

Thyroid Function in Patients with Glaucoma

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The relationship between thyroid disorders and glaucoma is not clear. This study aimed at determining the prevalence of thyroid functional disorders in patients with glaucoma.

Materials and Methods: 201 patients with glaucoma referring to Farabi Hospital were selected using simple non-random sampling. Intra ocular pressure (IOP) was measured and thyroid function tests (TFT) were done and the patients were divided into different groups according to their thyroid function status (hypo-, eu- and hyperthyroid).

Results: Mean age of the patients was 54 ± 17 years. Of the patients, 26.9% had open angle glaucoma (OAG), and the remaining had non-open angle glaucoma (NOAG). Of 201 patients, 8 cases (4%) were hypothyroid and 17 cases (8.5%) were hyperthyroid. The mean intraocular pressures of the hypo-, eu- and hyperthyroids were 18.1 ± 9.3 , 16.8 ± 3.7 and 14.2 ± 3.3 mmHg, respectively, which showed no significant difference. Mean IOP in patients with goiter was significantly lower than in those without goiter (16.0 ± 5 vs. 17.1 ± 7 mmHg, $p < 0.05$). No significant difference in the prevalence of thyroid disorders was found between those with OAG and NOAG.

Conclusions: Compared to other studies the prevalence of thyroid disorders in patients with glaucoma is higher than that of the normal population. Our findings controvert the results of some other studies, in which higher prevalence of hypothyroidism in OAG than that

of hypothyroidism in OAG than that of NOAG was observed.

Key Words: Glaucoma, Hyperthyroidism, Hypothyroidism, Thyroid function tests

Introduction

Glaucoma is a common ophthalmic disorder, and 1.5% of all individuals world wide are affected by this disease.¹ The correlation between glaucoma and systemic disorders like diabetes has been demonstrated.² Thyroid disorders induce heavy metabolic and enzymatic damage to cell function including increased levels of blood lipid profiles in hypothyroidism, decreased levels of blood lipid profiles in hyperthyroidism, accumulation of mucopolysaccharides in subcutaneous tissues in hypothyroidism, alterations in skin components and body fluid distributions and disturbances in serum enzymes concentrations. In addition associated immune disorders in some thyroid diseases increase thyroid stimulating or suppressing antibodies and anti-thyroid cell antibodies, which leads to other clinical manifestations.³⁻⁵ Increase in intraocular pressure has been reported in patients with hypothyroidism.⁶⁻⁷

Although, the association of thyroid disorders with glaucoma is unknown, a higher

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prevalence of thyroid disorders in glaucoma has been reported in some studies.¹ This study was conducted to determine the prevalence of hypothyroidism and hyperthyroidism in patients with glaucoma in Tehran.

Materials and Methods

This cross-sectional study was conducted between March and October 1991. All patients with glaucoma referring to the clinic of ophthalmology in Farabi Hospital were selected using the simple non-probability sampling method. Informed consent was obtained and information about the main, accessory and confounding variables including the history of the thyroid disorders and consumption of the drugs that affect the thyroid function or intraocular pressure was collected. All subjects were examined in detail, paying special attention to blood pressure, Intra-Ocular Pressure (IOP) and the thyroid gland. All data obtained and the clinical diagnosis of the type of glaucoma (OAG or NOAG), were recorded in special research forms. WHO diagnostic criteria were used to determine goiter grade.⁸ IOP was measured by ophthalmologists using Goldman tonometer. Blood samples were taken from all patients and the serum samples were frozen and transferred to the endocrine laboratory for measurement of T₃, T₄, TSH and T₃ resin uptake using Kodak kits (U.K.). FT₄I was then calculated. The thyroid status was assessed by history, physical examination and thyroid function tests and the patients were divided into 3 groups of hypothyroid, euthyroid and hyperthyroid. Those with TSH level higher than 4.5 µU/mL were considered to have hypothyroidism and those with T₄ more than 12.5 µg/dL, T₃ level higher than 220 ng/dL, FT₄I higher than 4 and TSH lower than 0.1 µU/mL were considered as hyperthyroid subjects.

All data were analyzed by SPSS software package (10.01). The data about thyroid function tests, age, Intraocular pressure (IOP) were classified before assessing the frequency of each variable. Mean value of each thyroid related hormone was assessed in different age, sex and glaucoma groups and the results were compared using t-test and ANOVA. Mean IOP was compared among the three main hypothyroid, euthyroid and hyperthyroid groups using ANOVA and t-test.

Results

The study population consisted of 110 (55%) males, and 91 (45%) females. Mean age was 54±17 years. Of the study population, 54 patients (27%) had OAG and 147 patients (73%) had NOAG. Hypothyroidism, hyperthyroidism and euthyroidism were observed in 4.0% (8 patients), 8.5% (17 patients) and 77.5% (176 patients) of study population, respectively. Hypothyroidism was observed in 2.1% of women and 5.5% of men and hyperthyroidism was observed in 7.6% of women and 0.9% of men. No significant statistical difference was observed in this regard.

In examination of the thyroid gland, no evidence of goiter was seen in 143 patients (71.1%), 14.9%, 8.5%, 4.5% and 1% had goiter grades of 1a, 2, 1b and 3, respectively. There was significant difference in the prevalence of goiter between men and women (23% vs.35%, p<0.05). Among those with OAG, 7.4% were hypothyroid and 7.4% were also hyperthyroid. Among those with NOAG, 2.7% were hypothyroid and 8.8% were hyperthyroid. None of these values show significant statistical difference.

There was no difference in mean IOP among those with hypo-, hyper- and euthyroidism (18.1±9.3, 16.8±6.7 and 14.2±3.3,

respectively). Mean IOP in men and women was 15.7 ± 6 and 17.9 ± 7 mmHg respectively, $p < 0.05$. The mean IOP of the study population was 16.7 ± 7.0 (18.9 ± 9.0 and 16.0 ± 5.5 mmHg in those with OAG and NOAG, respectively, $p < 0.05$). There was no significant difference in mean IOP in those with OAG among the 3 main groups (table 1).

Mean IOP in those with goiter (16.0 ± 5) was significantly lower than those without goiter (17.1 ± 7 mmHg) ($p < 0.05$).

There was no significant difference in the frequency of hypothyroidism and hyperthyroidism, age, sex, goiter grade and blood pressure between those with OAG and those with NOAG. The mean ages of those with hypothyroidism, euthyroidism and hyperthyroidism were 60 ± 8 , 55 ± 16 and 37 ± 27 years, respectively. There was a significant difference in mean age those with hyperthyroidism as compared with other groups ($p < 0.05$).

Significant correlations were found between age and thyroid function, goiter grade, IOP and blood pressure ($p < 0.05$). There was no significant correlation between age and the type of glaucoma.

Discussion

In this study out of 201 patients with glaucoma, 4% and 8.5% were detected as hypothyroids and hyperthyroids, respectively. Of the study population, 2.1% of females and 5.5% of males were hypothyroid, and 7.6% of females and 0.9% of males were hyperthyroid. Since this study did not have a concurrent control group, the results were compared with other reports regarding the prevalence of thyroid dysfunction. The prevalence of hypothyroidism is 4.5% in females and 0.9% in males, with a prevalence of hyperthyroidism of 2.5% in females and 0.6% in males.⁷ The Tehran Thyroid Study, a cross-sectional study (Dec 1999-Sep 2000) in a randomly selected sample of 1426 adults who approximately matched the urban population of Tehran and Iran in age and sex, documents the prevalence of thyroid disorders in this iodine-replete area. The prevalence of newly diagnosed overt hypothyroidism was 5.1 per 1,000 women and 1.6 per 1,000 men.

Table 1. Comparison of the study variables between patients with OAG and those with NOAG

Variable	Open angle glaucoma	Non-open angle glaucoma	Total
Number	54	147	201
Age (years)	64 ± 14	62 ± 19	63 ± 18
Sex			
Male (%)	61	52	55
Female (%)	39	48	45
Intraocular pressure (mmHg)	24.2 ± 11.2	20.4 ± 6.6	21.4 ± 12.0
Goiter (%)	22.2	31.3	28.9
Serum T4 ($\mu\text{g/dL}$)	11.9 ± 1.3	12.1 ± 0.8	12.0 ± 1.0
Serum T3 (ng/dL)	210 ± 27	209 ± 37	209 ± 35
Serum TSH (mU/L)	3.4 ± 1.1	3.6 ± 1.0	3.5 ± 1.1
Hyperthyroidism (%)	7.4	8.4	8.5
Hypothyroidism (%)	7.4	2.7	4.0

In this study, 3.2% of women and 0.9% of men had subclinical hypothyroidism, considering the mean (\pm SD) age of 41.7 ± 13.7 years in the observed sample. No new cases of overt thyrotoxicosis were found during the study. Subclinical thyrotoxicosis was diagnosed in 0.5% of women and 0.3% of men.⁹ Albeit the inappropriateness to compare two research samples specially in different times and places, it seems that prevalence of thyroid disorders in patients with glaucoma is higher than that of the normal population.

There was no significant difference in the prevalence of thyroid disorders (hypothyroidism or hyperthyroidism), between those with OAG and those with NOAG. Higher prevalences of hypothyroidism had been reported in those with OAG as compared to NOAG patients^{6,10-13}, but other studies did not reveal any correlation between thyroid disorders and any types of glaucoma.^{14,15}

In this study, no difference in mean IOP was observed in subjects with hypo-hyper- or euthyroidism; other studies however have demonstrated that thyroid disorders, especially hypothyroidism, increase the risk of Glaucoma.^{6,7,16} The mean IOP in those with clinical goiter was lower than patients without goiter. As mean age of those with goiter was lower than others, lower IOP in this group can be attributed to lower age.

Orbitopathy needs a long time to be induced by thyroid disorders;² some references

believe that glaucoma develops 12 years after the onset of thyroid disorders.⁷ It is therefore recommended to search for glaucoma in patients with confirmed thyroid disorders, with special attention to the duration of thyroid disorders.

In this study, mean age of those with hyperthyroidism is lower than those with euthyroidism or hypothyroidism. Also those with goiter showed a lower mean age than other groups. The association between hypothyroidism and goiter was reported to be higher in the youth and it seems that some immunological process in older individuals cause damage to thyroid gland. Therefore hypothyroidism in older individuals is less associated with goiter.¹⁴

In conclusion, we have demonstrated a higher prevalence of thyroid disorders in patients with glaucoma in a referral ophthalmologic hospital in Tehran. Further studies with an appropriate control group may shed more light in this subject.

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