CASE REPORT

Late recanalization of basilar artery occlusion in a previously healthy 17-month-old child

D Andrew Wilkinson,¹ Aditya S Pandey,¹ Hugh J Garton,¹ Luis Savastano,¹ Julius Griaudzde,² Neeraj Chaudhary,² Joseph J Gemmete^{1,2}

¹Department of Neurosurgery, University of Michigan, Ann Arbor, Michigan, USA

²Department of Radiology, University of Michigan, Ann Arbor, Michigan, USA

Correspondence to
D Andrew Wilkinson,
dawilki@umich.edu

Accepted 10 July 2017

ABSTRACT

Endovascular treatment of acute ischemic stroke in children is increasingly being reported, although the time window for intervention is unclear. We describe a previously healthy 17-month-old child who presented with vertebral artery thrombosis and cerebellar stroke requiring posterior fossa decompression. She later progressed to basilar artery thrombosis treated with mechanical thrombectomy 50 hours after clinical decline. At 3 month follow-up, the patient had a modified Rankin Scale score of 0.

BACKGROUND

Ischemic stroke in the pediatric population is rare but may cause long-term morbidity or death. Recently, mechanical thrombectomy has been reported increasingly in this population, though rarely in the very young. Outcomes and the acceptable time window for treatment are largely unknown.

CASE PRESENTATION

A 17-month-old previously healthy girl presented with lethargy and vomiting after an upper respiratory infection with mild imbalance 3 days earlier. Initial MRI/MR angiography (MRA) revealed multiple acute cerebellar, occipital, and thalamic infarcts, with occlusion of the left vertebral artery (figure 1). She became increasingly lethargic over the next 24 hours, requiring intubation and was taken emergently for a suboccipital decompression of her cerebellar stroke. She remained sedated postoperatively with normal intracranial pressure, though later that day she was noted to have a pulseless left arm due to an occluded left subclavian

artery. Anticoagulation was deferred given her strokes and recent craniotomy and she was transferred to our institution.

INVESTIGATIONS

On arrival to our institution, she did not open her eyes but grimaced slightly to pain, localizing on the right side with an incomplete left hemiparesis. Repeat MRI/MRA (figure 2) demonstrated progression of the vertebral artery occlusion to occlusion of the basilar artery. Given the lack of brainstem infarct on MRI and difficulty in assessing neurologic function given intubation, age, and sedation, the patient was taken to the angiography suite for potential mechanical thrombectomy 50 hours after her clinical decline and intubation.

TREATMENT

After right common femoral access, a right vertebral artery injection demonstrated complete occlusion of the right V4 segment at the level of the posterior inferior cerebellar artery (TICI 0). Right common carotid angiogram showed filling of the right posterior cerebral artery through the posterior communicating artery, but no retrograde filling of the basilar artery (figure 3A and B). A 6-Fr Cello balloon guide catheter (Medtronic, Minneapolis, Minnesota, USA) was advanced to the V2/V3 segment. A Rebar 18 microcatheter (Medtronic) was then placed within the right posterior cerebral artery and a 4 mm×20 mm Solitaire stent (Medtronic) was deployed from the proximal right P2 segment to the right V4 segment (figure 3C). After 5 min, under negative aspiration and flow reversal, the stent retriever was removed, revealing organized

Figure 1 (A) MR angiography (MRA) at presentation shows a left vertebral occlusion (asterisk) with patent right vertebral and basilar arteries. (B) Superior, (C) middle, and (D) inferior axial diffusion-weighted images show multiple areas of acute ischemia (arrows) within the thalamus, splenium of the corpus callosum, cerebellum, and medulla.

CrossMark

To cite: Wilkinson DA, Pandey AS, Garton HJ, et al. *BMJ Case Rep* Published Online First: [please include Day Month Year]. doi:10.1136/bcr-2017-013277

Figure 2 (A) MR angiography (MRA) 46 hours after first MRA shows occlusion of the basilar artery (asterisk). (B) Superior, (C) middle, and (D) inferior axial diffusion-weighted images with progression of the prior areas of ischemia (arrows).

thrombus within the tines. Repeat right vertebral arteriogram showed no flow within the right vertebral artery, with a filling defect at the tip of the balloon guide (figure 3D). Negative aspiration of the balloon guide revealed additional thrombus. Repeat angiography demonstrated a widely patent basilar trunk but with a filling defect at the top of the basilar extending into the right P1 segment (figure 3E).

A 4 mm×20 mm Solitaire stent was redeployed from the mid-right P2 segment to the distal basilar artery and was retrieved after 5 min. Repeat right vertebral arteriogram demonstrated a widely patent basilar artery, with filling of both posterior cerebral arteries. On the delayed images, there was a small filling defect within the distal right posterior cerebral artery (TICI 2b) (figure 3F).

OUTCOME AND FOLLOW-UP

Therapeutic heparinization and 81 mg aspirin was initiated 4 hours after thrombectomy. Heparin was held temporarily and the ventriculostomy was removed post-thrombectomy day 3. She was extubated post-thrombectomy day 5 and low-molecular weight-heparin was continued for a 3-month course. Perfusion and movement of ischemic left arm gradually improved with heparinization, though she required partial amputations of all five fingers 2 weeks following thrombectomy. Three-month MRI/MRA showed a widely patent basilar with a persistent occluded left vertebral artery (figure 4). At 3 months, the child was walking, speaking words appropriate for age and attending preschool.

Figure 3 Angiography/mechanical thrombectomy at 50 hours after last known normal. (A) Lateral right common carotid angiogram shows filling of the right posterior cerebral artery through the posterior communicating artery. (B) Anteroposterior (AP) right vertebral angiogram shows occlusion of the basilar artery. (C) Spot AP fluoroscopy image shows the Solitaire stent-retriever in the basilar artery. (D) Post-first pass AP right vertebral angiogram shows a filling defect at the top of balloon-guide catheter. (E) Repeat AP angiography after negative aspiration of balloon guide shows a widely patent basilar artery with a filling defect at the top of the basilar artery extending into the right P1 segment. (F) Final AP right vertebral angiogram shows a widely patent basilar artery and both posterior cerebral arteries with a small filling defect in a distal right posterior cerebral artery branch (TICI 2b reperfusion).

Figure 4 MR angiography (MRA) 3 months after thrombectomy shows a widely patent right vertebral artery, basilar artery, and bilateral posterior cerebral arteries, with persistent occluded left vertebral artery (asterisk).

No embolic or hypercoagulable etiology was found, and the stroke was presumed due to adenovirus, dehydration, and iron-deficiency anemia leading to a hypercoagulable state.

DISCUSSION

While pharmacological and mechanical recanalization therapies are now well proven through randomized controlled trials (RCTs) in adults, no trials have been completed in children. An RCT to assess the safety and efficacy of tissue plasminogen activator (tPA) in children was canceled due to lack of accrual, and further trials in this age group are unlikely due to the small number of patients.¹ Therefore, clinicians are left to glean information from case reports, small series, and extrapolation from the adult literature. A growing series of reported patients suggests good outcomes following revascularization of pediatric strokes. In a recent review of reported cases of thrombectomy in children, a disproportionately large number were basilar occlusions (45%).²

In the current case, the last known normal was 50 hours prior to intervention, and treatment was elected due to the absence of a brain stem stroke on MRI. The exact timing of the basilar occlusion is unclear, as the patient's exam was clouded by her recent decompressive surgery, young age, and intubation. Five pediatric patients have been reported previously with recanalization of basilar thrombosis at a time >24 hours, including one patient who underwent recanalization twice.^{3–7} Ladner *et al*⁸ noted excellent recovery in pediatric patients after basilar thrombectomy compared with adults. Good outcomes after thrombectomies in children must also be interpreted in the context of an overall better natural history of stroke in children when compared with adults.

Thrombectomy in very young children is even more rare. This is the third case reported of thrombectomy in a child under the age of 5 years and to our knowledge the youngest reported to date.^{9 10} All three children made independent recoveries.

Mechanical thrombectomy in children has been performed with good outcomes in some cases, though the complication risk and comparison to medical management is lacking. In the absence of good data in the pediatric population of an ideal time limit for intervention, we would advocate individualized, image-based decision-making. All attempted thrombectomies in this population should be reported to better understand the success and complication rates without publication bias.

Learning points

- ▶ Late thrombectomy (>24 hours) may be performed successfully for basilar artery occlusion in very young children.
- ▶ Viral infection and dehydration are risk factors for stroke in very young children.
- ▶ The window for successful intervention for stroke in children is unclear; treatment should be image based and all cases should be reported.

Contributors All the authors equally contributed to acquiring and analyzing the data, drafted and critically edited the article, and approved the final version for submission. JJG and DAW supervised the study.

Competing interests None declared.

Patient consent Guardian consent obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

© BMJ Publishing Group Ltd (unless otherwise stated in the text of the article) 2017. All rights reserved. No commercial use is permitted unless otherwise expressly granted.

REFERENCES

- 1 Rivkin MJ, deVeber G, Ichord RN, *et al*. Thrombolysis in pediatric stroke study. *Stroke* 2015;46:880–5.
- 2 Satti S, Chen J, Sivapatham T, *et al*. Mechanical thrombectomy for pediatric acute ischemic stroke: review of the literature. *J Neurointerv Surg* 2016 (Epub ahead of 22 Jul 2016).
- 3 Bodey C, Goddard T, Patankar T, *et al*. Experience of mechanical thrombectomy for paediatric arterial ischaemic stroke. *Eur J Paediatr Neurol* 2014;18:730–5.
- 4 Huded V, Kamath V, Chauhan B, *et al*. Mechanical thrombectomy using solitaire in a 6-year-old child. *J Vasc Interv Neurol* 2015;8:13–16.
- 5 Cognard C, Weill A, Lindgren S, *et al*. Basilar artery occlusion in a child: "clot angioplasty" followed by thrombolysis. *Childs Nerv Syst* 2000;16:496–500.
- 6 Grigoriadis S, Gomori JM, Grigoriadis N, *et al*. Clinically successful late recanalization of basilar artery occlusion in childhood: what are the odds? Case report and review of the literature. *J Neurol Sci* 2007;260(1–2):256–60.
- 7 Condie J, Shaibani A, Wainwright MS. Successful treatment of recurrent basilar artery occlusion with intra-arterial thrombolysis and vertebral artery coiling in a child. *Neurocrit Care* 2012;16:158–62.
- 8 Ladner TR, He L, Jordan LC, *et al*. Mechanical thrombectomy for acute stroke in childhood: how much does restricted diffusion matter? *J Neurointerv Surg* 2015;7:e40.
- 9 Savastano L, Gemmete JJ, Pandey AS, *et al*. Acute ischemic stroke in a child due to basilar artery occlusion treated successfully with a stent retriever. *J Neurointerv Surg* 2016;8:e33.
- 10 Stidd DA, Lopes DK. Successful mechanical thrombectomy in a 2-year-old male through a 4-French guide catheter. *Neurointervention* 2014;9:94–100.

Copyright 2017 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow