Macular disorders: study of demographic patterns and management trends

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Abstract

Background: Macular disorder is the major cause of visual impairment, which is an important complaint and requires immediate attention. If untreated it affects the quality of life of the patient significantly. Various macular disorders constitute a major part of our clinical practice.

Objective: To compare different management modalities with respect to therapeutic outcomes and cost effectiveness.

Methods: This prospective longitudinal hospital based study was conducted in Department of Ophthalmology. 111 patients attending the Retina clinic during the study period were included in the study. Detailed history and investigations were recorded. Data was entered in MS excel worksheet and analyzed using proportions.

Results: There is highly significant association between the age of the patient and the presenting macular disorder, and most of the macular disorders present in older age. The overall effect of use of either avastin or lucentis in patients of Neovascular ARMD is increase in visual acuity and visual improvement with the use of lucentis is slightly better than that with the use of avastin. But avastin is more cost effective than lucentis. Macular hole surgery for idiopathic macular hole has better visual outcome as compared to observation alone and is more cost-effective than observation.

Conclusion: The overall effect of use of either avastin or lucentis in patients of Neovascular ARMD is increase in visual acuity and visual improvement with the use of lucentis is slightly better than that with the use of avastin. But avastin is more cost effective than lucentis.

Key words: Macular disorders[2], Demographic patterns[1], Management trends[3]

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Introduction

An estimated 45million people around the world are blind. Eighty percent of them live in the under developed world, in countries where chronic economic deprivation is exacerbated by the added challenge of failing vision. Since eye disease is seen largely in older people the projected doubling of the world's population older than 50 years to 2 billion by 2020 have profound effects on the number of those with blindness and low vision. About 90% of the world's blind population lives in the developing world. It is estimated that there are 9-12 million blind living in India which amounts to about one-fourth of all the blind people worldwide. A survey in 1986 by the World Health Organization (WHO) and National Programme on Prevention and Control of Blindness (NPCB) in India showed that 10% of the 9.61 million that is 0.96 million persons have incurable blindness and would require rehabilitation services.[1]

In the past decade several large population based studies have provided new information on the prevalence of visual impairment and the major age related eye diseases in Asia. These include epidemiological studies from India, Taiwan, Mongolia, and Singapore and Japan in particular the epidemiology of refractive errors and glaucoma has been well characterized providing insights not only into the public health implications of these conditions but also into anatomical changes of the eye with ageing. In contrast there are few well conducted population based studies on diabetic retinopathy and age related macular degeneration in Asia, two conditions that are likely to be important causes of blindness in the future.[2]

Macular disorder is the major cause of visual impairment, which is an important complaint and requires immediate attention. If untreated it affects the quality of life of the patient significantly. Various macular disorders constitute a major part of our clinical practice.[3]

Study of demographic patterns, early evaluation and timely intervention is of great importance for patient management. Hence this study was taken up in the Ophthalmology department of our hospital which predominantly caters to the needs of the rural populations from surrounding villages. It is hoped that this study will yield useful information that can help us to formulate and plan services for the people suffering from macular disorders. The objectives were to study demographic patterns of macular disorders in the outpatient department, different modalities of management for macular disorders and to compare

different management modalities with respect to therapeutic outcomes and cost effectiveness.

Methods

The present study was conducted in Department of ophthalmology after approval from institutional ethics committee from 1-6-2009 to 31-06-2011.

Study design: This study was a prospective longitudinal hospital based study of patients presenting to the Retina clinic.

Sample size: Sample size was collected considering 10.4% prevalence of vitreoretinal disorders as reported by the Aravind Comprehensive Eye Study[4] (2004), using this formula

$N = (z\alpha)\ 2pq/L2$

Where,

N = sample size

Z α= z value at 10 % error

p = 10.4%

q= 1 – p

L = 10% of 10.4%

111 new patient attending retina clinics during the study duration were registered and written informed consent was taken from them for the study, those patients not giving consent for the study were excluded. These participants were interrogated, their demographic, investigative & management data were recorded, documented and analyzed.

Ocular examination

Each patient underwent a comprehensive vision and eye examination which included the visual acuity, anterior segment examination (by torch light and slip lamp examination), tonometry, macular function test (by Amsler grid test, Maddox rod test, two pin hole test, color vision test), Posterior segment examination (by indirect ophthalmoscopy with +20D Lens, magnified examination of fundus, retinal and macular examination slit lamp), fundus photography, and fundus fluorescein angiography.

Working Definitions

1. **Dry Age related Macular Degeneration (ARMD)**

Fundoscopic changes include the following

- Pigmentary changes
- Drusen
- Areas of Chorio-retinal atrophy

2. **Neovascular Age related Macular Degeneration (NARMD)**

Fundoscopic changes include the following

- Subretinal hemorrhage in or around the macula
- Localized retina elevation
- Retinal edema
- Exudates in or around the macula
- Detachment of retinal pigment epithelium

3. **Diabetic macular edema**

Diabetic macular edema (DME) was taken as retinal thickening within two disc diameter of the center of macula. DME patients were categorized into clinically significant macular edema (CSME) or non CSME by ETDRS. CSME includes any one of the following lesions.

1. Retinal thickening at or within 500 microns from the center of macula.
2. Hard exudates at or within 500 microns from the center of macula associated with thickening of the adjacent retina.
3. An area or areas of retinal thickening at least one disc area in size at least a part of which is within one disc diameter of the center of macula.

4. **Central Serous Retinopathy**

Ophthalmoscopy reveals a circumscribed round or oval area of retinal elevation in the macula. The foveal reflex may be absent or attenuated, slit lamp biomicroscopy typically shows serous elevation of the retina, there may be a yellow spot in fovea due to increased visibility of the xanthophylls. The Subretinal fluid is usually clear but in 10% of eyes the Subretinal space is filled with gray white serofibrinous exudates. These cases are associated with larger retinal detachments. Some chronic cases present with dot like yellow precipitates at the back of the retina. The underlying retinal pigment epithelial (RPE) detachment that may or may not be visible typically appears round or oval yellow or yellowish grey. It is best detected in retro-illumination. The function of the detached and attached RPE typically produces a circumscribed halo surrounding the base of the lesion. Fine mottling and occasional clumping of pigment resulting in a tradiate or cruciate pattern is common on the surface of the detached RPE. Other macular disorders screened were like CRVO, BRVO, and CRAO, Cystoic macular Edema, Epiretinal Membrane, and Myopic Maculopathy and were documented.

Data Collection and Statistical Analysis

The data was recorded in preformed pretested proforma (see annexure). Data entry was done for all the study cases for all the above mentioned variables in computer friendly data entry from. The data were entered into a database and analyzed with the SPSS software.

Results

Macular disorder was most common in the age group of 61-80 years i.e. 70.27% & least common in the age group of 21 – 40 years i.e. 4.50%. The mean age of subjects under study was 66.93+/-12.0 years. Macular disorder was more common in males 51.35% & less common in females 48.65%.

Table 1: Association between diagnosis and age groups

Diagnosis	Age Groups				Total	Chi square	P value
	21-40	41-60	61-80	81-100			
Age Related Macular Degeneration (ARMD)	0	5	22	2	29	77.196	0.0000
Central Serous Retinopathy (CSR)	3	1	0	0	4		
Diabetic Maculopathy with Clinically Significant Macular Edema (DMCSME)	0	3	5	0	8		
Idiopathic Epiretinal Membrane (ERM)	0	2	7	0	9		
Infero- Temporal Branch Retinal Vein Occlusion (IT BRVO)	0	0	4	0	4		
Myopic Choroidal Neovascular Membrane (MCNVM)	1	4	1	0	6		
Idiopathic Macular Hole (MHO)	0	0	6	0	6		
Non Age Related Macular Degeneration (NARMD)	1	4	30	7	42		
Supero-Temporal Branch Retinal Vein Occlusion (STBRVO)	0	0	3	0	3		
Total	5	19	78	9	111		

75.86% (22) subjects diagnosed to have ARMD belonged to the age group of 61 – 80 years, 75% (3) subjects of CSR belonged to age group of 21-40 years, 62.5% (5) subjects of DMCSME belonged to age group of 61 – 80 years, 77.78% (7) subjects of ERM belonged to age group of 61 – 80 years.

Table 2: Association between diagnosis and sex of the patient

Diagnosis	Sex		Total	Chi square	P value
	Female	Male			
Age Related Macular Degeneration (ARMD)	14	15	29	5.839	0.665
Central Serous Retinopathy (CSR)	2	2	4		
Diabetic Maculopathy with Clinically Significant Macular Edema (DMCSME)	3	5	8		
Idiopathic Epiretinal Membrane (ERM)	6	3	9		
Infero- Temporal Branch Retinal Vein Occlusion (IT BRVO)	1	3	4		
Myopic Choroidal Neovascular Membrane (MCNVM)	5	1	6		
Idiopathic Macular Hole (MHO)	3	3	6		
Non Age Related Macular Degeneration (NARMD)	19	23	42		
Supero-Temporal Branch Retinal Vein Occlusion (STBRVO)	1	2	3		
Total	54	57	111		

Above table shows no significant association between Diagnosis and Sex of patients.

Table 3: Anterior segment wise distribution of patients

Anterior Segment pathology	Frequency	Percentage
Early Cataract	11	9.91%
Normal	61	54.95%
Nuclear Sclerosis	11	9.91%
Pseudophakia	28	25.23%
Total	111	100.00%

Out of the total number of subjects (n =111), macular disorder was found in 9.91% (11) subjects with early cataract, 54.95% (61) subjects having anterior segment within normal limits, 9.91% (11) subjects having nuclear sclerosis of the lens, 25.23% (28) subjects having pseudophakia.

Table 4: Diagnosis wise distribution of patients

Diagnosis	Frequency	Percentage
Supero-Temporal Branch Retinal Vein Occlusion (STBVRO)	3	2.70%
Central Serous Retinopathy (CSR)	4	3.60%
Infero- Temporal Branch Retinal Vein Occlusion (ITBRVO)	4	3.60%
Myopic Choroidal Neovascular Membrane (MCNM)	6	5.41%
Idiopathic Macular Hole (MHO)	6	5.41%
Diabetic Maculopathy with Clinically Significant Macular Edema	8	7.21%
Epiretinal Membrane	9	8.11%
Dry Age Related Macular Degeneration (DARMD)	29	26.13%
Age Related Macular Degeneration (NARMD)	42	37.84%
Total	111	100%

The most common diagnosis was NARMD in 37.84% and the least common diagnosis was STBVRO in 2.7% of cases.

Table 5: Outcome status wise distribution of patients of Neovascular age related macular degeneration

Diagnosis	Treatment-INT VITR	Outcome Status		
		Unchanged	Improved	Deteriorated
NARMD	3D LUCNT	5	16	0
	3D AVAST	5	15	1

Out of the total 111, 42 subjects i.e. 37.84% were diagnosed as NARMD, out of which 21 i.e. 18.92% received treatment in the form of 3 doses of intra-vitreal injection of lucentis, of which visual outcome of 23.81% (5) subjects remained unchanged, 76.19% (16) subjects improved, and none (0)deteriorated as compared to pretreatment vision. Rest 21 i.e. 18.92% subjects received 3 doses of intra-vitreal injection of avastin of which visual outcome of 23.81% (5) subjects remained unchanged, 71.43% (15) subjects improved, and one subject deteriorated as compared to pretreatment vision. Every subject receiving avastin incurred a total expenditure of Rs.18,000 on treatment and every subject receiving lucentis had to spend Rs.1,00,000 for the treatment.

Table 6: Overall Visual Status wise Outcome of Subjects

Outcome Status	No of Patients	Percentage
Improved	62	55.86%
Unchanged	42	37.84%
Deteriorated	7	6.31%
Total	111	100%

Out of total 111 subjects under study, vision of 55.86%improved, vision of 37.84% subjects remained unchanged and 6.31% patients deteriorated.

Discussion

Macular disorder was most common in the age group of 61-80 years i.e. 70.27% & least common in the age group of 21 – 40 years i.e. 4.50%. Mean age was 66.93±12.01 years. Macular disorder was more common in males 51.35% & less common in females 48.65%. An increase in the occurrence of macular diseases with age was observed in the study population, this is similar to the study conducted by Nirmalan et al[4] who found that the increasing age was associated with increased occurrence of vitreoretinal disorders.

75.86% subjects were diagnosed to have ARMD belonged to the age group of 61 – 80 years, 75% subjects of CSR belonged to age group of 21-40 years. We conclude that there is highly significant association between the age of the patient and the presenting macular disorder, and most of the macular disorders present in old age.

Nirmalan et al[4] have done a similar population based prevalence study in a rural population aged 40 years and older. Mean age of the study population was 52.5 years ranging from 40-90 years and 55% were women. There were no significant differences in age

adjusted prevalence of vitreoretinal disorders between sexes. *Del Court et al*[5] found that the occurrence of ARMD increased with age.

Macular disorder was more common in middle socioeconomic class subjects (50.45%) & less common in upper socioeconomic class subjects (2.70%). On searching the literature we found that there are no studies on association of socioeconomic status with occurrence of macular disorders.

Macular disorder was found in 9.91% of subjects with early cataract, 54.95% of subjects having anterior segment within normal limits. Intraocular Pressure and Ocular Movements of all the patients under study were normal.

2.70% of subjects were diagnosed to have STBRVO, 3.60% subjects were diagnosed to have Central Serous Retinopathy.

The overall effect of use of either avastin or lucentis in patients of Neovascular ARMD is increase in visual acuity and visual improvement with the use of lucentis is slightly better than that with the use of avastin. But avastin is more cost effective than lucentis. Avery *et al*[6] reported the short-term safety, biologic effect, and a possible mechanism of action of intra-vitreal bevacizumab (IVB) in patients with Neovascular age-related macular degeneration (AMD). Spaide *et al*[7] described the short-term anatomical and visual acuity responses after IVB in patients with Choroidal neovascularization (CNV) secondary to AMD in 251 eyes. Costa *et al*[8] evaluated the safety of three dose regimen of IVB in 45 patients with AMD and subfoveal CNV. Compared with baseline, BCVA improved at week 1 ($P = 0.001$), week 6 ($P< 0.001$), and week 12 ($P = 0.001$). At week 12, the lesion area and CNV area were stable or decreased in 79.1% and 74.4% of patients; respectively. Cleary *et al*[9] reported a statistically significant improvement in VA and reduction in CMT. Bashshur *et al*[10] found that mean CRT decreased from 327.4µ at baseline to 227.8µ at 12 months ($P< 0.001$). A mean of 3.4 injections were given over the course of the study, and no ocular or systemic side-effects were noted. Furino *et al*[11] concluded that multiple IVB injections are well tolerated and associated with significant improvements in BCVA and decreased CMT by OCT in most patients with treatment-naive occult CNV. Arevalo *et al*[12] found that primary IVB at doses of 1.25 mg or 2.5 mg improves BCVA, and reduces macular thickness in subfoveal CNV. Rosenfeld *et al*[13] found that there was no significant lesion growth, and a decrease in area of leakage from CNV was detected through day 140. Rosenfeld *et al*[14] concluded that IVR for 2 years prevented vision loss and improved mean VA, with low rates of serious adverse events, in patients with minimally classic or occult CNV secondary to AMD.

Conclusion

There is highly significant association between the age of the patient and the presenting macular disorder, and most of the macular disorders present in older age. The overall effect of use of either avastin or lucentis in patients of Neovascular ARMD is increase in visual acuity and visual improvement with the use of lucentis is slightly better than that with the use of avastin. But avastin is more cost effective than lucentis.

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