Giant Anterior Communicating Artery Aneurysm Infiltrated with a Primary Cerebral Lymphoma: Case Report

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ABSTRACT

OBJECTIVE AND IMPORTANCE

Central nervous system lymphomas exhibit angiotropic characteristics. Nevertheless, direct association with an intracranial aneurysm is very rarely reported. We present a case of a giant aneurysm infiltrated with a large cell non-Hodgkin's lymphoma. The incidence of primary central nervous system lymphoma is increasing, and similar cases may become more frequent in the future.

CLINICAL PRESENTATION

A 65-year-old man had presented with a giant anterior cerebral artery aneurysm, new onset of seizures, aphasia, and hemiparesis. The aneurysm was treated with Guglielmi detachable coils. Six months later, the patient exhibited fever and neurological deterioration. Magnetic resonance images suggested an enhancing lesion posterior to the neck of the aneurysm. Antibiotic treatment given elsewhere was unsuccessful.

INTERVENTION

A craniotomy for a suspected abscess was performed, with removal of the aneurysm and clipping of the neck. The aneurysm sac appeared to be filled with thrombus and pus. The results of aerobic, anaerobic, and fungal cultures were negative. Postoperative magnetic resonance images demonstrated a residual

Primary central nervous system lymphoma (PCNSL) is rare in the immunocompetent population. This tumor represents 1 to 1.5% of all non-Hodgkin's lymphomas, and 1.7% of all primary malignant brain tumors (12, 13). PCNSL is attracting increasing interest because the disease has been rising in incidence in the United States and other countries, in both acquired immunodeficiency syndrome (AIDS) and non-AIDS populations (1, 2, 9, 13). PCNSLs are usually of the B-cell type. In the central nervous system, they exhibit angiotropism, frequent subependymal involvement, and diffuse spread (1, 3, 6). Despite angiotropism, direct association of lymphoma with a cerebral artery aneurysm is very rare. We are aware of only one previous report of such an association (16). We present a case of a giant aneurysm infiltrated by a large cell non-Hodgkin's lymphoma.

mass, posterior to the aneurysm within the striatum and the internal capsule. Histological examination of the aneurysm wall revealed a large B-cell lymphoma. The diagnosis was confirmed by a stereotactic biopsy. Radiation therapy resulted in a transient decrease in the size of the lesion.

CONCLUSION

Although the tumor was not apparent on the initial imaging studies, it may have been the cause of the patient's presenting symptoms. Infiltration of the aneurysm wall by the lymphoma also raises the possibility of a causal relationship. As the incidence of primary central nervous system lymphoma is reported to be on the increase, awareness this uncommon association of an aneurysm and malignant lymphoma is of value.

Keywords: Aneurysm, Giant aneurysm, Guglielmi coils, Primary CNS lymphoma, Resection

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CASE REPORT

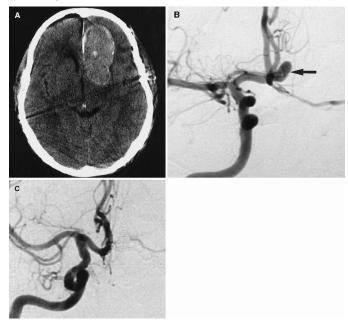
A 65-year-old right-handed Caucasian man was transferred to the Department of Neurosurgery at the University of Illinois at Chicago, with a history of a single episode of a generalized seizure. Findings included mild right hemiparesis and moderate expressive aphasia. Studies included computed tomography (CT) and angiography (Fig 1 , A and B). A giant anterior communicating artery aneurysm, $4.5 \times 4 \times 3.5$ cm, was seen on CT. It was mostly thrombosed, and demonstrated mass effect on the left frontal lobe. Angiography revealed a rather small lumen, compared with the aneurysm size seen on CT. The aneurysm filled from the right side. An additional left posterior communicating artery aneurysm was seen. The symptoms were assumed to be caused by the expanding giant aneurysm. Guglielmi detachable-coil embolization of both aneurysm was

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undertaken at separate sessions, 3 months apart, starting with the anterior communicating artery aneurysm (Fig. 1C). The posterior communicating artery aneurysm coiling was complicated by coil migration, and, at 48 hours, required a craniotomy with removal of the coils and clipping of the aneurysm. The giant aneurysm coils remained in place at that time. The patient's neurological condition was improving, and he was discharged to a rehabilitation facility and, subsequently, home. Six months after treatment of the giant aneurysm, the patient developed a persistent fever and gradual increase in neurological deficit, including progressive aphasia and right hemiparesis. He was admitted to another hospital.

FIGURE 1.

A, noncontrast axial computed tomographic scan, at the level of the basal ganglia, showing thrombus in a giant aneurysm in the left frontal lobe with effacement of the sulcal pattern and compression of the frontal horn of the lateral ventricle. *B*, subtraction angiogram, revealing the relatively small lumen of the anterior communicating artery aneurysm (*arrow*) filling from the right internal carotid injection. *C*, subtraction angiogram, immediately after coiling, showing more than 95% occlusion of the aneurysm.



An extensive systemic fever work-up revealed no extracranial source of infection. Lumbar puncture was performed twice, demonstrating lymphocytosis, normal glucose, negative results for Gram's stain, and no growth of bacteria. The working diagnosis was operative site infection, with possible infected giant aneurysm. Intravenous administration of antibiotics was given. Two months later, despite continuous antibiotic treatment, the patient's condition deteriorated further.

FIGURE 2.

A, noncontrast computed tomographic scan, 6 months after coiling, demonstrating new density at the posterior aspect of the thrombus (*white arrow*) with low density changes of vasogenic

edema in the frontal and temporal lobes and extending into the cerebral peduncle (*open arrow*). T2-weighted (*B*) and T1-weighted postgadolinium (*C*) magnetic resonance imaging scans, confirming the presence of the new lesion posterior to the thrombosed aneurysm (*B*, *black arrow* and *C*, *white arrow*). The lesion enhances after contrast enhancement, and a second lesion on the right side is detected (*B* and *C*, *curved white arrow*).

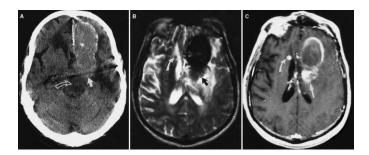


FIGURE 3.

Intraoperative photograph showing the open dome of the aneurysm, which appeared full of thrombus and pus. Note that the coils are still in situ and there is no bleeding, indicating persistent complete occlusion of the neck of the aneurysm.

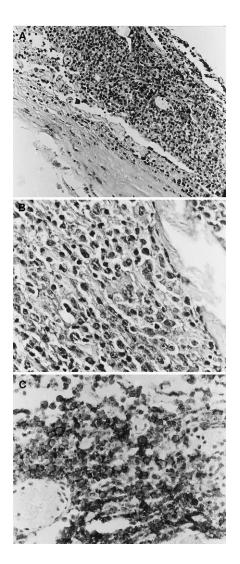


At this point, the patient was transferred back to our service. CT was repeated, demonstrating a new soft-tissue density at the posterior aspect of the giant aneurysm, with surrounding vasogenic edema (Fig. 2 A). Magnetic resonance images (Fig. 2, B and C) confirmed the presence of the lesion, posterior to the thrombosed aneurysm and demonstrating contrast enhancement, and two other enhancing lesions were revealed. We suspected that the deterioration was caused by an abscess within and near the giant aneurysm. A craniotomy was performed, with removal of the giant aneurysm and the coils within it, and clipping of the neck was done. At surgery, the aneurysm sac appeared to be filled

with thrombus and pus (Fig. 3). Near the base on the aneurysm, the brain appeared abnormal, with a yellow discoloration. However, no pus was seen, and the area was not resected. The presumptive diagnosis was that of cerebritis surrounding the giant aneurysm. The wall of the resected aneurysm was sent for histological examination (Fig. 4).

FIGURE 4.

Photomicrographs of lymphoma cells. *A*, cells infiltrating the collagenous aneurysm wall (hematoxylin and eosin stain; original magnification, $\times 4$). *B*, large cells with circumscribed cytoplasm and hyperchromatic pleomorphic nuclei, occasionally containing a prominent nucleolus (hematoxylin and eosin stain; original magnification, $\times 20$). *C*, CD-20 immunostaining (original magnification, $\times 20$). Note the distinct membranous staining pattern of the neoplastic cells with this B-cell marker.

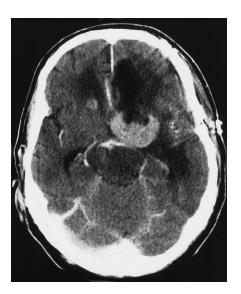


Neoplastic-appearing lymphoid cells were present, forming small masses and lining the external surface of the collagenous aneurysm wall. In many areas, the wall was also infiltrated by the lymphoid cells, which focally extended through the wall, into the aneurysm lumen. Intraluminally, organized blood clot was present; there was no evidence of infection. Necrosis was abundant within the tumor. The neoplastic cells exhibited large pleomorphic nuclei and moderately well-circumscribed cytoplasm. Results were immunopositive with antibody to CD20, a B-cell marker, and they were negative for immunostaining with CD3, a T-cell marker, cytokeratin antibody, and homatropine methylbromide-45 antibody. The pathological diagnosis was large cell lymphoma, B-cell type, infiltrating the aneurysm wall.

Postoperative CT revealed a residual mass, posterior to the aneurysm within the striatum and the internal capsule on the left side, with midline shift and persistent mass effect (Fig. 5). There was no improvement in the patient's condition; he remained lethargic, aphasic, and profoundly hemiparetic. A stereotactic biopsy of the residual mass confirmed the diagnosis of large cell lymphoma, B-cell type. All results of tissue stains and cultures, including those for tuberculosis and fungi, were negative; and the results of a human immunodeficiency virus test were negative. Further work-up revealed no evidence of a systemic lymphoma.

FIGURE 5.

Postoperative contrast-enhanced computed tomographic scan demonstrating excision of the thrombosed dome of the aneurysm; however, the enhancing mass and surrounding edema remain.



Radiation therapy was started, which resulted in a mild decrease in the size of the lesion. The clinical response was minimal, and chemotherapy was initiated. No further clinical response was noted, and the patient died 3 months later. The family declined an autopsy.

DISCUSSION

In our 65-year-old male patient, a primary cerebral lymphoma coexisted spatially and temporally with an unruptured giant cerebral aneurysm. We are aware of only one previously reported case of infiltration of a cerebral artery aneurysm by a malignant lymphoma (16). That patient died as a result of the rupture of the infiltrated aneurysm. In another case, a large cell, malignant PCNSL was found in a patient, 2 months after clipping of a ruptured anterior cerebral artery aneurysm; however, the lymphoma was separate from the aneurysm (15). Even in these

rare cases of coexisting brain lymphoma and aneurysm, the two conditions were considered purely coincidental (18).

The prevalence of intracranial aneurysms is estimated by autopsy and angiographic study to be 0.2 to 8.9% of the population (20). High prevalence (4.6%) was reported in Japanese autopsy-based studies (11). The prevalence of diagnosed aneurysm in living patients is much lower, and was about 0.01% in the Olmsted County, Minnesota study (14).

In the Caucasian population, incidental aneurysms can be expected to occur in at least 0.5% of patients with brain tumors (19). Association with common tu mors, such as meningiomas, is reported frequently (7, 17, 22). The average annual incidence of non-AIDS-related PCNSL was 1.56 cases per 1,000,000 (12). However, the incidence of PCNSL may be increasing in the United States and other countries, both in AIDS patients and as sporadic tumors in immunocompetent populations (2, 9, 10, 13).

In our case, close physical proximity between the tumor and the aneurysm, with infiltration of the aneurysm wall by the lymphoma, raises the possibility of a causal relationship. Aneurysms may be congenital, or they may form de novo during life. Several epidemiological and physiological factors are known to increase the risk for aneurysm formation, including female sex, arterial hypertension, and smoking (4, 21). In the absence of a disease process, aneurysm development is thought to be mediated mechanically, and it tends to occur at high shear-stress areas, such as bifurcations and curves (8). Recently, extensive inflammatory changes were found in unruptured intracranial aneurysms (5). These changes may contribute to aneurysm formation and rupture. In our patient, it is possible that infiltration by malignant cells weakened the arterial wall and promoted aneurysm formation. Nevertheless, the aneurysm originated at a common location for spontaneous aneurysms. Perhaps the aneurysm was there for years, and was asymptomatic and small. With the development of the lymphoma adjacent to the aneurysm, the wall was weakened further, allowing the aneurysm to grow. Plausibly, even the initial symptoms could have been caused by the tumor growing near the neck of the aneurysm, with the latter being an asymptomatic coincidental finding. An unlikely possibility is that the aneurysm caused or accelerated the growth of the lymphoma. To our knowledge, there are no published data consistent with this speculation.

Before the pathology report was available, our working diagnosis for the patient's deteriorating condition had been infection. Although coiling introduces a foreign body into the patient, infections are rare. We have found only one report in the literature (23), and that was associated with a venous infarction, rather than an infection within the treated vessel. In our experience at the University of Illinois at Chicago, we have seen no infections associated with aneurysm coiling (GM Debrun, 1998, unpublished data).

In retrospect, the time course and the symptoms were consistent with a growing malignant tumor in the brain. Lymphomas may develop in various locations in the brain, and they may imitate different lesions. Awareness of this possibility may shorten the time to diagnosis in the future. If the incidence of PCNSL increases further, cases such as ours may become more common. We think it is important to promote awareness of this rare combination of clinical and pathological findings. The development of new treatment strategies depends on a better understanding of the biology of intracranial aneurysms. Further reports may shed light on whether inflammation or invasion of a cerebral artery by tumor may contribute to the formation of an aneurysm.

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COMMENTS

The authors have reported a very unusual and interesting case of a patient with a giant anterior communicating artery aneurysm infiltrated by a primary cerebral lymphoma. Although the anterior communicating artery is the most common site for the development of berry aneurysms, aneurysms in this location rarely enlarge to giant proportions. Likewise, primary cerebral lymphoma is a relatively uncommon condition in the nonimmunocompromised population.

The authors' discussion of these two conditions is thorough. They speculate on the possible relationship between these two lesions, hypothesizing that the lymphoma may have infiltrated the artery and produced the aneurysm, or, less likely, the aneurysm in some manner induced the formation of the lymphoma. Although neither of these speculations can be proven or discounted, this common site for aneurysmal formation makes it highly probable that this is simply a very unusual coincidence.

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In this interesting case report, Roitberg et al. describe a patient who presented with a giant anterior communicating artery aneurysm. Six months after treatment with Guglielmi detachable coils, the patient's condition deteriorated, and, after various investigations, he was found to have a primary central nervous system (CNS) lymphoma that infiltrated the wall of the aneurysm and formed a mass in the adjacent brain tissue. The authors speculate that the tumor may have played a role in the growth of the aneurysm. Primary CNS lymphomas are characteristically angiocentric in brain tissue; however, their association with aneurysms involving intracranial vessels has apparently been previously reported only once. Interestingly, a recent article describes widespread infiltration of an abdominal aortic aneurysm by a T-cell lymphoma; the authors of that study also suggested that destruction of the vessel wall by infiltrating tumor cells may have played a role in the growth of the aneurysm (2). A possible causal relationship is also supported by the description of multiple intracranial aneurysms associated with the uncommon lymphoproliferative disorder, lymphomatoid granulomatosis (1). It is important to look for other cases of coexistent cerebral aneurysm and primary CNS lymphoma to further characterize the rare circumstances under which this tumor may play a causal role in aneurysm formation and growth.

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The authors document this very unusual situation of CNS lymphoma and associated intracranial aneurysm. As they point out, the initial radiographs look very much like a partially thrombosed giant aneurysm. There is no apparent indication that these images are consistent with tumor. The later studies, with increased enhancement, raise the issue of possible infection versus tumor. As the authors note, this case report is only the second one that documents the association of CNS lymphoma in an arterial aneurysm. The authors do a good job of illustrating the details of this situation.

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