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PREVIOUS TRANSIENT ISCHEMIC ATTACKS AS A FACTOR INFLUENCING THE SEVERITY OF NEUROLOGICAL DEFICIT IN HEMISPHERIC ISCHEMIC STROKE

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✓ ***Resume***

The effect of prior transient ischemic attacks (TIAs) on the dynamics of neurological recovery and the state of dynamic cerebral autoregulation (dCA) after ischemic stroke remains controversial. Objective. To compare changes in neurological status and dCA parameters in patients with a first-ever hemispheric ischemic stroke in the carotid territory, depending on the presence of a history of TIAs. A total of 74 patients were examined (40 with TIAs and 34 without TIAs), aged 40–65 years; the control group consisted of 20 healthy individuals. Neurological outcomes were assessed using the NIHSS, Rankin, and Rivermead scales. Dynamic cerebral autoregulation (dCA) was evaluated using the autoregulation coefficient (CA) and the reactivity coefficient (CR+) based on transcranial Doppler ultrasonography with functional tests. Statistical significance was determined using Student's t-test at $p < 0.05$. As early as day 3, patients with TIAs showed a faster regression of neurological deficit (NIHSS 4.40 ± 1.1 vs 6.06 ± 1.1; $p = 0.08$) and more favorable Rankin dynamics (2.01 ± 0.28 vs 2.44 ± 0.30). The autoregulation coefficient (CA) remained stable (0.81 ± 0.05) by discharge, whereas patients without TIAs continued to exhibit more pronounced impairments in dCA (CA = 0.88 ± 0.08). A negative correlation was found between CA and stroke severity ($r = –0.52$), and a positive correlation between CR+ and the Rivermead index ($r = 0.46$). Prior transient ischemic attacks (TIAs) are associated with faster clinical improvement and relatively preserved cerebral blood flow autoregulation in the acute phase of ischemic stroke. Patients without TIAs require more intensive hemodynamic monitoring and personalized prevention, whereas patients with TIAs may begin rehabilitation interventions earlier.

Keywords: transient ischemic attack; ischemic stroke; dynamic cerebral autoregulation.

ПРЕДШЕСТВУЮЩИЕ ТРАНЗИТОРНЫЕ ИШЕМИЧЕСКИЕ АТАКИ КАК ФАКТОР, ВЛИЯЮЩИЙ НА ТЯЖЕСТЬ НЕВРОЛОГИЧЕСКОГО ДЕФИЦИТА ПРИ ГЕМИСФЕРИЧЕСКОМ ИШЕМИЧЕСКОМ ИНСУЛЬТЕ

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✓ ***Резюме***

Влияние предшествующих транзиторных Влияние ишемических атак (ТИА) на динамику неврологического восстановления и состояние динамической церебральной ауторегуляции (ДЦА) после ишемического инсульта остается предметом дискуссий. Цель. Сравнить изменения неврологического статуса и параметров ДЦА у пациентов с первым в

жизни гемисферическим ишемическим инсультом в каротидном бассейне в зависимости от наличия в анамнезе ТИА. Всего было обследовано 74 пациента (40 с ТИА и 34 без ТИА) в возрасте 40–65 лет; контрольная группа состояла из 20 здоровых человек. Неврологические исходы оценивались с использованием шкал NIHSS, Rankin и Rivermead. Динамическая церебральная ауторегуляция (ДЦА) оценивалась с использованием коэффициента ауторегуляции (КА) и коэффициента реактивности (КР+) на основе транскраниальной допплеровской ультразвуковой диагностики с функциональными тестами. Статистическая значимость определялась с помощью t-критерия Стьюдента при p < 0,05. Уже на 3-й день у пациентов с транзиторными ишемическими атаками (ТИА) наблюдалась более быстрая регрессия неврологического дефицита (NIHSS 4,40 ± 1,1 против 6,06 ± 1,1; p = 0,08) и более благоприятная динамика Рэнкина (2,01 ± 0,28 против 2,44 ± 0,30). Коэффициент ауторегуляции (КА) оставался стабильным (0,81 ± 0,05) к моменту выписки, в то время как у пациентов без ТИА продолжали наблюдаться более выраженные нарушения dCA (КА = 0,88 ± 0,08). Была обнаружена отрицательная корреляция между КА и тяжестью инсульта (r = –0,52) и положительная корреляция между CR+ и индексом Ривермид (r = 0,46). Предшествующие транзиторные ишемические атаки (ТИА) связаны с более быстрым клиническим улучшением и относительно сохраненной ауторегуляцией мозгового кровотока в острой фазе ишемического инсульта. Пациенты без транзиторных ишемических атак (ТИА) нуждаются в более интенсивном гемодинамическом мониторинге и персонализированной профилактике, тогда как пациенты с ТИА могут начать реабилитационные мероприятия раньше.

Ключевые слова: транзиторная ишемическая атака; ишемический инсульт; динамическая церебральная ауторегуляция.

OLDINGI O'TKINCHI ISHEMIK XUJUMLAR YARIMSERIK ISHEMIK INSULTDA NEVROLOGIK TAQSIZLIKNING OG'IRLIK DARAGASIGA TA'SIR QILUVCHI OMIL SIFATIDA

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✓ ***Rezyume***

Oldingi o'tkinchi ishemik xurujlarning (TIA) nevrologik tiklanish dinamikasiga ta'siri va ishemik insultdan keyin dinamik miya avtoregulyatsiyasi (dCA) holati bahsli bo'lib qolmoqda. Maqsad. TIA tarixiga qarab, karotid hududida birinchi marta yarim sharsimon ishemik insultga uchragan bemorlarda nevrologik holat va dCA parametrlaridagi o'zgarishlarni taqqoslash. Jami 74 bemor (40 tasi TIA bilan va 34 tasi TIAsiz), 40-65 yoshda tekshirildi; nazorat guruhi 20 nafar sog'lom odamdan iborat edi. Nevrologik natijalar NIHSS, Rankin va Rivermead shkalalari yordamida baholandi. Dinamik miya avtoregulyatsiyasi (dCA) funktsional testlar bilan transkranial Doppler ultratovush tekshiruviga asoslangan avtoregulyatsiya koeffitsienti (CA) va reaktivlik koeffitsienti (CR+) yordamida baholandi. Statistik ahamiyatlilik Studentning t-testi yordamida p < 0,05 da aniqlandi. 3-kundan boshlab, TIA bilan og'rigan bemorlarda nevrologik defitsitning tezroq regressiyasi kuzatildi (NIHSS 4.40 ± 1.1 vs 6.06 ± 1.1; p = 0.08) va Rankin dinamikasi qulayroq (2.01 ± 0.28 vs 2.44 ± 0.30). Avtoregulyatsiya koeffitsienti (CA) kasalxonadan chiqarilgandan so'ng barqaror bo'lib qoldi (0.81 ± 0.05), TIA bo'lmagan bemorlarda esa dCAda aniqroq buzilishlar kuzatildi (CA = 0.88 ± 0.08). CA va insult og'irligi o'rtasida salbiy korrelyatsiya (r = –0.52) va CR+ va Rivermead indeksi o'rtasida ijobiy korrelyatsiya (r = 0.46) aniqlandi. Avvalgi vaqtinchalik ishemik xurujlar (TIA) ishemik insultning o'tkir bosqichida tezroq klinik yaxshilanish va miya qon oqimining nisbatan saqlanib qolgan avtoregulyatsiyasi bilan bog'liq. TIA bo'lmagan bemorlarga intensiv gemodinamik monitoring va shaxsiylashtirilgan profilaktika talab etiladi, TIA bilan og'rigan bemorlar esa reabilitatsiya aralashuvlarini oldinroq boshlashlari mumkin.

Kalit so'zlar: vaqtinchalik ishemik xuruj; ishemik insult; dinamik miya autoregulyatsiyasi.

Relevance

Ischemic stroke remains one of the leading causes of premature mortality and disability: in 2025, more than 12 million new cases are expected worldwide, with a further increase in disease burden due to population aging and inadequate control of vascular risk factors [3,5]. A key pathophysiological mechanism determining stroke outcome is the state of dynamic cerebral autoregulation (dCA). A 2024 meta-analysis of individual data demonstrated that significant impairment of dCA reliably increases the risk of an unfavorable functional outcome as early as the 7th day after ischemia [2].

At the same time, a substantial proportion of patients (up to 40%) experience transient ischemic attacks (TIAs) shortly before the development of cerebral infarction. Their clinical role remains controversial: some authors consider TIAs as a form of "ischemic preconditioning" that normalizes dCA [4], while others view them as a marker of depletion of vascular reserves, contributing to further deterioration of autoregulation [6]. The lack of consensus is reflected in recommendations for early rehabilitation; moreover, most clinical protocols still ignore the hemodynamic heterogeneity of patients with similar NIHSS scores.

The study of this issue is particularly relevant for healthcare systems in resource-limited settings, where the proportion of working-age patients is high and specialized stroke centers are limited [1]. The present study, for the first time, compares the dynamics of neurological deficit (NIHSS, Rankin) and dCA parameters (CA, CR+) in 74 patients with hemispheric ischemic stroke, stratified according to the presence or absence of prior TIAs. The obtained data are intended to clarify clinical and hemodynamic risk markers and to provide a basis for personalized stroke management in the early stages.

Objective of the Study: To assess how the presence of prior transient ischemic attacks (TIAs) influences the dynamics of neurological deficit in patients with a first-ever hemispheric ischemic stroke in the carotid territory.

Study Material

The study included 74 patients in the acute phase of a first-ever acute cerebrovascular event in the carotid territory. The patients were divided into two groups.

Group I consisted of 40 patients with a history of prior TIAs, aged 40 to 65 years (mean age 53.0 ± 6.0 years). Males accounted for 55% (22 patients), and females for 45% (18 patients).

Group II included 34 patients without a history of TIAs, aged 40 to 65 years (mean age 52.0 ± 7.0 years). Males accounted for 53% (18 patients), and females for 47% (16 patients) (Table 1).

Table 1. Distribution of patients by groups and gender.

Indicator	Group I (n=40)		GroupII (n=34)		Total (n=74)	
	abc	%	A c	%	abc	%
Male	22	55,00	18	52,94	40	54,05
Female	18	45,00	16	47,06	34	45,95
Total	40	54,05	34	45,95	74	100,00

The mean age of patients in both groups was comparable, which excludes the influence of age as a confounding factor on the study results. The gender distribution between the groups was nearly equal, allowing comparison without accounting for gender differences. The control group consisted of 20 relatively healthy individuals comparable in age and gender to the main groups.

Methods: Neurological status was assessed using the National Institutes of Health Stroke Scale (NIHSS), the modified Rankin Scale, and the Rivermead Mobility Index. General and biochemical blood tests were performed to evaluate overall condition and identify possible metabolic disturbances. Computed tomography (CT) of the brain was conducted to visualize the ischemic lesion. Ultrasound duplex scanning of the brachiocephalic vessels was used to assess the condition of extracranial arteries. The Glasgow Coma Scale was used to assess the level of consciousness.

Assessment of cerebral autoregulation was performed using transcranial Doppler ultrasonography (TCD) in combination with functional tests.

Statistical Methods. Data are presented as mean (M) and standard deviation (SD). Group comparisons were performed using Student's t-test. A value of $p < 0.05$ was considered statistically significant. Correlation analysis was used to identify relationships between autoregulation parameters and clinical data.

Results and discussions

On the first day of the acute phase of acute cerebrovascular event (stroke), the severity of neurological deficit according to the NIHSS was 8.21 ± 2.0 in Group I and 8.33 ± 1.7 in Group II. Thus, the initial severity of the condition and the degree of neurological deficit were comparable in both groups and showed no statistically significant differences ($p > 0.1$) (Table 2).

Dynamic observation showed that starting from day 3, Group I demonstrated a tendency toward a faster regression of neurological symptoms compared to Group II. Specifically, on day 3, the NIHSS score was 4.40 ± 1.1 in Group I and 6.06 ± 1.1 in Group II ($p = 0.08$).

A similar trend was observed on days 7–14 of the acute phase. It is important to note that although the difference between the groups remained statistically insignificant, it approached the level of significance ($p = 0.07–0.08$).

From day 21 of the acute phase, the difference in NIHSS scores between the groups slightly decreased; however, it remained substantial: 2.78 ± 0.7 in Group I and 4.72 ± 1.0 in Group II.

Table 2. Severity of Neurological Deficit According to the NIHSS in the Study Groups at Different Time Points After Stroke

Groups	Acute phase of stroke					
	upon admission	Day 3	Day 7	Day 14	Day 21	upon discharge
Group I (п=35)	8,21+2,0	4,40+1,1	3,85±0,7	3,69±0,6	2,78+0,7	2,78±0,7
Group II (п=30)	8,33±1,7	6,06±1,1	6,01+0,9	5,25+1,0	4,72+1,0	4,72+1,0
Significant. Div.(p)	p>0,1	p=0,08	p=0,07	p=0,08	p>0,1	P>0,1

Thus, in patients of Group I (stroke following prior TIAs), a faster regression of neurological deficit severity according to the NIHSS was observed at all time points starting from day 3 up to hospital discharge, compared to Group II (stroke without a history of prior TIAs).

A similar tendency toward a more favorable course of the acute phase of stroke in Group I compared to Group II was observed when assessing functional status after stroke using the Rankin scale (Table 3).

Thus, on day 3 of observation, the mean Rankin score in Group I was 2.01 ± 0.28 compared to 2.44 ± 0.30 in Group II (the difference was not statistically significant, $p > 0.1$).

Table 3. Assessment of Functional Status After Stroke According to the Rankin Scale in the Study Groups at Different Time Points

Groups	Rankin scale					
	upon admission	3 сутки	7сутки	14сутки	21сутки	upon discharge
Group I (п=35)	2,84±0,35	2,01±0,28	1,56±0,21	1,31±0,16	1,19+0,10	1,19+0,10
Group II (п=30)	2,95+0,41	2,44±0,30	2,09±0,25	1,88±0,19	1,74±0,16	1,74+0,16
Significant. Div.(p)	P>0,1	p>0,1	p=0,08	p=0,08	p=0,08	p=0,08

Starting from day 7 and up to discharge (day 21), the tendency toward a more favorable clinical course in patients of Group I was maintained. The difference between the groups approached statistical significance ($p = 0.08$).

Conclusions

The presence of prior TIAs is associated with a more favorable clinical course of stroke. As early as day 3 of the acute phase, patients with TIAs (Group I) demonstrated a faster regression of neurological deficit: the mean NIHSS score decreased from 8.2 ± 2.0 to 4.4 ± 1.1, whereas in Group II a higher severity of symptoms persisted at the same time point (6.0 ± 1.1).

Functional recovery according to the Rankin scale was faster in patients with prior TIAs. By day 21, the mean Rankin score in Group I was 1.19 ± 0.10 compared to 1.74 ± 0.16 in Group II, reflecting a higher level of independence at the time of discharge.

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