

MANAGEMENT OF ACUTE ISCHAEMIC STROKE DUE TO SHELDON CATHETER INSERTION INTO THE RIGHT COMMON CAROTID ARTERY USING THE ASPIRATION THROMBECTOMY: A CASE REPORT

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Accidental carotid cannulation using a large-bore catheter is one of the complications of central venous catheter insertion, reported in 1 % of performed procedures. Management of arterial catheterization contains direct manual compression, endovascular treatment, and open surgical repair. Inadvertent arterial cannulation can lead to hemorrhage, pseudoaneurysm, arteriovenous fistula, stroke or death. Mechanical removal of thrombotic material is presently the most effective method of stroke treatment. Rapid and early restoration of blood flow is crucial for the improvement of the neurological condition. This report describes a case of a patient with signs of severe stroke after management of accidental carotid catheterization using balloon tamponade. Aspiration thrombectomy was successfully performed to manage acute ischaemia of the brain.

Key words: mechanical thrombectomy; acute ischaemic stroke; carotid catheterization; balloon tamponade; interventional radiology.

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List of abbreviations

CVC	Central venous catheterization
DSA	Digital subtraction angiography

Introduction

Hemodialysis is one of the indications for central venous catheterization (CVC). The preferred site for cannulation is right internal jugular vein. During catheterization, serious complications may occur, including infection, haematoma, pneumothorax, nerve injury, thrombosis, and incidental arterial insertion [1, 2]. Inadvertent arterial cannulation using a large-bore catheter is reported in 1 % of performed procedures [3]. However, it can lead to hemorrhage, pseudoaneurysm, arteriovenous fistula, stroke or death [2–5]. Management of arterial catheterization contains direct manual compression, endovascular treatment, and open surgical repair. Despite the advantages, none of these procedures guarantee complete elimination of life-threatening problems, notably severe stroke. Mechanical thrombectomy is presently the most effective managing method of acute ischaemic stroke caused by occlusion of a large cerebral artery [6].

We report a case of the patient with signs of severe stroke after management of accidental carotid catheterization using balloon tamponade. Aspiration thrombectomy was successfully performed to manage acute ischaemia of the brain.

Case presentation

A 79-year-old male patient with end-stage renal failure was admitted to the Department of General and Vascular Surgery, because of arterial cannulation due to Sheldon catheter (12 French) insertion. Based on the condition of the patient, he was qualified for endovascular balloon tamponade. Vascular access was achieved by the Seldinger method and the digital subtraction angiography (DSA) of the brachiocephalic trunk was performed. DSA revealed a presence of the Sheldon catheter in the common right carotid artery and ascending aorta (Fig. 1). Balloon catheter measuring 8 × 40 mm was inserted into the damaged area under fluoroscopy. During continuous manual compression, Sheldon catheter



Fig. 1. DSA examination.
Presence of the Sheldon catheter in the common right carotid artery and ascending aorta

was removed and the balloon was repeatedly inflated for 2 min. The patient was in logical contact during the procedure. According to control angiography, there were no signs of hemorrhage from the common right carotid artery. After angiography, involuntary limb movements, weakness of muscle strength on the left side and speech disorders occurred (NIHSS scale, 16 points). Subsequent angiography revealed occlusion of the middle cerebral artery (M_1 -segment) (Fig. 2).



Fig. 2. Occlusion of the lumen of the middle cerebral artery (M_1 -segment)

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Fig. 3. Control DSA examination. Restoration of blood flow through cerebral vessels after successful mechanical thrombectomy

Analgosedation and intra-arterial thrombolysis were administered. Aspiration thrombectomy using Penumbra Indigo System was performed and restoration of cerebral vascularization was achieved in less than 1 hour (Fig. 3). Control DSA examination of the brachiocephalic trunk revealed a place of extravasation of the contrast agent in an initial segment of the common right carotid artery. Angioplasty with implantation of the stent graft (Bentley BeGraft Peripheral Stent Graft System) measuring 10 × 57 mm was performed. Vascular access was closed with the Angio-Seal system. The patient in a stable condition was transferred to another hospital. Small hypodense areas of white matter of right frontal gyri, which may indicated small damages of blood brain barrier, but no other severe changes connected with acute stroke were revealed by computed tomography scanning of the head.

Discussion

Proper CVC is required for efficient hemodialysis. The commonly used technique is based on anatomical landmarks. Unfortunately, it is associated with the risk of arterial catheterization, because of the vicinity and anatomical variation of the carotid artery and internal jugular vein [1]. Ultrasound-guided catheterization decreases the risk of mechanical complications, but does not eliminate them [1, 3].

No standard guidelines were established for the management of arterial puncture. Selection of method depends on several factors – diameter and localization of catheter, surgical access, and possible complications.

Previous evidence has reported that catheter with a diameter greater than 7F, especially in localization difficult to compress, should not be removed using direct manual compression, because it is associated with high complication rate (94.4 %) [2, 3, 5].

Endovascular therapy is an appropriate option for arterial injury located behind or below the clavicle and in sites with difficult surgical access [2]. Embolic stroke and hemorrhage were reported as complications of endovascular therapy, but its success rate reaches 94.6 % and it is suggested to use when possible [5]. Balloon tamponade is used for accidental subclavian artery cannulation with success rate reaches 100 % in case of single lumen injury. It is less invasive than surgical treatment, does not involve inserting foreign bodies and can be converted into more invasive managing options [4]. According to Dixon et al. surgery is the optimal method without any reported complications so far, but may be inefficient in the area with difficult access, as it requires general anesthesia [5].

Ischaemic stroke is commonly caused by the thrombotic or embolic material closing lumen of a large cerebral vessel. The duration of ischaemia has significant influence on the appearance of the clinically important and permanent neurological deficit. Therefore rapid and early restoration of blood flow is crucial for the improvement of the neurological condition. The most effective treatment method of ischaemic stroke caused by occlusion of a large cerebral artery is mechanical thrombectomy, irrespective of patient characteristics or geographical location. Goyal et al. in their analysis confirm benefit of endovascular thrombectomy in groups of the patients with symptom onset later than 300 min, patients not receiving intravenous alteplase and the elderly [6, 7].

Simultaneous application of thrombolysis and mechanical thrombectomy has become a standard of management of severe ischaemic stroke. Mechanical thrombectomy performed by experienced team significantly decreases the risk of failure and postoperative complications

[7]. Management of the acute ischaemic stroke in this specific situation was primary procedure despite the fact of previous catheter removal from the artery. According to application of the intra-arterial thrombolysis, as the next step, area of catheterization was secured with the peripheral stent graft (Bentley BeGraft Peripheral Stent Graft System).

Penumbra System is a first-generation mechanical thrombectomy device aspirating the thrombus by negative pressure suctioning. Penumbra System has a comparable duration of the procedure to retrievable stents. The successful recanalization ranges 86.6 % using Penumbra System and 92.9 % utilizing retrievable stents. However, the 3-month mortality rate was respectively 20.7 % and 12.3 % [8]. There are no signi-

ficant differences in safety and efficiency between the Solitaire and Penumbra devices in acute ischaemic stroke caused by occlusion of the middle cerebral artery or intracranial internal carotid artery [9]. The ASTER Randomized Clinical Trial indicated that the contact aspiration compared with retrievable stents, both used as the first-line thrombectomy, did not increase successful revascularization rate at the end of the procedure. There were no significant differences between revascularization rate and early improvement in neurological outcomes in these two groups [10].

In conclusion, catheterization of the artery is connected with life-threatening problems such as acute ischaemic stroke. Mechanical removal of thrombus has revolutionized the treatment of severe ischaemic stroke.

References

1. Ayoub C, Lavallée C, Denault A. Ultrasound guidance for internal jugular vein cannulation: Continuing Professional Development. *Can J Anesth.* 2010;57:500-14. <https://doi.org/10.1007/s12630-010-9291-7>
2. Guilbert M-C, Elkouri S, Bracco D, et al. Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *J Vasc Surg.* 2008;48: 918-25. <https://doi.org/10.1016/j.jvs.2008.04.046>
3. Bowdle A. Vascular complications of central venous catheter placement: evidence-based methods for prevention and treatment. *J Cardiothorac Vasc Anesth.* 2014;28, 358-68. <https://doi.org/10.1053/j.jvca.2013.02.027>
4. Dunham GM, Vaidya SS. Balloon tamponade repair after inadvertent subclavian artery catheterization. *J Vasc Access.* 2015;16:152-7. <https://doi.org/10.5301/jva.5000293>
5. Dixon OGB, Smith GE, Carradice D, Chetter IC. A systematic review of management of inadvertent arterial injury during central venous catheterisation. *J Vasc Access.* 2017;18:97-102. <https://doi.org/10.5301/jva.5000611>
6. Goyal M, Demchuk AM, Menon BK, et al. Randomized assessment of rapid endovascular treatment of ischemic stroke. *N Engl J Med.* 2015;372:1019-30. [http://doi.org/10.1016/S0140-6736\(16\)00163-X](http://doi.org/10.1016/S0140-6736(16)00163-X)
7. Evans MRB, White P, Cowley P, Werring DJ. Revolution in acute ischaemic stroke care: a practical guide to mechanical thrombectomy. *Pract Neurol.* 2017;17:252-65. <https://doi.org/10.1136/practneurol-2017-001685>
8. Almekhlafi MA, Menon BK, Freiheit EA, et al. A meta-analysis of observational intra-arterial stroke therapy studies using the Merci Device, Penumbra System, and Retrievable Stents. *Am J Neuroradiol.* 2013;34:140-5. <https://doi.org/10.3174/ajnr.A3276>
9. Caranfa JT, Nguyen E, Ali R, et al. Mechanical endovascular therapy for acute ischemic stroke: An indirect treatment comparison between Solitaire and Penumbra thrombectomy devices. *PLOS ONE.* 2018;13:e0191657. <https://doi.org/10.1371/journal.pone.0191657>
10. Lapergue B, Blanc R, Gory B, et al. Effect of endovascular contact aspiration vs stent retriever on revascularization in patients with acute ischemic stroke and large vessel occlusion. The ASTER Randomized Clinical Trial. *J Vasc Surg.* 2017;66:1910. <https://doi.org/10.1016/j.jvs.2017.10.034>

ЛІКУВАННЯ ГОСТРОГО ШЕМІЧНОГО ІНСУЛЬТУ ШЛЯХОМ АСПІРАЦІЙНОЇ ТРОМБЕКТОМІЇ З ВИКОРИСТАННЯМ КАТЕТЕРА SHELDON КРІЗЬ ПРАВУ ЗАГАЛЬНУ СОННУ АРТЕРІЮ: КЛІНІЧНИЙ ВИПАДОК

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Випадкова катетеризація сонної артерії катетером великого діаметра є одним із ускладнень уведення центрального венозного катетера, яке виникає в 1 % випадків. Керування катетеризацією артерії передбачає пряму мануальну компресію, ендovasкулярне лікування та відкрите

хірургічне втручання. Випадкова артеріальна катетеризація може призвести до крововиливу, псевдоаневризми, артеріовенозної нориці, інсульту або смерті. Механічна тромбектомія нині є найефективнішим методом лікування інсульту. Швидке та раннє відновлення кровотоку має вирішальне значення для поліпшення неврологічного стану. Наведено клінічний випадок хворого з ознаками тяжкого інсульту після випадкової катетеризації сонної артерії під час використання балонної тампонади. Для лікування гострої ішемії головного мозку була успішно виконана аспіраційна тромбектомія.

Ключові слова: механічна тромбектомія; гострий ішемічний інсульт; катетеризація сонної артерії; балонна тампонада; інтервенційна радіологія.

ЛЕЧЕНИЕ ОСТРОГО ИШЕМИЧЕСКОГО ИНСУЛЬТА ПУТЕМ АСПИРАЦИОННОЙ ТРОМБЭКТОМИИ С ИСПОЛЬЗОВАНИЕМ КАТЕТЕРА SHELDON ЧЕРЕЗ ПРАВУЮ ОБЩУЮ СОННУЮ АРТЕРИЮ: КЛИНИЧЕСКИЙ СЛУЧАЙ

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Случайная катетеризация сонной артерии катетером большого диаметра является одним из осложнений введения центрального венозного катетера, которое возникает в 1 % случаев. Управление катетеризацией артерий предусматривает прямую мануальную компрессию, эндоваскулярное лечение и открытое хирургическое вмешательство. Случайная артериальная катетеризация может привести к кровоизлиянию, псевдоаневризме, артериовенозному свищу, инсульту или смерти. Механическая тромбектомия в настоящее время является наиболее эффективным методом лечения инсульта. Быстрое и раннее восстановление кровотока имеет решающее значение для улучшения неврологического состояния. Приведен клинический случай пациента с признаками тяжелого инсульта после случайной катетеризации сонной артерии при использовании баллонной тампонады. Для лечения острой ишемии головного мозга была успешно выполнена аспирационная тромбектомия.

Ключевые слова: механическая тромбектомия; острый ишемический инсульт; катетеризация сонных артерий; баллонная тампонада; интервенционная радиология.