INTRA-ARTERIAL PRESSURES IN THE NECK
AND BRAIN

LATE CHANGES AFTER CAROTID CLOSURE, ACUTE MEASUREMENTS
AFTER VERTEBRAL CLOSURE*

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In the past six years we have carried out measurements of intra-arterial pressure in the carotid vessels in the neck and more recently in the intracranial arteries as well. Brackett and Mount and Woodhall, Odom, Bloor and Golden have reported similar studies. The intracranial studies have been facilitated greatly by the addition to our Sanborn electromanometer of a system to provide continuous minimal flushing with normal saline of the minute No. 27 gauge needle we use. Pressure readings take place during this flushing process without introduction of inaccuracy and the problem of clotting is virtually eliminated even though we now dispense completely with anticoagulants such as heparin.

We have already reported on a comparison between the pressures in the cervical carotid and those in intracranial arteries down to 0.4 mm. in diameter. The pressures measured in the neck and in the main intracranial branches of the internal carotid with the flow free reveal that there is virtually no measurable pressure drop in the anterior and middle cerebral trunks. Even in the small arteries on the superolateral surface of the hemisphere the systolic pressures run from 65 to 92 per cent of those in the cervical carotid with an average of 83 per cent in the twelve vessels measured in as many patients. Upon occlusion of the common carotid the percentage drop in pressure in all portions of the internal carotid and its accessible branches is the same. These measurements include some in arteries as small as 0.4 mm. in diameter. Hence measurement of the pressure drop in the carotid in the neck proves to be a reliable indicator of the degree of fall throughout the branches of that carotid’s tree, and cervical carotid ligation has essentially the same effectiveness in the treatment of an intracranial aneurysm whether it arises from the carotid trunk or one of its smaller branches. Furthermore, since cervical carotid occlusion usually lowers the arterial pressure distal thereto by about

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† The Sanborn electromanometer with equipment for continuous flushing is obtainable from the Sanborn Instrument Co., 39 Osborne St., Cambridge, Mass.
50 per cent, this tactic appears to represent the most rapidly controllable means of achieving hypotension in the distribution of the internal carotid artery and may prove to be the most satisfactory means of producing hypotension to facilitate surgical removal of haemorrhagic lesions in this part of the brain.

We wish to present now: (1) serial measurements of cervical carotid pressure in the neck from the time of occlusion up to several months thereafter and (2) findings on the distal pressures in the vertebral artery and its branches before and after occlusion of this main vessel.

CAROTID PRESSURES LONG AFTER OCCLUSION

It has long been established that collateral circulation to the brain of man develops promptly after one carotid is partially occluded. Thus Dandy found that his patients tolerated complete closure of the carotid in the neck within a week of a first operation at which such closure evoked neurologic signs of cerebral ischemia. Braden has recently reported 3 patients in whom intracarotid pressures rostral to closure of the common carotid had returned to the original level when measured 2 years, 48 hours and 24 hours respectively after the closure. In each patient there had been a substantial drop acutely immediately after occlusion.

It would appear valuable in ascertaining the efficacy of carotid ligation to know how long the falls in pressure may be expected to persist. We have data bearing on this point in 9 patients with intracranial aneurysms.* In 8 of them we have a set of pressure measurements at the time of the original exposure of the vessels in the neck, and another set 6 days to 24 weeks later when the wound was reopened for additional occlusive measures. In a ninth patient we have only the late reading nearly 2 years after total occlusion.

In the following 2 cases complete closure of a carotid artery was not carried out at the first operation.

Case 1. In Donalda B., aet. 40 years, the interval between measurements was 6 days. At the first session complete common carotid occlusion had reduced the pressure from 130/95 to 30/38 and additional occlusion of external carotid had no further effect. A residual systolic pressure of only 23 per cent of that with the flow free may be followed by a late thrombosis spreading from the aneurysm into the main arterial branches (see our case G.D.M. in Sweet, Sarnoff and Bakay). Hence we should not have employed complete occlusion here even if the patient had tolerated it for 30 minutes. However, in this patient, we had to open the occluding tantalum band almost completely in order to avoid the appearance of neurological signs. The pressure distal to it at that time was the same as with the flow free. Six days later the intracarotid pressure was about the same, 132/110, but now common carotid occlusion caused less reduction, to 63/58, or a remaining systolic level 48 per cent of the original. The addition of external carotid occlusion produced no further change and the patient remains well after permanent closure of the common carotid.

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