Familial Intracranial Aneurysms

MINORU SHIGEMORI, KENJI NAKAYAMA, YUKI OHSHIMA, MORIHISA SHIRAHAMA, KUNITADA HARA, OSAMU NAKASHIMA, KENSAKU KAWASAKI, TOMOYUKI KAWABA AND SHINKEN KURAMOTO

Department of Neurosurgery, Kurume University School of Medicine, Kurume, 830 and
*Division of Neurosurgery, Shakaihoken Tagawa Hospital, Tagawa, 826 Japan

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Summary: The authors describe 6 cases of familial intracranial aneurysms in 3 families. The aneurysms in 2 pairs of sisters were located on identical arteries and at relatively uncommon sites for familial aneurysms. Two were associated with relatively rare cerebrovascular anomalies. Aneurysms occurred on the middle cerebral artery and the internal carotid artery in a son and his mother, respectively. These cases may support a hereditary basis for some intracranial saccular aneurysms, in addition to the congenital theory of aneurysm formation. The characteristics of familial aneurysms in siblings are also briefly discussed.

Key words: Familial intracranial aneurysm—sibling—cerebral aneurysm—extravasation—genetic factor—identical arteries

Introduction

The familial occurrence of intracranial aneurysms is not frequent, but the characteristics in these cases of female predominance and young age at diagnosis have been well documented (Andrews, 1977; Brisman and Abbasioun, 1971; Hashimoto, 1967; Sakai, et al. 1974). A unique distribution of familial aneurysms from that of intracranial aneurysms has also been described. (Andrews, 1977; Hashimoto, 1977) In 1982, we reported a pair of sisters suffering from ruptured cerebral aneurysms of the anterior cerebral arteries in association with relatively rare cerebrovascular anomalies (Shigemori et al. 1982). In addition to these two, 4 cases of familial aneurysms in a two-siblings pair and a son-mother pair have been treated in our Department. The aneurysms were located on identical arteries in the posterior circulation in each sibling pair. This report describes these 6 cases, the characteristics of familial aneurysms generally, and in these siblings, in particular.

Case Reports

Family 1

Case 1

A 54-year-old hypertensive woman, a member of 5 siblings, developed a subarachnoid hemorrhage on November 17, 1975. Bilateral carotid angiography disclosed a saccular aneurysm at the proximal portion (A1) of the left anterior cerebral artery and an azygos anterior cerebral artery. The aneurysm located at the bifurcation of a large medial striate artery (recurrent artery of Heubner) was successfully clipped and, thereafter, the patient was discharged without any neurological deficits.
Case 2

A 53-year-old woman, a younger sister of the case 1, also suffered from hypertention and developed a subarachnoid hemorrhage on August 31, 1979. Right carotid angiography demonstrated a saccular aneurysm at the distal portion (A3) of the right anterior cerebral artery. The aneurysm was successfully treated by clipping. Postoperative vertebral angiography revealed bilateral fenestrations of the extracranial vertebral arteries situated symmetrically at the level of the atlanto-axial joint.

Their family history indicated that their mother, as well as their maternal grandmother and one aunt, died of cerebrovascular accidents although there was no evidence of ruptured intracranial aneurysm. These two cases have already been reported in detail (Shigemori, et al. 1982).

Family 2

Case 3

A 52-year-old hypertensive woman, a member of 7 siblings, developed a severe headache of sudden onset and lost consciousness on July 29, 1983. The patient was immediately referred to our Department. On admission, she was stuporous and showed marked nuchal stiffness. Computed tomography (CT) revealed massive subarachnoid hemorrhage in the posterior fossa and hemorrhage in the fourth ventricle. Vertebral angiography demonstrated a saccular aneurysm at the distal portion (choroidal point) of the left posterior inferior cerebellar artery. Her level of consciousness deteriorated over the next few days, despite intensive medical treatment, rebleeding was confirmed by serial CT scanning. The patient died before operation five days after the admission. An autopsy was refused by the family.

Family history revealed that both the mother and maternal grandmother died of cerebrovascular accidents, although there was no evidence of ruptured aneurysm. It was also unknown whether they were complicated with other cerebrovascular anomalies or multiple aneurysm because neither a detailed investigation of the cerebral vessels nor autopsy was performed.

Family 3

Case 5

A 49-year-old man suddenly developed a severe headache and vomiting on July 11, 1978. The patient was subsequently admitted to our Department where he was found to have a marked hyperreflexia of his left extremities with nuchal rigidity. CT demonstrated subarachnoid hemorrhage in the right sylvian fissure, and the right carotid angiogram disclosed a saccular aneurysm on the right middle cerebral artery. The aneurysm was successfully
treated by neck clipping and the patient was discharged without any neurological deficit. There were no associated abnormalities in this case.

Case 6

A 76-year-old woman, the mother of the patient described in case 5, developed headache of sudden onset and lost consciousness on May 27, 1983. On admission, she was semicomatose and hemiparetic on the right side. CT revealed massive subarachnoid hemorrhage at the basal subarachnoid space. Left carotid angiography demonstrated a large saccular aneurysm on the left internal carotid artery at the junction of the posterior communicating artery. No other aneurysms or anomalies were seen. Two months after onset, neck clipping for the aneurysm was successfully performed but death due to pulmonary complications occurred. An autopsy was not performed.

The paternal grandfather of case 5 and the mother of case 6 died of cerebrovascular accidents. There was no evidence of aneurysms.

There was no family history of Marfan’s syndrome, polycystic kidney, or hereditary connective tissue disorders in these 3 families.

Discussion

Much attention has been paid to the familial aggregation of intracranial aneurysm because of clinical findings which supports the heredofamilial concept for the origin of cerebral saccular aneurysm (Hashimoto, 1977; Sakai et al. 1974). However, the genetic factors influencing the occurrence of these lesions remains unknown. It is well-known that the sex, the site and the age of occurrence of familial intracranial aneurysm are different from those of the general aneurysm population (Andrews, 1977; Hashimoto, 1977;
Familial intracranial aneurysm tends to occur predominantly in females and in rather young individuals, and the incidence of aneurysms is high on the internal carotid and middle cerebral arteries but low on the anterior communicating artery. Andrews (1977) analyzed 98 cases of familial aneurysms and reported that 54.1% of the aneurysms were located on the internal carotid artery, 25.2% in the middle cerebral artery, 4.1% in the verteobasilar arteries and 16.4% in the anterior communicating artery. Brisman (1971) reported that the aneurysms were located on the same artery in both family members in 16 out of 28 families in which aneurysms on the same side were found in 17 instances. These characteristics in the distribution of the aneurysm were also substantiated by Andrews (1977). He collected 44 cases of aneurysm in pairs of siblings including eight pairs of brothers, 19 pairs of sisters and 17 brother-sister pairs and stated that the aneurysms in both members of a sibling pair occurred at identical sites more than twice as frequently as expected from the occurrence at the various sites on the major arteries in the general population of aneurysms. In addition he indicated the occurrence of mirror-image aneurysms was also more than twice as frequent as expected and that siblings commonly had aneurysms diagnosed at approximately the same age.

Five out of 6 cases in this report were females and the tendency of female predominance was also noted in these cases. The site of aneurysms in Family 3 (case 5 and 6) were in accordance with the characteristics of familial aneurysms previously reported (Andrews, 1977; Hashimoto, 1977; Sakai et al. 1974). The age of diagnosis in our cases was, however, much older than that of general familial aneurysms. Both members of each pair of sisters in this report had saccular aneurysms on identical arteries, which were considered to be relatively uncommon sites for familial aneurysms. The first sibling pair had aneurysms on the proximal and distal anterior cerebral arteries. Aneurysms arising from the proximal portion of this artery are uncommon, accounting for about of all intracranial aneurysm of 1.5% (Locksley, 1966). The aneurysm of the distal anterior cerebral artery is also uncommon as a familial aneurysm and only two cases of families with mother and son have been reported. In contrast to the report of Yasargil et al. (1974), multiplicity is not a feature of our cases. It is also noteworthy that both members of one sister pair had relatively rare developmental anomalies of the cerebral vessels, perhaps coincidentally accounted with cerebral aneurysms (Baptista, 1963). The second sibling pair had aneurysms of identical arteries on the same side of the posterior circulation. The incidence of aneurysms in the posterior circulation is reported to be 7.4% in sibling aneurysms, which is slightly higher than those of general and familial ones (Andrews, 1977). Both of them developed severe subarachnoid hemorrhage followed by re-bleeding before surgical intervention could be carried out. Marked extravasation of the contrast medium indicative of perangiographic rupture of the aneurysm was demonstrated in case 4. This finding is known to be associated with high fatality rate (Liliequist et al. 1976; Murray and Wortzman, 1977).

The mortality rate was as high as 50% in the present three families, although it is still unknown whether familial aneurysms have differences in prognosis from non-familial aneurysms; further analysis of familial aneurysms is necessary for determination of a possible difference. The mother-child pairs or sibling pairs seem to share not only the genetically influenced factors but also acquired factors, including environment and diet, which may contribute the aneurysm formation (Andrews, 1977). It is difficult to draw a firm conclusion with regard to the origin of the
cerebral aneurysms. The facts that cerebral aneurysms were aggregated on identical arteries in two sibling pairs and one sister associated with developmental anomalies of the cerebral vessels, however, strongly suggest the hereditary basis for some intracranial aneurysms in addition to congenital theory of aneurysm formation. Fox et al. (1980, 1982) described an interesting family with 13 siblings, among whom 7 had been discovered to have cerebral aneurysms; the future possibility of aneurysm formation in other members of siblings as well as their children in the cases of familial aneurysms was suggested. It was not possible to perform the neuroradiological evaluation of other members in 3 families reported here. Less traumatic methods of evaluation, such as digital subtraction angiography or high resolution CT, could be recommended for asymptomatic family members when two or more cases of cerebral aneurysms are encountered in a family because it is well known that the results of treatment for unruptured aneurysms are better than for the ruptured ones (Morooka and Waga, 1983).

References


