Arterial Dissection and Subarachnoid Haemorrhage in Human Immunodeficiency Virus-Infected Patients

A Report of Three Cases

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Summary

Cerebrovascular complications of AIDS have been reported as high as 34% in post mortem series. Most patients suffer from ischaemic strokes but there are a number of reports of patients presenting with subarachnoid haemorrhage (SAH) related specifically to aneurysm rupture. We present three patients with advanced HIV disease and low CD4 counts who present with SAH. In two of the patients the haemorrhage appeared to be caused by intracranial artery dissection which, to our knowledge, has not previously been described. Both patients were successfully treated endovascularly, one with segmental vessel trapping and the other with partial coil embolization of a false aneurysm. The pathological basis for HIV related arteriopathy is discussed in relation to these cases.

Introduction

Human Immunodeficiency Virus (HIV) infection is associated with cerebrovascular complications including ischaemic stroke, intracerebral and subarachnoid haemorrhage (SAH)¹. While the pathophysiology of these events is unclear there is imaging and histological evidence that HIV infection causes cerebral vessel injury sometimes associated with a dilated or aneurysmal arteriopathy^{2,3,4,5}. Previously pub-

lished reports of patients presenting with SAH include patients with saccular aneurysms and fusiform aneurysms^{1,7,6,8}. We present three patients who have advanced HIV infection and presented with SAH from suspected intracranial arterial dissection.

Case 1

A 32-year-old male with Centre for Disease Control stage C HIV infection presented to the emergency department with sudden severe headache, neck pain, nausea and vomiting. On examination he was noted to be thin with a body weight of less than 10% of what would be appropriate for his height. He was clubbed with extensive oral and oesophageal thrush. Neurological examination revealed features of meningism but no focal signs. He was confused with a Glasgow Coma Score of 13/15 and was assessed as Grade II subarachnoid haemorrhage (SAH) on the World Federation of Neurological Surgery (WFNS) scale.

The diagnosis of SAH was confirmed on lumbar puncture which showed xanthochromia of a centrifuged supernatant specimen. Cell counts were not possible because of the volume of blood in the CSF. Serology for cryptococcus and syphilis were negative. Platelets were 230 / μ l and a total white cell count was 5.8 cells/ μ l with a CD4 count of 123. A cardiac echo was

Figure 1 T1 weighted MRI showing subacute blood clot in the region of the left vertebral artery.

normal and blood cultures were negative. A computer tomography scan of the head showed extensive SAH (Fischer grade IV) with mild ventriculomegaly. MRI and MRA confirmed the presence of SAH but also showed a focal area of clot in the region of the intradural left vertebral artery with some vessel narrowing in this region (figure 1).

The patient was treated with analgesia, intravenous fluids and Nifedipine. Over a period of four days the patient's level of consciousness improved to normal although his neck pain persisted on the left side. Because of his continued improvement a cerebral angiogram was

Figure 3 Left vertebral lateral view showing stenosis and dilatation of the falx cerebelli artery origin.

Figure 2 Left vertebral AP view showing a small false aneurysm at the origin of the falx cerebelli artery (star) and dilatation of the right AICA (arrow).

performed which showed dilated arteriopathy of the right anterior inferior cerebellar artery (AICA) and left internal carotid artery. Other medium size vessels also appeared irregular and the intradural origin of the left falx cerebelli artery showed stenosis at its origin associated with a small aneurysm (figures 2,3,4). This was judged to be a false aneurysm related to dissection of the vertebral or falx cerebelli artery at its origin. Flow in the contralateral vertebral artery was good and no spinal artery filling was noted on the left vertebral run. Using a 5 Fr guider softtip (Boston Scientific) and Nautica microcatheter (EV3) the left vertebral artery was closed over the false aneurysm segment using 2 GDC coils (figure 5).

The intervention was performed under local anaesthetic. Following the procedure the patient remained well with no new deficit and over the next four hours his left-sided neck pain resolved. He was discharged home on day two after the treatment. Three months later the patient underwent follow-up angiography. The left vertebral injection showed that the coils were undisplaced and that the vessel had recanalised. The left PICA and falx cerebelli artery still filled and were irregular but no aneurysm was seen (figure 6).

Case 2

A 29-year-old female patient known to be HIV positive presented one week after developing symptoms of headache, neck stiffness,

nausea and vomiting. On examination she had no neurological deficit with a GCS of 15/15 and was categorised as a grade I SAH (WFNS scale). She was afebrile with no other evidence of bleeding diathesis and cardiovascular examination was normal. A lumbar puncture confirmed the diagnosis of SAH. A CT scan of the head showed SAH and intracerebral haemorrhage into the right caudate nucleus and frontal lobe with blood also visible in the lateral and third ventricles. A coagulopathy screen was normal and platelets were 217/ul. Total white cell count was 3.7 cells/ul and CD4 count was 137. Screening for syphilis was negative. Cerebral angiography was performed demonstrating a small but multilobulated aneurysm of the right A1 segment of the anterior cerebral artery at its origin (figures 7,8). There was also minor vessel narrowing related to this. No dilated arteriopathy was noted and other vessels appeared normal with good cross-flow seen on injection of the left carotid with cross-compression. Because the aneurysm morphology was irregular and its location and size unusual it was judged as being a false aneurysm related to vessel dissection.

Endovascular treatment was thought to be most suitable and using a steam shaped microcatheter (Excel 14, Boston Scientific) it was possible to place a GDC 10 soft 2 mm coil into the aneurysm without any force (figure 9). The patient made a good recovery and was discharged after five days. She remains well after three months of follow-up but has not yet had a control angiogram.

Case 3

A 36-year-old male patient on treatment for pulmonary tuberculosis with CDC stage C HIV infection presented with a four day history of occipital headache.

There had been no clear ictus and on examination the patient was afebrile, fully conscious with no focal neurological signs but had features of meningism. A lumbar puncture was performed which was blood stained with a xanthochromic supernatant. All CSF stains and cultures for infection were negative. A screen for coagulopathy revealed no abnormality. A CD4 count was 103 and cardiac echo was normal. An un-contrasted CT scan showed no subarachnoid blood but on administration of contrast there was enhancement of dilated

Figure 4 Right internal carotid artery AP view showing carotid siphon dilated arteriopathy.

vessels in the left sylvian and crural cisterns (figure 10).

MRA and cerebral angiography confirmed that there was a dilated arteriopathy involving mostly the left middle and posterior cerebral arteries (figures 11,12). Which of these dilations had caused the patient's haemorrhage was not apparent and no endovascular intervention

Figure 5 GDC placement in the left vertebral artery.

Figure 6 Three month control angiogram showing vertebral artery recanalisation and false aneurysm healing.

Figure 7 AP view of the right internal carotid artery with a false aneurysm of the A1 proximal vessel.

Figure 8 Lateral view of the small false aneurysm.

was undertaken. During the period of admission the patient remained stable with resolution of his meningism symptoms. He was later started on anti-retroviral therapy.

Discussion

The incidence of cerebrovascular disease in AIDS patients is reported as being as high as 34% with most patients having ischaemic infarcts rather than haemorrhages¹. There are however a number of publications describing SAH as a presenting clinical syndrome in HIV and AIDS^{1,6,7,8,9}.

Silverstroni et Al reported on a patient with autoimmune thrombocytopaenia who was HIV positive and presented with SAH, however most other reports found aneurysm rupture as the underlying aetiology⁹.

Maniker et Al document six patients with AIDS or HIV infection who had ruptured cerebral aneurysms⁸. These aneurysms were all described as saccular although other possibilities are not discussed or excluded. In contrast to this are publications describing paediatric patients presenting with multiple fusiform type

aneurysms and SAH in the setting of advanced HIV disease^{6,7,10}.

These findings of a dilated arteriopathy have also been reported by others in the absence of SAH but sometimes associated with ischaemic stroke^{4,5,11,12,13,14}. Post mortem studies in HIV patients with and without the dilated arteriopathy have shown intimal proliferation and fibrosis as well as destruction of the internal elastic lamina^{3,4,10,13}. Although one of the patients we present did not have evidence of arterial dilation and another had no false aneurysm we felt that all suffered SAH as a consequence of arterial dissection.

This was based on the aneurysms occurring in atypical locations for saccular aneurysms and having the morphological appearance of dissection with associated false aneurysms in two of the patients.

The treatment of transmural dissections remains controversial with proponents for surgery and endovascular treatment^{15,16}. Options range from proximal vessel occlusion to vessel reconstruction and revascularisation.

In our first patient the dissection was felt to be involving the origin of the falx cerebelli vessel and as has been noted previously this can be easily confused with a PICA region saccular aneurysm were it not for the other features of vessel disease. An endovascular approach seemed to offer significant advantage in an immune compromised patient and the treatment strategy appeared limited to vertebral artery occlusion preferably just below the PICA origin.

The risk of stroke was assessed as small based on good flow in the contralateral vertebral artery and minimal flow in the stenosed ipsilateral PICA with dominant cerebellar supply through a larger left AICA vessel. Two GDC coils were placed in the vertebral artery causing immediate occlusion but at follow-up the vessel had recanalised.

Figure 9 Single 2 mm coil in the false aneurysm with preservation of the A1 vessel.

Figure 10 Contrast enhanced CT scan showing dilated cerebral vessels.

The treatment was effective however in allowing occlusion for long enough for the false aneurysm to heal. Resolution of the patient's neck pain was interesting as we have noticed this in other patients treated with endovascular occlusion of vertebral dissections.

The second patient had a larger false aneurysm of the A1 origin. Surgery was felt to be contraindicated not only because of immune compromise but also because re-

Figure 11 MRA with dilated arteriopathy of medium sized arteries.

pair or trapping of the aneurysm would not be possible without middle cerebral artery compromise. Endovascular treatment was undertaken with the aim of trapping the A1 dissected segment. We were fortunate however in that the catheter tip positioned right opposite the

aneurysm origin and a soft 2 mm coil migrated into the false lumen without any force. Complete aneurysm filling was not obtained nor sought after because of the risk of rupture.

Our third patient demonstrates the dilated arteriopathy that has been previously described although in this instance there is involvement of distal vessels as well as the circle of Willis. We were unable to determine which segment of arteriopathy was responsible for the patient's haemorrhage and as such performed no direct treatment. Although no false aneurysm was identified as in the other cases we hypothesize that the dilated vessels represent areas of focal weakness that are prone to dissection. There may already have been some degree of healing at the time that our angiogram was performed.

Based on our observations in these three cases it seems probable that previously reported elastic lamina destruction and intimal thickening not only predisposes to vessel dilatation but also to dissection. If this hypothesis is correct then it would provide a unifying theory of how patients with dilated arteriopathy in HIV infection may present with either haemorrhage or occlusive stroke. HIV infection has been implicated in causing cerebrovascular injury through direct invasion of the endothelium.

Figure 12 Left carotid angiogram showing dilated arteriopathy of the middle cerebral artery branches.

Kure et Al were able to show arterial wall staining with HIV monoclonal antibody (Anti gp 41) in a patient with aneurysmal arteriopathy. The direct role of viraemia is strengthened by the observation that aneurysmal dilatation is seen in patients with advanced disease and high serum HIV (p 24) antigen load^{2,3,5,6,12}.

Our patients also had very low CD4 counts which in advanced disease correlates with high viral load. Other mechanisms of vascular injury in HIV infection have also been postulated. These include co-infection with varicella-zoster⁷ systemic elastase increase in response to infection³ or inflammation caused by immune reconstitution¹¹.

The role of anti-retroviral therapy in the treatment of HIV related arteriopathy is unclear. Mazzoni et Al showed no change in aneurysm size on MRI following four months

of treatment⁶. This was despite a reduction in viral load to undetectable levels. It might mean that in the face of impaired immunity repair processes could take longer than expected.

The above discussion suggests that advanced HIV infection associated with low CD4 counts and high viral load may be the cause of dilated or aneurysmal arteriopathy seen in some patients.

Our cases indicate that dissection is a possible complication of this arteriopathy and is a more likely cause of SAH than saccular aneurysm formation and rupture in this group. Endovascular approaches offer a rapid, safe and cost effective method of treatment even in this advanced stage of patient's disease. Ideally it should be accompanied by anti-retroviral treatment if the arteriopathy progression can hope to be limited.

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