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DIFFERENTIATED APPROACH TO THE TREATMENT OF CEREBROVASCULAR ARTERIOVENOUS MALFORMATIONS AND THEIR RESULTS

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SUMMARY.

The work consecrates modern methods of surgical treatment of arteriovenous malformations (AVM) of the brain. At present, various types of operating techniques are constantly being improved for this pathology, however, there are no studies with a high level of evidence base about the significant advantages of a particular treatment method.

Key words: AVM, microsurgical resection, endovascular embolization.

概括。

这项工作神圣化了现代手术治疗大脑动静脉畸形 (AVM) 的方法。目前, 针对这种病理的各种手术技术正在不断改进, 但是, 没有关于特定治疗方法的显着优势的高水平证据基础的研究。

关键词: AVM, 显微手术切除, 血管内栓塞。

Introduction. Arteriovenous malformation (AVM) are the most common vascular malformations of the central nervous system. Turning off the AVM from the blood circulation reduces the risk of developing cerebrohemorrhagic syndrome, therefore it is considered the dominant one among the methods of treating AVM. Both endovascular and microsurgical removal of AVMs became widespread. In recent years, multi-stage combined interventions (endovascular embolization, microsurgical operations and stereotactic radiosurgery) have become increasingly popular in the treatment of AVM [4]. In case of delay in diagnosis or surgery, the disease can lead to acute circulatory disorders,

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subarachnoid hemorrhage (SAH) or intracranial hematomas with all the ensuing consequences. [5]

AVM rupture with the formation of intracranial hemorrhage is the main and most severe variant of its clinical manifestation. The mortality rate due to rupture of malformations reaches 30%, half of the patients who have suffered a hemorrhage from the malformation remain disabled. Bleeding from AVM vessels is most typical for young people of working age - 20-50 years. The question of choosing the optimal method for treating patients with cerebral AVM remains controversial. [2,7]. Currently, there are the following main methods of AVM treatment: AVM excision, endovascular method (excluding malformation by embolization or occlusion); radiosurgery (radiotherapy) and combined method (combination of AVM embolization followed by its excision or radiosurgery) [1,3,6]. Despite the importance of this issue, in domestic and foreign literature there are only a few publications on this topic. Given the prevalence of this pathology, and, which is especially important, the body's response to the pathological condition, it is necessary to determine clear indications for various methods of treating AVM. The choice of the optimal treatment method in each specific observation will improve the quality of life of patients and increase the degree of their adaptation. [8,9]

Research objective:

to study the results of microsurgical removal and endovascular embolization of cerebral arteriovenous malformations.

Materials and methods. In the Republican Specialized Scientific and Practical Medical Center of Neurosurgery, 50 patients with

arteriovenous malformations of the cerebral vessels were examined and treated. All patients underwent such examinations as: selective angiography of cerebral vessels, MRI - of the brain and, in some cases, EEG - examination of the brain. The data from the examination of the ophthalmologist were also taken into account. Operated 50 patients with AVM, open microsurgical resection was performed in 33 patients, endovascular embolization in 17 patients. The age of the patients ranged from 17 to 60 years, the average age of the patients was 26.8 years. There were 32 men, 18 women (table 1).

Table 1
Distribution of patients by sex and age

Sex n(%)	Male 32 (64,0%)		Female 18 (36,0%)		Total 50 (100 %)
Age	1-40	41- 65	1-40	Over 41 years old	
Amount n(%)	24(75 %)	8 (25 %)	15(83 %)	3(17 %)	

According to our observations, the most frequent reason for the treatment of patients with AVM were headaches in 30 (60%) patients, seizures in 9 (18%) patients, neurological deficit in 8 (16%) patients, and loss of consciousness in 3 (6%) patients (Table 2.). The Spetzler-Martin scale was used to determine the risk of surgical treatment. The choice of tactics of surgical intervention was made taking into account the gradation of the Spetzler - Martin scale, the size, location and nature of AVM drainage.

Table 2
Reasons for treatment of patients with AVM

Причины обращения больных	Number of patients
Headaches	30 (60%)
Seizures	9 (18%)
Neurological deficit	8 (16%)
Loss of consciousness	3 (6%)
Total	50 (100%)

Results and its discussion. 50 patients with AVM of cerebral vessels, depending on the degree according to the Spetzler - Martin scale, underwent microsurgical AVM resection and endovascular embolization. Microsurgical AVM resection was performed in 33 (66%) patients, endovascular embolization in 17 (34%) patients. By localization, all AVMs were distributed as follows: parietal lobe - 17 (34%), occipital lobe - 6 (12%), temporal lobe - 7 (14%), frontal lobe - 9 (18%), cerebellum - 7 (14%), mediobasal departments - 4 (8%). In the final assessment of the results of surgical treatment of patients with AVM, taking into account neurological parameters, quality of life, radicality of AVM “shutdown” depending on the degree according to the Spetzler-Martin scale, with open microsurgical AVM resection, satisfactory results were achieved in 29 (87%) patients, unsatisfactory in 4 (13%) patients. Postoperative complications in the form of intracranial hemorrhages were observed in 2 (6%). Complication in the form of postoperative liquorrhea was observed in 4 (12%) cases, which did not require additional surgical correction. Mortality during microsurgical resection was revealed in 3 (9%) cases, which are directly related to the severity of the condition during the initial admission of patients to the hospital, and concomitant somatic pathology. With endovascular embolization - satisfactory results

in 15 (88%) patients, unsatisfactory in 2 (12%) patients (Table 3.).

Table 3
Results of surgical treatment of AVM according to S-M

Type of operation	Blocking and resection of AVM		Endovascular embolization	
	Satisfy result	Dissatisfy result	Satisfy result	Dissatisfy result
1 degree	17	-	2	-
2 degree	9	-	4	-
3 degree	3	1	1	-
4 degree	-	2	6	1
5 degree	-	1	2	1

Complications after endovascular embolization are divided into 2 categories:

1) Ischemic, caused by ingress of embolizing material outside the vessels of arteriovenous malformation or the so – called “catheter associated manipulations” leading to dissection and occlusion of arteries; 2) Hemorrhagic - which are more serious than ischemic. Excessive dilution of the embolisate in some cases can lead to occlusion of the drainage vein, followed by hemorrhage against the background of vein obstruction.

Out of 17 cases of endovascular embolization of cerebral arteriovenous malformation, total embolization was achieved in 6 (35%) cases, partial embolization in 11 (65%) cases. In the case of endovascular embolization of cerebral AVMs,

we observed complications in the form of intracranial hemorrhages of various volumes and localization in 2 (11.7%) cases. Complication in the form of ischemic stroke resulting from occlusion of a functionally significant vessel was observed in 3 (17.6%). Mortality in this type of surgery was 2 (11.7%) cases - 1 patient died with grade 4 according to Spetzler - Martin, 1 patient with grade 5. Considering the above, mortality directly depends on the location, size of the arteriovenous malformation and the presence of deep draining veins.

При этом выявлено, что превентивное «обескровливание» ядра мальформации практически не оптимизирует её последующего транскраниального удаления, расширяя зону диффузной части АВМ, что затрудняет её микрохирургическое удаление. При удалении АВМ в отдалённом периоде эндоваскулярного лечения, нефункционирующие части мальформации интраоперационно не определялись.

Conclusions:

1. Blocking and resection of AVMs is an effective method for treating AVMs and requires reoperation only in 5%. Significant factors that directly affect the development of postoperative focal neurological symptoms are: localization of AVMs in the occipital lobe and in adjacent areas); blood supply to AVMs from two or more vascular pools; increased risk on the S-M scale.

2. The results of surgical treatment for AVMs of 1-3 degrees according to Spetzler-Martin allows to achieve satisfactory results in 87%, and at 4-5 degrees it is possible to achieve satisfactory results with the help of endovascular embolization of AVMs in 88% of cases. Total microsurgical excision is a highly effective method for the prevention of AVM hemorrhage.

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