MEASUREMENT OF RETINAL ARTERY AND INTRACAROTID Pressures
Following Carotid Artery Occlusion with the Crutchfield Clamp*

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For many years, the carotid artery in the neck has been ligated in patients with intracranial aneurysms in an attempt to reduce the intravascular pressure in the vessels giving origin to the aneurysm. Although an acute reduction in the distal arterial pressure is known to occur immediately after ligation,2,8,10 the late changes in intracarotid pressure have not been definitely established. Bakay and Sweet1 observed significant reductions in the distal pressure in 5 of 7 patients from 12 days to 3½ months following ligation. Braden,3 however, reported 3 patients in whom the pressure above the site of closure of the carotid artery returned to its original level when measured 2 years, 48 hours, and 24 hours respectively after the closure. Although measurements of intracarotid pressure by arterial puncture above the occlusion is the most direct method for determining the late pressure changes, this procedure is not feasible for long-term studies. The determination of retinal artery pressures by ophthalmodynamometry, on the other hand, has proved to be a valuable technique in the diagnosis of carotid thrombosis and has been suggested as a practical means of observing the pressure changes following ligation of the carotid artery.4,6,7,9 In the present study this technique was applied to a group of patients in whom the common carotid artery was occluded with a Crutchfield clamp. The results indicate that serial determinations of retinal artery pressures provide reliable information regarding the early and late changes in the arterial pressure distal to the ligation.

CASE MATERIAL AND METHODS

Studies were made on 24 patients in whom the common carotid artery was occluded with a Crutchfield clamp. Of these, 22 had intracranial aneurysms, 1 had an arteriovenous malformation in the distribution of the middle

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cerebral artery, and 1 had an internal carotid-cavernous sinus fistula. The following studies were carried out:

1) The intracarotid pressure distal to the clamp occlusion was measured in 12 patients 4 to 45 days following application of the clamp and compared with that observed at the time the clamp was applied (Table 1). In 11 of these patients intravascular pressure was determined at a second exposure of the occluded vessel; in one (M.P.) it was measured through a percutaneous arterial puncture.

2) Retinal artery pressures were measured in 11 patients before application of the Crutchfield clamp, during its gradual occlusion and immediately following complete closure. Determinations of retinal pressures were repeated 6 to 19 months later (Table 2). The distal intracarotid pressure was measured after closure of the clamp in 6 of these patients and they are included in the group described above.

3) The effects of compression of the external carotid artery upon the ipsilateral retinal artery pressure was studied in 7 patients 1 to 18 months following clamp closure (Table 3). Three of these patients (I.D., L.B., and D.G.) are included in the preceding 2 groups.

4) The changes in retinal artery pressures in 3 additional patients are presented in detail to illustrate certain useful features of this procedure following application of the Crutchfield clamp.

Craniotomies were carried out on several patients following clamp closure of the common carotid artery. None of them, however, had a “trap” ligation of the internal carotid artery which would have isolated the ophthalmic artery. Consequently, the decrease in the retinal artery pressure following carotid occlusion can reasonably be taken to represent that of the other distal branches of the ipsilateral carotid system.

The dissection of the neck and application of the Crutchfield clamp to the common carotid artery were carried out under local anesthesia. The carotid vessels were exposed and direct intravascular pressure recordings were obtained immediately prior to applying the clamp. Pressure determinations were made with a Sanborn electromanometer. A continuous flushing device was used to prevent clotting in the 23 gauge intracarotid needle. After baseline pressure determinations were made, the common carotid artery was completely occluded proximal to the needle and the reduction in pressure was observed. The Crutchfield clamp was then applied to the common carotid artery and tightened sufficiently to produce only a slight reduction in the distal arterial pressure. The incision was closed and the clamp was gradually occluded over a 3- to 7-day period by daily turns of the screwdriver handle. The rapidity of closure depended upon the clinical response of the patient and the pressure reduction observed at the time the clamp was applied.

The technique of measuring retinal artery pressure using the Baillart ophthalmodynamometer has been previously described. Systolic and diastolic values were obtained in each patient. Both retinal artery and intra-