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Case Report CARDIOLOGY

Catheter-based management of a catheterization related stroke

Seref Kul, Mustafa Adem Tatlisu, Yusuf Yilmaz, Omer Faruk Baycan, Mustafa Caliskan

Department of Cardiology, Istanbul Medeniyet University Faculty of Medicine, Istanbul, Turkey

ABSTRACT

Ischemic stroke is a rare and serious complication of coronary angiography and percutaneous coronary intervention, which has high morbidity and mortality. To our knowledge, there is no large-scale randomized controlled trial for the management of catheter-related ischemic stroke. In this case study, we presented a 46-year-old male with peri-procedural ischemic stroke during the coronary angiography (CAG). The CAG was terminated after the stroke and the left carotid artery was selectively cannulated, and digital subtraction angiography (DSA) revealed total occlusion (Modified Thrombolysis in Cerebral Infarction, mTICI, 0) of the M1 part of the left middle cerebral artery (MCA). A stent-assisted thrombectomy was performed and the DSA revealed restoration of flow to the left MCA with mTICI 3 flow in the distal branches. The next day, the neurological exam showed no sensory, motor deficits. The patient was discharged four days later. In the setting of catheter-related stroke, mechanical thrombectomy seems to be the least time-consuming and effective approach.

Keywords: Cardiac catheterization; ischemic stroke; stent-assisted thrombectomy

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Ischemic stroke is a rare and severe complication of coronary angiography (CAG) and percutaneous coronary intervention (PCI), which has high morbidity and mortality [1]. The risk factors for CAG/PCI associated stroke are arterial hypertension, history of transient ischemic attack and stroke, chronic kidney disease, congestive heart failure, intra-aortic balloon pump use, bypass graft interventions [2]. We present a case of successful stent-assisted thrombectomy for the thromboembolic stroke of the middle cerebral artery (MCA).

CASE REPORT

A 46-year-old male with stable angina pectoris who underwent coronary artery bypass surgery [Left internal mammary artery (LIMA)-left anterior descending artery (LAD), aorta (Ao)-right coronary artery (RCA), Ao-first obtuse marginal artery (OM1)] nine years ago was admitted to our cardiology service for a diagnostic CAG. CAG revealed total occlusion of the native LAD, RCA, OM1, and Ao-RCA graft. LIMA-LAD and Ao-OM1 showed good patency and CAD showed 70% stenosis in the native circumflex artery. The patient became confused with right hemiplegia (Muscle strength, 1/5) and hemiparesis, global aphasia during the procedure. The left carotid artery was selectively cannulated and digital subtraction angiography (DSA) revealed total occlusion [Modified Thrombolysis in Cerebral Infarction (mTICI) 0] of the M1 part of the left MCA (Fig. 1). We decided to perform stent-assisted thrombectomy and intravenous 5000 IU systemic heparin was administered. 6F Terumo Pinnacle® destination guiding catheter (90 cm) was placed in the left carotid artery. Codman Agility® 0.014 (205 cm) hydrophilic guidewire

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Correspondence: Mustafa Adem TATLISU, MD. Istanbul Medeniyet Universitesi Tip Fakultesi, Kardiyoloji Anabilim Dali, Istanbul, Turkey.
Tel: +90 536 443 99 06 e-mail: ademtatlisu@gmail.com

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Figure 1. The digital subtraction angiography (DSA) of the left carotid artery shows (white arrow) the thrombus in the M1 segment of middle cerebral artery without distal flow [Modified Thrombolysis In Cerebral Infarction (mTICI) 0].



Figure 2. The DSA of the left carotid artery revealed restoration of flow to the left MCA with mTICI 3 flow in the distal branches.

and Marksman® microcatheter (160 cm) were advanced to the M1 part of the left MCA. After placing the microcatheter in the M1 segment of the left MCA, the hydrophilic guidewire was removed from the system. The Solitaire® Platinum revascularization device (6x40 mm/180 cm) was placed in the M1 segment of the left MCA. The device and the microcatheter were removed after waiting for three to five minutes after stent-retriever deployment. The DSA of the left carotid artery revealed restoration of flow to the left MCA with mTICI 3 flow in the distal branches (Fig. 2). The thrombus in the stent-retriever system is shown in Figure 3. The stent-assisted thrombectomy was completed within 15 minutes of the onset of the symptoms. The patient's confusion, global aphasia, and sensory-motor deficits improved immediately. Post-procedural diffusion magnetic resonance imaging (MRI) revealed multiple linear hyperintense lesions in the left parasagittal frontal cortex and left parietotemporal cortex, and showed no sign of hemorrhage (Fig. 4). After 24 hours of the procedure, diffusion MRI revealed the same lesions. The next day, the neurological exam showed no sensory, motor deficits. The patient was discharged four days later. Patient's consent was obtained for this case study.



Figure 3. The thrombi in the stent-retriever device.

DISCUSSION

Stroke is a severe complication after cardiac catheterization procedures, which is seen with an incidence of 0.08–0.4%, and the most common cause of catheterization-related stroke is embolism [2–4]. There are several risk factors, such as arterial hypertension, diabetes mellitus, advanced age, chronic kidney disease and congestive heart failure [2].

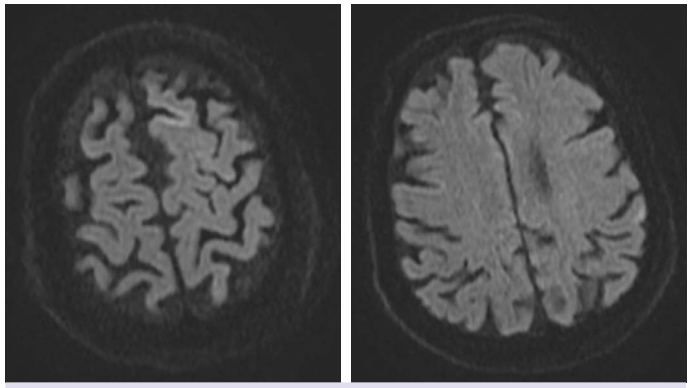


FIGURE 4. Post-procedural diffusion magnetic resonance imaging (MRI) revealed multiple linear hyperintense lesions in the left parasagittal frontal cortex and left parietotemporal cortex.

The embolism may arise from the dislodgement of the aortic plaque and thrombus formation in the diagnostic/guiding catheters [5, 6]. Keeley et al. [6] analyzed 1000 PCI and plaque dislodgement in the aortic arch was shown in 50% of all procedures. The thrombus formation in the catheter lumen is another cause of catheter-related ischemic stroke. The spectrum of clinical symptoms may be variable, but the most common findings are motor and verbal deficits. The diagnostic tools for catheter-related stroke include computed tomography and MRI, but DSA of the carotid arteries is able to show the level of the occlusion and morphology of the thrombus. DSA also can detect the hemorrhage by showing extravasation or late persistence of contrast.

There are several studies assessing the success of IV/intra-arterial thrombolytic or endovascular treatment. A case-series of intra-arterial thrombolytic therapy showed that 15% of the patients had intracranial hemorrhage [7]. The high-dose heparin (100 IU/kg) using in the PCI procedures is another issue in the setting of catheter-related stroke. PROACT-1 study assessing intra-arterial thrombolytic showed that the patients given IV heparin of 10.000 IU had higher hemorrhagic transformation compared to the patients given IV heparin of 3000 IU [8]. There are also some data in patients with hemostatic disorders (INR>1.7, aPTT>45 or platelet count <100.000/μl). Nogueira et al. [9] studied the efficacy of endovascular treatment in patients with hemostatic disorders and showed that there were no differences between groups (hemostatic disorder group and the control group) concerning mortality and intracranial hemorrhage. However, to our knowledge, there are no randomized-control studies assessing the success of endovascular treatment in the setting of catheter-related stroke; the efficacy of endovascular therapy has been shown in large-scale studies [10–13]. The study from Turkey showed that the success rate of the endovascular treatment is similar to international randomized-control studies [14, 15].

In our case, stroke occurred during the procedure. Thus, we preferred to perform DSA for early diagnosis and treatment. Although the reperfusion of the cerebral artery either by thrombolytics or mechanical thrombectomy is recommended within the first 3–4.5 hours [16], there is no large-scale randomized controlled trial for the management of the catheter-related ischemic stroke. There are some studies published on peri-procedural strokes, but the optimal therapy is still controversial [17–19]. In the setting of catheter-related stroke, mechanical thrombectomy seems to be the least time-consuming and effective approach, but large-scale randomized controlled trials are needed to confirm these findings.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

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