MANAGEMENT OF DE NOVO ANEURYSMS OF SUPRA-, INFRATENTORIAL LOCATIONS

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We represented a case of successful surgical management of intracranial hemorrhages from a rare occurring combination of aneurysms of supra-, infratentorial locations: anterior communicating artery and left inferior posterior cerebellar artery De Novo. When choosing surgical approach we decided for multimodal approach to managing patients with integration of microsurgical and endovascular treatment modalities. There were discussed risk factors of De Novo aneurysms development, the issues of diagnostics, surgical approach and follow-up of aneurysm risk patients.

Key words: multiple cerebral aneurysms; De Novo cerebral aneurysms.

De Novo cerebral aneurysms ("new aneurysms") are usually understood as sacculations developed in those places in cerebral arteries, which were considered intact according to previous angiography findings or the results of open operations [1]. Despite substantial progress of modern neuroradiology in cerebral vascular diseases imaging technologies, the cases of true De Novo aneurysms are rarely detected [2]. Sequential formation of the primarily supra-, and then — infratentorial aneurysm is even more rare [3].

The term "De Novo aneurysm" was first suggested by C.J. Graf and W.B. Hamby in 1964, when they described a case of sequential, with a three-year interval, manifestation of intracranial hemorrhages of the middle cerebral artery aneurysms bilaterally located [4].

According to large series of clinical observations, "new aneurysms" develop in 25% of patients discharged from hospital after radical microsurgical exclusion of all the existing aneurysms [5]. The frequency of De Novo aneurysms reaches 4% among those patients who had cerebral aneurysm manifestations in childhood [6]. Total risk of "new aneurysms" formation in patients operated for aneurismal intracranial hemorrhages and in those with asymptomatic aneurysms varies from 0.84–0.89% to 1.8% annually, according to different sources [7–9].

Risk group of new aneurysms formation is shown to consist of female patients, smokers; patients with family "aneurysmal" history, arterial hypertension and moyamoya disease; as well as patients previously operated for multiple intracranial aneurysms [5, 8]. Though there are reported the cases of saccular aneurysms formation in patients with no abovementioned risk factors [8].

We represent a case report of the combination of hemorrhagic type of anterior communicating artery (ACA) aneurysm and De Novo left inferior posterior cerebellar artery aneurysm.

A 41-year-old patient N. was admitted to Krasnodar Regional Clinical Hospital No.1 (Russia) on March, 3, 2009. Acute disease developed on 01.03.09: against the background of psychoemotional tension and arterial hypertension up to 260/120 mm Hg, acute headache developed followed by loss of consciousness. She was admitted to the therapeutic department of one of Central Regional Hospitals (Russia) with the diagnosis of hypertensic crisis. The conservative treatment she received for 2 days resulted in arterial pressure stabilization at the level of 180/100 mm Hg, though headache did not regress, meningeal signs appeared. The patient was consulted by a neurologist, and transferred to Regional Clinical Hospital No.1 when the diagnosis of subarachnoidal hemorrhage had been verified by lumbar puncture.

On admission the patient's condition was estimated as moderately severe. Somatic status: supernutrition, arterial pressure: 160/90 mm Hg, otherwise healthy. Neurological status: clear consciousness, rough meningeal syndrome, no focal symptoms. The severity according to Hunt–Hess scale — III (taking into consideration hypertensive disease of the patient).

Cerebral computed tomography (CT) revealed the signs of subarachnoidal hemorrhage, mainly in supracellar cisterns, on the left; hemorrhage in the fourth ventricle and in the right lateral ventricle (Fig. 1). Digital subtraction angiography revealed: ACA aneurysm with the downward dome direction filled from the left carotid system. The arteries of the right carotid and vertebrobasilar system were intact (Fig. 2).

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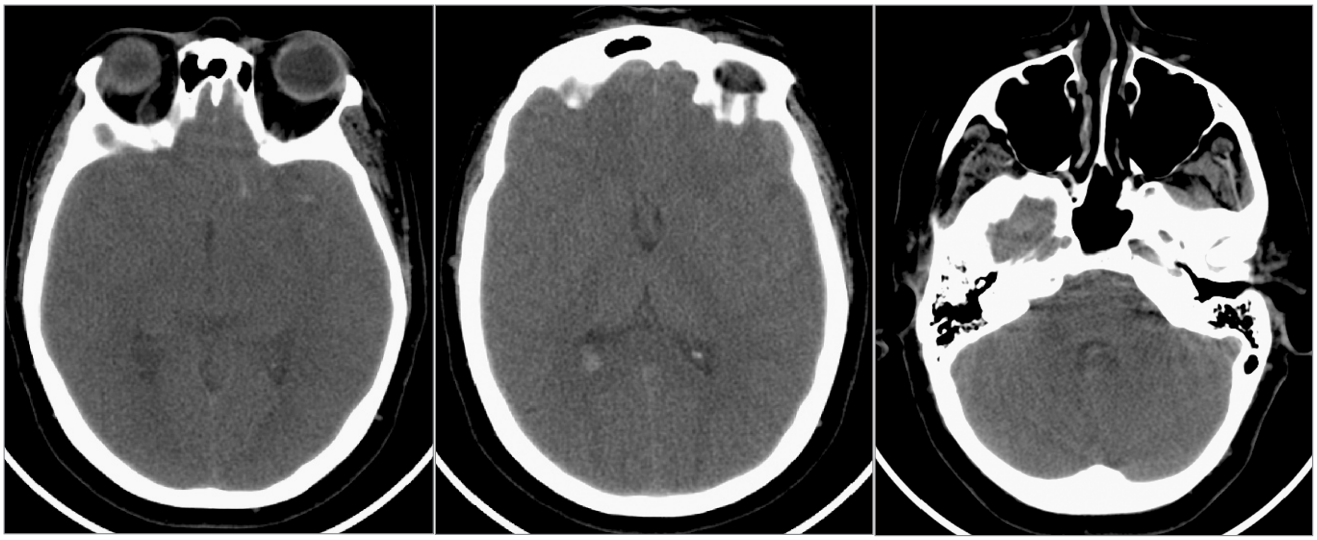

Fig. 1. Computed tomography of patient N. on the first admission to the hospital

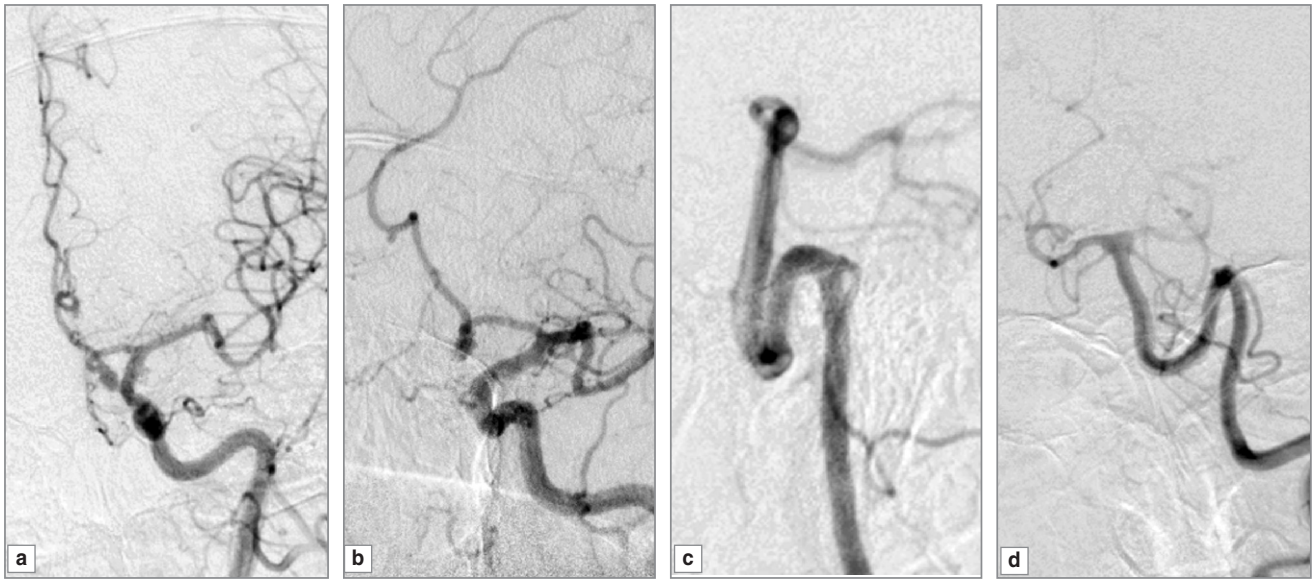

Fig. 2. Cerebral angiograms of patient N. on the first admission to the hospital: frontal (*a*) and oblique (*b*) views of the left carotid angiograms show the anterior communicating artery aneurysm with the downward dome direction; the lateral (*c*) and frontal (*d*) views of the left vertebral angiograms show no pathology

The patient was urgently operated. There were performed: the left pterional craniotomy; ventriculocisternostomy; ACA aneurysm clipping. Postoperative period was uneventful. Cerebral and meningeal symptoms regressed. The postoperative wound was healing by primary intention. The woman was discharged in satisfactory condition to be followed up by a neurologist and a cardiologist in an outpatient department. Due to a single aneurysm and no technical difficulties during the operation, the patient was not recommended a follow-up angiographic study.

The patient sought medical advice again on June 1, 2011. She complained of intensive headache that had occurred of no apparent course as two years ago, as the patient explained. She had nausea, vomiting. The patient was admitted to the neurology unit of the Central Regional Hospital, and then was transferred to Regional Clinical Hospital No.1 when the diagnosis of subarachnoidal hemorrhage had been verified by lumbar puncture.

On admission the patient's condition was critical. Somatic status: supernutrition, arterial pressure: 200/100 mm Hg, no other abnormalities revealed. Neurological status: moderate clouding of consciousness, intermittent psychomotor restlessness, fixation amnesia, rough meningeal syndrome, no focal symptoms. The severity of the condition according to Hunt–Hess scale — IV (taking into consideration hypertensive disease of the patient).

Cerebral CT revealed the signs of basal subarachnoidal hemorrhage mainly in prepontine, premedullary, and the left lateral cerebellomedullary cisterns. There was hemorrhage in the fourth and both lateral ventricles. In the ACA aneurysm clipping area there were no signs of repeated hemorrhages (Fig. 3). Cerebral angiography showed no

contrast enhancement of ACA aneurysm, and detected De Novo aneurysm of the left inferior posterior cerebellar artery entrance (Fig. 4). We came to the decision to transform diagnostic angiography into "therapeutic" taking into account the repeated hemorrhage, the severity of neurological state of the patient, the aneurysm location in vertebrobasilar system, the aneurysm anatomic features enabling to perform endovascular occlusion.

There was the transit of the patient to artificial lung ventilation, she underwent endovascular occlusion of the aneurysm by detachable coils with good radiological findings (Fig. 5) — a type according to J. Raymond et al. [10]. The postoperative period was uneventful. On day 3 the patient was extubated and could breathe autonomously. There was no the worsening of neurological symptoms observed. After cerebral and meningeal signs regression, the patient was transferred to inpatient neurological treatment according to the place of residence. Two weeks later she was discharged in a satisfactory condition. Follow-up cerebral angiography 6–12 months after the operation was recommended.

For early detection of new aneurysms, the most neurologists recommend to perform follow-up digital subtraction angiography, CT, and magnetic resonance angiography in previously operated patients [2, 5, 7–9 and others]. The follow-up period of the control study should not exceed 6–9 years after the operation [5, 9]. In addition, the case history we presented and other reports from literature [5, 11, 12] indicate that the recommended screening periods are to be considered conventional, since in rare cases rapid (from 1 month to 3 years) development and rupture on new aneurysms including multiple ones is possible.

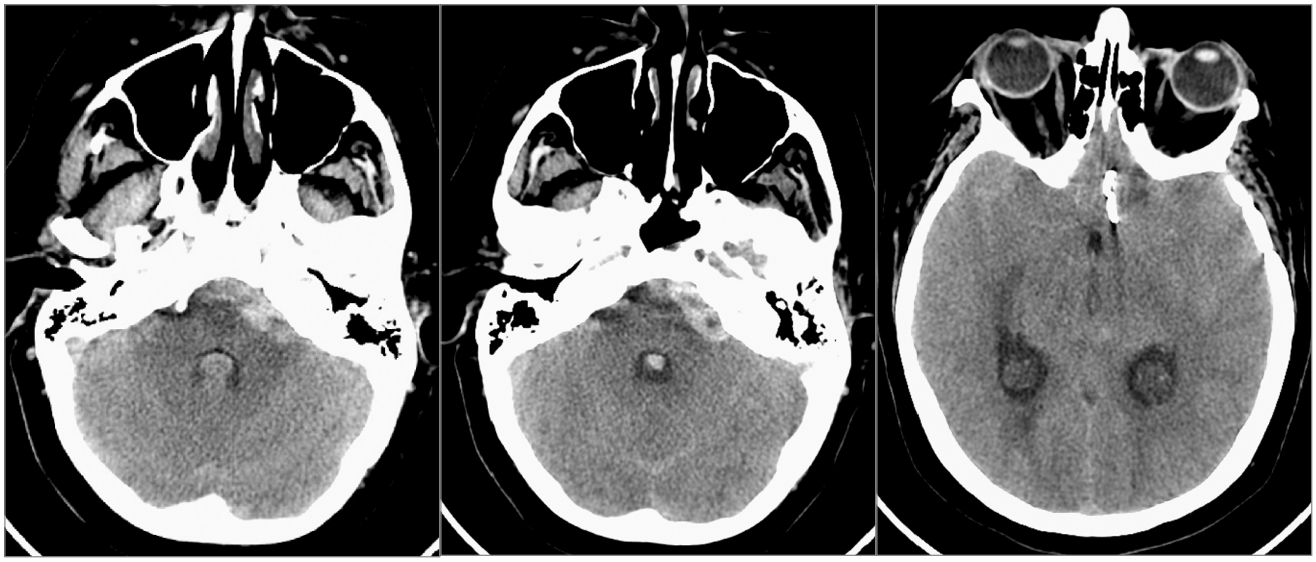

Fig. 3. Computed tomography of patient N. on the second admission to the hospital

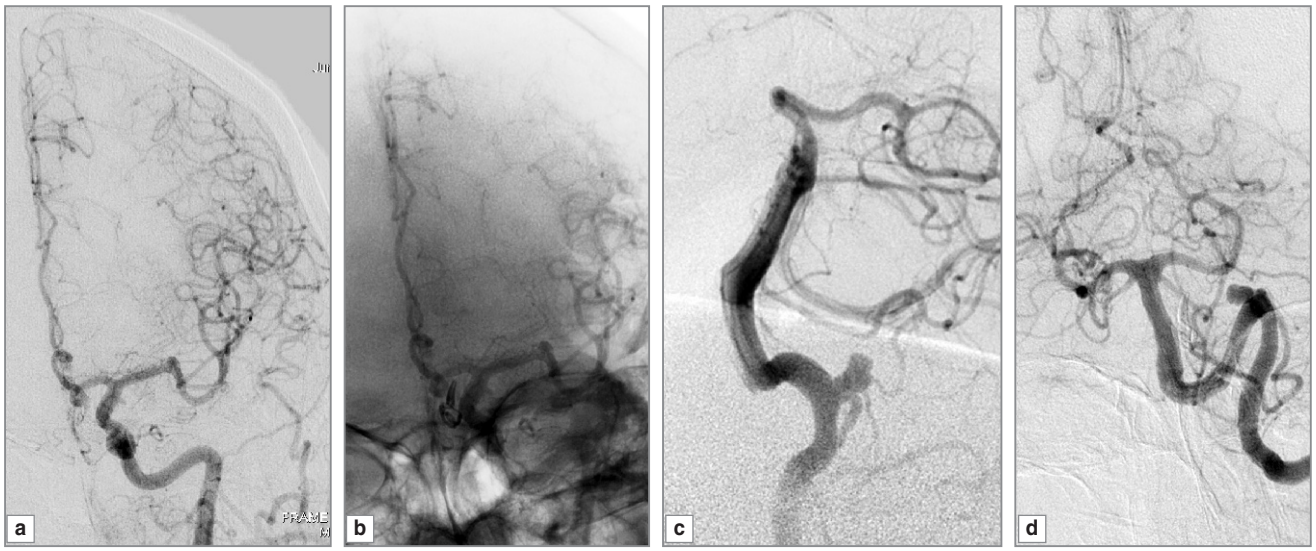

Fig. 4. Cerebral angiograms of patient N. on the second admission to the hospital: frontal views (*a, b*) of the left carotid angiograms show no contrast of the anterior communicating artery aneurysm; oblique views (*c, d*) of the left vertebral angiograms show the left inferior posterior cerebellar artery entrance

Fig. 5. Cerebral angiograms of patient N. after endovascular occlusion of the aneurysm by detachable coils. The lateral (*a*) and frontal (*b*) views of the left vertebral angiograms show the total occlusion of the left inferior posterior cerebellar artery entrance aneurysm

The study of the presented observation has dramatically changed our approach to follow-up angiographic studies. Currently, we advise all our patients operated for cerebral aneurysms using both endovascular, and microsurgical techniques, to undergo a follow-up angiographic study in the period of 6–12 months after the first surgery. De Novo aneurysm risk patients along with that are recommended to undergo an angiographic study every five years.

References

1. Kim do H., Jung J.Y., Lee J.W., Huh S.K., Lee K.C. A clinical analysis of twelve cases of ruptured cerebral de novo aneurysms. *Yonsei Med J* 2007 Feb 28; 48(1): 30–34.

2. Van der Schaaf I.C., Velthuis B.K., Wermer M.J., Majoie C., Witkamp T., de Kort G., Freling N.J., Rinkel G.J. ASTRA Study Group. New detected aneurysms on follow-up screening in patients with previously clipped intracranial aneurysms: comparison with DSA or CTA at the time of SAH. *Stroke* 2005 Aug; 36(8): 1753–1758.

3. Kawahara I., Nakamoto M., Matsuo Y., Tokunaga Y. De novo basilar head aneurysms — two case reports. *Neurol Med Chir (Tokyo)* 2010 Jan; 50(1): 54–56.

4. Graf C.J., Hamby W.B. Report of a case of cerebral aneurysm in an adult developing apparently de novo. *J Neurol Neurosurg Psychiatry* 1964 Apr; 27: 153–156.

5. Yoneoka Y., Takeda N., Akira I., Ibuchi Y., Kumagai T., Sugai T., Takeda K.I., Ueda K. Ruptured de novo intracranial aneurysms. *Acta Neurochir (Wien)* 2004 Sep; 146(9): 979–981.

6. Pilipenko Yu.V., Eliava Sh.Sh., Filatov Yu.M., Yakovlev S.B., Khukhlaeva E.A., Kheyreddin A.S., Myakota A.E. Arterial'nye anevrizmy golovnogo mozga u detey i podrostkov [Arterial aneurysms of brain in children and teenagers]. *Zhurnal Voprosy neyrokhirurgii im. akademika N.N. Burdenko — Journal of Neurosurgery Issues named after academician N.N. Burdenko* 2009; 4: 24–31.

7. David C.A., Vishteh A.G., Spetzler R.F., Lemole M., Lawton M.T., Partovi S. Late angiographic follow-up review of surgically treated aneurysms. *J Neurosurg* 1999 Sep; 91(3): 396–401.

8. Juvela S. Natural history of unruptured intracranial aneurysms: risks for aneurysm formation, growth, and rupture. *Acta Neurochir Suppl* 2002; 82: 27–30.

9. Tsutsumi K., Ueki K., Morita A., Usui M., Kirino T. Risk of aneurysm recurrence in patients with clipped cerebral aneurysms: results of long-term follow-up angiography. *Stroke* 2001 May; 32(5): 1191–1194.

10. Raymond J., Guilbert F., Weill A., Georganos S.A., Juravsky L., Lambert A., Lamoureux J., Chagnon M., Roy D. Long-term angiographic recurrences after selective endovascular treatment of aneurysms with detachable coils. *Stroke* 2003 Jun; 34(6): 1398–1403.

11. Matheus M.G., Castillo M. Development of de novo intracranial aneurysm in three months: case report and literature review. *Am J Neuroradiol* 2003 Apr; 24(4): 709–710.

12. Sim J.H., Kim S.C., Kim M.S. Early development and rupture of de novo aneurysm — case report. *Neurol Med Chir (Tokyo)* 2002 Aug; 42(8): 334–337.