the location of the optic chiasma and the size of the tumour(2). Pituitary adenoma can cause visual field abnormalities in 9% to 32% of cases(3). Pituitary adenoma is detected in the majority of cases when the tumour causes bitemporal hemianopia or when there is a significant loss of vision and optic disc pallor on fundus examination.

Goldmann perimetry was the traditional method for analysing visual fields, however new automated methods that are equally or more sensitive to identify and measure visual field defects have recently been developed. The most recent and extensively used automated perimetry programme is the Swedish Interactive Threshold Algorithms (SITA) series, which makes the visual field-testing procedure considerably quicker and more user-friendly for the patient(4).

We aimed to analyse the pattern of visual field defects in patients with pituitary macroadenomaand further ~~to~~ evaluatethe correlation between the tumour volume and severity of visual field defects.

**Materials and methods:**

We prospectively analysed 37 radiologically proven cases of pituitary macroadenomas who were referred tothe department of Ophthalmology for visual field analysis over a period of 5 years. Patients above the age of eighty years, those with optic neuropathy resulting from other disorders such as glaucoma and those with retinal disorders such as diabetic and hypertensive retinopathy, or patients with unreliable visual field test results were excluded from the study. After applying the exclusion criteria 31 patients were included in the study. The ophthalmological assessment includes best corrected visual acuity (BCVA), colour vision, and visual field test. The Swedish Interactive Threshold Algorithm (SITA) or full threshold 30–2 was the algorithm used in the assessment of automated perimetry. Fundus examination was done by + 78 Dioptre lens. Visual field examinations were considered abnormal if the pattern standard deviation (PSD) or glaucoma hemifield test was abnormal. Quadranopsia was defined as either :

1)Depression of thresholds by 5 dB or more, in three or more contiguous points adjacent to the vertical meridian in the involved quadrant as compared to their mirror image points across the vertical meridian, or

2)The pattern deviation plot showed three or more points adjacent to the vertical meridian in the involved quadrant depressed to the 1% probability level with normal mirror image points across the vertical meridian.

~~Patient~~ The patient had hemianopsia if criteria for quadranopsia had to be applicable to both quadrants comprising the hemifield. Results for the mean deviation (MD) and PSD of both eyes ~~was~~ wereused. The findings of radio-imaging by magnetic resonance imaging (MRI) were reviewed and tumour volume was assessed.

Statistical Analysis: ~~Software~~ The software used for statistical analysis was SPSS ver. 12.0 (SPSS Inc., Chicago, IL, USA). For categorical data, a chi-square test was employed, and for continuous variables, a Mann-Whitney U-test was utilised to compare groups. The associations between tumour volume and PSD and between tumour volume and MD were examined using Pearson's correlation analysis. When ~~p~~ the p-value is $< 0.05$, all association tests were deemed statistically significant.

**Results:**

A total of 37 patients ~~of~~ withpituitary adenoma presented to our department during the study period. Six patients were not included in the study as they didn't satisfy the inclusion criteria. ~~Mean~~ The mean age of the patients was 49 ± 14.8 years, ranging from 20-67 years. 19 patients were males and 12 were females. MD was -7.26 ± 5.66 dB and PSD was 6.08 ± 3.59 dB. The characteristics of the patients are shown in Table [1]

| Variable | Value |
|---|---|
| **No. of patients** | 31 |
| **Male: Female** | 19:12 |
| **Mean Deviation(dB)** | -7.26 ± 5.66 (0.65- 17.71) |
| **Pattern Standard Deviation (dB)** | 6.08 ± 3.59 (1.13- 11.73) |
| **Tumour Volume ($cm^3$)** | 7.46 ± 5.90 (1.05 – 17.31) |

Table 1: Baseline characteristics of the patients

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Thirteen patients had normal visual fields and 18 patients had abnormal visual fields. Seven patients had unilateral visual field defects, and 11 patients had bilateral visual field defects. The various types of visual field defects seen are summarised in Table [2]

| Visual Field Defect | Number of Patients |
|---|---|
| **Normal Visual Field** | 13 |
| **Abnormal Visual Field** | 18 |
| **Unilateral** | 7 |
| • **Temporal hemianopsia** | 3 |
| • **Superotemporalquadranopsia** | 4 |
| **Bilateral** | 11 |
| • **Bitemporal hemianopsia** | 6 |
| • **Hemianopsia in one eye, Superotemporalquadranopsia in other eye** | 2 |
| • **General reduction in one eye, temporal defect in other eye** | 1 |
| • **Homonymous hemianopsia** | 2 |

Table 2: Spectrum of visual field defects

Table[3] shows the comparison between gender, age, tumour volume, mean deviation, and pattern standard deviation between the group with and without visual field defect. As seen in the table, there is no statistically significant difference between the two groups in gender (p-value = 0.913) and age ( p-value 0.069). The group with visual field defect had a significantly larger pituitary tumour(p-value < 0.001). Mean deviation (MD)was significantly ~~more~~ higherin patients with normal visual fields, whereas pattern standard deviation (PSD) was significantly less in patients with normal visual fields.

| Variable | Patients with normal visual field | Patients with visual field defect | p-value |
|---|---|---|---|
| **Male:Female** | 8:5 | 11:7 | 0.913 |
| **Age(years)** | 36.69 ± 11.62 | 44.78 ± 11.90 | 0.069 |
| **Tumour volume($cm^3$)** | 2.96 ± 1.36 | 10.71 ± 5.79 | < 0.001 |
| **Mean Deviation (dB)** | -1.97 ± 0.94 | -11.08 ± 4.37 | < 0.001 |
| **Pattern Standard Deviation(dB)** | 2.54 ± 0.71 | 7.20 ± 2.16 | <0.001 |

Table 3: Comparison between patients with and without visual field defects

**Discussion:**

Pituitary adenomas account for approximately 12% of symptomatic intracranial tumors(6)Visual impairments are the most common objective manifestations of pituitary adenoma. There was a male preponderance in our study. The age and gender distribution in our study was similar to the community-based study conducted by Fernandes A et al(7).

Bitemporal hemianopsia was the most common symptom in our study, seen in 6 out of 18 patients with visual field defects (33%). Because the lesions that damage the body of the optic chiasm produce bitemporal hemianopsia, that is the most common symptom(8).~~Similar~~ A similar result was seen in a study reported by Alexander et al(9)and Huang WC et al(10). Lee et al in a study found bitemporal hemianopsia to be more common in patients whose MRI showed a displacement of the optic pathway of more than 3 mm from the baseline(11).However, as per size and position relative to optic chiasma, multitude of visual field defects can be produced(12). In our study, 61 % of the patients with visual ~~filed~~ field defects had bilateral involvement. Mono-ocular involvement was present in 39% of patients. 2 out of 18 patients with visual field defects had homonymous hemianopsia. Many authors previously also have reported that pituitary adenoma can cause homonymous hemianopsia(13). So evaluation by radio-imaging should be done even in mono-ocular visual field defects.

Our study showed that there was a positive correlation between tumour volume, as measured by MRI, and visual field defects. This was shown in the number of previous studies. Thomas et al also demonstrated that the severity of visual field defects was related to tumour size(5).Lee et alalso showed a significant positive correlation ~~of~~ betweenvisual field defects with tumour volume(14). The difference between our study and most of the previous studies is that ours was a prospective study.

Visual field defects were quantified in our study using Median Deviation (MD) and Pattern Standard Deviation (PSD) using the 30-2 SITA strategy. Our study showed a significant positive correlation between visual ~~filed~~ field defects and MD and PSD values. Higher MD values were seen in normal visual field patients whereas lower PSD values were seen in normal visual field patients. These findings are supported by the study by Lee et al, who also showed a similar association.

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**Conclusion:**

In summary, pituitary macroadenoma is known to manifest in a variety of visual field defects, with binocular involvement occurring in the majority of cases. The tumour volume determined the kind and extent of the visual field defect. Pituitary macroadenoma-related visual field defects can be quickly and quantitatively assessed using the SITA 30-2 procedure with Humphrey parameters.

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**Comment [SZ4]:** Refence 9 is the same as 2 . The author need to remove it & re-arranged the refertneces