

Managing Basilar Artery Occlusions with Endovascular Thrombectomy: A Single-Center Case Series

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Abstract

Acute ischemic infarctions are caused by occlusions to blood vessels supplying the brain. Rapid recognition and intervention affect the course of management to provide prompt recanalization to minimize tissue injury, for which endovascular thrombectomy (EVT) has become an emerging standard of care. Recent clinical trials for basilar artery occlusions done in 2022 concluded that mechanical thrombectomy performed on patients with a National Institutes of Health Stroke Scale of ≥ 6 within 24 hours offers a significantly lower risk of 90-day mortality, and a 90-day modified Rankin scale of 0-3 despite the higher incidence of intracranial hemorrhage. Three of four cases of basilar artery occlusion completed their mechanical thrombectomies in our institution; two of which were performed under the recommended time window. Among those, two cases had prolonged hospital stay due to complications, but had a 90-day mRS of 3. Although larger studies should be performed for better representation of clinical outcomes, there is difficulty in gathering cases in the Philippines as it belongs to a low-middle income country with a low annual thrombectomy rate. This study reports three cases of basilar artery occlusions managed through mechanical thrombectomy in a single institution with outcomes consistent with the conclusions of the recent clinical trials.

Key words: basilar artery occlusion; endovascular; stroke; thrombectomy

Introduction

The American Heart Association have set large vessel occlusions (LVO) at an upper 2.0-mm threshold and included the basilar and the vertebral artery for posterior circulation.[1] The association also identified the most frequent cause for large artery occlusions of the posterior circulation was large artery atherosclerosis followed by cardioembolism, dissection, and embolic stroke of unknown source.[2] Rapid recognition and imaging affect the course of management to provide prompt reversal for recanalization and reperfusion to minimize tissue injury. Mechanical thrombectomy has become a standard of care in the management of most large vessel occlusion strokes. The latest Emergency Neurologic Life Support (ENLS) guidelines identified cases eligible to undergo mechanical thrombectomy including those with a modified Rankin Scale (mRS) of 0-1, administration of intravenous alteplase within 4½ hours post-ictus, causative occlusion in the ICA or proximal MCA, age, National Institutes of Health Stroke Scale (NIHSS) ≥ 6 , and Alberta stroke program early CT score (ASPECTS) of ≥ 6.3 Of note in these guidelines was the absence of inclusion when involving posterior circulation occlusions.[3] As of 2021, the two large randomized clinical trials done for posterior circulation LVO were the Endovascular treatment versus standard medical treatment for vertebrobasilar artery occlusion (BEST)

and the Endovascular Therapy for Stroke Due to Basilar-Artery Occlusion (BASICS). Both revealed favorable outcomes (mRS 0-3) with EVT, but without statistically significant advantage over standard medical treatment. Two more recent randomized clinical trials from China, the ATTENTION (Endovascular Treatment For Acute Basilar Artery Occlusion: A Multicentre Randomised Clinical Trial) and BAOCHE (Basilar Artery Occlusion Chinese Endovascular) were presented at the European Stroke Organisation Conference in 2022 revealed that EVT was associated with the better functional outcomes at 90 days, achieving a higher rate of mRS score of ≤ 3 along with a significantly lower risk of 90-day mortality, but a higher incidence of symptomatic intracranial hemorrhage.[4,5] This study presents three cases of posterior circulation large vessel occlusion, who underwent mechanical thrombectomy done in a single tertiary institution in a lower-middle income country.

Case 1

The first case is a 70-year-old male, right-handed, known hypertensive and pre-diabetic, with a pre-morbid mRS of 0 presented at the emergency department with sudden onset left upper extremity paresis, associated with sensation of imbalance, unilateral deafness and lingual dysarthria of

14 hours duration with an NIHSS of 2. A cranial magnetic resonance imaging and angiography (Figure 1.) were facilitated revealing hyperacute non-haemorrhagic infarctions along the right pontine and cerebellar artery territories with noted diffuse weighted imaging-fluid

attenuated inversion recovery (DWI-FLAIR) mismatch. Due to a consideration of a migrating basilar artery thrombus, the patient was referred to an interventional neuroradiologist for mechanical thrombectomy.

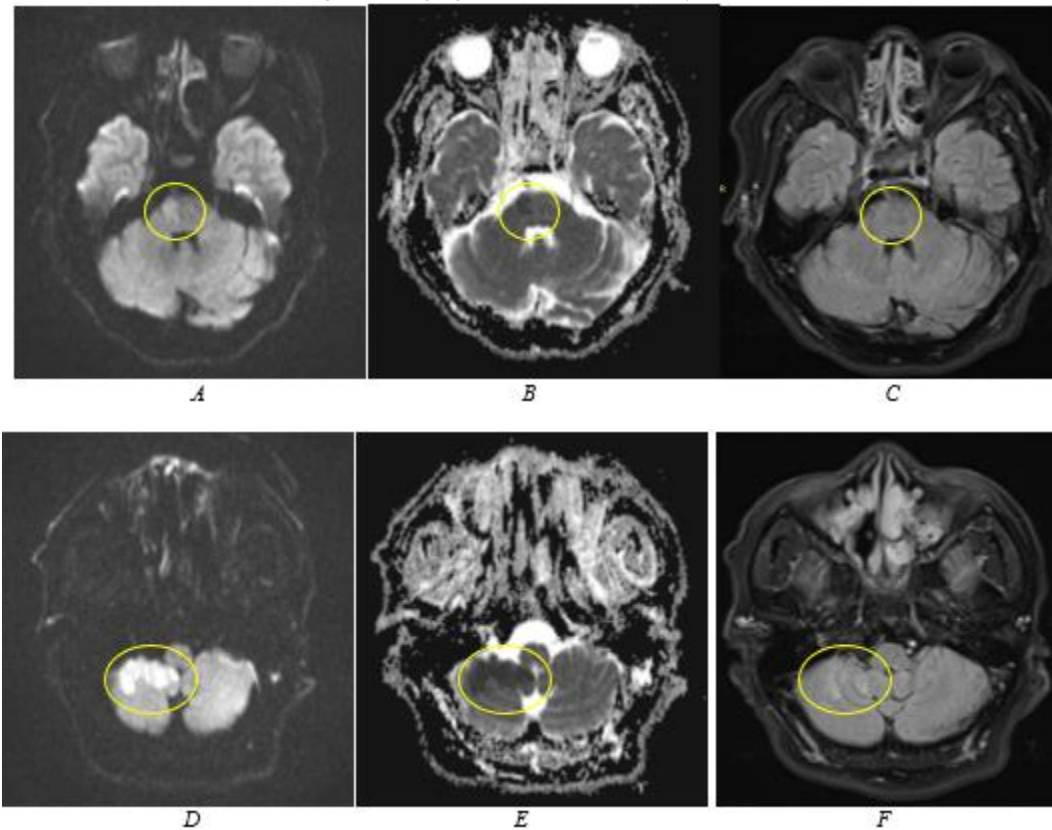


Figure 1. Areas of restricted diffusion with corresponding signal drop-out and DWI-FLAIR mismatch on the right hemispheres (A-C), and right inferior cerebellar hemisphere and tonsil (D-F)

On digital subtraction angiography (DSA), there was an occlusion over the posterior inferior cerebellar artery and vertebral artery (PICA-V4) junction, for which aspiration thrombectomy was done. This achieved a thrombolysis in cerebral infarction (TICI) scale of 2A. To complete the reperfusion, placement of a stent over the basilar artery was contemplated, but there was a noted hemorrhagic transformation over the right hemispheres on dynaCT. Further interventions were withheld, and the patient was transferred to a stroke unit, and medical decompression was maximized. Due to signs of herniation, referral to Neurosurgery service was offered for suboccipital decompressive craniectomy, however no consent was given for further surgical interventions, eventually leading to his demise on the fourth hospital day.

Case 2

The second case is of a 64-year-old male, left-handed, known hypertensive, with a pre-morbid mRS of 0 initially complaining of diplopia, followed by tinnitus, rotatory dizziness, and left sided weakness 11 days prior to admission. Initial findings revealed unremarkable neuroimaging. Within 11 days, his neurological deficits gradually progressed. A repeat cranial CT scan and angiography were done revealing a basilar artery thrombus, with right vertebral artery dominance and left vertebral artery hypoplasia. This prompted transfer to our institution for further management and intervention. Upon arrival at the emergency department, he was assessed to have an initial NIHSS of 15, presenting with an 8½ syndrome. He was immediately referred to an interventional neuroradiologist for evaluation if further intervention can be done to prevent stroke progression. A cranial MRI and MRA was done revealing infarctions at different ages (Figure 2.).

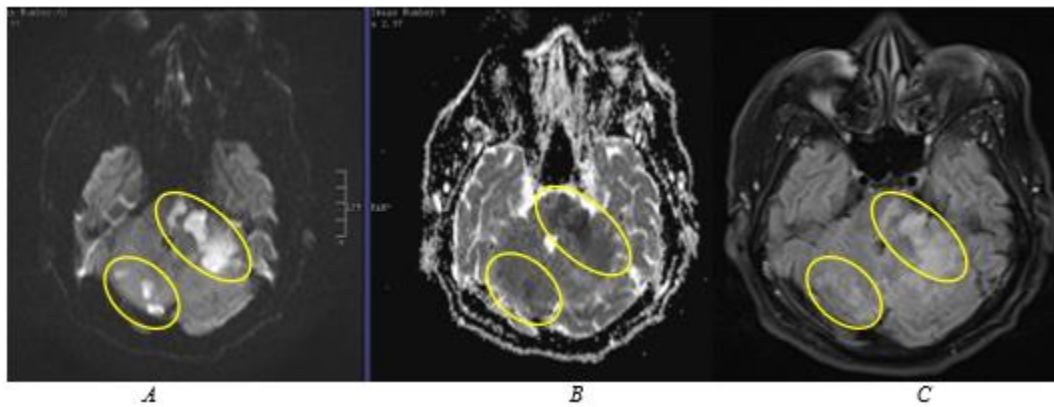


Figure 2. Areas of restricted diffusion with corresponding signal drop-out along the left hemispheres, right middle cerebellar peduncle, and bilateral cerebellar hemispheres

The patient underwent mechanical thrombectomy for a migrating basilar artery thrombus at eleven days post-ictus, after which complete revascularization (TICI3) was achieved. During the course of his admission, he developed edema and impending herniation, requiring him to undergo suboccipital craniotomy upon prompt recognition. He was admitted for two months in our institution during which medical decompression was maximized, and referral to physical rehabilitation services was facilitated for mobilization. The patient was discharged from our institution with an mRS of 4. He was advised to continue rehabilitation abroad, has a 90-day mRS of 3.

Case 3

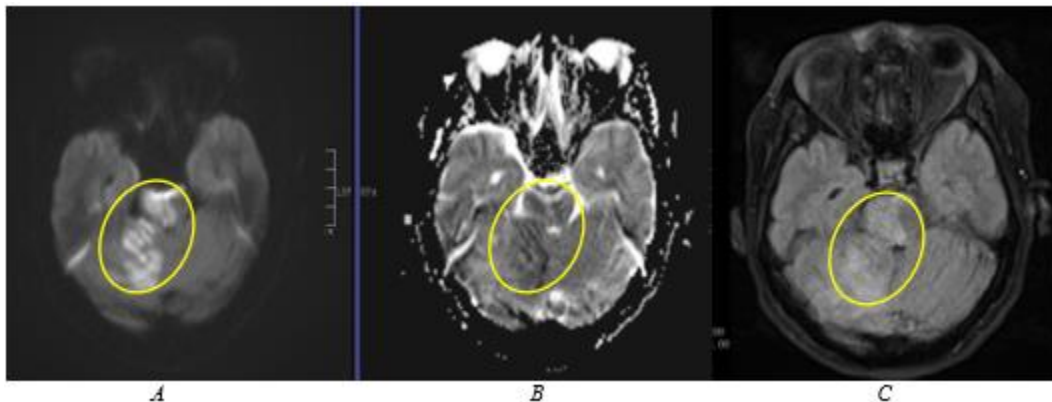


Figure 3. Areas of restricted diffusion with corresponding signal drop-out along the right hemispheres, and right cerebellar hemisphere

The patient only consented to interventional neuroradiology referral for further evaluation and mechanical thrombectomy nearing 24 hours post-ictus due to financial difficulties. TICI3 recanalization was achieved 22 hours post-ictus. The patient was discharged stable after a month of adequate medical decompression, treatment of nosocomial infections, and physical therapy. She had a discharge mRS of 5, and a 90-day mRS of 3.

Discussion

Acute ischemic infarctions with large vessel occlusions require immediate response time and identification of cases that are eligible to undergo endovascular thrombectomy. The ENLS has established guidelines as to the beneficial window period for mechanical thrombectomy at 6 hours for anterior circulation strokes.[3] The DAWN and DEFUSE trial done in 2017 and 2018 respectively, have proven that such intervention may be extended to 16-24 hours post-ictus.[6,7] However, there have been no successful trials applicable to posterior

The last case is of a 60-year-old female, right-handed, with no known comorbidities, and a pre-morbid mRS of 0, presenting at the emergency department of another institution with acute, persistent rotatory dizziness and gait imbalance. Initial NIHSS was 11 for drowsiness, dysconjugate gaze, and ataxia. A plain cranial CT scan was facilitated revealing no acute infarctions or haemorrhage; hence administration of intravenous thrombolysis was done decreasing the NIHSS to 9. The patient was transferred to our institution for closer monitoring. Upon arrival at our institution, she developed new onset left homonymous hemianopsia. The repeat cranial MRI and MRA (Figure 3.) revealed several tiny acute infarctions in the right cuneus, precuneus, lateral occipital, and lingual gyri.

circulation infarctions before 2022. Cohort studies were able to conclude that offering such intervention up to 8 hours post-ictus has been correlated with beneficial outcomes.[8] At the same time, treating these conditions more than 9 hours post-ictus resulted to extensive infarctions before treatment.[9] The ATTENTION and BAOCHE concluded that endovascular thrombectomy within 12 hours and 6-24 hours respectively, have led to good functional outcomes at 90 days, but was associated with more procedural complications and cerebral haemorrhages.[4,5]

With these established time windows, there are still case reports presenting patients who underwent such procedure beyond these recommendations.[10,11] An accepted explanation for this involves a blood clot lodged in the basilar artery creating a reverse circulation and arterial backflow from the circle of Willis through the PCOMs to the distal basilar artery. Blood would then directly flow from perforators and therefore creating a vast collateral vascular network. This would make the vital brainstem structures viable if the clot does not enlarge and in the

absence of a lethal ischemia. Although the arterial backflow maintains the brainstem viable, progression of the clot along the basilar artery would lead to further occlusion of the perforating arteries triggering the development of new infarctions in the brainstem. Comparing this mechanism with anterior circulation LVOs, a thromboembolus will become lodged to create a substantial penumbral tissue, during which the persistent ischemia will time-dependently necrotize into an infarcted core.[12] In posterior circulation infarctions, the successive clot formation and the extent of infarction is determined by the patency of the perforator to ensure sustenance of blood flow and perfusion in the brainstem.

In this writing, three cases of basilar artery occlusions underwent mechanical thrombectomy beyond 12 hours post-ictus due to the possibility of a migrating thrombus producing progression of deficits. Two of these cases had outcomes of mRS 3 by the 90th day post-ictus. Factors that may have influenced such outcome include the late window, the age of the patients, and post-procedural and hospital-acquired complications. Such patterns are consistent with the conclusion of both the ATTENTION and BAOCHÉ trial. With continued rehabilitation, two of the three cases post a possibility of further improvement.

A database done locally showed that the annual thrombectomy rate of three comprehensive stroke centers in Manila is 0.4 and 0.2% for combined intravenous rTPA and endovascular therapy. In lower-middle income countries with high stroke burden such as the Philippines, the identified gaps in providing this service include the cost of EVT, lack of adequate stroke-ready facilities nationwide, inadequate number of practitioners to perform the procedure, lack of unified territory-wide triage systems, and inadequate awareness regarding such intervention. [13]

Limitations

The study only presented 3 cases of basilar artery occlusion done in a single institution. As previously stated, there is difficulty in gathering cases in low-middle income countries such as the Philippines due to a low annual thrombectomy rate. Although consistent with the conclusion of larger clinical trials, further studies should be conducted locally for better representation of clinical outcomes.

Conclusion

Recent clinical trials have established that mechanical thrombectomy can be offered to patients with basilar artery occlusions within 24 hours post-ictus, however with noted increased risk for complications such as intracranial haemorrhage. The Philippines is one of the lower-middle income countries with a high stroke burden and a low annual rate of both intravascular and endovascular treatment, for which future programs and studies can be recommended to make this service more accessible. Through this study, we were able to present three cases managed with endovascular thrombectomy consistent with the recent clinical trials.

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