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Original article

Anterior segment optical coherence tomography changes with introduction and discontinuation of tamsulosin

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Abstract

Purpose: The aim of this study was to quantify changes and reversibility in pupil dilation and iris dilator muscle region thickness associated with introduction and subsequent discontinuation of tamsulosin in patients naïve to this drug with the aid of an anterior OCT system.
Methods: The study was carried out on 7 patients (14 eyes) naïve to tamsulosin and with benign prostatic hypertrophy (BHP). Measurements taken by Vistante OCT were done pre- and post-dilation of the following: pupil size, iris dilator muscle region (DMR) thickness, sphincter muscle region (SMR) thickness, and anterior chamber depth. These measurement were taken at Day 0 (tamsulosin naive), Day 30 (after one month of tamsulosin, the treatment period) and day 60 (after one month of no tamsulosin, the discontinuation period).
Results: Post-dilation pupil diameter significantly increased during the discontinuation period ($P = 0.047$). Iris DMR thickness measurements post-dilation significantly decreased during treatment ($P = 0.00044$), discontinuation (0.00011), and combined periods ($P = 0.000050$). Anterior chamber depth measurements in post-dilation were significantly decreased during treatment ($P = 0.0016$), discontinuation ($P = 0.017$), and combined periods ($P = 0.00022$).
Conclusion: Tamsulosin discontinuation effectively increases dilated pupil size, a measure that has been inversely linked to IFIS incidence pre-operatively. Decreased DMR thickness in this short term likely illustrates changes aside from atrophy, such as vascular changes. Decreased anterior chamber depths suggest aqueous humor production is decreased as well.

Keywords: Intraoperative floppy iris syndrome, Cataract surgery, Optical coherence tomography, Flomax, Tamsulosin, Benign prostatic hypertrophy

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Introduction

Benign prostatic hyperplasia (BPH) is a common condition affecting 2.7% of men aged 45–49 years and as high as 24% for men over 80 years old.[1] Pharmacological treatment of BPH involves the use of $\alpha 1_A$-adrenoreceptor antagonists, such as tamsulosin. This drug is now known to many ophthalmologists through its association with iris changes that complicate cataract surgery.[2] These changes have been coined as intraoperative floppy iris syndrome (IFIS) by Chang and Campbell.[3]

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In tamsulosin patients, a decreased preoperative dilated pupil diameter is associated with increased risk of IFIS.[4] Chang hypothesized that this was caused by a blockage of α_{1A} adrenoreceptors (α_{1A}-AR) in the iris dilator muscle. Tamsulosin users have been observed to have decreased dilated pupil diameters compared to control groups.[5,6] Pupil diameter decreases have also been observed with tamsulosin introduced to tamsulosin-naïve patients.[7]

In addition to pupil diameter changes, it is hypothesized that α_{1A}-adrenoreceptor antagonists lead to loss of iris dilator muscle tone and disuse atrophy due to chronic blockage of the α_{1A} receptor on the muscle.[3,8] This could explain both the flaccid characteristic of the tissue as found during cataract surgery and the occurrence of IFIS despite discontinued usage before surgery.[9] In support of atrophy, it has been found by optic coherence tomography, tamsulosin users have decreased iris thicknesses in the dilator muscle region.[6]

The aim of this study was to quantify changes and reversibility in pupil dilation and iris dilator muscle region thickness associated with an introduction and subsequent discontinuation of tamsulosin in patients naïve to this drug with the aid of an anterior OCT system. A small cohort of patients on tamsulosin was followed longitudinally to see whether any changes that may occur are reversible. To date, no other study has examined the anterior chamber morphology of tamsulosin naïve patients with a discontinuation period.

Patients and methods

Patients were recruited from the Urology Clinic and tested at the Eye Clinic in Toronto Western Hospital. Testing included 7 patients and 14 eyes, all of men in age range of 60–80 years old. There is no significant post void residual or urinary retention in any of the selected patients. All patients received an explanation of the risks involved and provided informed consent. The inclusion criteria included any diagnosis of BPH, if Tamsulosin deemed clinically necessary and no previous exposure to α1-adrenoreceptor antagonist. Exclusion criteria were eye drop usage besides artificial tears (i.e. mydriatics or α1-AR agonist), previous angle closure glaucoma, Pseudoexfoliation syndrome, previous ocular surgery (i.e. laser iridoplasty, cataract surgery), Horner's syndrome, ocular trauma and uveitis.

The study was carried out on 7 patients (14 eyes) with BPH and naïve to tamsulosin usage. One patient was diabetic. Anterior chamber OCT images of participants' eyes were taken at 3 different points in time over a 2 month duration, prior to tamsulosin, at the end of 30 day tamsulosin course, and another 30 days after completion of therapy. Measurements were made by OCT Visante software (Carl Zeiss Co.) at each of the three points in time, before and after dilation of each eye with Diophenyl-T eyedrops (Phenylephrine Hydrochloride 5%; Tropicamide 0.8%).

Measurements of interest were as follows: pupil size, iris dilator muscle region (DMR) thickness, iris sphincter muscle region (SMR) thickness, and anterior chamber depth. These were measured from the OCT images through use of the anterior chamber OCT (Fig. 1).

All tests were performed in the same clinic with the same instruments during the course of the study. Patients were examined and evaluated for a complete eye history before starting the study including in clinic pretest slit lamp biomicroscopy examination for the evaluation of anterior chamber, pupils, diameter, and refractivity. Additionally, OCT imaging measurements of pupil size measured between papillary margins, iris dilator muscle region (DMR) measured halfway between the scleral spur and pupil margin and iris sphincter muscle region (SMR) measured within anterior 0.75 mm from pupil margin at the thickest and thinnest aspects were recorded. The anterior chamber depth (ASD) measured from the anterior border of lens to the posterior border of cornea was also recorded. None of the patients experienced any urinary symptoms or complications. There were no patients lost to follow-up during the study.

Statistical analysis

Measurements for each eye at the start and end of the treatment, discontinuation, or combined period were analyzed using SPSS® version 20.0 (IBM Inc., Chicago, Illinois, USA). Shapiro-Wilk test was used to test for normality and the data were not normally distributed; hence, Friedman test was used to compare the paired data. Each eye was treated as an independent sample. The null hypothesis was set as no difference between the start and end of a period for all measures of pupil diameter, iris thicknesses, and anterior chamber depth. Significance was considered as $P < 0.05$.

Results

The post-dilation pupil diameter was found to be significantly increased during the discontinuation period

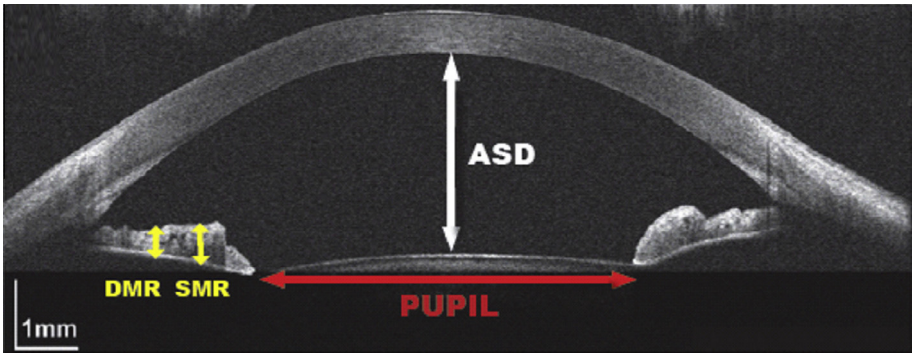

Figure 1. An example of anterior chamber imaging by Carl Zeiss Meditec's VisanteTM OCT system demonstrating standardized positions of measurement. This imaging allows accurate measurement of pupil size, iris dilator muscle region (DMR) thickness, iris sphincter muscle region (SMR) thickness, and anterior chamber depth (ASD).