

# Hypothyroidism and open-angle glaucoma: an accidental or an essential coexistence?

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قصور الدرقية والزرق (غلو كوما) المفتوح الزاوية: هل يجتمعان مصادفة أو بالضرورة؟  
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**خلاصة:** استهدفنا بهذه الدراسة أن نختبر النظرية التي موداها أن هناك ارتباطاً بين قصور الدرقية وبين الزرق الأولي المفتوح الزاوية. فقام طبيب عيون متمرس بفحص ما مجموعه ستون مريضاً بقصور الدرقية المكتسب بحثاً عن علامات الزرق. وتم تقييم الحالات عن طريق تسجيل قصة المرض وقياس توتر العين وتنظير قاع العين وتنظير الزاوية وقياس ساحة البصر. كما أجريت اختبارات لوظائف الدرقية وفحوص جلدية وعصبية. وكان المرضى متماثلين وفقاً للعمر والجنس. فكان هناك عشرة من الذكور وخمسون من الإناث (المدى العمري 34-72 سنة). وقد وجدنا ثلاثة من المرضى الستين بهم علامات الزرق المفتوح الزاوية، الأمر الذي يشير إلى وجود علاقة محتملة بين قصور الدرقية والزرق المفتوح الزاوية. ويقتضي الأمر توسيع نطاق الدراسة لتشمل عدداً أكبر من المرضى.

**ABSTRACT** We aimed to test the hypothesis that there is an association between hypothyroidism and primary open-angle glaucoma. A total of 60 patients with acquired hypothyroidism were evaluated by a senior ophthalmologist for evidence of glaucoma. Evaluations were carried out by history, tonometry, funduscopy, gonioscopy and visual field perimetry. Thyroid function tests, and dermatological and neurological examinations were performed. Patients were matched according to age and gender. There were 10 males and 50 females (age range 34-72 years). We found 3 of the 60 patients had signs of open-angle glaucoma, which indicated a possible relationship between hypothyroidism and open-angle glaucoma. It is worth expanding the study to a larger number of patients.

## L'hypothyroïdisme et le glaucome à angle ouvert: une coexistence accidentelle ou essentielle?

**RESUME** Nous avons comme objectif de tester l'hypothèse selon laquelle il existe une association entre l'hypothyroïdisme et le glaucome à angle ouvert primaire. Au total, 60 patients ayant un hypothyroïdisme acquis ont été évalués par un ophtalmologue principal pour mettre en évidence un glaucome. Les évaluations ont été réalisées en utilisant les antécédents, la tonométrie, l'examen du fond de l'oeil, la gonioscopie et l'examen du champ visuel à l'aide du périmètre. Des tests de la fonction thyroïde, des examens dermatologiques et neurologiques ont été réalisés. Les patients ont été appariés selon l'âge et le sexe. Il y avait 10 hommes et 50 femmes (âges extrêmes 34-72 ans). Nous avons trouvé que 3 des 60 patients présentaient des signes de glaucome à angle ouvert, ce qui indiquait une relation éventuelle entre l'hypothyroïdisme et le glaucome à angle ouvert. Il importe d'élargir l'étude à un nombre plus important de patients.

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Received: 22/12/98; accepted: 20/4/99

## Introduction

Many studies in the past few decades have emphasized some kind of relationship between open-angle glaucoma and hypothyroidism [1-5]. In a recent study, 84% of open-angle glaucoma cases were found to be taking one or more medications for a mean of 2.6 systemic conditions. Systemic antihypertensive agents were the most common class of drugs, being used by 48% of patients. Aspirin, the most common single drug, was taken by 25% of glaucoma patients [6].

Open-angle glaucoma affects a considerable number of the elderly making it worthwhile to look for a relationship between it and any systemic disease.

After cataract and diabetic retinopathy, open-angle glaucoma has been found to be the third most common cause of blindness among patients in the Ophthalmology Department of King Hussein Medical Centre [7]. The Ophthalmology and Endocrinology Departments of this centre cooperated in the study in which 60 Jordanian patients with hypothyroidism were investigated for possible coexistence of open-angle glaucoma.

## Patients and methods

The study was conducted among 60 patients (50 females, 10 males) with diagnosed hypothyroidism at the King Hussein Medical Centre. The patients were evaluated for possible association of glaucoma. They ranged in age from 34 years to 72 years and the female to male ratio was 5:1. All were under treatment for hypothyroidism.

The endocrinological examination of these patients included neck examination, pulse and blood pressure; the neurological examination included reflexes, mainly jerk

reflexes, as well as signs for the presence of carpal tunnel syndrome; the dermatological examination included skin thickness and dryness; the patients also underwent cardiac assessment.

The laboratory examination included the free thyroxine index ( $FT_4$ ), thyroid stimulating hormone (TSH), thyroid autoantibodies (antithyroglobulin antibodies, antimicrosomal antibodies), thyroid ultrasonography and thyroid isotope scan.

A complete ocular examination was conducted including history, slit-lamp biomicroscopy, measurement of intraocular pressure using a Goldman applanation tonometer, funduscopy for optic disc-cupping ratio, gonioscopy and perimetry using a Goldman perimeter. All patients were matched with respect to age and sex (Table 1).

In all the patients, hypothyroidism had been acquired and had been caused by: an autoimmune reaction in 39 patients (65%), postradioactive iodine treatment in 15 patients (25%) and postoperative effects in 6 patients (10%).

Associated diseases were found to be: diabetes (15 patients), hypertension (9 patients), vitiligo (3 patients), pernicious anaemia (1 patient), alopecia areata (1 patient), and Addison disease (1 patient).

The duration of hypothyroidism in the patients ranged from 5 years to 20 years and most of them were in an euthyroidic state at the time of referral. The thyroid profile in the endocrinology clinic was done monthly for 3 months in the beginning, then every 3 months for a year, and after that every 6 months.

## Results

We evaluated 60 patients, 50 (83.3%) women and 10 (16.7%) men with hypothyroidism, all of whom were randomly selected

from the endocrinology clinic. They ranged in age from 34 years to 72 years and were all receiving regular treatment at the clinic.

They were evaluated at the ophthalmology clinic for any evidence of glaucoma. Initially, three of them were found to have raised intraocular pressure and subsequent investigations were undertaken to confirm the glaucoma diagnosis.

None of the three patients had a family history of glaucoma. Gonioscopy showed open angles in all three patients, funduscopy showed signs of glaucomatous optic disc cupping, perimetry by Goldman perimetry demonstrated characteristic visual field defects that confirmed the diagnosis of open-angle glaucoma (Table 2)

These three patients had not been aware of their eye disease and they were advised

to start antiglaucoma treatment immediately and to have their intraocular pressure checked regularly in the ophthalmology clinic. They were also advised to follow the instructions of their endocrinologist. All three patients were continued on antiglaucoma treatment in spite of their euthyroidic status.

## Discussion

Some hormonal disturbances may affect the facility of aqueous humour outflow. Intraocular pressure decreases during pregnancy and increases just before or during menstruation. Oral contraceptives appear to lower intraocular pressure. Patients with acromegaly appear to have an increased

Table 1 Distribution of patients with hypothyroidism by age group and sex

Age group (years)	Female		Male		Total		Female:male ratio
	No.	%	No.	%	No.	%	
30-39	3	6	0	0	3	5	..
40-49	5	10	0	0	5	8.3	..
50-59	10	20	2	20	12	20	5
60-69	30	60	6	60	36	60	5
70+	2	4	2	20	4	6.7	1
Total	50	100	10	100	60	100.0	-

Table 2 Findings for the three patients with open-angle glaucoma

Patient	Intraocular pressure	C/D ratio*	Visual field defects
1	24 mmHg	0.6	Isolated paracentral scotomas
2	26 mmHg	0.5	Isolated paracentral scotomas
3	28 mmHg	0.6	Arcuate scotoma

\*Ratio of vertical optic disc cupping to vertical optic disc diameter

prevalence of glaucoma, suggesting an effect of growth hormone on intraocular pressure. Large doses of vasopressin lower intraocular pressure. Systemic administration, on the other hand, increases systemic blood pressure and raises intraocular pressure. There is evidence that there is some relationship between primary open-angle glaucoma and hypothyroidism. Glaucoma is more frequent in patients with diabetes mellitus. The effects of corticosteroids on intraocular pressure are well known, but there are variations among patients [8].

It has been recognized that in primary open-angle glaucoma, there is an impairment of the facility of aqueous humour outflow. The exact nature of this impediment in open-angle glaucoma has not been determined. Gonioscopic examination in this type of glaucoma has failed to show why the aqueous humour does not drain away efficiently.

In 1957, Zimmerman demonstrated an abundance of acid mucopolysaccharides within the intertrabecular spaces of open-angle glaucoma patients [9]. Davson in 1962 suggested that the open holes observed in tangential sections of the trabecular were full of this mucopolysaccharide jelly, which, by virtue of its viscosity, exerted the principal restrictive control over the outflow of the aqueous humour [10]. Writing on the pathology of myxoedema, Gabrilove and Ludwig in 1957 stated that the mucoid substance deposited consisted of an acid mucopolysaccharide in combination with protein [11]. The exact significance of this deposit *vis-à-vis* thyroid function is uncertain because localized deposits of a similar nature occasionally occur in hyperthyroidism.

It is conceivable then that, in thyroid dysfunction, some alteration occurs in either the quantity or the quality of the mucopolysaccharide in the trabecular spaces and that this may play some part in the etiology of open-

angle glaucoma. For some time it has been recognized that cases of nasal obstruction due to localized deposits of this pseudomucinous material and referred to ear, nose and throat (ENT) surgeons as sinusitis or deflected septum, proved to be cases of myxoedema [12]. Localized deposits are also recognized as an etiological factor in the carpal tunnel [13].

Smith and colleagues reported for the first time that after 1 year of control of hypothyroidism, a 62-year-old woman was helped in the normalization of her intraocular pressure and recovery of her visual field loss and was even able to stop the antiglaucoma treatment [14]. Similar findings occurred in a hypothyroid patient whose intraocular pressure inversely varied with the use or the discontinuation of systemic hypothyroid medications [12]. Smith and colleagues also studied 25 patients with newly diagnosed hypothyroidism who presented to the endocrinology clinic. Using tonometry and tonography, they demonstrated a reduction in facility of outflow in the hypothyroid state. With treatment of the hypothyroidism alone there was a statistically significant improvement in facility of outflow [2].

In a recently reported study of 64 patients with open-angle glaucoma, 23.4% were found to have hypothyroidism, which led the authors to conclude that 10.9% of patients with primary open-angle glaucoma had undiagnosed hypothyroidism [3]. However, in a study of British patients with primary open-angle glaucoma, the prevalence of hypothyroidism was not significant and there was no evidence of an association of hypothyroidism with glaucoma [4].

The etiology and pathogenesis of normal-tension glaucoma is unknown but increasing evidence suggests multiple mechanisms of damage. It has been report-

ed that of 25 normal-tension glaucoma patients, 6 (24%) had thyroid disease, which indicates that thyroid disease either causes optic neuropathy mimicking glaucomatous damage or is a risk factor for glaucoma [15].

Our findings showed a female-to-male ratio among patients with hypothyroidism of 5:1, a ratio that is universally accepted. It is

possible that some of the hypothyroidic patients in our study may have normal intraocular pressure because they are under treatment for hypothyroidism. In general, our study demonstrates a correlation between hypothyroidism and open-angle glaucoma. It is worth continuing this study and increasing the number of study patients in order to give statistical significance to this hypothesis.

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