

Endovascular treatment of ruptured middle cerebral artery aneurysm in a pregnant woman

Endowaskularne leczenie pękniętego tętniaka tętnicy środkowej mózgu u kobiety w ciąży

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Aneurysms of the cerebral vessels are disorders in the structure of the walls of cerebral arteries. They usually occur in large arteries in the base of the brain. Pressure on nerves, which is the result of the presence of aneurysms, may lead to various types of neurological disorders [1]. Subarachnoid haemorrhage (SAH) is a complication of a ruptured aneurysm. The symptoms accompanying SAH may include: strong headache (frequently described by patients as ‘thunderclap headache’), disturbances of consciousness, nausea, vomiting, and loss of consciousness [2, 3].

The development of modern neurosurgical and neuroradiological endovascular treatment methods has allowed less invasive management of aneurysms, thereby decreasing the risk of complications, compared to the classic neurosurgical procedures [4].

Embolisation consists of percutaneous, intravascular introduction of self-detached coils into the aneurysmal sac, sometimes with the use of stents or balloons for remodelling via the system of catheters and microcatheters, through femoral artery access. This surgical technique leads to the exclusion of the aneurysm from the circulation and restores normal cerebral blood flow. One of the complications of embolisation is a thromboembolic episode occurring as a result of irritation of the vascular endothelium and triggering of the clotting cascade [5].

The objective of the study was the presentation of the case of a patient in pregnancy with ruptured aneurysm of the middle cerebral artery, with secondary coagulation of the middle cerebral artery and an effective mechanical thrombectomy.

A 33-year-old patient, in week 34 of pregnancy, was referred from a district hospital to the Provincial Hospital in Kielce due to subarachnoid haemorrhage from a ruptured aneurysm of the right middle cerebral artery, with accompanying intracerebral haematoma in the right temporal lobe, diagnosed in magnetic resonance angiogram (MRI). At admission, in neurological examination, 15 points according to the GCS scale were diagnosed, positive meningeal signs expressed by a considerable stiffness of the neck; mild left-sided hemi-paresis. After neurological, neurosurgical, and gynaecological consultations, the patient was qualified for endovascular treatment in the Clinic for Neurosurgery and Spine Surgery, following previous termination of pregnancy under general anesthesia with delivery of a live male newborn. Directly after delivery, the patient was transported to the laboratory for surgical radiology in order to perform the procedure of embolisation of the ruptured aneurysm, without previous recovery from anaesthesia (Figure 1).

The procedure began with a puncture of the right common femoral artery by the Seldinger technique, and a 6 Fr arterial sheath was inserted. Classic digital subtraction angiography (DSA) of the cerebral arteries was performed, which confirmed the presence of the saccular aneurysm of the right middle cerebral artery division with the diameter of 5 mm × 4 mm. This change correlated with the radiological image and clinical symptoms. After assessment of morphological features of the aneurysm, the decision was made to undertake endovascular treatment.



Figure 1. Aneurysm before embolisation



Figure 2. Aneurysm during embolisation

Prior to embolisation, the patient received a bolus of 2000 IU of unfractionated heparin, and a 6 Fr Chaperon guiding catheter was subsequently inserted and placed in the terminal, straight segment of the right internal carotid artery. Through the guiding catheter, a balloon was inserted for a remodelling TransForm C Compliant of size 3 mm × 10 mm, which was placed in such a way as to protect the aneurysm neck during coiling. A Headway 17 microcatheter was inserted into the aneurysm sack through a Traxcess 14 micro guide. For embolisation a Smart Coil Standard 5 mm × 10 cm was first used; subsequently, the aneurysm sack was filled with electrolytically detached coils – Micro Plex 10 Hyper Soft (Figure 2).

Six spirals were used for closure of the aneurysm sack. The DSA control showed the exclusion of the aneurysm sack, with slight inflow into its neck, maintaining normal flow within all branches of the middle artery division (Figure 3).

After removal of the microcatheter and balloon for remodelling, a routine check-up examination was performed, ending the procedure, which showed a slowdown in the flow in the right middle cerebral artery, with coagulation in the arterial branches (trifurcation) (Figure 4).

This slowdown was not caused by the migration of the coil into the lumen of the vessel. Considering the lack of possibilities of pharmacological and fibrinolytic treatment due to the Caesarean section in the past, the decision was made to mechanically remove the thrombus using mechanical thrombectomy.

Through the previously inserted guiding catheter, a Sofia 5F distal access catheter was inserted, which was placed directly before the internal carotid artery division. Through this catheter, a microcatheter (Re-

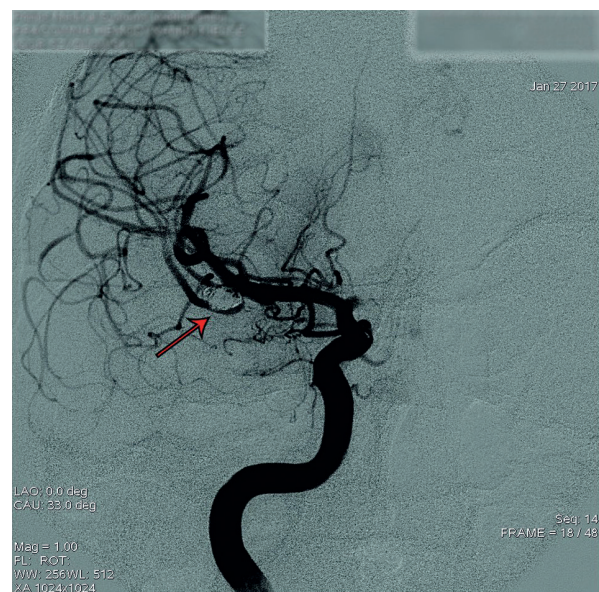


Figure 3. State after embolisation

bar 18) with a micro guide was inserted and placed in the branch of the middle cerebral artery. Through the microcatheter, the thrombectomy device, a Soliter FR 3 × 20, was introduced, which was opened and covered the whole thrombus. After the opening of the thrombectomy device, a check-up examination was performed, which demonstrated good reperfusion with respect to vascularisation of the right middle cerebral artery. The open thrombectomy device, according to recommendations by the manufacturer, was left in the vessel for approximately 3 min; subsequently, the system was removed from the vessel with



Figure 4. Blocked flow by the blood clot in right cerebral artery division



Figure 5. The artery after removal of the thrombus

a fresh thrombus with a length of 7 mm visible within the thrombectomy device. The check-up examination after 15 min revealed flow within the total vascularisation of the right middle cerebral artery, with a slight slowdown within the inferior branch (Figure 5).

After the patient recovered from sedation, the neurological state did not differ from the state before Caesarean section. On day 3, a control computed tomography examination (CT) of the head was performed, which showed a normal evolution of the intracerebral haematoma and subarachnoid haemorrhage; no fresh ischaemic foci were observed. After 8 days, the patient was transferred to the Clinic of Obstetrics and Gynaecology for further treatment. The patient was discharged in a good state, with a discrete left-sided paresis. The patient was referred for further ambulatory treatment in order to evaluate the long-term effects of treatment.

Embolisation is a relatively safe and effective method of endovascular treatment for aneurysms in the CNS. During the intravascular intervention thromboembolic complications may occur. The symptomatic thromboembolic episodes persist in 3–5% of treated patients [4–7]. They develop as a result of irritation of the vascular endothelium by the endovascular instruments applied, i.e. coils, stents, self-inflating balloons, and microcatheters [5]. In order to avoid such episodes, unfractionated heparin is applied during the procedure. Juszkat *et al.* proposed potential pharmacological management in the case of occurrence of a thromboembolic episode, with consideration of, among others, superselective intraarterial fibrinolysis, glycoprotein IIb/IIIa receptor platelet inhibitors, or systemic heparinisation [4]. An interesting case de-

scription was presented by Tassi *et al.*, where effective thrombolytic treatment by intravenous administration of rt-PA was applied in a 28-year-old patient in week 16 of pregnancy, with stroke and symptoms of right-sided hemiparesis syndrome [8].

In the above-described case, fibrinolytic treatment could not be applied due to the possibility of intensification of haemorrhage after the performance of Caesarean section and SAH. Therefore, the decision was made to mechanically remove the thrombus using the thrombectomy device. This is a very rare and very complex case with a complicated procedure. According to Meyers *et al.*, haemodynamic changes during the period of development of pregnancy may lead to instability of the aneurysm and rupture, causing SAH. In the above-mentioned article, three cases are also presented of pregnant patients with ruptured CNS aneurysms. In the first case, a classic neurosurgical procedure was applied with the use of vascular clips. In the same patient, due to the development of the subsequent aneurysm in week 30 of pregnancy, endovascular treatment was applied. In the second case, embolisation was applied exclusively (the patient in the third trimester of pregnancy). In both cases the course of pregnancy was normal. In the third case the pregnancy was terminated directly prior to embolisation, similar to the presented case. The author also emphasises the potential risk for the foetus caused by the X-ray radiation used in angiographic devices [9].

Mechanical removal of thromboembolic material using a Soliter thrombectomy device is a useful and safe method of treatment of complications after embolisation of aneurysms, as well as an alternative

method in the case of the lack of possibilities of pharmacological and fibrinolytic treatment.

Conflict of interest

The authors declare no conflict of interest.

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