Subarachnoid Hemorrhage Due to Ruptured Posterior Cerebral Artery Aneurysm Simultaneously Associated With Multiple Remote Intracerebral Hemorrhages
—Case Report—

Shinya SONOBE,1 Miki FUJIMURA,1 Hidenori ENDO,1 Takashi INOUE,1 Hiroaki SHIMIZU,2 and Teiji TOMINAGA2

1Department of Neurosurgery, Kohnan Hospital, Sendai, Miyagi; 2Department of Neurosurgery, Tohoku University School of Medicine, Sendai, Miyagi

Abstract

A 61-year-old woman presented with aneurysmal subarachnoid hemorrhage (SAH) associated with multiple remote intracerebral hemorrhages (ICHs). She had undergone microsurgical neck clipping for ruptured right middle cerebral artery aneurysm and ventriculo-peritoneal shunting 16 years previously. Computed tomography revealed SAH predominantly in the basal cistern and ambient cistern, in association with multiple ICHs in the bilateral tegmentum of the brain stem and right caudate nucleus. Digital subtraction angiography revealed an aneurysm at the P1 segment of the left posterior cerebral artery. The ruptured aneurysm was microsurgically clipped via a left subtemporal approach without complications. Simultaneous occurrence of aneurysmal SAH and multiple remote ICHs is rare. The spatial pattern of the ICHs in the present case is apparently unique.

Key words: cerebral aneurysm, subarachnoid hemorrhage, intracerebral hemorrhage, simultaneous occurrence, tegmentum

Introduction

Simultaneous occurrence of aneurysmal subarachnoid hemorrhage (SAH) and remote intracerebral hemorrhage (ICH) is rare, with only a few reported cases.5,7,8,12,13 Here we describe a case of SAH due to a ruptured posterior cerebral artery (PCA) aneurysm simultaneously associated with multiple ICHs, located in the bilateral tegmentum of the pons and right caudate nucleus.

Case Report

A 61-year-old woman was admitted to our affiliated hospital, suffering from sudden onset of severe conscious disturbance. Computed tomography (CT) established a diagnosis of SAH, and she was transferred to our service for surgical intervention. She had previously undergone microsurgical clipping for a ruptured right middle cerebral artery aneurysm and subsequent ventriculo-peritoneal shunting 16 years before presentation, and she lived independently.

On admission, she was semi-comatose with tetraparesis and bilateral oculomotor nerve palsy. Laboratory tests showed normal clotting function. CT and magnetic resonance imaging revealed SAH predominantly located in the basal cistern and ambient cistern, in association with multiple ICHs in the bilateral tegmentum of the pons and right caudate nucleus (Fig. 1). Digital subtraction angiography revealed an aneurysm arising at the P1 segment of the left posterior cerebral artery. The ruptured aneurysm was microsurgically clipped via a left subtemporal approach without complications. Simultaneous occurrence of aneurysmal SAH and multiple remote ICHs is rare. The spatial pattern of the ICHs in the present case is apparently unique.

Key words: cerebral aneurysm, subarachnoid hemorrhage, intracerebral hemorrhage, simultaneous occurrence, tegmentum
Fig. 1 Initial computed tomography scans (A) and T2-weighted magnetic resonance (MR) images (B) showing subarachnoid hemorrhage predominantly in the basal cistern, associated with intracerebral hemorrhages (ICHs) in the bilateral tegmentum of the brain stem and right caudate nucleus. Diffusion-weighted MR images (C) revealing ICHs as low intensity lesions. Apparent diffusion coefficient (ADC) maps (D) showing markedly decreased ADC values of the ICH and slightly increased ADC value in the area surrounding the hematoma.

Fig. 2 A: Preoperative digital subtraction angiogram demonstrating an aneurysm arising at the P1 segment of the left posterior cerebral artery. B: Postoperative three-dimensional computed tomography (CT) angiogram showing complete obliteration of the aneurysm. C: CT scans performed 10 weeks after onset showing disappearance of the intracerebral hemorrhages.

Discussion

The five reported cases of simultaneous occurrence of aneurysmal SAH and remote ICH were mainly associated with single ICH located in the thalamus, putamen, basal ganglia, internal capsule, and dorsolateral tegmentum, and only one case was associated with multiple ICHs in the bilateral basal ganglia.\textsuperscript{5,7,8,12,13} The present SAH case is quite unique in terms of the associated multiple ICHs and the anomalous hematoma localization.

The underlying mechanisms of the simultaneous occurrence of aneurysmal SAH and remote ICH are undetermined. The possible mechanisms are as follows. First, based on the pathology of SAH in the acute stage, a sudden

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increase in intracranial pressure and subsequent elevation of systemic blood pressure may contribute, at least in part, to the occurrence of ICHs, although the dorsal brain stem is an atypical region as a bleeding point of hypertensive ICH.\textsuperscript{1,8,10,11} Second, mechanical compression of the arachnoid membrane by a subarachnoid clot might induce remote ICH.\textsuperscript{5} In our case, a past history of SAH might have modified the arachnoidal structure in the basal cistern, which could promote mechanical injury of the perforators following SAH. Third, hemorrhagic infarction might be involved in the occurrence of ICHs,\textsuperscript{5} as the perforators arising from the proximal PCA supply blood to the tegmentum. Rupture of P\textsubscript{1} segment aneurysm might trigger transient cerebral ischemia in the region supplied by perforators of the proximal PCA, but apparent diffusion coefficient (ADC) maps showed increased ADC value in the area surrounding the hematoma, which might indicate venous congestion as the cause of ICH rather than post-ischemic hemorrhagic transformation.\textsuperscript{3} Fourth, activation of local signal transduction triggered by SAH\textsuperscript{3} might be associated with hematoma formation. Platelet activation following SAH induces local disruption of the endothelium and destruction of the adjacent basal lamina.\textsuperscript{4} Matrix metalloproteinase-9, which is known to increase after SAH,\textsuperscript{4,6} may induce neutrophil infiltration and basal lamina collagen IV degradation, resulting in blood-brain barrier breakdown.\textsuperscript{9}

The present case of SAH due to a ruptured PCA aneurysm was associated with multiple ICHs, located in the bilateral tegmentum of the pons and right caudate nucleus. Simultaneous occurrence of aneurysmal SAH and multiple remote ICHs is extremely rare, and the spatial pattern of the ICHs in the present case is apparently unique.

References


Address reprint requests to: Miki Fujimura, MD, PhD, Department of Neurosurgery, National Hospital Organization, Sendai Medical Center, 2–8–8 Miyagino, Miyagino-ku, Sendai 983–8520, Japan.
E-mail: fujimur@nsg.med.tohoku.ac.jp