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Original Research Article

Quantitative analysis of optical coherence tomography in age related macular degeneration

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ABSTRACT

Age related macular degeneration (ARMD) is a common degenerative disorder of macula in people above 50 years. The dry and wet/neovascular forms can lead to loss of vision. Optical coherence tomography is a popular tool in the diagnosis of AMRD.

Aim: Aim of the study is to assess the Optical Coherence Tomography to diagnose the Age Related Macular Degeneration in a tertiary care centre.

Materials and Methods: This prospective hospital based study was conducted on 50 patients presenting with age related macular degeneration clinically (100 eyes). Inclusion criteria was patients newly diagnosed clinically as ARMD and on no treatment. Exclusion criteria was Patients already diagnosed ARMD and on treatment, Patients with other retinal and macular diseases, and previous laser treatment.

Results: There were 42(84%) of patients are of 50-70 years age. Males were 21, and females were 29 without significant difference (p=0.7). Out of 100 eyes, 32% diagnosed as wet ARMD and 60% eyes had dry ARMD Dry ARMD is common in females (34%) and wet ARMD common in males (26%). In dry ARMD cases, 77.04% eyes had drusen by OCT, and 72.72% eyes had classic Choroidal neovascular membranes (CNVM). OCT showed sub-foveal CNVM as the common type of classic CNVM. 16 men were smokers, and 36 patients have hypertension. Smoking was significantly associated with ARMD ($P < 0.05$).

Conclusion: Increased prevalence of wet ARMD in males due to smoking, which leads to risk for CNVM. Smoking was significantly associated with ARMD ($P < 0.01$) in our study. The prevalence was increased with increasing age. Dry ARMD was much more common than Wet ARMD, and both types increased in frequency with increasing age. ARMD is more common in females. OCT is highly specific in detecting the early sub-retinal neo vascular membrane and to assess the activity of neovascular membranes in early wet ARMD.

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1. Introduction

ARMD is a degenerative disorder of the macula and progressive in nature affects the older than 50 years of age. The disease was manifest as drusen, geographical RPE atrophy, serous retinal pigment epithelium detachment, and choroidal neovascularisation.[1]

ARMD is the leading cause of irreversible blindness and the research on ARMD assume the increasing it's importance of high prevalence of this disease.[2] Since the population age 80 yrs is about to increase by 105% by next decade with expected to rise dramatically.[3]

Degenerative lesions of macula classified clinically into dry/atrophic/non-neovascular and the wet/ exudative / neovascular, both the forms may leads to loss of vision.

OCT has driven research to identify the anatomic biomarkers in neovascular AMD. OCT-derived parameters like central subfield thickness (CST) was used to inform re-treatment choice.[4,5]

Currently, we lack a reliable, noninvasive vascular biomarker to monitor the healthy aging and disease

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progression of AMRD. OCT-A represents a novel, noninvasive, dye-less retinal vascular imaging technique that can be rapidly acquired during a clinical consultation.

OCT is a three dimensional imaging highly sensitive in identifying location, activity and extent of CNVM in wet ARMD.[6,7] Unlike traditional angiography, OCT does not require the use of exogenous dyes, thus avoiding the side effects like nausea, or other serious adverse events. However, the role of OCT as a diagnostic tool has not been widely studied, very few clinical studies have evaluated the accuracy of OCT imaging for the diagnosis of ARMD. Therefore, we designed this study to evaluate the efficacy of OCT in detecting ARMD.

2. Materials and Methods

This prospective hospital based study was conducted in 100 eyes of 50 patients presenting to the ophthalmology outpatient department, who were newly diagnosed to have AMRD.

This is a observational study conducted at Narayana Medical College and Hospital, Nellore, A.P.

After obtaining informed consent, ARMD evaluations such as ocular history, Best corrected visual acuity, Slitlamp evaluation, slit lamp bio microscopy, Optical coherence tomography, and personal history such as history of smoking (in pack years), history of cataract surgery, diabetes [fasting capillary blood sugar level was >7 mmol/l and those already taking medicines to control diabetes were treated as diabetics] and hypertension (more than 140/90 mm Hg, WHO Classification of Hypertension) and patients who were on medication to control blood pressure were taken as hypertensive] was taken according to performa.

Participants were dilated with 1.0% tropicamide if the pupils were deemed to be too small for adequate OCT scans. IOP was measured before and after dilation by tonometry. B-scan was obtained with a single Stratus OCT machine (Carl Zeiss Meditec, Inc.).

Dry ARMD included few drusen of more than 63 microns in size at macula, and geographic atrophy.

Wet ARMD included neo-vascular vessels of chorio-capillary plexus in macular area (CNVM), macular star or combination of any of these three conditions.

2.1.

2.1.1. Inclusion criteria

Newly diagnosed clinically as ARMD.

2.1.2. Exclusion criteria

1. Patients already diagnosed ARMD and on treatment.
2. Patients with retinal and macular diseases.
3. Patients with media opacities.
4. Previous laser treatments.

Quantitative variable summarized using Mean ± SD and Z-test. Qualitative data was summarized using percentages. The chi-square test was applied and OR (odds-ratio) were calculated. Statistical significance was set at $p \leq 0.05$, Statistical analysis was performed with software for Windows, Version 22.0 (SPSS, Inc., Chicago, IL).

3. Results

3.1. Demographics

42(84%) of patients are of 50-70 years age. Number of males were 21, and females were 29 without significant difference (p=0.7).

Non exudative type of ARMD accounts for 64% (n=32). Of which, 65.6% were females and 34.3% were males. Exudative type accounts 36%, out of which, 44.5% were females and 55.5% were males. 21(65.6%) females and 11(34.3%) males observed with non exudative ARMD. 10 (55.5.%) males and 8 (44.5%) females observe with exudative ARMD.

3.2. Risk factors

36 patients were hypertensive, and 40 patients are of hyperlipidemia, and 16 men out of 21 are smokers.

3.3. Visual acuity and laterality

12% had unilateral, and 88% observed with bilateral disease. 32 eyes had drusen with visual acuity better than 6/18 and 16 eyes had drusen, 9 eyes had RPE alterations, 3 eyes had geographical atrophy and 18 eyes of wet ARMD had the visual acuity of 6/60 to 6/24. Two eyes with geographical atrophy and 14 eyes wet ARMD had acuity of 6/60-1/60 and 4 cases with disciform scar had visual acuity of CFCF.

3.4. Types of ARMD

Out of 100 eyes, 32% diagnosed as wet ARMD. 60% eyes had dry ARMD and 32% eyes had wet ARMD by OCT.

Out of 32% of dry ARMD, 77.04% had drusen manifesting had RPE elevation with moderate reflectivity, 14.75% had RPE alteration, and 8.19% had geographical atrophy manifesting as retinal thinning and hypo-reflectivity.

In total of wet AMRD, 24 patients had classic CNVM and 6.06% had occult CNVM. At an early stage, one eye had serous PED, OCT observed a notch between elevation and small mound. 3.1% had haemorrhagic PED, and OCT showed retinal thickening with hypo- reflectivity.

9% had disciform scar observed as retinal thinning. One eye had retinal thickening with increased reflectivity, which was diagnosed as sub-foveal CNVM.

58% had subfoveal CNVM. 25% of OCT had juxtafoveal CNVM. 16% of OCT had extra foveal CNVM.

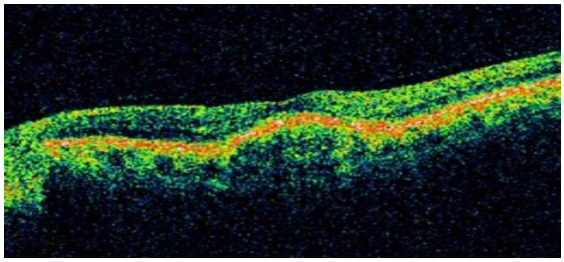

Fig. 1: OCT showing excrescences with sub RPE fluid and SFCNVM

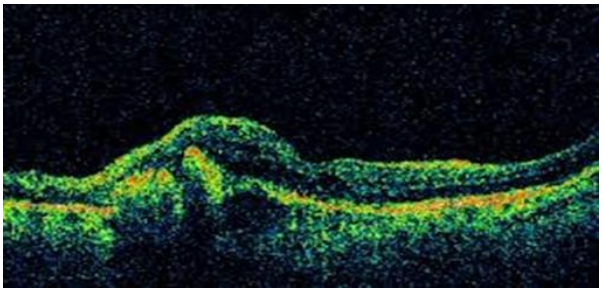

Fig. 2: Serous PED with SF CNVM

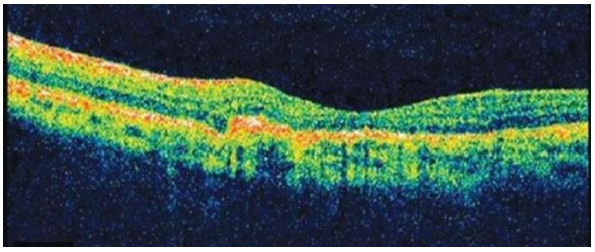

Fig. 3: OCT showing retinal thinning with SF CNVM

4. Discussion

In our study, there was significant difference in representation of genders, number of males were 21, and females were 29 without significant difference (p=0.7). 42(84%) of patients are of 50-70 years age. Similar trend observed in a study by Ehsan et al.[8] This shows advancing age is a risk factor for AMRD. The prevalence and progression of the forms of ARMD was steeply increased with increasing age. The results of our study also revealed that there was a trend for the overall retinal thickness to thin with age, but this difference was not statistically significant. There was 17 fold increased risk of ARMD compared to youngest age of Framingham study.[9] In Waterman study, the incidence of moderate to advanced ARMD will increase with decade after 60 year age.[10]

In our study, non-exudative ARMD accounts 64%, out of which 65.6% of females and 34.3% of males. Exudative ARMD had 36%, out of which 44.5% were females and 55.5% of Males. Beaver Dam Eye Study[11] observed that the early forms are more common than late stage ARMD, and both types frequency increases with increasing age. Late ARMD prevalence was 1.6%, overall and exudative maculopathy observed in 1.2% and geographical atrophy in 0.4%. The prevalence of ARMD rises to 7.1% in patients > 75 years.

16 men were smokers, and 36 patients have hypertension. Increased prevalence of wet ARMD in males due to smoking, which leads to risk for CNVM. Smoking was significantly associated with ARMD ($P < 0.01$) in our study. Cigarette smoking is the one of the risk factor other than age that has been consistently identified in various studies. Smoking doubles the risk of AMD, and there appears to be a dose response whereby increasing odds are associated with an increased number of pack-years smoked.[12–15] In our study, we did not find an association between hypertension and ARMD ($P>0.05$). There was no significant relationship between diabetes mellitus and ARMD ($P > 0.05$) found in our study.

Our study was compared to Querishi et al.,[16] occurrence of disease between the two eyes. In our study, 88% had bilateral representation and Querishi et al., study observed as 74% had bilateral presentation. Symptoms of this study was compared to Querishi et al., and the common was being defective vision, followed by metamorphopsia and scotoma.

These results were similar to study by Sandhu et al.,[17] and Mokwa et al.[18] Our study incidence of dry and wet ARMD diagnosed as 60%, and 32%eyes. Querishi et al., shows the 80.5% of dry and 19.2% of wet ARMD.

One eye diagnosed as early sub-foveal CNVM manifestation as retinal thickening and hyper reflectivity with defined edges. The results were similar to Querishi et al, Sandhu et al. and Mokwa et al.

In our study, 9% had serous PED in OCT. OCT observed a notch between elevation and small mound. Hence, OCT detected CNVM at early stage. 9% diagnosed patients had disciform scar as retinal thinning.

5. Conclusion

In our study, 60%eyes had dry ARMD and 32%eyes had wet ARMD by OCT. The prevalence was increased with increasing age. Dry ARMD was much more common than Wet ARMD, and both types increased in frequency with increasing age. Clinical manifestations of this disease entity includes dry ARMD (drusen, geographical atrophy) and wet ARMD (pigment epithelial detachment, RPE tear, classic and occult CNVM and disciform scar). ARMD is more common in females. OCT is more specific diagnostic tool in detecting early subretinal neovascular membrane and also to assess the extent, location and activity of the neovascular membranes. Hence, OCT is better diagnostic tool in diagnosing early wet ARMD which helps in early management of patients with ARMD and thereby preventing severe visual loss due to ARMD. If diagnosed

early, we can prevent the progression of dry ARMD lesions into visual impairing exudative lesions.

6. Source of Funding

None.

7. Conflict of Interest

The authors declare that there is no conflict of interest.

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