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OPTICAL COHERENCE TOMOGRAPHY IN PAPILLOEDEMA AND PSEUDO PAPILLOEDEMA WITH AND WITHOUT OPTIC NERVE HEAD DRUSEN

Ophthalmology

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ABSTRACT

Introduction: Papilloedema is swelling of the optic disc secondary to raised intracranial tension. It is associated with both vascular and mechanical changes at the optic nerve head. Pseudo papilloedema on the other hand has numerous causes and is associated with only mechanical changes without any vascular changes. Both these conditions cause Retinal Nerve Fibre Layer (RNFL) defects which can be picked up on Optical Coherence Tomography (OCT).1 Our study shows the differences in RNFL defects in different quadrants of optic nerve head in both these conditions. **Materials And Methods:** This is a prospective study of 90 eyes in 54 patients. The study was conducted between November 2018 and April 2019 over a period of 6 months. The OCT images of 60 eyes of 39 patients were done and compared with 30 normal eye OCT using Cirrus HD-OCT (Carl Zeiss Meditec Inc) by optic disc scan 200*200 protocol and HD cross. **Results:** In the eyes having papilloedema, 37% had increased RNFL thickness in all four quadrants, 40% had increased RNFL thickness in all quadrants except temporal. Eyes having pseudo papilloedema showed increased RNFL thickness in all quadrants in 5%, all except temporal quadrant in 31% cases, superior and inferior quadrants in 37%. **Conclusion:** Increased RNFL thickness in all quadrants is more suggestive of papilloedema. 2 Nasal RNFL thickness plays a vital role in differentiating true from pseudo papilloedema.

KEYWORDS

Papilloedema, Pseudo papilloedema, Optic disc drusen, Optical Coherence Tomography

INTRODUCTION

Papilloedema is swelling of the optic nerve head secondary to raised intracranial tension (ICT). Causes of raised ICT are idiopathic intracranial hypertension, obstruction of the ventricular system by congenital or acquired lesions, intracranial space occupying lesions, impairment of cerebrospinal fluid absorption, cerebral edema, cerebral venous sinus thrombosis and malignant hypertension.[1] Causes of pseudo papilloedema are disc drusen which are calcified substances in the optic nerve head present in 2% of the population, crowded disc as in hypermetropia, tilted optic disc and peripapillary myelinated nerve fibre.[3]

OCT has evolved to become an essential tool in Ophthalmology and is based on the principal of Low Coherence Interferometry. Different techniques are Time domain OCT, Spectral domain OCT, Swept Source OCT and Fourier Domain OCT. Typically, SD-OCT uses an infrared light source of wavelength 840nm and SS-OCT of 1050nm. The scanning speed, that is number of A scans per second, ranges from 500-4 lakh.[5] The latest commercial instruments typically have an axial resolution of approximately 5 micro metre while in research instruments it is around 2 micro metres.[6]

Papilloedema is associated with both vascular and mechanical changes at the optic nerve head. Pseudo papilloedema on the other hand has numerous causes and is associated with only mechanical changes without any vascular changes. Both these conditions cause RNFL defects which can be picked up on OCT.[7] Our study shows the differences in RNFL defects at the optic nerve head in both these conditions and is analyzed at various quadrants of the optic disc and compared.[8]

Objectives:

To compare SD-OCT findings of the optic disc and the peripapillary retina of the patients with papilloedema and pseudo papilloedema with and without optic nerve head drusen (ONHD).

Inclusion Criteria:

All the patients with optic disc swelling due to papilloedema with clinically evident and buried ONHD.

Exclusion Criteria:

All cases with significant corneal opacity, hazy media due to cataract and other causes

MATERIALS AND METHODS:

This is a prospective study of 90 eyes in 54 patients. The study was conducted between November 2018 and April 2019 over a period of 6 months. The OCT images of 60 eyes of 39 patients were done and compared with 30 normal eye OCTs. All OCT scans were performed with dilated pupils by a single examiner using Cirrus HD-OCT (Carl Zeiss Meditec Inc) by optic disc scan 200*200 protocol and HD cross. In Cirrus HD-OCT, the optic disc scan 200*200 is a 6mm*6mm consisting of 200 B scans in which RNFL thickness is measured along the circle of radius 1.73mm. Scans of poor signal strength and artefacts were excluded. Average RNFL thickness, quadrant wise RNFL thickness and total retinal thickness (TRT) were analyzed in all scans. TRT was measured manually from internal limiting membrane to the inner edge of RPE using calipers at superior and inferior edges of the optic disc. Morphology of the disc was studied and qualitative assessment was done.

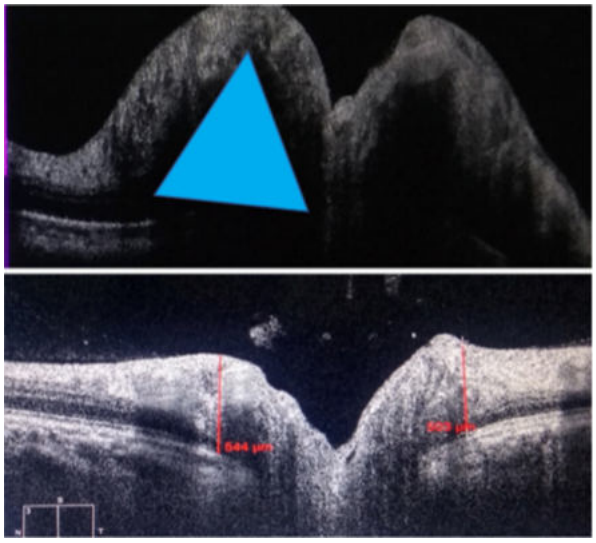
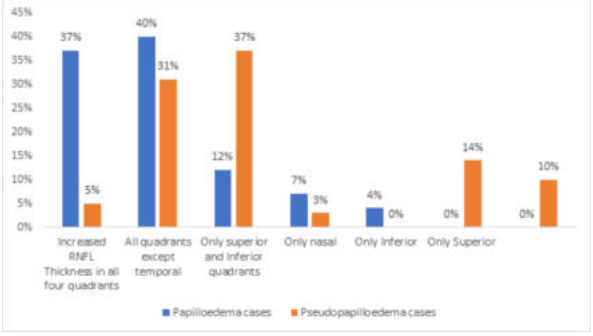


Figure 1: Shows a hypo reflective triangular sub retinal space which was noted above RPE with smooth surface in cases with papilloedema and subretinal space being comparatively small in pseudo papilloedema cases

RESULTS:

Table 1: Shows Demographic Details In The Study Group And Quadrant Wise RNFL Thickness, Average RNFL Thickness And TRT Superior And Inferior Edge Of The Disc In Three Groups

PARAMETERS	PAPILLOEDEMA	PSEUDOPAPILLOEDEMA	CONTROL
Sample size (No. of eyes)	30	30	30
Age in years (mean)	35	38	30
Gender Male:Female	14:16	12:18	16:14
Average RNFL Thickness (micrometers)	210(120-425)	113(95-120)	91.5(86-106)
Superior RNFL thickness(micrometers)	323.2 (171-639.5)	140(118-158)	122(98.5-138)
Inferior RNFL Thickness	312.6(163-630)	133.7(117-140)	119(105.6-123)
Nasal RNFL thickness	239(94-392)	102.3(83-127)	67(42.5-76)
Temporal RNFL Thickness	135(57.6-311)	57(40.9-87)	64(50-76.8)
Inferior TRT (micrometers)	654.7	532.9	352.8
Superior TRT	678.5	567.7	365.6



Graph 1: Eyes having papilloedema showed 37% having increased RNFL thickness in all four quadrants, 40% having increased RNFL Thickness in all quadrants except temporal. Increased RNFL thickness in in only superior and inferior quadrant in 12%, only in the inferior quadrant in 4% cases and only in the nasal quadrant in 7%. Eyes having pseudo papilloedema showed increased RNFL thickness in all quadrants in 5%, all except temporal quadrant in 31% cases, superior and inferior quadrants in 37%, only superiorly in 14% and only nasally in 3% and with all quadrants normal in 10%.

DISCUSSION:

Our study shows greater RNFL thickness values in patients with papilloedema or pseudo papilloedema than in controls. These findings are in agreement with the findings of Karam et al; Optical Coherence Tomography of the retinal nerve fibre layer in mild papilloedema and pseudo papilloedema.[1] Johnson et al stated that the difference in mean RNFL thickness between papilloedema and ONHD were significant. This study described papilloedema and ONHD were significant. This study described papilloedema disc as an elevated ONH with smooth internal contour and subretinal hypo reflective space (SHYPS) with recumbent "lazy V" pattern whereas ONHD displays "lumpy-bumpy" internal optic nerve contour and a rapid decline in SHYPS thickness.[2] Study by Shikha Talwar Bassi, showed that, in distinguishing papilloedema from pseudo papilloedema, nasal RNFL thickness had the highest sensitivity and specificity.[9] Increased RNFL thickness in all four quadrants was noted 43.3% in papilloedema and 9.7% in pseudo papilloedema which in our study was 31% and 5% respectively. Vartin et al used SD-OCT to study the OCT findings in 24 eyes with papilloedema. They reiterated the usefulness of TRT in the detection of early papilloedema stating that the TRT measurement increases the sensitivity of detection of mild papilloedema compared with conventional RNFL measurement.[10]

CONCLUSION:

OCT can be used as a tool to differentiate between papilloedema and pseudo papilloedema and to diagnose pseudo papilloedema due to optic nerve head drusen. Increased RNFL thickness in all quadrants is more suggestive of papilloedema. Nasal RNFL thickness plays a vital role in differentiating true from pseudo papilloedema. Direct visualization of ONH drusen is possible in buried drusen, using OCT.

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