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Case Report

Acute Ischemic Stroke in a Child Successfully Treated with Thrombolytic Therapy and Mechanical Thrombectomy

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Acute ischemic stroke · Childhood · Thrombolysis · Mechanical thrombectomy

Abstract
Acute ischemic stroke in the pediatric population is rare but carries lasting and often lifelong morbidity. Thrombolysis and mechanical thrombectomy are mainstays of care in adults, yet there is very little evidence for these treatments in children. We present the case of a 4-year-old boy with complex congenital heart disease, admitted 30 min after sudden onset of an aphasia and right hemiplegia, scoring 14 on the Pediatric National Institutes of Health Stroke Scale (PedNIHSS). Non-contrast brain computed tomography (CT) showed no evidence of acute ischemia. CT angiogram demonstrated a thrombus in the M1 segment of the left middle cerebral artery. Intravenous recombinant tissue plasminogen activator (rTPA) was infused 3.5 h after onset of symptoms. An improvement was observed in the hour after rTPA, with a PedNIHSS score of 7. Digital subtraction angiography was performed approximately 9 h from

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the onset of symptoms, showing a complete left M1 occlusion. The patient underwent successful mechanical thrombectomy and was discharged with a PedNIHSS score of 2. This case emphasizes the importance of early recognition to direct children towards rapid diagnosis and hyperacute treatment.

Introduction

Acute ischemic stroke (AIS) in the pediatric population is a rare event with an estimated incidence of 1.6 per 100,000 per year [1]. Although most children who experience stroke do not die of the acute disorder, the consequences of the brain injury persist during their lifespan [2].

Challenges in treating children and young people with stroke include delays in recognition, the logistic challenges of timely investigation and imaging, a wide differential diagnosis, diverse stroke etiologies, and the lack of trial-based evidence for hyperacute treatments [3]. For the first time, the recent guidelines by the Royal College of Paediatrics and Child Health set out recommendations for thrombolysis and mechanical thrombectomy in childhood stroke [3].

There are increasing case reports of treating AIS in children with thrombolysis and/or mechanical thrombectomy. We report a case of a 4-year-old boy with AIS due to left middle cerebral artery (MCA) occlusion who was successfully treated with thrombolysis followed by mechanical thrombectomy.

Case Report

A 4-year-old male child was admitted to the emergency department 30 min after sudden onset of tremor of the right leg and right hemiparesis. There was no evidence of fecal or urinary incontinence or tongue biting. There was no report of fever or other symptoms in the previous days.

Expressive aphasia, right hemiplegia, and hemi-hypoesthesia with face involvement were documented on examination, scoring 14 on the Pediatric National Institutes of Health Stroke Scale (PedNIHSS) [4].

Pertinent past medical history included multiple surgeries (the last one was 1 year before) for hypoplastic left heart syndrome, congenital heart disease (CHD), and mild developmental delay. Medications included lysine acetylsalicylate 100 mg daily and propranolol 5 mg and captopril 10 mg 3 times a day each.

Electroencephalogram findings were normal. Non-contrast brain computed tomography (CT) showed no evidence of acute ischemia (Fig. 1). CT angiogram demonstrated a thrombus in the M1 segment of the left MCA (Fig. 2).

The patient met all standard inclusion criteria for intravenous recombinant tissue plasminogen activator (rTPA) therapy, including blood pressure parameters, laboratory studies, and lack of intracranial hemorrhage on head imaging. Intravenous rTPA was infused 3.5 h after onset of symptoms using a dose of 0.9 mg/kg, with 10% of the total dose given as a bolus and the remaining 90% infused over 1 h. The rTPA perfusion was completed with no complications. An improvement of his right hemiparesis and aphasia was observed in the hour after rTPA, with a PedNIHSS score of 7.

The patient was transferred to a tertiary hospital. Digital subtraction angiography was performed approximately 9 h from the onset of symptoms, showing a complete left M1 occlusion. The patient underwent successful thrombectomy with stent retriever (TREVO 4 mm × 20 mm) and mechanical aspiration. Control angiogram showed complete recanalization of the left M1 (TICI 2b).

Echocardiogram showed no evidence of intracardiac thrombus. Electrocardiogram monitoring was normal. Follow-up magnetic resonance imaging showed an established ischemic lesion involving the left posterior lenticulocapsular region. An extended blood panel was unremarkable for thrombophilia or autoimmune diseases.

At the time of discharge, 8 days after the vascular event, he completely recovered from the aphasia and had mild right hemiparesis, but he was already capable of independent gait, with a PedNIHSS score of 2. Long-term hypocoagulation with warfarin was initiated.

Discussion

The limited available literature on thrombolysis and thrombectomy in pediatric stroke is composed of small case series, and consequently the existing recommendations are based on expert consensus and evidence from adult patients [3]. We described the management of pediatric AIS in a 4-year-old boy with a left MCA occlusion who underwent thrombolysis followed by mechanical thrombectomy. We did not report any complication attributable to the diagnostic or therapeutic approach.

First neuroimaging was at 1 h, thrombolysis at 3.5 h, and thrombectomy at 9 h after symptom onset. The first neuroimaging (non-contrast brain CT) was not diagnostic of AIS. Only the CT angiogram allowed confirming our suspicion. Even after an initial improvement in symptoms after rTPA, we decided to perform thrombectomy, with good results.

The presenting features in this case (hemiparesis and speech disturbance) are similar to those seen in adults with stroke in whom such clinical features are considered a neurological emergency prompting urgent neuroimaging. The hypothesis that the focal neurological signs could be related to epileptic seizures and subsequent Todd's paresis was partially responsible for the diagnostic and treatment delay.

It is estimated that 19–44% of children with AIS present with seizures [5]. There must be a low threshold for performing neuroimaging in children presenting with new-onset seizure in combination with focal neurologic deficits. The time required to transfer the patient from the first hospital to the neurovascular center also contributed to endovascular treatment delay.

The causes of stroke in children differ markedly from adults where atherosclerosis predominates. Cardiac disorders are one of the most common etiologies, with congenital causes predominating over acquired [6]. Children with complex CHD who require cardiac surgery are at the highest risk of stroke, and this risk remains elevated beyond the immediate postoperative period [7]. Our case adds to the increasing weight of evidence that research to optimize long-term stroke prevention in children with complex CHD is needed.

Currently, management decisions must be individualized and taken within an experienced team including pediatric neurologists and interventional neuroradiologists. Data regarding pediatric cases that undergo medical treatment with IV thrombolysis and endovascular therapy must be shared to document complications and outcomes.

This case report illustrates the importance of raising the awareness of child stroke and reinforces that adult-approved interventions like thrombolysis and thrombectomy can have a big impact in patient outcomes.

Statement of Ethics

The authors have no ethical conflicts to declare.

Disclosure Statement

The publication of this paper was supported by a grant from Boehringer Ingelheim. The authors declare that there is no other potential conflict of interest regarding the publication of this paper.

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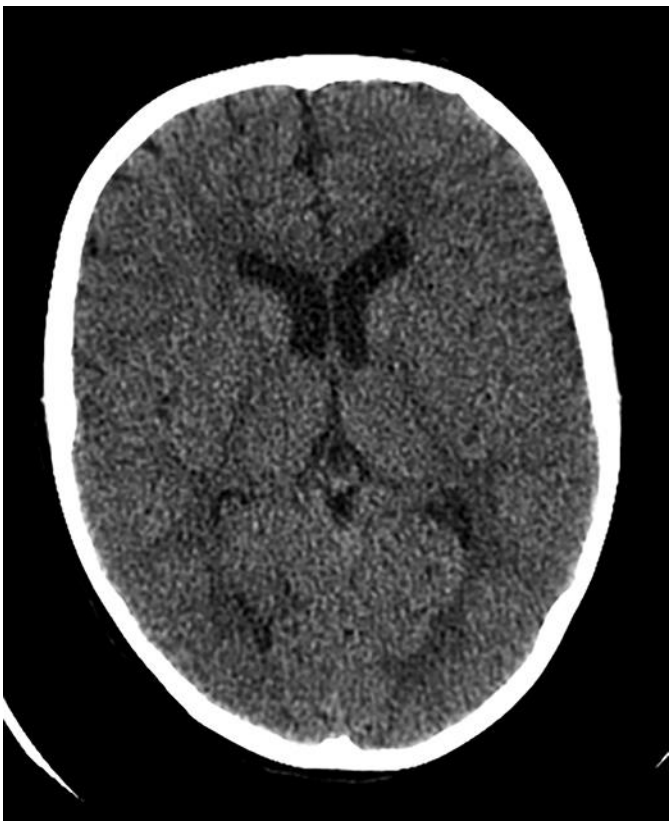

Fig. 1. Non-contrast CT showed no abnormal parenchymal attenuation.

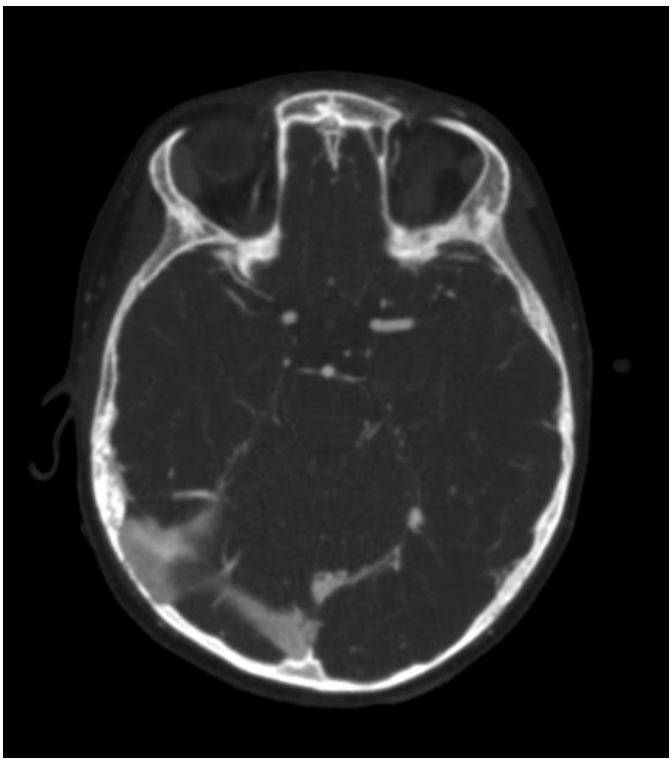

Fig. 2. CT angiogram demonstrated a thrombus in the M1 segment of the left MCA.