

The role of obesity in the development of ischemic stroke

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Currently, a number of targeted scientific studies are being conducted in the world to develop new approaches and methods for the diagnosis and treatment of cerebrovascular diseases, in particular ischemic stroke on the background of MS. Including the identification of MS as one of the main causes of the severe course of the disease in patients; early diagnosis of the development of severe complications, resulting in a decrease in the control of metabolic disorders in patients with AI and an assessment of their role in the occurrence of disability; determining the place and significance of hereditary predisposition in the development of the disease [1, 3, 6, 9,15].

An independent risk factor for the development of acute vascular pathology and mortality is obesity (body mass index – BMI – more than 30 kg/m) [4,13,23]. Obesity and increased body weight have a complex effect on the development of stroke. Obesity is largely associated with risk factors such as hypertension, diabetes mellitus (DM), dyslipidemia [5, 7,22]. According to the results of the Physicians Health Study, an increased BMI is associated with a significant increase in the frequency of ischemic strokes, regardless of the presence of hypertension, diabetes and cholesterol levels [4,15].

Evidence that a decrease in body weight leads to a decrease in the frequency of recurrent strokes has not yet been obtained. However, weight loss significantly improves blood pressure, stabilizes blood sugar, plasma lipids and physical tolerance [8,10]. A diet based on fruits and vegetables (for example, the Mediterranean diet) can help in controlling body weight and reduces the risk of stroke, myocardial infarction (MI) and death [2,20,21]

There is evidence that physical activity has a beneficial effect on many risk factors for the development of cardiovascular diseases (CVD), including stroke [18,19,22]. In the latest review of studies on physical activity and stroke risk (Physical activity and stroke risk: a meta-analysis) [10] was shown that individuals with moderate or increased physical activity have a lower incidence of stroke or mortality than individuals with low physical activity [17,19].

In men and women with moderate physical activity, the risk of recurrent acute vascular events is reduced by 20%, and in those with increased activity – by 27%. This fact is explained by the fact that physical activity reduces blood pressure and body weight [22], promotes vasodilation [13] and improves glucose tolerance [11,12]. Lifestyle changes, regular physical exercises can minimize the need for intensive therapeutic and pharmacological effects or improve the end points of treatment.

Results of comparison of anthropometric indicators.

Anthropometric parameters such as body mass index in patients with MS averaged 34.5 (31; 37) kg/sq.m. whereas in patients without MS this indicator was 28 (23; 30)kg/sq.m. waist circumference averaged 94 (90; 100) in the group of patients with MS) M 88 (88; 120) W and in the group of patients without MS 90 (85; 91) M 84 (84; 90) W, which indicated a violation of fat metabolism in patients with MS.

Analysis of the results of parameters such as waist circumference and BMI showed the characteristic of high figures of these data for MS and mainly in women.

Table 1

Distribution of patients by degree of obesity in subgroups.

Gradations by BMI	With MS		Without MS		Total	
	abs	%	abs	%	abs	%
Normal body weight	2	1,9	24	29	26	13,8
Excess body weight	13	12,4	33	40	46	24,5
Obesity 1 st	40	38,1	26	31	66	35,1
Obesity 2 st	37	35,2	0	0	37	19,7
Obesity 3 st	13	12,4	0	0	13	6,9
	105	100	83	100	188	100

Table 2

Distribution of patients by OT in subgroups

Waist Coverage (cm)	With MS		Without MS		Total	
	abs	%	abs	%	abs	%
>94 M/>80 F	101	96,2	29	34,9	130	69
<94 M/ <80 F	4	3,8	54	65,1	58	31

When conducting an anthropometric study, waist circumference (FROM, cm), their ratio (FROM / ABOUT), BMI (Table 2.) were evaluated. From the table

presented, it can be seen that the data on the above parameters significantly exceed the reference interval and, in addition, in patients without MS FROM, BMI have significantly lower values for compared with patients with MS.

Analysis of the results of anthropometric indicators of patients in the main group revealed that the body mass index (BMI) was higher than the norm – in almost all patients, 98.1% in the subgroup with MS and 71.08% in the subgroup without MS ($p<0.05$). Waist coverage (OT) exceeded the threshold value in 96.2% of patients in the subgroup with MS and in 34.9% of patients without MS ($p<0.05$).

Table 3

Distribution of BMI indicators among patients by gender.

BMS	Female		Male		Total	
	abs	%	abs	%	abs	%
BMS >30	62	53,45	54	46,55	116	100
BMS <30	29	40,28	43	59,72	72	100

As can be seen from Table 3. In the distribution among patients with a BMI >30, there were more women (53.4%), and among patients with a BMI < 30, men (59.7%) prevailed ($X^2=3.08$; $p=0.08$). (Obesity is greater in women).

Table 4

Distribution of patients by gender and FROM in subgroups

Waist Coverage (cm)	Female		Male		Total	
	abs	%	abs	%	abs	%
>94 M/>80 F	90	69,2	40	30,8	130	100
<94 M/<80 F	1	1,7	57	98,3	58	100

The distribution of patients by gender and OT is shown in Table 4. As can be seen from this table, the number of women (69.2%) with high OT is significantly higher than men, it also draws attention to the fact that almost all women in the main group of OT was higher than the borderline figures ($p<0.05$) (OT is greater in women).

In the main group, high rates of OT and BMI were mainly observed in the group with MS, and among these patients, female persons prevailed -69.2±4.05 and 53.4%±4.63, respectively (OR=1.96, 95% CI=1.2-3.3, $p=0.01$).

Indicators of obesity – OT and BMI showed a significant average the relationship with the indicators of CHL, TG, HDL, fibrinogen, blood glucose and a weak correlation with LDL indicators, the severity of hypertension.

Table 5

The relationship ¹³ between the degree of obesity and severity according to NIHSS.

NIHSS Scores	Normal body weight		Excess body weight		Obesity 1 st		Obesity 2 st		Obesity 3 st	
	abs	%	abs	%	abs	%	abs	%	abs	%
9-18 6	3	11,5	15	32,6	13	19,7	2	5,4	0	-
19-28 6	21	80,8	27	58,7	40	60,6	21	56,8	4	30,7
29-38 6	2	7,7	4	8,7	13	19,7	14	37,8	9	69,3

The stroke was severe mainly in patients with severe obesity. Among patients with grade 3 obesity, 69.3% of the severity on the NIHSS scale was assessed as extremely severe, among patients with grade 2 obesity, 37.8% were assessed as extremely severe.

It³ is worth noting that 54.7% of patients with extremely severe stroke had obesity of the 2nd and 3rd degree, 30% had obesity of the 1st degree, and only 13.7% had a BMI below 30.

Table 6

Average NIHSS values in patients depending on the degree of obesity.

	NIHSS[Me (LQ; UQ)]	P
Normal body weight	20 (20;23)	0,02
Excess body weight	18 (20;22)	<0,001
Obesity 1 st	24 (20;28)	0,82
Obesity 2 st	27 (24;33)	<0,001
Obesity 3 st	36 (28;37)	<0,001

Notes: the p – level of statistical significance is calculated according to the Mann-Whitney criterion

A comparative analysis of anthropometric and clinical neurological indicators revealed that BMI and OT had a positive correlation with the severity of the patient (r=0.63; p<0.001 c OT and r=0.53 p<0.001 c BMI). The presence of obesity in patients with AI on the background of MS significantly aggravated the course of this disease.

Thus, the analysis of anamnestic data and the results of clinical and instrumental examination of patients showed that the atherothrombotic type of AI significantly prevailed in MS compared to the comparison group (50.5% and 27.7%, respectively), whereas in the group of patients without concomitant MS, the lacunar subtype of AI prevailed (33.7% and 18.1%, respectively), which coincides with literature data.

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