*Cardiology in the Young* (2018), **28**, 461–463
doi:10.1017/S1047951117001974



*Brief Report*

# Subarachnoid haemorrhage from undiagnosed mycotic aortic aneurysm in a child

Takeshi Shinkawa,[1] Raghu H. Ramakrishnaiah,[2] Brian K. Eble[3]

[1]*Division of Pediatric and Congenital Cardiothoracic Surgery;* [2]*Division of Pediatric Radiology;* [3]*Division of Pediatric Cardiology, Arkansas Children's Hospital, University of Arkansas for Medical Sciences, Little Rock, Arkansas, United States of America*

**Abstract** We report a case of subarachnoid haemorrhage resulting from a mycotic aortic aneurysm in a child with CHD. The patient previously underwent operations for CHD and had a subarachnoid haemorrhage of unknown cause before the scheduled re-operation. During the re-operation, a sealed rupture of an undiagnosed mycotic ascending aortic aneurysm was identified, and the causative organism was later identified as *Streptococcus*. A postoperative MRI indicated a partially thrombosed cerebral aneurysm. This case demonstrates that a mycotic aortic aneurysm can be a cause of intracranial haemorrhage in children.

Keywords: Aortic aneurysm; child; CHD; intracranial haemorrhages

Received: 25 May 2017; Accepted: 28 August 2017; First published online: 4 December 2017

Non-traumatic intracranial haemorrhage is not common in children; however, it carries significant mortality and morbidity.[1] Several reports suggest that patients with CHD or infective endocarditis are at an increased risk for intracranial haemorrhage or cerebral aneurysm.[2–4]

## Case description

A 2-year-old boy came to the emergency department presenting with headache and vomiting that had lasted for a week. CT of head showed subarachnoid haemorrhage (Fig 1). He had a past medical history of an incomplete atrioventricular canal, status post atrioventricular canal repair at 5 months of age, and status post mitral valve replacement with a mechanical valve at 7 months of age. He had been on Coumadin, and the prothrombin time at the emergency department was 40.8 seconds. He had recently developed subaortic stenosis with a peak pressure gradient of 95 mmHg and was scheduled to undergo subaortic stenosis repair in 2 weeks. An emergency cerebral arteriogram did not show evidence of arteriovenous malformation or cerebral aneurysm. His symptoms improved after he was given fresh frozen plasma and the anticoagulation therapy was discontinued for 5 days. A second head-CT 7 days later showed a resolving subarachnoid haemorrhage with no obvious cerebral aneurysm, and he was discharged on Coumadin. He returned to the emergency department 1 month later because of lethargy and fever; an echocardiogram revealed severely reduced left ventricular function, but no sign of endocarditis or aortic aneurysm. A head CT did not show a recurrence of subarachnoid haemorrhage or cerebral aneurysm. Because of worsening ventricular function and the relatively stable condition of cerebral haemorrhage, the decision was made to urgently perform subaortic stenosis repair.

An operation was performed with regular redo-sternotomy and cardiopulmonary bypass. After aortotomy, it was noticed that there was a large tear with a dirty edge on the posterior wall of the ascending aorta (Fig 2) and an undiagnosed sealed rupture of an aortic aneurysm with an abscess between the ascending aorta and the right pulmonary artery. The abscess was adequately debrided and the ascending aortic wall was partially removed.

Correspondence to: T. Shinkawa, MD, Pediatric Cardiothoracic Surgery, Arkansas Children's Hospital, 1 Children's Way, Slot 677, Little Rock, AR 72202, United States of America. Tel: +1 501 364 5858; Fax: +1 501 364 5869; E-mail: TShinkawa@uams.edu

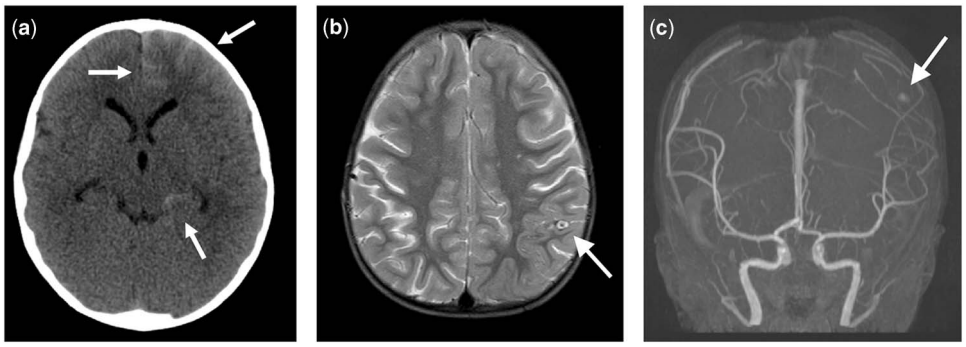


**Figure 1.**
*(**a**) Initial head CT showing parietal and occipital subarachnoid haemorrhage (white arrows). (**b**) Postoperative magnetic resonance T2-weighted image showing partially thrombosed cerebral aneurysm in the left central sulcus (white arrow) without recurrence of subarachnoid haemorrhage. (**c**) Postoperative magnetic resonance angiogram showing cerebral aneurysm in the distal M3 branch of the left middle cerebral artery (white arrow).*

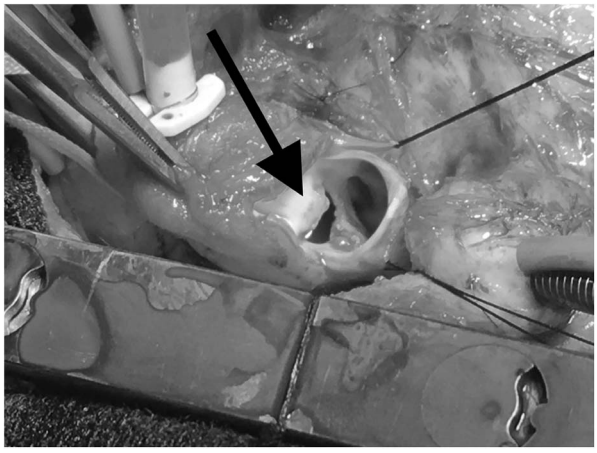

**Figure 2.**
*Intraoperative photo showing a large tear with a dirty edge on the posterior wall of the ascending aorta (black arrow).*

The subaortic stenosis was removed with septal myectomy, and the ascending aorta was reconstructed with end-to-end anastomosis. The patient recovered from the operation well and without neurological sequelae. A blood culture from 1 day before surgery was positive for non-haemolytic *Streptococcus*, and a microbiology examination from the aortic wall grew Gram-positive cocci. MRI performed 7 days after the operation showed a partially thrombosed cerebral aneurysm without the recurrence of subarachnoid haemorrhage (Fig 1). The patient did well with a 6-week course of antibiotics and had a stable neurological status. An echocardiogram performed 2 months after the operation showed minimal residual subaortic stenosis, improving ventricular function, and a smooth ascending aorta.

## Discussion

Mycotic cerebral aneurysm secondary to infective endocarditis is a well-known cause of intracranial haemorrhage in children, and patients with CHD are at an increased risk for infective endocarditis due to abnormal blood turbulence and the presence of foreign materials used for repair.[5] In this case, no evidence of infective endocarditis or mycotic cerebral aneurysm was found at the time of the initial subarachnoid haemorrhage. However, we suspect that the undiagnosed mycotic ascending aortic aneurysm resulting from subaortic stenosis caused a secondary mycotic cerebral aneurysm. Retrospectively, this patient should have been given antibiotics after the initial subarachnoid haemorrhage because his past medical history was highly associated with endocarditis.

A further challenge with this patient was anticoagulation therapy; it was difficult to balance the need for blood coagulation for the intracranial haemorrhage and the need for anticoagulation therapy for the mechanical heart valve. Moreover, there were no established criteria to determine how long the anticoagulation therapy should have been discontinued or how long the anticipated heart surgery with cardiopulmonary bypass needed to be delayed. In this case, it seemed adequate to delay the cardiopulmonary bypass surgery for 4 weeks to prevent further intracranial haemorrhage.

In conclusion, we report a case of subarachnoid haemorrhage caused by a silent mycotic aortic aneurysm in a child with CHD. For patients with unexplained intracranial haemorrhage and CHD, a detailed survey of the heart and aorta may be necessary.

## Acknowledgements

The authors would like to thank Kerry Evans for assistance with manuscript preparation.

## Financial Support

This research received no support from any funding agency or commercial or not-for-profit sectors.

https://doi.org/10.1017/S1047951117001974 Published online by Cambridge University Press

## Conflicts of Interest

None.

## References

1. Al-Jarallah A, Al-Rifai MT, Riela AR, Roach ES. Nontraumatic brain hemorrhage in children: etiology and presentation. J Child Neurol 2000; 15: 284–289.
2. Lo WD, Lee J, Rusin J, Perkins E, Roach ES. Intracranial hemorrhage in children: an evolving spectrum. Arch Neurol 2008; 65: 1629–1633.
3. Schievink WI, Mokri B, Piepgras DG, Gittenberger-de Groot AC. Intracranial aneurysms and cervicocephalic arterial dissections associated with congenital heart disease. Neurosurgery 1996; 39: 685–689.
4. García-Cabrera E, Fernández-Hidalgo N, Almirante B, et al. Neurological complications of infective endocarditis: risk factors, outcome, and impact of cardiac surgery: a multicenter observational study. Circulation 2013; 127: 2272–2284.
5. Awadallah SM, Kavey RE, Byrum CJ, et al. The changing pattern of infective endocarditis in childhood. Am J Cardiol 1991; 68: 90–94.

https://doi.org/10.1017/S1047951117001974 Published online by Cambridge University Press