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A systematic review: Foveal thickness in elderly vs. Adult

[1]Sumit Goswami, [2]Akash Deep Rastogi

[1]B.OPTOMETRY, [2]M.OPTOMETRY, Consultant Optometrist

[1]Dr.OM PARKASH Institute Of Medical science and Research ,

[2]DR.OM PARKASH EYE INSTITUTE

Abstract

Background: Macula lutea, in anatomy, the small yellowish area of retina near the optic disk that provides central vision. In the centre of the macula is a depression, called the fovea toward the center of the macula there are no blood vessels to interfere with vision; thus in this area, vision in bright light and color perception are keenest(1).

Aim: To find out the foveal thickness difference in old age group and adult group.

Design: prospective study

Methodology: This study was a prospective study conducted in tertiary eye care institute of Amritsar from a period of December 2019 to February 2020. All patient whose age is more than 50 & below 50 but more than 18 was taken & by the help of OCT. Patients who have normal retina were included in this study. Any retinal disease or any reason which can affect the normal foveal thickness (ERM, VMT) were not included here except dry ARMD (which is normal age related changes and commonest). First comparing above 50 years then compare below 50 years patient then compares above 50 years patients with below 50 years patients. Lastly all measurement in foveal thickness is done manually by the caliper in OCT machine software.

Results: After collection of data, the average foveal thicknesses of all data in different group were evaluated and comparison was done.

Key word: OCT,RETINA,MACULA,FOVEA

1.0 Introduction

Fovea also labeled as fovea centralis is the center depressed part of the macula. It is about 1.50 mm in diameter and about 1.55 mm in thickness. It corresponds to 5 degree of visual field and is the most sensitive part of retina(2). The fovea is responsible for sharp central vision (also called foveal vision), which is necessary in humans for activities for which visual detail is of primary importance, such as reading and driving. The fovea is surrounded by the parafovea belt and the perifoveal outer region(3).The fovea is located in a small avascular zone and receives most of its oxygen from the vessels in the choroid, which is across the retinal pigment epithelium and Bruch's membrane. The

high spatial density of cones along with the absence of blood vessels at the fovea accounts for the high visual acuity capability at the fovea[4].The fovea is employed for accurate vision in the direction where it is pointed. It comprises less than 1% of retinal size but takes up over 50% of the visual cortex in the brain[5].

Approximately half of the nerve fibers in the optic nerve carry information from the fovea, while the remaining half carries information from the rest of the retina. The parafovea extends to a radius of 1.25 mm from the central fovea, and the perifovea is found at a 2.75 mm radius from the fovea centralis[6]. The introduction of optical coherence tomography (OCT) has revolutionized ophthalmic clinical practice. OCT uses low coherence interferometry of light to examine the retina in vivo[7]. With progression of this technology, a true, non-contact, non-invasive "optical biopsy" of the posterior segment of the eye is achievable. It has enabled clinicians to appreciate refined details of the posterior segment of the eye on a micron scale, and to reliably detect and quantify subtle changes in macular thickness, thus making objective monitoring of disease progression and efficacy of different therapeutic modalities in various ocular diseases plausible[8,9,10].Since its advent, OCT has shown major improvements in technology, with increased resolution of images and higher acquisition speed. Standard OCT systems such as Stratus OCT, uses time-domain detection, achieving scan rates of 400 A-scans per second and an axial resolution of 8–10 µm[8].More recently, about 7 commercially available Spectral/Fourier domain OCT (SD-OCT) systems provide higher sensitivity, much higher speed of acquisition (greater than 20,000 A-scans per second) and better resolution (5–7 µm), thus making it possible to acquire large, volumetric data sets in a relatively much shorter time frame [8,11,12].

2.0 Literature review

Macular thickness by age and gender in healthy eyes using spectral domain optical coherence tomography *(by US National Library of Medicine National Institutes of Health):*

They found in this study that Foveal thickness in males was measured to be 232.68±21.07 µm, while in females it was 222.87±18.72 µm ($p<0.0001$). Mean macular thickness in males was 266±14.20 µm, while in females it was 258.21±10.03 µm ($p<0.0001$). When adjusted for age, males were found to have an increase in mean macular and foveal thickness ($p=0.005$ and $p=0.0008$ respectively) when compared to females.

3.0 Methodology

This study was a prospective study conducted in tertiary eye care institute in western Punjab from a period of july2018 to july2019. By the help of OCT we measure the foveal thickness manually by caliper and collect the data.

3.1 Inclusion criteria

1. All age group
2. Dry ARMD

3.2 Exclusion criteria

1. Below age 18
2. Retinal disease
3. Any ocular pathology
4. Patient having mature & dense cataract
5. Any ocular injury
6. ERM & VMT.
7. Axial myopia more than 6D or AXL >26.00

3.3 Parameters

By the help of OCT we collect the data and measure the foveal thickness in OCT in all age group. The data was conducted using standard case report form and were transcribed in Microsoft excel. The result of data is shown through Bar chart, Pie chart & table. The calculation was done by inserting the data in excel sheet which gives mean, median and standard deviation and variance.

4.0 Results

4.1 Total 90 Eyes of 90 patients has been enrolled in this study who have age of more than 50. Out of 90, 42(46.66%) were male eyes and 48 (53.33%) were female eyes (table1 & figure1)

Gender distribution of patients above 50	
Male eyes	42 (46.66%)
Female eyes	48 (53.33%)

Table 1 distribution of the study population according to gender

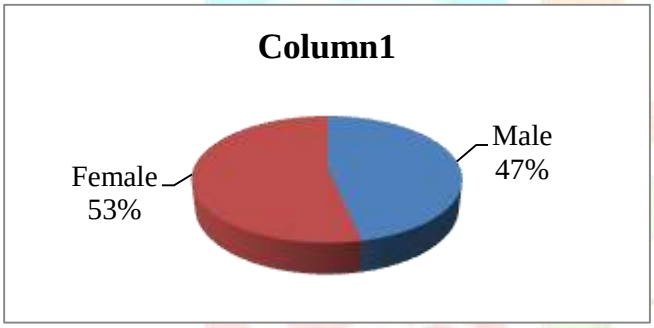


Fig 1 distribution of the study population according to gender

Patient with age of above 50 who are generally belongs to the northern area were included. All of them have no retinal pathology or any disease or any retinal abnormality.

In case of all 48 female patients after calculating the foveal thickness in microns, the data is represented in the table 2.1:

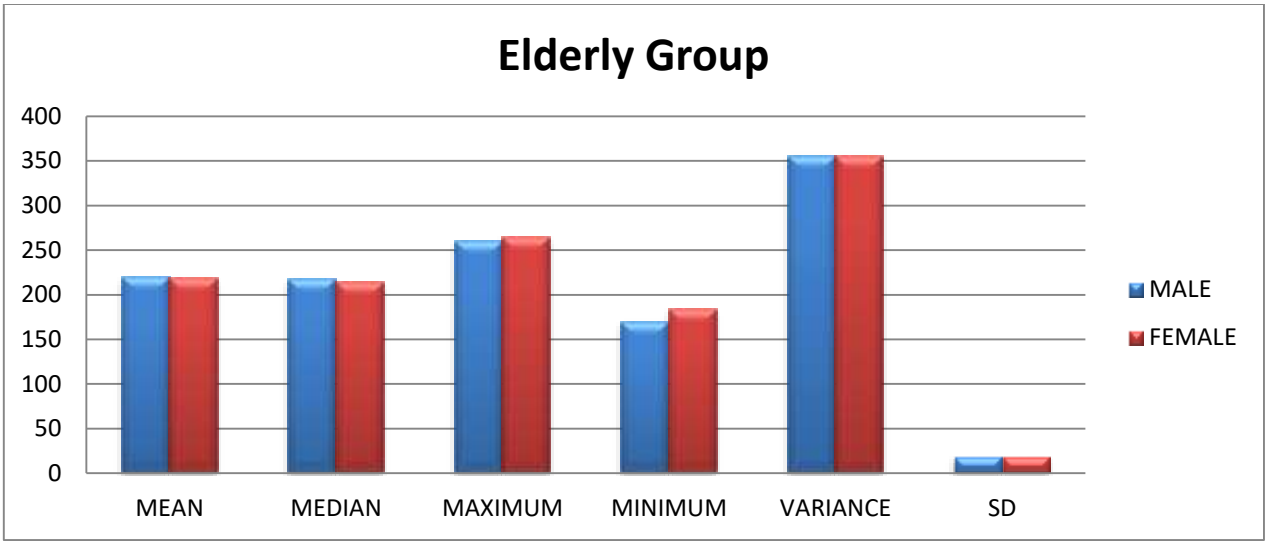
Count	Mean	Median	variance	Maximum	Minimum	SD
48	216.5	210	355.79	265	184	18.86

(Table2.1)

In case of all 42 male patients after calculating the foveal thickness in microns, the data is represented in the table 2.2:

count	Mean	Median	variance	maximum	Minimum	SD
42	219.97	217	355.404	260	169	18.85

(Table2.2)



This chart shows the comparison between male and female data >50:

4.2 Total 60 eyes of 60 patients are including here that have below the age of 50.

Among 60 eyes 30 (50%) eyes are male eyes & 30(50%) eyes are female eyes.

4.3 Male and female below 50 years number of eyes

Total 60 patients with below age of 50 were included. None of them have any retinal pathology or any disease or any retinal abnormality. In case of all 30 female after calculating the foveal thickness in microns, the data is represented in the table 3.1

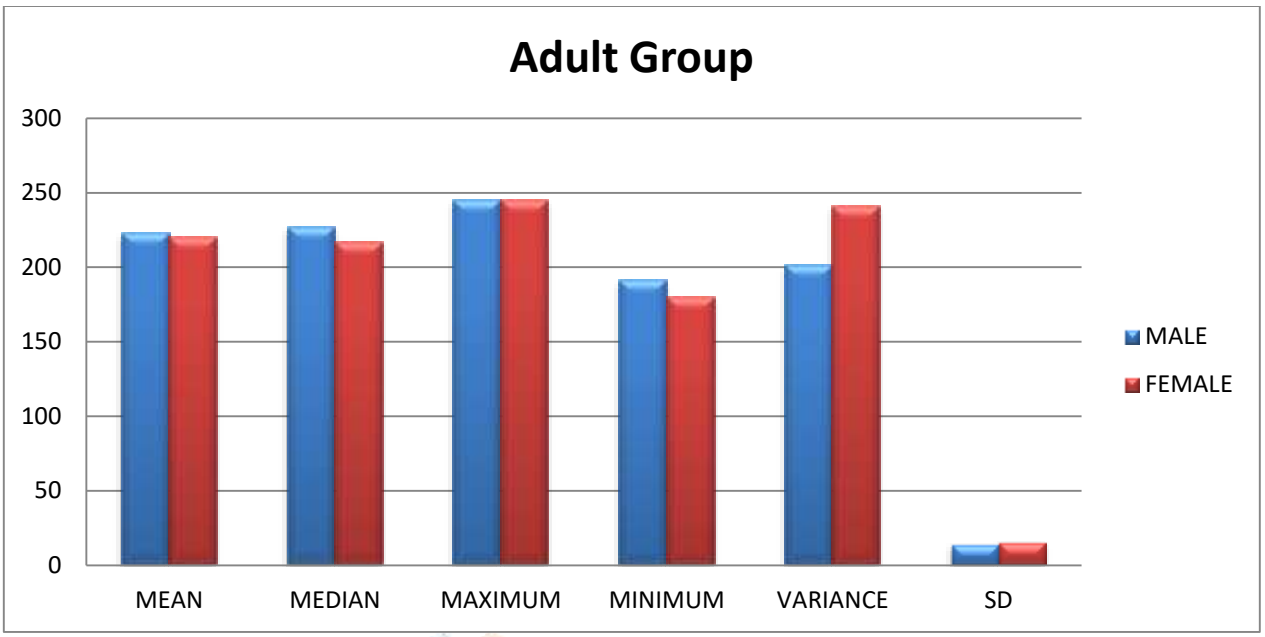
(Table3.1)

Count	Mean	Median	Variance	Maximum	Minimum	Sd
30	213.366	214	240.69	256	192	15.514

In case of all 30 male after calculating the foveal thickness in microns, the data is represented in the table 3.2

Count	Mean	Median	Variance	Maximum	Minimum	SD
30	222.066	224.5	201.52	245	191	14.196

(Table3.2)



This Chart Shows the Comparison between Male & Female Data <50:

4.3 Overall comparison of foveal thickness between adult and old age group were evaluated, After collecting all data and post analysis the data in old age group (>50) is given in below table 4.1

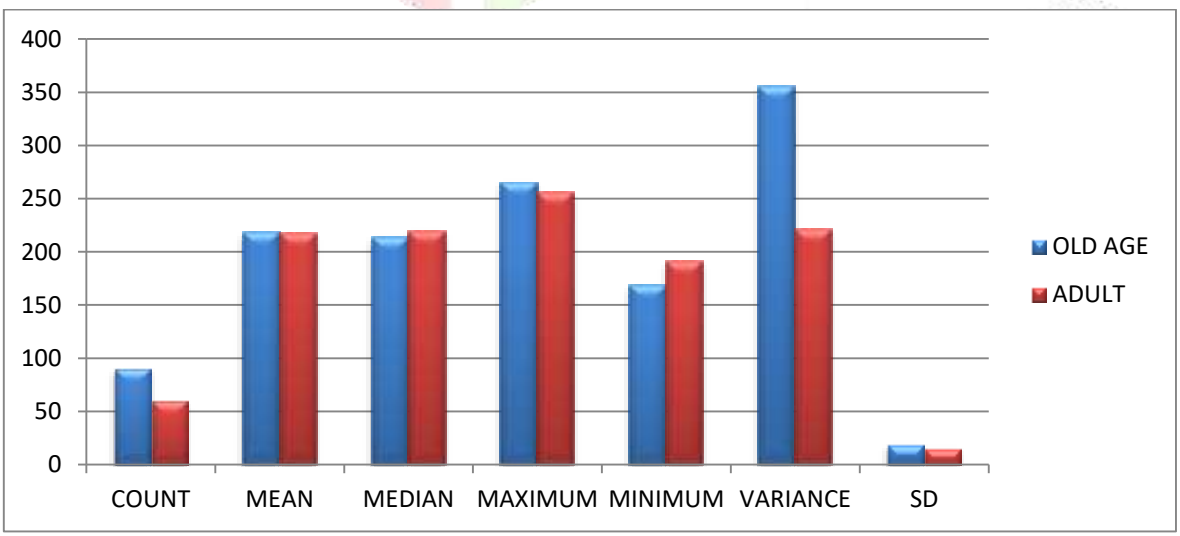
Count	Mean	Median	Variance	Maximum	Minimum	SD
90	218.235	213.5	355.597	265	169	18.857

(Table 4.1)

In adult group (<50) data is given below table 4.2

Count	Mean	Median	Variance	Maximum	Minimum	SD
60	217.71	219.25	221.105	256	191	14.85

(Table 4.2)



This chart shows the comparison between adult vs. old age group

5.0 Discussion

Quantitative data have been presented to show that we can compare between foveal thickness in adult and old age group. In this study in old age group which is above 50 years what we see that mean foveal thickness is more in male than female which is 3.47 micrometer, in case of median value the male is 7 micrometer higher than female. By this we can say that male have greater foveal thickness than female in old age group but the difference is not much. Standard deviation difference in male and female is 0.01. In case of adult age group which is below 50 but higher 18 we see the mean foveal thickness is 8.7 micrometer higher in male than female which is significant, and in case of median there is also significant difference which is 10.5. Here also we see that male have greater foveal thickness than female. When we compare overall foveal thickness in between in adult vs. old age group we see the mean thickness is 0.525 micrometer higher in old age group than adult age group, and in median we see that 5.75 is greater in adult age group than old age group which is significant. Standard deviation difference is 4.007 which are greater in old age group than adult age group.

6.0 Conclusion

By this study we found that there is decrease in foveal thickness in old age group than adult age group and female have lesser foveal thickness than male in all age group. By this study we also conclude that in old age group the central sharper vision is affect but that is not very much significant.

The comparison provides a suitable reference for optometry and ophthalmology. This study is also helpful for future research on macular and foveal thickness.

7.0 References

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