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Experience of Open Surgical Treatment of Non-traumatic Intracerebral Hematomas

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Abstract The purpose of this study was to analyze the experience of open removal of non-traumatic intracerebral hematomas in the conditions of the regional hospital for emergency medical care. The material was a retrospective and immediate analysis of 31 patients operated on for non-traumatic intracerebral hematomas in the department of neurosurgery of the Andijan branch of the Republican Scientific center of emergency medicine in the period from January 2017 to May 2020. As indications for surgical treatment, we took into account the volume of the hematoma, its localization, the degree of stunning, the general condition of the patient, and the presence of concomitant pathologies. The results were evaluated as good and satisfactory in 27 patients (87.1%), lethal outcome in the first 28 days was observed in 4 patients (12.9%) and thus, with strict consideration of indications and contraindications for surgical treatment, it is possible to achieve improved treatment results.

Keywords Non-traumatic intracerebral hematomas, Open surgical treatment, Indications for surgery

1. Introduction

Acute cerebrovascular accident is one of the three most common causes of mortality, along with cardiovascular and oncological pathologies. Hemorrhagic stroke, being, in fact, the result of hypertension, becomes, in most cases, and the final stage of this disease. In the structure of cerebral circulation disorders, non-traumatic intracerebral hematomas account for 4-27%. Mortality in hemorrhagic stroke, even with adequate treatment, reaches 40-50%, and disability - 70-80% [5].

It is also important that, until now, with the considerable development of neuroimaging and criteria for assessing the patient's condition, clear indications for surgery have not been identified. Some authors place emphasis on the volume of hemorrhage and its localization, someone assesses the level of consciousness and complications of non-traumatic intracerebral hematomas, most experts try to combine the above criteria [4]. The most popular among neurosurgeons and neuropathologists was the concept of patient selection proposed by V.V. Krylov and V.G. Dashyan in 2005. According to it, the selection criteria were:

1. The volume of hematoma (with lobar localization over 30 cm3, with putamenal - 20 cm3, with medial and cerebellar localization - 15 cm3)
2. The level of consciousness according to the Glasgow Coma Scale (from 6 points and above)
3. Absence of severe concomitant pathologies (diabetes mellitus, renal failure, etc.)
4. Controlled hemodynamics

An obstacle to immediate surgery was also the fact that the volume of the hematoma within 4 days tends to almost double (ongoing bleeding), which is facilitated by severe arterial hypertension, the presence of anemia, and a decrease in the level of calcium in the blood plasma. In the future, the course of stroke, as a rule, was complicated by cerebral edema, displacement of the midline structures, breakthrough of blood into the ventricular system, as well as acute occlusive hydrocephalus, followed by impairment of vital functions [10].

In this situation, a neurosurgeon is faced with a difficult choice of tactics for further treatment, which can be aggravated by insufficient material and technical equipment of a medical institution, lack of experience or specialist qualifications [9], which is often in an emergency medical service, even of regional significance.

It is known that the basic principles of drug treatment of acute cerebrovascular accidents of hemorrhagic type in the acute period include, along with hemostatic therapy, optimization of blood pressure, treatment of intracranial hypertension - osmotherapy, also correction of glucose

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levels, body temperature, prevention of epicomnia, the introduction of nootropic and neuroprotective agents [6].

With regard to surgical treatment, preference is given to the principle of minimally invasive neurosurgery: microsurgical, stereotaxic, endoscopic operations, puncture-aspiration method with local fibrinolysis [8]. The choice of surgical tactics, in principle, is the prerogative of the neurosurgeon, which must proceed from personal experience and capabilities, as well as the material and technical base of the medical facility [3].

Despite the success of drug and surgical treatment, in the world of neurosurgical practice, mortality in the acute period reaches 30–52% within the first 30 days [1].

The aim of this study was to analyze the results of open transcortical surgical treatment of patients with non-traumatic intracerebral hematomas in the conditions of the regional center for emergency medical care.

2. Materials and Research Methods

Analysis was based on survey which carried out in 163 patients with a diagnosis of stroke of hemorrhagic type of various localization, admitted to the departments of neurology and neurosurgery of the Andijan branch of the Republican scientific center of emergency medicine from 2017 to 2020. 31 (thirty one) patients according to the recommendations of V.V. Krylov underwent surgical treatment. This contingent was selected as the material for our study. The age of the patients varied from 21 to 77 years. By gender: men - 24 (77.4%), women - 7 (22.6%). When collecting anamnesis, it was revealed that 27 patients (87%) suffered from hypertension, with a limitation period of 3 to 20 years. In 5 (16.1%) patients, a history of hypertension was not observed or was mild. This contingent was assumed to have an arterial aneurysm or arteriovenous malformation.

All patients underwent clinical and neurological examination upon admission. The level of impaired consciousness was determined by the Glasgow Coma Scale (GCS). Cerebral, focal and meningeal symptoms were assessed. Disease outcomes were assessed using the Glasgow Outcome Scale (GOS). Of the instrumental research methods, MSCT of the brain was used at admission and in dynamics on the third and seventh days after the operation. Blood was regularly examined for general and biochemical composition, PTI and coagulogram. Was monitored the function of the cardiovascular system.

According to the level of impairment of consciousness before the operation, the patients were distributed as follows: clear consciousness - 2 (6.5%) patients, moderate stunning - 10 (32.3.0%), deep stunning - 13 (41.9%), stupor - 4 (12.9%), moderate coma - 2 (6.5%). Apoplexy was observed in 7 (22.6%) patients. The course with a gradual depression of consciousness and an increase in neurological deficit was observed in 3 (9.7%) patients, in 2 patients (6.5) the disease preceded with the progression of neurological deficit without depression of consciousness.

In terms of the volume of hematoma, the indications for surgery of hemorrhagic strokes were:

1. Subcortical stroke (hematoma with a volume of more than 30 ml);
2. Putamina and cerebellar stroke (hematoma more than 20 ml).
3. Mixed stroke-hematoma with a volume of over 20 ml.

The volume was measured on a tomography or retrospectively on the tomograph display according to the formula:

$$V=(A*B*C)/2$$

V is the volume of hemorrhage,

A - the largest diameter of the hematoma.

B - maximum diameter perpendicular to dimension A.

C is the number of 10 mm sections on which the hematoma is visible. If the area of the hematoma on the cut is more than 75%, the indicator is 1, with an area of 25-75%, the indicator is 0.5, with an area of less than 25%, this indicator was not taken into account.

The development of a coma in patients with hemorrhagic stroke is a poor prognostic sign, and surgery was recommended if the coma lasted more than 6-12 hours.

Operation stages:

1. Incision of the skin and subcutaneous structures. For the purpose of skin preparation and better tissue detachment, 30-70 ml of isotonic solution or sterile furacillin solution was previously injected into the incision area. For the purpose of local hemostasis, in some cases 1 ml of adrenaline or 1% -1 ml of atropine was added to the solution. A horseshoe-shaped, less often semilunar skin incision was made with the formation of a skin flap and its removal from the operating arch using a ligature. The muscle layer and the periosteum were cut, which were peeled off with a raspatory and pulled up similarly to a skin flap.
2. Craniotomy. A classical resection craniotomy was performed with the imposition of a milling hole and its expansion with nippers up to 4-8 cm.
3. Removal of hematoma. Under microscopic assistance, the dura mater was opened crosswise or semilunar, and a puncture cannula of non-traumatic intracerebral hematomas was performed with a subsequent aspiration of the liquid contents by surgical suction [7]. The liquid content usually did not exceed 30% of the non-traumatic intracerebral hematomas, and the next step was encephalotome using a bipolar coagulator, surgical suction, spatulas, and a dissector. After the performance of encephalotome, the brain substance was fixed with spatulas in order to form an operating channel. The depth of the operating canal, as a rule, did not exceed 30 mm. Further, the dense part of the hematoma was evacuated by surgical suction and fenestrated forceps. In a gentle way, with regular washing of the clots with a solution of furacillin, first the parietal, then the centrally located

convolutions were removed [8]. Hemostasis was performed thermally - with a coagulator, or chemically-mechanically - by compressing bleeding vessels with quilted jackets or gauze napkins and balls moistened in a solution of hydrogen peroxide.

4. Completion of the operation. If necessary, the hematoma cavity was drained. The dura mater, subcutaneous structures, and skin were sutured in layers. An aseptic bandage was applied.

3. Results and Discussion

Using microneurosurgical and optical techniques, 31 intracerebral stroke hematomas were removed. In one case, there was a relapse of hemorrhage on the third day. The volume of removed non-traumatic intracerebral hematomas ranged from 20 to 90 mm3. In the early postoperative period, patients underwent appropriate hemostatic, decongestant, nootropic therapy with constant monitoring of blood pressure. Subsequently, the treatment was aimed at restoring the lost functions and rehabilitation. Good results were obtained in 6 patients (19.4%), satisfactory in 21 patients (67.7%) and death on day 21 was observed in 4 patients (12.9%). It should be noted that good and satisfactory results were obtained in patients strictly screened out according to the selection criteria.

4. Conclusions

1. Open surgical treatment should be recommended to patients with hemorrhagic stroke, with a level of wakefulness to stupor, without severe somatic pathology.
2. Surgical treatment of patients with hemorrhagic stroke in a coma or soporous state or elderly patients is ineffective, and is accompanied by a high mortality rate - up to 66,6%.

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