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Research Article

Estimation of The Neurological Deficiency in Stroke Patients Who Received Intra-Arterial Thrombolysis Therapy

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Introduction

Aim: Aim of this work was to study the dynamics of the neurological status in patients who received intra-arterial thrombolysis therapy).

Materials and methods: 75 patients with acute ischemic stroke participated in the study. All patients were admitted to the clinic during the first days of the onset of the disease. The main group included 41 patients hospitalized in the hospital within a six-hour therapeutic window, which underwent selective thrombolytic therapy.

Results: In 41% of patients in the main group, there was a significant recovery in neurological functions, which was manifested by a decrease in the total score on the NIHSS scale by 4 or more points.

Thus, based on the above, it can be concluded that intra-arterial thrombolytic therapy in the first 6 hours after the development of ischemic stroke is a safe and highly effective method of treatment and significantly increases the number of patients with good functional outcomes (compared to patients who have not had thrombolysis; p<0,01).

Keywords: *Acute Stroke, Intra-Arterial Thrombolysis, Neurological Deficiency, Stroke Outcome*

Relevance

The increasing frequency of acute cerebral ischemic stroke (AS) and its "rejuvenation", ultimately more leading to extremely adverse of socio-economic consequences, force us to reconsider the traditional technology of treatment and rehabilitation of patients with this serious disease [1,2]. New approaches to the treatment of ischemic stroke, primarily include the use of modern highly effective methods of reperfusion of the brain substance in the first hours of the disease by restoring blood flow in the occluded vessel, which helps prevent or minimize the amount and severity of brain damage. According to the latest recommendations of the European Stroke Organization (ESO) and the American Stroke Association [3,4], thrombolytic therapy (TLT), carried out using recombinant tissue plasminogen activator (rt-PA, alteplase) and mechanical thromboectomy, is the most effective treatment method for AS [4-6].

It has been proven that when AS develops against the background of occlusion of the cerebral artery, neuronal death (the so-called nuclear ischemia zone) occurs quickly in a relatively small area of the brain [7]. In the next 6–12 hours, the delayed death of most neurons is observed as a result of a complex cascade of pathochemical reactions at the cellular level (neurons of the "ischemic penumbra"). That is why the elimination of arterial occlusion and the restoration of blood flow in the first hours of a stroke can potentially prevent the death of neurons of the "ischemic penumbra" and, consequently, reduce the size of brain infarction and the severity of a neurological defect. Thrombolysis therapy (TLT) contributes to the reperfusion of the ischemic area of the brain, thereby improving the functional state of the patient [1,2,8,9].

The aim of this work was to study the dynamics of the neurological status in patients who received intra-arterial thrombolysis therapy (TLT).

Materials and Methods

75 patients with acute ischemic stroke participated in the study. All patients were admitted to the clinic during the first days of the onset of the disease. The main group included 41 patients hospitalized in the hospital within a six-hour therapeutic window, which underwent selective thrombolytic therapy. The control group consisted of 34 patients, who also arrived within 6 hours of the onset of symptoms, but did not receive TLT, this group of patients was recruited retrospectively.

For objectification of the severity of the condition, severity of focal neurological deficit and assessment of the dynamics of clinical indicators, the NIHSS scale of stroke was used; clinical outcomes of the disease on the 21st - 30th day were assessed according to the modified Rankin scale (MRS; favorable outcomes - MRS <2; satisfactory outcomes - MRS from 2 to 3, unsatisfactory outcomes - MRS> 3).

Laboratory tests included: complete blood count, urinalysis, biochemical blood test, coagulation (activated partial thromboplastin

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time, prothrombin time, prothrombin index, international normalization ratio, fibrinogen, soluble fibrin monomer complexes, platelets).

Results

In 41% of patients in the main group, there was a significant recovery in neurological functions, which was manifested by a decrease in the total score on the NIHSS scale by 4 or more points. In 39.0% of cases, the positive dynamics in the neurological status was less pronounced (a decrease in the total score on the NIHSS scale by less than 4 points). In 19.5% of patients against a background of thrombolysis in the neurological status, there was no positive dynamics.

The dynamics of the total score on the NIHSS scale in the main and control groups in patients with mild, moderate and severe stroke are presented in the table 1.

The dynamics of the recovery of focal neurological functions against the background of intra-arterial thrombolysis was observed mainly due to the recovery of motor functions ($p < 0.05$). There was a tendency for faster recovery of movements in the lower limbs than in the upper ones.

The rate of recovery of motor functions in the limbs was significantly different from the speed of recovery of sensitive, coordinating and speech disorders. Speech disorders ($p < 0.05$) recovered more slowly, and the regression of aphasic disorders was less intense than the regression of dysarthria ($p < 0.05$).

The development of hemorrhagic transformation (HT) was observed in 23 (56.1%) of 41 patients who underwent TLT. In 13 (31.7%) patients developed according to the type of hemorrhagic infarction (HI) of the 1st type, in 6 (14.6%) of the type II HI, in 4 (9.8%) parenchymal hematomas were detected type 1, which in 3 cases were symptomatic.

Asymptomatic HT developed in 20 (48.8%) patients, symptomatic - in 3 (7.3%). Compared with foreign studies, in our study, HT on the background of TLT was much more common, which can be explained by the prevalence of patients with more severe stroke (in our study, the average value on the NIHSS scale was 16.1 ± 5.5 points). Despite the increase in the frequency of HT, in most cases it was asymptomatic, moreover, it was clinically accompanied by regress of neurological disorders.

Table 1: The dynamics of the total score on the NIHSS scale in patients of the main and control groups.

Stroke severity	Main group	Control group
NIHSS initial		
Mild	6,0±0,1	4,1±1,4*
Moderate	9,2±1,8	10,8±1,4
Severe	19,2±2,7	18,4±3,6
NIHSS on 1st day		
Mild	4,5±2,1	4,6±4,3
Moderate	6,2±3,5	10,0±3,3
Severe	14,5±6,	18,3±4,2*
NIHSS on 3rd day		
Mild	4,5±2,1	5,3±5,7*
Moderate	5,8±3,9	9,6±4,6*
Severe	14,6±7,1	19,8±8,5*
NIHSS on 7th day		
Mild	3,5±2,1	5,0±5,8*
Moderate	5,4±3,9	10,2±5,1*
Severe	12,2±7,6	14,3±6,3*
NIHSS on 14th day		
Mild	3,5±2,1	4,8±5,7*
Moderate	4,4±3,8	9,8±5,0*
Severe	10,7±7,8	12,2±6,4*
NIHSS on 21st day		
Mild	2,5±0,7	4,8±5,7*
Moderate	3,9±3,5	10,3±3,0*
Severe	10,1±8,0	10,5±5,8*

Note: * - *reliability of data between groups (P <0.05)*

In our study, a significant relationship was found between the initial MRS score and the development of HT in patients of the main group ($r = 0.4$; $p = 0.009$; sensitivity 81.25%, specificity 60.0%) and in patients included in the control group ($r = 0.7$; $p = 0.02$). Despite the close reliable relationship between the development of HT and the MRS score, the latter had no effect on the development of symptomatic GT ($p = 1.000$).

At the same time, a significant relationship was found between the MRS score and the clinical outcome of the disease by day 21 ($r = 0.46$; $p = 0.003$). In the control group of patients, a direct correlation between the mRS score and the clinical outcomes of the disease was also detected ($r = 0.4$; $p = 0.009$). Patients of the main group with a general score for ASPECTS <7 (in 11 (26.8%) out of 16) significantly more often ($p = 0.04$) had poor outcomes by 21 days than in patients with a total score> 7 on this scale (7 (17.1%) out of 25). The sensitivity and specificity of scores for ASPECTS <7 with respect to unsatisfactory outcomes were 68.75% and 72.0%, respectively.

When comparing patients with severe stroke (NIHSS> 14) of the main and control groups, functional differences and clinical outcomes revealed highly significant differences ($p < 0.01$). None of the patients with severe stroke from the comparison group had a good outcome of the disease by day 21, while in the main group 14 (48.27%) of the 29 patients with initial severe stroke had a full functional recovery by 21st day.

Thus, based on the above, it can be concluded that intra-arterial thrombolytic therapy in the first 6 hours after the development of ischemic stroke is a safe and highly effective method of treatment and significantly increases the number of patients with good functional outcomes (compared to patients who have not had thrombolysis; p<0,01). The dynamics of the restoration of neurological functions on the background of intra-arterial thrombolysis is observed mainly due to the restoration of motor functions. Slower is the recovery of speech function, while the regression of aphasic disorders is less intense than the regression of dysarthria.

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