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PURPOSE-EVALUATION OF RNFL AND GCL THICKNESS IN OPTIC NEURITIS AND PAPILLOEDEMA USING SD-OCT"

Ophthalomology

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ABSTRACT

PURPOSE-EVALUATION OF RNFL AND GCL THICKNESS IN OPTIC NEURITIS AND PAPILLOEDEMA USING SD-OCT"

METHODS-This cross-sectional ,observational study included 28 eyes of 28 patients diagnosed as optic neuritis were compared with fellow 28 eyes .Thirty-two eyes of 16 patients with papilloedema compared with 30 control eyes.Participants included in this study group underwent OCT and fundus examination under mydriasis. The data collected analysed by graph pad for statistics.

RESULTS-Females were most affected in both optic neuritis and papilloedema. Mean ±SD value of average RNFL thickness in optic neuritis (28 eyes), fellow eyes (28eyes) were 226.5±91.90, 92.57±11.97µm ($p<0.0001$), and 230.23±101.58 in papilloedema, 94.73±11.07 µm($p<0.0001$) in control eyes ,respectively.

CONCLUSION-The Quantification of RNFL & GCL thickness by OCT provides indirect measure of axonal & neuronal loss in anterior visual pathways. Also can detect subclinical axonal loss in patients with normal visual acuity. GCC loss is hallmark of optic neuropathy & should be monitored for early detection & prognosis in optic neuritis and papilloedema patient.

KEYWORDS

OCT, RNFL,GCL

Optic neuropathy refers to the damage to the optic nerve due to multiple causes. Optic neuritis (ON) is an acute inflammatory disorder of the optic nerve. The disease is characterized by unilateral or bilateral sudden loss of vision, often accompanied by peri-ocular pain. [1] . Papilloedema is swelling of the optic nerve head due to raised intracranial pressure.IIH is more common condition under papilloedema.[2] The Optical coherence tomography is a noninvasive, ocular imaging technique that uses low coherence interferometry to generate in vivo, high resolution(within 10µm),cross-sectional images of RNFL by measuring backscatter of infrared light.[3] .The measurement of RNFL can be an objective measurement of nerve swelling or nerve atrophy by analyzing the ganglion cell complex, OCT can help to detect early axonal damage and may predict the visual outcome.[4] . OCT has a wide use in ophthalmology, especially in the diagnosis and monitoring of wide variety of retinal diseases affecting the macula as well as calculates the thickness of the retina[5] . It uses coherent laser light to sweep the retina and analyze the light reflected by retinal layers so that in vivo biopsy of retina provides information of high quality resolution about all its layer .It can be useful for diagnosis and follow up of optic nerve and chiasmal compressive diseases. Furthermore OCT is useful in patient with multiple sclerosis [4], in distinguishing macular disease from optic neuritis and in monitoring the treatment. Multiple studies and clinical observation support the importance of OCT [6] in the diagnosis, treatment, and follow up of optic neuropathy.

MATERIAL AND METHOD

The study was observational, cross-sectional study carried out in the Department of Ophthalmology, Shyam shah Medical College & associated Gandhi Memorial Hospital, Rewa (M.P) during the period of September 2019 to August 2020.

CASE SELECTION

The study included the subjects diagnosed as case of optic neuritis and papilloedema.On the basis of optic disc appearance patient were grouped as optic neuritis and papilloedema .For optic neuritis cases, fellow eyes and for bilateral cases of papilloedema, healthy controls of similar age matched group were taken, respectively.

INCLUSION CRITERIA

Patients with optic neuritis and papilloedema, Age group 18-65 years
Those who were willing to participate in the study.

EXCLUSION CRITERIA

Patient with any media opacity, Age <18 years,>65years
Patient with AION, CRVO, Pseudopapilloedema, Retinitis Pigmentosa , Myopia etc

MEDICAL HISTORY AND PERSONAL HISTORY

History of any systemic disease like diabetes, hypertension, hypercholesterolemia, tuberculosis. Neurological symptoms like weakness or difficulty in moving limbs, history of any nutritional disease ,history of smoking or tobacco addiction or alcohol intake.

HISTORY OF OPHTHALMIC COMPLAINTS

A thorough history of the onset, duration and progression of diminision of vision (DOV).Sudden onset of DOV was presented within a week, while late presentation more than1 week considered as gradual onset. Any ocular or non ocular symptoms like headache, eye pain or pain with ocular movements was noted. History of any ocular trauma or surgery or prolonged use of any topical medication or defective colour vision was taken.

GENERAL EXAMINATION

General condition of patient assessed as poor/moderate/fair.Pulse rate, pallor, icterus, clubbing, lymphadenopathy, neurological deficit evaluation was done. Blood pressure was recorded.

SYSTEMIC EXAMINATION

Systemic examination was done properly especially central nervous system, to detect any gait abnormalities, ataxia, weakness or numbness. Since acute optic neuritis may be the early presenting sign associated with demyelinating disease.

OPHTHALMIC EVALUATION-A comprehensive ophthalmic evaluation was done as

1) Visual acuity
2) Ocular movements
3) Pupillary assessment
4) Slit lamp examination of the anterior segment, lens and vitreous
5) Fundus evaluation by indirect and direct ophthalmoscopy
6) Spectral domain optical coherence tomography (Zeiss Cirrus 500 OCT, CarlZeiss

1). VISUAL ACUITY (VA) Visual acuity (BCVA) was recorded bySnellen's chart at 6 meter distance at presentation then converted into Log MAR units for evaluation. On the basis of visual acuity of patient at presentation, they categorised as visual acuity less than 3/60 of Snellen's chart referred as blindness, VA <6/60 as severe vision loss (SVL),VA < 6/18 as moderate vision loss (MVL), VA<6/12 as mild vision loss and VA>6/12 considered as normal.

2) OCULAR MOVEMENTS Ocular movements were checked in all diagnostic position gazes of direction. Associated pain with ocular movements was noted.

3) PUPILLARY ASSESSMENT-Torch light examination in individual eyes done for RAPD evaluation by swinging flash light for 3 seconds pause in each eye in a darkroom and grading done as 1,2,3,4 and 5,similar as Bell RA et aldescribed in their study.
4) SLIT LAMP EXAMINATION-Evaluation of anterior segment done by slit lamp bio microscope to notify further findings.
5) DILATED OPHTHALMOSCOPY: DIRECT & INDIRECT-The pupils of all subjects were dilated using a combination of 0.75% tropicamide and 2.5% phenylephrine eye drops. Tropicamide 1% was used in hypertensive patient.Slit lamp indirect ophthalmoscopy with Volk +90D lens and indirect ophthalmoscope was used to evaluate disc findings, under headings margins, colour, shape ,size, cup disc ratio ,disc edema and pale disc evaluation, any haemorrhages, exudates, vessels details and general fundus .

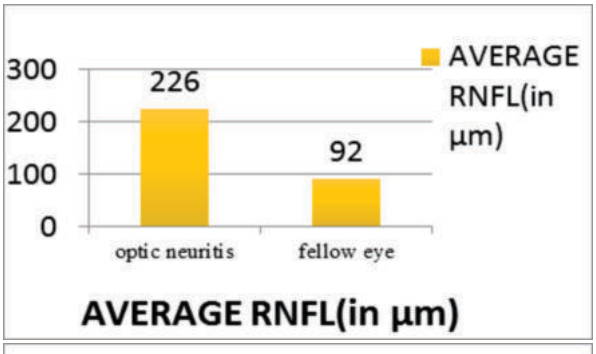
6) Spectral Domain Optical Coherence Tomography:
Optic nerve head and Macular scans

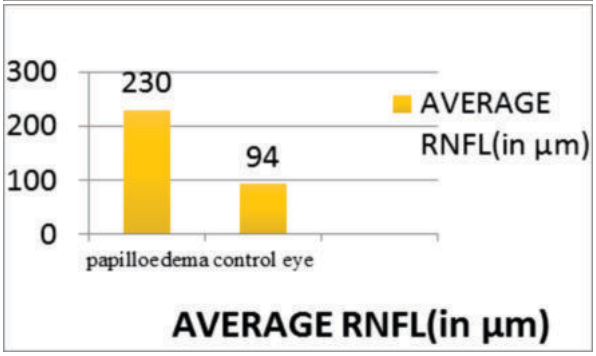
Subjects eyes were scanned with Spectral Domain Optical Coherence Tomography (SD-OCT, CIRRUS HD OCT MODEL 500). Optic disc and RNFL analysis was derived from Optic Disc Cube 200x200 scans which provide information of size, cup, disc ratio, rim area & volume and circumpapillary RNFL thickness by acquiring a series of 200 horizontal scan lines each composed of 200 A-Scans. The deduced values were reported using a colour pattern where cool colours represent thinner areas and warm colours represent thicker areas. The parameters recorded for this study were RNFL OU Analysis, average RNFL thickness and that in individual four quadrants namely superior, inferior, nasal & temporal were derived in microns (µm).

Macular cube 512x128 measures macula through a square grid of 6mm x 6mm square grid by acquiring a series of 128 horizontal scan lines each composed of 512 A-scans and a central horizontal HD B-scan. The recorded values were represented in a similar colour coded fashion as that of ONH and RNFL. For quantitative interpretation, the macula (6mmx6mm) is divided into nine regions as mentioned in the Early Treatment Diabetic Treatment Study (ETDRS) template by a central ring, i.e., foveal region (1mm diameter), an inner (3mm diameter) and outer ring (6mm), ganglion cell layer assessment was also done under average GCL+IPL thickness in µm and in sectors superotemporal, superior, superonasal, inferonasal, inferior and inferonasal. All scans were obtained single handed, reviewed for image quality and the best quality scan was chosen for the evaluation.

RESULTS

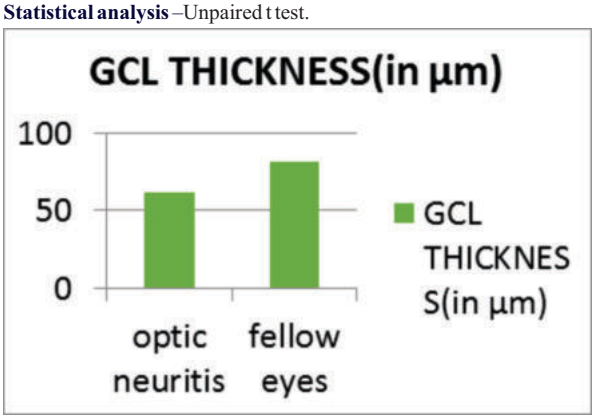
The female dominance was seen in both optic neuritis and papilloedema. Mean ±SD value of average RNFL thickness in optic neuritis(28 eyes),fellow eyes(28eyes) were 226.5±91.90, 92.57±11.97µm (p<0.0001), and 230.23±101.58 in papilloedema, 94.73±11.07 µm(p<0.0001) respectively.

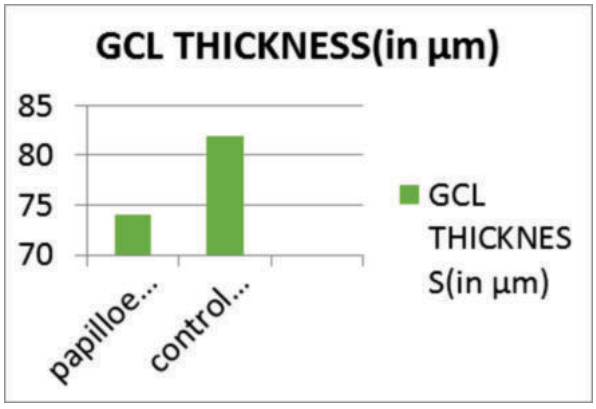




Average GCL thickness mean ±SD in optic neuritis, control eyes were 62.64±21.94, 82.07±14.92µm(p<0.0001) and 74.85± 17.11 in papilloedema,82.58± 8.21 in control eyes(p<0.05) respectively.

Statistical analysis –Unpaired t test.





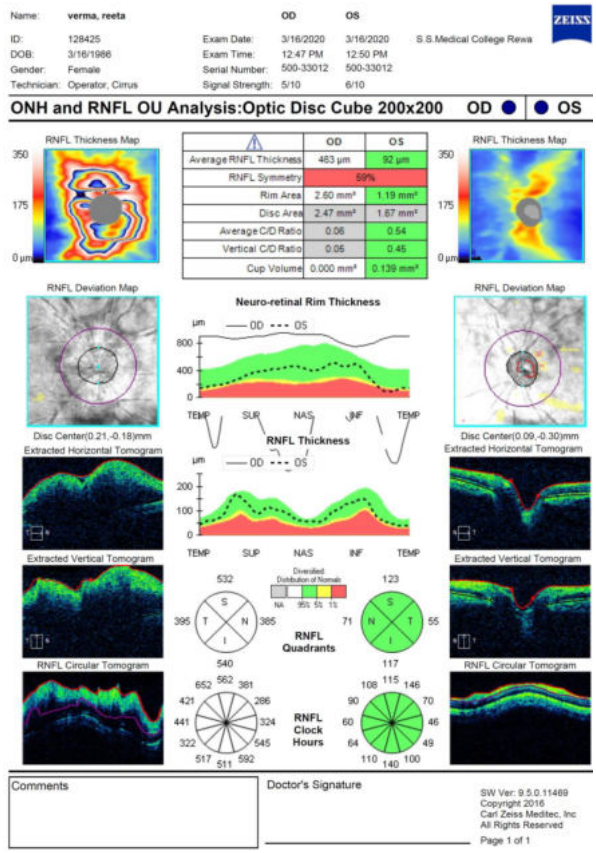


Figure 1.oct Scan Onh Of A Patient With Right Eye Optic Neuritis With Raised Rnfl Thickness In Right Eye

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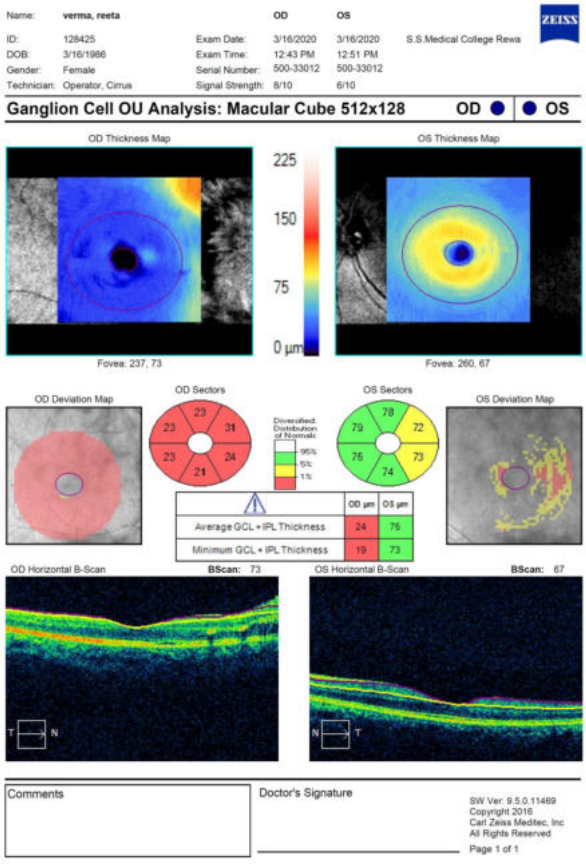

Figure 1.macular Scan Of Patient With Optic Neuritis Showing Gcl Thinning In Right Eye

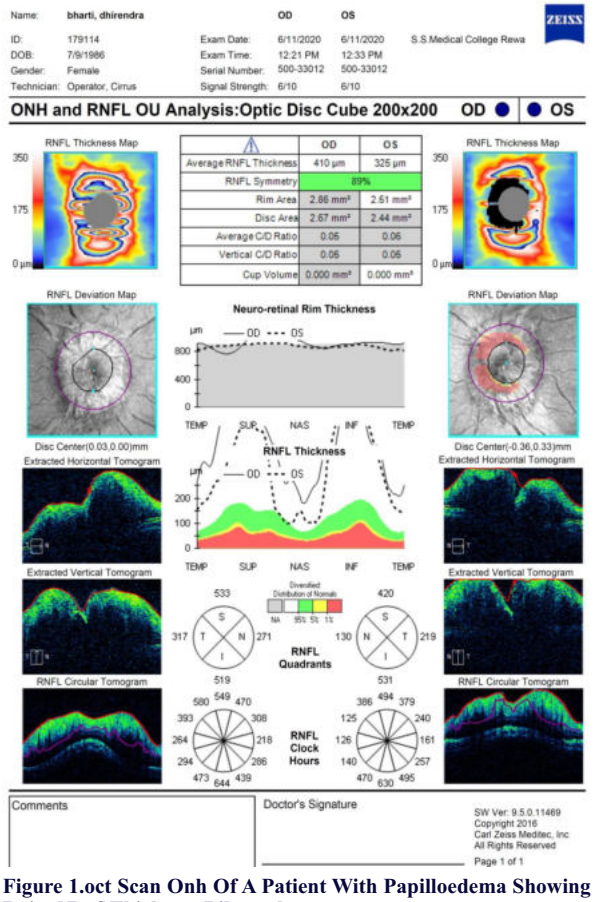

Figure 1.oct Scan Onh Of A Patient With Papilloedema Showing Raised Rnfl Thickness Bilateral

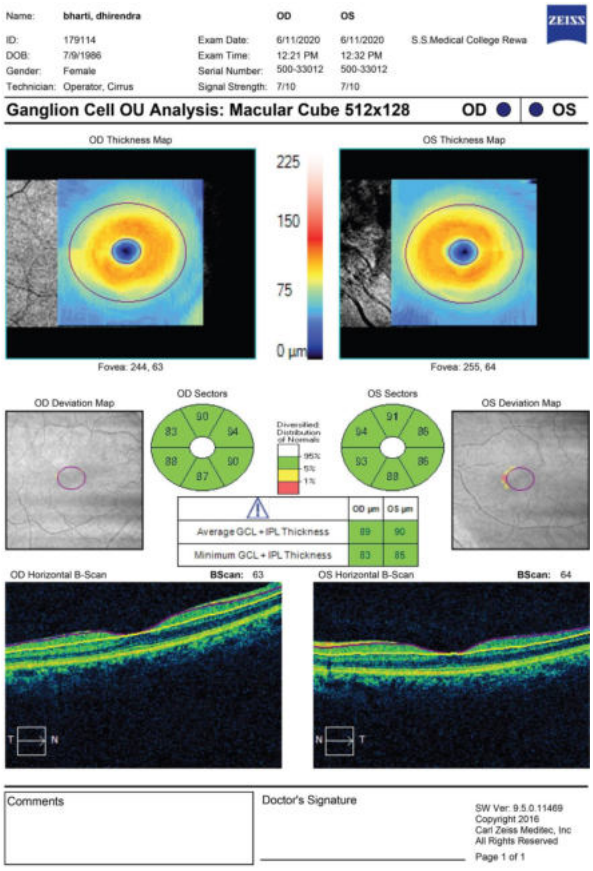

Figure 1.Macular Scan of Patient With Papilloedema Showing Gcl Thinning In Both Eye

DISCUSSION

The average RNFL thickness was raised in acute cases of optic neuritis & papilloedema, significantly.

Henderson et al [7]observed raised RNFL thickness in acute optic neuritis & thinning of RNFL with long duration . A study conducted by **Garas et al** [8] revealed acute episode of optic neuritis results in increased RNFL thickness.**Novel et al** [9] described the reduction of RNFL thickness with optic neuritis over 6 month duration.**S.ATrip et al** [10] reported significant reduction in average RNFL thickness after single episode of optic neuritis.

Menke et al[11] observed average RNFL thickness was significantly raised in disc edema group when compared with controls (P<0.0001). **Bassi and Mohana** [12] observed in their study average RNFL thickness was raised significantly. The RNFL quadrants thickness was increased significantly in all 4 quadrants except in temporal quadrant.**Karam et al** [13]observed measurable increment in RNFL thickness in OCT.

The average GCL+IPL thickness was reduced in both optic neuritis and papilloedema ,significantly. **Walter et al** [14]reported that GCL+IPL thickness was reduced in optic neuritis associated with MS.

CONCLUSION

Quantification of RNFL & GCL thickness by OCT provides indirect measure of axonal & neuronal loss in anterior visual pathways. Also can detect subclinical axonal loss in patients with normal visual acuity. GCC loss is hallmark of optic neuropathy & should be monitored for early detection & prognosis in optic neuritis and papilloedema patient.

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