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Ultrasonographic assessment of extraocular muscle thickness in thyroid eye disease and its correlation with thyroid optic neuropathy

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ABSTRACT *Thyroid related orbitopathy is an autoimmune disorder of the orbit, usually presenting with proptosis, lid lag, lid retraction, and motility disorders and pupillary abnormalities. Visual loss is an important conclusion in advanced stages. Ultrasonographic assessment of extraocular muscle thickness in thyroid eye disease and its correlation with thyroid neuropathy Superior rectus muscle was found to be enlarged most commonly in the hyperthyroid subgroup. Incidence of optic neuropathy is about 5% of all cases of dysthyroidism.*

KEYWORDS :

Introduction: Thyroid related orbitopathy is an autoimmune disorder of the orbit, usually presenting with proptosis, lid lag, lid retraction, and motility disorders and pupillary abnormalities. Visual loss is an important conclusion in advanced stages.

The incidence of optic neuropathy is reported to be about 5 %. Optic neuropathy is caused by the crowding of the enlarged extra ocular muscles in the relatively free orbital apex, which is due to accumulation of fluid and glycosaminoglycan. This can increase the volume of the muscle upto eight times, causing compression of the optic nerve.

Clinically the three types of dysthyroid conditions are the euthyroid, hypothyroid and hyperthyroid states depending on whether the levels of the thyroid hormones are normal, decreased or increased respectively. Our study aims to determine if there is any difference in the amount of enlargement of the extra ocular muscles in these three clinical subtypes. In addition, we also wish to deduce whether we can predict if optic neuropathy could be expected to occur more frequently in a particular clinical subtype of thyroid disorder.

Aim and Objectives:
Ultrasonographic assessment of extraocular muscle thickness in thyroid eye disease and its correlation with thyroid neuropathy optic

Methods and materials: This prospective study was done over an 18 month period. A total of 38 patients were included in the study. They were routinely filtered through the general outpatient department where their complaints were noted and preliminary clinical work up was done. Further clinical and investigative evaluation was carried out by the ophthalmologist at the orbit and oculoplasty clinic, where specific proptosis workup was done. A careful relevant clinical history was taken followed by anterior segment examination before and after pupillary dilatation, Hertel's exophthalmometry and recording and grading of extraocular motility. Lev itan's swinging flash light test for pupillary reaction, color vision by Ishihara's pseudoisochromatic plates, central fields by Bjerrum's screen and fundus evaluation were also done. Intraocular pressure was checked by Goldmann's applanation tonometer and fluorescein staining was done to detect signs of exposure keratopathy. All patients had their blood tests done for thyroid profile in a reliable clinical laboratory. Those with clinical and/or laboratory evidence of dysthyroidism (Fig 1&2) then underwent orbital ultrasonography (standardised B/A scan) (Fig 3) to measure the thickness of the four recti in each eye. Compulsory CT scan was done for all patients to rule out pseudotumor (Fig 4a, 4b). Patients with signs of optic neuropathy were excluded (Fig 5-6).
The patients were categorised as euthyroid, hypo or hyperthyroid depending on whether the thyroid hormone levels were normal, decreased or increased. Accordingly, the patients were started on medications. The hypothyroid patients were given replacement treatment with oral l-thyroxine. The hyper and euthyroid patients were given systemic steroids and were treated for exposure keratopathy (if present). Patients with impending optic neuropathy (Fig 5) underwent orbital decompression, and those with long standing restrictive myopathies underwent appropriate muscle surgeries.

Results: The mean age of the patients included in this study was found to be 40.74 years with a minimum of 18 years and a maximum of 64 years. Most of the [patients were above 48 years of age. In our study the reported male to female ratio was reversed, with 60.53% male patients (n=23), and 39.47% female patients (n=15).the female patients on an average were younger (Fig. 2). 44.74% of the patients were hyperthyroid (n=17), 34.21% were euthyroid (n=13) and the rest were hypothyroid. Among the males, hyperthyroidism was found to be the most prevalent thyroid disorder (52.17%). Typical thyroid swelling was found in only 18.42% of patients (n=7). Both eyes were affected in 39.47% cases (n=15), and the least common presentation was involvement of solely the left eye, found in 23.68% cases (n=9).upper lid lag was seen in 56.60% cases (n=30). It was more commonly found in hyperthyroid subgroup. Lower lid lag was present in only 1 female euthyroid patient. Upper lid retraction was present in 52.83% cases (n=28). Of the extraocular movements, abduction was the most commonly affected movement being restricted in 28.30% cases (n=15), followed by elevation (24.53%), adduction (9.43%) and depression (7.55%). According to the ultrasonography, the superior rectus was the most commonly enlarged muscle. It was found to be thickened beyond the 95th percentile of the normal population in 39 eyes. The next most commonly enlarged muscle was inferior rectus muscle (58.5%) followed by the lateral rectus (39.6%). The least affected was the medial rectus muscle (3.9%).

Discussion: In our study 60% (n=23) of patients were males. Almost all other studies, however report a female preponderance[1]. The mean age of the patients in our study included was 40.74 years. Most studies report TRO as a disease of young to middle aged adults[2]. In our study, 44.7% were hyperthyroid, 34% were euthyroid and 21% were hypothyroid. This was in concordance with the results of other major studies. A typical thyroid swelling was found in only 18% cases. Both hyper and hypothyroid patients presented most commonly with bilateral proptosis. None in our study had defective visual acuity or colour vision due to thyroid c auses. Other ocular features like lid lag, lid retraction and intraocular pressure were conforming to observations in other studies. Only our study showed elevation followed by adduction and depression to be most commonly affected movements, but the most commonly restricted movement according to literature is elevation followed by depression. In our study, the muscles most commonly involved were the SR, IR, LR and MR in this order. But according to study by

Stephen L et al, the most commonly affected EOM are the IR, MR, SR and LR, in the same order. 2 patients seen during the study developed dysthyroid optic neuropathy and hence were not included in the study. This incidence is the same as that quoted by ***Jonathan D Trobe et*** al in a major study[4].

Conclusion: Most patients were hyperthyroid. 60.5% patients in our study were male. Superior rectus muscle was found to be enlarged most commonly in the hyperthyroid subgroup. Incidence of optic neuropathy is about 5% of all cases of dysthyroidism.

Fig 1

Fig 2

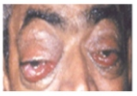

Fig 3

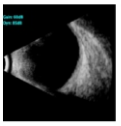

Fig 4a

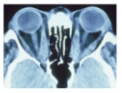

Fig 4b

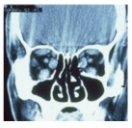

Fig 5

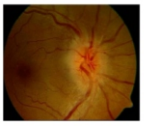

Fig 6

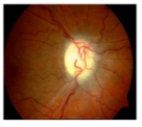

Fig 1: Quiscent TRO, **Fig 2**: Active TRO, **Fig 3**: USG B scan showing EOM thickening, **Fig 4a**: Axial CT scan showing bilateral EOM thickening, **Fig 4b**: Coronal CT scan showing bilateral EOM thickening, **Fig 5**: Diusc edema in TRO, **Fig 6**: Optic neuropathy in TRO

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