Ophthalmologic Findings of Parachiasmal Lesions in a Tertiary Philippine Hospital

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ABSTRACT

Background and Objective. A parachiasmal lesion is defined as a mass or growth arising from structures around or near the chiasm. Ophthalmologic signs and symptoms may be observed in such condition, such as blurring of vision, visual field defects, and binocular double vision. The primary objective of this study was to describe the presenting ophthalmologic signs and symptoms of parachiasmal lesions among patients consulting at a single institution in the Philippines.

Methods. This was a single-center, retrospective, cohort study. Medical records of patients with parachiasmal lesions seen in the Neuro-Ophthalmology clinic of a tertiary Philippine hospital from January 2014 to December 2019 were reviewed. Clinical profile, neuro-ophthalmologic presentation, diagnosis, management, and visual outcomes were summarized by descriptive statistics.

Results. One hundred thirty-three (133) patient records satisfied the study criteria. Most common presenting symptoms were blurring of vision. headache, and loss of vision. Visual acuity at initial visit ranged from 20/20 to no light perception. A relative afferent pupillary defect was present in half of the study population. Almost half presented with normal-looking discs or disc pallor. Bitemporal hemianopia is the most common visual field defect pattern seen in both confrontation and automated visual field testing. Histopathology was significantly associated with visual outcome.

Conclusion. Parachiasmal lesion should be suspected in patients who complain of unilateral blurring of vision, and those who present with normal or pale optic discs. Pituitary adenoma is the most common radiologic and histopathologic diagnosis. Visual outcome after intervention has improved or remained stable in two-thirds of patients; visual recovery is multi-factorial, which is influenced by duration, surgery, and histopathology.

Keywords: visual fields, retrospective studies, Philippines, pituitary neoplasm, visual acuity

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INTRODUCTION

A parachiasmal lesion is defined as a mass or growth arising from structures around or near the chiasm. Parachiasmal lesions are common in general, and are found in up to 20% of patients, based on autopsy or radiologic findings.[1] The most common of which are pituitary adenomas, which account for approximately 90% of all sellar tumors.[2] Other lesions are craniopharyngiomas, meningiomas, Rathke's cleft cysts, xanthogranulomas, aneurysms, lymphocytic infiltrations, and metastatic tumors.[3]

Parachiasmal lesions may compress or infiltrate the optic chiasm and surrounding structures, such as the intracranial segment of the optic nerve. When it invades the cavernous sinus, it may cause multiple cranial neuropathies affecting cranial nerves (CN) III, IV, VI, V-1, V-2 and the oculosympathetic fibers. The common ophthalmologic

symptoms in these lesions are blurring of vision and diplopia. Blurring of vision is due to compression of the optic chiasm or optic nerve and may be accompanied by ocular signs including visual field defects, color vision impairment, optic atrophy, and relative afferent pupillary defect (or RAPD).[4-6] Diplopia is due to hemislide phenomenon or extraocular muscle paresis caused by involvement of a single or combination of ocular motor nerves. Parachiasmal lesions may also lead to an optic chiasmal syndrome presenting as bitemporal hemianopia.[7] It may be associated with Horner's syndrome, as well as paresthesia or numbness of the skin and/or cornea supplied by CN V-1 and V-2.

Parachiasmal lesions are mostly treated via surgical removal. Other treatment modalities depend on the lesion, such as coil embolization for aneurysm, radiation therapy for meningioma and pituitary adenoma, and hormone suppression through medication in pituitary adenoma.[8-10] There are multiple studies showing improvement in visual outcome after decompression in patients with pituitary adenoma and craniopharyngioma.[4-6,10-14]

Due to its varied signs and symptoms, patients with parachiasmal lesions may initially consult an ophthalmologist. Findings of visual loss with a normal fundus in isolation or associated with limitation of ocular motility may confound the examining ophthalmologist as to the correct diagnosis and next appropriate plan. Hence, this study aimed to investigate the most common ophthalmologic presentation of parachiasmal lesions among affected patients. The primary objective of this study was to describe the presenting ophthalmologic signs and symptoms of parachiasmal lesions among patients consulting at a single institution. Secondary objectives were as follows: (1) to report the demographic characteristics of patients diagnosed with parachiasmal lesions; (2) to report the most common radiologic diagnosis of patients who had neuroimaging for parachiasmal lesions; (3) to report the most common histopathologic diagnoses of patients who underwent biopsy or excision of their parachiasmal lesion; and (4) to describe the visual outcomes of patients with parachiasmal lesions who received standard treatment.

Results of this study may help the local ophthalmologists in arriving at a better and faster diagnosis when presented with a patient who has ophthalmologic findings that suggest a parachiasmal lesion, and aid in counseling the prognosis in such patients.

METHODS

This was a single-center, retrospective, cohort study. Medical records of patients with parachiasmal lesions seen in the Neuro-Ophthalmology clinic of a tertiary Philippine government hospital from January 1, 2014 to December 31, 2019 were reviewed. Patients aged 12 years and older at the time of diagnosis of a parachiasmal lesion documented by a recent neuroimaging modality [i.e., brain computed tomography (CT) scan or magnetic resonance imaging (MRI) within 6 months from initial consult] and without prior treatment were included in the study. Only patients who were evaluated in the Neuro-Ophthalmology clinic were included in the study. Patients who had intrinsic chiasmal pathology (e.g., optic chiasmal glioma, chiasmitis, traumatic chiasmopathy), other clinically significant ocular disease that may affect their vision (e.g., glaucoma, retinopathy, optic neuritis, cataract, congenital optic disc anomaly, etc.), those who had previous intervention for the parachiasmal lesion, or those who did not undergo formal neuro-ophthalmologic evaluation were excluded from the study.

The censuses of the Neuro-Ophthalmology clinic of the Department of Ophthalmology and Visual Sciences at the Philippine General Hospital over the aforementioned 6-year period were reviewed. Available and accessible medical records of all patients with parachiasmal lesions who met the screening criteria were included in the study.

The following information were collected from the patient charts: date of initial visit, age at presentation, sex, chief complaint or presenting symptom, initial point of care, best-corrected visual acuity (BCVA) expressed in LogMAR, presence or absence of a RAPD, optic disc finding on presentation (classified as normal-looking, swollen, or pale), presence of other cranial nerve palsies particularly those affecting CN III, IV, VI, V-1, V-2 whether in isolation or in combination, presence of a Horner's syndrome, and ocular diagnosis. When available, printouts of formal perimetry test were reviewed taking into account the reliability indices (i.e., fixation losses, false positives, and false negatives) and the mean deviation was recorded. Pertinent neuroimaging reports (i.e., brain MRI or CT Scan) were retrieved and the top differential diagnosis based on the radiologic appearance of the parachiasmal mass was also recorded. If the patient underwent any type of intervention, the date and type of intervention performed (i.e., debulking, excision, etc.) as well as the final histopathologic diagnosis of the lesion were also collected. For patients who underwent surgical intervention, visual outcome was assessed by collecting BCVA and mean deviation on automated perimetry at last documented visit.

The study employed two measures of visual outcomes, namely BCVA and mean deviation on automated perimetry. Improvement of BCVA is defined as at least 3 Snellen lines of visual improvement or a BCVA of 20/20 at least 1 eye on the final visit. While worsened BCVA is a reduction in BCVA by at least 3 Snellen lines or a BCVA of no light perception in both eyes at final visit. While improvement and worsening in the mean deviation were noted when there was at least 1 decibel (dB) increase or decrease in the mean deviation, respectively.

The primary study outcomes were the frequency and proportion of the neuro-ophthalmologic presentations of the parachiasmal lesions at initial consult. Secondary outcomes were demographic profile and visual outcomes of patients who underwent standard treatment for the parachiasmal

lesion, reported in BCVA or as mean deviation on formal perimetry.

This study was approved by the University of the Philippines Manila Research Ethics Board (UPMREB) in November 2021 with the UPMREB code 2021-0558-01.

Statistical Analyses

Descriptive statistics were used to summarize the clinical profile, neuro-ophthalmologic presentation, diagnosis, management, and visual outcomes. Normally distributed continuous numerical variables were described as mean and standard deviation. Discrete and non-normally distributed continuous variables were described as median and interquartile range. Categorical variables were described as count and percentage.

Paired t-test or Wilcoxon sign rank test was done to determine significant change in BCVA and mean deviation between pre- and post-intervention. Chi-square test or Fisher exact test of association was done to determine the association of intervention and histopathology with BCVA outcomes. All tests of hypothesis were evaluated at significance level of $\alpha = 0.05$.

RESULTS

Among 2,381 patient charts screened, two hundred twenty-two (222) patients were diagnosed with parachiasmal lesions. One-hundred thirty-three (133) patient records satisfied the study criteria and were included in the study.

Table 1. Patient Characteristics

Parameter	Value (N=133)
Mean age at presentation ± SD, in years	45 ± 16
Sex, n (%)	
Male	52 (39%)
Female	81 (61%)
Initial Point of Care, n (%)	
Ophthalmology	68 (51%)
Neurosurgery	56 (42%)
Neurology	5 (4%)
Endocrinology	1 (0.8%)
General Medicine	1 (0.8%)
Otorhinolaryngology	1 (0.8%)
Pediatrics	1 (0.8%)
Presenting symptom, n (%)	
Blurring of vision	93 (70%)
Headache	13 (10%)
Loss of vision	11 (8%)
Visual field cut	8 (6%)
Diplopia	3 (2%)
Acromegaly	2 (1%)
Amenorrhea	1 (0.8%)
Eye pain	1 (0.8%)
Weakness	1 (0.8%)

SD – standard deviation

Demographic characteristics are summarized in Table 1. Mean age at presentation is 45 ± 16 years. Majority of the patients were female (n=81 or 61%). The initial point of care was the Ophthalmology department (68 patients or 51%) followed by the Neurosurgery department (56 patients or 42%). Most common presenting symptom was blurring of vision (n=93 or 70%).

Table 2 shows the frequency of neuro-ophthalmologic findings. The mean BCVA at initial visit was LogMAR 0.3 ± 2.3 in the right eye and LogMAR 0.5 ± 1.8 in the left eye, equivalent to 20/40 and 20/63 on the Snellen chart, respectively. There was no significant difference between the mean BCVA of the right and left eyes (p = 0.42). RAPD was present in half of the study population (n=67 or 50.4%). On

Table 2. Neuro-ophthalmologic Findings (N=133)

Parameter	Value
Mean BCVA + SD at initial consult (Range), in LogMAR	
Right eye	0.3 ± 2.3 (0.0-3.0)
Snellen equivalent	20/40
Left eye	0.5 ± 1.8 (0.0-3.0)
Snellen equivalent	20/63
RAPD, n (%)	
Present	67 (50.4)
Absent	66 (49.6)
Right optic disc finding, n (%)	
Normal	61 (45.9)
Edema	7 (5.3)
Pale	65 (48.9)
Left Optic disc finding, n (%)	
Normal	62 (46.6)
Edema	6 (4.5)
Pale	65 (48.9)
Cranial nerve deficits, n (%)	
CN III	6 (4.5)
CN IV	3 (2.3)
CN V	2 (1.5)
CN VI	6 (4.5)
CN VII	2 (1.5)
Horner's syndrome, n (%)	0 (0)
Confrontation test, n (%)	
No visual field cuts	29 (21.8)
Bitemporal hemianopia	48 (36.1)
Unilateral hemianopia	2 (1.5)
Unilateral hemianopia plus other eye total scotoma	27 (20.3)
Unilateral total scotoma	8 (6.0)
Bilateral total scotoma	14 (10.5)
Others	5 (3.8)
Visual field defect pattern, n (%) [n=43]	
No visual field cuts	5 (11.6)
Bitemporal hemianopia	18 (41.8)
Unilateral hemianopia plus other eye total scotoma	5 (11.6)
Unilateral hemianopia plus other eye near total scotoma	7 (16.3)
Others	8 (18.6)

SD – standard deviation, IQR – interquartile range, RAPD – relative afferent pupillary defect, CN – cranial nerve

optic disc examination, normal-looking disc was appreciated in 45.9% (n=61) of right eyes and 46.6% (n=62) of left eyes. Optic disc pallor was seen in 48.9% each of right and left eyes. While, optic disc swelling was only present in 7 (5.3%) and 6 (4.5%) of right and left eyes, respectively. Other cranial nerves were rarely involved: six patients (5%) with CN III involvement, six patients (5%) with CN VI, and three patients (2%) with CN IV. For the confrontation test results, majority (78% or 104 out of 133 patients) had an abnormal result, with bitemporal hemianopia being the most common pattern (48 patients, 36.1%). Only 43 patients had automated perimetry testing. Majority (88% or 38 out of 43 patients) had abnormal AVF results, with bitemporal hemianopia (18 patients, 41.8%) being the most common pattern.

For the top radiologic differential diagnosis, the most common was pituitary adenoma (79 or 50.6%), followed by sellar-suprasellar mass (39 or 25%), craniopharyngioma (21, 13.4%), and meningioma (17, 10.9%). Meanwhile, the most common histopathologic diagnosis was pituitary adenoma (50 or 62.5%), followed by meningioma (14 or 17.5%), craniopharyngioma (10 or 12.5%), and germinoma (2 or 2.5%) (Table 3).

There were 81 patients who underwent interventions – 79 had single interventions, and two had multiple interventions (i.e., surgical excision and radiotherapy). The most common type of intervention was transphenoidal excision (91.7%) (Table 3).

Visual outcomes in terms of BCVA at initial and final visits of the 39 patients who underwent intervention were analyzed (Table 4). Median of interval between initial and final visits was at 10 months. There was no significant difference in BCVA after intervention (p = 0.315, p= 0.879 for the right and left eye, respectively).

There were only six patients that had pre- and post-intervention automated visual field test results (Table 4). There was no significant change in the mean deviation before and after intervention in the right eye (p=0.366). On the other hand, there was significant change in mean deviation pre-and post- intervention of the left eye from -20.2 to -6.7 dB (p=0.026). This suggested improvement in the mean deviation of the left eye after intervention.

Lastly, association of histopathology and visual outcome was explored to see if a certain diagnosis was associated with a better visual prognosis (Table 5). Results revealed that histopathology was significantly associated with BCVA outcome (p = 0.018). There were more eyes that had improved BCVA after intervention for pituitary adenoma than other lesions (31.6, 11.1, 0% for pituitary adenoma, meningioma and craniopharyngioma, respectively).

Table 3. Diagnoses and Intervention

Diagnosis and Management	N (%)
Top radiologic differential diagnosis*	
Pituitary adenoma	79 (50.6)
Sellar-suprasellar mass	39 (25.0)
Craniopharyngioma	21 (13.4)
Meningioma	17 (10.9)
Histopathologic diagnosis [n=80]	
Pituitary adenoma	50 (62.5)
Meningioma	14 (17.5)
Craniopharyngioma	10 (12.5)
Germinoma	2 (2.5)
Others	4 (5.0)
Management*	
Transsphenoidal excision	77 (91.7)
Radiotherapy	5 (5.9)
Others	2 (2.3)

**Non-mutually exclusive categories*

Table 4. Visual Outcomes for Patients who Underwent Intervention

Parameter	N=39	*p*-value
Median interval between first and final visits [IQR], in months	10 [0.2-41.0]	
Median BCVA of right eye [IQR], in LogMAR		0.315
at initial visit	0.3 [0-3.0]	
Snellen equivalent	20/40	
at final visit	0.2 [0-3.0]	
Snellen equivalent	20/32	
Median BCVA of left eye [IQR], in LogMAR		0.879
at initial visit	0.5 [0-3.0]	
Snellen equivalent	20/63	
at final visit	0.4 [0-3.0]	
Snellen equivalent	20/50	
Mean AVF MD of right eye + SD, in dB		0.366
at initial visit	-13.9 ± 6.5	
at final visit	-10.3 ± 8.3	
Mean AVF MD of left eye + SD, in dB		0.026
at initial visit	-20.2 ± 8.4	
at final visit	-6.7 ± 6.0	

IQR – interquartile range, BCVA – best-corrected visual acuity, AVF – automated visual field, MD – mean deviation, SD – standard deviation, dB – decibel

Table 5. Association of Histopathology and Visual Outcome

Proportion of patients with BCVA	Pituitary Adenoma, N=38 n (%)	Meningioma, N=9 n (%)	Craniopharyngioma, N=6 n (%)	Others, N=3 n (%)	*p*-value
Improvement	12 (31.6%)	1 (11.1%)	0 (-)	0 (-)	0.018
Stable	20 (52.6%)	2 (22.2%)	3 (50.0%)	1 (33.3%)	
Worsening	6 (15.8%)	6 (66.6%)	3 (50.0%)	2 (66.6%)	

BCVA – best-corrected visual acuity

DISCUSSION

This study reported the demographic profile and ophthalmologic findings of patients diagnosed with parachiasmal lesions seen at a single referral hospital in the Philippines over a 6-year period. Study findings show that patients diagnosed with parachiasmal lesion have a mean age of 45 ± 16 years on presentation with a slight female preponderance (61%). This is consistent with previous studies on parachiasmal tumors.[15,16]

Not surprisingly, the most common presenting symptom of patients with parachiasmal lesions was blurring of vision with mean VA on initial presentation of LogMAR 0.3 (Snellen equivalent 20/40) and 0.5 (Snellen equivalent 20/63) for the right and left eye, respectively. Confrontation test was performed on all patients as part of the neuro-ophthalmologic exam and was abnormal in 78% of the patients. Only 43 patients had automated visual field testing on initial visit, and the machine was able to pick up abnormality in 88% of the patients tested. Our study results are consistent with previous papers.[15-17] Visual abnormalities in parachiasmal lesions are due to compression of the optic chiasm and adjacent visual afferent structures such as the intracranial segment of the optic nerve and less commonly, the optic tract. The optic chiasm is a x-shaped structure where crossing retinal nerve fibers from both optic nerves decussate to the other side. Lesions that affect the chiasm pathognomonically produce bitemporal hemianopias. But other visual field defect patterns can also be associated with parachiasmal lesions depending on their location and size.[16] Our study demonstrated that bitemporal hemianopia was the most common visual field defect pattern on confrontation test (36%) and on formal perimetry testing (42%). Bitemporal visual field defects were also present in 43% of patients reported by Lee et al.[18]

In this study, only 43 patients had available pre-operative automated perimetry testing results. This low number of available perimetry results could be due to several reasons including financial constraints, prioritization of other diagnostic tests to be performed which typically included neuroimaging and hormonal work-up, poor vision which could preclude a reliable perimetry testing, and unavailability of the machine. Of those who had the test, only 12% or 5 out of 43 patients had normal preoperative automated visual field tests. This is comparable to a Thai study comprised of 69 patients with suprasellar tumors wherein only 10% of the sample had normal preoperative visual fields.[19]

Other neuro-ophthalmologic findings of parachiasmal lesions include a positive relative afferent pupillary defect (RAPD), cranial nerve palsies, and a Horner syndrome. The afferent pupillary fibers responsible for pupillary constriction to light run along the optic nerve chiasm and tract, and these fibers may also be damaged by a mass that compresses any of these three structures. In this study, RAPD was present in half of the patients. Although the presence of a RAPD is a good clinical sign of a disorder affecting the anterior visual pathway, it may be absent when both optic nerves are affected symmetrically. Parachiasmal lesions may also grow laterally to compress the cavernous sinus on either side of the optic chiasm, and may manifest as palsies affecting CN III, IV, V, V-1, V-2, and VI. Involvement of these cranial nerves were found in <5% of our study population consistent with previous reports.[15,20] Moreover, CN III has been reported to be the most commonly affected ocular motor cranial nerve and this was observed in the study as well. This is explained by the location of the CN III at the roof of the cavernous sinus next to the cistern that makes it vulnerable to compression or infiltration.[20] The sympathetic fibers to the eye also run inside the cavernous sinus and injury to these fibers may cause a postganglionic Horner's syndrome. However, we found no case of Horner's syndrome from a parachiasmal lesion in this study.

Only 81 out of 133 patients or 60.1% underwent interventions for the parachiasmal tumor. As many as 52 patients (39.9%) did not have records of undergoing further procedures to relieve them of their symptoms. In a review paper by Mondia et al. on neuro-oncology in the Philippines and the deterrents to care, 18% of patients with brain tumors seen in the Philippine General Hospital did not have intervention due to poor prognosis or lack of patient consent.[21] A report from another limited-resource country, Ghana, stated that 36% of patients with brain tumors could not afford surgery.[22] There are several reasons why a patient with a serious disease may fail to follow thru a life-saving intervention including financial barriers, limited health insurance coverage, logistical challenges, and personal, cultural, and social factors.[21]

Our findings show that pituitary adenoma was the most common histopathologic diagnosis in as many as 62% of patients. Another local study also reported pituitary adenoma as the most common diagnosis of parachiasmal lesions.[23] Interestingly, our study showed visual outcome in terms of proportion of eyes with BCVA improvement was associated with the histopathology of the parachiasmal lesion. Furthermore, higher proportions of eyes with vision loss from pituitary adenomas had improved or stable BCVA compared to eyes with vision loss from meningiomas or craniopharyngiomas. These tumors behave differently from each other. Better visual outcome in pituitary adenoma may be due to its well-defined border and accessible location allowing for higher possibility of complete resection and lesser likelihood of recurrence. Complete resection in meningiomas and craniopharyngiomas are often challenging due to their proximity and invasiveness to critical structures in the brain as well as higher likelihood of recurrence.[24]

This present study also shows that two-thirds of patients who had intervention had improved or stable visual acuity. Of the six patients who had both pre- and post-operative visual field tests, mean deviation showed no significant change in the right eye and significant improvement in the left eye. These improvement in visual function has been consistently

demonstrated in multiple studies.[12] Visual recovery is multifactorial, and can be affected by duration of symptoms, age, tumor size and pathology, delays in consultation and intervention, presence of surgical complications, and residual or recurrent tumor.[19,25,26] These variables were beyond the scope of the study and were not collected.

Visual recovery has also been hypothesized to occur in 3 phases. Early phase is defined as within the first month after surgery that is due to the release of conduction block caused by the compression. The second phase between 1 and 4 months is contributed to remyelination. The late phase, from 4 months to 3 years, could be due to combination of the first two mechanisms plus neuroplasticity of the anterior visual pathway.[27] Median interval from intervention to last visit in this study was 10 months which may have not captured eyes with late visual recovery. This study also revealed that nearly one-third of patients had worsened visual acuity after intervention. Among patients who had surgical resection of pituitary adenomas, worsened visual outcome has been reported to be between 1-4%.[28] A higher rate of worsened visual outcome in this study could be due to differences in study definitions and to the inclusion of other types of parasellar tumors that may behave more aggressively than pituitary adenomas.

The robustness of our study findings is limited by its retrospective design. It is also constrained by the quality and completeness of data collected from medical records. Given the sole study setting was an ophthalmology subspeciality clinic, the proportions of eye findings in patients with parachiasmal lesions may be subject to overestimation. Lastly, there was only a small sample size of patients who underwent treatment, making it difficult to generalize conclusion in terms of visual outcomes.

CONCLUSION

In summary, parachiasmal tumors are seen among all age groups but are most common among middle-aged adults. Visual disturbance is the most common chief complaint. Clinic-based confrontation test is most helpful in the diagnosis of this condition as it can detect abnormalities in 8 out of 10 patients with parachiasmal tumors.

Apart from the anterior visual afferent pathway, involvement of other cranial nerves is rare. Pituitary adenoma is the most common histopathologic diagnosis and this may offer a good chance of visual recovery after surgical intervention.

Statement of Authorship

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Author Disclosure

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