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A Clinical Study to Assess Retinal Morphology In Various Grades Of Myopia Using Spectral Domain Optical Coherence Tomography

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Abstract:* *Aims And Objectives: *To evaluate retinal nerve fibre layer thickness and central foveal thickness in various degree of myopia during 2015to 2018.*
Methodology: *A total of 200 eyes of myopic patients between age group of 18-40 years were selected and complete ophthalmic examination was done. Subjects were categorised into low (-.50D SE, <-3.00D); moderate (-3.00D SE≤ -.600D) and high(-6.00D SE<-8.00D) degree of myopia. Using SD-OCT the CFT and RNFL thickness were measured. Axial length measured using A-SCAN Biometry for every subject.*
Result: *The CFT of high myopia 230±3.37µm (23 eyes) was greater than low 213.87±10.38µm (40 eyes) and moderate 219.64±4.2µm (37 eyes). The average RNFL thickness was (48.26±4.9)µm; (51.64±6.62)µm; (79.17±7.1)µm in high, moderate and low myopic group respectively. The average RNFL thickness was thin in highly and moderately myopic eyes as compared to low myopic. A significant linear correlation was found between SE and RNFL thickness.*
Conclusion: *The CFT and RNFL thickness vary with refractive status and axial length of eye. Myopia can be a confounding factor in RNFL thickness attributed to its influence on RNFL thickness. Myopics with thin RNFL should be screened for glaucoma at regular interval. As early detection of such change in CFT helpful in understanding mechanism and factors affecting the structural changes of myopic eyes.*
Keywords*: Myopia , central foveal thickness, RNFLt, optical coherence tomography, A-Scan.*

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I. Introduction

Myopia or shortsightedness is defined as the state of refraction in which parallel rays of light are brought to focus in front of the retina with accommodation at rest [1-3]. This result in blurred distant vision. The increasing prevalence of myopia has become a major public health impact due to its potentially blinding ocular complications like retinal detachment and glaucoma. In myopic children retinal defocus due to inaccurate accommodation during close work may be a stimulus for increase in elongation of axial length and progression of myopia [4]. In high myopia scleral ectasias are relatively frequent and it involves the posterior pole of the eye leading to poor visual progonosis in adult life [5]. Also, the risk of chorioretinal abnormalities such as retinal detachment, chorioretinal atrophy, lacquer cracks, Foster Fuchs spot, Pigmentary degeneration, Lattice degeneration, posterior staphyloma increased with severity of myopia and increase in axial length [6]. The prevalence of cataract [7] – posterior sub capsular, nuclear cataract and Glaucoma [7] – ocular hypertension, primary open angle glaucoma are found more in high myopia [8]. High degree of myopia is associated with retinal detachment at younger age groups [9]. The vitreous undergoes liquefaction and degeneration which leads to vitreous opacities [5] and posterior vitreous detachment (PVD).

Currently Myopia has been reported as a risk factor for glaucoma, accounting its influence on peripapillary retinal nerve fiber layer (RNFL) thickness. Assessment of the peripapillary retinal nerve fiber layer (RNFL) thickness has been an important approach for detecting structural damage in Patients with glaucoma [11,12] Therefore, it is urgent to establish the correlation between RNFL thickness and myopia, not Only for understanding the characteristics of RNFL with the Change of the degree of myopia, but also for using these Characteristics to be identified with the early stage of glaucoma. Also myopic fundus changes may complicate glaucoma diagnosis and management.

Optical Coherence Tomography is newer non invasive, non-contact technique of measuring thickness of retinal nerve fiber layer. It provides potential means for quantification of RNFL thickness and also for detection and documenting progression of RNFL loss. optical coherence tomography (OCT) has enhanced our understanding of changes in different ocular layers when axial myopia progresses and the globe is stretched. In this review, recent observations regarding retinal changes in highly myopic eyes explored by OCT are described to highlight structural findings that cannot be diagnosed by traditional methods.

This study is done to correlate the variations in retinal nerve fibre layer thickness in mild, moderate and high myopia between the age group of 18-40 years by optical coherence tomography and to correlate the axial length with foveal and macular thickness in various degrees of myopia.

II. Objectives

2.1 To state that SD OCT can qualitatively and quantitatively evaluate RNFL thickness ONH and various macular parameters in Myopic patients..
2.2 To assess and correlate SD-OCT parameters like Average RNFL thickness, peripapillary RNFL thickness and CFT with spherical equivalent and axial length in various grades of myopic patients.
2.3 To detect early structural changes in myopic patients.
2.4 To use this study for evaluation, prognostication and management of various types and grades of myopia.
2.5 To use this study as bench mark for further diagnostic and prognostic endeavor in field of myopia and relevant use of SD-OCT.

III. Material and methods

All the patients attending the outpatient department in Upgraded Department of Ophthalmology in NSCB MCH Jabalpur in the duration year 2015 – 2018 were evaluated.
18-40 Years young adults of both gender with out any pathologies and refractive error of
-8.00 D as well as no astigmatism higher than -1.00 D were included in this study. Informed consent was obtained from all subjects.
All patients were subjected to detailed history taking regarding following points.

1. Relevant history : diminution of vision for distance, asthenopic symptoms,
2. History regarding duration of myopia and history of spectacle usage.
3. History of surgery: example cataract surgery, filtering surgery, posterior segment surgery
4. History of associated systemic illness like diabetes mellitus, hypertension, bleeding disorders or any other.
5. History of trauma.
6. Family history.
7. Personal history.

All patients underwent a detailed clinical evaluation including:
3.1 Ocular examination
3.1.1 Snellen's visual acuity testing. aided and unaided with pinhole.
3.1.2 Cycloplegic Refraction and PMT done after one day.
3.1.3Evaluation of intraocular pressure by Non Contact Tonometry.
3.1.4Slit lamp biomicroscopy of anterior segment.
3.1.5Gonioscopy using Goldmans 3 and 4 mirror lens
3.1.6Dilated Fundus examination by indirect ophthalmoscopy, 90D examination,
3.1.7Automated Perimetry by Humphrey field analyzer.
3.1.8 A-scan biometry for axial length.
3.1.9Carl Zeiss Spectral Domain Optical Coherence Tomography

A total of 200 eyes of myopic patients between age group of 18-40 years were selected and complete ophthalmic examination was done. Subjects were categorised into low (-.50D SE, <-3.00D); moderate (-3.00D SE≤ -.600D) and high(-6.00D SE<-8.00D) degree of myopia. . Axial length measured using A-SCAN Biometry for every subject.

All included subjects were scanned with the SD-OCT by a single operator. Scan protocol of Cirrus HD-OCT called 'optic disc cube 200 x 200 is used for measurement of RNFL thickness. Three scans were taken. Three sessions of macular scanning using the macular cube 512x128 protocol was used for measurement of central foveal thickness.

These scans were taken by making the patient to sit comfortably on stool, adjust chinrest and keeping patient head in place. Finding the pupil and focus the image in iris view port. Capture the fundus image and high density scan. Review the captured image then save or try again. One of the 3 scans, obtained the same day, with maximum signal strength was included. The results were analyzed. All OCT scans were performed through a dilated pupil.

3.2 Exclusion Criteria

3.2.1Age less than 18 and more than 40 years.
3.2.2Best corrected visual acuity worse than <6/60
3.2.3Previous intraocular surgery
3.2.4Intraocular pressure >21mmHg
3.2.5Gonioscopic findings of angle closure
3.2.6Clinical evidence of pseudoexfoliation ,uveitis or pigment dispersion syndrome, corneal or media opacity , retinal diseases ,or neurologic condition affecting vision.
3.2.7Family history in first degree relative of glaucomatous or other optic neuropathy.
3.2.8Apart from optic disc and peripapillary changes associated with myopia, subjects do not have any other ocular abnormalities.
3.2.9OCT Image with signal strength of < 3/10 was excluded
3.2.10Unreliable and uncooperative pts were also excluded.

Selected subjects are included and cyloplegic refraction was done once pupil was dilated by installation of tropicamide+phenylephrine eye drops. Post mydriatic test was done after one day and patients were assingned to 3 groups as follows:

- **Low** (-.50d Se, <-3.00d);
- **Moderate** (-3.00d Se ≤ -.600d) And
- **High** (-6.00d Se<-8.00d) Degree Of Myopia.

IV. Statistical analysis

According to WHO manual for sample size determination in health studies, with a precision of 20% and confidence interval of 90% and prevalence of myopia from previous study as 34.6% the sample size is calculated as 200. The study subjects were described according to their demographic profiles such as age, gender and type of eyes in terms of percentages according to the degree of myopia. The degrees of myopia were classified in to three category such as High, Moderate and Mild. The macular retinal thicknesses and RNFL Thickness between the three categories were compared by ANOVA test.

The above statistical procedures were performed by the statistical package namely IBM SPSS statistics-20. The p-values less than 0.05 ($p<0.05$) were considered as statistically

significant in two tail test. . Data were reported as mean ± standard deviation (SD).The difference between groups was defined by oneway ANOVA. Pairs were compared with Bonferroni test statistics.

V. Observation

Table 1: Age Profile of Studied Subjects

Age group	Frequency	Percent	Cumulative Percent
upto 20 yrs	52	26	26
21-25 yrs	64	32	58
26-30 yrs	50	25	83
>30 yrs	34	17	100
Total	200	100	

The summary of the age distribution table showed that myopa is more prevalent in younger age group and was statistically significant ($p<0.01$).

Table 2: Gender Profile of Studied Subjects

Sex	Frequency	Percent	Cumulative Percent
Female	92	46	46
Male	108	54	100
Total	200	100	

The summary of the gender distribution table showed that myopia is more prevalent in males

Table 3: Frequency of Myopia in Different Age Group

	Sex			
	Female		Male	
Age Group	N	(%)	n	(%)
upto 20 yrs	36	39.10%	16	14.80%
21-25 yrs	16	17.40%	48	44.40%
26-30 yrs	24	26.10%	26	24.10%
>30 yrs	16	17.40%	18	16.70%

The summary of the age sex distribution table showed that myopa is more prevalent in males of age 21-25 followed by young females of age upto 20 years.

Table 4: Relationship Between Different Parameters And Three Categories Of Myopia

	SE Group		
	less than 3	-3 to -6	> -6
FACTORS	MEAN ±SD	MEAN ±SD	MEAN ±SD
AGE	25.33±5.71	26.11±4.75	22.22±4.22
SE	-1.59±0.64	-4±0.85	-6.83±0.83
AXIAL LENGTH	24.74±0.43	25.76±0.25	26.61±0.36
CFT	213.88±10.39	219.65±4.29	230.65±3.38
SupRNFL	101.65±9.33	56.76±8.51	59.96±4.52
nasalRNFL	61.2±6.34	52.59±6.69	47.87±5.68
infRNFL	96.93±9	51.68±7.09	47.91±6.75
temRNFL	56.15±6.38	44.24±5.93	36.57±7.77
avgRNFL	79.18±7.11	51.65±6.63	48.26±4.95
Avg GCLIPL	80.58±3.72	76.54±3.41	46.96±4.77
MiniGCLIPL	75.65±4.7	66.27±4.81	27.22±5.7

Summary of this table shows that as grade of myopia increases in terms of spherical equivalent the RNFL thickness decreases.
As myopia increases the axial length also increases.
As myopia increases CFT keeps on increasing.

Table 5: Comparision According To Gender between Various Parameters & Different Category of Myopia

FACTORS	SEX					
	FEMALE			MALE		
	SE Group			SE Group		
	less than 3	-6 to -3	> -6	less than 3	-6 to -3	> -6
	MEAN±SD	MEAN±SD	MEAN±SD	MEAN±SD	MEAN±SD	MEAN±SD
AGE	26±6.59	25.64±5.02	20.67±4.12	24.65±4.75	26.39±4.67	23.91±3.81
SE	-1.71±0.74	-3.93±0.92	-6.75±0.75	-1.46±0.51	-4.04±0.82	-6.91±0.94
AXIAL LENGTH	23.8±0.49	24.73±0.31	25.64±0.28	23.69±0.38	24.77±0.21	25.57±0.45
CFT	215.85±11.17	218.64±4.16	230.58±3.5	211.9±9.41	220.26±4.34	230.73±3.41
supRNFL	100.45±10.52	54.93±8.45	60.83±4.67	102.85±8.06	57.87±8.53	59±4.36
nasalRNFL	61.05±7.51	50.86±6.16	48.33±6.26	61.35±5.11	53.65±6.9	47.36±5.24
infRNFL	96.15±10.29	48.29±6.03	46.5±6.79	97.7±7.7	53.74±7	49.45±6.67
temRNFL	56.7±7.43	43.21±5.73	35.75±7.92	55.6±5.27	44.87±6.09	37.45±7.89
Avg RNFL	78.8±8.2	49.71±6.14	48±4.53	79.55±6.01	52.83±6.76	48.55±5.57
Avg GCLIPL	80.1±2.92	76.43±2.71	47.08±4.19	81.05±4.41	76.61±3.83	46.82±5.55
Min GCLIPL	75.1±4.63	66.57±4.75	27.75±5.61	76.2±4.83	66.09±4.94	26.64±6

Table 6 Comparison of Mean Axial Between Three Categories of Myopia.

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
AXIAL LENGTH	24.74±0.43	25.76±0.25	26.61±0.36	205.57 <0.0001	1vs 2 <0.0001 1 vs 3 <0.0001 2 vs 3 <0.0001

Comparison of axial length between three categories the mean axial length of high myopia was statistically highly significant with other two categories. Similarly other two categories were also very highly statistically significantly differed with each other.

Table 7: Comparision of CFT Between Three Categories Of Myopia.

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
CFT	213.88±10.39	219.65±4.29	230.65±3.38	38.96 <0.0001	1vs 2= 0.002 1 vs 3 <0.0001 2 vs 3 <0.0001

Table 8: Comparision of SupRNFL Between Three Categories Of Myopia

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
SupRNFLl	100.45±10.52	54.93±8.45	60.83±4.67	345.26 <0.0001	1vs 2 <0.0001 1 vs 3 <0.0001 2 vs 3 =0.428(NS)

Table 9: Comparision Of NasalRNFL Between Three Categories Of Myopia

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
nasalRNFL	61.2±6.34	52.59±6.69	47.87±5.68	36.44 <0.0001	1vs 2=<0.0001 1 vs 3 <0.0001 2 vs 3 =0.018

Table10: Comparision Of InferiorRNFL Between Three Categories Of Myopia

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
infRNFL	96.93±9	51.68±7.09	47.91±6.75	426.50 <0.0001	1vs 2=<0.0001 1 vs 3 <0.0001 2 vs 3 =0.002

Table 11: Comparision Of TemporalRNFL Between Three Categories Of Myopia

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
tempRNFL	56.15±6.38	44.24±5.93	36.57±7.77	71.08 <0.0001	1vs 2=<0.0001 1 vs 3 <0.0001 2 vs 3 <0.0001

Table 12: Comparision Of AvgRNFL Between Three Categories Of Myopia

	MILD (n=80)	MODERATE (n=74)	HIGH (n=46)	F RATIO P VALUE	SIGNIFICANE INDIVIDUAL COMPARISION
avgRNFL	79.18±7.11	51.65±6.63	48.26±4.95	238.48 <0.0001	1vs 2=<0.0001 1 vs 3 <0.0001 2 vs 3 =0.157(NS)

Table 13; Bonferroni Test Of Significance For Multiple Comparision

	ANOVA F	P value	P value Mild vs moderate	P value Mild vs high	P value Moderate vs high
AXIAL LENGTH	205.57	<0.0001	<0.0001	<0.001	<0.001
CFT	38.96	<0.0001	=0.002	<0.0001	<0.0001
RNFLs	345.26	<0.0001	<0.0001	<0.0001	=0.428(ns)
RNFLn	36.44	<0.0001	<0.0001	<0.0001	=0.018
RNFLi	426.50	<0.0001	<0.0001	<0.0001	=0.0002
RNFLt	71.08	<0.0001	<0.0001	<0.0001	<0.0001
RNFLavg	238.48	<0.0001	<0.0001	<0.0001	=0.157(ns)
Avg GCLIPL	600.86	<0.0001	<0.0001	<0.0001	<0.0001
Mini GCLIPL	721.60	<0.001	<0.0001	<0.0001	<0.0001

Table 14; Gender Wise Comparision Of Mean Values

	Sex	
	Female	Male
Factors	MEAN±SD	MEAN±SD
AGE	24.5±5.92	25.24±4.58
SE	-3.7±2.21	-3.67±2.15
AXIAL LENGTH	24.56±0.85	24.53±0.79
CFT	220.54±9.92	219.3±9.48
RNFLs	76.26±23.19	74.76±23.03
RNFLn	54.63±8.81	55.22±7.9
RNFLi	68.63±25.74	69.15±23.26
RNFLt	47.13±11.32	47.33±9.26
Avg RNFL	61.91±16.4	61.85±15.1
Avg GCLIPL	70.37±14.43	72.19±13.8
Mini GCLIPL	60.15±20.38	61.8±19.19

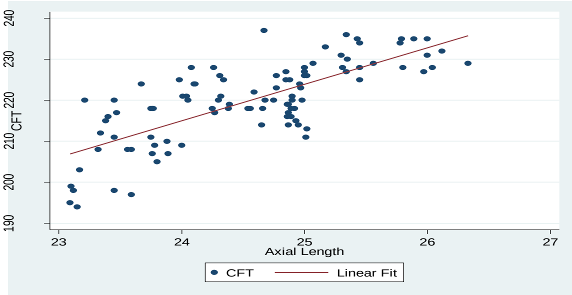

Fig: 1

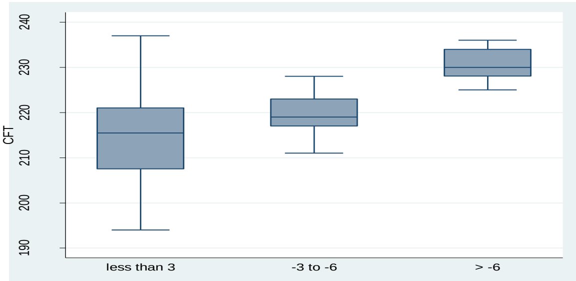

FIG: 2

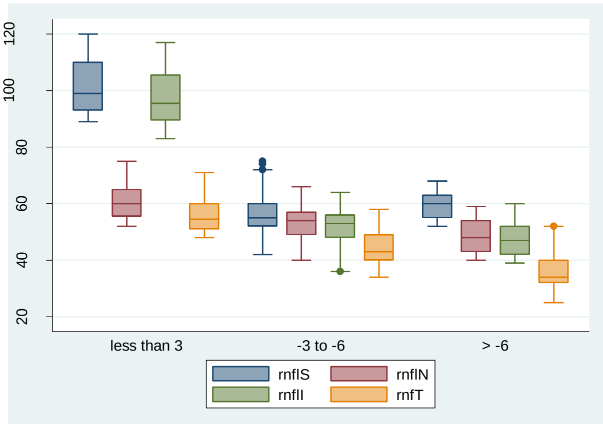

Fig: 3

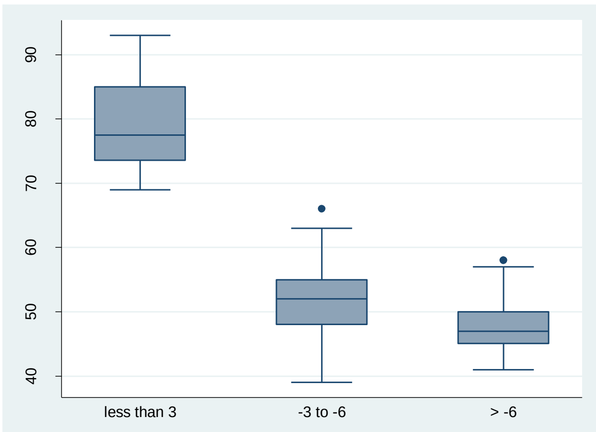

Fig: 4

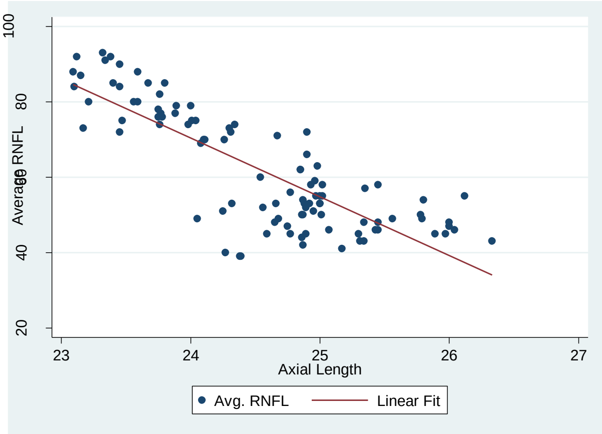

Fig: 5

VI. Results

This study was done to correlate the variations in retinal nerve fibre layer thickness in mild, moderate and high myopia between the age group of 20-40 years by optical coherence tomography and to correlate the axial length with foveal and macular thickness in various degrees of myopia.

In our study Among the 120 patients, A total of 200 eyes were examined of which 46 eyes in high myopia, 74 eyes in moderate and 80 eyes of mild myopia were included. In respect of total eyes the percentage of myopia was 23% in high myopia, 37% moderate myopia and 40% were mild myopia.

The mean ages of high, moderate and mild category were (22.22±4.22) y ; (26.11±4.75) y; and (25.33±5.71) y respectively.

The CFT of high degree mypia (230±3.37) was significantly thicker compared to mild (213.87± 10.38) and moderate group (219.64±4.2) with p<0.0001.[Table7/Fig-2].

The mean axial length of high degree myopia (26.61±0.36)mm was statistically Very highly significant with the other two categories such as Moderate (25.76±0.25)mm and mild (24.74±0.43)mm [Table6/Fig-1]

The RNFL Thickness was (101.65±9.33)µm ;(61.2±6.34) µm; (96.93±9)µm & (56.15±6.38)µm in superior nasal inferior and temporal quadrants respectively and the average RNFL thickness was significantly thinner in high myopia (48.26±4.95)µm group as compared to moderate (51.65±6.63)µm and mild (79.18±7.11)µm myopic group with p value <0.0001.[Table 8 9 10 11 & 12].

Also we found that as axial length increases RNFL Thickness decreases and CFT increases ie positive correlation between CFT & axial length. Negative correlation between axial length & RNFL Thickness.

VII. Disscussion

Myopia is one of the most common eye problem in the world. Its association with primary open angle glaucoma is well recognized. The risk of developing glaucoma is 2-3 times higher in myopic individuals than in non-myopic individuals.However, the clinical diagnosis of glaucoma in such patients is challenging becauseof the pre-existing myopic changes in the retina and the optic disc.

Currently, glaucoma is diagnosed by changes in the appearanceof the optic disc, retinal nerve fiber layer (RNFL) thickness and visual field changes.In early glaucoma, structural changes precedes the functional damage. The RNFL thickness measurement is a sensitive predictor of early glaucomatous changes and the extent of RNFL damage correlates with the severity of functional deficit in the visual field.

However, in myopic eyes, the globe is enlarged with increase in axial length. The axial length affects the RNFL thickness inversely.[s] Because of this, glaucomatous changes cannot be easily interpreted in myopic patients, possibly leading to overdiagnosis or under diagnosis of glaucoma.

In our study we found that the mean axial length of high, moderate and low myopic groups are (26.61±0.36)mm, (25.76±0.25)mm, (24.74±0.43)mm respectively. The mean value of spherical equivalent was(-1.59±0.64) D among low myopic subjects(-4.00±0.85) D and (-6.83±0.83) D in moderate and high myopic group respectively. And it was found that as the degree of myopia ie value of spherical equivalent increases the axial length also kept on increasing and was statistically very highly significant when compared between all three categories of myopia. (p<0.0001) . The mean CFT (in micron) was 230.65(±3.38) in high myopic subjects and 219.65(±4.29) in moderate and 213.88(±10.39) in low myopic subjects. The mean CFT in high myopic subjects found to be significantly higher than moderate and low myopic subjects (F=38.96 ;p<0.0001). The mean superior RNFL thickness in low myopes was 100.45(±10.52) µm, while among moderate it was

54.93(±8.45)µm and in high myopic subjects it was 60.83(±4.67)µm. It was found that superior RNFL thickness was significantly decreased when compared between low and moderate myopic groups.($p<0.0001$).But no significant decrease was found when compared between moderate and high myopic groups.($p=0.428$). The mean nasal RNFL thickness in low myopes was 61.2(±6.34) µm, while among moderate it was 52.59(±6.69)µm and in high myopic subjects it was 47.87(±5.68)µm. It was found that nasal RNFL thickness was significantly decreased when compared between low and moderate myopic groups.($p<0.0001$). Also low but significant decrease was found in nasal RNFL thickness when compared between moderate and high myopic subjects.($p=0.018$). The mean inferior RNFL thickness in low myopes was 96.93(±9.0) µm, while among moderate it was 51.68(±7.09)µm and in high myopic subjects it was 47.91(±6.75)µm. It was found that inferior RNFL thickness was significantly decreased when compared between low and moderate myopic groups ($p<0.0001$). Also low but significant decrease was found in nasal RNFL thickness when compared between moderate and high myopic subjects.($p=0.002$). The mean temporal RNFL thickness in low myopes was 56.15(±6.38) µm, while among moderate it was 44.24(±5.93) µm and in high myopic subjects it was 36.57(±7.77)µm. It was found that temporal RNFL thickness was significantly decreased when compared between low,moderate and high myopic groups.($p<0.0001$).

According to Lim et al (2005) the average macular thickness (overall) was 230±10.5 micron and was not significantly related to the degree of myopia. But the mean minimum retinal thickness (at the foveola)was 141±19.1 micron and this was positively correlated with axial length($p=0.015$) and spherical equivalent ($p=0.0002$).[13]

Choi et al (2006) investigated changes in the thickness of the fovea and peripapillary nerve fibre layer thickness associated with myopia. The thickness of fovea for each three group were 142.16±8.99 micron, 153.58±17.63 and 158.86±11.93 and the data showed significant differencesin fovea thickness between the groups. The average thickness of peripapillary RNFL for each group were113.29±10.80 µm ,103.85±14.48 µm and 100.74±9.15 µm.A statistically significant difference was found between group one the other group (p.<0.005)[14]

Othman SF et al(2012) studied relationship between macular thickness and spherical equivalent refraction and axial length found positive correlation between foveal thickness and axial length ($R=0.34$; $P<0.05$).[15]

Nancy Elizabeth et al (2015) found foveae minimum of high myopia (178 ±26.4 microns) was significantly thicker compared to moderate myopia ($p= 0.028$). There was no significant intergroup difference in the thickness significance of the outer and inner macular between mild, moderate and high degree of myopia. The mean axial length of high myopia (26.7±0.97mm) was significantly higher compared to moderate (24.6±0.81mm) and low myopia (23.5±0.81mm) with a p-value of $p= 0.001$. There was a positive correlation of axial length with foveae minimum, fovea and superior inner macula in respect to myopia

($p<0.05$).[16]

Raucher et al (2009) found that RNFL thickness decreased with higher axial length (Overall $R = -0.70$, $p<0.001$, Superior $R = -0.60$, $p=0.001$, Inferior $R =$

-0.60, $P=0.001$), and higher spherical equivalent (Overall $R = -0.52$, $p=0.005$, Superior $R = -0.41$, $p=0.03$, Inferior $R = -0.45$, $p=0.02$). Overall RNFL thickness decreased 7 microns for every 1 mm of axial length, and 3 microns for every 1 Diopter sphere. Nasal and temporal RNFL thickness showed no significant associations with myopia.[17]

Kang SH et al.(2010) evaluated the effect of myopia on the peripapillary retinal nerve fiber layer (RNFL) thickness measured by Cirrus HD optical coherence tomography (OCT) and showed that the axial length affected the average RNFL thickness, and myopia affected the RNFL thickness distribution. High myopes are likely to exhibit different RNFL distribution patterns. Since ocular magnification significantly affects the RNFL measurement in such patients, it should be considered in diagnosing glaucoma.[18]

Wang G et al.(2010) evaluated the effect of myopia on retinal nerve fibre layer (RNFL) thickness measured by spectral domain optical coherence tomography and scanning laser polarimetry and found that average RNFL thickness measured with cirrus HD OCT correlated significantly with axial length and degree of myopia while no such correlation was detected in GDx ECC.[19]

Kim et al (2010) Moderate-extreme high myopia speculated that the retinal was dragged toward the temporal horizon as the axial length increases.We all knew that the papillo macular bundles exist in the temporal quadrant.The fibers of macular area walked upper and lower of the horizontal suture towards the optic disc. Whether it would lead to the temporal RNFL different from other quadrants.[20]

In our study the mean avg GCL-IPL was 80.58(±3.72)µm in low myopic group while in moderate and high myopic groups it was 76.54(±3.41)µm and 46.96(±4.77) µm respectively. The mean minimum GCL-IPL was 75.465(±4.7)µm in low myopic group while in moderate and high myopic groups it was 66.27(±4.81)µm and 27.22(±5.7)µm respectively. The minimum and average GCL-IPL thickness both varies significantly with increase in axial length and spherical equivalent.

Kim NR et al (2011) compared diagonostic ability to detect glaucomatous changes between peripapillary RNFL thickness and macular ganglion cell complex (GCC) in highly myopic patients using FD-OCT and found that the ability to diagonose glaucoma with macular GCC was compararable with peripapillary RNFL thickness in highly myopic patients.[21]

Choi et al (2013) compared the glaucoma detection ability of macular ganglion cell-inner plexiform layer (GCIPL) thickness measured with Cirrus spectral-domain optical coherence tomography (SD-OCT) with that of peripapillary retinal nerve fiber layer (RNFL) thickness in high myopia and found in cases of high myopia, the glaucoma detection ability of macular GCIPL thickness was high and comparable with that of peripapillary RNFL thickness. diagnostic accuracy was measured by means of ROC analysis. the best SD-OCT (Carl Zeiss Meditec) parameters with the largest AUROC were inferior RNFL thickness (AUROC ¼ 0.906); the 7-o'clock sector (AUROC ¼ 0.840); and the inferotemporal GCIPL (AUROC ¼ 0.852) in the highly myopic group, and average RNFL thickness (AUROC ¼ 0.920); the 6o'clock sector (AUROC ¼ 0.851); and the minimum GCIPL thickness (AUROC ¼ 0.908).[22]

To conclude, we recognized that highly myopic patients have significant decrease in average, superior, inferior, nasal and temporal RNFL thickness as compared to moderate and low myopic patients.. Furthermore, we found positive correlation of axial length and spherical equivalent with central foveal thickness (CFT) . In this study we didn't analyzed the progression of myopia. A longitudinal study, with long followup of myopia is recommended**.**

VIII. Conclusion

The foveal thickness and RNFL thickness vary with refractive status and axial length of eye. Myopia can be a confounding factor in RNFL thickness attributed to its influence on RNFL thickness. Myopics with thin RNFL should be screened for glaucoma at regular interval because in few of the patients of myopia RNFL thickness is reduced at par with patient of POAG making it difficult to discern patient of myopia with and without POAG.Thereby early detection of changes in RNFL thickness are helpful in detecting preperimetric glaucoma. And also early detection of changes in CFT helps in understanding the mechanism and various factors affecting the structural changes of myopic eyes.

Reference

[1]. Yanoff M, Duker JS. "Ophthalmology". 2nd ed. Printed in United Kingdom; Copyright ©Mosby International Ltd: 2004.
[2]. Saw S-M, Katz J, Schein OD, Chew S-J, Chan T-K.Epidemiology of myopia. *Epidemiology Rev.* 1996 ;18(2):175–87.
[3]. Curtin BJ. The myopia: Basic science and clinical management. Philadelphia, PA: Harper and row. 1985.
[4]. Curtin B. Topics to be considered when establishing standards for clinical myopia studies. *Acta ophthalmol suppl.* 1988;185: 61-62.
[5]. Gwiazda JE. Accommodation and Related Risk Factors Associated with Myopia Progression and Their Interaction with Treatment in COMET Children. *Invest Ophthalmol Vis Sci*. 2004;45(7):2143–51.
[6]. Ursekar T N. Classification, etiology and pathology of myopia. *Indian J Ophthalmol.* 1983;31:709-11.
[7]. Saw SM, Gazzard G, Shih-Yen EC, Chua WH. Myopia and associated pathological complications. *Ophthalmic Physiol Opt*. 2005;25(5):381–91.
[8]. Leung CKS, Mohamed S, Leung KS, Cheung CYL, Chan SLw, Cheng DKy, et al. Retinal Nerve Fiber Layer Measurements in Myopia: An Optical Coherence Tomography Study. *Invest Ophthalmol Vis Sci*.2006;47(12):5171–76.
[9]. Schweitzer KD, Ehmann D, García R. Nerve fibre layer changes in highly myopic eyes by optical coherence tomography. *Can J Ophthalmol J Can Ophtalmol*. 2009;44(3):e13–6.
[10]. Burton TC. The influence of refractive error and lattice degeneration on the incidence of retinal detachment. *Trans Am Ophthalmol Soc*. 1989;87:143.
[11]. Sharples E Optical Coherence Tomography findings in High Myopia. *Optician*. 2005, Vol 230.
[12]. Wakitani Y, Sasoh M, Sugimoto M, et al. Macular thickness measurements in healthy subjects with different axial lengths using optical coherence tomography. *Retina.* 2003;23:177-82.
[13]. Lim MCC. Use of Optical Coherence Tomography to Assess Variations in Macular Retinal Thickness in Myopia. *Invest Ophthalmol Vis Sci*. 2005; 46(3):974–7
[14]. Choi SW, Lee SJ. Thickness changes in the fovea and peripapillary retinal nerve fiber layer depend on the degree of myopia. *Korean J Ophthalmol*. 2006;20(4):215–19.
[15]. Othman SF, Manan FA, et al. Macular thickness as determined by optical coherence tomography in relation to degree of myopia, axial length and vitreous chamber depth in Malay subjects. *Clinical and Experimental Optometry* 2012:95(5):484-91.
[16]. Nancy Elizabeth Samuel and Srikanth Krishnagopal, Foveal and Macular Thickness Evaluation by Spectral OCT SLO www.jcdr.net
[17]. Rauscher FM, Sekhon N, Feuer WJ, Budenz DL. Myopia affects retinal nerve fiber layer measurements as determined by optical coherence tomography. J Glaucoma. 2009;18:501– 505.
[18]. Kang, S. H., Hong, S. W., Im, S. K., Lee, S. H., & Ahn, M. D. (2010). Effect of myopia on the thickness of the retinal nerve fiber layer measured by cirrus HD optical coherence tomography. *Investigative Ophthalmology and Visual Science*, *51*(8), 4075–4083. https://doi.org/10.1167/iovs.09-4737
[19]. Wang G, Qiu KL, Lu XH, et al. The effect of myopia on retinal Nerve fibre layer measurement: a comparative study of spectral-domain optical coherence tomography and scanning laser polarimetry. Br J Ophthalmol. 2010;95:255–260.
[20]. Kim MJ, Lee EJ, Kim TW. Peripapillary retinal nerve fiber layer thickness profile in subjects with myopia measured using the Stratus optical Coherence tomography. 2010;94(1):115-120.
[21]. Kim NR, Lee ES, Seong GJ, et al. Comparing the ganglion cell complex and retinal nerve fibre layer measurements by Fourier domain OCT to detect glaucoma in high myopia. BrJ Ophthalmol. 2011;95:1115–1121.

[22]. Choi, Y. J., Jeoung, J. W., Park, K. H., & Kim, D. M. (2013). Glaucoma detection ability of ganglion cell-inner plexiform layer thickness by spectral-domain optical coherence tomography in high myopia. *Investigative Ophthalmology and Visual Science*, *54*(3), 2296–2304. https://doi.org/10.1167/iovs.12-10530

[23]. Xie R, Zhou XT, Lu F, Chen M, Xue A, Chen S, et al. Correlation between Myopia and Major Biometric Parameters of the Eye: A Retrospective Clinical study. *Optometry and Vision Science*. 2009; 86: 503-08.

Dr. Jyoti Kanoje. "A Clinical Study to Assess Retinal Morphology In Various Grades Of Myopia Using Spectral Domain Optical Coherence Tomography." IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 18, no. 2, 2019, pp 16-25