Direct Microsurgical Embolectomy for an Acute Distal Basilar Artery Occlusion

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BACKGROUND: **Acute basilar artery occlusion is associated with high mortality rates, up to 35%–40%. Early revascularization by intravenous thrombolysis, intra-arterial thrombolysis, and endovascular mechanical embolectomy is considered the best option to date. The objective of this technical report is to present the direct microsurgical embolectomy technique for an acute distal basilar artery occlusion as an urgent life-saving revascularization procedure.**

METHODS: **A 71-year-old male patient suffered from an acute embolic basilar artery occlusion and became unconscious (Glasgow Coma Scale 4). Computed tomography angiography and MRA revealed the distal basilar artery occlusion along with an increased diffusion-weighted imaging signal in the corresponding territory. After an individual case discussion, the patient underwent a microsurgical embolectomy via a frontotemporal craniotomy and an anterior temporal approach.**

RESULTS: **Intraoperative indocyanine green and postoperative computed tomography angiography revealed complete revascularization of the previously occluded basilar quadfurcation. The patient steadily recovered and was able to walk with assistance after 4 weeks.**

CONCLUSIONS: **Microsurgical embolectomy can be an effective treatment option for acute distal basilar artery occlusion in selected cases with experienced surgeons, but a critical preoperative decision-making process is needed.**

INTRODUCTION

Acute basilar artery occlusion, by arterial embolism or local atherosclerotic occlusion, accounts for less than 1% of ischemic strokes and is associated with a high mortality rate.[1] Because there is a high rate of fatality with time to treatment being the major limiting factor, treatment should be performed in specialized stroke centers.[2] The clinical diagnosis can be aggravated by a variety of symptoms. However, early magnetic resonance imaging with diffusion-weighted imaging (DWI) provides high sensitivity for the detection of ischemic strokes in the anterior and posterior circulation.[3] Intravenous thrombolysis with recombinant human tissue plasminogen activator (rtPA) has a limited effect on basilar artery revascularization within a 4.5-hour window.[4,5] It is because of this limitation that intra-arterial thrombolysis and the endovascular mechanical thrombectomy are used increasingly to achieve basilar artery recanalization even after unsuccessful intravenous thrombolysis.[6-10] However, the best treatment modality has yet to be studied effectively.

Since the first report of an intracranial surgical embolectomy by Welch in 1956,[11] several case series of microsurgical embolectomies in the anterior cerebral circulation have been reported.[12-14] Morgan and Biggs[15] published a case of successful microcoil evacuation from the basilar bifurcation

Key words
- Basilar artery
- Basilar artery occlusion
- Embolectomy
- Ischemic stroke
- Posterior circulation

Abbreviations and Acronyms
CTA: Computed tomography angiography
DWI: Diffusion-weighted imaging
ICG: Indocyanine green
MRA: Magnetic resonance angiography
PCA: Posterior cerebral artery
rtPA: Recombinant human tissue plasminogen activator
SCA: Superior cerebellar artery

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using a longitudinal posterior cerebral artery (PCA) arteriotomy in 1992. To date, there is only one report in the literature of an acute posterior circulation embolic stroke treated by direct microsurgical proximal PCA embolectomy.[16]

The objective of this technical report is to present the microsurgical embolectomy for an acute distal basilar artery occlusion as an urgent life-saving revascularization procedure by the use of a transverse PCA postcommunicating segment arteriotomy from an anterior temporal approach.

MATERIALS AND METHODS

History and Examination

A 71-year-old man was found in his home on the ground unable to walk. The estimated time of stroke was around 5 hours before discovery; this was the last time the patient was seen without symptoms. The patient was transferred to our hospital without delay. In the emergency department, the patient's neurologic examination consisted of only left upper-extremity motor response to a painful stimulus. He was otherwise completely unresponsive with equal pupils that were nonreactive but not dilated. The initial electrocardiogram revealed a new atrial fibrillation. There was no previous history of symptoms for a vertebrobasilar ischemia.

Imaging

The computed tomography angiography (CTA) reconstruction (**Figure 1A**) identified an occlusion of the distal basilar artery with an inflow interruption at the proximal superior cerebellar artery (SCA) and PCA. This distal basilar occlusion is more specific for an embolic occlusion than for atherothrombosis. No calcified atherosclerotic plaques were found at the intracranial vessels on computed tomography/CTA. Preoperative computed tomography perfusion imaging was performed. The infarct penumbra affected the right SCA territory, the midbrain, and the thalamus on both sides. DWI revealed a perfusion defect in the left thalamus (**Figure 1B**). Therefore, the actual affected area was small compared with the estimated territory at risk.

Indication

Emergent revascularization was deemed the only potential life-saving treatment option based on the patient's deteriorating clinical condition and the basilar occlusion with corresponding increased DWI signal. The angiography suite was not available, and the decision was made to perform an open microsurgical embolectomy based on the institutional experience with microsurgical treatment of vascular lesions in the posterior circulation.

Positioning, Craniotomy, and Graft Preparation

The patient was placed in the supine position with the head rotated 30° to the right and secured with a MAYFIELD headholder (Integra, Plainsboro, New Jersey, USA). The head was slightly elevated above the heart. A curved frontotemporal skin incision was performed. The temporal muscle was retracted caudally, followed by a frontotemporal craniotomy.

Intracranial Dissection

After the sphenoid wing subfrontally, the carotid cistern was opened at the level of the posterior communicating artery segment of the internal carotid artery and cerebrospinal fluid was released to obtain more working space. Thereafter, the proximal portion of the Sylvian fissure was dissected carefully and the superficial Sylvian veins were detached from the cortex of the frontal lobe and mobilized towards the temporal lobe. The temporal Sylvian veins were detached from the

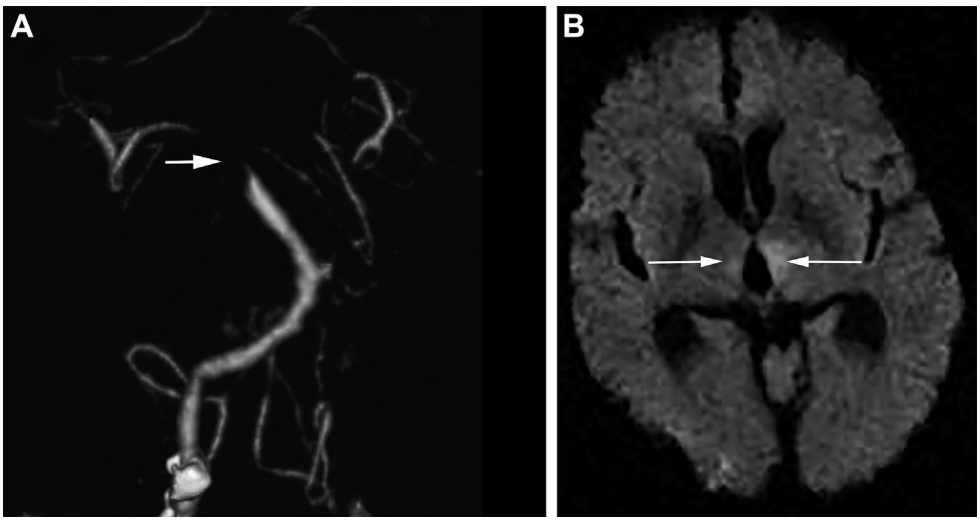

Figure 1. (**A**) The preoperative, 3-dimensional computed tomography angiography shows an occlusion (*arrow*) of the upper basilar artery trunk. (**B**) The preoperative diffusion-weighted imaging (axial) shows a small affected area (*arrows*) in the left posterior thalamus.