

Incorporating Blood Flow Into Clinical Practice

How does this parameter currently fit into the diagnosis and management of glaucoma?

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Although IOP is considered the main risk factor for the development of glaucoma and the only parameter subject to treatment, sufficient evidence suggests that the disease may continue to progress despite achieving a very low IOP. Several studies have implicated vascular risk factors in the pathogenesis of glaucoma. Of these, blood pressure and ocular perfusion pressure (calculated as the difference between blood pressure and IOP) have become increasingly important. A number of studies, including large epidemiologic surveys, have reported reduced ocular perfusion pressure in patients with primary open-angle glaucoma.¹⁻⁸ Population-based studies have identified low perfusion pressure as a risk factor for the development of glaucoma. Furthermore, recently published data from the Early Manifest Glaucoma Trial established lower systolic perfusion pressure as a new predictor for disease progression, with the suggestion of a 50% increase in risk.⁸

What conclusions can we begin to draw? Vascular abnormalities appear to be important risk factors for the development of glaucoma and prognostic factors for progression. Few of us, however, assess circulation or blood flow to the eye. Most of us consider the lack of sophisticated technology for measuring blood flow to be a barrier to incorporating these measurements into our clinical evaluations of patients. Furthermore, if a possible deficiency or abnormality in circulation were uncovered, the overwhelming impression of clinicians is that there is no current intervention that will make a difference. Why, then, measure blood flow in the first place?

Recent research indicates that sophisticated technologies are not necessary to begin assessing perfusion pressure in our patients with glaucoma. We clinicians

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may be able to significantly alter a patient's risk of developing glaucoma or progressive damage. By taking into account blood pressure as well as IOP and other factors, we may decide to observe or treat some patients differently. Assessing blood pressure may allow us to uncover abnormalities, both high and low, in our patients, a finding that may benefit their overall general health.

Here are some thoughts on how to proceed based on the clinical evidence linking blood pressure and glaucoma.

FIRST STEPS

It seems reasonable to begin training our office staff to check patients' blood pressure routinely. With that measurement, it is easy to calculate the diastolic perfusion pressure (diastolic blood pressure – IOP).

Abnormalities in perfusion pressure, however, may not be detected in the office. A more detailed approach would be to obtain a 24-hour assessment of blood pressure in order to verify its behavior throughout the day. It has been shown that nocturnal dips in blood pressure may be harmful to glaucoma patients.⁹ Furthermore, reductions in blood pressure associated with increases in IOP observed while patients are supine may result in low

diastolic perfusion pressures at night. Of course, the ideal situation would be to have information on the 24-hour perfusion pressure profile of our patients, but such data will have to wait until new methods are designed to allow real-time, noninvasive IOP measurements at home. Patients with a diastolic perfusion pressure below 50 to 60 mm Hg may deserve closer observation and possibly a further reduction of their IOP.⁹ Individuals with other abnormalities in their blood pressure can be referred for an evaluation.

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It is particularly important to note the blood pressure in patients who are already taking medication to lower it. A substantial number of patients with low diastolic perfusion pressure are on antihypertensive drugs. Interestingly, the Thessaloniki Eye Study found decreased rim area with the Heidelberg Retina Tomograph (Heidelberg Engineering GmbH, Heidelberg, Germany) in subjects who were taking antihypertensive medication, results suggesting that low blood pressures may be associated with a loss of nerve fibers.¹⁰ If a patient presents with a diastolic perfusion pressure of 40 mm Hg and an IOP of 15 or even 10 mm Hg, it may be reasonable to begin a dialogue with the primary care physician who is managing the patient's systemic hypertension. Although there may be reasons why the treating physician would want to keep the blood pressure very low, the internist may select another target pressure once aware of the potential risk that low blood pressure may pose to patients with glaucoma. The primary point, however, is that this dialogue will never take place if we do not measure our patients' blood pressure.

CASE EXAMPLE

A patient has moderate glaucoma in his right eye and advanced glaucoma in his left eye with cup-to-disc ratios of 0.6 OD and 0.9 OS. Pachymetry measures 540 μ m OD and 545 μ m OS. In the office, his blood pressure measures 110/50, and his IOP is 16 mm Hg OU on medical therapy with a topical prostaglandin analogue. Is there cause for concern?

What if the patient's blood pressure instead were

120/70? Would that alter our perception of his risk of glaucomatous progression? If the blood pressure would cause us to reconsider the treatment targets in this patient, then we should be measuring this parameter on a routine basis.

CONCLUSION

The currently available epidemiologic and population-based evidence indicates that vascular abnormalities are important risk factors for the development of glaucoma and its progression. A relatively simple calculation of patients' ocular perfusion pressure based on their blood pressure and IOP can help improve patients' care. Long-term, prospective studies are required, however, to investigate the role of perfusion pressure as a risk factor for glaucomatous progression. □

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