



RETINAL NERVE FIBRE LAYER AND VISUAL FIELD CHANGES IN ACUTE VERSUS (V/S) CHRONIC ANGLE CLOSURE DISEASE – A COMPARATIVE ANALYSIS

Ophthalmology

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ABSTRACT

Introduction: Glaucoma is a leading cause of irreversible blindness globally. Primary angle closure disease (PACD) is classified into: Primary angle closure suspect, primary angle closure, primary angle closure glaucoma. **Materials And Methodology:** Cross sectional, observational study performed from December 2022 to July 2024 at tertiary eye care centre. 150 eyes of 136 patients were studied. **Results:** Mean of average RNFL thickness was found to be lower in eyes with chronic angle closure disease compared to the acute group which was statistically significant ($p<0.05$). Average Mean deviation (dB) and average pattern standard deviation (dB) was found to be larger among the patients of chronic group and was statistically significant ($p<0.05$). **Conclusion:** A comprehensive eye examination helps in early detection of primary angle closure disease.

KEYWORDS

Acute primary angle closure(APAC), Chronic primary angle closure glaucoma(CPACG), Retinal nerve fibre layer(RNFL), Peripheral anterior synechiae(PAS)

INTRODUCTION

Glaucoma is a leading cause of irreversible blindness globally. It comprises of a group of progressive optic neuropathies characterized by degeneration of retinal ganglion cells and retinal nerve fiber layer, resulting in changes in the optic nerve head (1).

It has two major types: primary and secondary glaucoma. Open-angle and angle-closure glaucoma are their two major subtypes (1).

Primary angle closure disease (PACD) is classified based on 3 categories: IOP, gonioscopy, disc and visual field evaluation into: Primary angle closure suspect, primary angle closure, primary angle closure glaucoma.(3)

Acute primary angle-closure attack (APAC) is an ocular emergency with raised IOP due to obstruction of the aqueous humor outflow; it presents with symptoms like intense ocular pain, redness, diminution of vision, coloured halos, nausea, vomiting and headache.(4)

Chronic primary angle closure glaucoma (CPACG): the peripheral iris is in apposition to the trabecular meshwork with a gradual progression of the adhesion and IOP rises gradually, symptoms are rarely present.(2)

In acute angle closure glaucoma, high IOP is caused during the acute attack, and in chronic angle closure glaucoma, there is moderately elevated IOP for a long period of time, resulting in glaucomatous damage.(5)

This aim of the study is to observe the changes in RNFL and visual field and compare the changes seen in acute and chronic angle closure disease.

MATERIALS AND METHODOLOGY

- Study Design:** Cross sectional (observational study)
- Study Duration:** 20 months (December 2022 to July 2024)
- Study Site:** Tertiary eye care centre
- Sample Size:** 136 patients
- Inclusion Criteria:** All diagnosed cases of primary angle closure disease visiting tertiary eye care centre.
- Exclusion Criteria:** All patients with:
 - Primary open angle glaucoma
 - Secondary glaucoma
 - Ocular co-morbidities.
 - Fellow normal eye was excluded

Study Procedure:

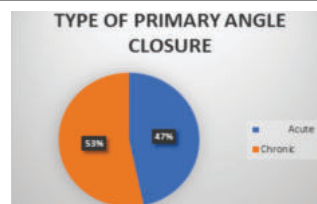
- This study has been conducted after receiving approval from the Institutional Review Board.
- Patients with acute angle closure disease have been examined 2 weeks after the episode of acute attack, when their IOP was under control. Patients with chronic angle closure disease had closed angles with peripheral anterior synechia (PAS) on gonioscopy.
- Detailed history of each patient was taken regarding symptoms, their duration, family history of glaucoma, history of trauma, any eye surgery, any drug taken for longer duration, steroid intake, systemic illness, personal history.
- Comprehensive eye examination was done which included:
 - Best corrected visual acuity (BCVA),
 - Slit lamp biomicroscopic examination,
 - IOP measurement done with Goldmann applanation tonometer,
 - Ultrasound pachymetry
 - Gonioscopy to know whether the iridocorneal angle is open or closed and check for the presence and extent of peripheral anterior synechia (PAS) in the angle,
 - OCT scan for optic disc and retinal nerve fibre layer evaluation,
 - Static Perimetry to find out visual field changes.

OBSERVATIONS AND RESULTS

In this study, a total of 150 eyes of 136 patients diagnosed as primary angle closure disease have been observed. Among the 66 patients with chronic disease, 14 patients had bilateral disease.

Table No.1: Total Number Of Eyes With Acute And Chronic Angle Closure Disease

	Number of Eyes	Percent (%)
Acute	70	46.67
Chronic	80	53.33

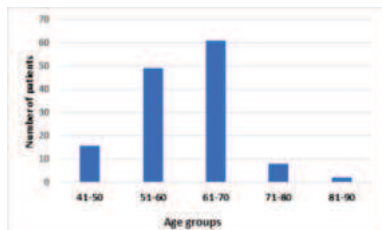


Graph No. 1: Showing Distribution Of Eyes Based On The Type Of Primary Angle Closure.

Total number of eyes having chronic disease was observed to be more(53.33%) in comparison to acute disease(46.67%).

Table No.2: Age Distribution Of PACD Patients

Age	Frequency	Percent (%)
41-50	16	11.76
51-60	49	36.03
61-70	61	44.85
71-80	8	5.88
81-90	2	1.47



Graph No 2: Age Distribution Of All PACD Patients

The above graph shows majority of patients were in the age group of 61-70 years.

Table No.3: Table Comparing The Eyes With Acute And Chronic Angle Closure Disease

	Acute group	Chronic group	P-value
Age	60.24±7.59	62.14±7.49	0.15b
IOP	15.86±2.51	15.85±2.58	0.99b
Central corneal Thickness (μmeter)	509.13±40.44	507.16±28.08	0.73b
Visual acuity (logMAR)	0.21±0.14	0.33±0.12	<0.001b
Systemic illness	14	15	0.69a
Family History	8	4	0.27a
Cup disc ratio	0.62±0.16	0.80±0.09	<0.001b

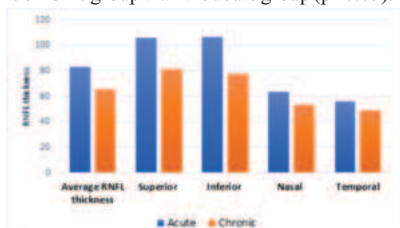
a- Chi-square test b- t-test

Table No.4: Comparing The Changes In RNFL Observed In Acute And Chronic Group

	Acute	Chronic	P value
Average RNFL thickness (μm)	83.36±16.93	65.63±10.52	<0.001b
Superior RNFL (μm)	105.81±23.79	80.98±16.06	<0.001b
Inferior RNFL (μm)	106.39±30.16	77.71±19.69	<0.001b
Nasal RNFL (μm)	63.26±10.88	53.69±7.79	<0.001b
Temporal RNFL (μm)	56.24±9.37	49.05±8.68	<0.001b

b- t-test

Mean of average RNFL thickness was found to be lower in eyes with chronic angle closure disease compared to the acute group which was statistically significant ($p<0.05$). Mean RNFL thickness of superior, inferior, nasal and temporal quadrants was observed to be significantly thinner in the chronic group than the acute group ($p<0.05$).



Graph No 3: Representing The RNFL Thickness Among The Acute And Chronic Groups.

Table No. 5: Comparing The Mean Global Indices Of Perimetry Of Eyes In The Acute And Chronic Groups

	ACUTE	CHRONIC	P value
MD	-6.53±5.44	-10.20±3.77	<0.001b
PSD	4.77±3.70	6.64±2.36	<0.001b
VFI	88.63±13.15	78.58±13.70	<0.001b
GHT (ONL)	34	80	<0.001a

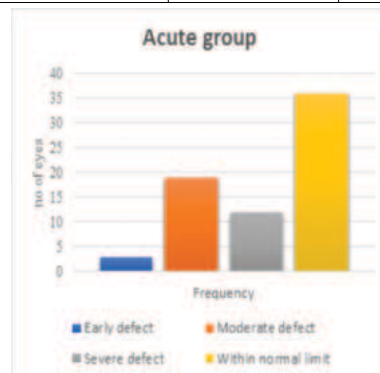
a-Fisher exact test b- t-test

Average Mean deviation and average pattern standard deviation was found to be larger in chronic group and was statistically significant ($p<0.05$). Average VFI was higher in patients of the acute group and was statistically significant ($p<0.05$). Glaucoma hemifield test (GHT) was outside normal limits (ONL) in chronic group compared to the acute group in which GHT was ONL in only 34 of 70 eyes ($p<0.05$).

In the acute group, out of a total of 70 eyes, majority (51.43%) eyes had normal visual fields. Among the eyes having visual field changes, majority (27.14%) eyes had moderate defect in visual field.

Table No.6: Classification Of Visual Field Changes Among The Acute Group According To Hoddap-parrish-anderson Criteria (8)

	Frequency	Percent%
Early defect	3	4.29
Moderate defect	19	27.14
Severe defect	12	17.14
Within normal limit	36	51.43

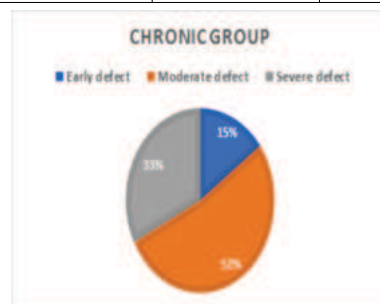


Graph No.4: Distribution According To Visual Field Changes Seen In Acute Group

Among the chronic disease, majority (52.50%) eyes had moderate defect in their visual field.

Table No.7: Classification Of Visual Field Changes Among The Chronic Group According To Hoddap-parrish-anderson Criteria (8)

	Frequency	Percent%
Early defect	12	15
Moderate defect	42	52.50
Severe defect	26	32.50



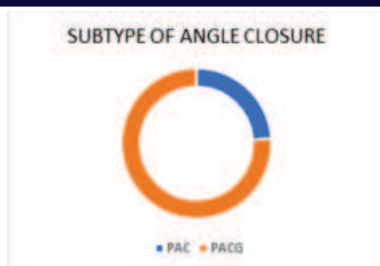
Graph No.5: Distribution Of Visual Field Changes Seen In Chronic Group

Among the 150 eyes with PACD, 76% eyes had PACG while 24% eyes had PAC.

Among the 70 eyes in the acute group, 36(51.43%) eyes had PAC and 34(48.57%) eyes had PACG. While all 80 eyes in the chronic group had PACG.

Table No.8: Classification Of All PACD Eyes Based Upon Subtype Of Angle Closure

	Frequency	Percent (%)
PACS	0	0
PAC	36	24
PACG	114	76

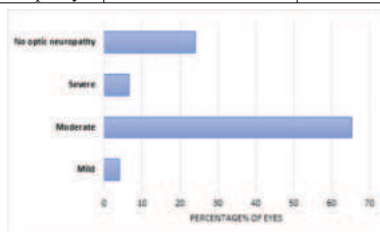


Graph No.6: Showing The Distribution Of All Eyes In This Study According To Different Subtypes Of PACD

Severity of glaucomatous optic neuropathy was classified according to Canadian guidelines(6), which showed that majority eyes 65.33% eyes had moderate disc changes,

Table No.9: Distribution Of All The Eyes With PACD According To Glaucomatous Optic Neuropathy

	Frequency	Percent (%)
Mild	6	4
Moderate	98	65.33
Severe	10	6.66
No optic neuropathy	36	24



Graph No. 7: Showing Eyes With Varying Severity Of Optic Neuropathy

DISCUSSION

In our study we have studied and compared patients with acute and chronic primary angle closure disease. A total of 150 eyes have been studied of which 70 eyes had acute angle closure and 80 eyes had chronic angle closure disease.

Not many studies have been conducted comparing retinal nerve fibre layer and visual field changes among acute and chronic PACD.

Age Distribution

Most patients in our study belonged to the age group of 61-70 years with a mean age of 61.16 ± 7.57 year.

A study by Ichhpujani P et al(9) in 2010 reported that patients with PACG had an overall peak presentation in the seventh decade while PAC was more common in the sixth decade.

Comparing Acute And Chronic Angle Closure Disease

In our study 46.67% of eyes had acute angle closure disease, and 53.33% eyes had chronic angle closure disease. BCVA was significantly lower, and the average cup disc ratio was higher in the chronic group as compared to the acute group.

Uhm et al(5) conducted a study comparing acute angle closure glaucoma and chronic angle closure glaucoma patients, where the mean age of the chronic group was observed to be higher than the acute group. The average cup disc ratio was significantly larger in the chronic group than the acute group ($p < 0.05$), which is consistent with our study.

RNFL Changes In Acute And Chronic Groups

Our study showed that the average RNFL thickness of the chronic group ($65.63 \pm 10.52 \mu\text{m}$) was significantly lower compared to that of the acute group ($83.36 \pm 16.93 \mu\text{m}$). Mean RNFL thickness of the superior, inferior, nasal and temporal quadrants obtained using Cirrus HD-OCT was comparatively thinner in the chronic group than the acute group ($p < 0.05$).

RNFL thickness was measured using OCT after a single attack of acute

angle closure in a study by Wong IYH et al (10) which showed a significant thinning in the affected eyes compared to the fellow eyes ($P < 0.001$), while in our study the fellow eyes were not considered.

Aung T et al(7) reported a significant decrease in both superior and inferior RNFL thickness 16 weeks after acute angle closure attack. In our study RNFL thickness was measured 2 weeks after the APAC attack and generalized RNFL thinning was observed in 48.57% eyes only whereas no optic neuropathy was found in 51.43% eyes.

Visual Field Changes In Acute And Chronic Groups

In our study mean deviation and pattern standard deviation were significantly higher in the patients of the chronic group ($p < 0.05$). Similar findings were observed in a study by Uhm et al(5).

In our study among the acute group, 27.14% eyes had moderate visual field defect, 17.14% eyes had severe field defect, and 51.43% eyes had their fields within normal limit. VFI was significantly higher in patients of the acute group. In a study by H Wong et al(11) 31% of subjects after an acute angle closure attack had significant visual field abnormalities while 69% eyes had no detectable functional damage in the first week after resolution of the acute episode.

Study Limitations

- Small sample size
- Long follow up was not taken

CONCLUSION

This study shows that average RNFL thickness of chronic angle closure disease is significantly lower than that of acute disease. Similarly, visual field examination shows significant higher values of mean deviation and pattern standard deviation in chronic angle closure disease as compared to acute disease.

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