AUCTORES
Globalize your Research

Journal of Neuroscience and Neurological Surgery
Vinicius Moreira Lima *

Case Report

Open Access

Mechanical Thrombectomy Via Direct Internal Carotid Artery Puncture

Vinicius Moreira Lima [1*], Camila Damasceno Ribeiro [2], Beatriz Luna Coutinho de Almeida [3], Larissa Franco Belem [4], Clara Demeneck Pereira [5], Bruno de Sousa Mendes Parente [6], Eduardo Siqueira Waihrich [7]

[1] Instituto Hospital de Base do Distrito Federal, Brasília, DF, Brazil.

[2] Medical student, Centro Universitário de Brasília (CEUB), Brasília, DF, Brazil.

[3] Medical student, CEUB, Brasília, DF, Brazil.

[4] Medical student, CEUB, Brasília, DF, Brazil.

[5] Medical student, CEUB, Brasília, DF, Brazil.

[6] Instituto Hospital de Base do Distrito Federal, Brasília, DF, Brazil.

[7] Instituto Hospital de Base do Distrito Federal, Brasília, DF, Brazil.

***Corresponding Author:** Vinicius Moreira Lima, SHDB QL 32 Cj 14, Casa 1 71676170 – Brasília, DF Brazil

Received date: April 03, 2023; Accepted date: April 18, 2023; Published date: April 27, 2023

Citation: Vinicius M. Lima., Camila D. Ribeiro., Coutinho de Almeida BL., Larissa F. Belem., Clara D. Pereira., et all (2023), Mechanical Thrombectomy Via Direct Internal Carotid Artery Puncture, *J. Neuroscience and Neurological Surgery.* 13(2); **DOI:10.31579/2578-8868/265**

Abstract

Introduction: Transfemoral access is the route of choice for endovascular treatment. However, anatomic variants may be an obstacle, leading to unfavorable outcomes due to difficulty in obtaining access and longer puncture-to-reperfusion times. Alternative routes should be considered in these cases.

Objective: To report a case of thrombectomy performed via direct internal carotid artery puncture access.

Report: An elderly patient presented with fluctuating neurological deficits (left-sided hemiparesis and dysarthria). Imaging showed ischemia in the right middle cerebral artery territory. The patient was referred for thrombectomy. Due to the tortuosity of the aortic arch, a radial approach was attempted, unsuccessfully. Direct internal carotid artery puncture was performed. The patient was discharged after 7 days with no deficits.

Conclusions: Similar cases reported to date have used ultrasound-guided puncture of the common carotid artery. This route was not feasible in the present case, leading to direct puncture of the internal carotid artery. This high-risk maneuver was justified by the adverse clinical picture, and a successful outcome was achieved.

Key words: endovascular treatment; thrombectomy ; internal carotid artery; reperfusion; alternative access

Introduction

Mechanical thrombectomy is currently the standard of care for patients with acute ischemic stroke secondary to large vessel occlusion (LVO) within the treatment window. Several studies have shown that shorter reperfusion time is associated with smaller infarct size and better clinical outcome [6]. Transfemoral access is the route of choice for endovascular treatments [1]. However, in some cases, anatomic variants can be a hindrance to this approach, such as elongation and tortuosity of the aortic arch and carotids [1]. Such variants may be associated with unfavorable outcomes due to difficulty in obtaining access and advancing the catheter, prolonging the time from puncture to reperfusion. In such cases, an alternative access route should be considered [2], which may include, for example, radial and transcarotid access. Studies show that the use of this alternative approach compared with abandoning the procedure was associated with significantly increased reperfusion rates, greater improvement in NIHSS scores,decreased infarct volumes, and better functional outcomes at 3 months [7].

Case Presentation

Four days before admission, an elderly patient with chronic atrial fibrillation discontinued oral anticoagulation for a scheduled cardiac catheterization, performed uneventfully 1 day before admission. Five hours before admission, the patient developed a fluctuating neurological deficit consisting of left-sided hemiparesis and dysarthria. At the time of presentation to the urgent care clinic of our hospital, the deficit was fixed and no further spontaneous regression occurred.

MRI revealed a perfusion deficit in the territory of the right middle cerebral artery. Non-contrast CT showed a lesion in the head of the caudate nucleus (ASPECTS 9) (Figure 1), while a cerebral CT angiogram showed occlusion of the superior (M2) segment.

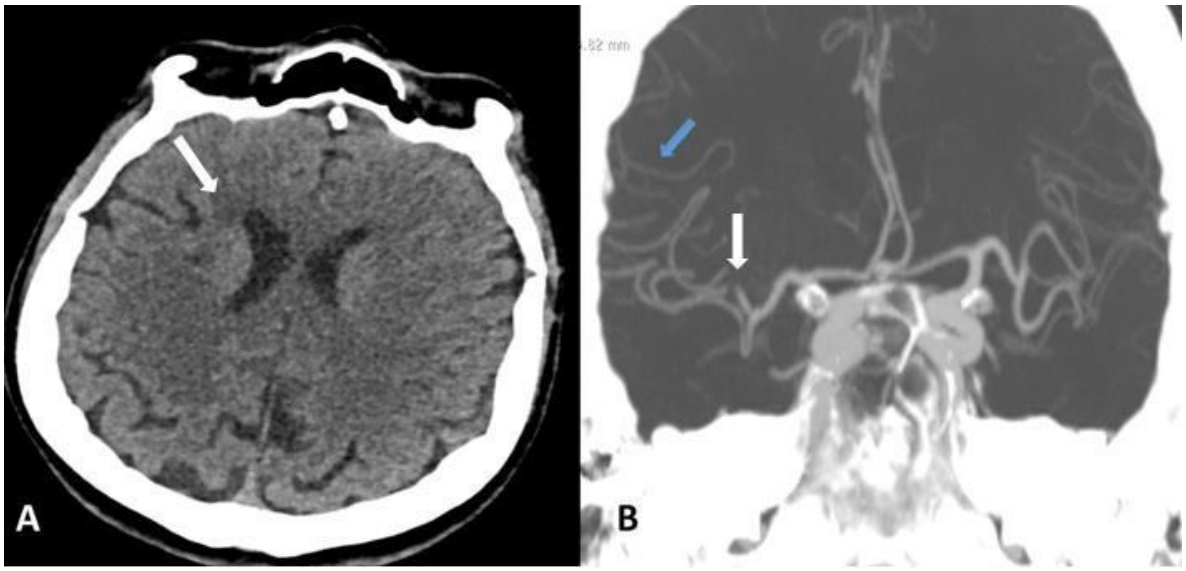

Figure 1: **A**) Head CT showing a small area of hypodensity in the head of the caudate (ASPECTS 9) *(whrite arrow)*. **B**) CT angiography showing complete occlusion of the superior (M2) branch on the right *(whrite arrow)*, with a satisfactory collateral supply *(arrow blue)*.

As the patient presented beyond the therapeutic window for thrombolysis, was referred for mechanical thrombectomy.

While obtaining access, severe tortuosity of the aortic arch was identified, which made it impossible to reach the right carotid artery via the femoral route (Figure 2).

Figure 2: Left oblique angiogram showing severe tortuosity of the aortic arch (*whrite arrow*), which prevented access to the right carotid artery.

We thus opted for the radial approach and secured access uneventfully, but again encountered marked tortuosity between the subclavian and right carotid arteries (Figure 3).

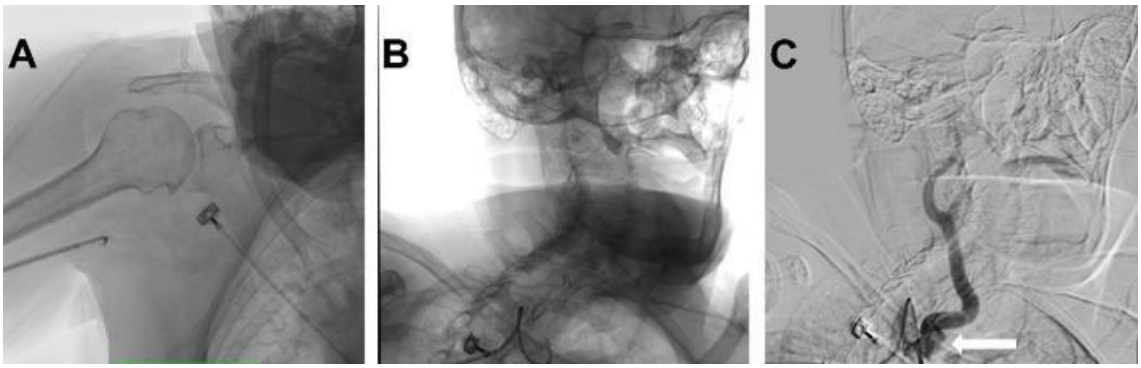

Figure 3: **A**) Radial access with a 6F long sheath. **B** and **C**) Tortuosity preventing access to the right carotid artery *(whrite arrow)*.

After several attempts at reaching the right carotid, a dissection of the common carotid artery occurred and the patient's clinical condition quickly deteriorated. We then decided to perform direct puncture of the internal carotid artery under Road-Mapping guidance (Philips®) (Figure 4)

Figure 4: **A**) Direct puncture of the internal carotid artery with a 5F introducer *(whrite arrow)*. **B**) Angiogram showing puncture of the right internal carotid artery and dissection of the common carotid artery (blue arrow).

Distal access was then obtained with a Sofia 5F catheter (MicroVention®), the thrombus was crossed with a Rebar 27 microcatheter (Medtronic®), navigated with an Avigo 0.014in microguide (Medtronic®), and mechanical thrombectomy performed with a Solitaire Platinum 4x40mm revascularization device (Medtronic®). Local aspiration was performed with a Sofia catheter under negative pressure using a 60-mL syringe.

The first pass achieved TICI 2A flow (Figure 5), while the second pass yielded complete (TICI 3) reperfusion (Figure 6).

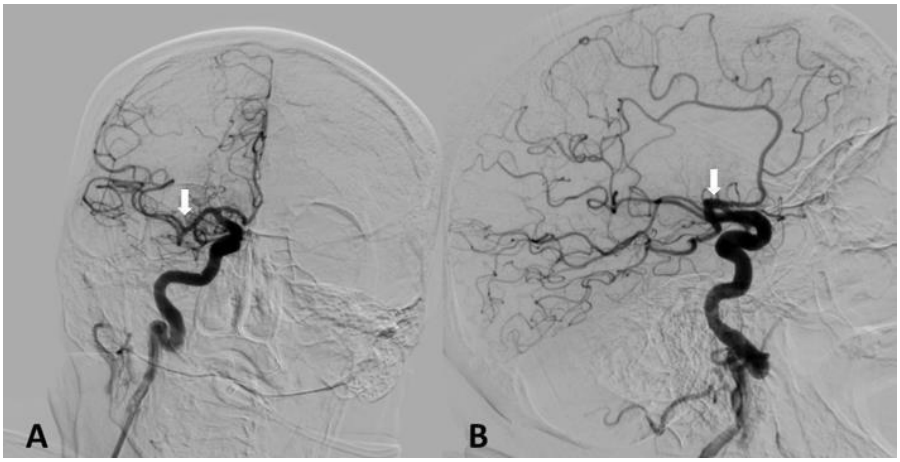

Figure 5: **A**) AP (**A**) and lateral (**B**) angiograms showing recanalization of the entire MCA and inferior M2 segment, with persistent occlusion of the superior M2 segment *(whrite arrows)* after the first pass.

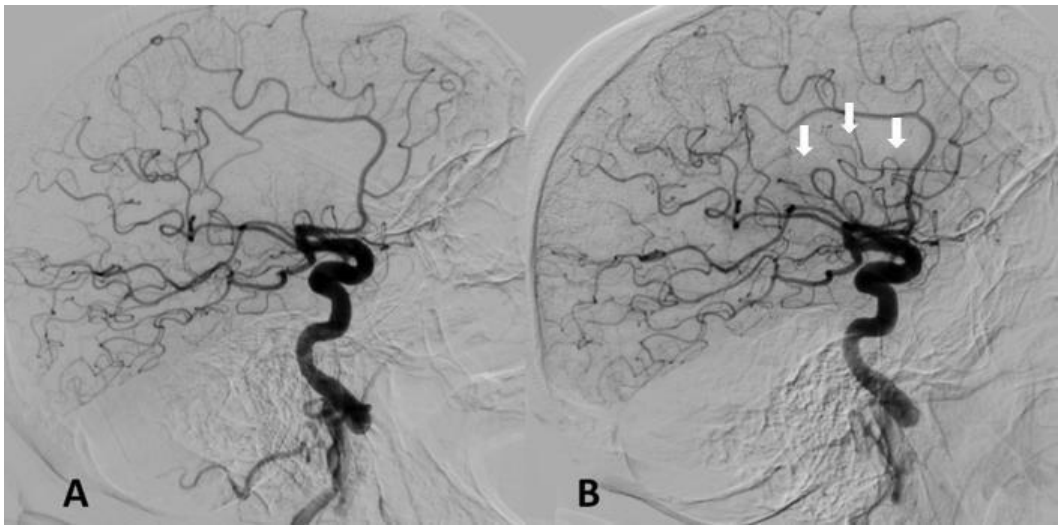

Figure 6: **A**) Lateral angiogram before (**A**) and after (**B**) the second pass, showing complete recanalization *(whrite arrows)*.

Postoperative control CT did not show any visible bleeding (Figure 7). MRI and MR angiography performed 4 days after the event did not reveal any evidence of established ischemic lesions, and showed complete healing of the common carotid dissection (Figure 8).

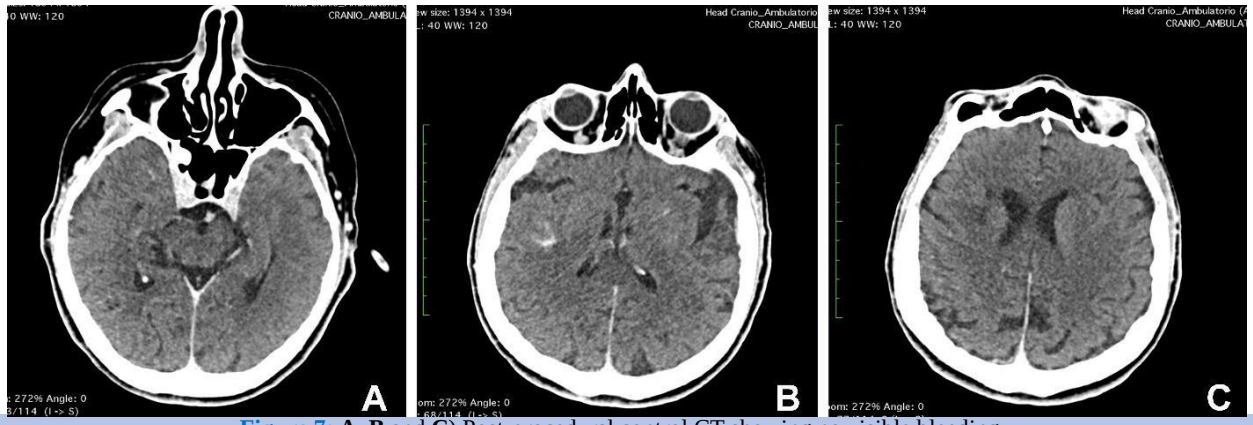

Figure 7: A, **B** and **C**) Post-procedural control CT showing no visible bleeding.

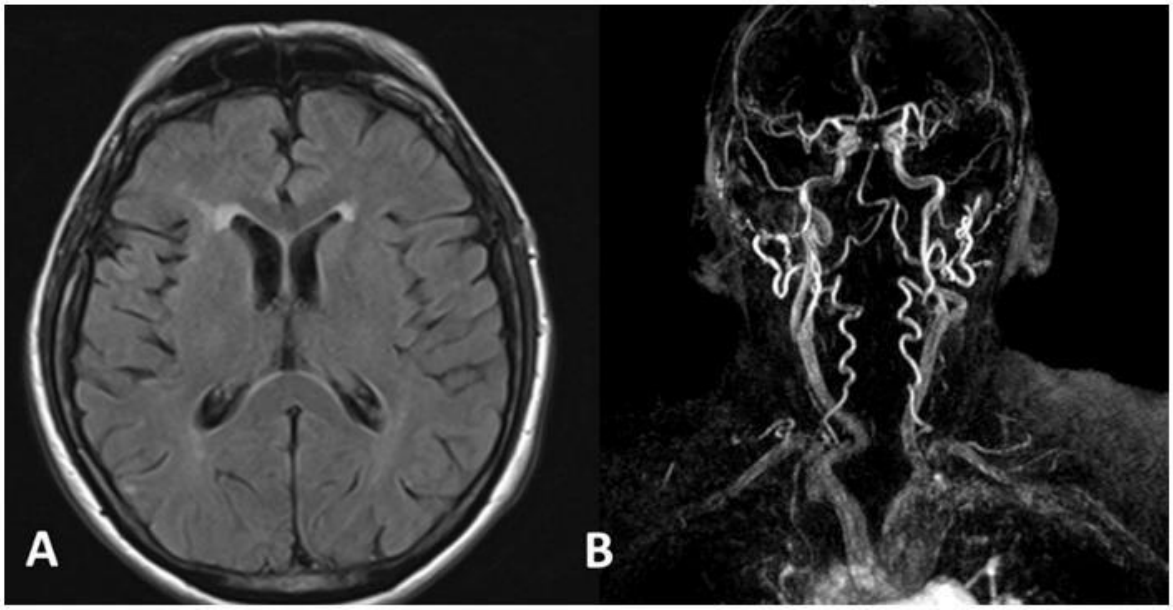

Figure 8: **A**) MRI (FLAIR) performed 4 days post-procedure showing no visible lesions in the treated territory. **B**) MRI angiography showing complete healing of common carotid artery dissection with conservative management.

The patient was discharged on the 7th postoperative day, completely asymptomatic.

Discussion

Endovascular intervention is the treatment of choice (class 1A evidence) for occlusion of intracranial arterial main trunks, and is probably the best option for M2 segment branches. Femoral access is the recommended standard route for endovascular treatment [3]. However, in some cases, such as the one presented herein, anatomic variants pose some difficulty and resistance, such as elongation and tortuosity of the aortic arch or supra-aortic vessels, hindering or altogether preventing navigation and stabilization of the guide catheter via the transfemoral route [3].

In this scenario, the brachial or transradial approaches are viable alternatives, as they can allow faster and safer access to the occlusion site to achieve recanalization [1]. When the standard approach is not feasible, alternative techniques should be sought immediately due to the importance of implementing treatment quickly and effectively, since delays in achieving reperfusion can be a determining factor in unfavorable outcomes [4].

Direct carotid artery puncture should also be considered a viable alternative once other alternatives have been ruled out, as in the present case [5]. Although considered a safe technique, the carotid approach carries a risk of complications that can lead to worse prognosis, such as reversible arterial spasm, arterial dissection, and cervical hematoma [3]. Thus, it is considered a technique of last resort, contingent upon scenarios where no other, safer access can be obtained.

In order to reduce the likelihood of complications and damage to the vessel wall, when accessing the carotid artery directly, the use of a micro puncture device under ultrasound [3] is recommended [6]. To reduce the risk of bleeding, it is essential that only a single puncture be made.

Similar cases reported [2, 3, 6, 7] to date have used ultrasound-guided puncture of the common carotid artery. In our patient, common carotid artery access became impossible due to the dissection caused in the attempt to access the radial route. Thus, the decision was made to perform direct puncture of the internal carotid artery under Road-Mapping guidance (Philips®). This is a high-risk maneuver, but given the patient's neurological deterioration and the odds of death or severe weakness, we judged the risk acceptable. The procedure was performed uneventfully and successfully, without any complications at the puncture site.

This is the first case of mechanical thrombectomy with access via direct internal carotid artery puncture reported in the literature.

Learning Points/Take Home Messages

Transfemoral access is the route of choice for endovascular treatment; however, anatomic variants may be a hindrance, leading to unfavorable outcomes due to difficulty in obtaining access and longer puncture-to-reperfusion times. Alternative routes should be considered in these cases

In order to reduce the likelihood of complications and damage to the vessel wall, when accessing the carotid artery directly, is recommended the use of a micropuncture device under ultrasound This is the first case of mechanical thrombectomy with access via direct internal carotid artery puncture reported in the literature

Competing Interests: None declared

Financial Disclosure: The authors have no financial relationships relevant to this article to disclose.

References

1. Ribo, M., Flores, A., Rubiera, M., Pagola, J., Mendonca, N. et all (2013). Difficult catheter access to the occluded vessel during endovascular treatment of acute ischemic stroke is associated with worse clinical outcome. *Journal of Neurointerventional Surgery*, 5(Suppl 1), i70-73.
2. Mokin, M., Snyder, K. V., Levy, E. I., Hopkins, L. N. & Siddiqui, A. H. (2015). Direct carotid artery puncture access for endovascular treatment of acute ischemic stroke: technical aspects, advantages, and limitations. *Journal of Neurointerventional Surger*, 7(2), 108-113.
3. Roche, A. D., Murphy, B., Adams, N., Sheahan, R., Brennan, P. & Looby, S. (2017). Direct Common Carotid Artery Puncture for Endovascular Treatment of Acute Large Vessel Ischemic Stroke in a Patient with Aortic Coarctation. *Journal of Stroke and Cerebrovascular Diseases*, 26(11), e211-e213.
4. Blanc, R., Piotin, M., Mounayer, C., Spelle, L. & Moret, J. (2006). Direct cervical arterial access for intracranial endovascular treatment. *Neuroradiology*, 48(12), 925-929.
5. Nii, K., Kazekawa, K., Onizuka, M., Aikawa, H., Tsutsumi, M., Tomokiyo, M., Iko, M., Kodama, T., Matsubara, S., Go, Y. & Tanaka, A. (2006). Direct carotid puncture for the endovascular treatment of anterior circulation aneurysms. *American Journal of Neuroradiology*, 27(7), 1502-1504.
6. John Chung Yan Chan, Yin Lun Edward Chu, Ivan Hoi Wei Cheung, Anderson Chun On Tsang, Kui Kai Lau, Raymand Lee. Direct Carotid Puncture for Mechanical Thrombectomy in Acute Ischemic Stroke: Literature Review and a Single-Center Experience. World Neurosurgery. Volume 163, 2022, e301-e309.
7. Cord, B. J., Kodali, S., Strander, S., Silverman, A., Wang, A. et all (2020). Direct carotid puncture for mechanical thrombectomy in acute ischemic stroke patients with prohibitive vascular access, Journal of Neurosurgery, 135(1), 53-63.
8. Nishimura K, Kaku S, Sano T, et al. Direct carotid puncture for endovascular thrombectomy in a 96-year-old patient with acute cerebral infarction: a case report. Article in Japanese. No Shinkei Geka. 2018; 46(9): 797–802.
9. Fjetland L, Roy S. Transcarotid endovascular thrombectomy for acute ischemic stroke. J Vasc Interv Radiol. 2018; 29(7): 1006–1010.
10. Roche A, Griffin E, Looby S, et al. Direct carotid puncture for endovascular thrombectomy in acute ischemic stroke. J Neurointerv Surg. 2019; 11(7): 647–652.

DOI:10.31579/2578-8868/265