

This Clinical manifestation and functional outcome of cerebral venous malformations

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Objective To summarize clinical and radiological characteristics, and to analyse risk factors of hemorrhage and poor outcomes of cerebral venous malformations(CVMs).

Methods The clinical manifestations, radiological characteristics, management and prognosis of the 60 cases of cerebral venous malformations, admitted to Beijing Tiantan hospital from January 2011 to February 2018, were retrospectively summarized and analyzed. The patients were followed up for 1-60 months with an average duration of 26 months. Poor prognosis indicates that the patient went through rebleeding, infarction, severe disability (mRS>2), or death.

Results Infratentorial CVMs is more prone to intracranial hemorrhage (75% vs 28.6%, $P < 0.001$), dizziness(37.5% vs 10.7%, $P=0.017$) and focal neurological deficits (65.6% vs 25%, $P=0.002$), while supratentorial CVMs is more prone to seizures (32.1% vs 0%, $P=0.001$). Multivariate logistic regression revealed that the major risk factors for intracranial hemorrhage in CVMs were infratentorial lesions ($P=0.003$) and complicated

cavernous angiomas ($P=0.016$). Compared with conservative treatment, resection of hematoma or cavernous angioma with preservation of CVMs, did not increase the risk of poor outcomes($P=0.646$), but the resection of CVMs significantly increase the risk of poor outcomes ($P=0.003$, $OR=44.0$).

Conclusions Conservative treatment of CVMs has a relatively good prognosis. For those complicated with hemorrhage or cavernous angiomas who need surgical interventions, the integrity of the CVMs should be preserved irrespective of the treatment of choice. In exceptional cases, before the resection of CVMs, their drainage functions should be rigorously evaluated.

Key words Cerebral venous malformation, Intracranial hemorrhage, Cavernous angioma, Headache, Epilepsy

Table 1. Differences in basic demographic information and clinical manifestation between supratentorial and infratentorial cerebral venous malformations.

	Location of CVM		P value
	supratentorial	infratentorial	
Gender			1.000
male	14	16	
female	14	16	
Age			0.121
Children (< 18y)	8	4	
adults (≥18y)	20	28	
Headache			0.221
yes	14	11	
no	14	21	
Dizziness			0.017
yes	3	12	
no	25	20	
Seizures			0.001
yes	9	0	
no	19	32	
Focal symptoms			0.002
yes	7	21	
no	21	11	
Hemorrhage			< 0.001
yes	8	24	
no	20	8	
Cavernous angioma			0.079
yes	7	15	
no	21	17	

Table 2. Logistic regression of the relationship between treatment and poor prognosis.

	prognosis		P value	OR
	good prognosis	poor prognosis		
Treatment B-Treatment A	17/34	1/1	0.646	
Treatment C-Treatment A	3/34	4/1	0.003	44.0
Treatment C-Treatment B	3/17	4/1	0.019	22.7
Treatment C-Treatment A/B	3/51	4/2	0.001	34.0

Treatment A: conservative treatment

Treatment B: resection of hematoma or cavernous angioma, with retaining of CVM

Treatment C: resection of hematoma or cavernous angioma, and CVM

good prognosis: without rebleeding, infarction, severe disability(mRS>2), or death

poor prognosis: rebleeding, infarction, severe disability(mRS>2), or death

Table 3. Logistic Regression of the Relationship between CVM resection and poor prognosis.

Factors	P value	OR	95 % CI	
			Lower	Upper
Mode1	0.001	34.0	4.3	266.3
Mode2	0.001	37.7	4.1	349.3
Mode3	0.002	33.7	3.6	311.5
Mode4	0.003	45.3	3.7	552.3
Mode5	0.007	86.4	3.4	2166.0
Mode6	0.011	77.1	2.7	2171.7

Mode1: univariate analysis of CVM resection

Mode2: adjusted by age and gender on the basis of Mode1

Mode3: adjusted by hypertension on the basis of Mode2

Mode4: adjusted by the location (supratentorial/ infratentorial) on the basis of Mode3

Mode5: adjusted by the cavernous hemangioma on the basis of Mode4

Mode6: adjusted by the hemorrhage on the basis of Mode5