ORIGINAL RESEARCH

Retinal Nerve Fiber Layer Thickness and Macular Thickness in Primary Microtropia

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ABSTRACT
Primary microtropia or microstrabismus with identity is a condition in which there is no manifest deviation on cover/uncover test, positive 4prism base out test, normal fusion, abnormal binocular single vision (BSV),foveal suppression scotoma and amblyopia. The aim of this study was to compare the macular and retinal nerve fiber layer (RNFL)thickness ofmicrotropic eye with the normal fellow eyes using optical coherence tomography. Fifteen patients of microtropia were evaluated. The mean macular thickness was 280+ _22 microns in microtropia& 281+_ 12 microns in fellow eye and the mean RNFL thickness was112.69+_15.12 and 107.47+_10.31 microns respectively.Macular thicknesses did not differ significantly, but RNFL thicknesses differ significantly. The Macula is significantly thinner in inner temporal quadrant (307+_29 micron) in microtropia as compared to normal fellow eye (321+_45 micron)$p<0.05$.
Keywords: Primary Microtropia, Retinal Nerve Fibre Layer Thickness, Macular Thickness, Optical Coherence Tomography.

BACKGROUND

Microtropia is defined as a deviation of 5° or less leading to abnormal binocular single vision (BSV), normal fusion, and reduced stereopsis.It is also associated with amblyopia, eccentric fixation, foveal suppression scotoma, andanisometropia.In microtropic patients there is no manifest movement on cover test and associated with anomalous retinal correspondence (ARC).[1]

Yen et al. postulated that there is decrease in reduction of ganglion cell in postnatal period in cases of amblyopia and this would cause increased retinal nerve fibre (RNFL) thickness.[2]The purpose of this study was to describe the structural changes in the macula in patients withmicrotropia using optical coherence tomography (OCT). OCT is a non-invasive, noncontact methodthat measures RNFL thickness.[3,4]

MATERIALS & METHODS

This study was done on 15 microtropic patients between the age group of 10 years to 25 years who were diagnosed with primary microtropia.RNFL thickness and Macular thickness for both microtropic eye and normal fellow eyes were done byspectral domain OCT (SD-OCT;Mastero 3D OCT, TOPCON, Japan).

Microtropia was defined by the following criteria:

(1) Cover test showed only latent or no deviation (microtropia with identity), or small manifest deviationof <5° (microtropia without identity).

(2)Central suppression scotoma in Bagolini glass test

(3) positive 4 prism base out test

(4) Normal fusion for near, absent fusion for distance and reduced stereopsis.

Prior to OCT segmentation scan, the pupils were dilated with tropicamide and phenylephrine drop.

To measure the macular thickness and RNFL thickness, a scanning beam was focussed on the fundus with an infrared camera. The sequential images were taken for macular scan and RNFL scan for each eye. The macular thickness maps consist of three concentric rings: central ring, inner ring and outer ring. Macular thickness was measured in nine quadrants with the help of Early Treatment Diabetic Retinopathy Study (ETDRS) grid map consists of three circles with diameters of 1mm, 3mm and 6mm.

The nine quadrants were named as central zone, inner superior-inferior-nasal-temporal and external superior-inferior-nasal-temporal quadrant. Each quadrant was compared with the respective quadrant in the fellow eye. The results were analyzed using Microsoft office SPSS version16. Comparison between normal and microtropic eyes were performedusing student's t-test. P valueof less than 0.05 was considered to bestatically significant.

The RNFL thicknesses were measured by experienced technician. Outer nuclear layer (ONL) thickness was distance between the internal limiting membrane and external limiting membrane at the center of fovea.

RESULTS

Total of 15 patients with primary microtropia was evaluated in this study. 10 (66.6%) were males, and 5 were (33.3%) females, with mean ageof17.5 +_4.67 years (age range 10–25 years).

Best corrected visual acuity ranges from 6/60 to 6/12in the microtropic eyesand 6/6 in normal eyes in all cases. The microtropic eyes were hypermetropicin all cases while normal fellow eyes were emmetropic.

The mean RNFL thickness, macula, and fovea thickness is shown in (Table-1). RNFL thicknessin microtropiceyes and fellow eyes were different which was statistically significant.No statically significant difference was observed in central macular thickness or macular thickness in the eight quadrantsbetween the normal fellow eyes and microtropic eyes except in inner temporal quadrant. The macular thicknesses are summarized in (Table-2&3).

Table 1: Retinal nerve fibre layer thickness, macular thickness, and foveal thickness (lm) in the strabismus amblyopic patients

	RNFLT		MT		FT	
	M	N	M	N	M	N
Mean	118.67+_9.29	105.92+_6.09	280+ _22	281+_ 12	204.31+_33.81	199.3+_39.31
P value		< 0.05		>0.05		> 0.05

M: Microtropic eyes, N: normal eyes, RNFLT: retinal nerve fibre layer thickness, MT: macular thickness, FT: foveal thickness

Table 2: Macular thickness in ETDRS grid mapping

	Microtropic eye	Fellow eye	P value
Central zone	204.31+_33.81	199.3+_39.31	> 0.05
Inner superior	342.75+_16.89	342.90+_14.86	> 0.05
Inner nasal	346.20+_16.70	346.20+_14.02	> 0.05
Inner inferior	343.85+_13.87	340.00+_19.72	> 0.05
Inner temporal	307.65+_14.93	321.70+_15.17	<0.050
Exterior superior	313.60+_13.64	309.75+_13.68	> 0.05
Exterior nasal	318.05+_17.80	318.75+_15.26	> 0.05
Exterior inferior	294.60+_18.76	294.90+_17.40	> 0.05
Exterior temporal	297.55+_13.73	293.55+_13.21	> 0.05

Table 3: Mean thickness of ONL, IS, OS

	Microtropic eye	Fellow eye	P value
ONL thickness	86.0+_11.1	82.2+_12	> 0.05
IS thickness	49.5+_10.0	43.0+_10	> 0.05
OS thickness	43.0+_4.0	49.0+_6.0	< 0.05

DISCUSSION

Small angle strabismus with typical feature of microtopia is described very well in literature.[5-7] Park has first introduced the term monofixation squint[8]which was changed to monofixation syndrome later on.[9] Lang has describedMicrotropia as a small angle squint with normal fusion, anomalous retinal correspondence (ARC), and reduced stereoacuity.[10]

Microtropia is considered as a motor as well as sensory phenomenon leading to diminished visual acuity and abnormal binocular single vision. There is no published literature available on structural changes in RNFL & macula in eyes with microtropia.There is also scarcity in literature to support our view regarding RNFL thickness and macular thickness in microtropia.

There are few limitations of this study. We investigated only a small number of microtopicsubjects. Additionally, all the patients included in this study are of same ethnicity and region. To confirm our findings further studies will be warranted on a large sample size of different ethnic group.

In conclusion there is no difference in average macular thickness between microtropic eye and normal eye, but RNFL thickness was different between microtpia and normal eye.Macula is also found to be thinner in inner temporal quadrant in the

eyes with microtopia than normal fellow eyes. Our study highlights that there are structural and quantitative changes in RNFL and macula in microtropia.

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