

ORIGINAL RESEARCH

Association of primary angle closures in retinal vein occlusive diseases

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ABSTRACT

Introduction and aims: The association between primary angle closure disease and RVO is less known. This study shows that primary angle closure can be an independent risk factor for development of RVO and should be borne in mind while evaluating patients with RVO. Gonioscopy should be done in all patients with RVO at presentation. **Materials and methods:** It is Observational cross sectional study included 50 patients for a period of 18 months of retinal vein occlusions who were diagnosed at retina department and those cases will be considered for further evaluation in Glaucoma department. All cases of retinal vein occlusions (CRVO, BRVO, Hemi retinal VO) are in study. **Results:** In this study among 50 patients mean age was 49.86. Among 50 RVO patients 17 primary angle closure diseased patients were found. In this 17 patients 11 females, 6 males. So females are at risk for developing angle closures than males. Among 50 patients 28 BRVO, 20 CRVO, 2 HRVO. Among 28 cases of BRVO in the diseased eye 11 OA without glaucoma, 3 OA with NTG, 4 POAG, 2 PACS, 2 PAC, 6 PACG. Among 20 cases of CRVO in the diseased eye 8 OA without glaucoma, 2 OA with NTG, 3 POAG, 2 PAC, 5 PACG. Among 2 cases of HRVO in the diseased eye 1 OA without glaucoma, 1 POAG. In contralateral eye among 28 BRVO 17 OA without glaucoma 1 OA with NTG, 2 POAG, 4 PAC, 4 PACG were diagnosed, among 20 CRVO 7 OA without glaucoma 6 OA with NTG, 1 PACS, 4 PAC, 2 PACG were diagnosed, among 2 HRVO 1 OA without glaucoma, 1 POAG were diagnosed. Mean AC depth in diseased eye 2.887 mm, in contralateral normal eye mean AC depth was 2.955 mm. So in this study mean AC depth was shallower in affected RVO eye than contralateral normal eye. So in diseased eye (RVO), cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved as p value 0.00 (<0.05) which is significant. **Conclusions:** Contralateral eye also cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved by p value 0.012 (<0.05) which is significant. So in this study shallow AC depth is one of the risk factor for developing primary angle closure disease.

Keywords: primary angle closure glaucoma (PACG), Anterior chamber (AC), central retinal vein occlusion (CRVO), Branch retinal vein occlusion (BRVO).

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INTRODUCTION

Glaucoma is considered as the leading cause of irreversible blindness worldwide, with Asians accounting for approximately half of the world's glaucoma cases. It also has been accepted that primary angle closure glaucoma (PACG) is higher in Asians than Europeans and Africans, with over 80% of those with PACG in Asia. Glaucoma is estimated to affect 60.5 million persons worldwide by the year 2010. The estimated prevalence of glaucoma for India is 11.9 million. [1,2]

In a study in a North Indian hospital PAC and glaucoma constituted 45.9% of all primary adult glaucomas seen. Because PACG appears to cause blindness more frequently than primary open angle

glaucoma (POAG), it is an important public health issue.

Retinal vascular obstructive disease is one of the commonest vascular diseases of eyes, second only to diabetic retinopathy. In the population-based Blue Mountains Eye Study, the prevalence of retinal vein occlusion was 1.6%. Data from previous studies have shown an association of retinal branch vein occlusion with hypertension, athero-sclerotic vascular disease, diabetes mellitus, rheological factors, refractive error, elevated intraocular pressure, and open-angle glaucoma, although these associations have not been consistent.

A less well recognized association between "angle-closure glaucoma" and retinal vein occlusion (RVO), has been reported in a small number of cases in older

articles. The incidence of primary open angle glaucoma in patients with central vein occlusion has been reported to be 5.7% to 65.5% and with Branch retinal vein occlusion to be 6.6% to 15%. [2]

The incidence of primary angle closure glaucoma in association with central retinal vein occlusion (CRVO) is generally reported to be 0 to 9.9 and 1.72% in cases of branch retinal vein occlusion (BRVO). This clearly leaves much uncertainty regarding any described association. Furthermore, since the first reports of angle-closure and RVO there have been limited additional data. To date there has only been one case series showing association between primary angle closure (PAC) and RVO. [3,4] Identification and reporting of such a link between RVO and angle closure is also significant as patients with RVO will undergo regular pupillary dilation during hospital follow-up visits. Probably even more important is the fact that it is an eminently treatable risk factor. Secondly, the direction of the association is not clear. So this study was undertaken to know whether there is any association between primary angle closure disease and retinal vein occlusions.

PATIENTS AND METHODS

It is Observational cross sectional study included 50 patients for a period of 18 months of retinal vein

occlusions who were diagnosed at retina department in sarojini devi eye hospital and those cases will be considered for further evaluation in Glaucoma department.

Inclusion Criteria: All cases of retinal vein occlusions (CRVO, BRVO, Hemi retinal VO).

Exclusion Criteria: Any media opacity precluding view of retina (dense corneal opacity, dense cataract), patients with other secondary glaucomas. 3) Pseudophakia in the involved eye and Retinal vein occlusion with associated neo-vascularisation of iris/angle

A detailed medical history and surgical history will be taken, past medical history about hypertension, diabetes mellitus, coronary artery disease and hyperlipidemia.

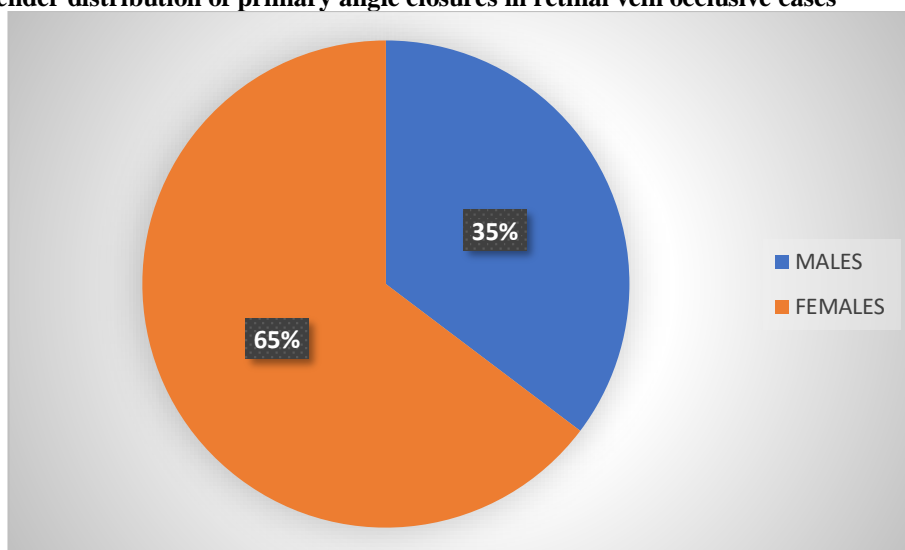
Clinical examination of both eyes includes visual acuity by snellens chart, slit lamp biomicroscopy, fundus examination under full mydriasis by indirect ophthalmoscopy using 20D lens. gonioscopy by goldmann four mirror lens to know irido- corneal angles, IOP by goldmann applanation tonometer. A scan bio-metry to know ACD. Bp by sphygmomanometer and RBS /FBS.

RESULTS

Table-1: Age and gender distribution in RVO cases

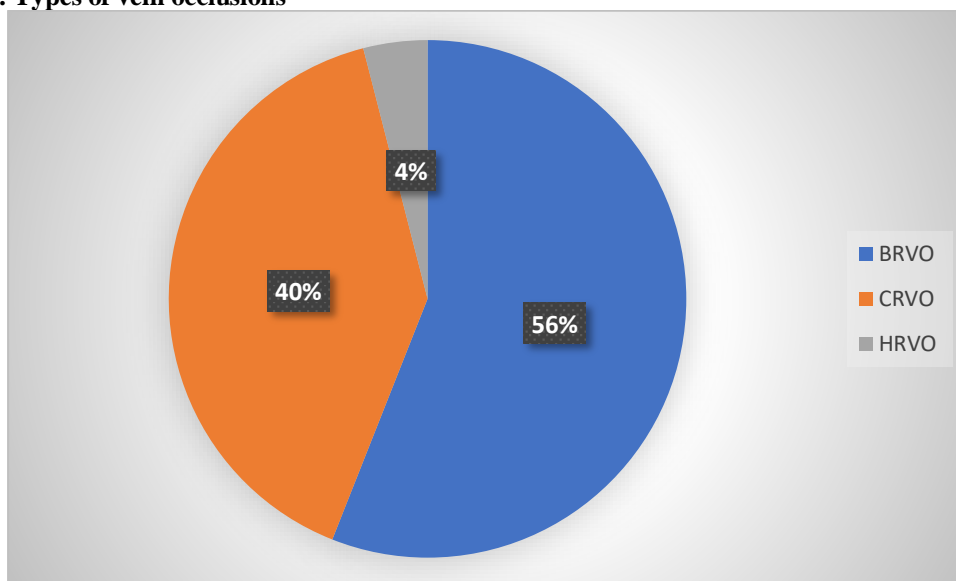
Age Group	Number Of RVO Cases
30-45	16
46-60	30
>60	4
Gender	
Male	25
Female	25

Figure-1: Gender distribution of primary angle closures in retinal vein occlusive cases



Among 50 RVO patients 17 primary angle closure diseased patients were found. In this 17 patients 11 females, 6 males. So females are at risk for developing angle closures than males.

Figure-2: Types of vein occlusions



Among 50 patients 28 BRVO, 20 CRVO, 2 HRVO.

Table-2: Distribution of primary angle closures in retinal vein occlusions in diseased eye(rvo affected eye)

Type of angle closure	BRVO Cases	CRVO Cases	Total
PACS	2	0	2
PAC	2	2	4
PACG	6	5	11
Total	10	7	17

chi square = 1.612, p value = 0.447 (NS)

Among 28 cases of BRVO in the diseased eye 11 OA without glaucoma, 3 OA with NTG, 4 POAG, 2 PACS, 2 PAC, 6 PACG.

Table-3: Type of glaucoma with gonioscopy findings in contralateral eye(RVO unaffected eye)

Type of glaucoma	BRVO	%	CRVO	%	HRVO	%	Total
OA with out glaucoma	17	60.7	7	35	1	50	25
OA with NTG	1	3.57	6	30	0	0	7
POAG	2	7.14	0	0	1	50	3
PACS	0	0	1	5	0	0	1
PAC	4	14.28	4	20	0	0	8
PACG	4	14.28	2	10	0	0	6
Total	28	100	20	100	2	100	50

Among 20 cases of CRVO in the diseased eye 8 OA without glaucoma, 2 OA with NTG, 3 POAG, 2 PAC, 5 PACG.

Among 2 cases of HRVO in the diseased eye 1 OA without glaucoma, 1 POAG.

In contralateral eye among 28 BRVO 17 OA without glaucoma 1 OA with NTG, 2 POAG, 4 PAC, 4 PACG were diagnosed, among 20 CRVO 7 OA without glaucoma 6 OA with NTG, 1 PACS, 4 PAC, 2 PACG were diagnosed, among 2 HRVO 1 OA without glaucoma, 1 POAG were diagnosed.

Table-4: Distribution of primary angle closures in contralateral eye (RVO unaffected eye)

Type of angle closure	BRVO cases	CRVO cases	total
PACS	0	1	1
PAC	4	4	8
PACG	4	2	6
Total	8	7	15

chi square = 1.607, p value = 0.448 (ns)

In this study distribution of primary angle closure disease cases in RVO affected and contralateral eye were analyzed by CHISQUARE TEST and p value which is more than >0.05 which means non significant.

Table-5: Anterior chamber depth in retinal vein occlusion cases.

	Diseased Eye	Contralateral Eye
Mean ACD in mm	2.887	2.9556

In this study mean AC depth in diseased eye 2.887 mm, in contralateral normal eye mean AC depth was 2.955 mm. mean AC depth was shallower in affected RVO eye than contralateral normal eye.

Table-6: Statistical analysis of ACD in diseased eye

Type of primary angle closure	No. of cases	Mean	Standard deviation
PACS	2	2.830	0.141
PAC	4	3.077	0.254
PACG	11	2.380	0.222
Total	17	2.597	0.374

diseased eye (RVO), cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved by CHI SQUARE and p value 0.00 (<0.05) which is significant.

Table -7: Statistical analysis of ACD in contralateral eye

Type of primary angle closure	No. of cases	Mean	Standard deviation
PACS	1	2.810	-
PAC	8	2.921	0.300
PACG	6	2.410	0.196
TOTAL	15	2.709	0.351

contralateral eye also cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved by CHI SQUARE and p value 0.012 (<0.05) which is significant.

DISCUSSION

The prevalence of angle closure shows much wider variations than for open angle glaucoma. To date there is limited data on the association between PAC and RVO. Recently there has been only one retrospective case series where 19 subjects were studied who had sustained an RVO and had PAC. They found that majority of patients were diagnosed with PACG in one or both eyes suggesting that PAC leads to RVO, rather than the reverse association. [5]

Among primary glaucoma, POAG in particular seems to have a close association with RVO as seen in older literature. Articles concerning occlusion of the central retinal vein have occasionally made allusions to the depth of the anterior chamber, without apparently attaching particular significance to it. In our study we have seen that mean ACD was 2.62mm in eyes with RVO and PAC whereas, mean ACD was 2.66mm in the contra-lateral eye which had RVO without PAC. Identifying these patients is important because these patients will require frequent pupillary dilatation on follow up visits which might precipitate an angle closure attack. Moreover several treatment options are available to improve the drainage angle configuration and thus prevent angle closure episodes. Similar results have been seen in a study done by R George et al. [6] where they compared ocular biometric values in a population based sample of eyes with occludable angles, angle closure glaucoma, and normal subjects and found that eyes with angle closure glaucoma or occludable angles have shorter axial lengths,

shallower anterior chamber depths, and thicker crystalline lenses.

In this study 50 patients were included with the mean age of 49.86. A basic risk factor for RVO is advancing age. CRVO most commonly occurs in elderly usually above 50 years^{61,62} BRVO's occur 3 times more common than CRVO's, men and women affected equally usual age of onset is 60-70 years. [7] In this study also among 50 patients major number of patients are in between age group of 46 - 60. It gives impression that elderly age group patients are at risk which is similar to previous studies. In this study total 17 patients had primary angle closures. Mean age in these patients 48.5. So elderly age group are at risk for angle closures it is similar to the study done by R George et al. [6]

Hayreh et al. [8] have observed that the most prevalent ages for CRVO development are 65 years and older, and it is more common in men than in women. However, BRVO is more common in women. Per Mark Cahill et al. [9] RVO is more common in females and RAO more common in males and most prevalent age of RVO and RAO is 60 years and older. But in present study among 50 patients 25 were males and 25 were females. Among 25 male patients 12 patients were having CRVO, 2 HRVO, 11 BRVO. Among 25 female patients 17 patients were having BRVO, 8 CRVO. In this study also BRVO is more common in females similar to previous studies. [8] It is known that women are more susceptible to angle closure glaucoma than men. In this study Among 17 primary angle closures 11

females, 6 males. So females are at risk for developing angle closures than males. It is similar to the previous study. As mentioned earlier there are so many risk factors reported for RVO, including Hypertension, Diabetes Mellitus, Arteriosclerosis, Hyperlipidaemia, Hyperviscosity.

A basic risk factor for RVO is advancing age. Further risk factors include systemic conditions like hypertension, arteriosclerosis, diabetes mellitus, hyperlipidemia, vascular cerebral stroke, blood hyperviscosity, and thrombophilia. A strong risk factor for RVO is the metabolic syndrome (hypertension, diabetes mellitus, and hyperlipidemia). Individuals with end-organ damage caused by diabetes mellitus and hypertension have greatly increased risk for RVO. Congenital thrombophilic diseases like factor V Leiden mutation, hyperhomocysteinemia and anticardiolipin antibodies increase the risk of RVO.^[7]

In this study among 50 RVO patients there are multiple systemic associations, 25 were having diabetes, 36 patients were having Hypertension, 30 patients were having abnormal lipid profiles, 29 patients were having elevated homocystiene levels, 22 were having CAD, but hypertension present alone in 2 patients, diabetes alone in 1 patient, diabetes and hypertension both in one patient, abnormal lipid profile alone in 1 patient, CAD alone in 2 patients. Among 50 patients of RVO 17 cases were found to have primary angle closure disease, among these 17 cases there are multiple systemic associations. Among these 17, 9 cases are diabetic, 9 hypertensives, abnormal lipid profile identified in 8 patients, hyperhomocystienemia in 9 patients, CAD in 6 patients, but in these 17 cases there are only multiple associations are seen, CAD alone is seen in two patients.

Hypertension was major association in RVO along with other systemic associations in this study similar to The Bhaktapur retina study done by Raba Thapa^[10] on Prevalence, Pattern and risk factors of retinal vein occlusion in an elderly population in Nepal. Concluded that Retinal vein occlusion is a common retinal vascular disorder in the elderly population of Nepal and the main risk factors for RVO were increasing age and hypertension. In the Eye Disease Case Control Study, in addition to hypertension, it was associated with a history of cardiovascular disease. ^[11]

A.R. Manaviat et al^[12]. also reported that mean Homocysteine level was significantly higher in patients than controls. Previous study showed that increased prevalence of hypercholesterolaemia in the group with BRVO (23.7%) and CRVO (22.5%) when compared with controls (7.5%). P M Dodson et al^[12] studied on Diabetes mellitus and retinal vein occlusion in patients of Asian, West Indian and white European origin concluded that RVO is associated with a greater prevalence of diabetes mellitus and

Hypertension. In this study among 50 patients 28 BRVO, 20 CRVO, 2 HRVO were found.

In this study among 28 cases of BRVO in the diseased eye 11 cases found to have open angles without glaucoma, 3 cases found to have open angles with NTG [normal IOP and cupping of disc], 4 cases found to have POAG, 2 cases found to have PACS, 2 cases found to have PAC, 6 cases found to have PACG.

Among 20 cases of CRVO in diseased eye 8 cases found to have OA without glaucoma, 2 cases found to have OA with NTG, 3 POAG, 2 PAC, 5 PACG. Among 2 cases of HRVO in diseased eye 1 case has OA without glaucoma and 1 case has POAG. In contralateral eye among 28 BRVO 17 OA without glaucoma, 1 OA with NTG, 2 POAG, 4 PAC, 4 PACG were diagnosed, among 20 CRVO 7 OA without glaucoma, 6 OA with NTG, 1 PACS, 4 PAC, 2 PACG were diagnosed, among 2 HRVO 1 OA without glaucoma, 1 POAG were diagnosed. So in this study among 50 cases of RVO 4 cases (8%) found to have PAC in affected RVO eye. 2 PAC in BRVO (7.14%), 2 PAC in CRVO (10%).

Studies found the prevalence of PACG to be 5.6% in CRVO and 1.7% in BRVO. On comparing the diseased eye and the normal eye in our study, it was seen that glaucoma was also present in the normal eye in majority of the patients who had glaucomatous changes in the eyes with RVO. Thus the cause for narrow angles in patients with angle closure and RVO is probably pupillary block and not anterior displacement of the lens-iris diaphragm caused by either the transudation of fluid from retinal vessels into the vitreous cavity or swelling of the ciliary body due to spasm, edema or detachment which may cause relaxation of lens zonules with subsequent crowding and closure of the angles in studies. So in this study distribution of primary angle closures in RVO cases in diseased eye were analyzed by CHI SQUARE it is 1.612 and P value is 0.447 (>0.05) which is non significant. So in this study distribution of primary angle closures in RVO cases in contralateral Eye were analyzed by CHI SQUARE it is 1.607 and P value is 0.448 (>0.05) which is non significant.

In this study mean AC depth in diseased eye was 2.887 mm. In contra lateral normal eye it was 2.9556 mm. So in this study mean AC depth was shallower in affected RVO eye than contralateral normal eye. It is similar to study done by Shiu -Chen Wu on anterior chamber depth and ACG after CRVO published in BMC ophthalmology 2015.^[14]

In this study 4 PAC cases were diagnosed in diseased RVO eyes. So mean AC depth in these 4 PAC cases 2.62 mm which is shallower than contralateral eye which was 2.66 mm with difference of 0.04 mm. and also these PAC cases have much shallower AC depth than unaffected eyes, It is also similar to the Previous study.^[14] In this study 2 PACS cases were diagnosed. In these 2 PACS cases mean AC Depth in affected eye was 2.835 mm, 2.94 mm in unaffected contralateral eye. In this study 11 PACG cases were

diagnosed. In these 11 PACG cases mean AC depth 2.38 mm which is much shallower than unaffected contralateral eye which is 2.57 mm with difference of 0.19mm. which is similar to previous study. So in diseased eye (RVO), cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved by CHI SQUARE and p value 0.00 (<0.05) which is significant. So in contralateral eye also cases associated with primary angle closures and not associated with primary angle closure cases there is significant difference in mean ACD which is proved by CHI SQUARE and p value 0.012 (<0.05) which is significant.

CONCLUSION

Primary glaucoma and retinal vein occlusion are important causes of blindness. Its early detection and timely intervention remains the key to prevent visual deterioration from these two diseases. Fifty retinal vein occlusion cases were evaluated for its association with primary angle closure disease. It would be worthwhile to carefully evaluate all the patients of retinal vein occlusion for primary angle closure disease. Good control of intraocular pressure in a patient known to have glaucoma may prevent occurrence of retinal vein occlusion. This study thus emphasizes frequent and careful evaluation of retinal vein occlusion cases for primary angle closure disease.

And AC depth measurement is also important because shallow AC depth is a risk factor for developing angle closures in our study. Gonioscopy should be done in all patients of retinal vein occlusion cases.

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