

The Literature

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NOCTURNAL SYSTEMIC HYPOTENSION INCREASES THE RISK OF GLAUCOMA PROGRESSION

Charlson ME, de Moraes CG, Link A, et al¹

ABSTRACT SUMMARY

Charlson et al report the results of a prospective, longitudinal study in which 85 patients (166 eyes) with normal-tension glaucoma (NTG) underwent 48-hour systemic blood pressure (BP) monitoring at 6-month intervals to determine whether or not nocturnal systemic hypotension is associated with progressive visual field (VF) loss.¹ The investigators considered consecutive patients with NTG and a minimum of five prior VF tests. Data reviewed included demographic information, clinical history, and systemic and ocular medications. All patients underwent comprehensive eye examinations and 48-hour ambulatory BP monitoring at baseline and at 6 and 12 months' follow-up.

Of 85 patients, 29% demonstrated progression in the five VFs performed prior to the study's initiation. The researchers compared the nocturnal mean arterial pressure (MAP) with daytime MAP. They found that the total time that the nocturnal MAP was 10 mm Hg lower than the daytime MAP was a significant predictor of later VF progression ($P < .02$). The area under the curve (ie, the product of duration and magnitude of nocturnal MAP that was more than 10 mm Hg below the daytime mean) also predicted progression. The investigators concluded that physiologic or medication-induced decreases in nocturnal BP may lead to VF progression in patients with NTG.

DISCUSSION

What are the study's implications in terms of understanding glaucoma?

Ischemia occurs when systemic BP drops outside the range in which autoregulation can maintain constant perfusion, which is roughly more than 20 mm Hg below a patient's MAP.² Previous reports suggest that diurnal variations in BP may influence the pathophysiology of glaucoma. Population-based studies such as the Barbados Eye Studies have identified lower systolic BP and lower ocular perfusion pressure as significant risk factors for the development of open-angle glaucoma.³ Hayreh et al demonstrated via 24-hour ambulatory BP monitoring of patients with NTG, primary open-angle glaucoma

(POAG), and anterior ischemic optic neuropathy that nocturnal BP was lower among those with VF progression.⁴ The study by Charlson et al¹ supports the notion that the optic nerve head, like the brain and heart, may be susceptible to ischemic insult from drops in nighttime BP, resulting in VF progression in patients with NTG.

What do these results tell us about the relationship between variations in BP and NTG and how it might affect their management?

It has been suggested that factors independent of IOP may contribute to the pathophysiology and progression of NTG to a greater extent than POAG. At present, however, IOP reduction is the sole treatment for patients with all open-angle glaucomas, including NTG. In the Collaborative Normal-Tension Glaucoma Study (CNTGS), an intent-to-treat analysis showed that the rate of VF progression was similar between treated and untreated patients.⁵ Only when data were censored for visually significant cataracts was VF progression shown to be significantly more common in untreated versus treated patients.

Patients with NTG who require aggressive BP control to reduce their cardiovascular risk may be vulnerable to nocturnal hypotension and VF progression, even when IOP is seemingly well controlled. Such patients should be carefully managed in concert with their primary care physicians. Ambulatory BP monitoring may play a role in furthering physicians' understanding of NTG and improving their management of patients with this disease.

THREE-YEAR TREATMENT OUTCOMES IN THE AHMED BAERVELDT COMPARISON STUDY

Barton K, Feuer WJ, Budenz DL, et al⁶

ABSTRACT SUMMARY

The Ahmed Baerveldt Comparison Study (ABC Study) is an ongoing, prospective, randomized, controlled trial comparing outcomes and complications of the Ahmed FP7 Glaucoma Valve (AGV; New World Medical) and the Baerveldt Glaucoma Implant 101-350 (BGI; Abbott Medical Optics). Barton et al reported the 3-year outcomes of 276 patients, aged 18 to 85 years with refractory glaucoma, who were randomized to undergo implantation of either an AGV or a BGI.⁶ Outcome measures included IOP, visual acuity, number of glaucoma medica-

tions, and complications. Failure was defined as an IOP less than 5 mm Hg or greater than 21 mm Hg or an IOP that did not decrease 20% from baseline; the need for additional glaucoma surgery, including explantation of the aqueous shunt; or a loss of light perception.

At 3 years, the cumulative probabilities of failure were 31.3% in the AGV group and 32.3% in the BGI group ($P = .99$). Patients in the AGV group required 2.0 ± 1.4 supplemental glaucoma medications versus 1.5 ± 1.4 in the BGI group ($P = .02$). Twenty-two percent of AGV patients developed serious postoperative complications (ie, complications requiring reoperation or resulting in a 2-line or greater decrease in Snellen acuity) versus 36% of BGI patients ($P = .035$). The relative risk of additional glaucoma surgery was 2.1 times greater in the AGV group versus the BGI group (95% CI, 1.0-4.8; $P = .045$). IOP and visual acuity (logMAR) were similar between the two groups at 3 years ($P = .086$ and $P = .66$, respectively).

DISCUSSION

What are the advantages and disadvantages of each type of aqueous shunt based on the ABC Study?

The 1-year results of the ABC Study showed a significantly lower IOP in the BGI group versus the AGV group ($P = .007$) but at the expense of a significantly higher rate of early complications ($P = .016$) and serious complications associated with reoperation or a 2-line or greater decrease in Snellen acuity ($P = .014$) in the BGI group.⁷ These findings are likely due in part to the restrictive valve mechanism of the AGV, which is designed to minimize early hypotony while the end plate undergoes encapsulation in the immediate postoperative period. Meanwhile, AGV patients required significantly more reoperations for glaucoma than BGI patients ($P = .016$).

At 3 years, patients in the BGI group required significantly fewer supplemental glaucoma medications ($P = .02$) and showed a trend toward lower IOP ($P = .086$) versus patients in the AGV group. Seventy-nine percent of AGV failures occurred due to elevated IOP or reoperation for elevated IOP, whereas the majority (55%) of BGI failures occurred due to persistent hypotony or complications.

In short, the tendency toward greater efficacy in the BGI group at the expense of a higher rate of serious postoperative complications, which was observed at 1 year, was still evident at 3 years.

How do the 3-year results of the ABC Study compare with previous studies evaluating the AGV and BGI?

The Ahmed Versus Baerveldt Study (AVB Study) is another prospective, randomized trial comparing the AGV-FP7 and BGI-350. In the AVB Study, Christakis et al randomized 238 patients aged 18 years or older to receive

either an AGV or a BGI.⁸ The AVB Study investigators used a stricter upper IOP limit of 18 mm Hg in their definition of failure (vs 21 mm Hg in the ABC Study). In the AVB Study, treatment was also classified as having failed in patients with vision-threatening complications.

At 3 years, the cumulative probability of failure was significantly higher in the AGV versus the BGI group ($P = .03$) in the AVB Study, whereas in the ABC Study, the two groups had similar cumulative probabilities of failure. The BGI group required significantly fewer medications at 3 years than the AGV group ($P = .002$) to achieve a similar mean IOP ($P = .09$), as in the ABC Study. In the AVB Study, the two groups had similar overall complication rates ($P = .12$), but the BGI group had a higher rate of visually threatening complications related to hypotony ($P = .005$).

Differences between the ABC Study and the AVB Study, including differing definitions of failure, make direct comparison difficult. At this time, neither aqueous shunt is a clearly superior option for all surgeons and patients. This article's authors eagerly await the 5-year outcomes of the ABC and AVB Studies, which may further guide the management of patients with refractory glaucoma for whom an aqueous shunt is deemed the best next option. ■

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