

Case Series Study of Visual Field Defects in Pituitary Gland Tumors

Vallabha K* and Vijayamahantesh M. Bijapur

Department of Ophthalmology, BLDEU's Shri B.M. Patil Medical College, Solapur Road, Vijayapura-586103 Karnataka, India

Abstract: *Background:* The pituitary gland is a small endocrine gland, weighing about 500 mg. Pituitary adenomas account for 12-15 % of all intracranial tumors. Pituitary gland is in the sella turcica, 8-13 mm lower than the optic chiasm. Therefore, when it increases, it can easily compress the optic nerve fibers in the chiasm. Micro adenomas can have a negligible effect on the visual system or on the function impairment when pituitary adenoma compresses the frontal part of optic nerve; impairments in visual fields, visual acuity, and color contrast sensitivity are possible. The long standing compression of the chiasm induces primary optic nerve atrophy, which directly impairs visual function. The prevalence of visual field defects in pituitary adenomas varies from 37 to 96% in different studies. Because of its anatomical relationship with optic chiasm, pituitary adenoma typically results in bitemporal hemianopia. However, according to the tumor size and optic chiasm position, a variety of field defects can be produced by pituitary adenoma and the tumor size is a significant factor in the severity of Visual field defects. *Aim:* To study the proportion of patients with visual field defects in pituitary adenomas and to study the pattern of visual field defects in pituitary adenomas. *Materials and Methods:* 7 patients diagnosed with a pituitary adenoma underwent complete ophthalmic and Humphrey's Perimetry 30-2 visual field test at Department of Ophthalmology, BLDEU'S Shri B M Patil Medical College Hospital, Vijayapura between January 2015 to December 2015. *Results:* Among the 7 cases in the study, 2 cases were of pituitary micro adenoma constituting 28.5% and the remaining cases (5 cases) were pituitary macro adenoma, constituting 71.5%. Visual acuity of 6/6 - 6/12 were observed in 10 (71.4%) out of total 14 eyes. Visual field defects were observed in all 6 cases (85.7%). Bilateral temporal hemianopia was observed in the majority (42.8%) of cases with field defects. One eye blind and contra lateral temporal hemianopia was observed in 14.2%. One eye temporal hemianopia and other eye involvement of 3 quadrants seen in 1 patients (14.2%). 1 patients had no visual field defects. *Conclusion:* Although ophthalmologists have a minor role in primary diagnosis of pituitary adenoma, routine ophthalmologic examination is very important. To detect early visual field defects, automated perimetry should be done as a part routine examination in patients with suspected pituitary adenoma.

Keywords: Visual field Defects, Pituitary Adenoma, Bitemporal Hemianopia.

Introduction

The pituitary gland is a small endocrine gland, weighing about 500 mg. Pituitary adenomas account for 12-15% of all intracranial tumors. The estimated prevalence of pituitary adenoma is found to be 14.4-22.5 % [1]. It has been reported that pituitary adenomas occur with a prevalence rate of 190-280 cases per 10,00,000 [2]. It is a benign tumor originating in adenohypophyseal cells of anterior lobe of uncton of secreting (functional) or non-secreting (non- functioning) pituitary adenoma.

According to the size, adenomas are classified into micro adenomas (< 10mm) and macro adenomas (>10 mm) [3]. Women have a 2 fold

increased risk of developing pituitary adenoma in comparison with men [4]. Pituitary adenoma is non-malignant tumor, however it tends to renew/ recur itself. Adenomas may cause symptoms in 2 ways:

- Due to tumor related hyper secretion or hypo secretion of hormones.
- Due to compression of pituitary adenoma to surrounding structures [3].

Hypophysis is in the sella turcica, 8-13 mm lower than the optic chiasm. Therefore, when it increases, it can easily compress the optic nerve fibers in the chiasm. Micro adenomas can have a negligible effect on the visual system or on the function impairment when pituitary adenoma compresses the frontal part

of optic nerve; impairments in visual fields, visual acuity, and color contrast sensitivity are possible. Visual impairment can also be triggered by a micro adenoma when it grows directly to the optic pathways and causes swelling of the pituitary gland. [3].

The long standing compression of the chiasm induces primary optic nerve atrophy, which directly impairs visual function. Functionally active pituitary adenomas usually appear with specific clinical symptoms because of hormone hyper secretion. They cause less damage to the visual function than the non-functioning glands, because the functioning pituitary adenomas become symptomatic due to hormone secretion. Non-functioning pituitary adenomas grow slowly, compress the optic chiasm, which is directly above the pituitary gland, and cause progressive visual loss [5]. Pituitary adenomas are diagnosed earlier nowadays due to availability of radioimmunoassay techniques for the hormones and increasing use of CT scanning and MRI imaging, done for indications unrelated to suspicions of pituitary tumors like head injury, evaluation of headache.

The prevalence of visual field defects in pituitary adenomas varies from 37 to 96% in different studies. Because of its anatomical relationship with optic chiasm, pituitary adenoma typically results in bitemporal hemianopia. However, according to the tumor size and optic chiasmal position, a variety of field defects can be produced by pituitary adenoma and the tumor size is a significant factor in the severity of visual field defects [6-9]. Goldmann perimetry has been classically considered to be the standard perimetry technique in neuro ophthalmology. However, several studies reported that most automated perimetry was similar or more sensitive than Goldmann perimetry in detecting and quantifying visual field defects in Neuro ophthalmology [10-12]. The Swedish interactive threshold algorithms (SITA) are the most recently developed and most widely used program resulting in a much shorter visual field testing process that is easier for the patient [13].

Need for the study: Pituitary tumor comprises 12-15% of all intracranial tumors. A spectrum of visual manifestations has been reported with these tumors, ranging from the absence of any

visual field defects and loss of vision. The prevalence of visual field defect in pituitary tumors in general has been reported in various studies as 37-96%. Ocular features sometimes form an early manifestation, which help us to diagnose the condition earlier and decrease the morbidity and mortality of the patients [14-16].

Visual fields serve three important purposes:

- Diagnostic: visual field defects indicate involvement of the visual pathways and the pattern of visual field defect helps in localizing site of the lesion.
- Follow up: visual field provides an excellent tool to monitor resolution and/or recurrence of the disease processes affecting the visual pathways.
- Activities of daily living: since visual field defect adversely affects the patient's ability to perform day to day activities such as personal hygiene, reading, driving, these defects should be actively sought when planning rehabilitation strategies.

Visual fields are crucial in guiding ongoing treatment and judging treatment success in the number of patients with pituitary adenomas. Patients with pituitary macro adenoma may not have symptoms of visual disturbances, yet may have field defects consistent with compression of visual pathways. It is therefore important to perform field testing on patients with pituitary adenomas even if they have no visual complaints. Automated static threshold perimetry is the current gold standard for visual field testing. [14]

Material and Methods

Patients diagnosed as having pituitary tumor were taken for a visual field test in the Department of Ophthalmology BLDEU'S Shri B M Patil Medical College Hospital, Vijayapura from January 2015 to December 2015 for a cross sectional hospital based observational study. 7 patients were recruited in our study, according to the inclusion and exclusion criteria.

Inclusion criteria: Patients diagnosed to be having a pituitary adenoma on imaging.

Exclusion criteria: Patients with ocular media opacities Patients with glaucoma, choroiditis, retinitis pigmentosa, optic neuritis, or any other ocular pathology affecting the visual field. Patients physically and/or mentally unfit for detailed ocular examination Patients in whom visual field testing is not possible.

Parameters Assessment:

Field protocol:

- The 30 -2 program on the Humphrey field analyzer used for visual field testing.
- The reliability criteria used was fixation losses less than 20 %, false positive and false negative error less than 33%.
- Quadrantanopia was diagnosed if either of the following criteria were fulfilled:
 1. Depression of threshold by 5 db or more, in 3 or more contiguous points adjacent to the vertical meridian in the involved quadrant as compared to their mirror image points across the vertical meridian.
 2. The pattern deviation plot shows 3 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.
- For the diagnosis of hemianopia, the diagnostic criteria for quadrantanopia have to be applicable to both quadrants comprising the hemi field.
- Advanced field defects were considered hemianopia if the comparison of the least involved quadrant across the vertical meridian, met the threshold depression criteria for the diagnosis of quadrantanopia.
- Atypical field defect is defined as defect that does not fit into any characteristic diagnostic pattern considered typical of pituitary adenomas.

Results

The present study titled “Case series study of visual field defects in pituitary gland tumors “was done on patients diagnosed as having pituitary tumor and taken for visual field tests in the Department of Ophthalmology, BLDEU’S Shri B M Patil Medical College Hospital, Vijayapura between January 2015 to December 2015 for a cross sectional Hospital based observational study. 7 patients were recruited in our study, according to the inclusion and exclusion criteria.

Table-1: Age distribution of the patients studied

Age	Frequency	Percent
21-35 Years	2	28.57
36-50 Years	2	28.57
51-65 Years	3	42.86
Total	7	100

Out of 7 patients 4 males (57.14%) and 3 females (42.86%) (Table-1) with a range of 21-65 years, 2 in 21-35 years 2 in 36-50 years, 3 in 51-65 years and a mean age of 45.86yrs (Table-2).

Table-2: Gender distribution of patients studied

Gender	Frequency	Percent
Male	4	57.14
Female	3	42.86
Total	7	100

Best corrected visual acuity of 6/6-6/12 is seen in 4 eyes (28.58 %), 6/18-6/36 in 5 eyes (35.71 %) and <6/60 is seen in 5 eyes (35.71 %) (Table-3).

Table-3: Visual acuity of the patients included in the study

	Best corrected visual acuity (BCVA)			Total
	6/6 -6/12	6/18-6/36	<6/60	
Right eye	2 28.57 %	2 28.57 %	3 42.86 %	7 100 %
Left eye	2 28.57 %	3 42.86 %	2 28.57 %	7 100 %
Total	4 28.58 %	5 35.71 %	5 35.71 %	14 100 %

Based on CT/MRI scan report, patients were classified into 2 groups. Pituitary micro adenoma and Pituitary macro adenoma. Pituitary micro adenoma in 2 patients (28.58 %) and Pituitary macro adenoma in 5 patients (71.42 %) (Table-4).

Table-4: Number of patients with different types of adenomas		
Based on CT/MRI Scan	Frequency	Percent
Pituitary micro adenoma	2	28.58 %
Pituitary macro adenoma	5	71.42 %
Total	7	100%

Various patterns of visual field defects are seen. Out of 7 patients 3 patients have Bitemporal hemianopia, 1 patient has Non-specific changes, 1 patient has Normal visual field, 1 patient has One eye blind and contra lateral temporal hemianopia, 1 patient has One eye temporal hemianopia, other eye involvement of 3 quadrants (Table-5).

Table-5: Pattern of visual field defects in pituitary adenomas		
Visual fields	Frequency	Percent
Bitemporal hemianopia	3	42.8%
Non-specific changes	1	14.3%
Normal	1	14.3%
One eye blind and contra lateral temporal hemianopia	1	14.3%
One eye temporal hemianopia, other eye involvement of 3 quadrants	1	14.3%
Total	7	100%

Discussion

According to the medical literature, the most common symptoms of pituitary adenomas are headache and decreased visual acuity [17-20]. Significant numbers of patients with pituitary

tumours either present with or have associated decrease in visual acuity or visual field defects. Although bitemporal hemianopia is the classical visual field defect caused by pituitary tumours, other variants of field defects also occur. Field defects like arcuate scotomas, isolated nasal field loss, although uncommon, can occasionally be seen and their presence does not rule out pituitary tumours per se [21].

The study included 7 subjects consisting of 4 males (57.14%) and 3 females (42.86%) with a range of 21-65 years and a mean age of 45.86yrs. The vulnerable age group were those in the 51-65 years, followed by other age group. Among the 7 cases in the study 5cases were pituitary macro adenoma constituting 71.42 % and remaining 2 cases were of pituitary micro adenoma constituting 28.58 %. Visual acuity of 6/6-6/12 was observed in 4 eyes (28.58%). Visual field defects were observed in 6 cases (85.71%) out of 7 cases. Bitemporal hemianopia was observed in the majority (42.8%) of cases with field defects, followed by others. Other studies also showed the Bitemporal hemianopia as the most common visual field defect in pituitary adenoma [8-9]. Ocular features may form an early manifestation, which helps to diagnose the condition earlier and decrease the morbidity and mortality of the patients by early management.

Conclusion

Bitemporal hemianopia is the most common visual field defect in pituitary tumors. Although ophthalmologists have a minor role in primary diagnosis of pituitary adenoma, routine ophthalmologic examination is very important to detect early visual field defects, automated perimetry should be done as a part of routine examination in patients with suspected pituitary tumors.

References

1. Ezzat S, Asa SL, Could Well WT, Barr CE, Dodge WE, Vance ML. The prevalence of pituitary adenomas: a systematic review. *Cancer*. 2004; 101(3):613-619.
2. Davis FG, Kupelian V, Freels S, McCarthy B, Surawics T. Prevalence estimates for primary brain tumors in the united states by behavior and major histology groups. *Neuro Oncol*. 2001; 3(3):152-8.
3. Kovacs K, Scheithauer BW, Horvath E, Lloyd RV. The world health organization classification of adeno hyperphysical neoplasm. A proper five tier scheme. *Cancer*. 1996; 78: 502-10.

4. Nistor R. Pituitary tumors. *Neuro Rew.* 1996;57:264-72.
5. Jagannathan J, Dumont AS, Prevedello DM, Lopes B, Oskouian RJ. Genetics of pituitary adenomas: current theories and future implications. *Neurosurg Focus.* 2005; 15:19(5):E4.
6. Ramamurthy G. Experience with large pituitary adenomas in India. *Neurology India.* 1986; 34:195-201.
7. Natchiar G. Neuroophthalmology considerations in pituitary tumors. *Neurology India.* 1986; 34:165 -170.
8. Kaur A, Banerji D, Sharma K, Visual status in suprasellar pituitary tumors. *Indian Journal of Ophthalmology.* 1995; 43; 131-134.
9. Poon A, Mc Neil P, Harper A. Pattern of visual field loss associated with pituitary macroadenomas. *Australian & New Zealand J Ophthalmology* 1995; 23:107-14.
10. Donahue SP. Perimetry techniques in neuroophthalmology. *Curr Opinophthalmol* 1999; 10:420-8.
11. Mills RP. Automated perimetry in neuroophthalmology. *Int Ophthalmology Clin.*1991; 31:51-70.
12. Fujimoto N, Saeki N, Miyauchi O, Adachi - Usami E. Criteria for early detection of temporal hemianopia in asymptomatic pituitary tumor. *Eye (lond).* 2002; 16:731-8.
13. Bengtsson B, Olsson J, Heijl A, Rootzen H. A new generation of algorithms for computerized threshold perimetry. *SITA.Acta Ophthalmol Scand.*1997;75:368-75
14. Thomas R, Shenoy K, Seshadri MS, Muliylil J, Rao A, Paul P. Visual field defects in nonfunctioning pituitary adenomas. *Indian Journal of Ophthalmology.* 2002; 50:127-30.
15. Dhasmana R, Nagpal RC, Sharma R, Bansal KK, Bahadur H. Visual Fields atpresentation and after Trans sphenoidal Resection of Pituitary Adenomas. *J Ophthalmic vis Res* 2011; 6(3):187-91.
16. Dhar MY, Pehere NK. Unusual visual field manifestations of pituitary tumors. *Kerala. J ophthalmology.* 2007; 19(2):147-55.
17. Jain IS, Gupta A, Khuarana GS, Khosla VK. Visual prognosis in pituitary tumors. *Ann Ophthalmol.* 1985; 17(7):392-6.
18. Lundström M. Atrophy of optic nerve fibres in compression of the chiasm. Observer variation in assessment of atrophy. *Acta Ophthalmol (Copenh).* 1977; 55(2):217-26.
19. Dantas AM, Zangalli A. Neuro-oftalmologia. Rio de Janeiro. *Cultura Médica* 1999.
20. Poon A, McNeill P, Harper A, O'Day J. Patterns of visual loss associated with pituitary macroadenomas. *Aust N Z J Ophthalmol.*1995; 23(2):107-15.
21. Meenakshi Y. Dhar MS, Niranjan K et al. Unusual Visual Manifestations of Pituitary Tumours. *Kerala J Ophthalmology.* 2007; 19(2):147-55.

*All correspondences to: Dr. Vallabha K., Professor and HOD, Department of Ophthalmology, BLDEU's Shri B.M. Patil Medical College, Solapur Road, Vijayapura-586103, Karnataka, India. E-mail: aniketankv@yahoo.co.in