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TEAR FILM EVALUATION IN CASES OF PARKINSON'S DISEASE

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ABSTRACT

AIM: To evaluate tear film status in cases of Parkinson's Disease and compare with a study group

METHODS: 50 patients of Parkinson's Disease and 50 age-gender matched controls were included in this study. Both groups underwent detailed history regarding dry eye symptoms,tear film evaluation using slit-lamp bio-microscopy, fluorescein staining, tear meniscus height, tear breakup time, Schirmer test, blink rate. Statistical analysis was done with Statistical Package for Social Sciences [SPSS] - Version 22.0 Released 2013 version

RESULTS: There was a significant difference between the various groups in terms of distribution of Meibomian Gland Disease 72.0% of the Case group as compared to 40% of control group had Meibomian Gland Disease,There was a significant difference between the various groups in terms of distribution of Tear Meniscus Height <0.25Mm , Case group had the larger proportion of Tear Meniscus Height of <0.25Mm .There was a significant difference between the various groups in terms of distribution of Tear Breakup Time <5 Sec, Schirmer's Test <5Mm in 5Min and Blink Rate <10 .There was no significant difference between the various groups in terms of distribution of corneal Staining and dry eye symptoms.

CONCLUSION: The study concluded that patient of Parkinson's disease had higher dry eye symptoms and Meibomian gland disease Also they have reduced Tear miniscus height,Tear film break up time,Schirmer test I and Blink rate

KEYWORDS : Parkinson's disease,schirmer's test,meibomian gland disease

INTRODUCTION

Parkinsons Disease (PD) is a neurodegenerative disorder characterised by motor symptoms like bradycardia, cog wheel rigidity and resting tremors[1].It is also associated with non motor abnormalities like cognitive and autonomic dysfunction, sleep and mood disorders all affecting the quality of life[2].

Dry eye is a frequently encountered entity in PD due to reduced rate of blinking which is an important and necessary process for the proper distribution of tears on the ocular surface and the prevention of tear evaporation[3].

Seborrhea is also a common entity in PD which causes meibomian gland dysfunction and subsequently lipid layer abnormality in the tear[4].

Therefore, age, reduced blinking rates, seborrhea and meibomian gland dysfunction all contribute to the increased frequency of evaporative dry eye in PD.Apart from evaporative problems of the tear film, studies have also demonstrated reduced tear secretions, probably due to autonomic dysfunction of the lacrimal gland[5].

According to The Dry Eye Workshop Study II (DEWS II) report updated the definition of dry eye as follows: "Dry eye is a multifactorial disease of the ocular surface characterized by a loss of homeostasis of the tear film, and accompanied by ocular symptoms, in which tear film instability and hyperosmolarity, ocular surface inflammation and damage, and neurosensory abnormalities play etiological roles"[6].

This study evaluates tear film function in PD and age matched healthy control group by assessing Schirmer's test, tear meniscus height, tear breakup time, meibomian gland evaluation, fluorescein staining and blink rate.

AIM OF THE STUDY:

To evaluate tear film status in cases of Parkinsons Disease and compare with a study group

MATERIALS AND METHODS:

Study design: Observation cross-sectional study.

Duration of study: January 2019 to November 2020

Study Setup: The study was conducted in the department of ophthalmology OPD and the department of Neurology OPD.

Sample size: 50 Parkinson's Disease and 50 age and gender-matched healthy control group.

INCLUSION CRITERIA:

A diagnosed case of Parkinson's Disease fulfilling the United Kingdom Brain Bank criteria taking anti-Parkinson therapy.

Age group of 40-80 years.
Ability to give written informed consent.

EXCLUSION CRITERIA:

Other Anterior segment disease
Ocular surgery
Other Neurological disease or drug therapy
A Written, and informed consent was taken from the patient.

50 patients of Parkinson's Disease and 50 age-gender matched controls were included in this study.

Patients from neurology OPD who satisfied the United Kingdom Brain Bank criteria for the clinical diagnosis of idiopathic Parkinson's Disease were included.

Both groups underwent tear film evaluation using slit-lamp biomicroscopy, fluorescein staining, tear meniscus height, tear breakup time, Schirmer test, blink rate and data was incorporated into a logistic regression model to predict changes in two groups.

Dry eye symptom-
assessment-dryness, grittiness, ocular fatigue, redness, and soreness.

Meibomian gland evaluation(MGD) -was graded with slit-lamp biomicroscopy

Table1: MGD Grading

Grade 1	1-2 blocked MG
Grade 2	3-4 blocked MG with thick secretions
Grade 3	Half of the glands blocked/stenosed
Grade 4	>Half of the glands blocked/stenosed

Tear meniscus height evaluation- Tear meniscus height measurements (millimeters) were made using the variable beam height on the slit-lamp biomicroscope - < 0.25mm abnormal

Tear film breakup time and fluorescein staining was done using fluorescein strips with non preserved saline drop .TBUT of < 5 seconds- Abnormal

The **Schirmer's test** was performed with Whatman 41 strips without anesthetic drops (5 minutes, closed eye) and the strip was placed over the inferior lid margin towards the lateral canthus <5 mm in 5 minutes for Schirmer's test was considered abnormal.

STATISTICALANALYSIS

Statistical Package for Social Sciences [SPSS] - Version 22.0 Released 2013.Descriptive analysis of the explanatory and outcome parameters was done using frequency and proportions for categorical variables. The mean, and Standard Deviation(SD) was used for continuous variables. The Chi-Square Test was used to compare different study variables on categorical distribution.Mann Whitney test was used to compare the mean scores of different study variables with continuous distribution.Kruskal Wallis test was used to compare mean scores of different scales of important study variables within each study group.The confidence interval was set at 95%. The level of significance in the study was set at P value <0.05.

RESULTS

ASSOCIATION BETWEEN GROUPAND AGE

Table2: Comparision Of Age Distribution Among Study And Control Groups

AGE GROUPS	GROUP			FISHER'S EXACT TEST	
	CASE	CONTROL	TOTAL	χ 2	P VALUE
41-50YRS	6(12%)	7(14%)	13(13%)	0.410	1.000
51-60YRS	23(46%)	23(46%)	46(46%)		
61-70YRS	19(38%)	19(38%)	38(38%)		
71-80YRS	2(4%)	1(2%)	3(3%)		
TOTAL	50(100%)	50(100%)	100(100%)		

There was no significant difference between the various groups regarding the Age Group's distribution ($\chi2 = 0.410$, $p = 1.000$)

Table3: Gender Distribution Among Groups, disease Duration, Disease Severity

Gender	Group			Chi-Squared Test	
	CASE	CONTROL	TOTAL	χ2	P VALUE
Male	24 (48.0%)	24 (48.0%)	48 (48.0%)	0.000	1.000
Female	26 (52.0%)	26 (52.0%)	52 (52.0%)		
Total	50 (100.0%)	50 (100.0%)	100 (100.0%)		
Disease duration (Avg. in years)	4.5 ± 3.5	NA	NA		
UPDRS Severity Score(Avg.)	25±9.5	NA	NA		

There was no significant difference between the various groups in terms of the distribution of gender ($\chi2 = 0.000$, $p = 1.000$).

Table 4:Association Between Group And Dry Eye Symptoms

Dry Eye Symptoms	Group			Chi-Squared Test	
	Case	Control	Total	χ2	P value
Yes	17(68.0%)	14(56.0%)	31(62%)	0.764	0.382
No	8(32.0%)	11(44.0%)	19(38.0%)		
Total	25(100.0%)	25(100.0%)	50(100.0%)		

There was no significant difference between the various groups in terms of distribution of Dry Eye Symptoms ($\chi2 = 0.764$, $p = 0.382$).

Table5:Association Between Group And Meibomian Gland Disease

Dry Eye Symptoms	Group			Chi- Squared test	
	Case	Control	Total	χ2	P value
Yes	18 (72.0%)	10 (40.0%)	28 (56.0%)	5.195	0.023
No	7 (28.0%)	15 (60.0%)	22 (44.0%)		
total	25 (100.0%)	25 (100.0%)	50 (100.0%)		

There was a significant difference between the various groups in terms of distribution of Meibomian Gland Disease ($\chi2 = 5.195$, $p = 0.023$).

72.0% of the Case group as compared to 40% of control group had Meibomian Gland Disease

Table6:Association Between Group And Tear Meniscus Height <0.25mm

Tear Meniscus Height <0.25Mm	Group			Chi-squared test	
	Case	Control	Total	χ2	P value
Yes	18 (72.0%)	10 (40.0%)	28 (56.0%)	5.195	0.023
No	7 (28.0%)	15 (60.0%)	22 (44.0%)		
Total	25 (100.0%)	25 (100.0%)	50 (100.0%)		

There was a significant difference between the various groups in terms of distribution of Tear Meniscus Height <0.25Mm ($\chi2 = 5.195$, $p = 0.023$).

Group: Case had the larger proportion of Tear Meniscus Height of <0.25Mm

Table7: Association Between Group And Tear Break Up Time <5sec

Tear Breakup Time <5 Sec	Group			Chi-Squared Test	
	Case	Control	Total	χ2	P value
Yes	16 (64.0%)	9 (36.0%)	25 (50.0%)	3.920	0.048
No	9 (36.0%)	16 (64.0%)	25 (50.0%)		
Total	25 (100.0%)	25 (100.0%)	50 (100.0%)		
TBUT(Second)	8.54±4.99	12.11±2.66			0.022

There was a significant difference between the various groups in terms of distribution of Tear Breakup Time <5 Sec ($\chi2 = 3.920$, $p = 0.048$).

Table 8: Association Between Group And Schirmer's Test<5mm In 5min

Schirmer'S Test <5Mm In 5Min	Group			Chi-Squared Test	
	Case	Control	Total	χ2	P value
yes	16 (64.0%)	7 (28.0%)	23 (46.0%)	6.522	0.011
No	9 (36.0%)	18 (72.0%)	27 (54.0%)		
Total	25 (100.0%)	25 (100.0%)	50 (100.0%)		
Schirmer test 1 (mm)	8.25±5	18.16±3.5			0.01

There was a significant difference between the various groups in terms of distribution of Schirmer'S Test <5Mm In 5Min ($\chi2 = 6.522$, $p = 0.011$).

Table9: Association Between Group And Blink Rate <10

Blink Rate <10	Group			Chi-Squared Test	
	Case	Control	Total	χ2	P value
Yes	15 (60.0%)	4 (16.0%)	19 (38.0%)	10.272	0.001
NO	10 (40.0%)	21 (84.0%)	31 (62.0%)		
Total	25 (100.0%)	25 (100.0%)	50 (100.0%)		
Blink rate (Blinks/ min)	9.5±5	16.50±6.5			0.001

There was a significant difference between the various groups in terms of distribution of Blink Rate <10 ($\chi2 = 10.272$, $p = 0.001$).

Table10: Association Between Group And Corneal Staining

Corneal Staining	Group			Fisher's Exact Test	
	Case	Control	Total	χ2	P Value
Yes	5 (20.0%)	1 (4.0%)	6 (12.0%)	3.030	0.189
No	20 (80.0%)	24 (96.0%)	44 (88.0%)		
Total	25 (100.0%)	25 (100.0%)	50(100.0%)		

There was no significant difference between the various groups in terms of distribution of Corneal Staining ($\chi2 = 3.030$, $p = 0.189$).

DISCUSSION

In the present study the mean age group were between 51-60 years for case and control group.

Female group (52%) exceeded slightly than male group (48%)

68% of PD group has symptoms of dry eye as compared to 56% in control group.

72% of PD group had Meibomian gland disease and tear meniscus height of <0.25mm as compared to 40% in control group (p value : 0.023)

The TBUT , Schirmer test and Blink Rate were significantly reduced in PD patients .

Biousse et al demonstrated that Blink rate with tear film breakup time were significantly decreased in PD with a significantly high dry eye symptoms, whereas Schirmer's test and rose bengal staining results did not significantly differ from those of the controls [7].

Karson et al. reported that blink rate were decreased in patients with advanced PD however, were relatively normal in patients with mild disability[8].

20% of PD group had corneal staining as compared to only 4% in control group. (p value : 0.189)

Reddy et al. reported that reduced BR might be caused by reduced corneal sensitivity in PD patients[9]

There are different theoretical explanations for dry eye development in PD.

1. The autonomic dysfunction may affect the tear secretion and meibomian gland excretion of PD patients probably due to deposition of Lewy bodies at sympathetic and parasympathetic ganglia as well as substantia nigra[10]
2. Reduced blink rate causing tear film layer disruption, evaporation and dry eye[9]

CONCLUSION :

The study concluded that patient of Parkinsons disease had higher dry eye symptoms and Meibomian gland disease
Also they have reduced
Tear miniscus height
Tear film break up time
Schirmer test I and
Blink rate.

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