

ACUTE CEREBROVASCULAR ACCIDENT IN YOUNG AGE

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ABSTRACT

Background: Acute cerebrovascular accident (CVA) is one of the leading causes of death in the industrialized world: suffer a stroke each year 6-8 million people in Russia - more than 450 thousand, and mortality from cardiovascular diseases in Russia remain among the highest in the world. The tendency to «rejuvenation» of stroke, a high percentage of the most able-bodied and disability perspective of the population determines the importance and relevance of the study of this disease in young patients. Development of a stroke at a young age requires careful elucidation of family history, conduct a full examination of the patients in order to identify all risk factors and their correction. Objective: to analyze the CVA in young patients for 2014-2015 in the Republic of Bashkortostan.

Methods: We analyzed 103 medical records of the patients with CVA at a young age treated in the neurological department for patients with acute stroke in the emergency hospital in Ufa of Bashkortostan for the period of 2014 and 2015. All patients who received treatment had the most acute and acute stroke. We have selected the patients of both sexes aged 18 to 45 years old (young age according to WHO criteria) in whom the neurological deficit persisted for more than 24 hours. The following scale was used: the international classification of pathogenetic subtypes of ischemic stroke TOAST, scale NIHSS, Rankin scale, mobility index Rivermid. **Results:** The ratio of ischemic and hemorrhagic stroke was 4: 1. The male to female ratio was 2: 1. The average age of the patients with ischemic stroke of the both sexes was 37.2 ± 1.3 years. The average age of the patients with GI of the both sexes was $37.0 \pm 1,52$ years. According to the criteria TOAST, 54 (65.8%) of 82 patients had AI of the unknown etiology; in 19 (23.2%) - cardio embolic subtype; in 3 (3.7%) - atherotromboembolic; 5 (6.1%) - lacunar; in 1 (1.2%) - hemorheologic. The pathogenetic subtypes of GI in young people are presented with the following frequency: parenchymal in 8 patients(38.1%); subarachnoid hemorrhage in 6 patients (28.6%); subarachnoid parenchymal hemorrhage in 4 patients(19%); parenchymal ventricular in 3 patients (14.3%). The functional outcomes measured in the patients via modified Rankin scale was $0,8 \pm 0,97$ points with AI and $2,71 \pm 1,95$ with GI; and Rivermead scale was $10,63 \pm 3,21$ points with AI and $7,95 \pm 6,04$ with GI. **Conclusion:** Stroke in young patients is characterized by a significant etiological polymorphism, a variety of clinical and neurological manifestations and their leading role in the genesis of hypertension, cardiac disease, brain aneurysm. The ratio of ischemic and hemorrhagic stroke is 4: 1. In accordance with the criteria TOAST, the most frequently encountered subtype of ischemic stroke (65.8%) had a stroke of unknown etiology. The most frequently encountered subtype of hemorrhagic stroke (38.1%) had parenchymal hemorrhage. During the period of hospitalization marked regression of neurological symptoms and restore lost functions.

KEYWORDS

Ischemic Stroke, Young Age, Gender

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INTRODUCTION

Acute cerebrovascular accident (CVA) is one of the leading causes of death in the industrialized world: suffer a stroke each year 6-8 million people in Russia - more than 450 thousand, and mortality from cardiovascular diseases in Russia remain among the highest in the world [1,3,4]. The tendency to «rejuvenation» of stroke, a high percentage of the most able-bodied and disability perspective of the population determines the importance and relevance of the study of this disease in young patients. The incidence of stroke in young adults, according

to various sources, ranging from 3 to 23 per 100 thousand. and increased in recent years. The average annual incidence of stroke in people 15-45 years of age is 11.4 per 100 thousand, and in 15-44 years of age - 6.9 per 100 thousand [3]. Ischemic strokes are developed in 4 times more often than a brain hemorrhage. Cerebral infarction, occurring between the ages of 15 to 45 account for about 1% of all strokes in the population [2]. Development of a stroke at a young age requires careful elucidation of family history, conduct a full examination of the patients in order to identify all risk factors and their correction.

METHODS

A retrospective analysis was conducted of case 103 histories of patients with stroke in young patients

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treated in the neurological ward for patients with acute stroke in GBUZ Bashkortostan Emergency Hospital for the years 2014-2015. 103 patients totally were hospitalized with CVA for 2014 and 2015 years, of which 82 (79.6%) patients with ischemic stroke (IS), and 21 (20.4%) patients with hemorrhagic stroke (GI).

The incidence of stroke in the young was 8.1 per 100 000 population. The ratio of ischemic and hemorrhagic stroke was 4:1. Recurrent IS was observed in 14 patients (13.5%). Repeated IS in another vascular pool was observed in 4 patients (3.9%). From the total number of patients there were 68 (66%) males and 35 (34%) females. We used the following indicators: the international classification of pathogenetic subtypes of ischemic stroke TOAST, scale NIHSS, Rankin scale, mobility index Rivermid and the results of clinical and instrumental studies.

RESULTS

The average age of patients with ischemic stroke of both gender was $37.2 \pm 1,3$ year. The average age of patients with HS of both gender was $37.0 \pm 1,52$ year. In the majority of 76 (73.7%) it was the inhabitants of the city of Ufa, and 27 (26.2%) patients from the area. By the nature of the professional activities of the distribution was as follows: knowledge workers accounted for 31,1% (n = 32), manual workers 30,1% (n = 31). It should be noted that at the time of stroke in 40 patients (38.8%) is temporarily not working. The distribution of males and females of age are shown in Table 1. As seen from Figure 1 stroke in 2 times more common in men aged 36-40, 41-45 years.

According to the international classification of pathogenetic subtypes of ischemic stroke TOAST, in 54 (65.8 %) of the 82 patients had an IS of unknown etiology; 19 (23,2%) - cardioembolic subtype; in 3 (3,7%) - atherothromboembolic; 5 (6,1%)- lacunar; in 1 (1.2%) - hemorheological (Fig.2).

Pathogenetic subtypes of HS have young adults represented by the following frequency: parenchymal - 8(38,1%); subarachnoid hemorrhage - 6 (28,6%); subarachnoid - parenchymal hemorrhage - 4(19%); parenchymal - ventricular - 3 (14,3%) (Fig.3).

According CT of the brain in 54 people (52,4 %) had CT-picture of the ischemic focus, the rest 28 people (27,2%) - focal changes of the brain is not revealed, 21 people (20,4%) had the CT-picture of HS. According to the brain CT scan ischemic lesions of small size were observed in 9 people (16,7%), medium - 21 people (30,5%); large ischemic focus- 20 persons (24.4 %), and in the brainstem - 4 persons (7.4%). Edema and dislocation of the brain was observed in 8 people (7.7 %) by CT of the brain. Localization of hematomas was dominated by mixed forms - 42,8% (n=9); cortical -19,1% (n=4); subcortical - 14,3% (n=3); undercortical - 9,5% (n = 2).

The level of consciousness of patients with HS were distributed as follows: clear - at 9 persons (42.8%); stunning - in 1 (4.7%); stupor - in 3 (14.3%); coma - in 8 (38.1%).

According to the results of clinical and instrumental studies, in 25-s of the 82 people (30,5%) with ischemic stroke the area of lesion was localized in the pool of the

Age, years	The number of patients (n=103)			
	Men		Women	
	absolute	%	absolute	%
15-20	1	0.9	-	-
21-25	4	3.9	2	1.9
26-30	2	1.9	4	3.9
31-35	12	11.7	6	5.8
36-40	20	19.4	9	8.7
41-45	29	28.2	14	13.6
Total	68	66	35	34

Fig. 1. The distribution of men and women by age

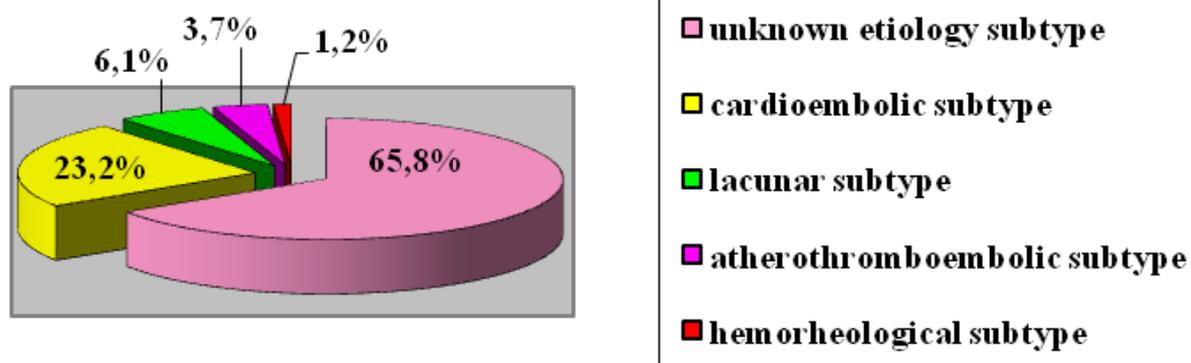


Fig. 2. Subtypes of ischemic stroke in young adults

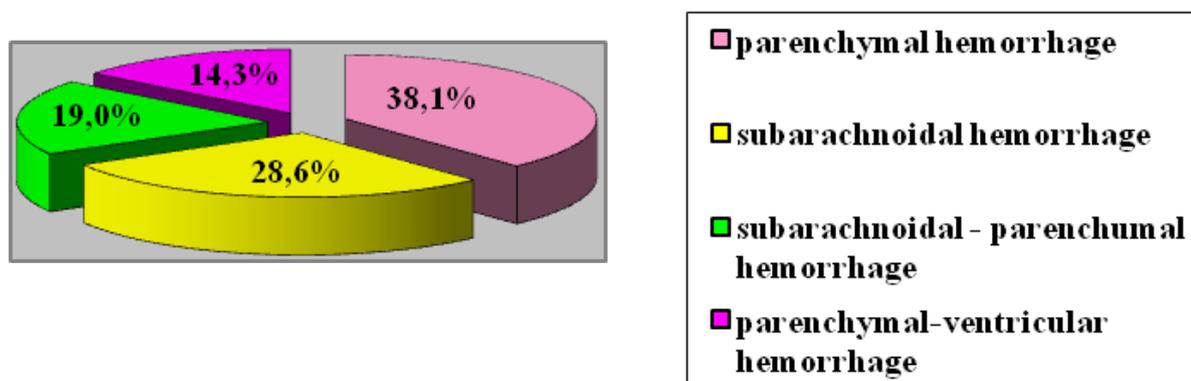


Fig. 3. Subtypes of hemorrhagic stroke

left middle cerebral artery with sensomotor aphasia, hemiparesis and hemihypesthesia in the opposite side of the hearth; 21 people (25,6%) in the vertebral-basilar pool with the development of alternating syndroms of hemianopsia and bulbar syndrome; 20 persons (24,4%) ischemic stroke occurred in the right middle cerebral artery; 5 persons (6,1 %) - in posterior cerebral artery in 11 people (13,4 %) - in several pools (LCP+VBP, ACP+VBP, VBP+PCA) (Fig. 4).

5 patients (6.1%) was held thrombolysis, 3 patients (3.7%) - thromboembolectomy. In 1 patient (1.2%) had secondary hemorrhagic transformation of the type of imbibition with the formation of a hemorrhagic focus in the parietal lobe.

There was a certain relationship of stroke to the season - the peak falls on autumn-29,1% (n = 30), summer-24,3% (n = 25), in winter - 24,3% (n = 25), the spring - 22,3% (n = 23).

According to laboratory studies, 38 (36,9 %) patients

had changes in gemostaziogramma, 36 (43,9 %) patients revealed hypercholesterolemia (with IS).

Etiological factors in the development of stroke in young adults, is characterized by considerable diversity. The main reason the IS was cardiogenic pathology (rheumatic fever, valvular heart disease, infective endocarditis, atrial fibrillation) – 22 people (26,8%). On the second place among the IS - arterial hypertension (AH) -11 people (13,4%); HIV, syphilis – 6 patients (7,3%); paroxysmal night hemoglobinuria - 1 (1.2%). The development of HS, in addition to AH (66,7%, n=14), been associated with rupture of arterial aneurysm and arteriovenous malformation 19,0%(n=4), alcohol abuse and drug 9.5% (n=2), hemorrhagic vasculitis – 4,7% (n=1). It should also be noted that the proportion of cardiogenic embolism in men was 2 times higher (n=14; 17.1%) than women (n=8; 9.7%). The main cause of cardiogenic embolic strokes were congenital heart disease (n=13;15,8%).

According to the extracranial carotid and

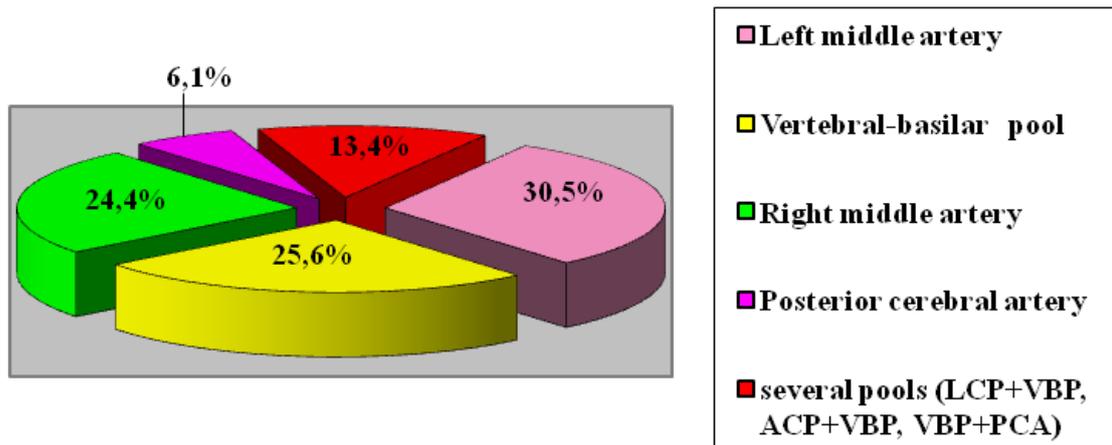


Fig. 4. Subtypes of hemorrhagic stroke

	scale NIHSS	Rankin scale	mobility index Rivermid
Ischemic stroke	<u>4.52± 3.18*</u>	<u>1.9 ± 1.39*</u>	<u>7,52 ± 2,35*</u>
	3.45±4.56	0.8± 0.97	10,63 ± 3,21
Hemorrhagic stroke	<u>20.25± 11.0*</u>	<u>3.52 ± 1.33*</u>	<u>4,43 ± 3,61*</u>
	12.81 ± 12.85	2.71± 1.95	7,95 ± 6,04

Fig. 5. Dynamics of activities of daily living (in points)

Note: The figures in the numerator - when entering *, in the denominator - discharge ($p < 0,001$)

vertebrobasilar duplex ultrasound scan, at 8 (7.7%) patients were enrolled hemodynamically significant sonographic signs of atherosclerosis of brachiocephalic arteries (stenosis, hemispheric asymmetry of blood flow), and 43 (41.7%) patients hemodynamically were not registered significant sonographic signs of atherosclerosis of brachiocephalic arteries.

According to the neurological examination of focal symptoms most frequent movement disorders (52 man-63.4% for IS and 16 people - 76.2% for the HS); sensory disturbances (18 man-21.9% at IS); speech disorders (18 persons - 21.9% with IS and 3 persons - 14.3% at HS); vestibular-atactic disorders (11 man-13.4% at IS); brainstem disorders (11 persons - 13.4% with IS and 7 people - 8.5% for HI);

Movement disorders were presented at IS hemiparesis varying severity: slight hemiparesis - 27 people. (32.9%), moderate - 5 people (6.1%), deep-13 people (15.9%); combination of paresis and plegia observed in 3 people (3.7%); In 4 (4.8%) showed signs of pyramidal insufficiency. After the HS - light hemiparesis - in 3 persons (14.3%); deep - in 3 persons (14.3%); plegia - from 10 people (47.6%).

In the analysis of daily activity revealed a positive trend as in IS, and in HS (Fig.5).

In 2 (1.9%) cases were deaths of ischemic stroke. Both patients (1 man and 1 woman) were from cardiac pathology (in the first patient had a congenital heart defect, aortic valve replacement, the second acute coronary syndrome). In 8 (7.7%) cases were hemorrhagic stroke deaths, mostly they were men.

DISCUSSION AND CONCLUSIONS

Stroke in young patients is characterized by a significant etiological polymorphism, a variety of clinical and neurological manifestations and their leading role in the genesis of hypertension, cardiac disease, brain aneurysm.

A systematic review of the incidence of the stroke in young people has been published by Marini²¹ et al., who analyzed 29 studies conducted between 1980 and 2009 years which included 3,548 patients till 45 years old with the first stroke. The total incidence rate (against the population as a whole) varies in the range from 5.76:100,000 to 39.79:100,000. However, after excluding extreme values (Benghazi, Dijon,

Baltimore - Afro-Americans, Israel) the ranges have become much denser - 8.63 to 19.12 per 100,000 population. Some studies on the incidence of stroke in young people have been published after 2009. Groppo and others²² reported that the overall incidence rate of stroke among young Italians is 12.1 cases per 100,000 population. In our study, the incidence rate of stroke in the young was 8.1 per 100,000 population which is consistent with the estimates of the most studies.

In the same review, the proportion of the ischemic stroke varies between 21.0% and 77.9%, hemorrhagic is between 3.7% and 38.5%, and subarachnoid hemorrhage is between 9.6% and 55.4%. In the recent study conducted in Bosnia and Herzegovina²⁷, the ischemic stroke among young people has been diagnosed in 61% of cases, intracerebral hemorrhage is in 17%, and subarachnoid hemorrhage is in 22%. In our study, the proportion of IS was 79.6%, the proportion of GI was 20.4%, which is consistent with the literature data.

The modifiable risk factors are the same for both the young and for the older age groups. However, the prevalence of these factors has significant differences. Hypertension, heart disease (including atrial fibrillation) and diabetes are the most common risk factors among the elderly. In contrast, in the study conducted among 1008 young patients with stroke in Finland, the most common risk factors for “vascular catastrophe” were dyslipidemia (60%), smoking (44%), and hypertension (39%). In another study by Putaala al. the risk factors were studied among 3,944

young stroke patients in three different geographical regions of Europe. The three most frequent risk factors were smoking (49%), dyslipidemia (46%) and hypertension (36%). In our study, the etiologic factors causing the development of stroke in young adults, are characterized by a considerable diversity. The main cause of IS was cardiogenic pathology (rheumatism, heart disease, infective endocarditis, atrial fibrillation) in 22 patients (26.8%). The second place causing IS was arterial hypertension (AH) in 11 people (13.4%); HIV, syphilis in 6 patients (7.3%); paroxysmal nocturnal hemoglobinuria in 1 patient (1.2%). It should also be noted that the proportion of cardiogenic emboli in men was 2 times higher (n = 14; 17.1%) than in women (n = 8; 9.7%). The main cause of cardiogenic embolic stroke was congenital heart disease (n = 13; 15.8%).

Despite the systematic diagnostic approach, the availability of modern diagnostic equipment which enables visualization of blood vessels and the presence of hematological and genetic studies, the stroke of uncertain etiology is the most common subtype of stroke among patients with stroke at young age, with the exception of two studies. Such a large number of patients with strokes of uncertain etiology can partially be explained by insufficient equipment and length of the study.

On the other hand, the TOAST classification is not perfect and can lead to overestimation of the cases of strokes with uncertain etiology, mostly because patients with two or more potential causes fall into

Researcher	Country	Atherothrombotic	Cardioembolic	Lacunar	Other identified etiology	Other uncertain etiology
Cerrato ¹⁸	Italy	16	24	17	19	24
Nedeltchev ²³	Switzerland	4	30	9	24	33
Rasura ²⁷	Italy	12	34	3	28	24
Varona ²⁷	Spain	20	18	5	22	36
Jovanovic ²⁷	Serbia	8	20	22	24	26
Putala ²⁷	Finland	8	20	14	26	33
Spengos ²⁵	Greece	9	13	17	27	34
Smajlovic ²⁴	Bosnia and G.	15	10	26	9	40
Tancredi ²⁶	Italy	9	19	16	29	27
Yesilot ²⁸	Europe	9	17	12	22	40

Fig. 6. The research of the stroke etiology in young adults (%)

this group. This group also includes patients with an incomplete diagnostic study, as well as those cases where there is no apparent reason, despite thorough examination.

The stroke of another identified etiology accounts to 20% -30% of cases of stroke in young patients. The dissection of cerebral arteries is the second most common cause of cervical artery lesion after atherosclerosis, and it is the first or second in the etiology of the ischemic stroke in young patients (up to 25% of cases). The Moya-Moya disease affects mainly the residents of Asian countries (representing 6% -15% of cases of neatherothrombotic angiopathy), but the disease is found worldwide. The connection between migraine and ischemic stroke has been known for many years. The risk is especially high among young women who have aura migraine and is increasing among smokers and those using oral contraception.

Hypercoagulable condition is causing stroke in 2-7% young patients. One of the common causes of IS at a young age, creating hypercoagulability is antiphospholipid syndrome (APS). One third of ischemic strokes in young patients (Table 2) is caused by cardio embolic subtype. However, it is often very difficult to diagnose. The causes of cardiogenic embolism are various. Hart developed the concept of sources of high and medium risk cardio embolism 30 years ago. Atherosclerosis of the main arteries has been shown to be a rare cause of ischemic stroke in young patients which is less than 10% of all the cases.

In general, the etiology of intracerebral hemorrhage in young patients is similar to the one occurring in people older than 45 years old. It is dominated by arteriovenous malformations, cavernoma, drug abuse, and the hemostatic system disorders. Hypertension is a common cause of intracerebral hemorrhage in young and elderly people, and the major part of the hemorrhages is lobar.

The possibility of cocaine and other types of drugs abuse should be considered as the cause of hemorrhagic stroke in young patients. In one study, the abuse of cocaine and amphetamine was associated with an increase in the number of hemorrhagic strokes. The narcotic drugs intake is one of the lesser-known causes of CVD at a young age.

Aneurysms in young patients have the same anatomical

sites and clinical data, as well as in elderly patients. Subarachnoid hemorrhage younger and older than 45 years old is diagnosed and treated in the same manner.

Our data supports that in accordance with the criteria TOAST, the most frequently encountered subtype of ischemic stroke (65.8%) had a stroke of unknown etiology. The most frequently encountered subtype of hemorrhagic stroke (38.1%) had parenchymal hemorrhage. The ratio of ischemic and hemorrhagic stroke is 4: 1. The ration of male and female is 2:1. During the period of hospitalization the regression of neurological symptoms and restore lost functions is noted both in IS and HS.

CONFLICT OF INTEREST

Authors confirm that this article content has no conflicts of interest.

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