

been reported to recur between 2 months and 14 years after initial treatment; 80% of recurrences have been within 5 years.<sup>3,6-8</sup> To our knowledge, the present case represents the longest period between prior treatment and recurrence reported to date.

The radiosensitivity of germinomas has been well documented.<sup>2,3,5,9</sup> The 5-year survival rates of patients with germinomas after radiotherapy have been reported to be 95–100%.<sup>2,8,9</sup> The rate of recurrence of CNS germinomas after irradiation has been reported to be 6–17%.<sup>2,3</sup> Ono et al.<sup>3</sup> described 4 patterns of recurrence: an inadequate initial irradiation field, a benign teratoma caused by late growth of the teratoma component,  $\alpha$ -fetoprotein- or human chorionic gonadotropin-producing tumours of extraembryonic origin, and extraneural metastasis without evidence of intracranial germinoma. The pattern of first recurrence in this case may have been an inadequate initial irradiation field, as this targeted only the pineal region. Ono et al.<sup>3</sup> noted that no pure germinoma recurred as the same histological tumour within the irradiated field. Our patient received 50 Gy of irradiation to the pineal region to target the primary germinoma. Seventeen years later, the germinoma recurred in the suprasellar region. The patient received 50 Gy of irradiation to the suprasellar region, because of the danger to the pineal region posed by irradiation of the whole brain. A further recurrence developed in the right frontal lobe along the catheter 4 years after irradiation to the suprasellar region.

We were intrigued that the recurrent tumour disseminated along the ventricular catheter. Although abdominal metastases of brain tumours via ventriculoperitoneal shunts have been reported,<sup>3,4,6</sup> there have been no reports of specific dissemination along the catheter. We consider that the tract around the catheter, created when the catheter was inserted, caused this pattern. Tumour cells brought together by the shunt flow lodged on the brain tissue near the tract and multiplied, subsequently disseminating into the ventricle.

In conclusion, recurrence after such a long period calls attention to the need for long term follow up of patients with germinoma. It is considered that irradiation to the whole ventricular field is necessary as a primary treatment. Also, it is possible that CNS germinomas can recur by dissemination along the ventricular catheter.

## CONCLUSION

We have reported a rare case of intracranial germinoma that recurred along the shunt tube 17 years after prior treatment. Recurrence after such a long period highlights the necessity of long term follow up for patients with germinoma.

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## Transient aphasia and persistent amnesia after surgery for internal carotid artery – posterior communicating artery aneurysm

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**Summary** We report a case of transient aphasia and persistent amnesia after clipping of a ruptured cerebral aneurysm to treat a subarachnoid haemorrhage. Postoperatively, aphasia was identified and magnetic resonance imaging (MRI) showed an abnormal intensity area in the left anterior thalamus. Single photon emission computed tomography (SPECT) revealed a wider area of low perfusion surrounding the left thalamus and left frontotemporal lobe than that shown by the MRI. His aphasia resolved over the subsequent 12-week period. He was left with an isolated disturbance of memory; in the absence of any dementia, aphasia or disturbance of consciousness, his condition was classified as one of amnesia. SPECT 14 weeks after admission revealed an area of low perfusion limited to the left thalamus. These findings suggest that the persistence of amnesia in this case was caused by the infarction of the mammillothalamic tract, and the recovery from aphasia may have resulted from the disappearance of surrounding edema. © 2002 Published by Elsevier Science Ltd.

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**INTRODUCTION**

It is well known that left unilateral thalamic damage is associated with disturbances of language and memory.<sup>1</sup> Although there have been many patients with aphasia and/or amnesia due to thalamic infarction<sup>2-4</sup> or haemorrhage,<sup>5</sup> few patients with aphasia and amnesia after clipping of an aneurysm in a subarachnoid haemorrhage have been reported. We recently had an opportunity to examine a patient who experienced mild transient aphasia and persistent amnesia after a direct operation for an internal carotid-posterior communicating artery (IC-PC) aneurysm.

**CASE REPORT**

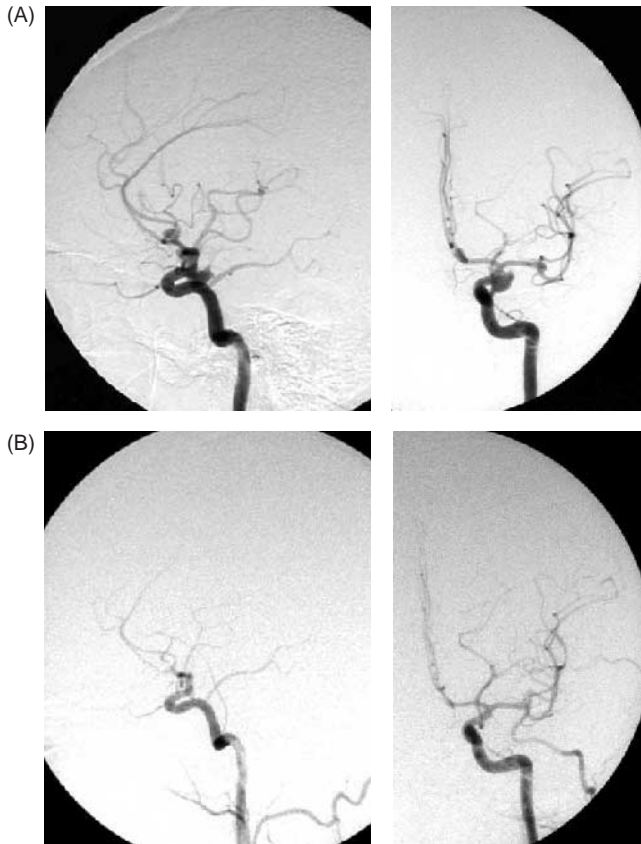
A 48 year old man with a history of hypertension experienced a sudden attack of severe headache with vomiting and was admitted to our hospital. He had no focal neurological signs except for mild neck stiffness. A CT scan showed a subarachnoid haemorrhage (SAH) and an angiogram revealed a left IC-PC aneurysm (Fig. 1A), a left middle cerebral artery (MCA) aneurysm and a distal anterior cerebral artery aneurysm. During the operation, the IC-PC aneurysm was determined to be ruptured, and both the IC-PC and MCA aneurysms were clipped via a left frontotemporal approach. Postoperatively, aphasia was identified and a CT scan showed a low density area in the left anterior thalamus (Fig. 2).

The patient's spontaneous speech was fluent after the operation. He had no difficulty initiating speech or articulating normally, and he did not have logorrhea. Echolalia was not observed, and the patient's phonological structure was clear. Confrontation naming was moderately impaired, with

considerable paraphasia. His repetition ability was excellent and his ability to read aloud was good. His writing was impaired, and considerable paraphasia was seen. On the Wechsler Adult Intelligence Scale-Revised (WAIS-R), his performance intelligence quotient (IQ) was 75. His verbal IQ was unmeasurable because of the aphasia. His score on Raven's coloured progressive matrices (RCPM) was 28/36.

Magnetic resonance imaging (MRI) 4 weeks after onset showed a lesion in the left anterior thalamus including the anterior ventral nucleus (Fig. 3). Single photon emission computed tomography (SPECT) revealed a wider area of low perfusion surrounding the left thalamus and left fronto-temporal lobe than that revealed by CT/MRI (Fig. 4A). Although postoperative internal carotid angiography showed the posterior cerebral artery via the left posterior communicating artery, neither the left tuberothalamic artery (polar artery) nor the thalamoperforating artery was demonstrated (Fig. 1B).

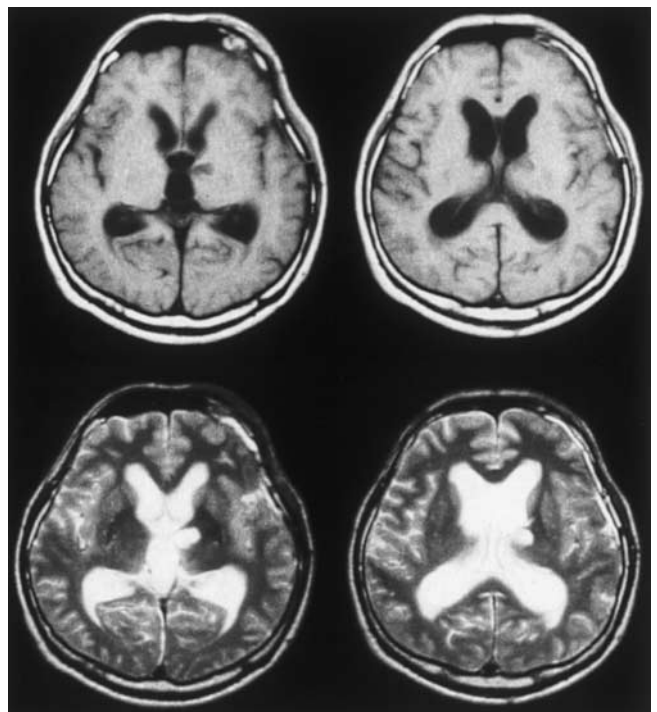
Although his aphasia had resolved almost completely 12 weeks after the operation, the amnesia has persisted. On the



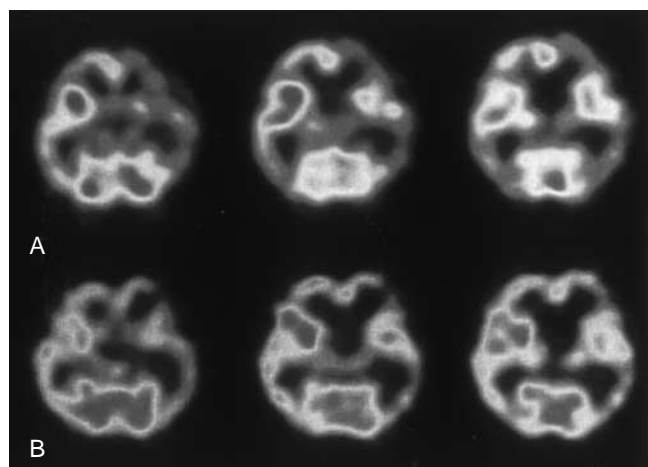
**Fig. 1** (A) Cerebral angiography of the left internal carotid artery revealed a left IC-PC aneurysm. (B) Postoperative internal carotid angiography showed the posterior cerebral artery via the left posterior communicating artery.



**Fig. 2** Postoperative CT scan showed a low density area in the left anterior thalamus.



**Fig. 3** Magnetic resonance imaging 4 weeks after onset showed a lesion in the left anterior thalamus including the anterior ventral nucleus.



**Fig. 4** (A) Single photon emission computed tomography revealed a wider area of low perfusion surrounding the left thalamus and left frontotemporal lobe than that revealed by CT/MRI. (B) Single photon emission computed tomography 14 weeks after onset revealed an area of low perfusion limited to the left thalamus.

WAIS-R, his verbal IQ was 84 and his performance IQ had risen to 86, with an overall IQ of 85. His score on RCPM was 30/36. His digit recollection span was seven, and his word fluency in naming animals was 8 words per minute. Despite these preserved functions, his memory remained clearly disturbed. Although he did not show confabulation, he remained disoriented with respect to day and place. The Benton visual recognition test (BVRT) showed an immediate recall score of 6/10; delayed recall, 2/10; and copying, 10/10. On the auditory verbal learning test (AVLT), his immediate recall performance was 2, 2, 5, 3, 3/15; his delayed recall performance was 0/15; and his recognition performance was 8/15. SPECT 14 weeks after onset revealed an area of low perfusion limited to the left thalamus (Fig. 4B).

## DISCUSSION

Although this patient experienced thalamic aphasia immediately after the surgery, the aphasia resolved over the subsequent 12-week period. He was left with an isolated disturbance of memory; in the absence of any dementia, aphasia or disturbance of consciousness, his condition was classified as one of amnesia.

Earlier reports have noted that cases of thalamic ischaemia that produce aphasia can be divided into either occlusions of the posterior thalamo-subthalamic paramedian artery, which supplies blood to the lateral medial corpus of the thalamus,<sup>6</sup> or occlusions of the tuberothalamic artery, which supplies the anterior and central thalamic corpi.<sup>7</sup>

Recent discoveries indicate that damage to the thalamus may cause secondary impairment of cortical function.<sup>8</sup> In some cases, thalamic aphasia may be correlated with cortical hypometabolism rather than with the extent of the lesion itself. In our case, the lesion as seen in CT/MRI appeared restricted to the anterior section of the thalamus, perfused by a branch of the tuberothalamic artery or the thalamoperforating artery. Examination by SPECT of the area extending from the left frontal lobe to the temporal and parietal lobes also confirmed a regional decline in cerebral circulation.

In cases of thalamic lesions, amnesia tends to persist even in cases where the associated aphasia resolves or improves to a considerable degree. The discrepancies between the characteristics of thalamic aphasia and those of thalamic amnesia

suggest that neither is solely of neuropsychological origin. The important role of the ventrolateral nucleus (VL) in thalamic aphasia and amnesia has been extensively discussed.<sup>6</sup> Ojemann et al.<sup>9</sup> found that electrical stimulation of the VL facilitated recording of verbal information but caused deterioration in the ability to retrieve verbal memories and disturbed object naming. Thalamic aphasia is often accompanied by amnesia,<sup>10</sup> suggesting that the VL may be involved in both aphasia and amnesia.

On the other hand, some investigators have reported that anteriorly located lesions are necessary for amnesia.<sup>4</sup> Damage to the mammillothalamic tract, anteriorly located structures, relates to amnesia.

In this case, one possible reason for the recovery from the aphasia and the persistence of the amnesia may be that the anterior thalamus was affected not only by the infarction itself but also by surrounding oedema, which gradually resolved in the weeks following the damage.

Hunter et al.<sup>11</sup> reported that patients after SAH with a late result of either good or fair frequently had cognitive deficits such as disturbed memory, concentration or language. As a result of surgery, our patient had amnesia and aphasia caused by left thalamic damage to the tuberothalamic artery or the thalamoperforating artery, both of which are perforating branches of the PC. Three possible causes for the syndrome are: the mechanical obstruction of these arteries by clipping, the thromboembolism caused by manipulation – e.g., a temporary clipping – or the distortion of the clip due to postoperative oedema of neighboring structures. An infarct may appear as a result of sacrificing the artery during surgery, but a clear cause was not apparent in our case. Many authors have emphasised that meticulous caution is necessary to preserve the various perforators of the PC in neurosurgical operations such as ICA aneurysms. We also insist that a neurosurgeon needs to explain to the patient that he or she may have neuropsychological deficits after surgery.

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## Intratumoral hemorrhage due to hemangioblastoma arising from a cervical nerve root – a case report

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**Summary** We describe a case of a 70 year old man suffering from sudden weakness of the left foot. Preoperative neuroimaging examinations showed an oval mass 2 cm in maximal diameter with intratumoral hemorrhage at the seventh cervical vertebra. The mass was supplied by the right lateral thoracocervical artery and was drained to the anterior spinal vein. The intraoperative findings showed the hard reddish tumor was not attached to the pia and the posterior root of the fifth cervical nerve was totally encased by the tumor. A histopathological examination revealed that hemangioblastoma encasing the posterior nerve root totally, so that the tumor was thought to arise from it. Unusual presentation of the neuroimaging examinations is described. © 2002 Published by Elsevier Science Ltd.

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### INTRODUCTION

Hemangioblastoma of the spine is relatively rare, representing 1.6–5.8% of all spinal tumors. Few reports have described acute hemorrhage due to spinal hemangioblastoma, located in either the cord parenchyma or the subarachnoid space.<sup>1–3</sup> Although there have been some reported cases of extramedullary hemangioblastoma,<sup>2,4–10</sup> in many of these cases the tumor was only attached to the nerve root.<sup>5,7,10</sup> Subdural type

hemangioblastoma encasing the nerve root wholly, which is considered to arise from the nerve root, is a very rare event.<sup>2,6,9</sup> Here, we describe a case of intratumoral hemorrhage due to hemangioblastoma encasing the posterior root of the fifth cervical nerve.

### CASE REPORT

A 70 year old man was admitted to a regional hospital after sudden occurrence of pain in the neck and weakness of the left foot on May 28, 2000. Five years before admission he had undergone total gastrectomy due to malignant lymphoma. There was no familial history associated with his illness. Magnetic resonance (MR) imaging 24 hours after the development of the weakness revealed a lesion with an unclear margin at the seventh cervical (C) vertebra. The inner part of it was hyperintense on T1-weighted images (WI) and T2WI and its outer part was mixed intensity on T1WI and hypointense on T2WI (Fig. 1A). When he was referred to our hospital for further therapy on June 19, neurological examinations revealed mild weakness of the left arm, severe paresis of the left foot, severe sensory disturbance below the higher level of the thoracic (Th) vertebra, and hyperreflexia of his bilateral lower extremities. Urinary obstruction was also detected. Lumbar tapping showed watery clear cerebral spinal fluid with no evidence of a subarachnoid hemorrhage or xanthochromia. MR imaging 4 weeks after the development of weakness revealed that the mass had grown and showed a clearer margin than it had at the initial imaging (Fig. 1B). Angiographic studies showed a signal in the manner of an arteriovenous fistula which was supplied by the right lateral thoracocervical artery and was drained rostrally to the anterior spinal vein (Fig. 2).

Six weeks after the patient had developed the weakness, C6–Th1 laminoplasty and tumor removal were performed. A hard reddish oval tumor 2 cm in maximal diameter was found in the subarachnoid and extramedullary region, with no attachment to the pia. After easily blunt dissecting from the arachnoid, a posterior nerve root of C5 totally encased with the tumor was recognized. The tumor was supplied by an artery through the lateral foramen of C7 and was drained to the anterior spinal vein. Microscopic diagnosis was that the extramedullary tumor originated from the nerve root because the tumor had the only attachment with it.

A histopathological examination revealed that the demarcated tumor was composed of delicate vascular channels with interstitial 'stromal' cells, accompanied by massive central hematoma formation. The diagnosis was hemangioblastoma with organizing hematoma. Additional immunohistochemical determination using S100 protein revealed a marked positivity for a few cellular components, which indicated the nerve root being totally surrounded by the tumor mass (Figs 3A,B). The postoperative course was uneventful with no neurological deterioration.

### DISCUSSION

Hemangioblastoma of the spine is considered a relatively rare tumor, representing 1.6–5.8% of all spinal tumors.<sup>1–3</sup> Thirty-two percent of patients with spinal hemangioblastoma have von Hippel-Lindau syndrome, while those remaining have sporadically occurring tumors.<sup>2</sup> The mean age of patients with spinal hemangioblastoma is 30 years at onset,<sup>1–3,7</sup> with the presented case constituting an unusual elderly example. In usual cases of spinal hemangioblastomas, MR imaging demonstrates hypointensity to isointensity on T1-weighted