Target Intraocular Pressure

by
Moustafa Kamal Nassar, M.D.
Assistant Professor, Ophthalmology Department,
Menofyia University,
Egypt

The concept of target intraocular pressure arises from the observation that progression in advanced glaucoma, and even occasionally in early glaucoma, often occur at what is thought to be "physiologic" intraocular pressure. An IOP of 21mmHg or lower (the previously thought goal) may not be low enough for many glaucomatous eyes and progressive field defect continues. Thus target intraocular pressure is defined as "the mean intraocular pressure obtained with treatment that prevents further glaucomatous damage" (European Glaucoma Society (EGS), 1998. (1)

The target IOP is estimated for each patient based on initial intraocular pressure and degree of existing damage. It is important to be continuously reassessed and reset based on the clinical course. The less the initial pre-treatment, the more advanced the optic nerve damage; and the older the patient, the lower the target should be set. Also the presence of vasculopathy such as diabetes or arteriosclerotic cardiovascular diseases should lower the target intraocular pressure.

A young person with glaucoma and pre-treatment intraocular pressure of 32mmHg and an 0.5 cup: disc ratio with early visual field loss may do quite well with an initial target intraocular pressure of 25mmHg. An elderly patient with a pre-treatment IOP of 22mmHg, a cup: disc ratio of 0.9, and advanced field loss may require a target intraocular pressure of 15mmHg or lower. (2)

Continuously monitor the target intraocular pressure:

Determining the effectiveness of treatment requires constant monitoring of IOP, optic nerve appearance and visual function. Deterioration in any of these parameters is a sign to consider more aggressive therapy (i.e. to set the target intraocular pressure at a lower level).

Ask about and monitor ocular and systemic side effects:

Potential side effects should be evaluated and placed in perspective by the physician-patient team. Patients will usually be forthcoming about ocular side effects. Often however, patients do not relate systemic side effects to eye drops. Therefore, the treating physician must be pro-active and ask specifically about systemic side effects such as breathing difficulties, irregular heartburn, gastrointestinal disturbance, fatigue, impotence and mood or behavioral changes.

Simplify, reduce and replace treatment when possible:

The patients should be treated with the lowest concentration(s), the smallest number of medicines and the fewest number of administrations per day that have the desired effect.(3) Monotherapy should provide at least a 20% reduction in intraocular pressure. If the target intraocular pressure is not reached, try a different single agent

before going to multiple agents. Adjunctive therapy should add 15% or more additional intraocular pressure lowering.

Choosing initial and combination medical therapy for glaucoma:

1. First line therapy (monotherapy):
- Beta blockers
- Alpha2- agonist brimonidine
- Prostaglandin analog latanoprost

2. Second line medications:
- topical carbonic anhydrase inhibitors
- Alpha2- agonist brimonidine

3. Third and fourth line agents:
- pro-drug dipiverin
- epinephrine
- pilocarpine
- oral carbonic anhydrase inhibitors

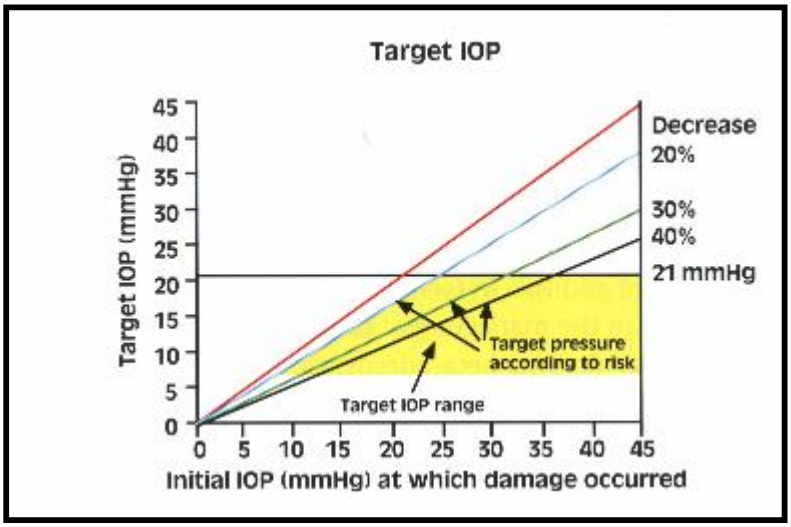
When glaucomatous changes damage continues, in spite of medical treatment, and target intraocular pressure could not be achieved, trabeculectomy should be performed.

Despite proper lowering intraocular pressure after trabeculectomy, visual field loss may continue and the use of a neuroprotective drug is a must for at least two months post-operatively. Once the RGCs are stressed, they release glutamic acid that has itself a toxic effect on the neighboring RGCs (chemical stress factor), resulting in more death of the cells and consequently more release of glutamic acid and so on (secondary degenerative process). By surgical interference, the IOP (mechanical and vascular stress factors) is lowered, but still the previously released glutamic acid is present and not washed out. Thus the vicious cycle continues and the visual field deteriorates further more. Neuroprotective drugs post-operatively block the RGC receptors (NMDA receptors) to glutamic acids, stopping the chemical stress factor and breaking the vicious cycle, giving a chance for the present glutamic acid to be washed out.

Determining the target intraocular pressure:

The target intraocular pressure is a "best guess" level of intraocular pressure, below which further damage to the ON is unlikely to occur. The estimate is based on the initial level of IOP, degree of existing damage (ON cupping, Reserving power of the O.N (4) visual field loss and nerve fiber layer thickness) age, presence of other risk factors (diabetes and arteriosclerotic vascular diseases), rate of progression if known, and family history of glaucoma. In the average patient, the European Glaucoma Society (EGS) recommmends that an initial target intraocular pressure should be set at least 20-30% lower than the pressure at which the occular damage originally occurred. The older patient, the more advanced the glaucoma, the greater the number of risk factors and the greater the vascular component, the lower the target IOP should be. The target IOP also helps the physician to assess the success of the treatment. The earlier the target IOP reached the better the outcome for the patient. The target

intraocular pressure should be reassed periodically and lowered if progression, optic nerve hemorrhage, or increase in risk factors occurs. Fig.



Treatment follow-up:

The initial efficacy of therapy is determined by its effect on IOP, but long-term efficacy must be determined by the analysis of damage. Therefore, it is essential to have good baseline studies of the factors to be followed, which most often are the visual field, the optic nerve head (table 1) and if possible the retinal nerve fiber thickness.

Careful and rigorous documentation of the initial status of these factors is essential to ensure accurate decisions regarding future therapy.

Table 1

Level of damage	Disc	V isual field
Mild	0.0-0.5 with uniform pink rim	None, mild depression or slight defect
Moderate	0.6-0.7 with some local narrowing of rim.	General depression, arcuate defect, or paracentral scotoma.
Advanced	0.8-0.9 with rim narrowing or notching	Large arcuate, double arcuate hemifield loss, or fixation threatened.

Once a therapy has been determined effective, how should the treatment be followed?

Determining follow-up procedures depends on two factors: amount of damage and adequacy or pressure control. Guideline of intraocular pressure control for long term management of chronic open-angle glaucoma is presented in table 2.

Table 2.

Control	Mild level of damage	Moderate level of damage	Advanced level of damage
Good	< 21	<18	<16
Uncertain	21-24	19-22	16-18
Uncontrolled	> 25	>21	>18

These guidelines are only estimates and the target IOPs should be individualized.

- The more advanced the glaucoma, the older the patient, the greater the number of risk factors. The greater the vascular component, the lower the target pressure should be.

- The more advanced the damage and the poorer the control, the more frequent the re-evaluations must be.

- The fewer the number of risk factors and the less advanced the glaucoma, the more tolerant the optic nerve is to slightly elevated pressure.

- The better the control, the earlier the disease, and the fewer the number of risk factors, the less frequently the patient can be evaluated.

Example to put these guidelines in perspective:

A 42 year old man with an initial intraocular pressure of 32mmHg, an 0.6 cup: disc ratio, a small arcuate scotoma and no other health problems, may be able to tolerate pressure in the low 20s for many years. Conversely, an 85 year old woman with diabetes mellitus, an initial intraocular pressure of 23mmHg, an 0.8 cup: disc ratio, and an altitudinal visual field defect; will probably require an intraocular pressure of 14 mmHg or lower to prevent further optic nerve damage.

References:

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