



## Screening of intraocular pressure before routine pupil dilation for retinal photography: Clinical case report

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### Abstract

**Introduction:** Pharmacologic dilation of the pupil results in twice the sensitivity of detection of diabetic retinopathy compared with undilated retinal examination. The potential risk of acute angle-closure glaucoma after pupil dilation has been hypothesized to be higher in Asian patients with diabetes mellitus.

**Clinical case:** A 61-year-old man with diabetes mellitus and hypertension was incidentally found to have elevated intraocular pressure (IOP) before routine retinal photography. He was asymptomatic and the visual acuity was 0.67 for both eyes. An ophthalmologist later found he had anatomical narrow-angle borderline glaucoma. Topical administration of pilocarpine and oral administration of acetazolamide were initiated, and laser iridotomy was later performed.

**IOP screening:** Among 1736 diabetic and/or hypertensive patients who underwent IOP screening, 31 patients (1.8%) had IOP of any eye persistently higher than 21 mm Hg on at least two occasions. The mean (standard deviation) IOP of the right eye was 24.1 (2.1) mm Hg, while that of the left eye was 24.6 (2.5) mm Hg. Four patients (12.9%) were found to have glaucoma, and treatment was initiated by an ophthalmologist. Therefore further study should be conducted to evaluate the cost-effectiveness of IOP screening among this group of patients.

**Keywords:** Glaucoma; intraocular pressure; screening

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### Background

One of the commonest indications for pupil dilation is in screening for diabetic retinopathy, where it doubles the sensitivity of screening [1]. However, the possibility of inducing acute glaucoma by mydriasis has also been recognized for more than a century and is often cited by general physicians, by diabetologists, and in textbooks as a reason for not dilating the pupil routinely [2–6]. It has been hypothesized that the risk of acute angle closure after pupil

dilation may be higher in Asian patients with diabetes mellitus [7].

### Case presentation

FBK is a 61-year-old man with diabetes mellitus and hypertension who is cared for under the supervision of the Family Medicine and General Outpatient Department of Kwong Wah Hospital. His glucose control was good, with a glyated hemoglobin fraction of 6.1%, blood pressure of 115/64 mm Hg, and a low



density lipoprotein cholesterol level of 1.8 mmol/L. Intraocular pressure (IOP) was measured before routine retinal photography for annual diabetic complication screening. The patient was found to have elevated IOP in his right eye of 20.4 mm Hg and in his left eye of 28.7 mm Hg. On retesting, the IOP was 19.8 and 24.6 mm Hg respectively. Visual acuity was 0.67 for both eyes. FBK did not report any blurring of vision, and there was no ocular pain, no headache, no nausea, and no family history of glaucoma. He was referred to the Ophthalmology Department urgently for further assessment, and was found to have anatomical narrow-angle borderline glaucoma. Topical administration of pilocarpine and oral administration of acetazolamide were initiated, and laser iridotomy was later performed.

### IOP screening

The Family Medicine and General Outpatient Department of Kwong Wah Hospital implemented IOP measurement for all patients before referral for dilated-pupil retinal photography. Patients with persistent elevated IOP (i.e., greater than 21 mm Hg on at least two occasions) are referred to the Ophthalmology Department for further assessment. From December 1, 2013 to November 30, 2014, IOP was measured by noncontact pneumotometry in 1736 diabetic and/or hypertensive patients before referral for dilated retinal photography. Thirty-one patients (1.8%), including 13 male and 18 female patients, were found to have IOP of any eye persistently higher than 21 mm Hg on at least two occasions. Most of them were asymptomatic, except for one patient who reported blurred vision and another patient with a family history of glaucoma.

Among the 31 patients, 10 (32.3%) had both diabetes mellitus and hypertension, 9 (29.0%) had diabetes mellitus alone, and 12 (36.4%) had hypertension alone. Their mean (standard deviation, SD) blood pressure was 126.1 (15.6)/73.4 (8.8) mm Hg, and the mean (SD) body mass index was 26.1 kg/m<sup>2</sup>. The mean (SD) IOP of the right eye was 24.1 (2.1) mm Hg, while that of the left eye was 24.6 (2.5) mm Hg. The mean (SD) visual acuity of the right eye was 0.8 (0.3) and that of the left eye was 0.9 (0.3). Four patients (12.9%) were found to have glaucoma, and treatment was initiated by their ophthalmologist. Two patients received topical treatment, while one patient received both topical treatment and laser iridotomy.

### Discussion

The cases series revealed that 1.8% (31/1736) of diabetic or hypertensive patients have asymptomatic elevation of IOP. Further, 12.9% (4/31) of diabetic or hypertensive patients with elevated IOP were found to have silent glaucoma and required further treatment. Further research should be conducted to evaluate the cost-effectiveness of IOP screening among this group of patients. In addition, the potential risk of precipitating acute angle-closure glaucoma after pupil dilation for retinal photography should be addressed.

Glaucoma describes a group of eye diseases in which there is progressive damage to the optic nerve leading to impaired vision and blindness if it is not treated [8]. Primary open-angle glaucoma is the commonest form of glaucoma in Caucasians, whereas primary angle-closure glaucoma is relatively rare. In the Hong Kong Chinese population, primary angle-closure glaucoma appears to be commoner than in the West [9].

A systematic review reported that among an estimated 600,000 individuals who received mydriatic eye drops, 33 (0.006%) developed acute angle-closure glaucoma, giving an estimated risk of 1 in 20,000 [10]. A study of 1232 Chinese Singaporeans showed that none developed acute glaucoma after mydriasis [11]. In a cohort study of 1910 Asians with diabetes, the risk of acute angle closure was insignificant after routine dilation of the pupil for fundus examination [12].

To conclude, the risk of acute angle closure was insignificant after routine dilation of pupils for a retinal examination in Asian patients with diabetes, including Chinese patients. The current evidence supports the safety of pharmacologic pupil dilation in the primary care setting for screening and detection of diabetic retinopathy. On the other hand, silent glaucoma is not uncommon among diabetic or hypertensive patients, and further research is needed to assess the effectiveness of IOP screening to identify these subgroups of patients.

### Conflict of interest

The author declares no conflict of interest.

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## References

1. Pugh JA, Wiley R, Tuley MR, Velez R, Van Heuven WAJ, Jacobson J, et al. Diabetic retinopathy screening: the non-mydratric camera (NMRC) performs better mydratrically. *Diabetes* 1990;39:170A.
2. Derby H. Mydratics in glaucoma. *Trans Am Ophthalmol Soc* 1868;1(4-5):35-8.
3. Awh CC, Cupples HP, Javitt JC. Improved detection and referral of patients with diabetic retinopathy by primary care physicians: effectiveness of education. *Arch Intern Med* 1991;151(7):1405-8.
4. Owens DR, Dolben J, Young S, Ryder REJ, Jones IR, Vora J, et al. Screening for diabetic retinopathy. *Diabet Med* 1991;8(S2):S4-10.
5. Wilding J, Williams G. Diabetes mellitus and disorders of lipid and intermediary metabolism. In: Souhami RL, Moxham J, editors. *Textbook of medicine*. 3rd ed. Edinburgh: Churchill Livingstone; 1997.
6. Gale EAM, Anderson JV. Diabetes mellitus and other disorders of metabolism. In: Kumar P, Clark M, editors. *Clinical medicine*. 4th ed. Edinburgh: Saunders; 1998.
7. Yip JL, Foster PJ. Ethnic differences in primary angle-closure glaucoma. *Curr Opin Ophthalmol* 2006;17(2):175-80.
8. Woo J. Glaucoma – an update and overview on classification and management. *Hong Kong Pract* 2006;28:76-84.
9. Lai JSM, Liu DTL, Tham CCY, Li RTH, Lam DSC. Epidemiology of acute primary angle-closure glaucoma in the Hong Kong Chinese population: prospective study. *Hong Kong Med J* 2001;7(2):118-23.
10. Pandit RJ, Taylor R. Mydrasis and glaucoma: exploding the myth. A systematic review. *Diabetic Med* 2000;17(10):693-9.
11. Foster PJ, Oen FT, Machin D, Ng TP, Devereux JG, Johnson GJ, et al. The prevalence of glaucoma in Chinese residents of Singapore: a cross-sectional population survey of the Tanjong Pagar district. *Arch Ophthalmol* 2000;118(8):1105-11.
12. Tan GS, Wong GY, Wong TY, Govindasamy CV, Wong EY, Yeo IY, et al. Is routine pupil dilation safe among Asian patients with Diabetes? *Invest Ophthalmol Vis Sci* 2009;50(9):4110-3.

## Related Information

For more information about diabetes mellitus or hypertension, please read the following articles published in *Family Medicine and Community Health*.

- Availability and social determinants of community health management service for patients with chronic diseases: An empirical analysis on elderly hypertensive and diabetic patients in an eastern metropolis of China  
<http://www.ingentaconnect.com/content/cscript/fmch/2015/00000003/00000001/art00003>
- Exploring point-of-care transformation in diabetic care: A quality improvement approach  
<http://www.ingentaconnect.com/content/cscript/fmch/2015/00000003/00000002/art00004>
- Correlation between KCNQ1 gene polymorphism and type 2 diabetes mellitus in Huaihai region of China  
<http://www.ingentaconnect.com/content/cscript/fmch/2014/00000002/00000001/art00003>
- Longitudinal study of a community hospital integrated model for diabetes management in the Beijing Jingsong community  
<http://www.ingentaconnect.com/content/cscript/fmch/2014/00000002/00000001/art00004>
- Hypomagnesemia is a risk factor for metabolic syndrome and type 2 diabetes mellitus in native Balinese  
<http://www.ingentaconnect.com/content/cscript/fmch/2013/00000001/00000001/art00003>
- Four-year dynamic observation and study on standardized management of elderly patients with type 2 diabetes in Beijing Yongding Road Community  
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- Antihypertensive drugs in pregnancy  
<http://www.ingentaconnect.com/content/cscript/fmch/2013/00000001/00000001/art00007>
- Epidemiology of community pre-hypertensive patients and related risk factors in Chengdu city  
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