RETINAL ARTERY BLOOD PRESSURE MEASUREMENTS IN DIAGNOSIS AND SURGERY OF SPONTANEOUS CAROTID OCCLUSIONS

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RECENT interest in vascular surgery of atherosclerosis has been extended to the carotid system. Undoubtedly, the possibility of surgical relief of spontaneous carotid occlusions will be explored further despite the relatively few encouraging reports as yet available.5,6,9,10,19 The comparatively bad prognosis of the untreated lesion makes early diagnosis of the occlusions mandatory if therapy, either medical or surgical, is to be effective before important nervous function is lost. Comparative studies of retinal artery pressure can materially and safely aid the physician in diagnosis of these vascular occlusions if carefully integrated in diagnostic judgment.

While the determination of retinal artery blood pressure or ophthalmodynamometry is subject to limitations so far as absolute values are concerned, there is good evidence for its validity in comparing pressures in the two eyes. From differences in such readings one is entitled to make inferences in regard to comparative pressures in the parent internal carotid arteries.

In a normal carotid system pressure in the major intracranial branches (taken by direct measurement) is almost equal to that in the cervical internal carotid.8 The pressure gradient downward from large to small vessels is uniformly progressive but the over-all drop is not great. Bakay and Sweet2 have found after clamping the common carotid that the absolute drop in pressure throughout the carotid system on the same side is marked but the gradient of drop remains about the same as that before occlusion. It seems reasonable to assume that pressure in the ophthalmic and retinal arteries will parallel that in comparable branches of the carotid tree and will approximate the pressure in the internal carotid artery on the same side. Rand16 has in one case compared the retinal artery pressure readings with directly measured pressure in the internal carotid artery and found a rather close correlation.

OPHTHALMODYNAMOMETRY

The technique of ophthalmodynamometry generally used is that of Baillari.1 It was described by Magitot14 in 1932 and elaborated by Weigelin and Müller.34 This relatively simple clinical procedure has been illustrated and described in detail by Thomas and Petrohelos,8 Svien and Hollenhorst,20 and by Heyman et al.12 The ophthalmodynamometer is a small cylinder with
spring-loaded plunger and attached rod with footplate for application of pressure to the optic globe. The plunger is calibrated in grams.

After anesthetizing the conjunctivae and dilating the pupils, the footplate is placed against the eyeball at the outer canthus and pressure is applied progressively while the operator observes the major branches of the retinal artery. The diastolic pressure reading is that which is associated with the first visible distinct pulsation of the vessels, while the systolic pressure is that which is associated with collapse of the vessels. The readings in grams can be converted to millimeters of mercury by use of a conversion table which takes into account the already existing intraocular pressure. Since the direct readings in grams under conditions of normal intraocular pressure correspond closely to those for millimeters of mercury in the conversion table and since we are concerned primarily with comparative measurements in the two eyes, we have recorded only the figures taken directly from the instrument scale.

Retinal artery pressures have been measured in healthy adults and in patients with neurological diseases not associated with apparent vascular insufficiencies. Thomas and Petrohelos\textsuperscript{21} reported that in their subjects the difference in diastolic pressures in the two eyes ranged from 0 to 15 per cent of the highest figure while the difference in systolic pressures ranged from 0 to 12.2 per cent. The average of the percentage differences in a larger number of subjects was 5.2 for diastolic and 3.3 for systolic pressures.

**OPHTHALMODYNAMOMETRY AS AN AID IN THE DIAGNOSIS OF SPONTANEOUS OCCLUSION OF THE CAROTID ARTERIES**

In analyzing the ischemic brain syndrome in 107 proved cases of spontaneous carotid occlusion, Johnson and Walker\textsuperscript{13} found that the locus of obstruction was at the origin of the internal carotid artery in 81 of 97 cases in which this artery alone was involved. Many of these patients were suspected of harboring an intracranial tumor. It is evident that some method of clinical examination that might provide diagnostic information relating to occlusion of the internal carotid artery, in lieu of or at least before angiography, would be quite welcome. Ophthalmodynamometry does appear to be valuable in this regard.*

Thomas and Petrohelos\textsuperscript{21} reviewed 19 cases of carotid occlusion from various causes. Only 4 failed to show a significantly lower pressure in the retinal artery on the side of the occlusion. The average percentage difference between the two sides for diastolic pressure was 31.7 and for systolic pressure was 24.1. Svien and Hollenhorst\textsuperscript{20} recently reported 4 cases of unilateral thrombosis of the internal carotid in which they found the difference in diastolic retinal artery pressures on the two sides to range from 25 to 59

\* We\textsuperscript{22} have repeated previously performed studies of the effect of digital compression of the common carotid artery on ipsilateral retinal artery pressures and have found that this maneuver causes an average acute drop of 50 per cent in both systolic and diastolic readings. There was considerable variation among the several subjects. Ophthalmodynamometry is of value in the management of patients undergoing therapeutic carotid ligations.