OCT Chronicles : Insights into Thyroid Eye Disease

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Abstract

AIM: To evaluate the changes of Choroidal Thickness, Retinal Nerve Fiber Layer in Thyroid Eye Disease (TED).
Methodology: This is a hospital based, Prospective, cross-sectional study. We included all patients with TED [both active and inactive] who presented to our Orbit clinic from Oct 2023 to Jan 2024. A CAS [Clinical Activity Score] score of ≥3/10 was classified as clinically Active disease. Patients with no ocular abnormalities and euthyroid were taken as controls. Patients with high degree of refractive errors, Media opacity, Retinal or Choroidal diseases, systemic vascular disorders and any past ocular surgeries were excluded. **Results:** 40 eyes of 20 eyes were examined out of which 8 had active TED. The mean sub-foveal choroidal thickness was greater in eyes with active TED than inactive and normal eyes. Active TED patients had thinner RNFL thickness than the control group

Keywords: Thyroid eye disease (TED), OCT, Retinal Nerver Fibre

INTRODUCTION

Thyroid eye disease (TED) is an autoimmune condition affecting the orbit, leading to inflammation, edema, and orbital congestion. These result in structural and functional changes in the optic nerve, impacting visual function. Optical Coherence Tomography [OCT] is a non-invasive tool valuable in detecting changes in Retinal Nerve Fibre layer thickness and choroidal thickness.

AIM

To evaluate To Evaluate and compare the changes in retinal parameters namely CT (Choroidal Thickness) and RNFLT (Retinal nerve fiber layer thickness) in Thyroid Eye Disease

STUDY DESIGN

A Hospital based, prospective case control study

PERIOD OF STUDY

Period of study : 4 months, Oct 1st 2023-Jan 30th 2024

INCLUSION CRITERIA

- All patients with Thyroid eye disease [Active and Inactive]
- Age group : 30 – 65 years

EXCLUSION CRITERIA

- Patients with high degree of Myopic or Hypermetropic errors,
- Retinal or Choroidal disorders
- Current pregnancy and breastfeeding,
- Auto-immune disease, and
- Any past intraocular surgeries

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METHODOLOGY

- In our study, cases included 20 patients [40 eyes] with Thyroid eye disease who attended the orbit clinic at a tertiary care medical college hospital.
- Control group had 20 healthy individuals [age and gender matched]
- All the patients were subjected to detailed ophthalmic examination which included assessment of Visual acuity, Colour vision, Evaluation of Anterior segment by Slit-lamp Biomicroscope, Hertel's Exophthalmometry , Intraocular pressure by Goldmann Applanation tonometer , Axial length by A-scan, Fundus examination by 20D and 90D.
- The following OCT parameters were measured in Spectral Domain OCT(SD-OCT) and compared amongst the active TED, inactive TED & control groups. All OCT scans were taken by a single observer.
    1. Retinal nerve fiber layer thickness in 4 quadrants around the disc
    2. Choroidal thickness. Sub Foveal Choroidal Thickness was defined as the vertical distance between the outer border of the hyperreflective line corresponding to the retinal pigment epithelium and the inner surface of the sclera
- The patients were categorised into Active and Inactive groups based on Clinical Activity Scoring system.

Symptoms	Signs	Changes
• Pain with upward, downward, or Lateral eye movement • Pain or pressure in a periorbital or retro orbital distribution	• Swelling • Redness of eyelids • Conjunctival injection • Chemosis • Inflammation of caruncle or plica	• Decrease in Visual Acuity over 1-3 months • Decrease in eye movement over 1-3 months • Increase in proptosis >2 mm over 1-3 months

RESULTS

In our study of 40 patients, 16 patients [40%] were male and 24 patients [60%] were females (Figure no 1). Majority of our study population belonged to 50-60 years as depicted in Figure no. 2

Mean age of the patients in case group was 42.3 years and in control group was 38.9 years. (Figure no 3)

Visual acuity assessed and analysed in our study showed that 12 patients in case group , 2 patients in control group had a visual acuity in between 6/60 to 6/18. 8 Patients in cases and 18 patients in control had a visual acuity between 6/18 and 6/6 as shown in figure no 4.

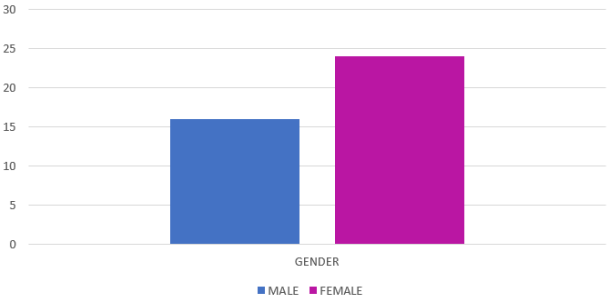

Figure no 1: Demographic profile of our study population - GENDER

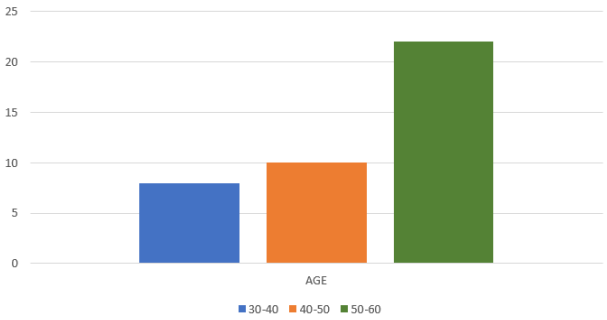

Figure no 2: Demographic profile of our study population - AGE

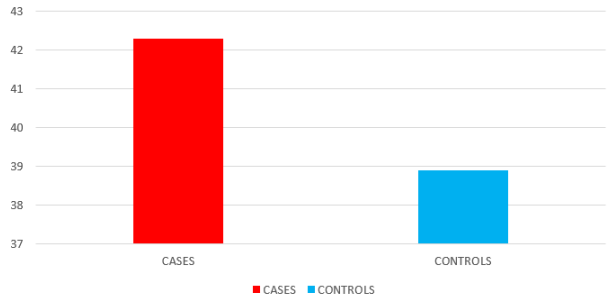

Figure no 3: Demographic profile of our study population MEANAGE

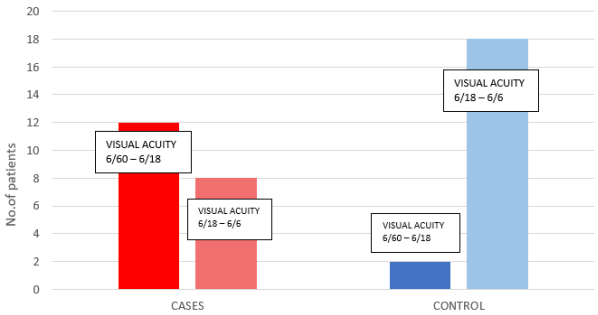

Figure no 4: Comparison of Visual acuity between cases and controls

Patients were assessed based on Clinical Activity Scoring system. It was found that predominant entities noted were Swelling [35%], Redness[35%] and Conjunctival injection [35%], whereas increase in proptosis were noted in 2 patients (Figure no 5). Based on the activity score, 12 patients were found to be in Inactive stage and 8 patients were found to be in active stage (Figure no 6)

The IOP was measured using Goldmann Applanation tonometer and further analysis showed us that the patients in active stage of TED had a mean IOP of 24.14 mmHg which was higher than patients with Inactive stage [19.07 mmHg] which was statistically significant. [p = 0.024] as seen in figure no : 7

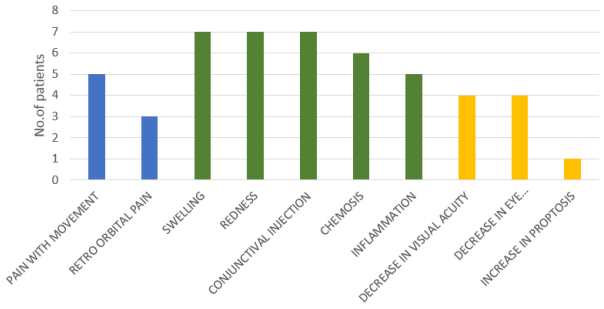

Figure No 5: Evaluation of patients based on clinical activity score

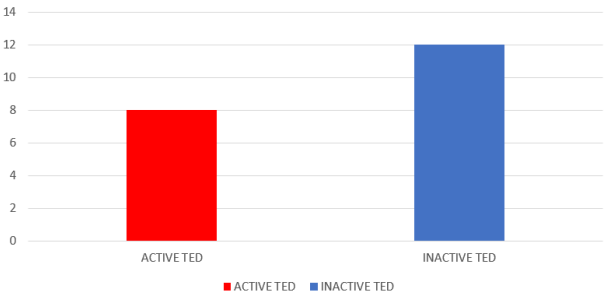

Figure No 6: Number of patients in active and inactive groups

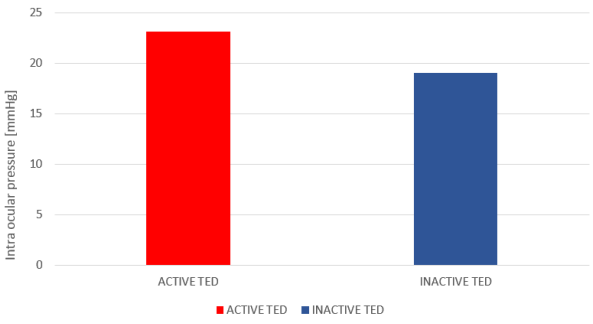

Figure No 7: Comparison of IOP between two groups

The Sub foveal Choroidal thickness was measured using SD-OCT and analysed. Our analysis showed us that the mean Sub-foveal choroidal thickness in patient with active stage (328.32 ± 50.91µm) was higher than patients with inactive stage (306.4± 48.93µm) while the control group showed 256.9 µm. All the 3 values however comes within the normal range of SFCT i.e 250-350 µm by SD-OCT(Figure no: 8) The difference between Active and Inactive eyes was statistically significant [p=0.027]

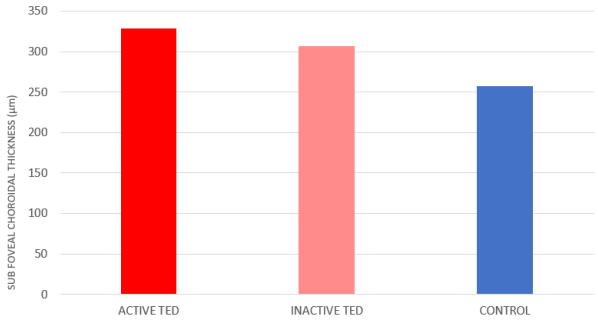

Figure No 8: Comparison of subchoroidal thickness between active, inactive and control groups

RNFL Layer thickness were measured using SD-OCT and analyzed. Active TAO patients had thinner RNFL thickness than the other two groups (Table no: 1) in all 4 quadrants. The Peripapillary RNFL thickness analysis showed statistically significant difference between study and control group especially in Superior, Inferior and Nasal quadrants[p = 0.037 ; p = 0.031 ; p = 0.022]. Between active and inactive TED groups, only superior and Nasal RNFL thickness showed statistically significant decrease [p = 0.017 ; p = 0.03]

Table No 1 : Comparison of RNFL thickness in active, inactive and control groups

Rnfl Thickness	Active Ted	Inactive	Control
Superior Quadrant	92.88 µm ↓	112.54 µm	114.31 µm
Inferior Quadrant	106.76 µm ↓	112.81 µm	110.56 µm
Temporal Quadrant	90.9 µm ↓	94.02 µm	96.57 µm
Nasal Quadrant	91.09 µm ↓	96.55 µm	95.21 µm

DISCUSSION

Thyroid eye disease is a common extra thyroidal manifestation of Grave's disease. It is of autoimmune origin against orbital fibroblasts and adipocytes.

TED has a bimodal peak of incidence in age groups of 40 to 44 years and 60 to 64 years in females, and ages of 45 to 49 years and 65 to 69 years in males.[1] Majority of our study population were 5th decade.[2] In our study of 40 patients, 18 patients were male, 22 patients were female which was in accordance with literature.[3]

Majority of Patients in case group had a poor visual acuity in comparison to control group. Refractive changes in Graves' ophthalmopathy might have been affected by the immune complexes accumulated on the lateral walls of the orbit and by enlarged volume of the extraocular muscles of eyeball.[4]

Based on the Clinical Activity scoring system,12 patients were in inactive stage and 8 patients were in active stage. In our study predominant entities of clinical activity scoring system noted in patients was swelling of lids, redness of lids, conjunctival injection.

Mean intraocular pressure in active stage of thyroid eye disease was 24.14 mmHg which was significantly higher than patients with inactive stage. The cause of elevated IOP in thyroid eye disease is due to increase in the episcleral venous pressure.[5]

Subfoveal Choroidal thickness (SFCT) measured using SD OCT showed that the mean SFCT in patients with active stage was higher(328.32 ±50.91µm)than patients with inactive stage(306.4± 48.93µm). This was thought to be due to impaired venous drainage from the orbit due to vascular compression. These changes occur during the active phase of the disease, when the enlargement of extraocular muscles and surrounding soft tissues occurs.[6]

The patients in active stage of thyroid eye disease had a thinner peripapillary RNFL thickness than the patients with inactive stage and the results were statistically significant. In the initial stages, the nerve fiber layer may thicken due to swelling and fluid buildup. As time passes, RNFL thinning occurs because of increased pressure and reduced blood, leading to hypoxia and ischemia.[7]

CONCLUSION

This study highlights the structural alterations in retinal nerve fiber layer (RNFL) and choroidal thickness, their role in disease activity and its impact on visual function. Though SD-OCT has its limitations at accurately assess the SFCT, it is valuable in early diagnosis, monitoring disease progression, and assessing treatment response.

FINANCIAL SUPPORT AND SPONSORSHIP

Nil.

CONFLICTS OF INTEREST

There are no conflicts of interest.

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