

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Evaluation of Efficiency of the Mechanical Thrombectomy and Selective Thrombolytic Therapy in Patients Suffering From Ischemic Hemispheric Stroke.

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ABSTRACT

A retrospective analysis of medical records of 29 patients who received endovascular treatment was made, 20 patients underwent mechanical thrombectomy and 9 patients applied selective thrombolysis, patients received outside the period of the "therapeutic window", the average time from the onset of stroke and before surgery was 340 ± 23 and 264 ± 23 minutes, respectively, in groups, both groups of patients matched for age, the average score on a scale of severity of stroke was NIHSS 9.4 and 10.2 points accordingly. The analysis of risk factors, time of stroke onset, severity of neurological deficit and treatment outcomes has been done. The dependence achieve recanalization and regression of neurological deficit was investigated. Predictors of effective treatment identified.

Keywords: Ischemic stroke, the therapeutic window, thrombectomy, selective thrombolysis, recanalization, predictors of treatment outcome stroke, thrombolytic therapy, mechanical thrombectomy, PCI, stroke, stent - Retriever, Penumbra System.

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INTRODUCTION

Cerebral vascular diseases remain one of the most topical medical and social issues. In the Russian Federation, according to the National Association Stroke Control (NABI), cerebral stroke incidence rate makes 600 thousand cases per year, the increase in its prevalence among people of productive age is also observed [1, 2, 3]. Despite the new approaches to the organization of treatment, creation of a network of specialized primary neuro-vascular departments, early diagnostics, use of the advanced methods of treatment the high disability index, high repeated stroke rate persist which requires searching for the new options of the stroke treatment and prevention [4,5].

Medical culture, patient awareness is still not high enough, not more than 20% of patients are admitted during the “therapeutic window”. Today the thrombolytic therapy (TLT) is the only proven method of treatment of patients with stroke but the significant number of patients have contraindications to thrombolytic therapy (TLT) [6,7]. The large percentage of the patients admitted beyond the “therapeutic window”, high disability rate requires the new approaches and treatment options.

Searching for the modern methods of treatment of acute ischemia especially during the period falling beyond the “therapeutic window” is important today. We consider the use of the endovascular methods of treatment and prevention to be more convincing and efficient [8].

MATERIAL AND TECHNIQUES

We have performed the post-hoc analysis of 29 case reports of the patients in inpatient treatment at the Belgorod Regional St. Josaphat clinical hospital. The criteria for selection of patients for endovascular treatment were the presence of occlusion of the large intracranial arteries, absence of intracerebral hemorrhage, the duration of the period from the appearance of the initial symptoms of a disease to the beginning of treatment not exceeding 6 hours, absence of an extensive ischemic focus (not more than 1/3 of territory) according to the findings of computer tomography (CT). The first group included 20 patients that were subjected to thrombectomy (TE). The second group consisted of 9 patients. In this group the patient underwent the selective thrombolytic therapy (TLT). The surgical interventions were performed under the intratracheal multi-component anesthesia. Thrombectomy was performed with the use of the Solitaire AB ev3 stent or device for the continuous aspiration thrombectomy Penumbra System. For this purpose the guide catheter was inserted into the internal carotid artery (BCA). By using a stent-retriever for the distal embolism prevention it is preferable to use the guide catheter with an option of a temporary BCA obstruction. The recanalization of occlusion was performed with the use of a micro-guide. Then the distal mouth was evaluated through a micro-catheter. The stent-retriever was placed in such a manner that allowed covering the entire occlusion area. Solitaire AB ev3 was kept open for about 3 minutes to capture the thrombotic masses. Where necessary the manipulations were repeated. The aspiration thrombectomy with the Penumbra System device was performed under the generally accepted procedure.

The TLT was performed with the use of Actilyse® (Boehringer Ingelheim). The dose of the drug administered made not more than 25% of the total maximum permissible thrombolytic dose - 0,9 mg/kg of the patient’s weight. The micro-catheter was inserted into a thrombus for thrombolysis. 1 mg of the product was injected in bolus with the further selective injection through the syringe dispenser with the rate 19 mg/h. During the TLT though the guide catheter the control angiography was carried out every 15 minutes. The average dose of the injected drug made 18,2±2,0 mg.

The first group included 16 men and 4 women. The average age made 66 years. The average body mass index (BMI) made 26,4. All the patients suffered from hypertension, 7 patients had a high grade of angina (3-4 according to NYHA), 2 patients had ischemic stroke in their past medical history, 11 patients had arrhythmia. All the patients had more than one risk factor. The stroke severity NIHSS score – 9,4 ±2,0. The average period from the disease onset to the surgical treatment made 340 ±23 minutes.

In the second group there were 6 men and 3 women. The average age made 61,4 years. The BMI 28,5. The associated somatic pathology was identical to the first group. The stroke severity NIHSS score – 10,2 ±1,4. The average period from the disease onset to the selective TLT 264 ±23 minutes.

The isolated occlusion of the medial cerebral artery (CMA) was diagnosed in 8 patients, occlusion of BCA – in 2 cases, in 1 case the occlusion of CMA was combined with subtotal vertebral artery stenosis, in 1 patient with the trifurcation of BCA the extension of thrombus from the bifurcation BCA to CMA and postero-cerebral artery (3MA), 2 patients had occlusion in the area of the BCA bifurcation with the thrombus extension to CMA, in 1 case the embolic occlusion of the BCA bifurcation was combined with subtotal stenosis of the contralateral BCA, in 1 case there was an unstable hemodynamically relevant plaques in the BCA mouth and occlusion of CMA, basilar artery occlusion with the thrombus extension to the both 3MA was detected in 1 case, embolic occlusion of CMA and CMA was detected in 1 case, occlusion of BCA from the mouth combined with occlusion of the ipsilateral subclavian artery was observed in 1 case, occlusion of BCA from the mouth with thrombus in CMA and subtotal stenosis in the ipsilateral subclavian artery was observed in 1 case.

In the second group 3 patients had an isolated occlusion of CMA, the BCA occlusion was detected in 4 cases, 1 patient had BCA occlusion with a thrombus in CMA, 1 patient had occlusion of the common carotid artery (OCA) combined with the subtotal stenosis of the contralateral BCA.

FINDINGS AND DISCUSSION

The successful recanalization after thrombectomy was performed in 15 patients (75%). Among them in 1 case the thrombectomy was performed after non-effective systemic thrombolysis. Numerous attempts to perform thrombectomy in 2 patients were unsuccessful and in 1 case it was not possible to insert the micro-catheter and aspiration catheter because of the expressed deviation of the patient's iliac segment, brachiocephalic trunk, BCA. In 2 cases distal embolization was determined after thrombectomy. For these patients the intervention was supplemented by the selective TLT. In the 2d case the successful aspiration thrombectomy has been performed. For 6 patients the thrombectomy from the intracranial areas was supplemented by the BCA stenting. In 1 case the thrombectomy from CMA with the Solitaire AB ev3 stent was performed after stenting of the ipsilateral BCA. By traction the stent-retriever got caught in the stent in BCA which required insertion of another stent into the BCA. In 1 case after thrombectomy the dissection in the occlusion area was observed that required the stent insertion. In 4 patients the postoperative period was complicated by nosocomial pneumonia, in 1 case there was the acute gastric ulcer complicated by bleeding. The bleeding was stopped conservatively. The hemorrhagic infarctions type 1 and 2 by ECASS were observed in 6 patients, the parenchymal hematomas type 2 by ECASS – in 2 (10%) patients. The hemorrhagic transformation rate made 40% of which the symptomatic hemorrhagic transformation – in 10%. In the first group 4 patients died. The mortality rate made 20%. 1 patient died underwent the unsuccessful attempt of thrombectomy, the ischemic focus was building up during another day after the disease onset and made more than 1/2 of the symptom-dependent artery, then the cerebral edema and brain herniation developed; in 1 case after the successful thrombectomy, restoration of the neurologic functions (as of the initiation of treatment by NIHSS – 11 scores, at the third day by NIHSS - 8, however, there was cardiac decompensation and at the 26th day the patient died); in case of 2 patients the cause of death was the symptomatic parenchymal hematomas, the attempt of recanalization of one of which was successful, of another one – no recanalization has been achieved. All the 4 patients scored 4 points by the THRIVE scale.

In the second group the “successful” (in terms of the recanalization achievement) TLT was observed in 6 cases (66%). In 3 cases by the control angiography no dynamics was observed after 40 minutes since the drug injection. In 2 patients the TLT was supplemented by the BCA stenting. In 1 case stenting was performed after a successful TLT in a patient with a BCA occlusion, in another case the stenting of the contralateral subtotal stenosis was performed. The hemorrhagic infarction type 2 by ECASS was observed in 1 patient, in 1 case a patient with a non-effective TLT had a hemorrhagic infarction type 1 by ECASS, 1 (11%) patient had a parenchymal hematoma type 2 by ECASS. The hemorrhagic transformation rate made 33%. 3 patients died. The mortality rate made 33%. In 2 patients with unsuccessful TLT the cause of death consisted in the development of ischemia, cerebral edema and brain herniation. In this group another death happened as the result of the hemorrhagic stroke transformation and blood breakthrough to the ventricular system.

In both groups the combination of the recanalization achieved and reduction of the neurologic impairment matched in 100%, the average score by the NIHSS scale at discharge made $4,6 \pm 1,8$, in the second group $6,0 \pm 1,0$, all the patients scored 0-1 by the Rankin scale and were independent in the everyday life.

It is known that the recanalization degree is an important predictor of a good clinical outcome of applying the thrombectomy by the acute ischemic stroke. The findings of the MERCI trials and multi-MERCI trial have shown that upon the complete recovery of the blood flow through the intracranial arteries the probability of the favorable clinical outcome increased by 2,6 and the 90-day survival – by 2,2. The partial recanalization results in the adverse clinical outcome [9].

In order to estimate the probability of the clinical outcome by application of the endovascular methods of the acute ischemic stroke treatment we have used the THRIVE scale (Total Health Risks In Vascular Events score). The post-hoc analysis of the use of intra-arterial methods of recanalization has shown that for the patients that scored 0-2 points by the THRIVE scale at admission the probability of the favorable clinical outcome made 64,7%, for those that scored 3–5 points – 43,5%, and at 6-9 points the favorable clinical outcome was observed only in 10,6% cases ($P < 0,001$) [10].

CONCLUSIONS

The application of mechanical thrombectomy from the symptom-dependent artery and selective TLT in patients admitted beyond the “therapeutic window” is efficient.

The high efficiency of the application of the mechanical thrombectomy method as compared with the selective thrombolysis method is stated both in terms of recovery of the vascular bed patency and in terms of the favorable disease outcome.

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