Correlation Between the Location of Hematoma and its Clinical Symptoms in the Lateral Type of Hypertensive Intracerebral Hemorrhage

Observations on Pantopaque Radiography of the Hematoma Cavity in Cases of Early Surgical Treatment

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SUMMARY The authors studied the Pantopaque radiograms of a hematoma cavity in 46 patients following early surgical treatment for the lateral type of hypertensive intracerebral hematoma. All patients were operated on within 7 hours after the apoplectic attack. Most of them had a localized hematoma. It was concluded that they could be classified in three subtypes from the location of hematoma in the antero-posterior direction. Each subtype had particular clinical symptoms and prognosis.

LATERAL HYPERTENSIVE intracerebral hematomas show different clinical symptoms and signs depending upon their location and extent. It has been difficult to assess the actual site of a hematoma and the extent of cerebral tissue destruction by ordinary carotid angiography or pneumoencephalography. In 1973 we developed Pantopaque radiography of the hematoma cavity. In this technique a few drops of Pantopaque are put into the hematoma cavity at the time of operation and the extent of the hematoma is then determined on the postoperative carotid angiogram. By using a stereotaxic atlas to localize the hematoma, we reviewed 46 patients with a lateral hematoma, all operated on within 7 hours after the apoplectic attack. The accuracy of this method was recently proved by computerized axial tomography. This method was valuable to show the exact location of destroyed brain tissue after surgery and to relate this to the prognosis of an individual case.

Methods

Pantopaque Radiography of the Hematoma Cavity

Tagging of the cavity was done at the time of operation as follows: After the intracerebral hematoma was evacuated, small pieces of cottonoid oxycel soaked in Pantopaque were put into the cavity and fixed on the wall at each end. Cottonoid oxycel is an absorbable fibrin fiber and can be left in the tissue for its original purpose — as a hemostatic agent. The distribution of the droplets of Pantopaque can be observed on the plain skull film after operation. They are evaluated on the postoperative carotid angiogram usually two weeks after the operation when brain edema subsides and an accurate diagnosis of the extent of destroyed brain tissue can be made. Peterson's method was used to distinguish the anterior and posterior commissures from the deep veins in the venous phase of the carotid angiogram. Both commissures can be identified from the average distances on the VA-VG line shown in figure 1. The location of each droplet of Pantopaque appears as a spot on the AC-PC line and is then transcribed using the stereotaxic atlas of Andrews & Watkins or of Schaltenbrand. This method has been applied to more than 80 patients with several varieties of intracerebral hematoma.

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Results

The Pantopaque radiograms of 46 patients showed variable location and extent of the hematoma in each patient. When classified into three groups related to the anterior two-thirds of the posterior limb of the internal capsule each group had particular clinical symptoms. These 3 groups were the anterior subtype, the middle subtype and posterior subtype of lateral intracerebral hematoma. The characteristic symptoms and the frequency of each are as follows:

1. The Anterior Subtype

The hematoma is located anterior to the level of the pyramidal tract or the anterior two-thirds of the posterior limb. Six of 46 patients were in this group. The clinical characteristics were mild disturbances of consciousness from onset with hemiplegia. Postoperative recovery of gross muscle power was satisfactory but fine movement of the hands were clumsy. Before operation all patients had ocular conjugate deviation and extensor plantar responses which continued for a few days after operation. No visual field defect or sensory disturbance were noted. These patients showed fairly good functional recovery and they were often able to return to work. The angiographic findings, included elevation of the Sylvian point and the loop of early M-2 was pushed latero-inferiorly. The lateral lenticulo- striate arteries were shifted medially at their origin (fig. 1). In the postoperative Pantopaque radiogram of the hematoma cavity, drops of Pantopaque were located anteriorly to the venous angle of the internal cerebral vein. If mapped on the stereotaxic atlas the hematoma was located in the region of the anterior limb of the internal capsule (fig. 2).

2. The Middle Subtype

This was the most frequent type of hematoma and was located in the region of the anterior two-thirds of the
HEMATOMA LOCATION AND CLINICAL SYMPTOMS

FIGURE 1. Carotid angiogram of the Anterior subtype. The elevation of the Sylvian point is not marked and the beginning of the M2 is compressed latero-inferiorly. The proximal portion of the lenticulo-striate artery is swept medially and the distal portion is back to the normal position.

posterior limb of the internal capsule near the posterior half of the putamen. Twenty-eight patients were in this group. The clinical symptoms were motor weakness, the severity of which depended on the distance between the hematoma and the internal capsule. If the hematoma was located more laterally around the external capsule, recovery from hemiplegia was rapid after surgery. Complete transection of the internal capsule was rarely observed. Recovery from weakness was generally less likely in the arm than the leg in most of the patients. With hemorrhage in the dominant hemisphere, variable degrees of aphasia were observed. Sensory disturbances were minimal. No visual field defect was observed. Conjugate deviation of the eyes and Babinski's sign were often observed. Characteristics of the carotid angiogram were that the Sylvian point was moderately elevated, the M-2 portion was swept laterally and the middle portion of the lenticulo-striate artery was pressed medially (fig. 3). On Pantopaque radiography of the hematoma

FIGURE 3. Carotid angiogram of the Middle subtype. The Sylvian point is elevated moderately, the portion of M-2 is swept laterally and the lenticulo-striate artery is shifted medially (arrow).

FIGURE 2. Two examples of the Anterior subtype. The hematoma is located in the level of the anterior limb of the internal capsule.
cavity, the hematoma was located near the posterior half of the putamen (fig. 4).

3. The Posterior Subtype

Ten of 46 patients were in this group. The hematoma was located more posteriorly than the middle type and extended from the posterior one-third of the posterior limb of the internal capsule to the occipital white matter. The clinical symptoms were more sensory disturbances than motor weakness. They often were associated with autotopagnosia, astereognosia or slight disturbance of superficial sensation in the opposite half of the body. Some patients had inferior homonymous quadrantopsia (fig. 8). Generally motor weakness improved and the patient often could walk. Conjugate deviation of the eyes was usually eliminated and Babinski's sign disappeared, even if present at onset. The angiographic characteristics included elevation of the Sylvian point, slight lateral sweep of M-1 and M-2, and medial shift of the distal portion of the lenticulo-striate artery (fig. 5). Pantopaque radiography of the hematoma cavity is shown in the figures (figs. 6, 7).
FIGURE 7. Pantopaque radiogram of the hematoma cavity in the Posterior type. The Pantopaque droplets are scattered around the Galen's vein on the lateral view.

FIGURE 8. Visual field defect in the Posterior subtype. Homonymous inferior quadrantopsia was often identified in this subtype.
Discussion

The pathogenesis of the hypertensive intracerebral hematoma supposes rupture of a microaneurysm of a cerebral artery due to angionecrosis. Oneda found that microaneurysms develop after fibroinoid degeneration of the arterial wall. As to the frequency and distribution of microaneurysms, Oneda showed they were more frequent in the putamen, thalamus, and caudate nucleus and rarely found in the globus pallidus. Matsuoka found 120 microaneurysms on histological examination of serial sections of the brain. They were distributed as follows: 51.7% in the putamen, 21.7% in the thalamus, 12.5% in the pons, and 4.2% in the pallidum. According to Cole they are found more frequently in the putamen, globus pallidus, thalamus, and less frequently in the caudate nucleus, internal capsule, and subcortical white matter. Those reports help explain why intracerebral hemorrhages are found more frequently outside the internal capsule.

The variation in the location of the hematoma in the anteroposterior direction was previously thought to be due to the difference in the hematoma extension. Now it is believed that this variation is due to differences in the site of a microaneurysm which ruptures. There are 4 to 7 lenticulo-striate arteries on the proximal middle cerebral artery. If a microaneurysm ruptures on the medial lenticulo-striate artery it then develops into the Anterior sub-type. If it ruptures on the middle lenticulo-striate artery it develops into the Middle sub-type of hematoma. The Posterior sub-type is due to the rupture of a microaneurysm on the lateral lenticulo-striate artery. From our experience in early surgery and autopsy examination, we believe that a hematoma is usually caused by rupture of a single microaneurysm on a branch of a lenticulo-striate artery. These three subtypes of intracerebral hematoma can be attributed to the location of the microaneurysm which ruptures originally.

References


Long-Term Prognosis for Cerebral Infarction in Relation to Brain Circulation – A 7-Year Follow Up Study

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SUMMARY Seventy-seven patients with cerebral infarction have been re-examined every year and followed for 7 years. Thirty-one patients had normal cranial blood flow (BF) and the remaining 46 had subnormal cranial BF, determined by the intravenous RISA method at the time of the original attack.

During a 7-year follow up, 7 patients (22.6%) of the normal cranial BF group died; 3 of stroke and the remaining 4 from other causes, while 24 patients (52.2%) of the subnormal cranial BF group died; 13 of stroke and the remaining 11 of various diseases. The cumulative survival rate was consistently lower in the subnormal cranial BF group than the normal one. This difference reached statistical significance at 5 and 7 years of follow up. However, stroke recurrence did not differ significantly between the 2 groups. This suggests that a decreased cranial BF is an indicator of a poor long-term prognosis.

There has been no report of a prospective study on the long-term prognosis of patients with cerebral infarction related to cerebral hemodynamics, although cerebral blood flow is frequently determined in these patients. It seems reasonable to expect that the prognosis of patients with stroke who have a decreased cerebral or cranial blood flow might be worse than for those who have a normal blood flow. It is not known whether recurrence, and long-term mortality are different in these two groups of patients.

Methods

Of 260 patients admitted to our clinic for evaluation of cerebrovascular diseases between 1962 and 1967, 153 had had cerebral infarction. Of these 153 patients, 77 were selected for study. They had had a stroke within the

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