Postural Ophthalmodynamometry in the Surgical Management of Occlusive Aortocranial Disease

RAUL G. CALDERON, M.D.,* AND ARTHUR B. EISENBREY, M.D.
Divisions of Neurology and Neurosurgery, Henry Ford Hospital, Detroit, Michigan

In recent years recognition of the importance of occlusive disease of the aortocranial vessels as a cause of impaired cerebral circulation\(^2,3\) has resulted in the definition of two major problems: a) the differentiation between aortocranial insufficiency and that of smaller intracranial vessels; and b) the choice of adequate therapy, whether it be medical or surgical. The value of ophthalmodynamometry in the differential diagnosis of these vascular problems has been established. Its potential in the pre- and postsurgical or medical management has been utilized but little.

To study the validity of postural ophthalmodynamometry in evaluating anticoagulants, vasodilators or endarterectomy in occlusive aortocranial disease, a review has been made of the histories of 54 patients with this diagnosis in whom angiographic studies had also been made. In only 34 of these patients, however, had the ophthalmodynamometric readings been obtained both prior and subsequent to the institution of therapy. These patients were followed from 3 to 28 months; 17 of them had endarterectomy; 11, anticoagulant therapy; 2, vasodilators; 1, anticoagulants and vasodilators; and 3 patients had no therapy.

Method

The technique of ophthalmodynamometry has been well documented\(^4,6,8\) and recently we have reported on the importance of postural changes on the retinal arterial pressure in patients with occlusive disease of the carotid artery.\(^1\) Certain points should be emphasized: a) measurements should be obtained in three successive positions: supine, sitting and standing; b) three readings should be obtained from each eye in each position, alternating right and left eye; c) the speed at which the measurements are performed must be the same on the two sides.

Only diastolic pressures of the retinal artery were measured, as measurements of systolic pressure have a higher source of error when attempting to determine the endpoint, or when repeated measurements are taken in rapid succession.

In agreement with other reports\(^1,5,7\) we have found that a difference and/or drop of 20 per cent or more between pressures of the retinal artery indicates definite and significant reduction in blood flow in the ipsilateral carotid system.

Occlusive Aortocranial Disease

Thirty-four patients with occlusive aortocranial disease were studied clinically and angiographically: 11 had unilateral involvement of the carotid artery (partial or complete occlusion); 3, unilateral carotid and vertebrobasilar arterial disease; 15, bilateral carotid arterial disease (bilateral stenosis or unilateral complete obstruction with stenosis on the opposite side); and 5, bilateral carotid and vertebrobasilar arterial disease.

Of the entire group only 16 patients had right to left asymmetries greater than 20 per cent in the ophthalmodynamometric readings. In 10 patients asymmetry was present in all positions; in 6 it had to be elicited by postural changes. The other 18 patients showed no significant asymmetry in any positions. A drop in diastolic pressure of the retinal artery greater than 20 per cent of the initial reading was observed in 32 patients, a unilateral drop in 14, and bilateral drop in the other 18.
Endarterectomy

Seventeen patients with occlusive aorto-cranial disease were treated by endarterectomy on one side (Table 1). Ten had bilateral involvement of the carotid artery; in 6 of these the postoperative pressures of the retinal artery returned to normal on the side of the operation, in 2 the improvement was moderate and no appreciable change was seen in the other 2. Seven patients had unilateral carotid arterial disease; the postoperative pressures of the retinal artery returned to normal in 6 and did not change in 1.

The symptoms of intermittent cerebral dysfunction and transient monocular blindness as well as local bruit and decreased carotid pulsation of the 14 patients with improvement of the retinal arterial pressure were completely relieved in 7, less frequent and severe in 5 and unchanged in 2. The established neurological deficits, such as hemiplegia, showed little or no improvement. These changes in symptoms did not correlate with the degree of restoration of retinal arterial pressure.

The 3 patients whose retinal arterial pressures showed no appreciable change after operation were proven by arteriography in 2 and by arteriography and autopsy in the other to have reocclusion of the ipsilateral carotid artery. In 2 of these patients the ophthalmodynamometric readings suggested reocclusion of the vessel before any clinical indication of this.

The following 4 cases exemplify the effect of endarterectomy upon the pressure of the retinal artery in patients with occlusive aorto-cranial disease.

Case 1. A 63-year-old man with occlusive disease of both femoral arteries was admitted to the hospital because of intermittent "dizzy" spells and transient episodes of numbness of the left hand and arm. There were rough bruits over both carotid arteries and right mastoid area, decreased pulse of the right carotid artery and absent pulse of the left superficial temporal artery. The clinical diagnosis was occlusive disease of both carotid arterial systems.

Diastolic pressure of the retinal artery in the right eye was: 33 supine, less than 5 sitting, less than 5 standing; left eye: 37 supine, 18 sitting, 13 standing. Arteriographic studies showed marked stenosis of the right internal carotid artery, moderate narrowing of the right vertebral and atheromatous and tortuous left common carotid artery with stenosis of the external carotid of the same side.

A right carotid endarterectomy was performed; at the end of the operation good backflow of blood was observed.

Diastolic pressure of the retinal artery 2 and 7 days after operation showed, right eye: 35 su-