IMPROVING THE EFFICACY AND SAFETY OF INTRAOCULAR PRESSURE-LOWERING DRUGS IN ANGLE-CLOSURE GLAUCOMA

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Abstract. *A prospective clinical study was conducted involving 70 patients with angle-closure glaucoma treated at the Andijan Regional Ophthalmology Hospital. Baseline intraocular pressure, visual acuity, optic nerve status, and visual field parameters were assessed before treatment initiation. Patients received miotics, β-adrenergic blockers, carbonic anhydrase inhibitors, or their combinations. Follow-up examinations evaluated changes in intraocular pressure, visual function, and drug tolerability.*

The study demonstrated a significant reduction in intraocular pressure in all treatment groups, with the most pronounced and sustained effect observed in patients receiving combination therapy. Individualized selection of antihypertensive regimens improved treatment effectiveness and safety in patients with angle-closure glaucoma.

Keywords: *angle-closure glaucoma; intraocular pressure; antihypertensive therapy; miotics; beta-adrenergic blockers; carbonic anhydrase inhibitors; optimization.*

Introduction. Primary angle-closure glaucoma (PACG) remains one of the leading causes of irreversible blindness worldwide, particularly in Asian populations. Elevated intraocular pressure (IOP) is the main modifiable risk factor determining disease progression and visual prognosis [1]. Pharmacological reduction of IOP is a cornerstone of conservative management, especially in patients awaiting laser or surgical intervention or those with contraindications to invasive procedures.

However, the choice of antihypertensive agents, their combinations, efficacy, and tolerability in real clinical practice require regional evaluation, considering demographic and clinical characteristics of patients [2, 3]. The aim of this study was to optimize the use of miotics, β-adrenergic blockers, and carbonic anhydrase inhibitors in patients with angle-closure glaucoma among residents of the Andijan region by assessing their effectiveness and safety.

Materials and methods. This prospective clinical study included 70 patients diagnosed with angle-closure glaucoma who were examined and treated at the Andijan Regional Ophthalmology Hospital. All participants underwent comprehensive ophthalmological evaluation prior to treatment initiation and during follow-up.

Visual acuity was assessed using standard visometry, while the condition of the optic nerve head and retina was evaluated through direct and indirect ophthalmoscopy. Biomicroscopic examination of the anterior segment was performed to assess structural changes, and gonioscopy was used to evaluate the iridocorneal angle. Functional assessment of the visual field was conducted using standard perimetric techniques, and intraocular pressure was measured by tonometry. Patients were stratified according to the prescribed antihypertensive regimen, including miotics, β-adrenergic blockers, carbonic anhydrase inhibitors, or their combinations.

Baseline intraocular pressure values, optic nerve functional status, and visual field parameters were recorded and compared with follow-up data to assess treatment efficacy. Drug tolerability, occurrence of adverse effects, and patient compliance were also analyzed.

Results. At baseline, the mean intraocular pressure (IOP) among all 70 patients was 32.4 ± 4.5 mmHg, with mean visual acuity of 0.6 ± 0.2 (Snellen). Optic nerve assessment showed mild glaucomatous damage in 45% of patients, moderate damage in 40%, and severe damage in 15%.

Visual field defects were present in 72% of patients. After 8 weeks of treatment, patients receiving miotics (n = 20) demonstrated a decrease in IOP from 31.8 ± 4.2 mmHg to 24.5 ± 3.5 mmHg ($p < 0.01$), with local side effects reported in 25% of cases. In the β-adrenergic blockers group (n = 20), IOP decreased from 32.5 ± 4.6 mmHg to 23.8 ± 3.1 mmHg ($p < 0.01$), with systemic side effects observed in 10% of patients.

Patients treated with carbonic anhydrase inhibitors (n = 15) experienced a reduction in IOP from 33.0 ± 4.8 mmHg to 25.0 ± 3.2 mmHg ($p < 0.01$), with mild adverse effects in 13%. The combination therapy group (n = 15) showed the most pronounced and sustained effect, with IOP decreasing from 32.8 ± 4.3 mmHg to 20.5 ± 2.8 mmHg ($p < 0.001$), while side effects were mild and occurred in 13% of patients. Visual field indices remained stable in the combination therapy group, with mean deviation improving slightly from -5.8 ± 2.3 dB at baseline to -5.5 ± 2.1 dB, whereas the other groups showed minimal changes.

Overall, combination therapy provided the highest efficacy in intraocular pressure reduction and stabilization of visual function, while monotherapy with miotics, β-blockers, or carbonic anhydrase inhibitors was effective but to a lesser degree.

Discussion. The results of this study confirm that intraocular pressure reduction remains the key therapeutic target in angle-closure glaucoma. All evaluated antihypertensive drug classes demonstrated clinical effectiveness; however, their efficacy and tolerability varied.

Miotics were more effective in early-stage disease but were limited by local adverse effects and reduced long-term compliance. β-adrenergic blockers provided stable intraocular pressure control but required careful use in patients with systemic comorbidities.

Carbonic anhydrase inhibitors showed high efficacy as adjunctive therapy with good tolerability. The most pronounced and sustained intraocular pressure reduction was achieved with combination therapy, which also contributed to stabilization of visual field parameters. These findings support an individualized, mechanism-based approach to antihypertensive treatment.

Despite the limited sample size, the study provides practical evidence for optimizing pharmacological management of angle-closure glaucoma in the Andijan region.

Conclusion. Individualized selection and optimization of antihypertensive therapy significantly improve clinical outcomes in patients with angle-closure glaucoma. Combination regimens incorporating β-adrenergic blockers and carbonic anhydrase inhibitors demonstrated the highest efficacy and acceptable safety profile.

These findings support the use of tailored pharmacological strategies to achieve optimal intraocular pressure control and preserve visual function in patients with angle-closure glaucoma in the Andijan region.

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