

# Acute vertebrobasilar artery thrombosis: long-term benefit of vertebral artery stenting

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## ABSTRACT

**Acute vertebrobasilar artery occlusion is a life-threatening event, even after thrombolytic treatment with local intra-arterial (IA) recombinant tissue plasminogen activator. We report a 70-year-old man with acute vertebral artery occlusion in which IA thrombolysis resulted in partial recanalisation and revealed pre-existing severe stenosis as the underlying cause. Stenosis was managed with stenting with excellent long-term clinical as well as angiographical outcomes.**

**Keywords:** basilar artery, stent, thrombolytic therapy, vertebral artery

*Singapore Med J 2007; 48(10):e277–e280*

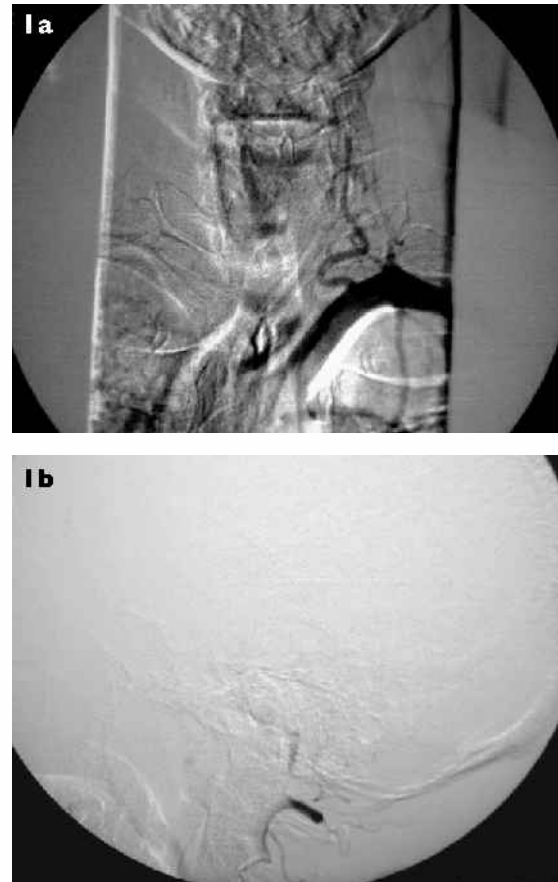
## INTRODUCTION

Vertebral artery (VA) stenosis is a devastating disease with poor prognosis.<sup>(1)</sup> The mortality rate of associated thrombosis of vertebrobasilar (VB) system is as high as 80%–100%.<sup>(2)</sup> Intra-arterial (IA) thrombolytic therapy of acute VB occlusion has been shown to improve the clinical outcome with an approximately 35% survival rate at three months.<sup>(3)</sup> However, the thrombolytic therapy may fail to re-establish a sufficient blood flow in the basilar trunk due to the presence of pre-existing stenosis.<sup>(4)</sup> Additional procedures, such as stent application, to such intracranial vessels may help establish a sufficient flow, and hence, improve prognosis. There are only few reports on stenting procedures as rescue therapy in acute VB artery occlusion.<sup>(4–8)</sup>

We report a case of acute VA thrombosis with underlying stenosis that was treated using IA recombinant tissue plasminogen activator (rTPA) and stenting with excellent angiographical and clinical outcomes, and excellent long-term follow-up.

## CASE REPORT

A 70-year-old physically-active man, with a known case of hypertension, was presented in the emergency room (ER) within 30 minutes of onset of vertigo and slurring



**Fig. 1** Angiograms show (a) complete occlusion of the left vertebral artery at the vertebrobasilar junction; and (b) thrombus in the left distal vertebral artery with poor visualisation of a basilar artery.

of speech. Immediately after arrival to the ER, he became quadriparetic and drowsy with brain stem signs [National Institute of Health Stroke Score (NIHSS) 16, Modified Rankin Scale (MRS) 5], requiring oropharyngeal intubation. Initial brain computed tomography was normal. Angiography performed five hours after the onset of symptoms revealed complete occlusion in the distal part of the right VA with no filling of the basilar artery (BA). The left VA was small-sized and tortuous with occluded distal part and minimal flow in the BA (Fig. 1).

Regional IA thrombolysis was performed with 20 mg rTPA on each VA as 1 mg boluses at 2–3 minute

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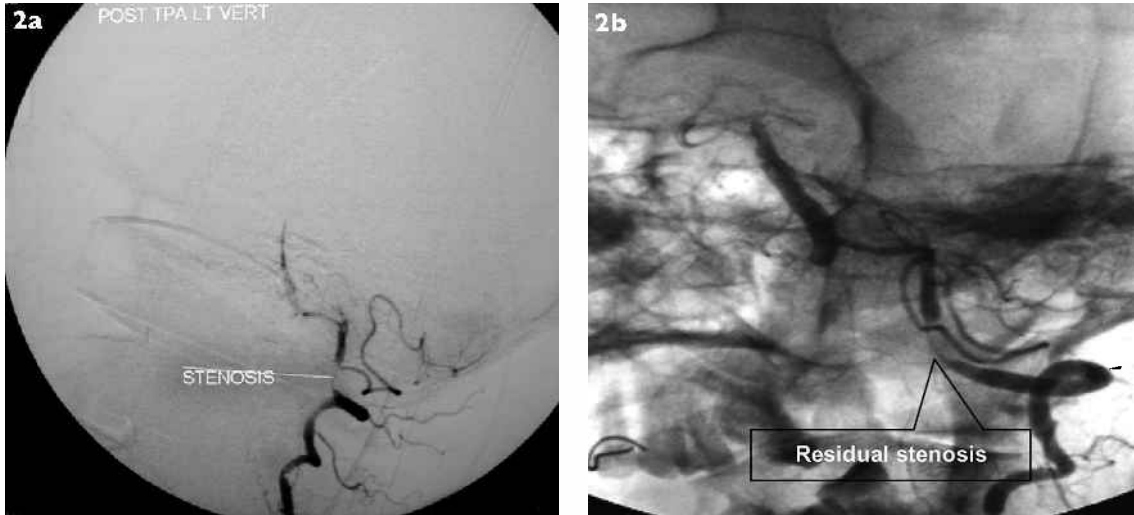
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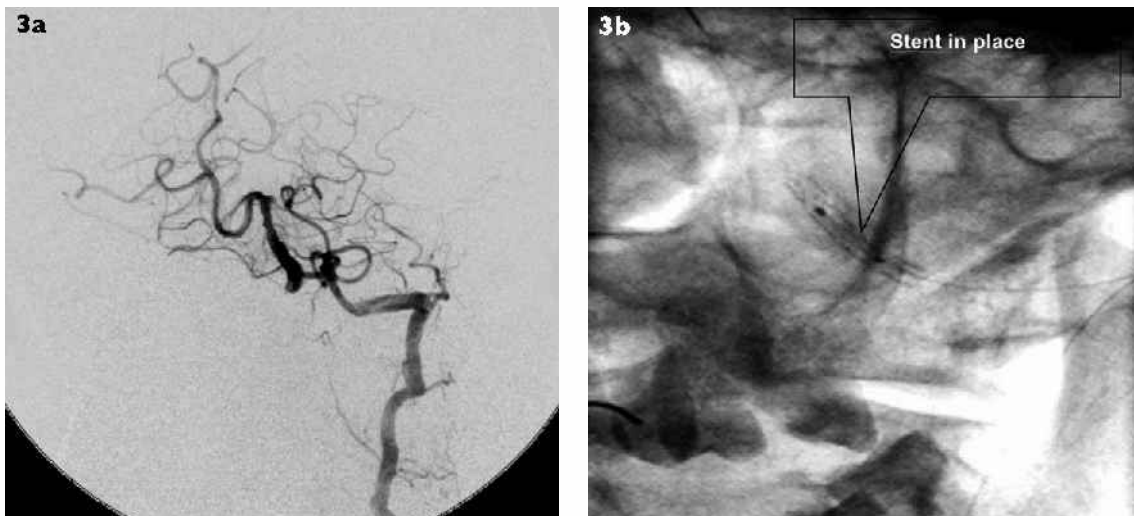
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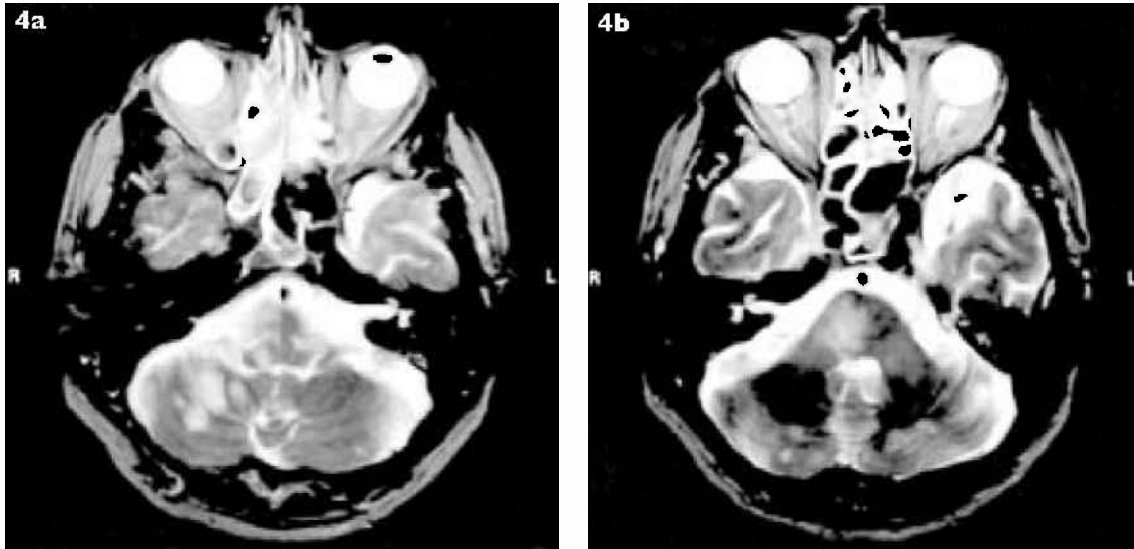
**Fig. 2** Angiograms show post intra-arterial thrombolytic therapy (a) with significant improvement in the blood flow from the left VA with restoration of blood flow to BA; and (b) with a 1 cm long segment stenosis in the distal left VA just proximal to the origin of the left PICA (arrow).



**Fig. 3** Post-stenting angiograms show (a) normal calibre is restored with remarkable distal blood flow across the VB system; and (b) coronary stent in left VA (arrow).

intervals at different catheter positions within and proximal to the thrombus. Angiography on the right side revealed persistent occlusion of distal VA with improved flow into the posterior inferior cerebellar artery (PICA) through collaterals forming the distal tip of the basilar artery (BA), while on left side it showed significant restoration of blood flow to the BA (Fig. 2a). Residual 80%–90% stenosis was noted in the distal left VA. (Fig. 2b). Clinically, the patient’s muscle power improved over the next 10–12 hours (NIHSS 11, MRS 3) with severely-impaired gag reflex. Because of tight stenosis of the distal left VA, which is the sole artery supplying BA and potential to re-occlude, it was decided to

immediately dilate the stenosis with stent deployment. Angioplasty of the stenotic segment was carried out by angioplasty balloon (2 mm diameter, 8 mm length) followed by deployment of Bx Velocity® coronary stent (2.5 mm diameter, 13 mm length) resulting in marked improvement in the flow of blood across the VB system (Fig. 3). A procedure-related small dissection was noted in the middle of the left VA, which was also stented with a Bx Velocity coronary stent. Patient was heparinised during the entire procedure and was also administered abciximab (0.25 mg/kg bolus over 5 min) and clopidogrel (300 mg through a nasogastric tube).



**Fig. 4** Axial T2-W MR images of the brain show hyperintense signals in the pons area and anteroinferior region of the cerebellum on the right side.

Post-stenting magnetic resonance (MR) imaging of the brain revealed ischaemic infarcts in the posterior circulation (Fig. 4). MR angiograms documented flow in the left VA as well as in the BA. The patient demonstrated marked functional improvement during his two-week hospital stay (NIHSS 5, MRS 1). A combination of aspirin (300 mg) and clopidogrel (75 mg) was prescribed for secondary prophylaxis. On two-month clinic follow-up, the patient had only mild right facial weakness (NIHSS 1, MRS 0). Follow-up MR angiogram at 22 months of index stroke revealed good flow signals in BA (Fig. 5), and the patient had no posterior circulation symptoms since the index stroke.

## DISCUSSION

We report a case of long-term benefit and outcome of stent application in acute thrombosis of VA with underlying severe stenosis. VA occlusion had long been treated with IV heparin for decades with a mortality rate of 88%.<sup>(9)</sup> Intravenous or local IA thrombolytic therapy with rTPA has been administered for acute VA thrombosis. Although recanalisation rates have approached 44%–83%, the mortality rate has remained high.<sup>(2)</sup> Angioplasty of VB artery stenosis has been proposed as a novel therapeutic approach for patient's refractory to medical therapy.<sup>(10)</sup> A new generation of flexible intravascular stents may provide a new therapeutic approach. While most stents are applied during an elective procedure,<sup>(11)</sup> there have been a few reported cases of its application in acute VB artery occlusion as rescue therapy.<sup>(4-8)</sup> Data regarding long term



**Fig. 5** MR angiogram taken at 22 months shows good flow signal in the basilar artery.

patency and restenosis due to neointimal proliferation in intracranial stents are still lacking. Cloud et al described the outcome of ten patients, who were treated by primary stenting of symptomatic VA stenosis and followed them up for a mean of 19.7 months (range 1–48 months).<sup>(12)</sup> None of the patients has reported posterior circulation stroke symptoms during

prospective follow-up. Spreer et al reported two out of three cases that showed long-term benefit of stenting of acute BA thrombosis based on clinical examination at 14 months follow-up.<sup>(4)</sup> In Lin et al's series of six cases, a 32-month MR angiogram follow-up of one patient with patent BA was reported.<sup>(8)</sup> Our patient's 22-month follow-up showed excellent early clinical recovery with no recurrence of symptoms of posterior circulation insufficiency. The MR angiogram, after 22 months of his index stroke, showed patent left VA and BA.

Antithrombotic therapy during VB stenting is not standard practice. Spreer et al used intravenous heparin during stent procedure and triple therapy (heparin, aspirin and clopidogrel) in their patients, and aspirin plus clopidogrel or warfarin for secondary prophylaxis.<sup>(4)</sup> Qureshi et al showed benefit of abciximab as an adjunct to intracranial angioplasty.<sup>(3)</sup> In our study, we also used heparin during the entire neurovascular procedure, and additionally gave clopidogrel and abciximab. Aspirin and clopidogrel were prescribed for secondary prophylaxis. Balloon angioplasty is associated with multiple risks, such as vessel ruptures, occlusion of perforators, dissection of the vessels, and embolism.<sup>(14)</sup> The rate of restenosis is high after VA balloon angioplasty without stenting, but is uncommon with stenting.<sup>(11)</sup> During angioplasty, our case was complicated by a small dissection in the middle of left VA, which was successfully treated with a separate small stent.

Large, randomised controlled studies will be required to evaluate the effectiveness and safety of emergency stent placement in the posterior circulation. Nevertheless, our report corroborates previous reports of emergency posterior circulation stenting,<sup>(4-8)</sup> and suggests that emergency stent placement may be

a promising therapy for life-threatening VA or BA occlusion with long-term durability.

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