A COMPARATIVE STUDY OF SEVERITY AND DURATION OF DIABETIC RETINOPATHY IN TYPE 2 DIABETES IN TESSELLATED AND NON-TESSELLATED FUNDUS

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ABSTRACT

BACKGROUND

Tessellated/tigroid fundus appearance are polygonal dark areas of choroid in between choroidal vessels - due to retinal pigment epithelium atrophy and prominent choroid pigmentation and large surface area along with retinal thinning. Low ocular perfusion pressure associated with thin and or long retinal arterioles reduces the occurrence of Diabetic Retinopathy (DR) compared to non-tessellated fundus.

METHODS

This cross-sectional observational study was conducted among Type 2 Diabetes Mellitus (DM) patients who attended as outpatient and admitted in the wards at Department of Ophthalmology, Govt. Rajaji Hospital, Madurai, to determine whether tessellated fundus is a protective factor for incidence and severity of DR, and to compare the duration and severity of DR in tessellated and non-tessellated fundus. All the patients with DR were examined and assessment of DR done with + 90 D lens under slit lamp microscope. Fundus Fluorescein Angiography (FFA) was performed and grading of DR done as per Early Treatment of Diabetic Retinopathy Study classification (ETDRS) to analyse severity and duration of DR in Type 2 diabetes patients with tessellated and non-tessellated fundus.

RESULTS

Among the 60 patients, 30 had tessellated fundus and 30 had non-tessellated fundus**.** The average age group of patients presenting with DR in this study was 45-70 years with male preponderance; 32 patients were myopic, 23 were hyperopic and 5 were emmetrope. On fundus examination, 93.33% of patients with diabetes for more than 5 years showed majority DR changes. Incidence of Proliferative DR was less in myopes compared to hyperopes; 13 patients had mild non-proliferative diabetic retinopathy (NPDR), 25 had moderate NPDR, 12 had severe NPDR, 2 had very severe NPDR, 5 had early Proliferative Diabetic Retinopathy (PDR) and 3 had high risk PDR. Very severe NPDR, Early PDR and High risk PDR was 100% absent in tessellated ('p' value was 0.03).

CONCLUSION

Hence, tessellated fundus is a protective factor for incidence and severity of DR.

KEYWORDS

Diabetic Retinopathy, Tessellated Fundus, Myopia.

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INTRODUCTION

Diabetes mellitus is a metabolic disorder with disturbance in carbohydrate, because of the partial/complete deficiency of insulin secretion or action. According to the International Diabetes Federation, 381 million people worldwide suffer from diabetes. In India 62 million suffer from diabetes, of them 1 million die every year due to diabetes.

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The colour of normal fundus ranges from orange to vermilion. The spectrum of fundus[1] corresponds to the diffusion of blood, oxyhaemoglobin being the largest factor. Choroidal vasculature also plays an important role in colour of fundus**.** Tessellated/tigroid fundus[2] are polygonal dark areas of choroid in between choroidal vessels due to retinal pigment epithelium atrophy and prominent choroid pigmentation. Special features of tessellated fundus include RPE atrophy, choroidal segmentation and large surface area of retinal thinning.[3]

Risk factors for type 2 diabetes include ethnicity, age, lack of physical activity, increased dietary cholesterol intake, obesity with Body Mass Index more than 30 kg/sq. m, family history, drugs causing diabetes, insulin resistance and smoking. Protective factors from Diabetic Retinopathy (DR)

include myopia[4] more than 2.00D, glaucoma, posterior vitreous detachment and retinitis pigmentosa.[5]

METHODOLOGY

This cross-sectional comparative study was conducted among 60 patients with Type 2 Diabetes Mellitus who attended OPD and wards at Ophthalmology Department, Govt. Rajaji Hospital, Madurai. Subjects with valid consent, who believed to fulfil all eligibility criteria - Patients diagnosed with Type 2 Diabetes, older than 20 years of age with physiological tessellated and non-tessellated fundi and with none of the exclusion criteria - Patients with glaucoma, optic neuropathy, optic atrophy, age related maculopathy, anaemia, renal failure, hypercholesterolemia, hypertension, undergone any ocular surgeries, prior laser treatment and pregnant women were invited to participate in the study.

Ethical Committee Clearance

Ethical Committee Clearance was obtained from Institutional Review Board/Independent Ethics Committee of Govt. Rajaji Hospital.

Assessment of DR

Assessment of DR was done for all patients. All the patients with DR were examined with + 90 D lens under Slit Lamp Microscope, FFA performed and grading done as per ETDRS classification.[6] Their refractive status, axial length assessment, fundus photography, etc. was done to divide subjects into 2 groups - tessellated and non-tessellated fundi.

OBSERVATION AND ANALYSIS

Among 60 patients, 30 patients had tessellated fundus (Fig: 1), 30 patients had non-tessellated fundus. Majority of the patients are between 51 to 70 years of age. The average age group of patients presenting with DR in this study was 45 -70 years with 53% males and 47% females. Among the 60 patients 32 were myopes, 23 patients were hyperopes and 5 were emmetrope. Patients with diabetes for more than 5 years showed majority of the Proliferative Diabetic Retinopathy (PDR) or Non-Proliferative Diabetic Retinopathy (NPDR) changes.

Visual Acuity was 6/6 in 11 eyes, 6/9 to 6/18 in 54 eyes and 6/24 to 6/60 in 55 eyes. The defective vision in these patients was due to refractive error, immature cortical cataract and nuclear sclerosis and/or DR changes like clinically significant macular oedema/PDR. On fundus examination 13 patients had mild NPDR, 25 patients had moderate NPDR, 12 patients had severe NPDR, 2 patients had very severe NPDR and 5 patients had early PDR and 3 patients high risk PDR. Very severe NPDR, Early PDR and high risk PDR was 100% absent in tessellated fundus, but was 100% present in non-tessellated fundus (Table 1).

Data analysis was done with the help of computer using Epidemiological Information Package - EPI 2010, developed by Centre for Disease Control, Atlanta. Age has a significant correlation with refractive error; 'p' value 0.0005. The correlation between tessellated fundus in the severity and duration of DR; 'p' value was 0.03 is also significant. Incidence of proliferative DR was less in myopes when compared to hyperopes; 'p' value was 0.02.

Severity of Retinopathy	Type of Fundus			
	Tessellated Fundus		Normal Fundus	
	No.	%	No.	%
Mild NPDR	8	26	5	17
Moderate NPDR	15	50	10	33
Severe NPDR	7	24	5	17
Very Severe NPDR	0	0	2	6
Early PDR	0	0	5	17
High Risk PDR	0	0	3	10
Total	**30**	**100**	**30**	**100**
'p' value	**0.03 Significant**			

Table 1: Showing Distribution of Severity of Diabetic Retinopathy among our Study Subjects Grouped as With and Without Tessellated Fundus

Fig. 1: Tessellated Fundus & DR

DISCUSSION

One of the major health problems that have significant impact on socioeconomic life of individual is Diabetes Mellitus. It results in long-term damage, dysfunction and failure of target organs such as eyes, kidneys, nerves, heart and blood vessels. Diabetes mellitus is an endocrine disorder that occurs due to inadequate insulin or insensitivity of cells to insulin, classified as Type 1 IDDM (Insulin Dependent Diabetes Mellitus) or Type 2 NIDDM (Non-Insulin Dependent Diabetes Mellitus) respectively.

Glycaemic control is the fundamental for the management of diabetes as proved by Diabetes Control and Complication Trial (DCCT).[7] Multiple risk factors that have influence on development of DR such as duration of diabetes, persistent poor glycaemic control, hyperlipidaemia, hypertension, nephropathy, pregnancy anaemia, obesity, genetic factors - HLA type – DR3/DR4, intraocular surgeries, etc.

The second major cause for blindness in the world is DR. It has recently got greater attention, because when retinopathy is detected early it is potentially treatable with laser photocoagulation and blindness can be prevented. There is a significant increase in risk of visual loss in patients with delayed diagnosis.

Tessellated/tigroid fundus are dark areas seen in choroid between choroidal vessels due to atrophy of the retinal pigment epithelial layer, retinal layer thinning and prominent choroidal pigmentation.

Attenuation of arteriolar pressure is seen in patients with tessellated fundus. Pressure attenuation in retinal arterioles is directly proportional to the length and inversely proportional to the diameter of the arteriole segment. A pressure attenuation index[8] is important in light of the entities and is presumed to protect the retina from DR. The hypothesis is that low end arteriolar pressure[9] in tessellated fundus due to a low ocular perfusion pressure is a common denominator for the protective factor in DR.

CONCLUSION

From the above study conducted, it was found that Refractive error has a significant correlation with the age of the patient. Incidence of proliferative DR in tessellated fundus is low compared to non-tessellated/Hyperopic fundus. Very severe NPDR, Early PDR and HR PDR was 100% absent in tessellated fundus, but was 100% present in non-tessellated fundus. Incidence of PDR[10] was less in myopes when compared to hyperopes. Hence, tessellated fundus is a protective factor for the incidence and severity of DR.

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