

Venous thromboembolic complications in stroke patients: prevention problems

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Objective: Clinical assessment of the efficacy and safety of the use of the Protocol for the prevention of Venous Thromboembolic Complications (VTEC), including the use of standard doses of anticoagulants and elastic compression of the lower extremities.

Materials and methods: A prospective analysis of 86 cases of stroke was performed. Depending on the amount of preventive measures of VTEC, patients were divided into two groups. In the first group (n = 42), non-drug methods were used: compression knitwear, patient's turns in bed every 2 hours, passive gymnastics and massage of paralyzed limbs, in the second group (n = 44), non-pharmacological prophylaxis was supplemented with nadroparin.

Results: Patients with acute stroke are at high risk of VTEC, and in almost all cases deep vein thrombosis of the lower leg was not accompanied by clinical symptoms and was diagnosed only during the ultrasound examination. The protocol for the prevention of VTEC is effective and safe in patients with hemorrhagic and ischemic stroke. During prophylaxis by the Protocol the frequency of VTEC is reduced from 32 to 24%, while the frequency of hemorrhagic complications doesn't increase.

Conclusion: The results of the study confirm the high efficacy and safety of the Protocol of prevention VTEC in patients with stroke.

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As part of the Health Modernization Program and the Federal Target Program on Mortality Reduction from Succeeded Causes, the Regional Council Center for the Treatment of Patients with Acute Stroke has been opened and is operating successfully at the Republican Clinical Hospital (Makhachkala).

Timely hospitalization, thrombolysis and rational pharmacotherapy, the introduction of neuronavigation and the improvement of neurosurgical care have significantly reduced stroke mortality and post-stroke disability [5, 7]. However, there are still many problems associ-

ated with stroke mortality from other causes. One of these, and perhaps the most important problem, was and remains in patients with stroke the problem of the development of venous thromboembolic complications. Among the many factors that play a role in the occurrence of VTEC, the main factors in severe stroke are: impairment of consciousness to stupor or coma, the development of deep motor deficit and hypodynamia, elderly patients (over 60 years), increased viscosity -VI, chronic venous insufficiency, the presence of purulent infections, obesity, concomitant cardiovascular pathology [1, 7, 10].

Diagnosis of VTEC in neurological patients in critical conditions is extremely difficult, due to the presence of respiratory and cardiovascular disorders, including the central gene, concomitant somatic pathology, inability of adequate contact and limited transportability of this category of patients. Earlier studies have shown that, without prophylactic measures, the frequency of VTEC like acute venous thrombosis and thromboembolic pulmonary artery in patients with stroke reaches 50–75% [4, 5, 11].

According to the same data, the prevention of thromboembolic complications is obtained by no more than 25-30% of neuro-reanimation patients [5, 6, 10]. The reason for the contradictions is obvious: on the one hand, prevention with direct anticoagulants is the main and only effective method for preventing VTEC in patients in critical condition. On the other hand, taking into account the localization of the pathological process, the danger of iatrogenic

hemorrhagic complications, especially intracranial hematomas, is especially great.

Objective: a clinical assessment of the effectiveness and safety of the use of the Protocol to prevent VTEC, including the use of standard doses of anticoagulants and elastic compression of the lower extremities.

Material and methods

A prospective analysis of 86 cases of stroke of various nature, localization and severity in patients treated in reanimation and intensive care units of the departments of acute cerebral circulatory disorders and neurosurgery of the Republican Clinical Hospital was conducted.

Exclusion criteria: constant (before admission) anticoagulants, the lethal outcome during the first 5 days. surveillance, conducting systemic thrombolysis. The patients were divided into two groups depending on the volume of measures used to prevent TEC.

Table 1. The distribution of patients according to the nature, location and severity of stroke

Indicator		Frequency, % (n)
Gender	Male	59,3%; (51)
	Female	40,7%; (35)
Average age		53,7±9,7
Nature of stroke	hemorrhagic	31,4%;(27)
	Ischemic	68,6%; (59)
Localization of stroke	Supratentorial	83,7%;(72)
	Subtentorial	16,3%; (14)
The severity of stroke (on a scale of NIHSS)	Light (less than 8 points)	4,7%; (4)
	Moderate (8-16 points)	44,2%; (38)
	Heavy (over 16 points)	51,1%; (44)
Surgery		9,3%;(8)
Conservative therapy		90,7%;(78)

In the 1st group (n = 44), non-medication methods were used (compression three-cottage, patient turns in bed every 2 hours, passive gymnastics and massage of paralyzed extremities). In patients of the 2nd group (n = 42), non-drug prophylaxis was supplemented by administering nadro-parin 0.3 mg subcutaneously once a day. Nadroparin was used, as a rule, from the second or third day of the disease provided that hemodynamics is stable (or stabilized with the use of medicinal preparations) [1, 9]. In the case of neurosurgical intervention, in the first 48 hours of the postoperative period, a control computed tomography of the head was compulsorily performed to exclude hemorrhagic complications (formation of an after-operating hematoma).

If the nature of the hemorrhagic complication did not require revision of the operative wound and removal of hematoma, the prophylactic protocol of DVT (deep vein thrombosis)

and PATE (thromboembolia of pulmonary artery) was unchanged: on the third day after the operation, the first dose of anticoagulant was administered [1, 3, 9].

Evaluation of the neurological status was performed for all patients - on admission and daily throughout the entire period of hospitalization. The following scales were used:

- The Glasgow Coma Scale (GCS), which is the most used in clinical practice and is used to make an emergency assessment of the level of consciousness disorders in patients in critical conditions, including Acute Cerebrovascular Event [5, 8];
- Scale for assessing the severity of stroke of the US National Institutes of Health - National Institutes of Health Stroke Score (NIHSS) [4, 5].

Neurological complications of stroke were monitored daily; instrumental techniques were used according to indications. Brain edema

with displacement and compression of the median structures and the brainstem, acute occlusive hydrocephalus, hemorrhagic soaking or hemorrhage into the ischemic zone, blood breakthrough into the ventricular system and / or subarachnoid space, angiospasm - were diagnosed on the basis of the neurological examination, an examination of the ventricular system and / or the subarachnoid-space methods of neuroimaging in different modes and transcranial doppler.

The state of the venous system of the inferior vena cava (VCI) system was assessed using an integrated ultrasound study (ultrasound), which includes angiography using spectral, color and energy Doppler modes and soft tissue echography. The study was carried out upon admission, on 3, 5, 7, 10, 14, 21 days of Acute Cerebrovascular Event, and also as needed. multislice spiral computed tomography -angiopulmonography was performed to diagnose pulmonary embolism (PE). Monitoring of systemic hemodynamics, breathing, body temperature: non-invasive monitoring (heart rate, blood pressure, respiratory rate, pulse oximetry, thermometry) was carried out to all patients using bedside monitors. Evaluation of the main clinical risk factors for VTEC was performed in

all patients according to the revised Geneva scale [1, 3, 5]. Taking into account the characteristics of the studied contingent and clarifying the role of additional adverse factors for the development of VTEC, the Algorithm for assessing the risk of VTEC in non-surgical patients was used [1, 5].

Results and discussion

The study showed that of 44 patients in the 1st group, 14 — that is, 32% of cases had acute venous deep vein thrombosis of the tibia. This occurred more often with hemorrhagic insult in 9 (20.4%) patients (compared with ischemic patients in 5 (11.6%; $p < 0.05$)). In 8 (57%) of 14 patients, venous thrombosis developed on the 1st week of stroke, in 6% - during the 2-3rd week of stroke. Practically in all - 13 out of 14 (95%) patients, venous thrombosis was asymptomatic, not accompanied by the development of edema. In 9 (60%) cases, thrombosis was aggravated by movement disorders ($p < 0.05$). Pulmonary embolism developed in 5 patients of the 1st group (11%) and in its character in the majority of patients - in 4 (80%) - was nonmassive. More often, it was developed in patients with severe hemorrhagic stroke ($p < 0.05$). In one case, PE was fatal.

Table 2. The frequency and timing of development of VTEC in the observation groups

	Group 1 - drug-free prophylactic (n = 44)		Group 2 - protocol prevention (n = 42)		R
	Frequency (%; n)	terms of development (days of stroke)	Frequency (%; n)	terms of development (days of stroke)	
TEC (n=24)	32%; 14	6,7±2,4	23,8%; 10	8,5±3,1	0,069
PATE (n=8)	11%; 5	8,2±2,8	7,14%; 3	8,4±3,7	0,069
deathful PATE (n=2)	2,2%; 1	9	2,4%; 1	10	

Table 3. The frequency and timing of development of VTEC in ischemic and hemorrhagic stroke

	Ischemic stroke (n=59)		Hemorrhagic stroke (n=27)		R
	Frequency (%; n)	terms of development (days of stroke)	Frequency (%; n)	terms of development (days of stroke)	
TEC (n=24)	16,6%; 10	6,7±2,4	51,8%; 14	8,5±3,1	0,069
PATE (n=8)	3,3%; 2	10,2±0,8	22,2%; 6	9,7±3,3	0,069
deathful PATE (n=2)	0		7,4%; 2	10,1±1,4	0,005

Table 4. The frequency and timing of the development of VTEC in the supratentorial and subtentorial localization of stroke

	Supratentorial (n=72)		Infratentorial (n=14)		P
	Frequency (%; n)	terms of development (days of stroke)	Frequency (%; n)	terms of development (days of stroke)	
TEC (n=24)	26,3%; 19	6,7±2,4	35,8%; 5	8,5±3,1	0,069
PATE (n=8)	8,3%; 6	10,2±0,8	14,2%; 2	9,7±3,3	0,069
deathful PATE (n=2)	1,4%; 1	9	7,1%; 1	10	

In the 2nd group of patients who received prophylaxis under the Protocol, VTEC occurred in 10 (23.8%) patients. All patients had venous thrombosis of the lower extremities. The development of VTEC in this group was noted equally often in both hemorrhagic and ischemic stroke: 5 and 5 patients, respectively. Pulmonary embolism occurred in 3 patients - in all patients with hemorrhagic stroke. Fatal mass pulmonary embolism was observed in one case - in a patient with a hemorrhagic stroke.

VTEC developed comparably often, as in the supratentorial localization of stroke, and in the subtentorial one. In order to identify a correlative connection (or lack thereof) between the development of VTEC and the severity of neurological disorders and multiorgan dysfunction, the dynamics of the neurological and somatic status were analyzed (Tables 2-4).

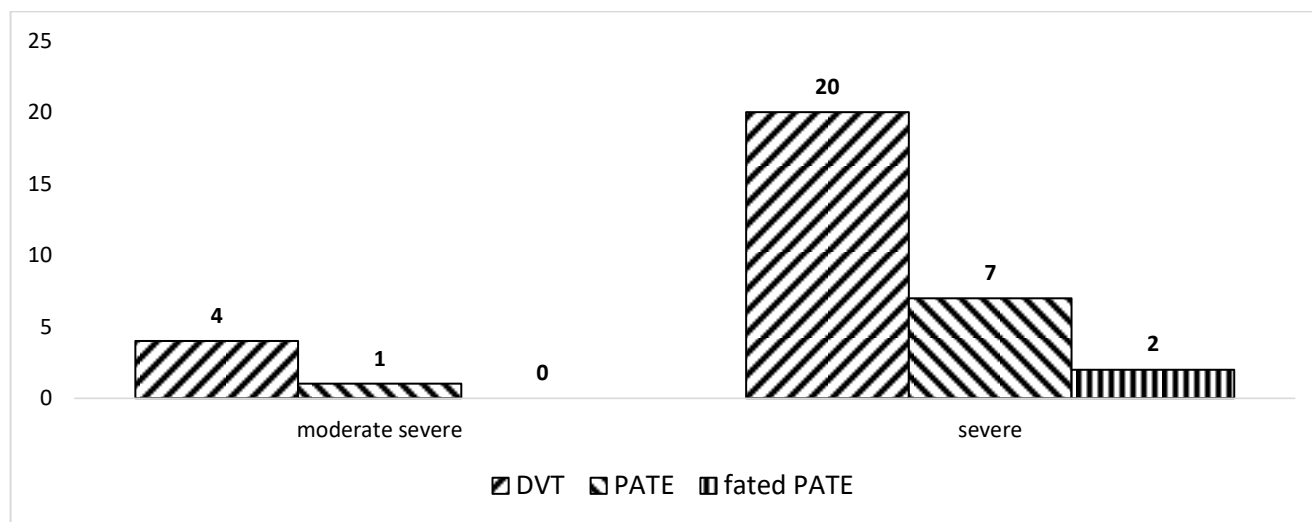


Figure. The frequency of VTEC in patients with stroke of varying severity.

Of the 38 patients with moderately severe stroke, VTEC developed in 5–13.5% [DVT - 4 cases (10.5%), PATE - 1 case (2.6%)] of 44 patients with severe stroke - in 29 (66%) (DVT

– 20 cases (45.4%), pulmonary embolism – 7 cases (16%), and in 2 cases (4.5%) PATE was fatal)) (Figure).

Table 5. Comparative characteristics of subgroups of patients at the time of admission (a prospective study)

Index		Patients with VTEC (n = 24)		Patients without VTEC (n = 62)		R
		1 группа (n=14)	2 группа (n=10)	1 группа (n=30)	2 группа (n=32)	
Sex (n)	male	8	4	19	10	
	female	6	6	11	22	
Mean age, years (M + m)		61±7,7	64±9,5	59±8,4	63±9,8	
The nature of the stroke (n)	hemorrhagic	9	5	7	6	
	ischemic	5	5	23	26	
Stroke localization (n)	supratentorial	10	7	27	28	
	subtentorial	4	3	3	4	
The severity of stroke for NIHSS, the average score (Me)		26	22	19	21	>0,05
GCS, average score (Me)		9	9	11	10	>0,05
APACH II, average score (Me)		14	14	14	14	>0,05

As can be seen from the table, in the group of patients who later developed VTEC, initially there were more patients with severe stroke and less - with mild severity of stroke. In 35% of cases, stroke in the group of patients with

VTEC was repeated, in 27% there were rhythm disturbances with permanent forms of atrial fibrillation, 34% in the anamnesis had myocardial infarction, in 94% - arterial hypertension with a high risk of heart failure. -vascular complica-

tions. The development of VTEC, obviously, occurs more often in patients with severe stroke with an increase in the severity of multiple organ failure.

One of the tasks of the work was to assess the frequency and nature of hemorrhagic complications during treatment with Acute Cerebrovascular Event in stroke patients. In 1 patient out of 48 with a hemorrhagic stroke, according to the results of a neuroimaging study of the brain on the 4th day of the stroke, an increase in hematoma volume was detected. Note that in this case we are talking about an operated patient: on the third day after trepanning of the skull and emptying the intra-cerebral hematoma, a postoperative hematoma was revealed that did not require revision of the surgical wound, removal of hematoma and reoperation. On computer tomography (CT), the resorption of hematoma was observed in the dynamics without the development of any additional hemorrhagic complications. In one case, spontaneous hemorrhagic transformation of cerebral infarction took place on the 6th day of the disease - the patient did not receive low molecular heparin (LMH), thromboprophylaxis was carried out by non-drug methods. Gastrointestinal bleeding was not detected in any case.

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Conclusions

Thus, these studies confirm that patients with acute ischemic stroke are at high risk of VTEC, and in almost all cases thrombosis of the deep veins of the leg was not accompanied by clinical symptoms and was diagnosed only during ultrasound. When carrying out prophylaxis under the Protocol, the frequency of VTEC decreases from 32 to 24%, and the frequency of hemorrhagic complications do not increase. The above allows us to recognize the Protocol for the prevention of thromboembolic complications as effective and safe in patients with stroke.

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