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Optical Coherence tomography 3 predicts visual loss in glaucoma suspects

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Introduction

Standard Automated Perimetry has poor sensitivity for dectecting glaucoma.Clearly there is a compelling need for more sensitive glaucoma diagnostic tests. Assessing the Retinal Nerve Fibre Layer Thickness (RNFLT) could be a step forward in this direction.

Aim

To evaluate whether peripapillary RNFLT loss as estimated by the Optical Coherence Tomography 3 (OCT 3)in patients labelled as glaucoma suspects, actually converted to Short Wavelength Automated Perimetry (SWAP) changes within a study period of two years.To establish RNFLT loss as the earliest evidence of POAG.

Materials and Methods

332 eyes of 212 Indian individuals in the age group of 30-70 years attending the glaucoma service of B B Eye Foundation over a period of two calendar years were labelled as glaucoma suspects on the basis of

BCVA of atleast 20/20 with ≤+5 or -5 Dsph and ≤+2 or -2 Dcyl

IOP ≥ 22mmHg

Central Corneal Thickness-within normal limits

Asymmetrical Cupping>0.2 difference in two eyes or >0.6 in either eye

Open angles on gonioscopy

Transparent ocular media

Humphrey Visual Field Analysis – within normal limits(24-2 Full Threshold)

SWAP- within normal limits

All 332 eyes who met the inclusion criteria were subjected to

SWAP(blue on yellow 24-2 Full Threshold) every month and

RNFLT analysis –peripapillary 3.4mm circular scans by the OCT3 every month.

Abnormal SWAP was defined as

4 points depressed at p<5% or

a cluster of 3 points depressed at p<1%.

RNFLT loss was defined as

≥ 1 quadrant abnormal at the <5% level or

≥ 1 clock hour abnormal at the <1% level

Correlations between deviation from normal (thinner than 95% of normal) RNFLT measurements taken at 30º sectors (12 sectors described as clock hours) and SWAP average Pattern Deviation of 21 VF zones were determined. The number of OCT measured RNFL sectors outside normal limits and the number of VF zones outside normal limits were also compared.

Abnormal SWAP	RNFLT loss 1 quadrant	RNFLT loss 1 clock hr	RNFLT loss >1quadrant	RNFLT Loss >1clock hr	No RNFLT loss
4 points	6	0	72	36	7
3 points	4	0	54	24	3

Chi square test showed

Group α : Group β (p<0.01)

Group Y : Group δ (p>0.05)

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Results

The total of 332 eyes were divided into 4 groups

Group α - 274 eyes had RNFLT loss

Group β - 196 eyes had RNFLT loss & converted to SWAP changes

Group Y - 58 eyes had no RNFLT loss

Group δ - 10 eyes converted to SWAP changes without any RNFLT loss.

The RNFL areas most frequently outside normal limits were the inferior and inferior temporal regions.The least sensitive Visual Field(VF) zones were in the superior hemifield.Linear regression showed OCT sectors 6 0'clock, 7 0'clock and 8 0'clock (inferior and inferior temporal) was best correlated with SWAP pattern deviation in VF zones 13, 14, & 16 (superior hemified, central and arcuate areas).

RNFLT loss measured with OCT3 is topographically correlated with glaucomatous VF defects measured with SWAP.

The conversion time from detection of RNFLT loss to SWAP changes was 5.4 to 9.8 months.The average lead time was 7.6 months.

Using this study results, the positive predictive Value(diagnostic performance) of RNFLanalysis, which is the most relevant index for early detection of glaucoma is 72%.

Discussion

The principle finding of the study is that a statistically significant number of glaucoma suspects with RNFLT loss converted to SWAP abnormalities ($p<0.01$).We used SWAP VF results as the criteria since SWAP has been

Reference

1. Baker-Shaffer's Diagnosis & therapy of the glaucomas: 7th Edition; Chapter 17; Pg 302.
2. Handbook of glaucoma : Azuara-Blanco.Costa.Wilson: Chapter 1; Pg 14 & 15.
3. Imaging in glaucoma : Joel S. Schuman : Chapter 5;
4. Optical coherence tomography of ocular diseases: Schuman.Puliafito.Fujimoto : Section III ; Chapter 12.
5. Kwok Hei Mok etal . Retinal nerve fiber layer measurement by optical coherence tomography in glaucoma suspects with short wavelength automated perimetry abnormalities:Journal of glaucoma 2003,12:45-49
6. Joel S . Schuman etal.Quantification of nerve fiber layer thickness in normal & glaucomatous eyes using OCT-pilot study: Arch Ophthalmol. 1995; 113:586-596
7. Christopher Bowd etal. Detecting early glaucoma by assessment of retinal nerve fiber layer thickness & visual function . INV ophthalmology&visual science,Aug 2001, vol 42 no 9.
8. El Beltagi et al. Retinal nerve fibre layer thickness measured with Optical Coherence Tomography is related to visual function in glaucomatous eyes. Ophthalmology Nov 2003 110(11): 2185-91
9. Cesar A. Sanchez-geleana et al. Short Wave Length Automated Perimetry results were correlated with Optical Coherence Tomography retinal nerve Fibre layer thickness