OXFORD

Oxford Medical Case Reports, 2023, **6**, 238–240
https://doi.org/10.1093/omcr/omad065
Case Report

MOYAMOYA disease in an adolescent with HIV-1

Noella Maria Delia Pereira [1,*], Yashwant R. Gabhale[1], Mamatha M. Lala [2], Harshad Dere [1] and Radha Ghildiyal[1]

[1]Department of Pediatrics, Pediatric Centre of Excellence for HIV Care, LTMMC & GH, Mumbai, India
[2]Department of Pediatrics, K. B. Bhabha Bandra Hospital, Mumbai, India and Department of Pediatrics, Pediatric Centre of Excellence for HIV Care, LTMMC & GH, Mumbai, India
*Correspondence address. Department of Pediatrics, Pediatric Centre of Excellence for HIV Care, 1st Floor, College Building, Lokmanya Tilak Municipal Medical College & General Hospital, Dr. Babasaheb Ambedkar Road, Sion (West), Mumbai 400022, India. Tel: +91-9821301567; E-mail: noella_pereira@yahoo.com

Abstract

Moyamoya disease has been reported in both children and adults with HIV-1. Most cases reported in children were found to have unsuppressed viral loads and low CD4 counts. Although the aetiology of the disease is largely unknown, a few studies have postulated cytokine imbalance and immune activation as possible causes. Intimal staining of the involved cerebral arteries have revealed transmembrane glycoprotein of HIV-gp 41. We present the case of an 18-year-old boy with congenitally acquired HIV-1 who presented with right hemiparesis at the age of 12 years and was found to have Moyamoya disease on neuroimaging. His CD4 count has always been low (<100 cells/cumm) in spite of being virally suppressed. He was started on anti-retroviral therapy at 5 and half years of age and he was continued on the same. He was treated conservatively and he continues to have residual right hemiparesis.

INTRODUCTION

Moyamoya disease has been seen in patients with long-standing human immunodeficiency virus (HIV) now that survival has improved with good adherence to medication [1]. A few cases have been reported in children, in both controlled and uncontrolled HIV infection [1–4]. We present the case of an 18-year-old adolescent with congenitally acquired HIV with moyamoya disease who first presented with a stroke at the age of 12 years.

CASE REPORT

An 18-year-old boy with congenitally transmitted HIV-1 was diagnosed and started on anti-retroviral therapy (ART) at the age of 5 and half years with stavudine, lamivudine and nevirapine. One month later, he was diagnosed to have abdominal tuberculosis and was given 6 months of anti-tuberculosis therapy. He also has a past history of varicella at the age of 2 and half years. His ART regime was later substituted to abacavir, lamivudine and nevirapine due to the phasing out of stavudine at the age of 9 years, and it was later changed to tenofovir, lamivudine and lopinavir/ritonavir at 12 years due to suspected immunological failure. Lopinavir/ritonavir was later substituted to dolutegravir. He has been virally suppressed all throughout. However, his CD4 count has always been <100 cell/mm^3 in spite of being virally suppressed. Cotrimoxazole prophylaxis has been given all throughout. No other opportunistic infections were seen.

At 12 years of age, he developed right hemiparesis with right-sided choreiform movements. Aspirin was started and the patient's magnetic resonance imaging (MRI) revealed a focal/fusiform aneurismal dilatation/ectasia predominantly along the left lateral aspect of the basilar artery just adjacent to its bifurcation, with ectasia of the origin of right posterior cerebral artery (PCA) measuring 8 × 8 × 8 mm along with aneurismal dilatation/ectasia involving the terminal left internal cerebral artery and its bifurcation measuring 6 × 6 × 6 mm, extending to involve proximal A1 and M1 segments along with paucity of M2 and M3 cortical segment vessels. Small vessel ischemic changes were also seen. Thrombotic workup was found to be normal. Renal and lower limb dopplers were normal.

Digital subtraction angiography (DSA) done a year later revealed ectasia of the basilar artery at the bifurcation of the posterior cerebral artery (PCA), left anterior cerebral artery (ACA) A1 segment saccular aneurysm. Both right and left middle cerebral arteries (MCA) showed vasculitic changes of patchy appearance most pronounced on the left side. ART was continued along with daily aspirin and cotrimoxazole preventive therapy.

Repeat MRI done 5 years later revealed aneurysms at the left internal carotid artery (ICA), with bifurcation of size 5 × 5 mm, and at the basilar artery bifurcation of size 8.7 × 7.6 mm.

DSA repeated 6 years later revealed diffuse narrowing of both right and left supra-clinoid internal carotid arteries (ICA), with aneurysmal dilatation at the right ICA top involving the A1 segment of the anterior cerebral artery (ACA), proximal M1 with non-visualization of the middle cerebral artery (MCA) beyond proximal M1 with distal reformation via extensive lenticulostriate collaterals giving a puff of smoke appearance suggestive of moyamoya phenomenon as seen as Fig. 1.

On examination, his weight was 42.45 kg and height was 160 cm. Body mass index (BMI) was 16.58 kg/m^2 (Z score between −2 and − 3 SD). His heart rate was 110 beats/min, respiratory rate was 20 breaths/minute and blood pressure was 114/80 mmHg. Old scars of varicella infection were present over the face. Cardiovascular system examination was unremarkable. Neurological examination revealed a residual paresis on the right

Received: April 6, 2023. **Revised:** May 16, 2023. **Accepted:** May 24, 2023

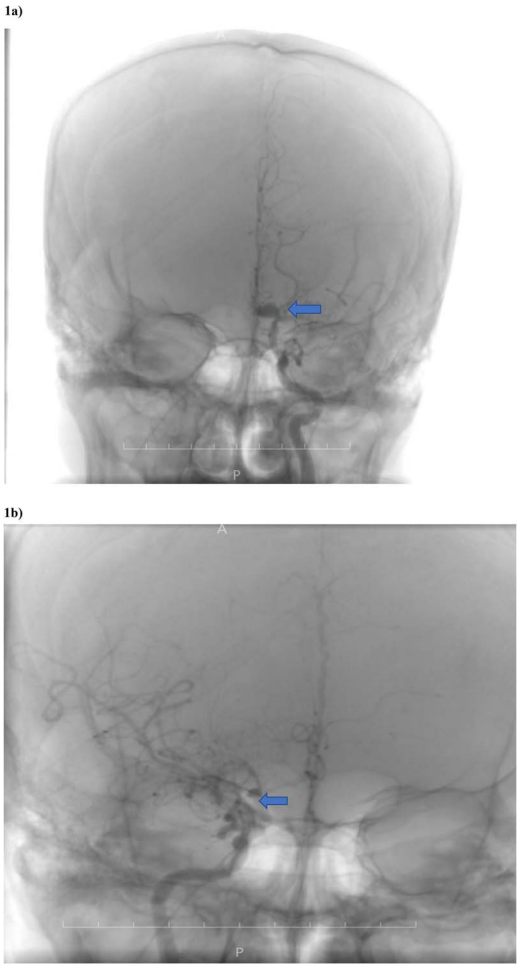

Figure 1. DSA showing (**a**) left supraclinoid ICA and (**b**) right supraclinoid ICA narrowing with obliteration of the anterior carotid and middle carotid arteries and extensive lenticulostriate collateral giving a puff of smoke appearance on both sides.

side with a power of Grade 5. The aspirin was discontinued and the patient continues to be on regular follow-up.

DISCUSSION

HIV-associated vasculopathy in patients with HIV-1 disease has been found to be due to the proinflammatory state and cytokine imbalance, leading to endothelial damage [4]. Involvement of the regulatory protein Tat in cytokine dysregulation in the central nervous system has been mentioned as a possible cause along with elevated levels of intercellular adhesion molecule-1 and soluble vascular cell adhesion molecule-1 [5, 6]. Immune activation in response to transendothelial migration of HIV strains coupled with HIV tropism for brain mononuclear cells has been postulated in the pathogenesis of cerebral aneurysms [7, 8]. Moyamoya disease should be considered in children with HIV having a stroke. The most common arteries to be affected are the ICA, followed by the MCA and ACA [9]. Our patient also showed involvement of both the ICAs. Medial fibrosis, intimal hypoplasia and loss of muscularis and elastic tissue are the common histopathological findings [6, 9]. Intimal staining of the involved cerebral arteries have revealed transmembrane glycoprotein of HIV-gp 41, suggesting transendothelial migration of the virus and a direct effect of the virus in the pathogenesis [8, 10]. Varicella infection and tuberculosis have been described as possible aetiologies of acute hemiplegia [1, 6, 7]. However, our patient did not show any clinical signs of active infection. Complications of moyamoya disease include cerebral ischemia and haemorrhage, leading to weakness, speech disorder and convulsions [9]. Our patient presented with hemiparesis on the right side with no speech abnormalities or seizures. Treatment in children is largely conservative [9]. However, revascularization surgery is being increasingly used [3].

Early initiation of ART plays a vital role in the prevention of HIV vasculopathy. Protease inhibitors have been linked to drug-induced vasculopathy. Monitoring of patients to maintain good adherence to ART, thus achieving viral suppression and good immunity, may help prevent vascular complications. Ongoing clinical monitoring to prevent rupture of the cerebral aneurysm and haemorrhage is vital in these patients.

ACKNOWLEDGEMENTS

The authors thank Dr Krishna Chidrawar, Clinical fellow—Interventional Radiology, Lokmanya Tilak Municipal Medical College & General Hospital, Sion, Mumbai 400022.

CONFLICT OF INTEREST STATEMENT

None declared.

FUNDING

Funding towards the article processing charges received from the London School of Hygiene and Tropical Medicine.

ETHICAL APPROVAL

Taken from Hospital Ethics Committee.

CONSENT

Patient's written consent was obtained for publication.

GUARANTOR

Dr Noella Pereira, Consultant—Paediatric HIV & Telemedicine, Paediatric Centre of Excellence for HIV Care, Lokmanya Tilak Municipal Medical College & General Hospital, Sion, Mumbai 400 022.

DETAILS OF THE CONTRIBUTION OF EACH AUTHOR

All authors were involved in patient management, preparation of manuscript and approval of the final version.

NAME OF THE DEPARTMENT AND INSTITUTION TO WHICH THE WORK SHOULD BE ATTRIBUTED

Department of Pediatrics, Pediatric Centre of Excellence for HIV Care, Lokmanya Tilak Municipal Medical College & General Hospital, Sion, Mumbai 400 022, India.

DISCLAIMERS, IF ANY

None.

REFERENCES

1. Sharfstein SR, Ahmed S, Islam MQ, Najjar MIRV. Case of moyamoya disease in a patient with advanced acquired immunodeficiency syndrome. *J Stroke Cerebrovasc Dis* 2007;**16**:268–72.
2. Hammond CK, Shapson-Coe A, Govender R *et al.* Moyamoya syndrome in south African children with HIV-1 infection. *J Child Neurol* 2016;**31**:1010–7.
3. Jindal AK, Bhattad S, Suri D, Singhal M, Gupta A, Singh P. Moyamoya syndrome in a child with HIV-1 infection. *Pediatr Infect Dis J* 2018;**37**:e166–7.
4. Yamanaka J, Nozaki I, Tanaka M, Uryuu H, Sato N, Matsushita TSH. Moyamoya syndrome in a pediatric patient with congenital human immunodeficiency virus type 1 infection resulting in intracranial hemorrhage. *J Infect Chemother* 2018;**24**:220–3.
5. Rappaport J, Joseph J, Croul S, Alexander G, Del Valle L, Amini S *et al.* Molecular pathway involved in HIV-1-induced CNS pathology role of viral regulatory. *J Leukoc Biol* 1999;**65**:458–65.
6. Monsuez JJ, Charniot JC, Escaut L, Teicher E, Wyplosz B, Couzigou C *et al.* HIV-associated vascular diseases: structural and functional changes, clinical implications. *Int J Cardiol [Internet]* 2009;**133**:293–306. Available from: https://doi.org/10.1016/j.ijcard.2008.11.113.
7. Tipping B, De Villiers L, Candy S, Wainwright H. Stroke caused by human immunodeficiency virus-associated intracranial large-vessel aneurysmal vasculopathy. *Arch Neurol* 2006;**63**:1640–2.
8. Mazzoni P, Chiriboga CA, Millar WS, Rogers A. Intracerebral aneurysms in human immunodeficiency virus infection: case report and literature review. *Pediatr Neurol* 2000;**23**:252–5.
9. Baeesa SS, Bakhaidar M, Almekhlafi MA, Madani TA. Human immunodeficiency virus-associated cerebral aneurysmal vasculopathy: a systematic review. *World Neurosurg [Internet]* 2016;**87**:220–9. Available from: http://dx.doi.org/10.1016/j.wneu.2015.11.023.
10. Kure K, Park YD, Kim TS, Lyman WD, Lantos G, Lee S *et al.* Immunohistochemical localization of an HIV epitope in cerebral aneurysmal arteriopathy in pediatric acquired immunodeficiency syndrome (AIDS). *Pediatr Pathol* 1989;**9**:655–67.