A STUDY TO COMPARE FUNDUS FLUORESCEIN ANGIOGRAPHY AND OPTICAL COHERENCE TOMOGRAPHY IN AGE RELATED MACULAR DEGENERATION

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ABSTRACT

PURPOSE

To compare the diagnostic accuracy of optical coherence tomography with Fundus Fluorescein Angiography in diagnosing Age related macular degeneration.

METHODS

A total 25 patients newly diagnosed as Age related macular degeneration were included in the study. The study was done during the time period between August 2013 to November 2015 this is a prospective randomized hospital based study.

RESULTS

Maximum no of patients affected belonged to the age group of 50-70 years and 60% were females. The most common symptom was defective vision accounting for 92%. Hypertension and hyperlipidemia were the most common risk factors. 12% of the cases had unilateral disease and 88% had bilateral disease. 6% of eyes were normal in both FFA and OCT. 62% of the eyes by FFA and 61% of the eyes by OCT had dry ARMD and 32 % of the eye by FFA and 33 % by OCT had wet ARMD.

CONCLUSION

Fundus Fluorescein Angiography is the gold standard tool for screening ARMD and OCT is more specific in detecting early subretinal neovascular membrane and also to assess the activity of the neovascular membranes. Hence OCT is superior to FFA in diagnosing early wet ARMD and thus helps in early management of patients with ARMD.

KEYWORDS

FFA- Fundus Fluorescein Angiography, OCT- Optical Coherence Tomography, ARMD- Age Related Macular Degeneration, RPE- Retinal Pigment Epithelium, AREDS- The Age Related Eye Disease Study.

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INTRODUCTION: Age related macular degeneration (ARMD) is a common, chronic, progressive degenerative disorder of the macula that affects older individuals usually above 50 years of age.[1]

Risk Factors of ARMD:

1. **Age:** Disease usually occurs over the age of 50 years and the prevalence of the disease increases with increasing age.[2]
2. **Gender:** Prevalence of the disease is more among women than men.
3. **Race:** 30 % of the bilateral blindness among whites and 5% among blacks is accounted by ARMD. The prevalence of melanin is protective against oxidative damage.[3]
4. **Hypertension:** High blood pressure is associated with the development of macular degeneration.
5. **Family History:** The risk of ARMD is increased to 50 % in persons with a relative having ARMD as compared to only 12 % with no family history.[4]
6. **Oxidative Stress:** Age–related accumulation of low-molecular-weight, phototoxic, prooxidant melanin oligomers within lysosomes in the retinal pigment epithelium is responsible for decreased digestive rate of photoreceptor outer rod segments (POS) by the RPE. This is associated with lipofuscin formation-classic sign associated with macular degeneration.[5]
7. **Ocular Risk Factors:** Ocular melanin is protective against oxidative damage induced by light to the retina.
8. **Light Exposure:** Reactive oxygen intermediates causes photo oxidative damage which produces ARMD.
9. **Smoking:** Exudative type of ARMD is increased to 2.8 times with smokers. Cessation of smoking lowers the risk of ARMD.
10. **Drugs:** Drugs like phenothiazine and chloroquine induce macular degeneration.
11. **Dietary and Medication Factors:** The fellow eye with neovascular ARMD is protected by high doses of zinc, vitamin C, vitamin E and B carotene. But supplementation with B-carotene in smokers increase the risk of lung cancer. A multivitamin supplementation increases overall cancer mortality.

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AIM: To compare the diagnostic accuracy of Optical Coherence Tomography with Fundus Fluorescein Angiography in diagnosing Age Related Macular Degeneration.

MATERIALS AND METHODS: This is a prospective randomized hospital based study. The period of my study was from August 2013 to November 2015. 25 patients presenting to the Ophthalmology department of Dr. B.R. Ambedkar Medical College who were diagnosed with Age Related Macular degeneration clinically were subjected to fundus fluorescein angiography and optical coherence tomography and observations were made.

After obtaining informed consent from the patient, following evaluations were made:

1. Relevant ocular history.
2. Best corrected visual acuity.
3. Slit lamp examination.
4. Posterior segment evaluation with both direct and indirect ophthalmoscopy and slit lamp bio microscopy using 90 D.
5. Fundus photography taken and FFA done as per procedure.
6. Optical coherence tomography done.

Inclusion Criteria: All newly diagnosed clinically as ARMD.

Exclusion Criteria:

1. Patient already diagnosed to have ARMD and on treatment.
2. Patients having coexisting other retinal and macular diseases.
3. Patients with significant media opacities.
4. Previous laser treatment.

RESULTS:

1. Age Incidence: The age distribution of the patients included in the study is as follows:

Age in years	No. of patients
41-50	1
51-60	12
61-70	10
71-80	2
Total	**25**

Table 1

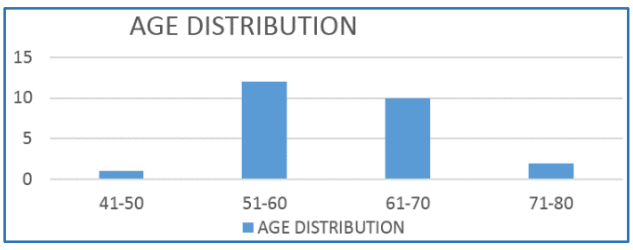

Fig. 1

2. Sex Ratio:

Sex	No. of Patients (%)
Male	10(40%)
Female	15 (60%)
Total	**25**

Table 2

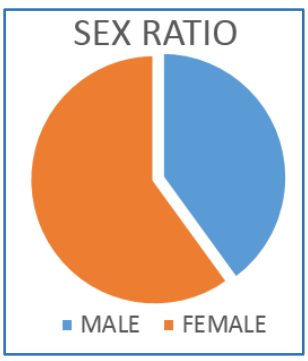

Fig. 2

3. Age and Sex Wise Distribution:

Age	Male	Female
41-50	0	1
51-60	5	7
61-70	5	5
71-80	0	2
Total	**10**	**15**

Table 3

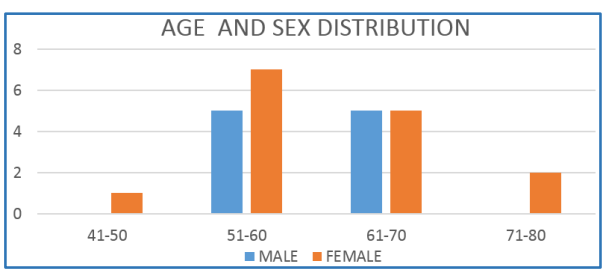

Fig. 3

4. Gender Distribution of Exudative And Non Exudative ARMD:

	Male	Female
Non Exudative	5	10
Exudative	6	4
Total		

Table 4

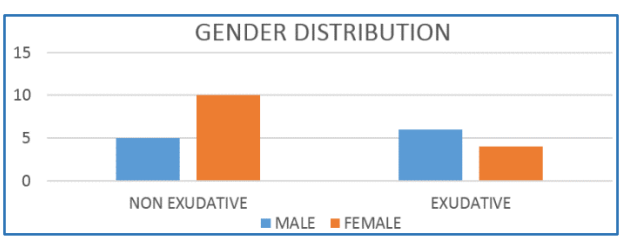

Fig. 4

5. Symptomatology/Amsler Grid Evaluation:

Symptoms	No. of Patients
Defective vision	23(92%)
DV+ metamorphopsia	3(12%)
DV+ Scotoma	1(4%)
DV+ micropsia	1(4%)

Table 5

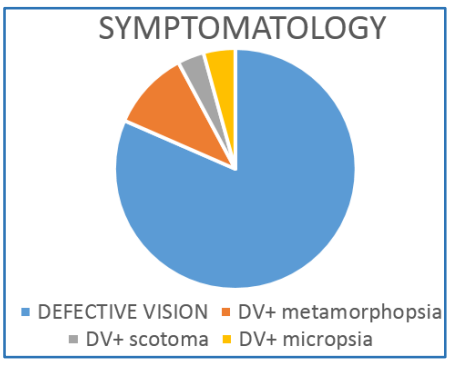

Fig. 5

6. Risk Factors:

	Present	Absent
Hypertension	18	7
Smoking	8	2
Hyperlipidemia	20	5
Diabetes	14	11

Table 6

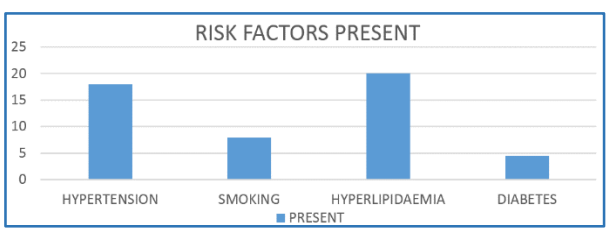

Fig. 6

7. Visual Acuity:

Visual Acuity	No. of Eyes
6/18-6/9	19
6/60-6/24	21
6/60-1/60	8
CFCF-HM	2
Total	**50**

Table 7

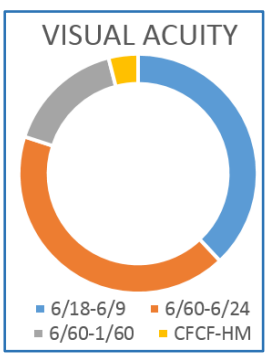

Fig. 7

8. Laterality:

Laterality	No. of patients
Unilateral	3(12%)
Bilateral	22(88%)
Total	**25**

Table 8

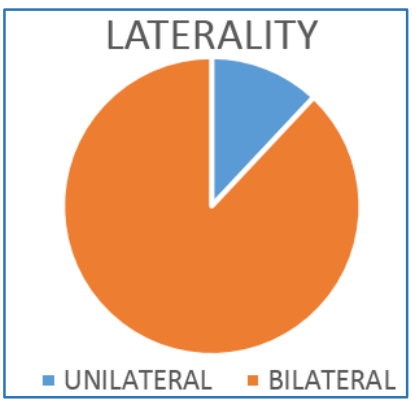

Fig. 8

9. Types OF ARMD:

Types	FFA (No. of Eyes)	OCT (No. of Eyes)
Normal	3	3
Dry	31	30
Wet	16	17
Total	**50**	**50**

Table 9

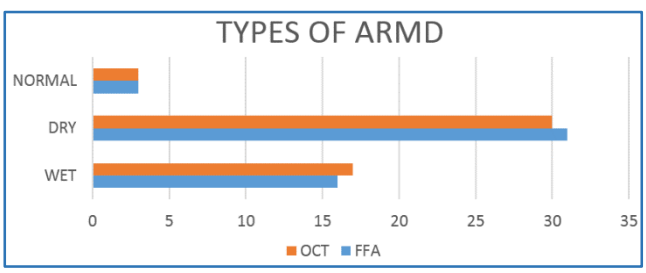

Fig. 9

10.Types of Classic CNVM:

Classic CNVM Types	FFA	OCT
Sub Foveal CNVM	6	7
Juxta Foveal CNVM	3	3
Extrafoveal CNVM	2	2
Total	**11**	**12**

Table 10

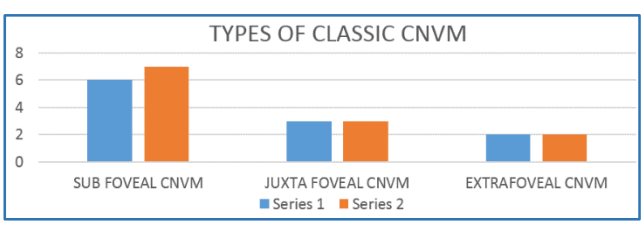

Fig. 10

DISCUSSION: Age related macular degeneration (ARMD) is classified into 2 clinical forms[5,6]:

A. Dry or Atrophic or Non exudative form.
B. Wet or Exudative form.

DRY ARMD: In dry ARMD, there is gradual loss of vision. There are yellowish sub retinal deposits called Drusens, or irregularities in the retinal pigment epithelium like hyperpigmentation or hypopigmentation

WET ARMD: Sudden visual loss may occur when fluid or blood leaks into sub pigment epithelial or sub retinal space from choroidal neovascular membrane.

The Age-related Eye Disease Study (AREDS) classifies ARMD as[6]:

1. **No ARMD (AREDS category 1)**: the control group from the AREDS with no or few small drusen (< 63 microns in diameter).
2. **Early ARMD (AREDS category 2):** Had a combination of multiple small drusen, few intermediate drusen (63 to 124 microns in diameter), or abnormalities of the RPE.
3. **Intermediate ARMD (AREDS category 3)**: Had extensive intermediate drusen, at least one large drusen (125 microns in diameter), or geographic atrophy without involving the center of the fovea.
4. **Advanced ARMD** (AREDS category 4).

Pathophysiology of ARMD: Can be explained by 4 theories[2]:

1. **Traditional Theory:** RPE senescence lead to ARMD.
2. **Vascular Theory:** choroidal vascular changes secondarily affect the RPE and lead on to macular degeneration.
3. **Oxidative Insult:** macular pigments lutein (L) and zeaxanthin (Z) accounts for the yellowish pigmentation of the macula lutea. These pigments filter the harmful wavelength of light there by reducing the oxidative insults to the macula.
4. **Pigment Epithelial Detachment:** with increasing age the bruchs membrane gets thickened and there is deposition of lipids in the inner surface of bruchs membrane.

FUNDUS FLUROSCEIN ANGIOGRAPHY IN ARMD:

Classic CNVM: late leakage of dye with discrete, early hyperfluorscence into the overlying neurosensory retinal detachment is present.

Occult CNVM are categorized as 2 basic patterns; late leakage of undetermined source and fibrovascular pigment epithelial detachment (PED).

Optical Coherence Tomography IN ARMD: Serous, Haemorrhagic and Fibrovascular PED of the retina appears as separation of the RPE from the neurosensory retina[7]:

CLASSIC CNVM:

- Increase in thickness of neurosensory retina, either nodular, fusiform or continuous band.
- Foveal depression flattening.
- Detachment of RPE.

OCCULT CNVM:

- Hyper reflective band in RPE which is irregular and fusiform in shape.
- Associated subretinal fluid/retinal oedema.
- Shadowing towards the choroid.

CONCLUSION: Age related macular degeneration is a common, chronic progressive degenerative disorder of macula and it is the leading cause of irreversible blindness.

The various manifestations includes drusen, geographical atrophy, pigment epithelial detachment, RPE tear, classic and occult CNVM and disciform scar.

Prevalence of disease increases with increasing age and is more common in females than males. Age related macular degeneration is usually a bilateral disease and most of the people have reasonable visual acuity at the time of diagnosis. Hence we should prevent the progression of dry ARMD. Exudative ARMD accounts for most of the cases with poor vision.

Fundus fluorescein angiography is very useful in identifying dry ARMD. In wet ARMD it helps in identifying the early lesion like serous PED, fibrovascular PED and in established cases it helps to delineate the location and extent of CNVM.

But in some cases there is difficulty in identifying the CNVM due to either diffuse blocked fluorescence or pooling which obscures the underlying pathology.

Optical coherence tomography,[8] a three dimensional imaging technique is highly sensitive in identifying the location, activity and extent of CNVM but it is less sensitive in diagnosing dry ARMD.

Fundus Fluorescein Angiography is the gold standard tool for screening ARMD and OCT is more specific in detecting early subretinal neovascular membrane and also to assess the activity of the neovascular membranes. Hence OCT is superior to FFA in diagnosing early wet ARMD and thus helps in early management of patients with ARMD.

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