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Study of Retinal Nerve Fibre Layer Thickness in Diabetic and Non-Diabetic Patients by OCT

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Abstract*: **Purpose**: To assess the effects of diabetes on retinal nerve fibre layer thickness. **Materials and methods**: This is a cross sectional study carried out on 500 patients(250 diabetics and 250 non-diabetics of age group 14 to 80 yrs, selected by non probability convenient sampling having no significant media opacity like dense cataract, significant corneal corneal opacity, vitreous hemorrhage which prevents visualization of fundus. Detailed history taking, assessment of visual acuity (unaided, best corrected), detailed anterior and posterior segment examination including RNFL thickness by OCT was done in all the patients. **Result**: There is loss of RNFL thickness in diabetics and most significant loss is noted in superotemporal quadrant and the loss increases with increase in diabetic age. **Conclusion**: OCT can be used to detect neurodegeneration progression in diabetic retinopathy patients by measuring RNFL thickness and this can be used as diagnostic and prognostic factor in cases of DR.*

Keywords: Diabetic Retinopathy (DR), Retinal nerve fibre layer thickness (RNFL), Optical Coherence Tomography (OCT)

1. Introduction

Diabetic retinopathy is leading cause of visual impairment. DR is ranked as the fifth most common cause of preventable blindness and fifth most common cause of moderate and severe visual impairment. An estimated 285 people worldwide with diabetes, over one third have signs of DR, and a third of these are afflicted with vision threatening diabetic retinopathy. DR (diabetic retinopathy) can be classified into NPDR (non proliferative diabetic retinopathy) and PDR (proliferative diabetic retinopathy) Diabetes affects visual function by increased intraretinal vascular permeability, damaging non vascular cells of retina, causing neuronal cell degeneration.

Various studies have shown the difference in RNFL thickness in diabetic patients, as compared to normal age matched population. Diabetic neuropathy is supposed to affect neurons, and thus, measurement of RNFL thickness in patients with DM can be utilized to diagnose patients with, or at risk for development of diabetic neuropathy.

Diabetes can also damage non vascular cells of the retina. In autopsy samples, retinal ganglion cells are lost, atleast in part, through apoptosis. Histological studies of neural components of the retina have revealed that diabetes-induced biochemical mechanisms can potentially cause neural cell degeneration. Optical coherence tomography (OCT) can detect retinal neural tissue loss caused by diabetes by measuring the retinal nerve fiber layer (RNFL) thickness on the cross-sectional imaging of the retina.

2. Objectives

1) To assess whether RNFL thickness is decreased in diabetics or not.
2) If affected which quadrant is more commonly involved.
3) To assess the relationship between RNFL thickness and diabetic age.

3. Materials and Methods

This is a prospective interventional case study carried out on 500 patients of age group from 14-80years, selected by non probability convenient sampling. Patient presenting at OPD of GTSH Eye hospital, PDU Govt. Medical College and Hospital, Rajkot, if diagnosed as having diabetic retinopathy. The study was carried out during period of November 2018 to September 2020.

Inclusion Criteria

A diabetic patient presenting at OPD of G. T. Sheth Eye hospital, PDU Govt. Medical College and Hospital, Rajkot, if diagnosed as having diabetic retinopathy are included in the study.

Exclusion Criteria

Patients having pre-existing ocular morbidities - Corneal disease, glaucoma, inflammatory eye disease, Optic neuropathy, Cystoid macular edema & Age related macular degeneration are excluded from study.

Also Patients having Advanced Diabetic Eye disease including Vitreous hemorrhage, Tractional retinal detachment, Tractional retinoschisis, Neovascular glaucoma are excluded.

Patients with previous history of laser treatment are also excluded from study.

In this study RNFL thickness is measured by OCT in all quadrants, Fundus examination is done by indirect ophthalmoscopic examination and 90 lens examination.

4. Results and Analysis

In this study 500 patients were evaluated (250 diabetics and 250 non diabetics) and their RNFL thickness was assessed by OCT

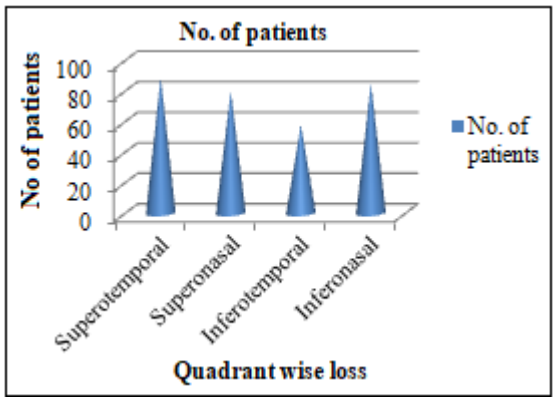

Chart 1: Quadrant wise RNFL thickness loss

This shows that maximum loss of RNFL is noted in supeotemporal quadrant followed by inferonasal, superonasal and least in inferotemporal quadrant.

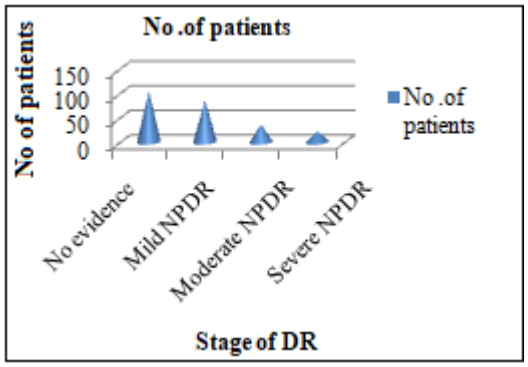

Chart 2: Distribution of patients according to stage of DR

This shows incidence of DR changes among patients.
105 patients (42%) have no evidence of DR changes.
86 patients (34.4%) have mild NPDR changes.
36 patients (14.4%) have moderate NPDR changes.
23 patients (9.2%) have severe NPDR changes

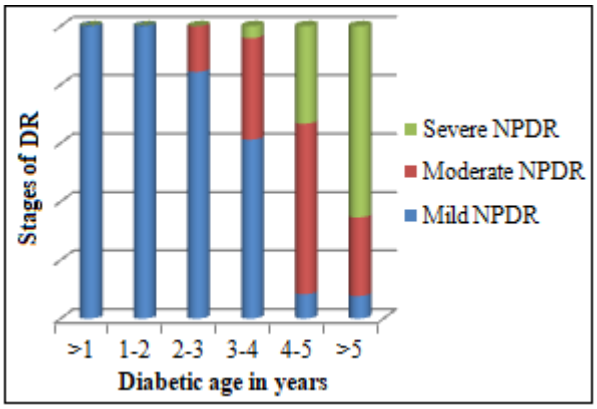

Chart 3: Comparison of stage of DR with diabetic age

This shows that with increase in diabetic age, severity of DR changes increases.

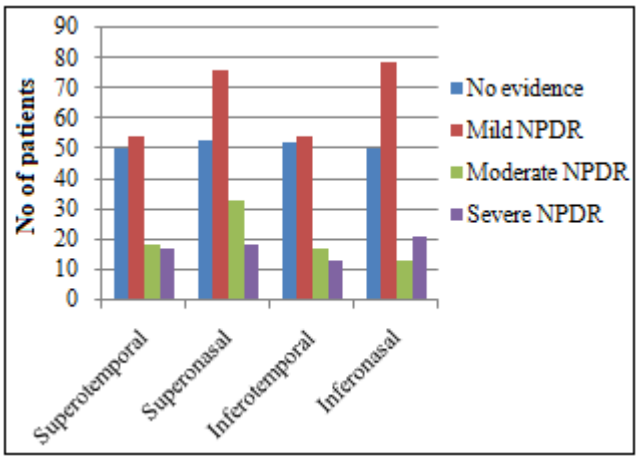

Chart 4: Comparison of RNFL thickness loss with stage of DR

This shows that inferonasal quadrant has maximum loss in any stage of DR followed by superonasal, superotemporal and least in inferotemporal quadrant.

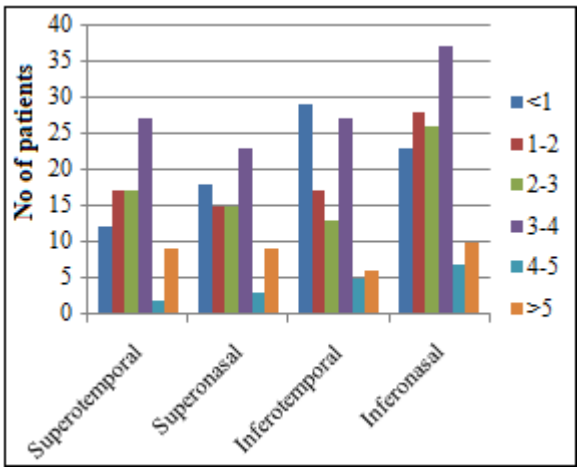

Chart 5: Comparison of RNFL thickness loss with diabetic age

Maximum loss of RNFL thickness is noted in inferonasal quadrant followed by inferotemporal, superotemporal and least in superonasal quadrant irrespective of diabetic age.

5. Discussion

Psychophysical and functional visual tests have demonstrated retinal dysfuction before onset of clinically evident retinal vascular changes. Clinical evidence shows that in diabetic patients without DR, there is reduced contrast senstivity including impaired In the present study, RNFL thickness was measured and compared among normal subjects, diabetic patients with and without DR. RNFL thinning was noted in both diabetic groups. Thinning was statistically significant in the ST quadrant in diabetic patients both in non DR and DR group and NU quadrant in comparison with normal control group.

RNFL thinning could be possibly attributed to DM's effects on the microcirculation, namely leukostasis, vascular obliteration, and degenerative changes of the capillary basal membrane. As the blood supply from the superficial capillaries to the fibers and the optic nerve head diminishes,

RNFL may be disrupted due to increased sensitivity of the ganglion cells to the metabolic stress of diabetes. This may explain the occurrence of early vision disturbances in diabetics, for example, reduced contrast sensitivity, distorted color perception, abnormal occipital lobe potentials, and worsening of visual fields, prior to the emergence of fundoscopically evident vascular aberrations. Retinal ganglion cell layer as well as cells of the inner granular layer obviously follow an apoptotic death program early in the course of DM.

6. Conclusion

1) It can be concluded that RNFL thickness loss is noted in diabetics.
2) Superotemporal quadrant loss is most commonly noted.
3) Patients having RNFL thickness loss in one quadrant also have loss in other quadrants.
4) RNFL thickness loss increases with increase in diabetic age.

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