

Clinical Correlation of Conjunctival Vessel Width With Grades of Retinopathy in Diabetes Mellitus

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Abstract

Background: Diabetes is a chronic, progressive, metabolic disorder which is characterised by elevated levels of blood glucose (or blood sugar) that can lead to various macrovascular (cardiovascular, cerebrovascular, and peripheral artery disease) and microvascular (diabetic retinopathy, nephropathy, and neuropathy) complications. Diabetic Retinopathy is one such complication with high socioeconomic impact. Early diagnosis and timely intervention can prevent its progression to vision threatening complications.

Purpose: to study clinical correlation between conjunctival vessel width with grades of retinopathy in diabetes mellitus.

Materials and Method: 300 eyes of 150 patients of diabetes mellitus of age group 50-70 years were examined between May2020 to July2021. Anterior segment imaging for measurement of conjunctival vessel width and Posterior segment examination for the grading of diabetic retinopathy was done. All findings were noted and statistical analysis of conjunctival vessel width with grade of retinopathy was done.

Results: The average conjunctival (most prominent temporal bulbar conjunctival) vessel width was 27.4 μ diabetic with no retinopathy and 32.6 μ in mild, 36.8 μ in moderate, 40.2 μ in severe and 43.9 μ in proliferative diabetic retinopathy. With increasing grades of diabetic retinopathy there was increase in conjunctival vessel width (p<0.001).

Conclusion: Conjunctival vessel width positively correlates with increasing grades of severity of diabetes mellitus.

Keywords: diabetes mellitus, conjunctival vessel width, retinopathy.

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Introduction

Diabetes is a chronic, progressive, metabolic disorder which is characterised by elevated levels of blood glucose (or blood sugar) that can lead to various macrovascular (cardiovascular, cerebrovascular, and peripheral artery disease) and microvascular (diabetic retinopathy, nephropathy, and neuropathy) complications affecting almost all the vital organ systems. Worldwide about 422 million people are suffering from diabetes and the majority of them belongs to low-and middle-income countries[1-4]. It has emerged as a global health emergency and it is among the top 10 leading causes of death[2] attributing to 1.5 million deaths each year directly due to diabetes[1]. Our eyes are the window to assess the end organ damage in Diabetes as it affects almost all the structures of eyes from conjunctiva to retina and optic nerve[3]. Diabetes mellitus has emerged as a leading cause of blindness either due to tractional retinal detachment or vitreous

Hemorrhage[5]. Blindness due to diabetic retinopathy is highly preventable if early detection and timely intervention is initiated.

Even after so much advancement in the field of medical sciences for effective detection and treatment of diabetes mellitus, there are still no practical means for early detection before the onset of clinical symptoms. The vascular complications related to diabetes do not present themselves until significant microvascular damages have already occurred.

Aim and Objective

The aim of this study was to measure the width of the conjunctival vessel and to correlate it with the severity of grades of diabetic retinopathy. The most prominent temporal bulbar conjunctival vessel width was measured and analysed.

Material and Method

After the approval of institutional ethics committee and informed consent of the study participants the study was conducted at a tertiary care hospital of Jharkhand between May 2020 to July 2021. This study adheres to the requirements of the Declaration of Helsinki. 150 diagnosed patients of T2DM of the age group 50-70 years were

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examined.

Inclusion criteria

1. Diagnosed case of diabetes mellitus.
2. Those who gave consent for the study.

Exclusion criteria

1. Those having media opacity obscuring posterior segment examination.
2. Those having any other ocular pathology or who did not give consent.

After taking the general and ophthalmic history and assessment of BCVA, complete ophthalmic examination was done. Slit lamp biomicroscopy of the anterior segment and fundus evaluation with indirect ophthalmoscopy was done. Patients were then classified for diabetic retinopathy based on ETDRS classification into mild, moderate, severe non proliferative diabetic retinopathy (NPDR) and proliferative diabetic retinopathy (PDR). The image of the most prominent vessel on the temporal bulbar conjunctiva was taken by the slit lamp imaging system. The image of the same was also taken using the red free filter and the width of the most prominent temporal vessel

was measured.

All the findings were noted on MS excel sheet and data was analysed using SPSS 21.0 package (SPSS Inc., Chicago, USA). The conjunctival vessel width was correlated with the severity of retinopathy and p-value < 0.05 was considered as significant.

Result

Among the 150 patients (n=150) there were 79 male and 71 females suggesting there were no significant difference in the sex distribution of the diabetic patients. Table 1 shows that majority of patients were in the age group of 50-60 years with an average duration of diabetes of 8.8±3.8 years.

Among total of 150 patients, 28 patients i.e. 9.3% had no features of diabetic retinopathy. Majority of patients had mild to moderate NPDR 55.3% (166/300 eyes), severe NPDR was seen in 21.3% and 14% of the patients had features of PDR as shown in table 2.

The average conjunctival (most prominent temporal bulbar conjunctival) vessel width was 27.4µ in diabetic with no retinopathy and 32.6µ in mild, 36.8µ in moderate, 40.2µ in severe and 43.9µ in proliferative diabetic retinopathy. With increasing grades of diabetic retinopathy an increase in conjunctival blood vessel width was observed. (p<0.001) as depicted in chart 1 and table 3.

Table 1: Age and sex distribution with average duration of diabetes

Age group of patients	Male/female	Average Duration of diabetes (in years)
51-55	24/18	7.4
56-60	38/35	9.6
61-65	15/18	15.4
66-70	2/0	21.5

Table 2: Severity of diabetic retinopathy (DR)

Severity of diabetes	Number of Eyes
No DR	28(9.3%)
Mild NPDR	78(26.0%)
Moderate NPDR	88(29.3%)
Severe NPDR	64(21.3%)
Proliferative DR	42(14.0%)

Table 3: Conjunctival vessel width and severity of DR

Conjunctival Vessel Width (in µ)	No DR	Mild DR	Moderate DR	Severe NPDR	Proliferative DR
21-25	14 (24.1%)	0	0	0	0
26-30	38 (65.5%)	24 (10.5%)	4 (5.0%)	0	0
31-35	6 (10.3%)	46 (62.2%)	26 (32.5%)	24 (35.3%)	0
36-40	0	4 (5.4%)	48 (60.0%)	36 (52.9%)	2 (10.0%)
41-45	0	0	2 (2.5%)	6 (8.8%)	16 (80.0%)
46-50	0	0	0	2 (2.9%)	2 (10.0%)

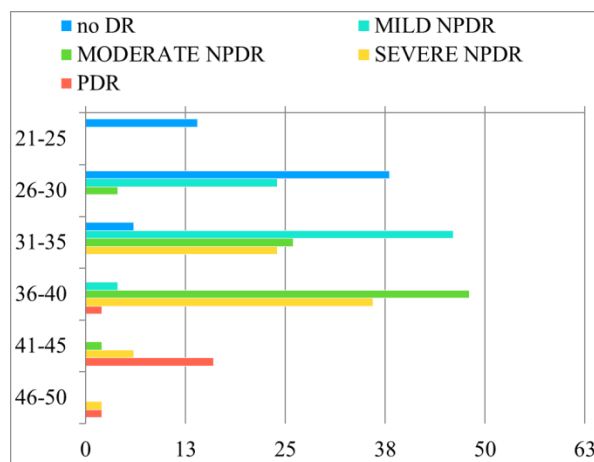


Fig. 1: Conjunctival vessel width and severity of DR

Discussion

Microvascular hemodynamic disturbances in diabetes mellitus leading to retinopathy and similar changes in the conjunctival vessels are well studied and documented [6]. Conjunctival vessels are easily visible and accessible for imaging and analysis. Role of screening and early intervention in preventing diabetes related blindness is well established by many large clinical studies like the Diabetic Retinopathy Study (DRS), the Early Treatment Diabetic Retinopathy Study (ETDRS) and National Diabetes Retinopathy Study [8,9]. However 30–50% of patients with diabetes are not screened annually and that about 10–36% of known diabetics have never had a dilated eye examination [7]. Several studies have been carried out to study the morphological changes in the conjunctival vessels of diabetic and their control subjects. Accurate quantification and quantitative analysis is now possible due to recent advances in digital photography and the association of microangiopathic changes in the retinal vessels with changes in the conjunctival vessels is studied widely [13,14].

In our study, changes in the conjunctival vessels width among type 2 diabetics with various grades of retinopathy were measured and documented using digital photography and correlated with various grades of retinopathy. In our study group, significant retinopathy was seen among those in 6th to 7th decade which corroborates with other published studies. Wild et al. showed a higher prevalence of diabetes and its complication in men as compared to women [15] which does not corroborate with our study as we found equal preponderance among both male and female as was observed by Khan MA et al. [10]. Khan MA et al. [10] conducted the study on 96 patients with type 2 diabetes mellitus and their conjunctival vessels widths and tortuous segment length were photographed and measured using Zeiss Fundus camera Visupac software. In their study they found the mean conjunctival vessel width of 40.61 μ m (SD 17.25) which uniformly increased from 34.4 μ m (SD 8.70) in mild NPDR to 53.50 μ m (SD 33.45) in the PDR group which was statistically significant ($p < 0.01$). Statistically significant increase in tortuous conjunctival vessel segment length was also noted. Similar results were observed by Rishi Sharma et al. [11] in 280 eyes of 140 patients using slit lamp imaging system for conjunctival vessel width measurement. Studies using computer-assisted intravital microscopy (CAIM) technology to study diabetic microangiopathy in the microcirculation in the bulbar conjunctiva of diabetic patients have concluded that microvascular abnormalities progress with age and the natural course of the disease [12].

Cheung et al. studied the conjunctival vessel morphology using computer assisted intravital microscopy (CAIM) and concluded significant increase in conjunctival vessel width among diabetes as compared to non diabetic controls [16]. Similar results were obtained by Lagrue et al. by conjunctival angiography [17].

Our study finding resonates with the above mentioned studies and establishes a positive correlation of conjunctival vessel width with the increasing grades of severity of DR. However, the selection bias of the patients and observer bias in selecting the most prominent bulbar conjunctival vessel cannot be ruled out, thus, limiting the generalisation of the results to a wider population.

Conclusion

Conjunctival vessel width positively correlates with the severity of diabetic retinopathy. Thus measurement of conjunctival vessel width has potential of being a marker for early diabetic microangiopathy detection. Detecting the changes of diabetic retinopathy early and timely intervention to halt the disease progression can go a long way in preventing morbidity associated with it.

Conflict of Interest: Nil Source of support: Nil

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