Angioplasty of the Middle Cerebral Artery as a Treatment of Ischemic Stroke Developed in the Course of a Routine Diagnostic Angiography – A Case Report

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ABSTRACT

Neurological events are one of possible complications which may occur in the course of invasive diagnostic and therapeutic procedures within aortic arch and coronary territory. The current case describes a patient in whom symptoms of massive stroke occurred immediately after routine coronary and peripheral angiography, treated by MCA angioplasty.

CASE REPORT

INTRODUCTION

Neurological events including strokes and transient ischemic attacks (TIA) are one of possible complications which may occur in the course of invasive diagnostic and therapeutic procedures within aortic arch and coronary territory. The events rate ranges from 0.27% to 0.7% [1-3]. The most common reason of the events is distal intracranial arteries embolization with atheromatous debris or thrombus. The current case describes a patient in whom symptoms of massive stroke occurred immediately after routine coronary and peripheral angiography.

CASE DESCRIPTION

Patient BD, 68 years old male, with a history of myocardial infarction and cerebral stroke, was admitted to the Department Vascular Surgery, American Heart of Poland in Chrzanow in order to perform diagnosis of chronic lower limb ischemia (distance of claudication ca. 150m). Based on color duplex ultrasound, bilateral 50% diameter stenosis of internal carotid arteries (ICA) was discovered. Following cardiological examination and consultation, the patient was qualified to invasive diagnosis. Coronary, aortic arch and peripheral angiography of lower extremities were performed as a planned procedure, using right femoral artery access. Arteriography revealed atherosclerotic lesions in the area of left common femoral artery bifurcation which required surgical treatment as well as 80% stenosis of right coronary artery qualified to planned percutaneous coronary intervention (PCI).

Thirty minutes after the procedure, increasing symptoms of consciousness decrease with focal neurological deficits (mouth corner drooping, increasing aphasia and right hemiplegia) occurred. Due to the fact that arterial sheath was left temporarily in the femoral artery the decision was made to perform a control angiography of carotid and cerebral arteries. In the meantime, the consulting neurologist confirmed right hemiplegia with aphasia. Due to possibility of immediate angiographic evaluation and possible revascularization of intracranial arteries the decision was made to not perform nuclear magnetic resonance (NMR) or computed tomography (CT). Angiographical evaluation did not reveal any significant pathology within left carotid artery, however the complete lack of contrast filling in the middle cerebral artery (LMCA) was found (Figure 1).

After neurological consultation the decision of intravascular intervention was made. A hydrophilic 0.014" guidewire passed through the carotid artery siphon and then it was gently introduced into obstructed /not visible by cine-angiography/ segment of LMCA. After the wire passed through the occlusion a partial flow of the contrast was visualized. Subsequently, it helped to further introduce the wire more distally. Subsequent contrast injections revealed stenosis of 5-6mm in length localized in the middle part of the LMCA. After angioplasty (Figure 2) with the use of 1.5x15mm balloon was performed a complete flow restoration was observed (Figure 3).

The whole procedure was monitored by an anesthesiologist. Already few minutes after the flow was restored, regression of neurological symptoms was observed with right upper and lower extremity movement and aphasia recovery. At the end of the procedure, only slight drooping of the right mouth corner was observed. After neurological re-consultation the patient was treated conservatively with the use of dual antiplatelet therapy and low molecular weight heparin. Within the period of 12 hours after the procedure the neurological symptoms recovered completely.

The patient was discharged from the hospital on day third. He was scheduled for readmission to treat stenosis of right coronary artery and subsequently to perform surgery on left femoral artery. The control brain NMR at 30 days follow-up revealed chronic diffuse subcortical and periventricular changes in white matter, more pronounced on the left side. Within the area of front branches of left middle cerebral artery a small focal infarct was detected (Figure 4). Additionally, a minor cortical focus of infarction in the temporal lobe was noted. Based on physical examination, the patient remained free from neurological symptoms at 1 and 6 months follow-up.

DISSCUSSION

Although the occurrence of stroke after aortic arch and coronary arteries angiography is a rare complication, it increases the risk of cardiovascular mortality. Following Ergelen, the risk is rising, especially in specific patients subgroups including ST segment elevation myocardial infarction (STEMI), female gender, hypertension and diabetes mellitus [3].

Interesting findings in this regard were published in STROKE in 2011 by Jurg et al. [4], who assessed cerebral microembolization during coronarography using transfemoral or transradial access. They found significantly bigger amount of microembolization material in patients with transradial approach. Although this technique is widely used in everyday clinical practice, the presence of so called “silent strokes” is usually not recognizable because NMR should be done in each patient after examination to confirm the diagnosis [5].

Regardless of distal embolization, a contrast injection may cause temporal cortical visual disturbances. The main reason of this phenomenon is penetration of a contrast media through the blood-brain barrier as a consequence of the opening of tight junctions between capillaries or due to increase of pinocitosis in endothelial cells [6]. It penetrates into cerebral cortex and adversely affects neuronal membranes. Described symptoms usually resolve spontaneously after proper hydration and heparinization [7].

In our case, it seemed that conservative and even very intensive pharmacological treatment would not be successful. Thus, decision was made to treat the patient interventionally. The choice was also justified by the character and structure of the Heart and Vessels Center, American Heart of Poland in Chrzanow, which consists of Vascular and Endovascular Surgery Department, Department of Interventional Cardiology and NMR Laboratory. Additionally, there is Department of Neurology with Stroke Unit and Computed Tomography Laboratory in close proximity.

Following the European Stroke Organization guidelines from 2008 [8], such a department in cooperation with a stroke unit may be a reference center for stroke treatment. For the patient described in the current case, in whom complication occurred, the proper care was provided together with a possibility of percutaneous coronary intervention and NMR imaging without necessity for a long transportation.

Although the case described here comes from only one single patient, the experience acquired may be helpful for the treatment of patients presenting with ischemic strokes admitted to a stroke unit. Unfortunately, it needs to be stressed out that no formal system for the interventional strokes treatment exists in Poland, on the model similar to the treatment of myocardial infarction. At present, 60-70 thousands of strokes occur every year in Poland. Of this number, a significant amount of patients die and more than half lose their efficiency. If the mentioned model of interventional stroke treatment would exist in Poland many patients could benefit from it by reducing stroke deficiencies.

One alternative treatment modality in the current case would be mechanical thrombectomy. Although, results of this technique are promising, further randomized studies are necessary [9-11]. In addition, these procedures are currently not reimbursed by the National Health Fund. This situation may change in near future as many new clinical centers with capabilities of doing interventional endovascular procedures are opening.

SUMMARY

Stroke may be a rare complication of diagnostic angiography. Immediate, interventional treatment of a stroke caused by embolic material, increase the chance for full recovery or at least for reduction of neurological deficiencies. It is of important meaning to create a multidisciplinary interventional centers which could provide the best possible treatment in these particular clinical settings.

TEACHING POINT

Stroke is a rare but very serious complication of interventional, endovascular diagnostic procedures such as coronarography and angiography. Early diagnosis, imaging can lead to interventional treatment if in a cause ischemic, embolic lesions. Sometimes this type of treatment can be performed in a high-volume cardiovascular center.

QUESTIONS

Question 1: What percentage of patients may develop symptomatic ischemic brain lesions after routine coronary angiography?

a) no such complication occurs after coronarography
b) 5%
c) 2%
d) 0.1%
e) less than 1%.

Neurological events including strokes and transient ischemic attacks (TIA) are one of possible complications which may occur in the course of invasive diagnostic and therapeutic procedures within aortic arch and coronary territory. The events rate ranges from 0.27% to 0.7%.

Question 2: Are neurological symptoms after coronary angiography or carotid angiography always associated with cerebral microembolization?

a) yes, it is a rare complication of invasive diagnostics

b) yes, it is associated with maneuvering catheters in the aortic arch

c) no, it can be caused by contrast administration alone

d) no, may be caused by inadequate hydration of the patient before the examination

e) yes, therefore preventive use of neuroprotective devices is advisable

Regardless of distal embolization, a contrast injection may cause temporal cortical visual disturbances. The main reason of this phenomenon is penetration of a contrast media through the blood-brain barrier as a consequence of the opening of tight junctions between capillaries or due to increase of pinocytosis in endothelial cells. It penetrates into cerebral cortex and adversely affects neuronal membranes. Described symptoms usually resolve spontaneously after proper hydration and heparinization.

Question 3: Which imaging test allows rapid assessment of the extent of early ischaemic changes in the brain?

a) CT scan without contrast agent

b) MRI scan without contrast agent

c) CT scan with contrast agent

d) MRI scan - diffusion-weighted imaging (DWI) and perfusion-weighted imaging (PWI)

e) MRI scan with contrast agent

In cases of diagnostic imaging of early stroke very useful id MRI in special protocol MRI-DWI and MRI-PWI, which is useful for recognition ischemic lesion just after several minutes. DW MRI was the first line neuroimaging technique. CT scan was performed in patients with suspected subarachnoid haemorrhage or if MR was contraindicated (for example, pacemaker, neurosurgical clip) or was unavailable.

Question 4: When and in which cases are there indications for interventional treatment of ischemic stroke?

a) never, standard of care is conservative treatment

b) never, if intravenous thrombolysis was done

c) only in cases 6 hour from onset

d) up to 24 hours

e) never, hemorrhagic rate complications are to high

In patients with strokes caused by large vessel occlusion, the indications for endovascular thrombectomy have been extended to include larger core infarcts and basilar artery occlusion, and the treatment time window has increased to up to 24 h from stroke onset, irrespective of prior thrombolysis.

Question 5: Which endovascular tools are useful for the interventional treatment of a stroke?

a) drug eluting balloon

b) drug eluting stent

c) clot removal device

d) carotid artery dedicated stent

e) atherectomy devices

In a most cases interventional treatment of stroke clot removal devices, carotid stents are using.

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FIGURES

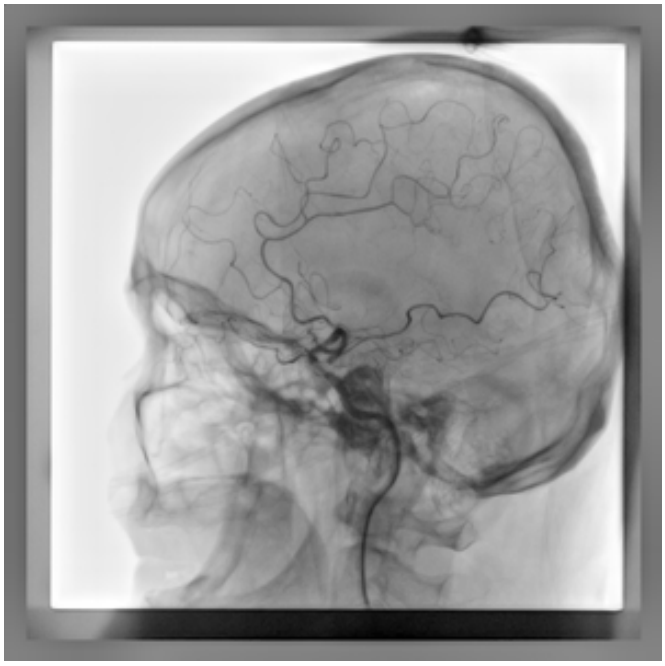

Figure 1: Angiographical evaluation shows the complete lack of contrast filling in the middle cerebral artery (LMCA).

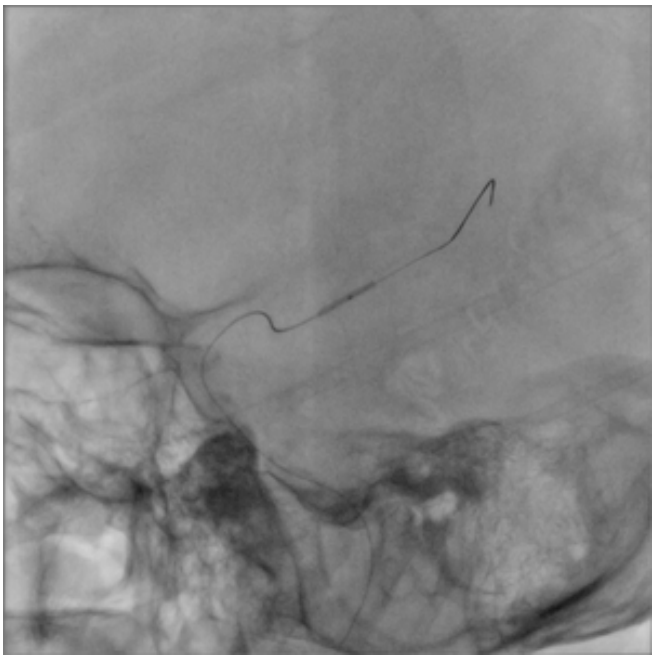

Figure 2: LMCA 1.5x15mm ballon angioplasty.

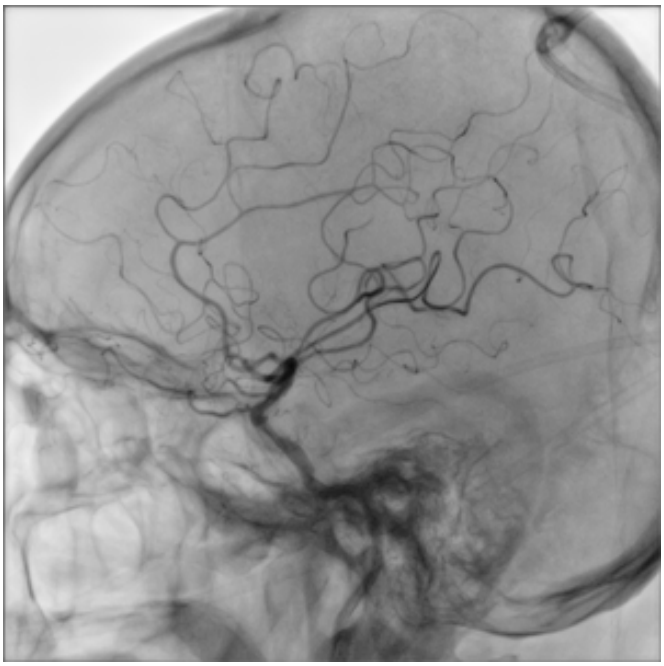

Figure 3: Flow restoration in LMCA after ballon angioplasty.

Figure 4: NMR 30 days follow-up. Within the area of front branches of left middle cerebral artery a small focal infarct was detected.

KEYWORDS

Angiography, Stroke, Cerebral Intervention