

# SUBARACHNOID HAEMORRHAGE AND THE NEGATIVE ANGIOGRAM

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"Subarachnoid haemorrhage and intracranial berry aneurysms occur much less commonly in India and the Eastern countries than in the West", stated Ramamurthi in 1969.<sup>(1)</sup> This statement was later shown to be untrue when Suzuki found that the prevalence of intracranial aneurysms in Japan is comparable to that in Western countries.<sup>(2)</sup>

What is the incidence of intracranial aneurysms and subarachnoid haemorrhage (SAH) in South East Asia and particularly in Singapore? Selby, reporting on his experience in Malaysia, stated that intracranial aneurysms were "very uncommon", and that arteriovenous malformations outnumbered aneurysms 10 to 1.<sup>(3)</sup> On the other hand, Vejajiva found that the incidence of aneurysms in Thailand, though "relatively low", is still more common than that of arteriovenous malformations.<sup>(4)</sup>

According to epidemiological studies conducted in Europe and North America, the incidence of SAH is 11-12/100,000/year.<sup>(5)</sup> If the incidence of SAH in Singapore is similar to that in the Western countries, one would expect 250 to 300 cases of SAH a year. 22 patients with SAH were admitted to Medical Unit III, Singapore General Hospital in 1967, forming 9% of all forms of cerebrovascular accidents seen in the Unit in the same year. Carotid angiography, performed in only 6 of these patients, demonstrated berry aneurysms in 2 and an arteriovenous malformation in another.<sup>(6)</sup> In 1977, only 15 surgical operations were performed for intracranial aneurysms at the Department of Neurosurgery, Tan Tock Seng Hospital. The figure rose to 41 in 1986, possibly because of better case detection, and a shift in management strategy to one of early surgery for patients with good clinical grades. However, this is still far below the expected incidence. What are the reasons for this?

There are three possible reasons: failure to diagnose SAH; failure to demonstrate an aneurysm angiographically in a patient with SAH; and the incidence of SAH and intracranial aneurysms in Singapore may indeed be lower than in the Western countries.

Misdiagnosis of aneurysmal SAH remains a major problem, not only in Singapore, but also in North America.<sup>(7)</sup> A "warning bleed" occurs prior to the major episode in a number of patients but the significance of the symptoms is often not appreciated by the patient or the doctor. Initial diagnoses in patient with SAH have included "flu", gastroenteritis, migraine, hypertensive crisis, cervical arthritis or herniated disk, sinusitis, neuralgia, hysteria, brain tumour, meningitis, myocardial infarction, cerebral infarction, alcohol intoxication, head injury, and syncope.<sup>(7, 8)</sup> Gillingham, who estimated this would occur in as many as 50% of patients, described the event as follows:

*"The minor episode was usually ushered in by severe headache in the occipital or nuchal region which radiated upwards to the vertex or downwards to the spine without loss of consciousness but occasionally associated with vomiting. Recovery was rapid with some neck stiffness and generalized headache but the patient was usually well in about 48 hours and returned to work."<sup>(9)</sup>*

The pathognomonic history is one of sudden, explosive, severe headache, often associated with nausea, vomiting and neck stiffness, and sometimes with transient loss of consciousness. The most important aspect of the history is the suddenness of onset of headache, with the patient often being able to relate the exact time or what he or she was doing when it occurred. When such a history is given, the patient should be referred to a neurosurgeon so that urgent computerized tomographic (CT) scanning may be carried out. If CT scan is negative, lumbar puncture must be performed because CT scanning has been shown to be unreliable in demonstrating the subarachnoid blood produced by a minor leak.<sup>(6, 10)</sup> The lumbar puncture should not be delegated to the most junior and inexperienced doctor on the staff because it must be atraumatic. Cerebral angiography is performed when CT scanning or lumbar puncture confirms SAH.

Are cerebral aneurysms missed because of inadequate or poor quality angiography? In this issue, a paper from Malaysia attempts to address this question by studying the quality and adequacy of cerebral angiography in 22 cases of proven SAH which did not have a known cause.<sup>(11)</sup> The author found a 46% incidence of negative angiography — more than double that in North America. He suggested that this might be because of failure to repeat angiography in patients whose first study showed vasospasm. It is thought that severe vasospasm may prevent the contrast medium from entering the aneurysmal sac.<sup>(12)</sup> A repeat angiogram at a later date, when the vasospasm has resolved, may demonstrate the aneurysm.

68 patients who had proven or suspected SAH underwent cerebral angiography at the Department of Radiology, Tan Tock Seng Hospital in 1986. 41 patients, or 60% were positive for 1 or more intracranial aneurysms. Cerebral angiography was not repeated in 15 of the remaining 27 patients. 11 underwent angiography twice and in 1 patient, it was performed three times. No aneurysm was found in any of these patients. Atherosclerosis was often seen in patients who did not have an intracranial aneurysm.

Although the cause of haemorrhage could not be determined in 22% of the cases in the North American Cooperative Study, this should not be taken to mean that cerebral angiography demonstrated an aneurysm in 80% of patients with SAH. In fact, intracranial aneurysm was the cause of SAH in only 51% of cases (15% were caused by "hypertensive and/or arteriosclerotic vascular disease" while "miscellaneous or multiple causes" accounted for 6%).<sup>(13)</sup> The incidence of intracranial aneurysms as a cause of SAH in Singapore is therefore not lower than in the West. It is difficult

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to compare the 46% negative angiography in the Malaysian study against Locksley's figure of 20% because the author did not give a breakdown of the causes of SAH that were demonstrated by angiography.

Should cerebral angiography be repeated after an initial negative study? It would appear to be reasonable to do so because in that cooperative study, repeat angiography detected an aneurysm in 23% of 207 patients with initial negative studies.<sup>(13)</sup> However, more recent literature suggests that repeat cerebral angiography after an initial negative study is useful for the elucidation of underlying abnormality only if a patient has a recurrent haemorrhage, or if the first angiogram was incomplete or showed spasm.<sup>(15, 16)</sup> Lin and Kricheff defined the complete angiogram for intracranial aneurysms as one that consists of "selective injections in both internal carotid arteries and at least, in one vertebral artery, with satisfactory retrograde reflux filling the upper portion of the contralateral posterior inferior cerebellar artery."<sup>(12)</sup>

At the Tan Tock Seng Hospital, the current practice is to repeat pan-angiography in all patients who suffered a SAH but had an initial negative study. This is because on some occasions, we have detected an aneurysm in the repeat study which was either not demonstrated or missed in the first.

In the International Cooperative Study involving over 3,500 patients from 69 centres, the mortality at 6 months after the haemorrhage was 27.5%. Only 56.4% could be classified as having a good recovery. This was despite the fact that 80% of patients were admitted in a good condition. (Only 25% of those who were comatose on admission survived 6 months!)<sup>(17)</sup> Many neurosurgeons have observed that the mortality from the first major SAH is horrendous and have stressed that recognition of the warning leak should result in improved management results.<sup>(5, 7, 8)</sup> With greater awareness of the varied clinical presentations of SAH and better neuroradiological evaluation, we can expect a smaller number of intracranial aneurysms to be missed in Singapore.

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