MECHANICAL THROMBECTOMY FOR BASILAR ARTERY OCCLUSION: A CASE REPORT OF SUCCESSFUL REVASCULARIZATION

Ivanova N.[1,2], Dimitrova-Kirilova V.[2,3], Vasilev M.[2,3], Drenski T.[1,2], Todorov G.[4,5], Tsalta-Mladenov M.[1,2], Andonova S.[1,2]

[1]Department of Neurology and Neuroscience, Faculty of Medicine, Medical University "Prof. Paraskev Stoyanov", Varna, Bulgaria
[2]Department of Optometry and Occupational Diseases, Faculty of Public Health, Medical University "Prof. Paraskev Stoyanov", Varna, Bulgaria
[3]Department of Diagnostic Imaging, Interventional Radiology and Radiotherapy, Faculty of Medicine, Medical University "Prof. Paraskev Stoyanov", Varna, Bulgaria
[4]Second Clinic of Neurology with ICU and Stroke unit, University Hospital "St. Marina", Varna, Bulgaria
[5]Interventional radiology center, Imaging diagnostics clinic, University Hospital "St. Marina", Varna, Bulgaria

Abstract

Background. *Basilar artery occlusion (BAO) is a rare but life-threatening form of acute ischemic stroke (AIS) associated with high morbidity and mortality. While mechanical thrombectomy (MT) is established as the standard of care for large vessel occlusion (LVO) in the anterior circulation, its role in posterior circulation strokes is less clearly defined. This case report illustrates the effectiveness of direct MT in BAO management when intravenous thrombolysis is contraindicated.*

Case presentation: A 38-year-old female presented with sudden-onset coma and quadriplegia. Neuroimaging revealed complete occlusion of the middle third of the basilar artery with absent contrast filling in its cranial segment. Due to contraindications to intravenous thrombolysis, the patient underwent urgent endovascular treatment. Direct MT was performed using an aspiration catheter and a stent retriever, resulting in full recanalization (TICI 3). The patient showed early neurological recovery, including restoration of spontaneous breathing and consciousness. She was discharged with only mild residual deficits, specifically a neocerebellar syndrome.

Conclusion. *This case supports the growing evidence that direct mechanical thrombectomy is a safe and effective therapeutic option for posterior circulation strokes such as BAO, especially when systemic thrombolysis is contraindicated. Timely diagnosis, advanced neuroimaging, and rapid endovascular intervention remain crucial for achieving favorable outcomes in this high-risk population.*

Keywords: Basilar Artery Occlusion, Large vessel occlusion, Posterior Circulation Stroke, Acute ischemic stroke, Mechanical Thrombectomy, Endovascular treatment, Thrombectomy, TICI Recanalization, Reperfusion Therapy, Functional Outcome

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For correspondence: Tsalta-Mladenov M., e-mail: MihaelTsalta@gmail.com

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Information about authors
Ivanova N., https://orcid.org/0000-0001-6603-2425
Dimitrova-Kirilova V., https://orcid.org/0000-0002-9833-2702
Vasilev M., https://orcid.org/0009-0007-1460-5958
Drenski T., https://orcid.org/ 0000-0001-7457-2675
Todorov G., https://orcid.org/ 0000-0002-9908-6355
Tsalta-Mladenov M., https://orcid.org/0000-0001-9898-3962; e-mail: MihaelTsalta@gmail.com
Andonova S., https://orcid.org/0000-0002-1156-9724

МЕХАНИЧЕСКАЯ ТРОМБЭКТОМИЯ ПРИ ОККЛЮЗИИ БАЗИЛЯРНОЙ АРТЕРИИ: КЛИНИЧЕСКОЕ НАБЛЮДЕНИЕ УСПЕШНОЙ РЕВАСКУЛЯРИЗАЦИИ

Иванова Н.[1,2], Димитрова-Кирилова В.[2,3], Василев М.[2,3], Дренски Т.[1,2], Тодоров Г.[4,5], Цалта-Младенов М.[1,2], Андонова С.[1,2]

[1]Кафедра неврологии и нейронаук, Медицинский факультет, Медицинский университет «Проф. д-р Параскев Стоянов», Варна, Болгария
[2]Кафедра оптометрии и профессиональных заболеваний, Факультет общественного здравоохранения, Медицинский университет «Проф. д-р Параскев Стоянов», Варна, Болгария
[3]Кафедра диагностической визуализации, интервенционной радиологии и радиотерапии, Медицинский факультет, Медицинский университет «Проф. д-р Параскев Стоянов», Варна, Болгария
[4]Вторая клиника неврологии с отделением интенсивной терапии и инсультным блоком, Университетская больница «Св. Марина», Варна, Болгария
[5]Центр интервенционной радиологии, Клиника лучевой диагностики, Университетская больница «Св. Марина», Варна, Болгария

Резюме

Введение: *Окклюзия базилярной артерии (ОБА) является редкой, но жизнеугрожающей формой острого ишемического инсульта (ОИИ), сопровождающейся высокой заболеваемостью и летальностью. Хотя механическая тромбэктомия (МТ) признана стандартом лечения при окклюзиях магистральных артерий переднего сосудистого бассейна, ее роль при инсультах в бассейне задней циркуляции остается менее определенной. Настоящее клиническое наблюдение иллюстрирует эффективность прямой МТ при ОБА в ситуации противопоказаний к системному тромболизису.*

Клиническое наблюдение. *38-летняя пациентка поступила в состоянии внезапно возникшей комы с квадриплегией. Нейровизуализация выявила полную окклюзию средней трети базилярной артерии с отсутствием контрастного наполнения ее краниального сегмента. Ввиду противопоказаний к внутривенному тромболизису было проведено неотложное эндоваскулярное вмешательство. Выполнена прямая МТ с использованием аспирационного катетера и стент-ретривера, что привело к полной реканализации (TICI 3). Отмечено быстрое восстановление, включая самостоятельное дыхание и сознание. Пациентка была выписана с легкими остаточными проявлениями в виде мозжечкового синдрома.*

Заключение. *Представленный случай подтверждает нарастающий объем данных о том, что прямая механическая тромбэктомия является безопасным и эффективным методом лечения инсультов в заднем сосудистом бассейне, включая ОБА, особенно при невозможности проведения системного тромболизиса. Своевременная диагностика, использование современных методов нейровизуализации и быстрое эндоваскулярное вмешательство имеют решающее значение для достижения благоприятных исходов в этой группе высокого риска.*

Ключевые слова: окклюзия базилярной артерии, окклюзия магистральных сосудов, инсульт в бассейне задней циркуляции, острый ишемический инсульт, механическая тромбэктомия, эндоваскулярное лечение, тромбэктомия, реканализация TICI, реперфузионная терапия, функциональный исход.

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Для корреспонденции: Цалта-Младенов М., e-mail: MihaelTsalta@gmail.com

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Информация об авторах

Иванова Н., https://orcid.org/0000-0001-6603-2425
Димитрова-Кирилова В., https://orcid.org/0000-0002-9833-2702
Василев М., https://orcid.org/0009-0007-1460-5958
Дренски Т., https://orcid.org/ 0000-0001-7457-2675
Тодоров Г., https://orcid.org/ 0000-0002-9908-6355
Цалта-Младенов М., https://orcid.org/0000-0001-9898-3962; e-mail: MihaelTsalta@gmail.com
Андонова С., https://orcid.org/0000-0002-1156-9724

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Abbreviations: AIS — acute ischemic stroke; BA — basilar artery; BAO — basilar artery occlusion; CT — computed tomography; CTA — computed tomography angiography; CTP — computed tomography perfusion; EVT — endovascular treatment; GLCS — glasgow-liège coma scale; IVT — intravenous thrombolysis; LVO — large vessel occlusion; MT — mechanical thrombectomy; NCCT — non-contrast computed tomography; NIHSS — national institutes of health stroke scale; RCT — randomized controlled trial; REVASK — registry on revascularization in ischemic stroke patients; tPA — tissue plasminogen activator.

Background

Acute ischemic stroke (AIS) is a severe cerebrovascular disorder caused by abrupt interruption of cerebral blood flow, resulting in focal neurological deficits; in 2021, AIS accounted for approximately 7.8 million new cases, 3.6 million deaths, and 70.4 million disability-adjusted life years (DALYs) globally [1]. Basilar artery occlusion (BAO), a rare but devastating subtype of AIS, accounts for approximately 1% of all strokes and is associated with high mortality rates, reaching 45% in untreated cases [2]. Clinical manifestations include rapid neurological deterioration, quadriparesis, coma, and respiratory failure, underscoring the need for urgent diagnosis and intervention [3].

This study aims to describe the clinical presentation, diagnostic approach, and therapeutic management of acute BAO, emphasizing the efficacy of mechanical thrombectomy (MT) as a first-line intervention. Advanced neuroimaging, including computed tomography angiography (CTA) and computed tomography perfusion (CTP), plays a pivotal role in detecting large vessel occlusion (LVO), evaluating collateral circulation, and determining salvageable brain tissue [4, 5].

A key debate in stroke management is whether intravenous thrombolysis (IVT) should precede MT.

Despite the potential benefits, IVT exhibits limitations, including sub-optimal recanalization rates in large vessel occlusion and an increased risk of hemorrhagic transformation [6]. Recent randomized controlled trials, including ATTENTION and BAOCHE, support the superiority of MT in BAO, establishing its role as a first-line treatment [7, 8]. Emerging evidence suggests that direct MT without prior IVT may be a feasible alternative, particularly in high-risk patients [9].

Prognostic factors influencing BAO outcomes include baseline National Institutes of Health Stroke Scale (NIHSS) score, time to recanalization, age, occlusion location, and therapeutic strategy [10]. This case highlights the necessity of early intervention, advanced neuroimaging, and multidisciplinary collaboration in optimizing stroke outcomes.

Case presentation. A 38-year-old woman was admitted in a comatose state. According to her relatives, she had experienced a two-hour history of malaise, speech disturbances, and right-sided weakness prior to deterioration. Prehospital assessment by emergency medical services documented an initial blood pressure of 200/100 mmHg. On admission, the patient was in a comatose state. Respiratory examination revealed bilateral vesicular breathing with stridor. Cardiovascular assessment showed a rhythmic heart function, blood pressure of 140/80 mmHg, and tachycardia with a heart rate of 120 bpm. The abdomen was soft, with preserved physiological peristalsis. Peripheral vascular examination demonstrated intact arterial pulsations in all extremities, with no evidence of oedema.

The initial neurological evaluation revealed bilaterally miotic pupils with an absent light reflex, slow roving eye movements, and severe quadriparesis progressing to quadriplegia. The patient exhibited generalized tonic extension seizures involving all four limbs. Babinski's sign was bilaterally positive. The Glasgow-Liège Coma Scale (GLCS) score was 8/20, and the NIHSS score was 32 points. The patient did not have any previous diagnoses. Neither did she take any medications.

The blood samples revealed no abnormalities, including normal complete blood count, C-reactive protein, renal and hepatic function markers, electrolytes, cholesterol levels, and coagulation parameters.

Computed tomography (CT) of the head without contrast showed no acute pathology, with intact bone structures and no evidence of ischemic, haemorrhagic, or space-occupying lesions. A chest X-ray revealed suspicious early inflammatory changes.

A few hours after admitting to hospital the patient showed fast deterioration with evident apneic pauses. She was immediately intubated and put on mechanical ventilation with the following settings: synchronized intermittent mandatory ventilation (SIMV) — mode of ventilation, respiratory rate — 16 bpm, tidal volume — 490 ss, positive end expiratory pressure — 5 PEEP, Fi02 — 33%.

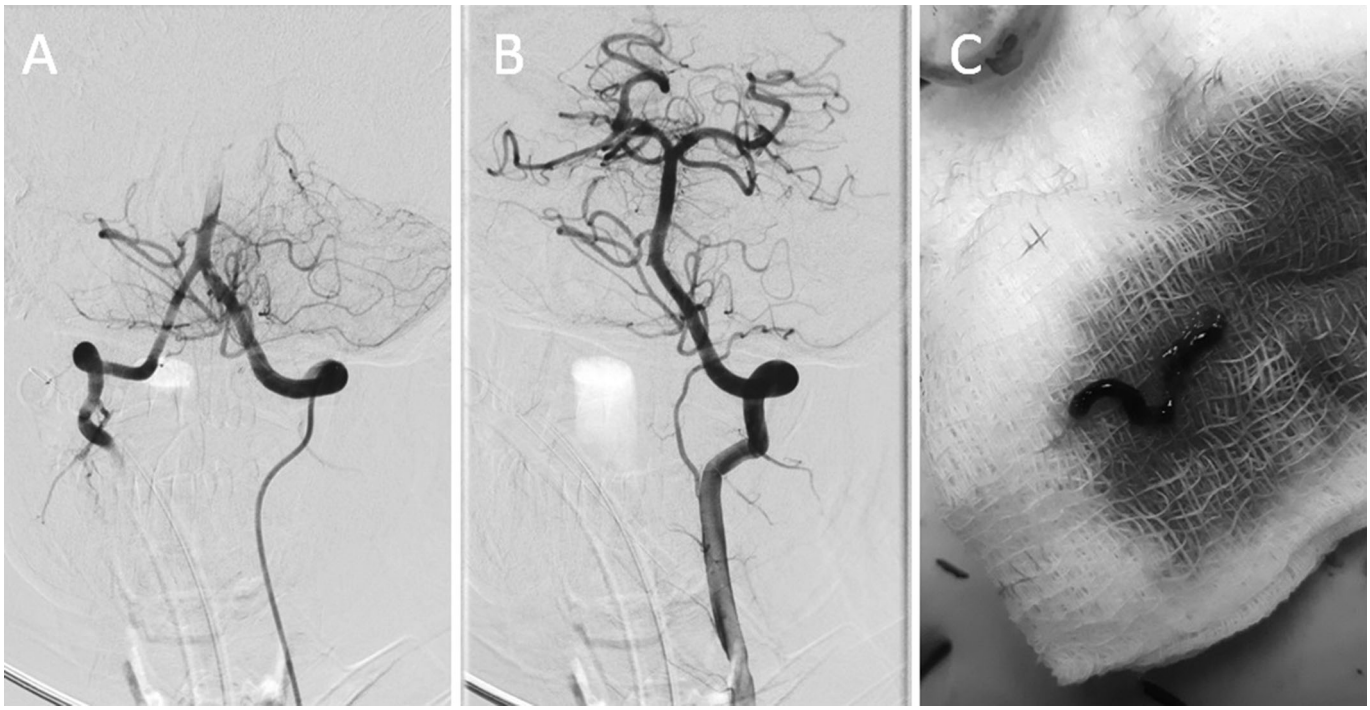

Fig. 1. Mechanical thrombectomy for basilar artery occlusion: A — cerebral angiography, revealing complete occlusion in the middle third of the basilar artery; B — cerebral angiography, following the mechanical thrombectomy, revealing complete revascularisation of the basilar artery; C — a photo of the extracted thrombus with histopathological morphology of a mixed thrombus

Рис. 1. Механическая тромбэктомия при окклюзии базилярной артерии: А — церебральная ангиография: выявлена полная окклюзия средней трети базилярной артерии; В — церебральная ангиография после механической тромбэктомии: полная реваскуляризация базилярной артерии; С — фотография извлеченного тромба с гистопатологической характеристикой смешанного тромба

A multidisciplinary team, including a neurologist, interventional radiologist, neurosurgeon, and anesthesiologist, evaluated the case. The clinical presentation suggested an acute ischemic stroke due to a large vessel occlusion, possibly a basilar artery occlusion (BAO). The uncertain efficacy of intravenous thrombolysis (IVT) in BAO and the high NIHSS score led to the decision to omit IVT. The patient was taken for cerebral angiography and endovascular treatment.

Diagnostic cerebral angiography revealed a complete occlusion in the middle third of the basilar artery, with absent contrast filling in its cranial segment, both posterior cerebral arteries, perforating arteries, and the right cerebellar hemisphere.

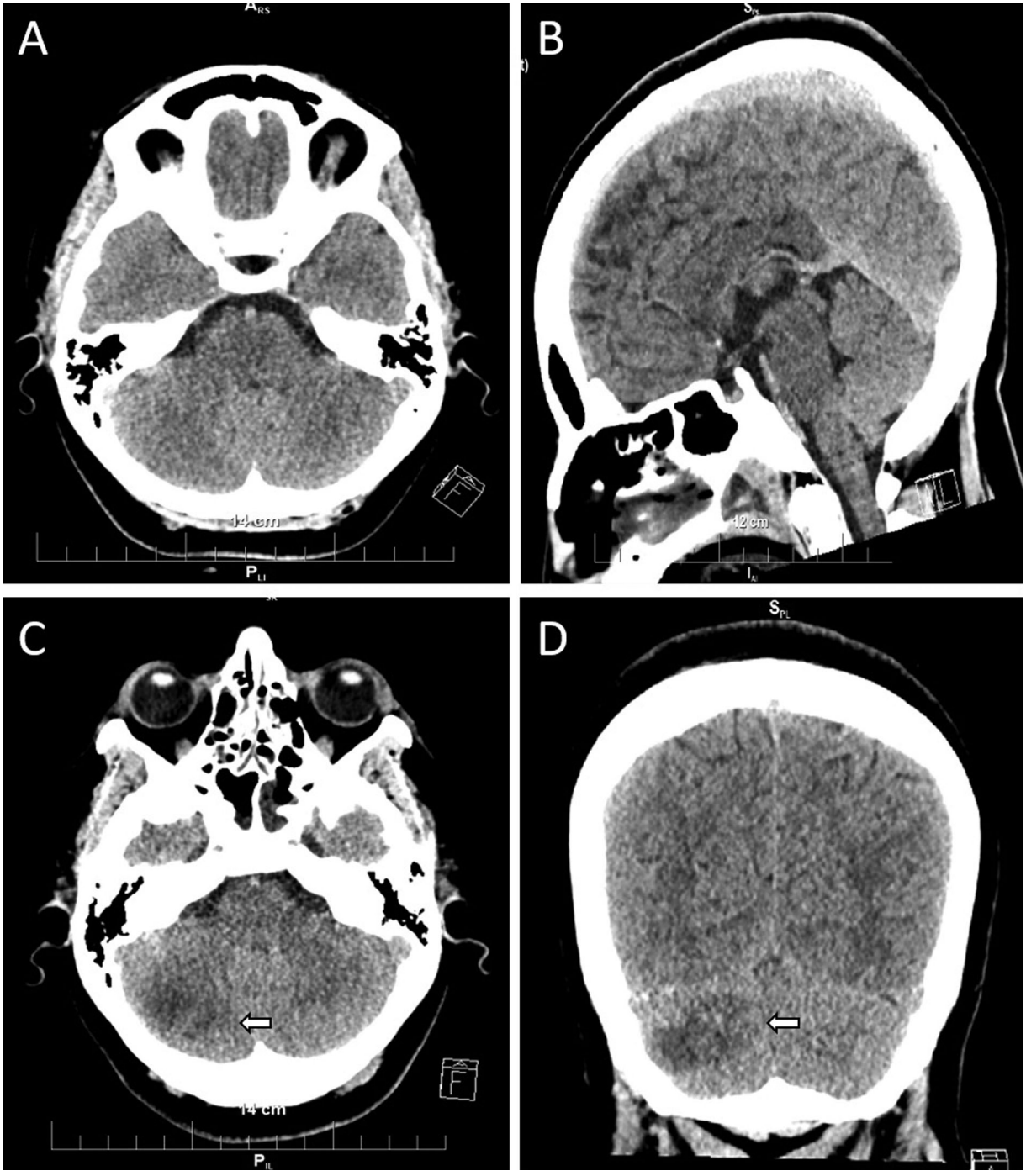

Fig. 2. CT of the head before the procedure and 24 hours after the mechanical thrombectomy: A — axial plane; B — sagittal plane — initial CT findings of a hyperdense basilar artery — indirect sign for occluded segment of basilar artery; C — axial plane; D — coronal plane — CT scan 24 hours after the procedure — presenting a hypodense lesion in the right cerebellar hemisphere

Рис. 2. КТ головного мозга до процедуры и через 24 часа после механической тромбэктомии: A — аксиальная проекция, B — сагиттальная проекция: исходные КТ-данные — гиперденсный сигнал от базилярной артерии, косвенный признак ее окклюзии; C — аксиальная проекция, D — коронарная проекция: КТ-скан через 24 часа после процедуры — визуализируется гиподенсный очаг в правом полушарии мозжечка

MT was performed using an aspiration catheter Sofia 5Fr, a microcatheter Headway 21, and a thrombectomy device ERIC 6 × 44 mm. The procedure achieved complete revascularization of the basilar artery, its branches, and the posterior circulation (Figure 1).

After comprehensive diagnostic work-up, including advanced neuroimaging and cerebral angiography, and following completion of the endovascular intervention, the final clinical diagnosis was established as acute ischemic stroke of the posterior circulation secondary to complete occlusion of the mid-basilar artery. The lesion was successfully treated with direct mechanical thrombectomy, achieving complete recanalization (TICI 3).

A CT scan of the head performed immediately after mechanical thrombectomy showed no evidence of haemorrhage. A follow-up CT scan, 24 hours post-procedure, revealed a hypodense area in the right cerebellar hemisphere, consistent with a subacute ischemic stroke. The basilar artery appeared relatively hypodense compared to the initial CT scan (Figure 2).

Further investigations were performed to identify potential underlying risk factors for ischemic stroke. Transthoracic echocardiography revealed no abnormalities, with no evidence of valvular pathology, thrombotic masses, or persisting foramen ovale. Duplex ultrasonography of the cerebral vessels demonstrated reduced blood flow in the right vertebral artery, but no structural abnormalities such as atherosclerotic plaques or arterial dissection. A cardiologist initiated antihypertensive therapy and excluded any other underlying cardiovascular diseases.

During hospitalization the patient received standard supportive care, including anticoagulation during the acute phase, osmotic diuretics, and neuroprotective therapy with citicoline, alongside structured physical rehabilitation. Citicoline was administered as part of a neuroprotective strategy aimed at supporting neuronal recovery and limiting ischemic injury.

The patient was hemodynamically stabilized, with restoration of spontaneous breathing and successful extubation. Neurological recovery was substantial, with full restoration of consciousness and marked improvement of focal neurological deficits. At discharge, she exhibited only mild residual neocerebellar syndrome. Ongoing neuroprotective therapy with citicoline and antiplatelet treatment was prescribed, reflecting the absence of other identifiable thromboembolic risk factors.

To further clarify the stroke etiology and guide individualized long-term secondary prevention, additional investigations — including transesophageal echocardiography, Holter electrocardiography, and genetic testing for inherited thrombophilic disorders — were recommended. This comprehensive diagnostic approach is considered essential for appropriate risk stratification and the optimization of secondary prevention strategies, particularly in young patients with stroke of undetermined etiology.

Discussion. The etiology of ischemic stroke in young patients without conventional vascular risk factors warrants careful consideration. A substantial proportion of such cases are classified as cryptogenic, among which the presence of a patent foramen ovale (PFO) has been frequently implicated as a potential mechanism for paradoxical embolism or in-situ thrombus formation. Additionally, inherited thrombophilic disorders — including factor V Leiden mutation, prothrombin G20210A mutation, protein C deficiency, protein S deficiency, antithrombin III deficiency, hyperhomocysteinemia associated with MTHFR polymorphisms, and other related prothrombotic conditions — may contribute to stroke risk in this population [11]. Several studies have highlighted that PFO and thrombophilic abnormalities are among the most commonly detected findings in young patients with otherwise unexplained posterior circulation strokes.

Further diagnostic assessment, including transesophageal echocardiography, thrombophilia screening, or contrast-enhanced transcranial Doppler, may therefore be indicated to confirm or exclude these potential risk factors. In selected patients with a high-risk PFO profile or confirmed prothrombotic disorder, percutaneous closure combined with tailored antithrombotic therapy has been shown to reduce the risk of recurrent ischemic events [12].

Ischemic stroke remains a leading cause of mortality and long-term disability worldwide. It occurs when an arterial occlusion disrupts cerebral blood flow, leading to ischemic injury and neuronal death. Without timely reperfusion, these changes become irreversible, resulting in permanent neurological deficits. Time is a critical determinant in stroke treatment, as earlier reperfusion therapy is associated with better functional outcomes. It has been estimated that every 15-minute reduction in onset-to-treatment time significantly lowers the risk of long-term disability at three months [13].

Most ischemic strokes present with a sudden onset of focal neurological deficits, including visual disturbances, dysarthria, dysphagia, hemiparesis, and ataxia. Alterations in consciousness may also occur. The initial severity of symptoms serves as an important prognostic factor and provides insights into the location of vascular occlusion. In this case, the patient's severe neurological status strongly suggested a large vessel occlusion (LVO).

Over the past decade, mechanical thrombectomy (MT) has revolutionized the treatment of acute ischemic stroke (AIS) caused by LVO. Multiple large randomized controlled trials (RCTs) have confirmed its superiority over medical management in anterior circulation stroke [14].

The basilar artery (BA) is a major arterial supply to the brainstem, occipital lobes, thalami, and cerebellum. Acute basilar artery occlusion (BAO) is a rare but devastating stroke subtype, with a mortality rate of up to 45% [15]. In some cases, BAO results in locked-in syndrome, characterized by quadriplegia and anarthria, while prolonged occlusion leads to severe and irreversible neurological damage.

Early RCTs, including THRACE, BEST, and BASICS, demonstrated the benefit of MT in anterior circulation stroke, but included only a small number of BAO patients [4,16]. The BEST trial, which evaluated endovascular treatment for vertebrobasilar occlusion, was terminated due to slow recruitment and high crossover rates [17]. The ATTENTION and BAOCHE trials, presented at the 2022 European Stroke Conference, were the first RCTs to confirm MT as an effective therapy for BAO [15].

A major debate in stroke treatment concerns whether intravenous thrombolysis (IVT) should precede MT. Tissue plasminogen activator (tPA) has limited efficacy, achieving recanalization in only 40% of cases, with even lower success rates in LVO [13]. Current practice often involves initiating IVT while preparing for MT. However, most studies evaluating bridging IVT have focused on anterior circulation strokes, with conflicting results regarding its efficacy. The optimal approach for BAO remains unclear.

A retrospective cohort study conducted across multiple comprehensive stroke centres in Europe and Asia compared direct MT versus bridging IVT plus MT for BAO patients [18]. The results showed no significant improvement in 90-day functional outcomes with bridging IVT. However, in patients with large artery atherosclerosis, IVT demonstrated a significant treatment effect [18].

The question of long-term secondary prevention remains particularly relevant in patients with stroke of undetermined etiology. In the present case of a young female patient without conventional vascular risk factors, the exact underlying mechanism — whether thrombotic, embolic, or related to inherited prothrombotic conditions — remains uncertain. Current evidence does not demonstrate a benefit of anticoagulation over antiplatelet therapy in non-cardioembolic cryptogenic stroke, and anticoagulants carry a higher risk of bleeding [12]. Individualized strategies, including antithrombotic therapy or device closure, may only be justified if high-risk PFO or confirmed prothrombotic disorders are identified through further investigations [19].

While this case primarily illustrates the efficacy and safety of mechanical thrombectomy for basilar artery occlusion, it also underscores the importance of comprehensive etiological assessment in young stroke patients to guide appropriate secondary prevention and long-term management.

Conclusion. Basilar artery occlusion is a relatively rare but potentially devastating condition with a high risk of mortality and severe disability in stroke survivors. This case reinforces the evolving role of mechanical thrombectomy in the treatment of basilar artery occlusion, particularly when intravenous thrombolysis is contraindicated. Early imaging, rapid triage, and direct endovascular access were critical to the favourable outcome. Despite limited trial data on posterior circulation strokes, growing evidence, including this case report, supports MT as a viable frontline option.

Future research should continue to refine treatment algorithms and identify predictors of functional recovery in posterior circulation stroke.

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