

## Severity and spatial distribution of visual field defects in primary glaucomas

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### Abstract

**Purpose:** To find out the spatial distribution and to assess the severity of visual field defects in Primary Open Angle Glaucoma (POAG) and Primary Angle Closure Glaucoma (PACG) patients and also to compare among the two groups.

**Materials and Methods:** 45 eyes of 28 patients with Primary Open angle Glaucoma and 39 eyes of 28 patients with Primary Angle Closure Glaucoma who were clinically diagnosed and monitored in the Glaucoma Service of our hospital for a period of 16 months were recruited into the study. Main outcome measures were 1) distribution of visual field defects, 2) severity of visual field defects and 3) comparison among the two groups.

**Results:** There was no significant statistical difference in Mean Deviation and Pattern Standard Deviation between the two groups. Superior Field was more depressed in both groups. Glaucoma Hemifield Test also shows that all the zones of superior field were depressed in both the groups but the severity is more in open angle group.

**Conclusion:** My study shows that superior field is more severely affected than the inferior in both groups. However, trans meridional variation in field loss is less pronounced in subjects with angle closure glaucoma.

**Keywords:** Visual Field Defects, Humphrey Field Analysis, POAG, PACG.

### Introduction

Glaucomatous field damage results from damage to the intra ocular portion of the optic nerve extending from the retinal ganglion cells to the portion just posterior to the lamina cribrosa. Axonal damage is the cause of defects in Glaucoma and the pattern of these defects corresponds to the pattern of distribution of intra ocular axons. The nasal portion of the visual field is often affected in early Glaucoma. These defects may be isolated or associated with Bjerrum's area defects.

In chronic POAG, in the early stages, there may be a generalised depression that progresses gradually or sometimes in steps through paracentral scotoma to arcuate and finally to end stage defects. Defects become denser and then increase in area in one hemifield before progression to other hemifield.

In angle closure Glaucoma, the acute phase with high intra ocular pressure, corneal edema and retinal ischemia produce bizarre field defects. After the pressure has been normalised, if ischemic atrophy of the nerve has occurred, visual field defects may be extensive and may not correspond well to the amount of cupping of the optic nerve head.

### Materials and Methods

45 eyes of 28 patients with POAG and 39 eyes of 28 patients with PACG who were clinically diagnosed and monitored in Glaucoma Service of our hospital were recruited into the study for a period of 16 months.

Subjects aged 30 years and older, Patients with Triad of open angle in Gonioscopy, evidence of Glaucomatous Optic Nerve Head changes in Slit Lamp Biomicroscopy and intra ocular pressure >21 mm of Hg. with Applanation Tonometry in POAG group, Patients with occludable angle (if pigmented Trabecular Meshwork was not seen over 270 or more of the angle

without indentation) and with intra ocular pressure >21 mm of Hg. in PACG group were included in the study.

Subjects with Normo Tension Glaucoma, Subjects with history of uveitis, any neovascularisation, trauma, epithelial in growth, previous intra ocular or conjunctival surgery, longterm use of topical or systemic steroids, Subjects with secondary Glaucoma including pseudo exfoliation, pigment dispersion were excluded from the study.

All patients underwent preliminary examination in the Glaucoma Department which included visual acuity testing by Snellen chart, Slit lamp Biomicroscopy of anterior segment, Gonioscopy with Goldman single mirror contact lens, Intra ocular pressure (basal and at the time of enrolment) measured with Goldman Applanation Tonometer, optic nerve head changes seen stereoscopically at the slit lamp with 90D Volk lens and visual field examination with Humphrey Field Analyser using SITA standard 24-2 strategy.

### Results

Of 84 subjects assessed, 45 had POAG and 39 had PACG. There were no significant differences between the groups in age ( $p=0.173$ ). There were more men in POAG group and more women in PACG group [Table 1].

**Table 1: Subject Characteristics**

S. No.	Characteristics	Subjects All(n=84)	POAG (n=45)	PACG (n=39)	POAG vs PACG (p Value)
1.	Age	48.2	47.27	49.1	.173
2.	Sex				
	Men	43	31	12	.000
	Women	41	14	27	
3.	Initial IOP(mm)		23.4	22.3	

	Hg)				
4.	IOP at enrolment(mm Hg)		18.9	17.6	

Mean baseline recording of IOP in PACG group is 22.3mm of Hg. and that of POAG group is 23.4 mm of Hg. [Table 1; Fig. 1]

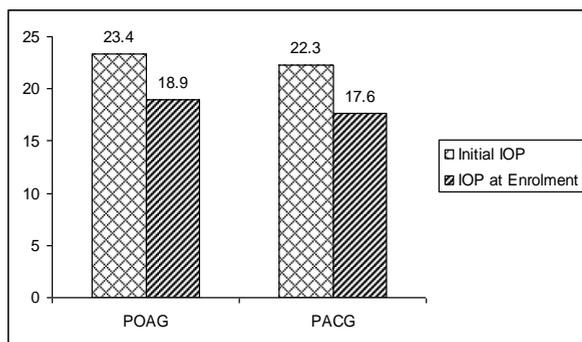


Fig. 1: IOP levels in POAG & PACG

Visual Field Analysis using central 24-2 SITA Standard Programme on Humphrey II was done and the parameters MD, PSD and GHT values were compared among the two groups.

There was no significant difference in Mean Deviation (p=0.615) and Pattern Standard Deviation values (p=0.107) between POAG and PACG[Table 2; Fig. 2 & 3].

Table 2: Global indices for subjects with POAG and PACG

Index	Subjects, Mean (SD) POAG (n=45) PACG (n=39)	POAG vs PACG p value
Mean Deviation, dB	-13.3(8.2) - 14.79(9.6)	.615
Pattern Standard Deviation	8.5(3.2) 7.2(3.1)	.107

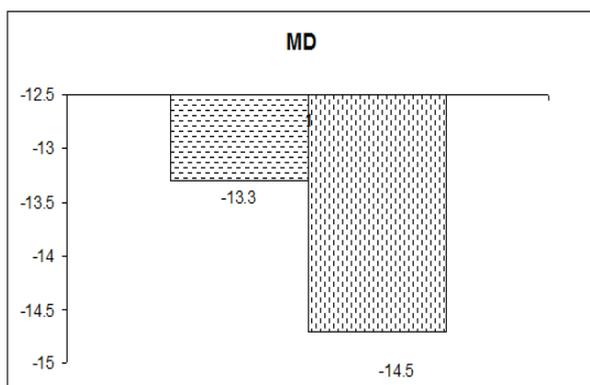


Fig. 2: MD Comparison between POAG & PACG

Comparing the variation in sensitivity between superior and inferior hemifield among POAG and PACG groups, sensitivity was significantly less in the superior hemifield in POAG group; A similar but smaller difference was detected in PACG group [Table 3; Fig. 4 & 5].

Table 3: Superior-inferior hemifield comparison between POAG and PACG

Subjects	Hemifield Pattern Deviation Mean (SD) Superior Inferior	p value
POAG(n=45)	-10.1(6.4) -5.3(3.5)	.000
PACG(n=39)	-7.9(5.2) -5.6(3.9)	.038

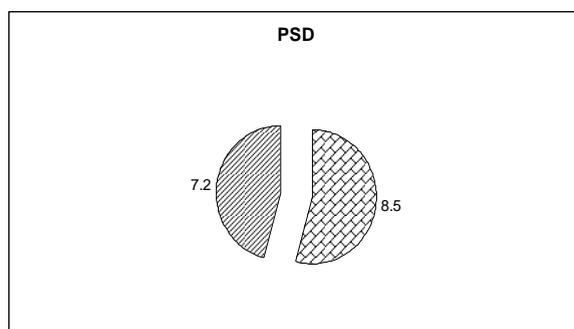


Fig. 3: PSD Comparison between POAG & PACG

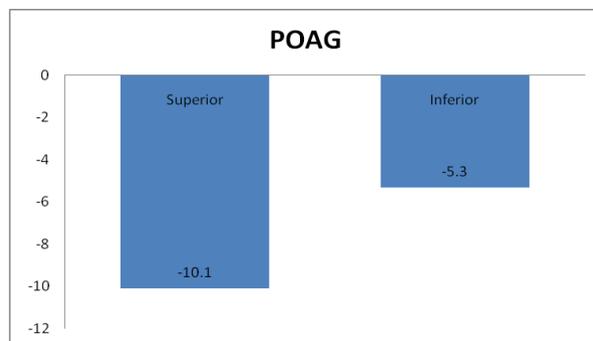


Fig. 4: Superior Vs Inferior Field Comparison

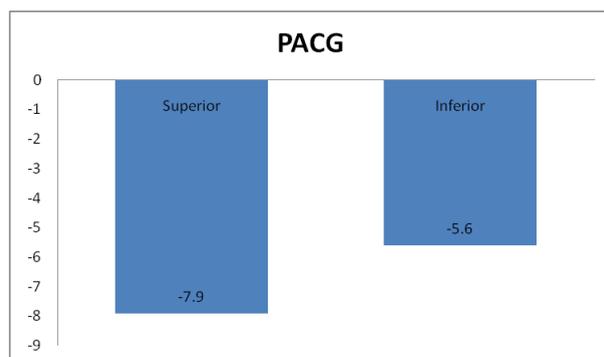
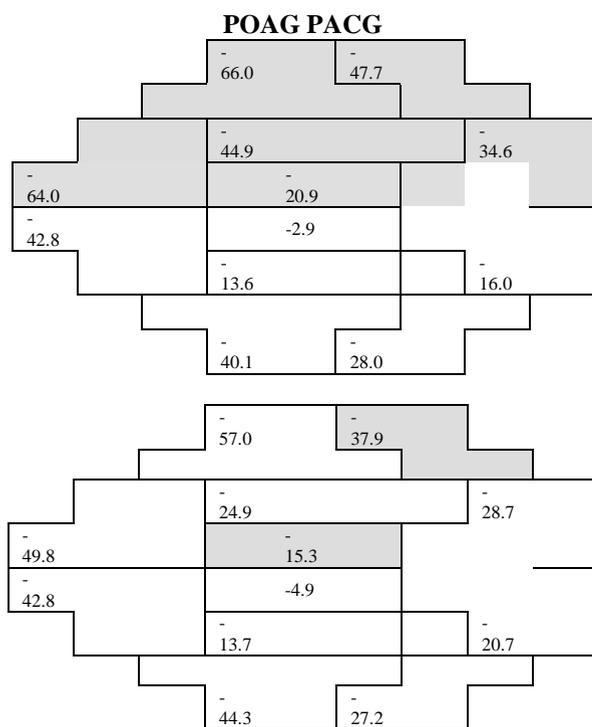


Fig. 5: Superior Vs Inferior Field Comparison

Glaucoma Hemifield Test showed that all the zones of the superior field were significantly depressed than the inferior zones in both groups [Fig. 6].



**Fig. 6: Glaucoma Hemifield Test Mean Sensitivity in Superior Vs Inferior GHT Regions**

### Discussion

Our data shows that the superior field is severely affected than the inferior in both POAG and PACG groups. In superior to inferior field comparison, mean of SF in PACG group is -7.9 and Mean of IF in PACG is -5.6. Mean of SF in POAG is -10.1 and of IF in POAG is -5.3 [Table 3]. The variation is comparatively more in POAG group.

Comparison of the Visual Field defects between POAG and PACG patients by Gus Gazzard also found that superior hemifield was more severely affected than the inferior in both POAG and PACG groups.<sup>(1)</sup>

Boomi L and his team studied the effect of acute attack of PACG on the visual field and found that upper nasal quadrant was frequently affected with common involvement of area within 9-20 degree.<sup>(2)</sup>

Lau LI and his co-workers studied the field defects in CACG patients and concluded that nasal field was commonly affected in early stage of CACG and the MD of the nasal area was worse than those of arcuate and paracentral area.<sup>(3)</sup>

Joseph Caprioli MD and his co-workers hypothesize that diffuse loss of visual field sensitivity from glaucoma is largely pressure dependent and the field loss in localised loss group is less pressure dependent.<sup>(4)</sup>

Greve and Geijssen detected difference in the distribution of visual field defects between high tension and low tension groups- in low tension group, large defects were frequently in the upper half the visual field but the field loss was closer to fixation in high tension group.<sup>(5)</sup>

Aung's team analysed the visual field following acute PACG and majority of them had hemifield defects consistent with NFB pattern loss.<sup>(6)</sup>

To conclude, my study shows that the superior field is severely affected than the inferior in both POAG and PACG groups. However, trans meridional variation in field loss is less pronounced in subjects with PACG compared to the other group.

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