Section: Ophthalmology

Original Research Article

A CLINICAL STUDY OF FUNDUS FLUORESCEIN ANGIOGRAPHY IN DIABETIC MACULOPATHY

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Received : 10/04/2023
Received in revised form : 21/05/2023
Accepted : 05/06/2023

Keywords:
Maculopathy, Fundus Fluorescein Angiography, Diabetic Mellitus.

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DOI: 10.47009/jamp.2023.5.4.169

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2023; 5(4); 839-842

Abstract

Diabetic maculopathy is a common complication of diabetes mellitus and a leading cause of visual impairment. Fundus fluorescein angiography (FFA) is a valuable diagnostic tool for evaluating the vascular changes in the macula and guiding treatment decisions. This clinical study aimed to investigate the role of FFA in the assessment and management of diabetic maculopathy. A total of 50 patients with diabetic maculopathy were enrolled in this prospective study conducted in the department of Ophthalmology at Darbhanga Medical College & Hospital, Bihar During the period November 2021 to October 2022. FFA was performed to assess the retinal vasculature, identify macular ischemia, and aid in the determination of suitable therapeutic interventions. In terms of gender distribution, male patients accounted for approximately 72% of the study population, while females represented 28%. The higher proportion of male participants may be reflective of the general gender distribution in diabetic maculopathy cases, although further investigations are required to understand the underlying factors influencing this distribution. The mean duration of diabetes among the participants was 7.45 years, with a standard deviation of 3.44 years. it was interpreted that 45 patients (90%) had visual acuity of 6/12 or worse in at least one eye. The mean value of post prandial blood glucose and HbA1C level of the patients. The mean value of post prandial blood glucose level was 127.44 mg/dl. It was foundthatmaximumpost prandial blood glucose level was 216.0 mg/dl and minimum was 71.0 mg/dl. In case of HbA1C the mean value was 8.6%. maximum and minimum HbA1C level found in this study was 10.1% and 5.8% respectively. This clinical study provides valuable insights into the demographic characteristics, clinical profiles, and angiographic findings of patients with diabetic maculopathy. The high prevalence of visual impairment, along with the variations in types of maculopathy related to gender, type of diabetes, and duration, underscores the importance of early diagnosis and effective management strategies. The findings call for continued efforts in optimizing glycemic control and timely interventions to improve visual outcomes and enhance the quality of life for patients with diabetic maculopathy.

INTRODUCTION

Diabetes mellitus is a systemic metabolic disorder characterized by chronic hyperglycemia, which can lead to various ocular complications, including diabetic maculopathy.[1] Diabetic maculopathy involves vascular changes in the macular region and can lead to visual loss or impairment. Early detection and appropriate management are crucial to prevent irreversible vision loss.[2,3] Fundus fluorescein angiography (FFA) is a non-invasive imaging technique that provides dynamic visualization of the retinal blood vessels and allows clinicians to detect subtle vascular changes in the macula. FFA has become an essential tool in the assessment and management of diabetic maculopathy due to its ability to identify macular ischemia, leakages, and neovascularization. This clinical study aims to evaluate the utility of FFA in diagnosing and guiding therapeutic decisions in patients with diabetic maculopathy.[4]

MATERIALS AND METHODS

This prospective clinical study included 50 patients diagnosed with diabetic maculopathy between November-2021 to October 2022. The study was

ISSN(O): 2687-5365; ISSN(P): 2753-6556

conducted at Darbhanga Medical College & Hospital.

Inclusion Criteria

1. Patients aged 18 years or older.
2. Confirmed diagnosis of diabetes mellitus.
3. Diabetic maculopathy diagnosed based on clinical examination and optical coherence tomography (OCT) findings.

Exclusion Criteria

1. History of prior retinal laser therapy or intravitreal injections.
2. Presence of other retinal pathologies that could confound the diagnosis.
3. Inability to undergo FFA due to allergy to fluorescein dye.

All enrolled patients underwent a comprehensive ophthalmic examination, including best-corrected visual acuity (BCVA) measurement, slit-lamp biomicroscopy, and dilated fundus examination. OCT was performed to assess macular thickness and morphology.

FFA was performed using a digital fundus camera equipped with a fluorescein filter. After the intravenous injection of 5 mL of 10% sodium fluorescein dye, serial images of the retinal vasculature were captured during the arterial, venous, and late phases.

RESULTS

In terms of gender distribution, male patients accounted for approximately 72% of the study population, while females represented 28%. The higher proportion of male participants may be reflective of the general gender distribution in diabetic maculopathy cases, although further investigations are required to understand the underlying factors influencing this distribution. The mean duration of diabetes among the participants was 7.45 years, with a standard deviation of 3.44 years. The relatively short duration of diabetes in the study population could suggest that the patients were diagnosed with diabetic maculopathy in the early stages of the disease.

From the [Table 2], it was interpreted that 45 patients (90%) had visual acuity of 6/12 or worse in at least one eye.

The mean value of post prandial blood glucose and HbA1C level of the patients. The mean value of post prandial blood glucose level was 127.44 mg/dl. It was foundthatmaximumpost prandial blood glucose level was 216.0 mg/dl and minimum was 71.0 mg/dl. In case of HbA1C the mean value was 8.6%. maximum and minimum HbA1C level found in this study was 10.1% and 5.8% respectively. [Table 3]

From [Table 4] it was found that 26 (52%)patients had Hypertension, 31 (62%) patients had Nephropathy and 13(26%) patients had Neuropathy.

[Table 5] showed the angiographic findings of the patients.All the 50 patients were having diabetic maculopathy.Among them 21(42%) patients had Focal maculopathy, 22(44%) patients had diffuse maculopathy, 5(10%) patients had Ischaemic maculopathy and 2(4%) patients presented with both focal type in one eye and diffuse type in other eye.

[Table 6] shows the relationship of maculopathy with type of diabetes. In Type I DM therewere 2 cases of focal,7cases of diffuse and 1 cases of ischaemic maculopathy were seen.In Type II DM there were 19 cases of focal,15 cases of diffuse,2 cases presented with both focal maculopathy in one eye and diffuse maculopathy in other eye and 4 cases presented with ischaemic maculopathy.

[Table 7] shows the relationship between type of maculopathy and duration of diabetes. The duration of diabetes was divided into 5 groups i.e. 0-5 years, 6-10 years, 11-15 years, 16-20 years and >20 years duration.0-5 years duration group consisted 3 patients of focal maculopathy and 1 patient of diffuse maculopathy. 6-10 years duration group consisted 11 and 4 patients of focal and diffuse maculopathy respectively and 1 patient presented with both focal maculopathy in one eye and diffuse maculopathy in other eye. 5 patients of focal maculopathy and 9 patientsof diffuse maculopathy belonged to 11-15 years duration group and 1 patient presented with both focal maculopathy in one eye and diffuse maculopathy in other eye. 16-20 years duration group consisted 2,6 and 3 patients of focal, diffuse and ischaemic maculopathy respectively. More than 20 years duration group had 2 patients each who had diffuse maculopathy and ischaemic maculopathy.

Table 1: Demographic Characteristics of Study Population

Characteristic	Mean ± SD	Percentage
Age (years)	62.32 ± 8.55	-
Gender		
Male	72.0	72%
Female	28.0	28%
Duration of Diabetes	7.45 ± 3.44	-

Table 2: Visual acuity of the patients studied.

Visual acuity	RE	LE
6/6	5	3
6/9	11	12
6/12	11	12
6/18	15	5
6/24	0	5
6/36	7	10

ISSN(O): 2687-5365; ISSN(P): 2753-6556

6/60	1	2
Worse than 6/60	0	1

Table 3: Mean value of Post Prandial Blood Glucose & HbA1c

Post Prandial Blood Glucose & HbA1c Level	Minimum	Maximum	Mean
Post Prandial Blood Glucose	71.0 mg/dl	216.0 mg/dl	127.44
HbA1c	5.8%	10.1 %	8.60

Table 4: The following AssociatedSystemic Findings were present

Cases	No of Patients(n=50)	Percentage (%)
Hypertension	26	52
Nephropathy	31	62
Neuropathy	13	26

Table 5: Angiographic findings

Angiographic findings	No of Patients(n=50)	Percentage (%)
Focal maculopathy	21	42
Diffuse maculopathy	22	44
Focal maculopathy along with Diffuse maculopathy	2	04
Ischaemic maculopathy	5	10
Total	50	100

Table 6: Relationship of Maculopathy with Type of Diabetes

Type of Maculopathy	Type I DM	Type II DM
Focal	2	19
Diffuse	7	15
Focal maculopathy along with Diffuse maculopathy	0	2
Ischaemic	1	4
Total	10	40

Table 7: Relationship between type of Maculopathy and duration of Diabetes.

Maculopathy	0-5 years	6-10 years	11-15 years	16-20 years	> 20 years
Focal	3	11	5	2	0
Diffuse	1	4	9	6	2
Focal maculopathy along with Diffuse maculopathy	0	1	1	0	0
Ischaemic	0	0	0	3	2

DISCUSSION

In this study 50 cases of diabetic maculopathy evaluated. Out of 50 cases there were 27 males sex ratio of Male: Female in this study was 1:1.73 it has been mentioned thatout of 50 cases observed in this study 10 patients were found to have Type 1 diabetes mellitus and 40 patients were found to have Type 11 diabetes mellitus.

From the Wisconsin Epidemiologic study of Diabetic Retinopathy it was concluded that

a) The duration of Type I and Type II diabetes is a risk factors for diabetic retinopathy.

b) Diabetes duration of 10 years has 77.4% sensitivity for detecting the presence of retinopathy in Type I diabetic.

Also from the Knopia University study,[5] Finland it was concluded that the frequency of maculopathy inType II diabetes was low at the time of diagnosis, but increased sharply after 5 years of the disease and at the 10 years examination.

the cluster of cases starts at 0-5 years age group and starts increasing as the duration of diabetes increases with peak between 6-15 years age group. There after it declines but this may be due to the fact that after 20 years we get a reduction in the number of cases as the life expectancy gets crossed in that age group.

The average duration of diabetes found in this study is 12.224 years and SD value was ±5.70 years. The data is significantly on its higher side. Hence duration of diabetes is a major risk factor for the development of diabetic maculopathy (statistically significant, $p<0.01$).

Severe loss of vision (SLV) was defined as visual acuity <6/60, at two consecutively completed 4-months follow-up visits (Diabetic Retinopathy Study) whereas moderate loss of vision (MLV) is doubling of visual angle at 2 consecutively completed visits 4-months apart (ETDRS).In the present study from Table no-4, it is evident that only 4 patients presented with visual acuity ≤6/60 with cluster of cases having visual acuity between 6/9 to 6/36.

Hence it can be concluded that diabetic maculopathy patients presents with moderate loss of vision (MLV).

A number of studies were conducted including the DCCT, The Stockholm Diabetes intervention study. The Kumamoto study, the UKPDS and the WESDR, to show the correlation between diabetic retinopathy and glycaemic control and it was concluded that elevated blood glucose measured by glycated haemoglobin is the strongest risk factor for predicting the incidence and progression of retinopathy, regardless of diabetic type.

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ISSN(O): 2687-5365; ISSN(P): 2753-6556

to show the correlation between diabetic retinopathy and glycaemic control and it was concluded that elevated blood glucose measured by glycated haemoglobin is the strongest risk factor for predicting the incidence and progression of retinopathy, regardless of diabetic type.

In this study the average glycosylated haemoglobin (HbA1c) is 8.6% (normal <7.3%) which signifies that the studied patients had poor glycaemic control which was mentioned in [Table 5].

Most (eg. HDS/UKPDS study, The EUCLID study, the WESDR) studies report an association of hypertension and retinopathy. There was a continuous relationship between the risk of diabetic retinopathy and systolic blood pressure (> 130 mm Hg) observed in the UKPDS. In both the 4 and 10 years follow-up studies of the WESDR, increased systolic blood pressure (independent of other risk factors), predicted proliferative diabetic retinopathy in people with Type I but not Type 2 diabetes. In both types of diabetes elevated diastolic blood pressure was a risk factor for macular edema and elevated systolic blood pressure was a risk factor for loss of vision. In conclusion, elevated blood pressure is an independent risk factor for any retinopathy, macular edema, and loss of vision in both Type I, & Type 2 diabetes [87-89] and for proliferative retinopathy is Type I diabetes.[6]

Relationship of maculopathy with Type of Diabetes

cases with Type II diabetes mellitus are more prone to develop diabetic maculopathy than Type I diabetes mellitus ($P < 0.05$). This rejects the null hypothesis at 5% level of confidence but there is no correlation between type of diabetes and type of diabetic maculopathy. it was seen that diffuse and ischaemic maculopathy occurs more as duration of diabetes increases as compared to focal maculopathy.

CONCLUSION

This clinical study provides valuable insights into the demographic characteristics, clinical profiles, and angiographic findings of patients with diabetic maculopathy. The high prevalence of visual impairment, along with the variations in types of maculopathy related to gender, type of diabetes, and duration, underscores the importance of early diagnosis and effective management strategies. The findings call for continued efforts in optimizing glycemic control and timely interventions to improve visual outcomes and enhance the quality of life for patients with diabetic maculopathy. Further research and larger-scale studies are warranted to better understand the underlying mechanisms and risk factors contributing to the observed associations.

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ISSN(O): 2687-5365; ISSN(P): 2753-6556