Causes of spontaneous subarachnoid hemorrhage in Thai infants and children

A study of 56 patients

PONGSAKDI VISUDHIPHAN, M.D., SURANG CHIEMCHANYA, M.D., RACHA SOMBURANASIN, M.D., AND DHANIT DHEANDHANOO, M.D.

Departments of Pediatrics, Radiology, and Neurological Surgery, Ramathibodi Hospital, Bangkok, Thailand

The authors report 56 cases of spontaneous subarachnoid hemorrhage in Thai infants and children. The causes were: hemorrhagic disorders in 22 cases, arteriovenous malformations and aneurysms in 18, gnathostomiasis in nine, bleeding tumors in four, hypernatremia in one, and undetermined causes in two cases. Coagulation studies and cerebrospinal fluid examination for eosinophils are recommended before further invasive studies in such cases.

KEY WORDS • subarachnoid hemorrhage • aneurysm • arteriovenous malformation • prothrombin deficiency • gnathostomiasis • nematode infection • Thailand

SPONTANEOUS subarachnoid hemorrhage (SAH) in infants and children has been a relatively neglected subject, although it has been known since 1871. The causes of bleeding are many, and a large number of reports have been concerned only with ruptured aneurysms and arteriovenous malformations. Many of these cases are associated with intracranial hematoma. Prompt and appropriate investigations to find the causes and the associated hematoma are important in order to save the lives of these patients.

The purpose of this paper is to present our experiences on 56 cases of spontaneous SAH in infants and children who were admitted to the Department of Pediatrics at our institution in Bangkok. Emphasis is placed on the causes and the approach for correct diagnosis of these children.

Clinical Material and Methods

The present series was collected from January, 1971, to December, 1978. The patients were all under 15 years old. Subarachnoid hemorrhage was confirmed by lumbar punctures in all cases. Significant cerebrospinal fluid (CSF) findings included the presence of red blood cells, xanthochromia, and an elevated protein level. Patients who presented clinical evidence of intracranial hematoma, such as hemiparesis, papilledema, or signs of impending herniation, in whom lumbar puncture was contraindicated, were excluded from the study, as well as those with bleeding from head trauma, birth injuries, and prematurity, and known cases of blood dyscrasia. Complete blood count, urinalysis, and lumbar punctures were performed in all cases. Coagulation studies, subdural tapping, and cerebral angiography were performed only as indicated.

Summary of Cases

The causes of spontaneous SAH in these 56 patients could be divided into five groups (Table 1). Bleeding disorders were the most common cause of spontaneous SAH in this series, and comprised about 40% of the cases (Group 1). The most common cause of bleeding in this group was prothrombin complex
Arteriovenous malformations were found in 13 cases; hemophilia A, hemophilia B, and idiopathic thromboctopenic purpura. Associated subdural hematoma was also corrected by vitamin K administration or plasma revealed prolonged prothrombin time, which could be deficiency, which was found in 19 cases. These patients were under 2 months old, except for one patient who was 7 months old. Coagulation studies revealed prolonged prothrombin time, which could be corrected by vitamin K administration or plasma transfusion. Associated subdural hematoma was also found in 10 patients. The causes of spontaneous SAH in the other three patients in this group were hemophilia A, hemophilia B, and idiopathic thromboctopenic purpura.

The second most common cause of spontaneous SAH was rupture of vascular lesions (Group 2). Arteriovenous malformations were found in 13 cases; in 12 of these the lesions were located intracranially, whereas in the other case it was in the spinal cord. These patients were 5 to 14 years old. The association of intracranial hematoma was found after subsequent investigations in seven patients. Aneurysm was the cause of spontaneous SAH in five patients; four of these were mycotic. Small intracerebral hematomas were noted in the cerebral angiograms in three patients. The aneurysms were located on small branches of the middle cerebral arteries in three, and at a branch of the posterior cerebral artery in one. Symptoms and signs of septicemia were present in only one patient who had a staphylococcal infection. Evidence of valvular heart disease, which could be the source of infection, was present in two of the other three patients. One patient was considered to have a congenital aneurysm of the anterior communicating artery. The patients in Group 2 ranged from age 4 to 14 years.

Parasitic infestation caused spontaneous SAH in nine patients (Group 3). *Gnathostoma* was presumed to be the causative parasite. The onset of the hemorrhage was sudden, and half of the cases had a history of parasitic migration through the skin before the onset of SAH. Eosinophils were present in the CSF of all patients, but not in the same proportion as in the peripheral blood.

In four patients SAH was the result of bleeding from tumors: a malignant astrocytoma of the brain stem, a medulloblastoma, a choroid plexus papilloma of the lateral ventricle, and a metastatic neuroblastoma (Group 4). All of these patients presented symptoms of spontaneous SAH. The diagnosis of the tumors was confirmed after subsequent investigations and also at operation. These patients ranged in age from 8 months to 14 years old.

In our 56 cases of spontaneous SAH, the causes could not be determined in only two cases (Group 5).

### Discussion

According to previous reports, arteriovenous malformations and aneurysms are the two most common causes of spontaneous SAH in children. A review of four studies by Sedzimir and Robinson showed that of 8413 patients with SAH, 321 were under 20 years of age. In this younger age group (321 cases), the bleeding was due to aneurysms in 36.13%, and arteriovenous malformations in 27.41%; in 33.65%, the lesions could not be determined. However, in a review of 45 cases studied in Japan, Sano, *et al.*, reported that 23 had arteriovenous malformations, 10 had spontaneous intracranial hemorrhage, three had aneurysms, two had bleeding from brain tumors, and the causes could not be determined in two cases. The prevalence of prothrombin complex deficiency among the young infants and the presence of parasitic infestation in the older children in our series seem to be the main differences from previous reports.

*Gnathostoma spinigerum* is a tissue parasite widely distributed throughout Asia. Man acquires this nematode by consuming inadequately cooked food that harbored the third-stage larvae. The parasite migrates easily through any soft tissue, including the central nervous system (CNS). With its spinous body and marked activity, it can cause a great deal of damage to the neural tissue and blood vessels. Radiculomyelitis, radiculoencephalomyelitis, and SAH are the common manifestations of *Gnathostoma* infestation, and signs of migration are the hallmark of this entity. The presence of eosinophils in the CSF is the most important noninvasive diagnostic guide, and recovery of the parasite from the tissue provides a definite diagnosis.
Subarachnoid hemorrhage in Thai children

Data on the causes of SAH in children in different parts of the world would be helpful for prompt and appropriate investigation and treatment of this condition. In Thailand, according to this study, coagulation studies should be considered as a first step in diagnosis, particularly in infants or older children who have a bleeding tendency. This would be helpful for the diagnosis of prothrombin complex deficiency in infants and other bleeding disorders in older children. The CSF should be examined for eosinophils in all patients in the older age group. Arteriovenous malformations and aneurysms are common causes of bleeding, and angiographic studies are needed to confirm the diagnosis and locate the lesions. The presence of eosinophils in the CSF can be helpful in establishing the diagnosis of parasitic infestation of the CNS and might avoid unnecessary angiographic studies in these patients.

References

Address reprint requests to: Pongsakdi Visudhiphan, M.D., Department of Pediatrics, Faculty of Medicine, Ramathibodi Hospital, Rama Vi Road, Bangkok 4, Thailand.

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