

Dark-room Prone-position Test for Intermittent Angle Closure

Tae-Woo Kim, MD,^{1,2} Ki Ho Park, MD,² Chul Hong, MD³

Department of Ophthalmology, Seoul National University Bundang Hospital¹, Seongnam, Korea

Department of Ophthalmology, Seoul National University College of Medicine², Seoul, Korea

Glaucoma Service, Dr. Hong's Clinic³, Seoul, Korea

Purpose: To determine the efficacy and safety of the dark-room prone-position test (DRPT) for intermittent angle closure (IAC) and to investigate the correlation between A-scan ultrasound biometric measurements and the results of DRPT.

Methods: Medical records were reviewed of 37 eyes in 24 patients who were diagnosed with IAC and received DRPT. The increase of intraocular pressure (IOP) induced by DRPT and the results from A-scan ultrasound biometric measurements were obtained. An increase in IOP of at least 8 mmHg from baseline was considered a positive result for DRPT. Associations between the increase of IOP induced by DRPT and the parameters of A-scan biometry were tested by linear regression analysis.

Results: The DRPT results were positive in 28 eyes of 19 patients. After DRPT, the IOP returned to near-baseline levels within 2 hours in all patients; some patients were treated with anti-glaucoma eye drops. Lens thickness was significantly correlated with the amount of IOP elevation induced by DRPT ($r=0.338$, $p=0.041$).

Conclusions: DRPT is a safe and effective test in patients with IAC. DRPT can be used effectively to make a concrete diagnosis of IAC. Lens thickness appears to be associated with a positive response to DRPT. *Korean Journal of Ophthalmology 21(3):151-154, 2007*

Key Words: Dark-room prone-position test, Intermittent angle closure

Intermittent angle closure (IAC) is defined by repeated, brief episodes of angle closure with mild symptoms and elevated intraocular pressure (IOP).¹ These episodes resolve spontaneously and ocular function is normal between attacks. IAC can be readily diagnosed when examination reveals iris bombe, narrow angle, and increased IOP in patients who complain of intermittent headache and/or mildly blurred vision. However, owing to the brief and episodic nature of the attacks, almost all patients present with normal IOP between attacks. Hence, the majority of diagnoses are made on the basis of the patients' symptoms and results of gonioscopic examination.

Laser iridotomy (LI) is a definitive treatment for IAC and also plays a diagnostic role. Disappearance of the symptoms and IOP elevation after LI confirm the diagnosis. However, an adequate provocative test may improve the diagnosis and management of IAC by allowing a concrete diagnosis before LI and making the patient more likely to comply with laser

surgery.

In the present study, we investigated the characteristics of the darkroom prone-position test (DRPT) in patients with IAC to clarify the efficacy and safety of this test for the diagnosis of IAC. In addition, we investigated the correlation between the parameters of A-scan biometry and the results of DRPT in an attempt to determine the biometric risk factors for a positive response to DRPT.

Materials and Methods

We reviewed the records of all eyes suspected to have IAC examined at Dr. Hong's Eye Clinic from 1993 to 2001. For the purposes of this study, IAC was defined as a condition fulfilling the following criteria: (1) repeated episodes of symptoms such as blurred vision, halos, and headache or periocular or frontal eyebrow pain. (2) presence of a shallow anterior chamber, (3) a narrow angle without goniosynechia.

Patients diagnosed with IAC undertook DRPT in the following manner. The IOP was first measured by Goldmann applanation tonometry. Each patient was then placed in a prone position in a dark room for a minimum of 45 minutes. The patient either had a companion in the room or someone checked every five minutes to make sure the patient stayed awake during the test. The patients were instructed to keep

Received: March 8, 2006 Accepted: July 26, 2007

Reprint requests to Ki Ho Park, MD. Department of Ophthalmology, Seoul National University College of Medicine, 28 Yeongun-dong, Chongro-gu, Seoul 110-744, Korea. Tel: 82-2-2072-3172, Fax: 82-2-741-3187, E-mail: kihopark@snu.ac.kr

their eyes open and not to exert any pressure on them. At the end of the test, the patients were told to close their eyes and were taken as quickly as possible to the slit lamp where the IOP was re-measured. An increase in IOP of at least 8 mmHg from baseline was considered a positive result for the test.

To ascertain the biometric characteristics of IAC, A-scan ultrasound biometry was performed 3 times in each subject to measure the anterior chamber depth, lens thickness, and axial length. The mean of the 3 measurements of each parameter was taken for the statistical analysis. Associations between the amount of IOP elevation induced by DRPT and

the parameters of A-scan biometry were tested by linear regression analysis.

Results

The medical records of 27 patients diagnosed with IAC were included in the present study. Among them, 24 patients underwent DRPT. Of the 48 eyes in the 24 patients, 37 were diagnosed as having IAC and enrolled for the present study. Demographic characteristics and the IOP before and immediately after the DRPT are summarized in Table 1.

Table 1. Demographic characteristics of patients and intraocular pressures before and immediately after the dark-room prone-position test

Patient No	Age (yr)	Sex	Laterality	PreIOP* (mmHg)	PostIOP† (mmHg)	Δ IOP‡ (mmHg)	Response
1	64	M	R	16	27	11	+
			L	13	21	8	+
2	49	M	R	12	21	9	+
			L	11	20	9	+
3	57	M	R	18	38	20	+
			L	16	25	9	+
4	59	M	L	23	32	9	+
			5	61	M	R	23
L	21	36				15	+
6	66	M	R	14	25	11	+
			L	23	32	9	+
7	61	M	R	25	35	10	+
			L	17	27	10	+
8	69	F	R	21	25	4	-
			L	22	32	10	+
9	55	F	R	19	26	7	-
			L	19	25	6	-
10	51	F	R	14	27	13	+
			L	17	32	15	+
11	78	F	R	21	35	14	+
12	70	M	L	18	46	28	+
13	59	M	R	14	45	31	+
14	68	F	L	19	36	17	+
15	74	M	R	14	37	23	+
			16	83	F	R	12
L	12	17				5	-
17	58	F	R	23	27	4	-
			L	27	34	7	-
18	59	F	R	22	39	17	+
			L	22	37	15	+
19	57	F	L	15	39	24	+
20	61	F	R	17	25	8	+
			L	20	33	13	+
21	62	M	R	17	33	16	+
22	56	F	R	16	51	35	+
23	53	F	L	14	21	7	-
24	24	M	R	18	25	7	-

* intraocular pressure before DRPT, †intraocular pressure immediately after DRPT, ‡postIOP-preIOP.

Table 2. Biometric values (mean±SD) measured by A-scan ultrasound biometry

Parameters	Results
Axial length (mm)	22.3±0.9
Anterior chamber depth (mm)	2.2±0.2
Lens thickness (mm)	4.6±0.3

Table 3. Correlation analysis between the amount of IOP elevation induced by DRPT and biometric values

	R	P value
Axial length (mm)	0.250	0.135
Anterior chamber depth (mm)	-0.312	0.060
Lens thickness (mm)	0.338	0.041

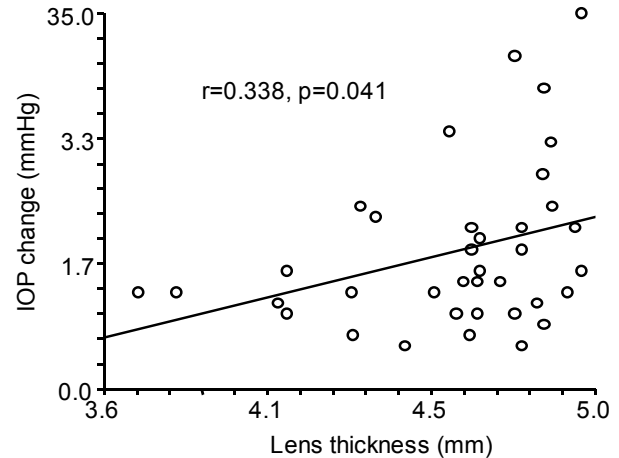
The average age was 60.6±11.3 (mean±SD) years; twelve patients were male. Positive results were obtained for 28 eyes (75.6%) in 19 patients. The range of IOP elevation induced by DRPT was 4 to 35 mmHg. Among the 9 eyes that showed negative results, 4 eyes showed 7 mmHg, 1 showed 6 mmHg, 2 showed 5 mmHg, and 2 showed 4 mmHg elevation. After DRPT, 1% pilocarpine was instilled to promptly lower the elevated IOP in 13 patients. The IOP returned to near-baseline level within 2 hours in all patients. A full-blown attack was not observed in any case.

The biometric values measured by A-scan ultrasound biometry are summarized in Table 2. Among them, lens thickness showed a significant correlation with the amount of IOP elevation induced by DRPT ($r=0.338$, $p=0.041$, Table 3, Fig. 1.).

Discussion

LI can eliminate the pupillary block in IAC and, in turn, the patients' symptoms will subside if the eye is otherwise normal. Because LI is a simple and safe procedure, it can be performed on the basis of a presumptive diagnosis. However, the symptoms of some patients may be attributed to other causes. When the symptoms persist after LI, patients may claim that the treatment was unnecessary. Further, there have been reports of laser burns of the retina,^{2,3} corneal decompensation,⁴ and malignant glaucoma⁵ after LI. Thus, it seems prudent to establish a concrete diagnosis by performing a provocative test before performing LI.

A prone-position test was originally advocated as a sensitive and specific test for angle-closure glaucoma.⁶ This test was found to yield an approximately 50% incidence of positive results in narrow angle glaucoma. When the prone-position test was combined with the dark-room test, the incidence of positive results reached approximately 90% in narrow angle patients.⁷ However, in a follow-up study of patients presumed to have angle-closure glaucoma with shallow anterior chambers or narrow anterior chamber angles,

**Fig. 1** Linear regression analysis between the change in IOP after the dark-room prone-position test and the lens thickness. ($r=0.338$, $p=0.041$).

IOP change, intraocular pressure change after DRPT.

DRPT did not show high sensitivity.⁸ In that study, out of the 129 presumed glaucoma patients who performed DRPT, only 25 eyes in 17 patients (19.4%) showed positive results. In the present study, DRPT demonstrated a much higher positive result rate (75.6%). There is no doubt that patients with IAC have an anterior chamber structure that is more prone to develop a true angle closure than patients presumed to have angle-closure glaucoma. We speculate that the higher positive rate in our patient group reflects this structural difference.

The exact mechanism of the prone-position test remains unknown. A positive response to the provocation test may be caused by a relative pupillary block, either because of the forward movement of the lens or the compression of the anterior chamber angle caused by a forward shift of the lens-iris diaphragm.^{6,7,9} Recently, Kondo et al. used ultrasound biomicroscopy (UBM) and observed that the anterior chamber angle of each eye remained open, despite the high level of IOP in eyes that showed a positive response to the prone provocation test, whereas the profile of the iris showed a markedly convex shape with a large space behind the posterior iris.¹⁰ They suggested that the initial increase in IOP during the prone provocation test was associated with high pressure in the posterior chamber because of the relative pupillary block. In the present study, the lens thickness showed a significant correlation with the DRPT result. On the basis of this result, it might be speculated that thicker lenses are more likely to move forward during the prone-position test and thereby develop a relative pupillary block. Another possibility is that the distance between the lens and the pupil is shorter in eyes with thicker lenses so that less forward movement of the lens may be needed to develop the relative pupillary block.

In patients with IAC, angle closure and self-resolution tend

to recur. Hence, there may be concern that the provocative test could lead to a full-blown attack that does not self-resolve. In our patients, the elevation of IOP ranged from 4-35 mmHg. The IOP returned to near-baseline levels within 2 hours in all patients, some of whom were treated with anti-glaucoma eye drops.

In conclusion, DRPT is safe and effective in patients with IAC. When examination reveals a shallow anterior chamber and narrow angle in patients who complain of intermittent headache and halo vision, DRPT can be used effectively to make a concrete diagnosis of IAC.

References

1. Ritch R, Lowe RF. Angle-closure glaucoma: clinical types. In: Ritch R, Shields MB, Krupin T, ed. *The glaucomas*. 2nd ed. Missouri: Mosby, 1996;821-3
2. Berger BB. Foveal photocoagulation from laser iridotomy. *Ophthalmology* 1984;91:1029-33.
3. Bongard B, Pederson JE. Retinal burns from experimental laser iridotomy. *Ophthalmic Surg* 1985;16:42-4.
4. Zabel RW, MacDonald IM, Mintsoulis G. Corneal endothelial decompensation after argon laser iridotomy. *Can J Ophthalmol* 1991;26:367-73.
5. Small KM, Maslin KF. Malignant glaucoma following laser iridotomy. *Aust N Z J Ophthalmol* 1995;23:339-41.
6. Hyams SW, Friedman Z, Neumann E. Elevated intraocular pressure in the prone position. A new provocative test for angle-closure glaucoma. *Am J Ophthalmol* 1968;66:661-72.
7. Harris LS, Galin MA. Prone provocative testing for narrow angle glaucoma. *Arch Ophthalmol* 1972;87:493-6.
8. Wilensky JT, Kaufman PL, Frohlichstein D, et al. Follow-up of angle-closure glaucoma suspects. *Am J Ophthalmol* 1993;115:338-46.
9. Hong C, Park KH, Hyung SM, et al. Evaluation of pupillary block component in angle-closure glaucoma. *Jpn J Ophthalmol* 1996;40:239-43.
10. Kondo T, Miyazawa D, Unigame K, Kurimoto Y. Ultrasound biomicroscopic findings in humans with shallow anterior chamber and increased intraocular pressure after the prone provocation test. *Am J Ophthalmol* 1997;124:632-40.