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Differential Diagnosis of the Combined Type from the Lateral Type of Hypertensive Intracerebral Haemorrhage in Cerebral Angiography

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The most frequent cause of death in Japan is still hypertensive intracerebral haemorrhage. Since 1960 we have performed surgery on the patients with hypertensive intracerebral haemorrhage. And other neurosurgeons in Japan dealing with the early stage of this disease show a growing tendency to perform the surgery to save the patients with an advanced neurological abnormality.

At the end of July in 1974, 1,558 patients with hypertensive intraterebral haemorrhage excluding brain stem and cerebellar haemorrhages were reported to be operated upon in Japan according to an investigation carried out by KANAYA and HANDA[7].

It is well known that the patients with lateral type haematoma have a good indication for surgery and that those with the combined type haematoma show a poor prognosis after surgery in terms of operative mortality and postoperative degree of improvement from hemiplegia. In this sense, it is very important to differentiate the combined type from the lateral haematomas before surgery in order to predict the postoperative result.

The purpose of this paper is to present the angiographic criteria for the diagnosis of the combined type haematoma for the clinical convenience.

Materials and Methods

An analysis was performed of the preoperative cerebral angiograms of 18 patients with the combined type haematoma proved at autopsy. Shift of the important intracerebral vessels, signs of transtentorial herniation, changes in cerebral circulation and an increase in the size of the lateral ventricles were investigated on serial cerebral angiograms. Shift of the important intracerebral vessels includes that of the internal cerebral vein, the middle

Key Words : Differential diagnosis, Combined and lateeal type haematomas,Cerebral angiography, Hypertensive intracerebral haemorrhage, Signs of transtentorial herniation, Degree of ventricular dilatation

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cerebral artery, the lenticulostriate arteries and the maximum distance between the middle cerebral and the lenticulostriate arteries. Transtentorial herniation is diagnosed by the medial and downward displacement of the anterior choroidal, the posterior communicating and the posterior cerebral arteries. Early venous filling and delayed cerebral circulation time are regarded as the result of changes in cerebral circulation. An increase in the size of the lateral ventricles is measured by the distance between the internal cerebral and the thalamostriate veins in the venous phase of A-P view and the distance larger than 20 mm is regarded as hydrocephalus. Shift of the middle cerebral artery is the shortest distance between the inner table of the skull and the middle cerebral artery and shift of the lenticulostriate arteries is the distance from the origin and the midpoint of these arteries to the midplane on A-P views respectively (Fig. 1).

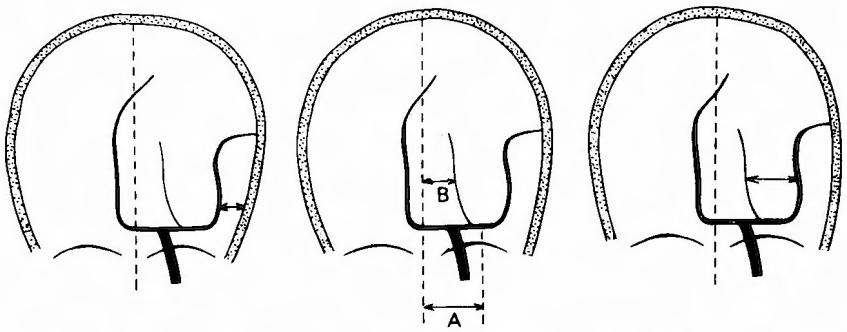

Fig. 1. Measurement of the middle cerebral and lenticulostriate arteries. Left: Arrow shows the shortest distance between the middle cerebral artery and the inner table of the skull. Center: Arrow A shows the distance from the origin of the lenticulostriate artery to the midplane and arrow B represents the distance from the midpoint of the lenticulostriate artery to the midplane. Right: Arrow shows the maximum distance between the middle cerebral and the lenticulostriate arteries.

Fifteen cases with the lateral type haematoma were also reviewed from the same point of view described as a control study.

Results

Shift of the important intracerebral vessels

All of the cases with the combined type haematoma showed shift of the internal cerebral vein of more than 5.9 mm and 9.8 mm in the mean value. Cases with the lateral type haematoma showed the shift of the vein of more than 2. 9mm. Shift of the middlel cerebral artery was 17 mm in the mean vaue and less than 21 mm in most of the cases (88%) of the combined type haematoma. In the lateral type haematoma shift of the artery was 20.6 mm in the mean value and more than 18 mm in 87% of the cases. The distances from the lenticulostriate arteries were 27 mm at the origin and 23 mm at the midpoint of this artery in the mean value and the distances of less than 28.1mm at the origin and less than

27.1 mm at the midpoint were observed in 71% of the combined type haematomas. The distances in the lateral type haematomas were 30 mm at the origin and 28 mm at the midpoint of the artery in the mean value. The distances of more than 26.9 mm at the origin was found in 87% and that of more than 26.9 mm at the midpoint in 53% of the cases. The maximum distance between the middle cerebral and the lenticulostriate arteries was 38mm in the mean value and 71% of the cases showed the distance larger than 30 mm in the combined type haematomas. The lateral type haematomas showed the mean value of this distance of 28 mm and the distance smaller than 30 mm was found in 53% of the cases (Fig. 2).

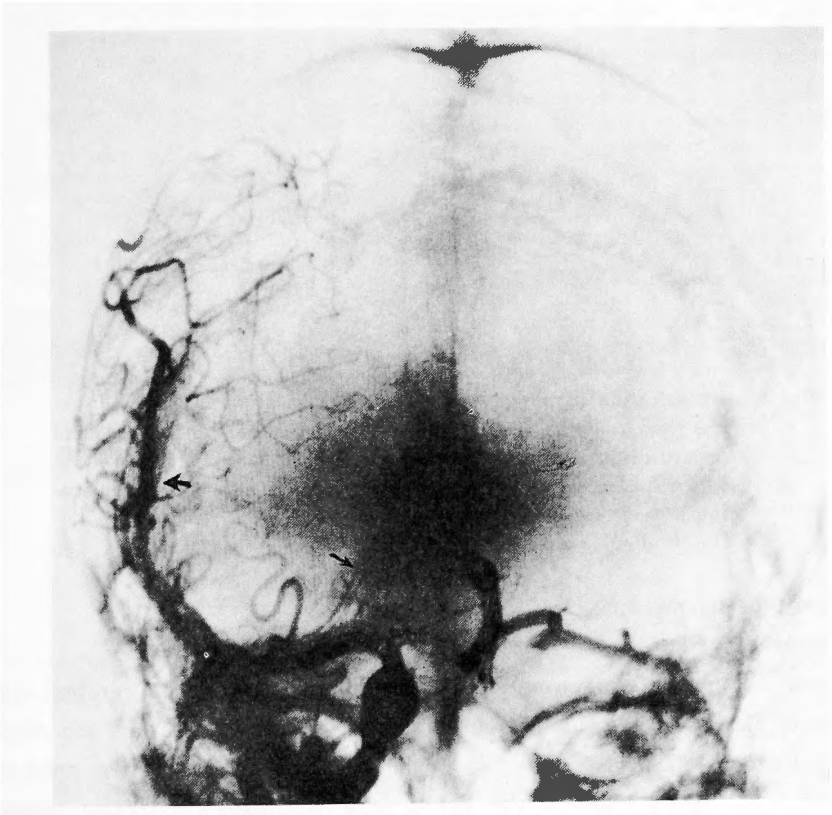

Fig. 2. A case of the combined type haematoma.
The right common carotid angiogram showing markedly lateral shift of the middle cerebral artery and markedly medial shift of the lenticulostriate arteries. Note the increased distance of two arteries (arrows).

Signs of transtentorial herniation

The medial and downward displacement of the anterior chroidal artery, the posterior communicating and the posterior cerebral arteries if they are visible on the common carotid angiograms was observed in all of the cases with the combined type haematoma (Fig. 3). There was, however, no signs of transtentorial herniation except for one out of 15 cases

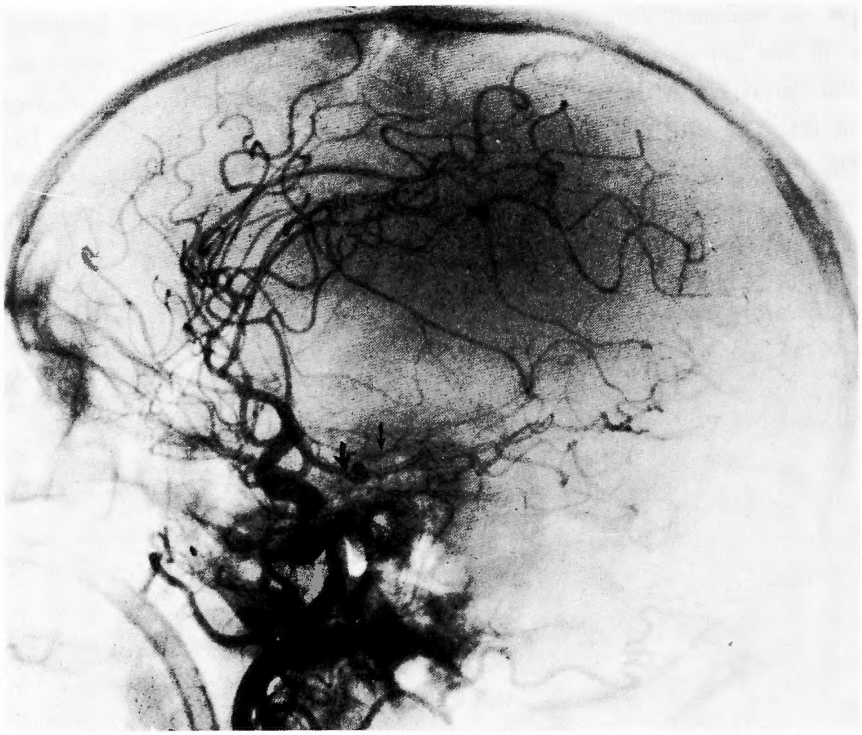

Fig. 3. A case of the combined type haematoma.
The right common carotid angiogram showing markedly upward and forward displacements of the sylvian triangle and markedly downward displacement of the anterior choroidal and posterior communicating artereis (arrows).
This finding is typical of transtentorial herniation.

with the lateral type haematoma.

Changes in cerebral circulation

Early venous filling of the deep cerebral veins such as the internal cerebral vein and/or the basal vein of Rosenthal and delayed cerebral circulation time over 6.2 sec. measured by the method of Greitz (1956) were observed in 71% of the cases with the combined type haematoma (Fig. 4). In the cases of the lateral type haematoma no early venous filling was noted and only one case showed delayed cerebal circulation time.

An increase in the size of the lateral ventricles

The dilated lateral ventricles were noted in 100% of the cases with the combined type and in 44% of the lateral type haematomas. They were classified into three groups according to the degree of hydrocephalus. Mild hydrocephalus (21-25mm) was exclusively seen in the lateral type haematomas, and moderate (26-30mm) and severe (more than 30 mm) hydrocephaluses occupied 75% of the combined type haematomas with 25% belonging to mild hydrocephalus.

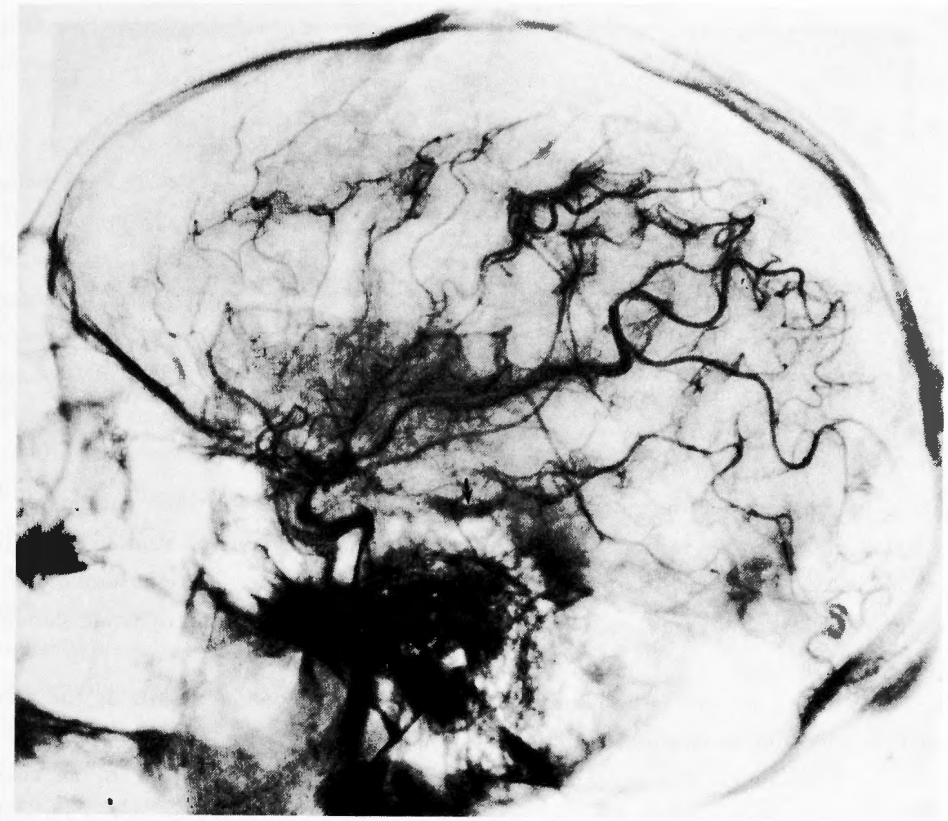

Fig. 4. A case of the combined type haematoma.
Arrow indicating the faintly opacified basal vein of Rosenthal in the arterial phase (early venous filling).

Discussion

In recent years, the surgical treatment of hypertensive intracerebral haemorrhage has been growing in popularity in Japan when the patients are in moderate or severe clinical conditions[7,11].

However, according to our experiences over the past 16 years in this field the patients with hypertensive intracerebral haemorrhage may be classified into two groups proposed by SCHEINKER[15] on the basis of the extension of haematomas proved at autopsied brain. One is termed the lateral type haematoma which involves the internal capsule and the basal ganglia except for the thalamus, the other is designated the combined type haematoma which extends into the thalamus in addition to the area described above (Fig. 5). These two groups have a good correlation with the clinical results in terms of operative mortality and postoperative recovery of disabled limbs[6,8,13]. In other words, the lateral type haematomas show a good prognosis and the combined type haematomas a poor postoperative results.

It is, therefore, very necessary for neurosurgeons to differentiate the combined type from the lateral type haematomas in order to anticipate the postoperative course and to

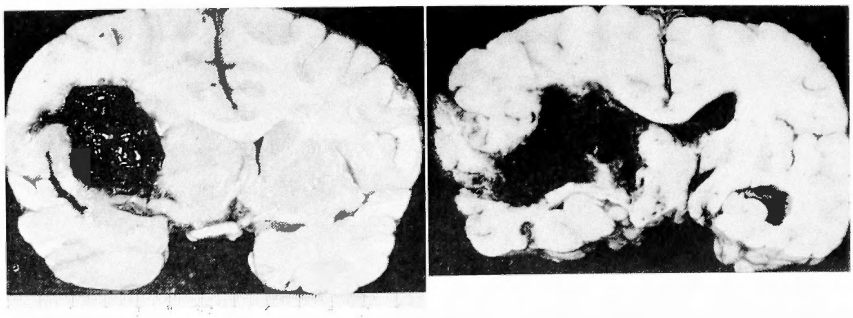

Fig. 5. Coronal sections of the brain showing the laterel type haematoma (left) and the combined type haematoma with rupture into the ventricles (right).

recommend the surgery for the doctor in medicine and the family of the patients.

So far as we know, there has been little literature on the subject studied by cerebral angiography[1)4)16)17)]. This is, therefore, the reason why the authors present here the criteria for the differential diagnosis of two groups of haematoma from static and dynamic standpoints in cerebral angiography.

The results obtained from this study include: (a) the pronounced shift of the internal cerebral vein, the middle cerebral and the lenticulostriate arteries in the combined type haematomas, (b) signs of transtentorial herniation and ventricular dilation in all cases of the combined type haematomas, and (c) frequently observed early venous filling and delayed circulation time in the combined type haematomas.

The above findings indicate that the combined type haematomas tend to have a larger mass including an associated edema compared with the lateral type haematomas. In this series, however, there was no difference in haematoma volume measured at operation, namely the mean haematoma volume was 67.0 ml in the combined type and 75.0ml in the lateral type haematomas.

One of the authors had studied microscopically of cerebral edema in the autopsied brain and reported that intensive cerebral edema was observed in the combined type[12)]. He also pointed out that this finding may be explained by the following four possibilities : the first is that cerebral edema is caused by pulmonary edema resulting from haemorrhages adjacent to the 3rd ventricle and the brainstem[9)]; the second is that cerebral edema has a tendency to occur frequently in the white matter and consequently, it is severer in the combined type; the third is that the patients with a larger haematoma frequently observed in the combined type compared with the lateral type haematoma; and the fourth is that the patients belonging to the combined type die shortly after the onset and therefore, they reveal intensive cerebral edema[12)].

In relation to the fourth possibility, the interval from the onset of attack to the examination of cerebral angiography was investigated in this series. Cases in which cerebral angiography performed within 24 hours occupied about 65% in the combined type

haematomas and nearly 60 % in the lateral type. In other words, cerebral angiography was performed on most of the cases in the early stage of this disease and therefore, this time factor was considered not to influence the degree of cerebral edema on cerebral angiography in this series. Consequently, it may be said that haematoma volume and time factor are excluded from the above four possibilities in this series.

In summary intensive cerebral edema in the combined type haematomas may be caused by the site and extension of haematomas and pulmonary dysfunction secondary to hypertensive intracerebral haemorrhage. Moreover, this study disclosed that transtentorial herniation also plays an important role for production of intensive cerebral edema in the combined type haematomas as a result of disturbance in CSF passage by obliteration of the basal cisterns.

According to this study signs of transtentorial herniation on cerebral angiography is regarded as one of the most significant characteristic features for the diagnosis of the combined type haematomas. Transtentorial herniation is considered to be an accelerating factor of cerebral edema caused primarily by haematomas. Increased edema elevates intracranial pressure, prolongs circulation time, and seriously damages intracerebral metabolic changes. Perifocal vasodilatation of capillaries due to a regional cerebral hyperaemia caused by tissue hypoxia is a manifestation of early venous filling[2)10)14)] on cerebral angiography of the combined type haematomas.

It is generally considered that ventricular dilataion is an angiographic sign of rupure of haemorrhage into the ventricular system and it results from subarachnoid adhesions on the cerebral convexities[3)5)].

In this series mild ventricular dilatation was exclusively observed in the lateral type haematomas, but moderate and severe ones were noted in most of the cases of combined type haematomas. This fact suggests that there is another factor besides subarachnoid adhesions for progress of ventricular dilatation. This may be confirmed by the fact that transtentorial herniation frequently complicates the combined type haematomas. Transtentorial herniation causes blocking of CSF passage in the subarachnoid cisterns due to the herniated uncus and hypocampus and it makes the ventricular system enlarged.

In conclusion, both signs of transtentorial herniation and more enlarged ventricles are major important differential points of the combined type from the lateral type haematomas in hypertensive intracerebral haemorrhage.

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和文抄録

脳血管撮影像よりみた高血圧性脳出血における Combined Type および Lateral Type の鑑別診断

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最近における高血圧性脳出血に対する外科治療の普及は目覚しいものがある. また本症のうち, Combined Type の血腫を有する症例は, 血腫剔除術によっても生命予後, 機能予後とも不良であり, しばしば中枢性胃腸管出血を伴うことが, 諸家の研究により判明している. 従って脳神経外科の立場からは, 如何にして術前に Combined Type を除外して, 手術成績の良好な Lateral Type を診断するかが重要である. この点に関しては, ごく最近, 本邦にも導入された CT Scan が威力を発揮してはいるが, 脳血管撮影像の分析もなお重要な役割を失ってはいない。そこで著者等は, 剖検によって確認された Combined Type 症例18例の術前の脳血管写像を分析し, 更に Lateral Type の脳血管写像とも比較対照して検討した結果, 下記の如き成績を得た. 即ち, Combined Type 血腫例では, 1) 内大脳静脈, 中大脳動脈およびレンズ核線状体動脈の偏位が著明である. 2) 天幕切痕ヘルニアの存在. 3) 中等度ないし高度の脳室拡大. 4) early venous filling と delayed circulation time の存在等である.