

## Decrease in Intraocular Pressure by Timolol

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### INTISARI

Soemarsono — *Penurunan tekanan bola mata dengan timolol*

Glaukom merupakan salah satu dari lima penyebab utama kebutaan di Indonesia. Timolol merupakan obat glaukom yang belum lama dipergunakan di Yogyakarta. Timolol tergolong *beta-blocker* yang dapat menurunkan tekanan bola mata dengan cara menghambat produksi humor aquosa pada corpus ciliare.

Telah dilakukan percobaan pada orang normal kelompok muda berumur antara 10–20 tahun, kelompok normal lanjut usia berumur 40–60 tahun, dan kelompok penderita glaukom primer. Pada ketiga kelompok tersebut diberi tetesan maleat timolol 0,5%. Terjadi penurunan tekanan bola mata yang jelas setelah satu jam. Dua jam setelah tetesan masih terjadi penurunan tekanan bola mata yang nyata pada kelompok normal muda usia dan kelompok penderita glaukom primer. Dengan perhitungan statistik penurunan tersebut ternyata bermakna.

*Key Words:* timolol maleate – beta blocker drugs – glaucoma – intraocular pressure – tonometer

Glaucoma is one of the five major eye diseases causing blindness in Indonesia, besides cataract, infection, trauma and anomalous refraction. The blindness caused by glaucoma is of permanent nature.

Up to the present, it is still difficult to treat primary glaucoma, and the treatments are still being debated. There are two kinds of treatment for glaucoma, *i. e.* using local or general medication and operative treatment. For local treatment, we use pilocarpine eye drops which have been popular in Indonesia for quite a long time.

Miotic drugs like pilocarpine can increase the outflow of the aqueous humor. However, these have side-effects and can cause visual disturbance or obstruct the visual field (Perera, 1957; Adler, 1962; Kolker & Hitherington, 1976).

On the other hand, the application of timolol maleate eye drops for the treatment of glaucoma is still new in Indonesia. This drug has the nature of a beta-blocker which has an effect of decreasing the aqueous humor production in the ciliary body.

The mechanism of timolol is still debatable up to now (Richardson, 1972; Kass *et al.*, 1987). It has been argued that timolol may have general side-effects like palpitation, difficulty in breathing, and other symptoms related to the nature of beta-blockers (Van Buskirk *et al.*, 1986). The problem is: How the effect of timolol eye drops can decrease intraocular pressure for patients in Yogyakarta?

The following is a presentation of an experimental study on the use of timolol maleate eye drops for the treatment of glaucoma. Experiments have been conducted on the normal eyes of young, middle-aged, and elderly patients, as well as in primary glaucoma cases.

## EXPERIMENTAL METHODS AND SUBJECTS

The experimental cases include:

1. Young normal patients, aged 10–20 years, mainly students coming for eye-examinations.
2. Normal middle-aged and elderly patients, who are presbyopic and asking for new prescribed glasses.
3. Primary glaucoma patients coming for treatment.

Patients eligible for the experimental study are those not taking any drugs 48 hours prior to the timolol treatment.

### Experimental procedures:

Routine eye-examination involves visual examination, using a Slit Lamp biomicroscope. After the diagnosis and upon consent of the patients to become subjects of the experiment, measurements of the intraocular pressure are taken by using a Schlötz tonometer. The first reading on the tonometer is recorded as data I. Subsequently two drops of timolol maleate 0,5% are given in the eyes of the respective patients. Care must be observed that the patients do not squeeze their eyes during the recording of the tonometric pressure, as this will raise the internal pressure of the eyes. After an hour interval, the intraocular pressure is measured with the same tonometer, and recorded as data II. And then, after a two-hour interval, the intraocular pressure is measured again with the same tonometer, and the reading on the scale is recorded as data III.

Eventually, there are three readings on the scale:

- I : the intraocular pressure prior to timolol eye-drops.  
 II : the intraocular pressure, one hour after timolol eye drops.  
 III: the intraocular pressure, after a two-hour interval.

## RESULTS

The readings on the scale can be seen as follows:

The mean intraocular pressure in young normal eyes prior to timolol eye drops is 13,78 mmHg, one hour after timolol eye drops 9,78 mmHg, and after a two-hour interval 7,82 mmHg. Statistically it is ( $F_{2,33} = 16,54$ ) significant (TABLE 1).

The mean intraocular pressure in normal middle-aged and elderly patients prior to timolol eye drops is 13,96 mmHg, one hour after timolol eye drops 12,37 mmHg, and after a two-hour interval 12,22 mmHg. Statistically it is ( $F_{2,33} = 3,22$ ) non-significant (TABLE 2).

The mean intraocular pressure in primary glaucomas prior to timolol eye drops is 27,99 mmHg, one hour after timolol eye drops 20,82 mmHg, and after a two-hour interval 16,01 mmHg. Statistically it is ( $F_{2,42} = 5,90$ ) significant (TABLE 3).

TABLE 1.- Intraocular pressure in young normal eyes

Name	Age (yrs)	OD/OS	I mmHg	II mmHg	III mmHg
T	16	OD	13,1	10,9	9,0
		OS	13,1	10,9	9,0
D	19	OD	15,6	9,0	5,0
		OS	15,6	9,0	5,0
W	14	OD	15,6	10,9	9,0
		OS	15,6	10,9	9,0
A	17	OD	13,1	10,9	9,0
		OS	9,0	5,0	5,0
F	16	OD	18,5	13,1	10,9
		OS	13,1	10,9	9,0
R	10	OD	15,6	10,9	9,0
		OS	7,5	5,0	5,0
Mean intraocular pressure			13,78 mmHg	9,78 mmHg	7,82 mmHg

TABLE 2.- Intraocular pressure in normal middle-aged &amp; elderly patients

Name	Age (yrs)	OD/OS	I mmHg	II mmHg	III mmHg
A	53	OD	10,9	10,9	10,9
		OS	18,5	18,5	
R	41	OD	21,9	15,6	13,1
		OS	13,1	13,1	13,1
S	54	OD	13,1	12,0	10,9
		OS	13,1	12,0	10,9
S	50	OD	13,1	12,0	10,9
		OS	10,9	10,0	10,0
R	68	OD	13,1	13,1	10,9
		OS	18,5	17,0	15,6
S	43	OD	18,5	15,6	13,1
		OS	13,1	10,9	9,0
Mean intraocular pressure			13,96 mmHg	12,37 mmHg	12,22 mmHg

TABLE 3.- Intraocular pressure in primary glaucomas

Name	Age (yrs)	OD/OS	I mmHg	II mmHg	III mmHg
W	60	OD	30,4	21,9	15,6
W	50	OD	30,4	15,6	7,5
P	18	OS	30,4	18,5	15,6
P	25	OD	13,1	9,0	7,5
W	32	OD	50,6	37,2	31,8
W	52	OS	25,8	21,9	18,5
P	85	OD	21,9	15,6	10,9
W	48	OD	15,6	13,1	10,9
W	14	OD	42,1	35,6	30,4
P	24	OS	15,6	10,9	6,3
W	70	OD	35,6	30,4	25,8
W	32	OS	35,6	30,4	25,8
W	25	OS	18,5	15,5	13,1
W	50	OD	18,5	10,9	7,5
P	21	OD	35,6	25,8	13,1
Mean intraocular pressure			27,99 mmHg	20,82 mmHg	16,01 mmHg

## DISCUSSION

It is evident that one hour after being given timolol maleate 0.5%, there is a decrease of 27.56% in the intraocular pressure in the young normal eyes, and a decrease of 13.53% after a two-hour interval, whereas in the normal eyes of middle-aged and elderly patients, there is a decrease of 11.39% after a one-hour interval, and 1.07% after a two-hour interval.

In primary glaucomas, there is a decrease of 25.61% in the intraocular pressure after a one-hour interval, and 17.24% after a two-hour interval, as shown in FIG. 1.

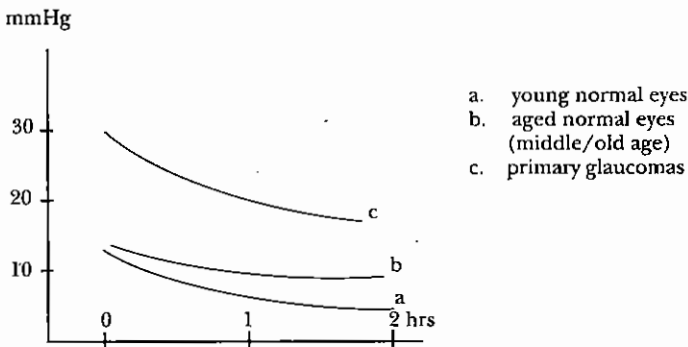


FIGURE 1.- Decrease in the intraocular pressure

In is evident that in primary glaucomas, timolol eye drops may decrease the intraocular pressure, within a one-hour or two-hour interval. Therefore, a few researchers have drawn the conclusion that pilocarpine can rapidly decrease the intraocular pressure, and can be used for the treatment of acute glaucomas, especially in consecutive treatment. It is obvious from this experimental study that there is a rapid decrease in the intraocular pressure by timolol, *i. e.* 25.61% after a one-hour interval and 17.24% after a two-hour interval.

Airaksinen *et al.* (1987) made experiments on glaucoma patients, using a combination of pilocarpine and timolol, and it has proved to be effective in decreasing the intraocular pressure for a long time. It is subsequently concluded that the combination of timolol and pilocarpine is more effective in decreasing the intraocular pressure in acute glaucomas.

Other researchers like Arrata & Massin<sup>1</sup> (1980), Tsoy *et al.* (1986), and Kass *et al.* (1987) said that timolol has a long-term effect in decreasing the intraocular pressure, and it is sufficient for twice a day treatment. Hence, it can be concluded that timolol maleate 0.5% is very effective for the treatment of glaucoma and has a quick and durable effect.

It is also evident from the experiments that there is a difference in the decrease of intraocular pressure in the normal eyes of the young, middle-aged, and elderly patients. As a matter of fact, the decrease is slower in the normal middle-aged and elderly patients, as seen in FIGURE 1. This is possibly due to the degenerative process in the middle-aged and elderly patients, and it has a corresponding effect on the decrease of the intraocular pressure (Sinclair, 1978).

There are no complications or side-effects caused by timolol during this experimental study. In addition to that, there are no complaints from the patients about their sight or disturbance of the eyes. Consequently, it can be concluded that timolol maleate is very effective for the treatment of acute as well as chronic glaucomas, and can be used as a combination or replacement for pilocarpine, when this is not effective anymore.

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