Reduction of intraocular pressure in a glaucoma patient undergoing hormone replacement therapy

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Abstract

Objectives: To show the reducing effect of estrogens and progestins on the elevated intraocular pressure (IOP) in the case of a 56-year-old woman showing typical climacteric complaints, who was admitted to the menopause outpatient unit. She also suffered from a primary open-angle glaucoma treated with betaophtiole eye drops with intraocular pressures of 16–20 mmHg under this local therapy. Methods: IOP patterns were monitored by means of standardised daily pressure profiles four times a day before as well as 4 and 12 weeks after the beginning of hormone replacement therapy (HRT). The local glaucoma therapy remained unchanged. Results: During HRT, IOP levels were reduced from 16–20 mmHg before therapy to 12–15 mmHg at week 4 and to 13–15 mmHg at week 12 after the beginning of HRT. Conclusion: The finding of a close chronological relationship between the onset of menopause and the development of a glaucoma is a potentially new indication for HRT. © 1998 Elsevier Science Ireland Ltd. All rights reserved.

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1. Introduction

The incidence of primary open-angle glaucoma is much higher in men than in women under 50 years of age. This difference between the sexes becomes less pronounced after this age, which leads to a relationship between intraocular pressure (IOP) and a reduction of estrogens and progestins in postmenopausal women. Proper regulation of IOP in the human eye has important physiological implications, whereas improper regulation may have pathological consequences. Increased IOP is a significant risk for visual
Impairment in glaucoma patients. In many patients with glaucoma, IOP elevation is associated with an increase in outflow resistance. In some cases, the increase in outflow resistance is caused by restricted access of aqueous humor to the trabecular meshwork, leading to angle closure or narrow-angle glaucoma, or to mechanical clogging of the meshwork, leading to pigmentary glaucoma. However, in most cases of primary open-angle glaucoma, the angle appears normal and the cause for the increase in outflow resistance through the outflow pathway has remained obscure. IOP is maintained as a result of a balance between secretion of aqueous humor by the ciliary processes and reabsorption or outflow of the aqueous humor through the trabecular meshwork, into Schlemm’s canal, and then through collecting channels to the scleral veins. Changing the resistance of outflow pathway as well as changing the tone of ciliary muscle can influence IOP. The aim of this study was to investigate the hypothesis that the IOP is influenced by the level of steroid hormones in a glaucoma patient on the basis of our data which have previously shown a significant reduction of IOP in normal-IOP patients [1–3].

2. Material and methods

A 56-year-old woman presenting with climacteric complaints was admitted to the menopause outpatient unit at the Vienna University Hospital. Hormone deficiency-related symptoms included hot flushes, sleep disturbances and effluvium. She had been amenorrhoic for 4 years and had not been given any hormone replacement therapy (HRT). The history revealed a chronic open-angle glaucoma treated with betaophtiole 0.1% eye drops twice daily (1 mg Metipranolol; Mann-Pharma, Berlin, Germany). IOP oscillated between 16 and 20 mmHg during therapy. Serum hormone levels showed a typical menopausal hormone constellation with a follicle-stimulating hormone level of 136 mU/ml and an estradiol level of 14 pg/ml. Bone density as measured by densitometry was within the normal range at 115%. In view of her hormonal status and menopausal symptoms, the patient received HRT consisting of 1 × 1 daily tablet of Progynova (2 mg estradiol valerat; Schering, Vienna, Austria), and 1 × 1 progesterone suppository 0.4 g (Progesteroni 0.4, Adipis neutulis qu. Sat.) for the last 10 days of each monthly administration period.

The patient was examined regularly at the glaucoma outpatient unit of the Vienna University Department of Ophthalmology. IOP patterns were monitored by means of standardised daily pressure profiles recorded at 08:00 h, 12:00 h, 17:00 h and 20:00 before as well as 4 and 12 weeks after commencement of HRT. IOP was exclusively measured by one examiner and with the same split lamp using a Goldmann applanation tonometer.

3. Results

During HRT, the topical glaucoma therapy remained unchanged, and IOP levels were reduced from 16–20 mmHg to 12–14 mmHg after 4 weeks and to 13–15 mm Hg after 12 weeks.

4. Discussion

The eye maintains its shape by having an IOP that is the result of the balance between secretion of aqueous humor by the ciliary body and reabsorption and outflow of aqueous humor through the trabecular meshwork, into Schlemm’s canal, and then to the scleral veins. Raised IOP is the major risk factor in the development of the commonest form of glaucoma, primary open-angle glaucoma. Nitric oxide (NO) regulates the resistance in the systemic blood vessels and has an important regulatory role in the vascular endothelium and smooth muscle elsewhere in the body [4,5]. In animals, the topical use of nitroglycerine reduced IOP in normal eyes. Nitroglycerine mimics the nitrovasodilators regulating vasoressistence and thus influences IOP [6]. The ciliary muscle and outflow pathway are enriched sites of NO synthase (NOS). Immunological analysis showed that the major part of NOS is endothelial nitric
oxide synthase (NOS-3). NO in the anterior segment of the eye modulates aqueous outflow resistance either directly at the level of the trabecular meshwork, Schlemm’s canal and collecting channels, or indirectly through an alteration in the tone of the longitudinal ciliary muscle. 17β-Estradiol significantly enhances the activity of NOS-3 via a receptor-mediated system [7,8] or some other mechanism, such as the enhancement of the Ca2+/calmodulin system. The same mechanism as that for nitroglycerine also applies to 17β-estradiol. Estradiol increases the endothelial-based type-3 NOS and is responsible for reducing IOP in primary open-angle glaucoma or normal eye patients. We showed that HRT lowered IOP significantly in normal eye patients [1]. It remains to be seen if HRT is acting by a receptor-mediated system or whether other mechanisms are responsible for the effect. These findings constitute a basis for a potentially new therapeutic approach by HRT in postmenopausal glaucoma patients.

References