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Ophthalmology

A STUDY OF MACULAR FUNCTION IN EYES WITH MACULOPATHIES USING AMSLER'S GRID TEST

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ABSTRACT

INTRODUCTION: There are several tests to evaluate macular functions. In present era of technology driven diagnostic testing, there appears to be less utilization of simpler and cost effective clinical tests. This study was undertaken to evaluate macular function by Amsler's grid in eyes with and without Maculopathies.

AIM: Study various Maculopathies using Amsler's grid.

METHODOLOGY: This study was conducted on 389 eyes with maculopathies and 400 normal eyes. A detailed ophthalmic and macular examination with Amsler's grid was performed in all cases.

RESULTS: Maculopathy was commonly observed in age group of 41 to 50 years with a higher prevalence amongst males. 18 types of maculopathies were found in the study, Dry ARMD(25.15%) and Diabetic Maculopathy(8.9%) were most common. Amsler's grid was positive in 65 eyes (16.2%) out of 389 eyes with Maculopathy.

CONCLUSION: Amsler's grid is an useful indicator in early diagnosis of Maculopathies.

KEYWORDS : Macula, Amsler's Grid, Maculopathy

INTRODUCTION

A variety of ocular diseases of the eye gain importance from the fact that they often affect visual function. Macular area of the retina is responsible for many visual functions which include form vision, colour vision, photopic vision and contrast sensitivity. Thus disorders affecting the macular area can cause degradation of vision, ranging from reduction in visual acuity, image distortion, and decreased contrast sensitivity, to gross impairment of central vision. Photopic vision is subserved by retinal cones which constitute 5% of photoreceptors and are located mainly in the macular area. The size and density of the cones in this area impact retinal image resolution. Diameter of each cone is 0.006mm. Density of cones is greatest in the foveal area exceeding 1,40,000 cones/mm^2.[1],[2]

When fewer cones are stimulated, the brain interprets this as a smaller size of image (micropsia), while stimulation of greater numbers of cones is interpreted as occurring due to a larger image size (macropsia). The lack of density of cones in a given area may occur due to separation of the cones by oedema. Similarly, the edges of an oedamatous lesion shows crowding of cones. Thus a patient may suffer from micropsia, macropsia and/or waviness of lines (metamorphopsia). If the sparsity of cones is very great, no image is perceived in that area, resulting in a scotoma. These signs may be detected by examination of the central fields using an Amsler's grid.

Some of the common diseases which can affect the macula include Age related macular degeneration(ARMD), Diabetes mellitus, post operative Cystoid macular oedema, Central serous chorioretinopathy and Bull's eye maculopathy.

The Amsler's grid is simple test of macular function. Amsler's chart was first described in 1947 by Swiss ophthalmologist Marc Amsler and are thought to have been inspired by a grid designed by Landolt.[3],[4] The complete set of Amsler's charts consists of seven plates. It is kept at a distance of 28-30 cms with the patient wearing his near correction and the patient is asked a series of structured questions while viewing the grid.[5] Despite the fact that it is easy to perform and is readily available for clinical use, it is underutilized. This study was conducted to assess macular function in different diseases of macula by using the Amsler's grid.

MATERIALS AND METHODS

This is a comparative, clinical, observational, cross sectional study which was duly approved by the institutional ethics committee. It was carried out in Ophthalmology Department of a Medical College and teaching hospital during the period August 2011-July 2013. Written informed consent was obtained from participants, prior to enrolment in the study.

Inclusion criteria:

- Male and female subjects above 20 years of age
- Subjects with a diagnosis of Maculopathy
- Persons under treatment with drugs known to cause macular toxicity e.g. antitubercular drugs, chloroquine therapy
- An equal number of age and gender matched subjects with normal eyes were enrolled as controls

Exclusion criteria:

Individuals with media opacities, neurophthalmic disorders and glaucoma

Demographic data, detailed history and clinical examination findings was captured on a predetermined proforma. All participants underwent a detailed ocular examination of both eyes. Amsler's grid using Standard chart number 1 (conventional white-on-black grid) with its standard questionnaire - technique of testing was done.

Questionnaire[9]:

- Do you see central white spot?
- Do you see 4 corners of big square?
- Do you notice any interruption in the network?
- Do you see all vertical and horizontal lines straight?
- Do you see movements or vibrations of lines, or anything shining, or colour tint?
- If there is blur or distortion, how far from the central spot and what about its size?

Results were tabulated and statistically analyzed using Fischer's exact test and Chi Square Test to ascertain association between the various parameters. A p-value of <0.05 was considered statistically significant. The data analysis is done using SPSS (Statistical package For social sciences) for Windows, version17, was used for analysis.

RESULTS

A total of 411 participants from ages ranging from 21 to 84 years, mean age being 55.29 years. Group-A comprised of 211 participants (123 males and 88 females) with maculopathies. A total of 178 patients had bilateral involvement of the eyes while 33 had unilateral involvement(389 eyes). Group-B comprised of 200 patients (101 males and 99 females) with normal eyes (400 eyes).

Table 1: Types of Maculopathies

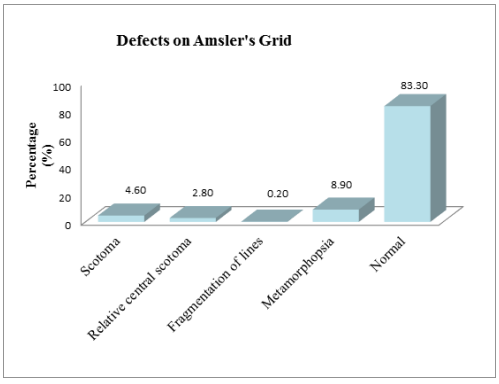
Type of Maculopathy	Number of patients	Percent
BRVO with Macular Oedema	4	0.5
Cellophane Maculopathy	3	0.4
CNVM	1	0.1
CSCR	2	0.3
CSME	56	7.1
CME	6	0.8
Diabetic Maculopathy	70	8.9
Dry ARMD	198	25.1

Juxtafoveal Telangiectasia	2	0.3
Macular Detachment	4	0.5
Macular Dystrophy	8	1.0
Macular Fan (Gr IV HTR)	2	0.3
Macular Haemorrhage	3	0.4
Macular Hole	3	0.4
Macular Pucker	1	0.1
Macular Scar	17	2.2
Myopic Macular Degeneration	4	0.5
Wet ARMD	5	0.6
Total	389	100

Table 2: Amsler's grid in Group A and B patients

Group	Type of Maculopathy	Amsler's grid		Total
		Normal	Abnormal	
Group-A	BRVO with Macular Oedema	1	3	4
	DRY ARMD	183	15	198
	Juxtafoveal Telangiectasia	2	0	2
	Cellophane Maculopathy	2	1	3
	Diabetic Maculopathy	68	2	70
	Macular Dystrophy	5	3	8
	Macular Hole	2	1	3
	Macular Pucker	0	1	1
	CNVM	0	1	1
	CSCR	0	2	2
	CSME	43	13	56
	CME	3	3	6
	Macular Detachment	0	4	4
	Macular Fan (Gr IV HTR)	0	2	2
	Macular Haemorrhage	1	2	3
	Total	327	63	389
Group-B	Normal Macula	398	2	400
	Total	398	2	400

Graph 1: Defects on Amsler's Grid in Group-A



DISCUSSION

411 patients were enrolled in the study out of which 211 patients (123 males and 88 females) with Maculopathy (389 eyes) were allotted to Group-A and 200 patients (101 males and 99 females) without any clinical evidence of Maculopathy (400 eyes) were allotted to Group-B. The ages of the patients ranged from 21- 84 years and the mean age was 55.29 years. The prevalence of Maculopathy was greatest (37%) in the 41-50 years age group.

In Group-A, the various types of Maculopathies seen in the study were ARMD dry(25%) and wet(0.6%), Diabetic maculopathy with and without CSME (7.1%% and 8.9% respectively), Cystoid macular oedema (0.8%), CSCR (0.3%), CNVM (0.1%), Myopic macular degeneration (0.5%), BRVO with macular odema (0.5%), Juxtafoveal telangiectasia (0.3%), Serous macular detachment (0.5%), Macular dystrophy (1%), Macular fan in Grade IV Hypertensive retinopathy (0.3%), Cellophane maculopathy (0.4%), Macular haemorrhage in anemic retinopathy (0.4%), Macular hole (0.4%), Macular scar (2.2%) and Macular pucker (0.1%).

The majority of cases had dry ARMD (25.1%) followed by Diabetic maculopathy without CSME (8.9%) and with CSME (7.1%). Eyes with CNVM and Macular pucker (0.1% each) had the least occurrence.

The macular function was assessed by using Amsler's grid number 1 chart performed on individual eyes.

Amsler's grid revealed defects in 65 eyes in Group-A patients. The most common defect was Metamorphopsia (8.9%). The sensitivity of the test was 16.2 %. One individual with high myopic astigmatism had a clinically appearing normal macula, but identified fragmentation of lines on Amsler's grid. To the best of our knowledge, such a finding has not yet been reported in literature, so far.

The sensitivity of Amsler's grid has been reported in other studies carried out by Anat Lowenst, Rafael Malach ein et al[6], Eva Chamorrow, Juan Cedrún et al[7] and Edoardo Midena, Claudia Delgi Angeli[8] to be higher than that found in the present study. However this may be attributed to the restricted group of maculopathies that were included in the studies.[6],[7],[8]

In 2003, Anat Lownstein, Rafael Malach et al[6] studied central field defects in eyes with and without maculopathy using the Amsler's grid. In 108 eyes with AMD and 102 eyes of 51 patients with no overt evidence of retinal disease, it was observed that of 32 patients of CNV, 11 (34%) were found positive on Amsler's grid. Of 23 patients with Geographic atrophy, 7 (30%) were found positive on Amsler's grid. Of 35 patients with AMD with High risk characteristics, 3 (9%) were found positive on Amsler's grid. Of 18 early AMD patients, 3 (17%) were positive on Amsler's grid. Of the 51 controls, 1 (2%) were positive on Amsler's grid. The sensitivity of Amsler's chart for detection of AMD varied between 9% in early AMD and 34% in late AMD with choroidal neovascularization. This higher sensitivity is in contrast with the findings of the present study, wherein the use of Amsler's grid could pick up field defects in only 16.20% patients with maculopathies.

In 2010, Eva Chamorro, Juan Cedrún et al[7] compared the sensitivity of preferential hyperacuity perimeter with that of the Amsler grid in their ability to detect age-related macular degeneration. The Amsler's grid detected central field defects in 86 % of cases with AMD.

In 1997, Edoardo Midena, Claudia Delgi Angeli[8] studied macular function impairment in 47 patients with early AMD. They found that the Amsler's grid had a sensitivity of 36% to diagnose early ARMD.

CONCLUSION

From the present study of 789 eyes it is concluded that Maculopathies had a higher prevalence amongst males (M:F =1.4:1). Maculopathy was commonly observed in the age group of 41 to 50 years (37%). Dry ARMD (25.1%) & Diabetic maculopathy without CSME (8.9%) were the most prevalent forms of maculopathies in this study. Amsler's grid was positive in 65 eyes with maculopathies. Sensitivity of Amsler's grid is 16.20% in this study. There was a statistically significant correlation between the test and presence of maculopathy ($p<0.001$).

This study suggests that even though the sensitivity of Amsler's grid is low, it is easily available and easy to perform and is not time consuming.

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