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ORIGINAL ARTICLE

Sonographic Assessment of Retinal Detachment in diagnosed cases of Glaucoma

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ABSTRACT

Aims: To assess the retinal detachment in diagnosed cases of glaucoma in normal, diabetic, and hypertensive patients and to see the association of retinal detachment with diabetic and hypertensive patients.
Study design: This study was cross-sectional analytical.
Place & duration of study: This study was conducted at Mayo Hospital, Lahore from June 2020 to June 2022.
Materials: The inclusion criteria was diagnosed glaucoma patients by an ophthalmologist. Exclusion criteria was Ophthalmologic surgery on the affected eye (prior 2 weeks). A sample size of 262 eyes was included in this research comprising 122 males (60.6%) and 79 females (39.3%). Data entry and analysis were done by using SPSS version-23.
Results: Total number of 262 eyes (201 patients) were included in this research comprising 122 males (60.6%) and 79 females (39.4%). A total number of 140 patients with unilateral eye glaucoma were collected and 18 had a retinal detachment. And out of the 61 patients who had bilateral eye glaucoma 10 eyes had a retinal detachment. 46 patients had diabetes out of which 10 had a retinal detachment. 40 patients had hypertension out of which 6 had a retinal detachment.
Practical implication: To prevent the vision loss of patients, prompt but accurate detection is essential to carry out appropriate treatment of retinal detachment and its complications. Due to its minimal effort of use, lack of radiation or contrast medium, and remarkable sensitivity and specificity, ultrasonography is the present first-line imaging evaluation for retinal detachment.
Conclusion: The result of this investigation is that retinal detachment occurs in those patients suffering from glaucoma. Diabetes and hypertension affects eye health and aggravate abnormalities. Glaucoma-related vision loss could be reduced by identifying risk factors and drugs that enhance a patient's susceptibility to glaucoma and by recommending high-risk individuals for a comprehensive ophthalmologic checkup.
Keywords: Glaucoma, Retinal Detachment, Diabetes Mellitus, Hypertension.

INTROUCTION

With an annual incidence of one out of every 10,000 people, RD (retinal detachment) is the most frequent retinological emergency that threatens vision[1]. Detachment of the retina from the retinal pigment epithelium is referred to as "retinal detachment"[2].

Older age, male gender (60%), race (Jews and Asians), lattice degeneration, and myopia are all possible causes. RD is a serious visual impairment that primarily affects adults aged 50 and above. The retina of the eye thins and turns more brittle as people get older. Tiny holes occur within the retina as a result of this, allowing fluid between both the retina and the lens of the eye to leak beneath the retina. A collection of fluid beneath the retina might lead it to pull away from the small blood vessels beneath it. This deprives the retinal oxygen, causing the light-converting nerve cells to die[3]. Although the disease seldom affects both eyes, 10% of those with retinal detachment in one eye will have it in the other after ten years. Males have roughly twice the chance of bilateral disorder as females[4].

The most frequent reason for registration in the retinal clinic was diabetes-related retinal disorders (39.8%), followed by retinal detachment (20.6%)[5]. Tractional retinal detachment and neovascular glaucoma are two complications of diabetic retinopathy. The most frequent microvascular consequence of diabetes mellitus is diabetic retinopathy, affecting 3-4% of persons in Europe, whereas the possibility of forming diabetic retinopathy is 50% greater in type I diabetes than in type II diabetes (30%)[6].

Glaucoma affects up to 70 million individuals globally, with about 10% of those affected going blind on both sides, forming it primary factor of permanent blindness[7]. Glaucoma is a word that refers to a collection of ocular abnormalities that share a multi-factorial origin and are characterized by intraocular pressure-related optic neuropathy[8]. Glaucoma can occur in many types. Glaucoma is also linked to becoming older[9]. It is more prevalent in adults over the age of 60(90.2%)[10].

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Glaucoma is more likely in those who suffer from diabetic retinopathy. This can develop if aberrant blood vessel growth, which can happen as a consequence of retinopathy, obstructs the eye's natural drainage. In an emergency department environment, a background and physical evaluation might not be enough to provide a formal diagnosis. With the introduction of ocular ultrasonography, emergency care specialists have seen encouraging outcomes in precisely identifying ocular disorders, greatly lowering the burden of ocular issues[11]. Ultrasound is a helpful addition to the examination of patients with ocular disorders because of its portability, non-invasive nature, and efficiency. Ocular ultrasonography is capable of diagnosing a wide range of ocular illnesses, including retinal detachment[12]. A recent large multi-center, prospective investigation found that identifying RD with ultrasound had a high sensitivity and moderate specificity (96.9% and 88.1% respectively)[13].

Muhammad Hannan Jamil and Nesr Farooq conducted the prospective observational study at Layton Rahmatullah Benevolent Trust, Lahore during the period of 2010 to 2011, to determine the presenting characteristics of retinal detachment in a consecutive series of Pakistani patients. Bilateral Retinal detachment was discovered in 2.8% patients. No identifiable risk factor for RD was present in 28%, while in rest of the 72% eyes, the commonest risk factors were intraocular surgery, trauma and peripheral myopic degeneration in decreasing order of frequency. Total Retinal detachment was found in 35.5% eyes[5]. In our study retinal detachment was assessed in diagnosed cases of glaucoma in normal, diabetic, and hypertensive patients and to see the association of retinal detachment with diabetic and hypertensive patients. Total number of 262 eyes (201 patients) were included in this research. A total number of 140 patients with unilateral eye glaucoma were collected and 18 had a retinal detachment. And out of the 61 patients who had bilateral eye glaucoma 10 eyes had a retinal detachment. 46 patients had diabetes out of which 10 had a

retinal detachment. 40 patients had hypertension out of which 6 had a retinal detachment.

Vision loss due to retinal detachment in glaucoma patients is a problem that needs prompt but accurate detection and management. We performed this study to see sonographic frequency and features of retinal detachment. With an early diagnosis of RD, we can prevent vision loss.

MATERIALS AND METHOD

This study design was Cross-sectional analytical. The study was conducted at Mayo Hospital Lahore. Duration of study was 9 months after the approval of the synopsis. A sample size of 262 subjects is measured by using a 95% confidence level, and 2% absolute precision required ad by taking an expected percentage of retinal detachment as 262.

$$n = \frac{z^2_{1-\alpha/k} P(1-P)}{d^2}$$

α Confidence level= 95%
d Absolute precision required= 2%
P Percentage of Retinal Detachment= 2.8%.[5]
n Sample Size= 262

Non-probability consecutive sampling technique was used

Inclusion Criteria: Diagnosed glaucoma patients by an ophthalmologist

Exclusion Criteria: Ophthalmologic surgery on the affected eye (prior 2 weeks). Ultrasound machine with linear frequency range (7.5-12 MHZ). Ultrasound examinations of the eye are usually performed using a high-frequency linear transducer with a small footprint. The patient lies supine on the examination table with closed eyelids.

Data entry and analysis were done by using SPSS version 23. Quantitative variables (age) were presented with mean±SD. Qualitative variables (gender, diabetes, hypertension, glaucoma, retinal detachment, flashes, floaters, hyperechoic band in posterior chamber) was presented by using frequency and percentages. Pie charts, Bar charts were given. The chi-square test was applied to observe an association of retinal detachment with flashes, floaters and floating bands in glaucoma patients. P-value ≤ 0.05 was taken as significant.

RESULTS

Out of the 201 patients, 42 (20%) were between 2 to 16 years of age category, 24(11%) were 17 to 25 years, 19(9.5%) were from 26 to 39 years and 116(57.7%) were from above 40 years of age category. And 79(39.3%) were females and 122(60.6%) were males.

Out of the 201 patients, 40(19.9%) had hypertension and 161 (80.0%) had no hypertension, and 48(23.8%) had diabetes and 153 (76.1%) had no diabetes. A total of 24 patients had retinal detachment, from them 10 had diabetes. And a total of 24 patients had retinal detachment, from them 6 had hypertension.

Unilateral: Out of 76 right eye glaucoma patients 42(55%) were male and 34(44%) were females. From 64 left eye glaucoma patients 40(62%) were male and 24 (37%) were females. Out of the 140 patients 76(54%) had glaucoma in the right eye and 64(45%) patients had glaucoma in the Left eye. And in 8 (5%) patients retinal detachment was present in the right eye. 10 patients had retinal detachment of the Left eye. Out of the 140 glaucoma patients, 17(12%) patients shown the clinical history of flashes, 19(13%) patients had floaters and 16(11%) had floating bands history. Out of the 64 left eye glaucoma patients, 9(14%) patients shown the clinical history of flashes, 11(17%) patients had floaters and 9(14%) had floating bands history. Out of the 76 right eye glaucoma patients, 9(11%) patients shown the clinical history of flashes, 8(10%) patients had floaters and 7(9%) had floating bands history.

Out of the 140 patients 29(20%) had dense intragel hemorrhage, 6(4%) had vitreous detachment. In 06(4%) patients ONH shows deep cup and 7(5%) patients had siliconized eyeball. Rest of the diseases was rare. And in 88(62%) patients there was no other disease.

Out of 140 patients, retinal detachment in right eye was present in 8(5%) patients. Along with retinal detachment out of 8 patients, 1(12%) had choroidal detachment, 1(12%) had siliconized eyeball and 6(75%) had no sonographic findings. 132(94%) patients had no retinal detachment but 50(35%) had other sonographic findings and 82(58%) are sonographically normal. In patients with right RD flashes are present in 8(100%), floaters in 6 (85%) and floating bands in 8(100%) patients. Out of 132 patients without right RD 9(6%) had flashes, 13(9%) had floaters and 8 (6%) had floating bands history.

Out of 140 patients, retinal detachment in left eye was present in 10(7%) patients. Along with retinal detachment out of 10 patients, 1(10%) had Choroidal edema in soft eyeball, 3(30%) had Dense intragel hemorrhage, 1(10%) had Synchisis scintillans in subretinal space, 1(10%) had Vitreous detachment and other 3 (30%) had no sonographic findings. 130 patients had no retinal detachment but 46(35%) from them had other sonographic findings and 84(64%) are sonographically normal. In patients with left RD flashes are present in 6(60%), floaters in 8(80%) and floating bands in 8(80%) patients. Out of 130 patients without LRD 11(8%) had flashes, 11(8%) had floaters and none had floating bands history.

Bilateral: Out of 61 patients with bilateral eye glaucoma 40(65%) were male and 21(34%) were females. Out of the 122 bilateral glaucoma eyes, retinal detachment was present in 10(08%) eyes. From them 4(40%) had left retinal detachment, 6(60%) had right retinal detachment. Out of the 122 glaucoma eyes, 11(9%) had flashes, 13 (10%) had floaters and 10 (8%) had floating bands history.

Table 1: Relation of retinal detachment with flashes, floaters and floating bands in unilateral eye glaucoma patients.

		Retinal detachment			P-value
		Present	Absent	Total	
Flashes	Present	13	4	17	0.000
	Absent	2	121	123	
Total		15	125	140	
Floaters	Present	13	6	19	0.000
	Absent	2	119	121	
Total		15	125	140	
Floating band	Present	15	1	16	0.000
	Absent	0	124	124	
Total		15	125	140	

Chi-square test is applied and it shows obtained p-value of retinal detachment with flashes, floaters and floating bands in unilateral eye glaucoma patients is <0.001 so this shows that it is significant as shown in Table 1.

Table 2: Relation of retinal detachment with flashes, floaters and floating bands in bilateral eye glaucoma patients.

		Retinal detachment			P-value
		Present	Absent	Total	
Flashes	Present	10	1	11	0.000
	Absent	0	111	111	
Total		10	112	122	
Floaters	Present	9	4	13	0.000
	Absent	1	108	109	
Total		10	112	122	
Floating band	Present	10	0	10	0.000
	Absent	0	112	112	
Total		10	112	122	

Out of 122 eyes with bilateral eye glaucoma, retinal detachment was present in 10(8%) eyes. Out of 10 patients with

retinal detachment, 4(40%) had dense intragel hemorrhage and vitreous detachment, 1(10%) had siliconized eyeball, 1(10%) had subhyloid hemorrhage and vitreous detachment, other 4(40%) had no sonographic findings. Out of 112(91%) patients who had no retinal detachment, 27 (24%) from them had other sonographic findings and 83 (74%) are sonographically normal. In patients with Retinal detachment flashes are present in 9(90%), floaters in 7(70%) and floating bands in 10(100%) patients. Out of 112 patients without retinal detachment 1(0.8%) had flashes and 4(3%) had floaters history.

Out of the 122 bilateral glaucoma eyes 2(2%) had buphthalmos, 2(2%) had choroidal edema in soft eyeball, 3(4%) had degenerative changes in vitreous, 15(12%) had dense intragel hemorrhage, 6(4%) had vitreous detachment and ONH of 8(6%) eyes showed deep cup. Rest of the diseases were rare and in 87(71%) eyes there was no other disease. Chi-square test is applied and it shows obtained p-value of retinal detachment with flashes, floaters and floating bands in bilateral eye glaucoma patients is <0.001 so this shows that it is significant as shown in table 2.

Fig 1: Retinal detachment.

Fig. 2: Typical V shaped retinal detachment.

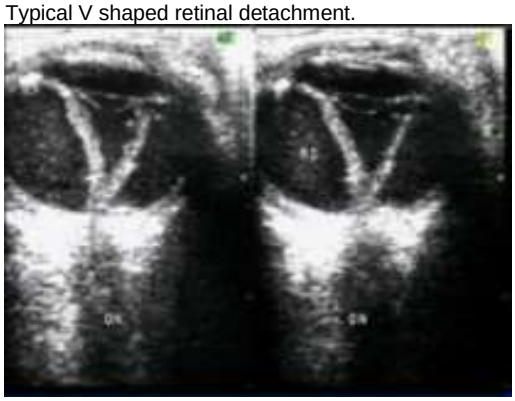

Fig. 3: Tent like retinal detachment

Fig. 4: Broad wide retinal detachment with wide base also due to the traction RD known as the table top detachment.

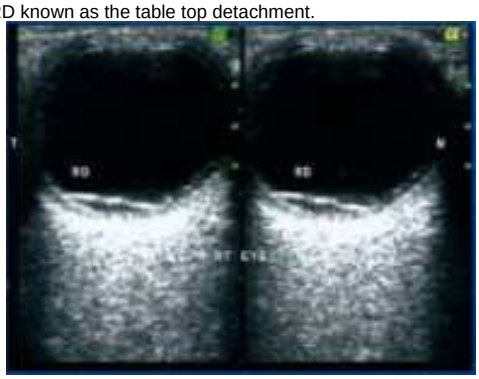

Fig. 5: Giant Retinal tear.

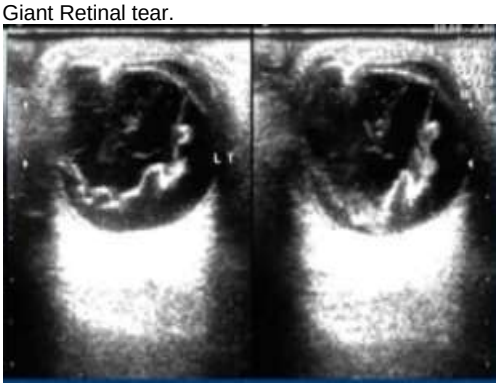

Fig. 6: Multiple retinal cysts formation in the posterior segment due to the folding of retina in chronic long standing tear.

Fig 7: Giant retinal tear with retinal cyst formation.

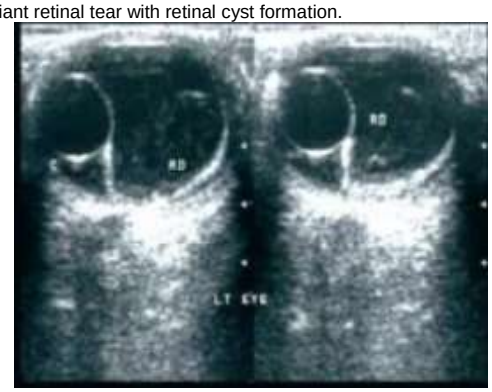

Fig 8: Chronic retinal detachment, image shows a thick membranous shadow with open funnel shaped pattern, which is seen attached at the optic nerve.

DISCUSSION

This investigation aimed to find the prevalence of retinal detachment that occurs in a group of glaucoma individuals at a single academic medical facility and to determine the relation of retinal detachment with diabetes and hypertension. The present study's strengths comprise the massive number of glaucoma sufferers who were all followed for a long time. In this research, we included diagnosed glaucoma patients by ophthalmologists. Patients who had prior ophthalmologic surgery were excluded.

Patients with glaucoma are often aged. The greater average age maybe because growing older is a potential risk for a variety of eye disorders[14]. One study showed that there was a significant risk of glaucoma after 60 years of age and the risk increased with each subsequent decade of life. A similar age-related trend was shown in the Barbados Incidence Eye Study[15] and numerous prevalence studies. Increased age may reflect the cumulative effects of some other factors that cause the aging optic nerve head to be more vulnerable to intraocular pressure, even of normal range[16]. Our results are consistent with earlier research, which found that 116 (57.7%) patients were from above 40 years of age category.

Whether a gender difference exists in the prevalence of glaucoma has been controversial. Numerous studies have reported that the prevalence of glaucoma is higher in men, others have reported a higher prevalence in women, and yet others have reported no gender difference in prevalence. [17] In our research glaucoma occurs more frequently in men. 39.3% were females and 60.6% were males.

Our research results indicate that 23% of glaucoma patients have diabetes and the ocular symptoms are consistent with earlier research, which found that 3.4% of Americans above 40 years old have diabetic retinopathy[18]. Twenty-five percent of diabetes-related vision loss stems from complications of diabetic retinopathy, it may progress uncontrollably to advanced pathologies such as traction retinal detachments, combined traction/rhegmatogenous retinal detachments and vitreous hemorrhages, which produce mild-to-severe loss of vision.[19] In our research out of 48 diabetic patients 10 had retinal detachment.

A meta-analysis of population-based studies showed that individuals with hypertension have an approximately 1.2-fold higher risk of developing glaucoma than individuals without hypertension. Hypertension has profound effects on various parts of the eye. Classically, elevated blood pressure results in a series of retinal microvascular changes called hypertensive retinopathy, comprising of generalized and focal retinal arteriolar narrowing, retinal hemorrhages etc.[20] The results of this study showed that 20% of the patients had hypertension.

One hundred and forty patients had unilateral eye glaucoma, from them 18 had a retinal detachment. 17 had flashes, 19 had floaters and 16 were presented with a clinical history of floating bands. In glaucoma patients besides retinal detachment, other sonographic findings were also present. 31 patients with right eye glaucoma and 21 patients with left eye glaucoma had other sonographic findings. The most common findings were dense intragel hemorrhage, vitreous detachment, optic nerve head deep cupping, siliconized eyeball, and subhyloid hemorrhage. Other diseases include choroidal detachments, dislocated crystalline lens in the vitreous, hemophthalmia, choroidal edema in the soft eyeball, corneal tear, and degenerative changes in the vitreous, diffuse edema of the choroid, large-sized eyeballs, intragel haze, phthisis bulbi and synchisis scintillans in subretinal space were rare.

Sixty one patients had bilateral eye glaucoma. Out of the 122 bilateral glaucoma eyes, 4 had left retinal detachment, and 6 had a right retinal detachment. From them 8 retinal detachments of the eyes were bilateral. 11 had flashes, 13 had floaters and 10 were presented with a clinical history of floating bands. Out of 122 eyes with bilateral eye glaucoma, the retinal detachment was present in 10 eyes, along with that 4 had dense intragel hemorrhage and vitreous detachment, 1 had siliconized eyeball, 1 had subhyloid hemorrhage and vitreous detachment, other 4 had no sonographic findings. 112 patients had no retinal detachment but 27 of them had other sonographic findings and 83 are sonographically normal. In patients with Retinal detachment, flashes are present in 9, floaters in 7, and floating bands in 10 patients. Out of 112 patients without retinal detachment 1 had flashes and 4 had floaters history.

Michael Gottlieb revealed that ultrasonography is both specific and sensitive for the detection of retinal detachment in a meta-analysis and systematic review[21].

Vrablik and colleagues discovered that ultrasonography was 97%-100% sensitive and 83%-100% specific for RD in a previous comprehensive study[22].

That review, was conducted in 2012 and was restricted by small sample numbers and the inability to do a meta-analysis of the data. Although ocular ultrasonography can be useful for diagnosing retinal detachment, it's also essential to keep in mind that it has certain limits. First and foremost, it is provider-dependent, as are many ultrasounds uses. As a result, physicians must have enough training and experience with this approach. Because ocular ultrasonography is not confined to the evaluation of retinal detachments and because 3.4% of individuals present with ocular problems, the average physician will have the chance to do this assessment once every 29 individuals (or around once per shift)[23].

Clinicians would see a RD once per 5,000 to 15,000 individuals, based on a yearly incidence of 6.3 to 17.9 per 100,000 individuals. As a result, clinicians need to refresh their ultrasonography skills for detecting retinal detachment. It's essential to make sure the hand is appropriately balanced on the nasal bridge/maxilla, and that enough gel is administered. Lastly, distinguishing retinal detachment from posterior vitreous detachment can be difficult, therefore practitioners must have a low threshold for referring patients to ophthalmology if the identification is ambiguous[24].

CONCLUSION

The result of this investigation is that retinal detachment occurs in those patients suffering from glaucoma. Diabetes and hypertension affects eye health and aggravate abnormalities. For the confirmation of retinal detachment, ultrasound is specific and sensitive. Glaucoma-related vision loss could be reduced by identifying risk factors and drugs that enhance a patient's susceptibility to glaucoma and by recommending high-risk individuals for a comprehensive ophthalmologic checkup.

Limitations: The research has certain limitations. Considering the time restriction, the sample size was limited. Because of the COVID-19 outbreak, many patients didn't visit the hospital since the hospital that gathered data was draining patients from several cities.

Conflict of interest: Nil

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