Hypertensive supratentorial intracerebral hemorrhage: clinical picture, diagnosis, treatment

Abstract. Background. The paper analyzed the severity and prevalence of hypertensive supratentorial intracerebral hemorrhages (ICH). This pathology is an urgent problem in the global health context, as it leads to severe consequences, including disability and death of patients. Recent discoveries and clinical guidelines provide physicians and researchers with new opportunities to improve clinical practice and improve the effectiveness of treatment for these complications. An increase in the number of cases of hypertensive supratentorial intracerebral hemorrhages and their impact on public health makes this problem extremely relevant in the field of medicine. Materials and methods. Two hundred and thirty-two patients with supratentorial intracerebral hemorrhages caused by hypertension were examined and treated in 2019–2020 at the Kyiv City Clinical Emergency Hospital. The average age of patients was 60 years: for men, it was 56 years, for women 69 years. They were observed during treatment in the hospital for up to 21 days. On the 21st day, the degree of disability was assessed. All patients underwent a neurological examination with an assessment of consciousness according to the Glasgow Coma Scale, Intracerebral Hemorrhage Score, Barthel index, modified Rankin scale, National Institutes of Health Stroke Scale (NIHSS). We have used neuroimaging methods (computed tomography, magnetic resonance angiography, if necessary). Clinical and laboratory studies were conducted. Results. It was found that 127 (57 %) patients had putaminal supratentorial hemorrhage, 24 (10 %) — thalamic, 34 (15 %) — subcortical (in the white matter of the cerebral hemispheres), 47 (20 %) — mixed. Seventy-seven (33 %) patients were hospitalized in a coma (Glasgow Coma Scale \( \leq 8 \) points), 36 (16 %) in a sopor, 81 (35 %) in a stunned state, and 31 (13 %) patients were conscious. Patients over 60 years of age had ICH of deep localization, while young patients had cortical ones. Ninety-four surgical interventions were performed in 84 patients with lobar and lateral hematomas, as well as with breakthrough into the ventricular system (liquid drainage surgery). General mortality was 39.5 %, surgical — 46.4 %. Contraindications for surgical interventions were as follows: an existing severe coma, unstable hemodynamics, the need for constant administration of vasopressors, as well as severe comorbid conditions. Conclusions. It was found that the clinical picture of acute supratentorial intracerebral hemorrhages against the background of hypertension is characterized by polymorphic neurological symptoms according to the localization of the hematoma, its volume, cerebral edema, and intracranial hypertension. The results of the treatment of patients with hypertensive ICH indicate the need for early hospitalization, early computed tomography scan, and a differentiated approach to surgical removal of the hematoma. The favorable outcome of supratentorial ICH is more typical for patients with initial mild and moderate neurological symptoms in case of a hemorrhage volume of less than 30 cm\(^3\). The presence of blood breakthrough into the ventricular system increases the risk of death by 35 times.

Keywords: acute violation of cerebral circulation; hypertensive intracerebral hematoma; hypertension

Introduction

The problem of cerebrovascular diseases (CVD) is one of the most urgent in modern medicine, including in the health care system of Ukraine. Indicators of the incidence and prevalence of CVD among the population of Ukraine in recent decades are characterized by constant growth [1, 8, 9]. CVD, especially hemorrhagic stroke [2], is one of the causes of mortality and disability of the population of Ukraine [1]. Ukraine belongs to those countries where the number of strokes is higher than the average in Europe. Every year, from 100 to 120 thousand residents of the country suffer from a stroke for the first time, 35.5 % of all strokes occur in people of working age. However, only...
10% of patients return to work, 20% need outside help. This is a problem of great socio-economic importance [2, 6, 10]. Hemorrhagic stroke is the most devastating type of stroke, which probably leads to death and severe disability more often.

The ratio of ischemic to hemorrhagic strokes in Ukraine ranges from 4:1 to 3:1, while in the developed countries of the world from 7:1 to 4:1. Mortality within 30 days after a hemorrhagic stroke ranges from 30 to 55% [7, 11], up to half of patients die in the acute period, especially during the first 48 hours.

Pre-hospital mortality in primary hemorrhage is 10–15% without surgical treatment, up to 50% of victims die within three months after the first hemorrhage. The main causes of complications are the rupture of blood vessels (aneurysm), with a mortality rate of up to 70%. Another dangerous complication is terminal spasm, which is observed in almost half of patients after cerebral hemorrhage.

The main risk factor for the development of a hemorrhagic stroke is hypertension, an increase in blood pressure by 20/10 mmHg doubles the risk of developing cardiovascular diseases. Early identification and treatment of hypertension, other risk factors for intracranial hemorrhages, measures for the primary prevention of cardiovascular events, bleeding diatheses are carried out at the primary care center [2, 6]. Intracerebral hemorrhage (ICH) belongs to urgent conditions and requires emergency medical care and urgent hospitalization to the health care institutions that provide secondary medical care in which neurosurgical treatment can be performed in the shortest possible time from the onset of the disease.

Prognosis of intracerebral hemorrhage is important for planning a set of diagnostic and treatment measures.

Today, ICH remains one of the topical problems of clinical neurology and neurosurgery, with both scientific and medical and social significance. This determines the relevance of further comprehensive study of ICH against the background of hypertension, in particular of supratentorial localization, features of its clinical manifestations depending on the initial volume of ICH, factors affecting the course of the disease and the development of complications, prediction of recovery after the acute period of ICH, improvement of surgical treatment [1, 3].

The purpose of the study: to improve the diagnosis and treatment of supratentorial ICH in patients with hypertension based on comprehensive clinical-neurological and instrumental research methods.

Objectives of the study:
1. To evaluate the features of clinical manifestations of acute supratentorial ICH.
2. To determine the relationship between clinical and neuroimaging parameters of acute supratentorial ICH in hypertensive patients.
3. To conduct an analysis of the course and functional outcome of the acute period of supratentorial ICH against the background of hypertension.
4. To determine prognostic criteria of clinical and paraclinical features of the acute period of supratentorial ICH in hypertensive patients.
5. To improve the schemes of drug and neurosurgical treatment for supratentorial ICH against the background of hypertension.

Object of study: supratentorial ICH in the acute period.

Materials and methods
All patients underwent a neurological examination with an assessment of consciousness according to the Glasgow coma scale (GCS), Intracerebral Hemorrhage Score, Barthel index, the modified Rankin scale, National Institutes of Health Stroke Scale (NIHSS). Patients are consulted by a neurologist, cardiologist, ophthalmologist, anesthesiologist, and, if necessary, an endocrinologist.

Neuroimaging methods, computed tomography (CT) of the brain were used, except for persons in extremely serious condition, with unstable hemodynamics, who required the urgent intensive care. In case of suspicion of a cerebral aneurysms or arteriovenous malformations, patients underwent CT and magnetic resonance angiography of cerebral vessels.

A clinical and laboratory study of peripheral blood, cerebrospinal fluid, biochemical indicators, blood glucose level was conducted. Doppler ultrasound of the vessels of the head and neck, transcranial Doppler ultrasound were performed.

In 2019–2020, we examined and treated 232 patients with supratentorial intracerebral hemorrhages caused by hypertension.

Patients with organic lesions of the brain (neoplasms), aneurysms, arteriovenous malformations, cavernous angiomas and severe comorbid conditions were excluded. At the time of hospitalization, most patients were males (64%). The average age was 60 years: for men, it was 56 years, for women 69 years.

A stroke was diagnosed according to the WHO criteria on the basis of a detailed clinical and instrumental examination.

ICH with a volume of less than 30 cm³ were considered small-sized, 30–60 cm³ — medium-sized, above 60 cm³ — large-sized.

All the examined patients suffered from hypertension, its duration was less than 5 years in 5% of cases, from 5 to 10 years — in 37.7%, more than 10 years — in 25.6%. Of these, less than 30% of patients took antihypertensive drugs. In 25.5% of cases, hypertension was diagnosed for the first time during current hospitalization.

Patients were observed during treatment in the hospital for up to 21 days after the onset of ICH. On the 21st day, the degree of disability was assessed according to the NIHSS and independence in everyday life according to the Barthel index.

Conservative therapy was carried out in accordance with modern, domestic and international guidelines for the management of patients with spontaneous ICH (Order of the Ministry of Health of Ukraine No. 275 dated April 17, 2014).

Statistical data analysis was performed using SPSS 21.0 and stata programs.

Results and discussion
According to the clinical picture and neuroimaging data, we registered the following types of supratentorial ICH against the background of hypertension: putaminal in the
area of the subcortical nuclei lateral to the internal capsule in 127 (57 %) patients; thalamic (in the area of the thalamus, sometimes with spread to the midbrain with breakthrough into the ventricular system) in 24 (10 %); subcortical (in the white matter of the cerebral hemispheres) in 34 (15 %); mixed ICH in 47 (20 %) of cases. It should be noted that in case of large hemorrhages, it is sometimes impossible to determine the extent of the hematoma.

Seventy-seven (33 %) patients were hospitalized in a coma (GCS ≤ 8 points): 3–4 points in 29 people, 5–6 in 32, 7–8 in 18. Thirty-six (16 %) patients were admitted with sopor, 81 (35 %) were stunned (13–14 points), and 31 (13 %) were conscious. In 7 cases (3 %), it was impossible to determine the level of consciousness due to convulsions. Mortality in the coma group was about 85 % (65 people), regardless of the choice of treatment method.

We analyzed the features of the clinical picture in patients with supratentorial ICH on the first day of the disease.

Cerebral and meningeal symptoms were observed in case of cerebral edema with dislocation syndrome. Analysis of focal neurological symptoms showed that central paralysis and paresis, hemianesthesia, aphasia in damage to the left hemisphere, and dysarthria were most often observed in patients with deep-seated ICH. We detected movement disorders such as central paralysis and paresis in patients with isolated thalamic ICH. Sensitive disorders (hemianesthesia of all types of sensitivity according to the conductive type) were observed in all people under our supervision.

Hyperkinesis and other specific symptoms were registered in some patients with lateral localization of the ICH, which indicated damage to the basal nuclei.

For ICH in the carotid basin, an acute onset was characteristic, the occurrence of general brain and meningeal symptoms.

As we have already said, the ICH in our patients had different volumes (sizes). We found that among the small-sized ICH, there were those of deep localization (in the thalamus), and the large-sized ones could spread to 2 or more parts of the brain.

It should be noted that large-sized hematomas were observed in men, medium and small — in women. They also had an age difference. Patients over 60 years of age had ICH of deep localization, and young patients had cortical ones. According to indications, we operated 84 patients, who underwent 94 surgical interventions. Among them, there were individuals with lobar and lateral hematomas, as well as with significant hemorrhages with blood breakthrough into the ventricular system (liquid drainage surgery). Total mortality was 39.5 %, surgical mortality was 46.4 %.

Surgeries were performed to eliminate compression-dislocation syndrome and hydrocephalus, reduce intracranial pressure and neurological deficits. In the presence of occlusive hydrocephalus, a patient underwent ventricular drainage or CSF bypass.

Contraindications for surgical interventions were as follows: the presence of a severe coma (< 7 points on the GCS), unstable hemodynamics, the need for artificial administration of vasopressors, as well as severe comorbid conditions.

In accordance with the task, we analyzed the dynamics of the recovery of neurological functions.

The average indicators of neurological deficit according to the NIHSS on the 21st day of the disease in men were 9.89 ± 3.90 points, in women 9.71 ± 3.88 points. Thus, we did not find a statistically significant difference between neurological deficit recovery in women and men. Although, according to the Barthel index, only 4 % of men and 5 % of women achieved complete independence in everyday life. Among the patients examined by us, 97 (42 %) died on the 21st day of illness, 63 (65 %) men and 34 (35 %) women.

Functional independence according to the Barthel index do not differ in patients of the same age groups (p < 0.05).

We analyzed the dynamics of blood pressure in patients with favorable and unfavorable functional outcome of the ICH.

On the 21st day of the disease, the systolic, diastolic, and average blood pressure fluctuated against the background of antihypertensive therapy, but at the end of the observation, a trend toward higher blood pressure was revealed.

Also, on the 21st day of the disease among patients with different localization of hematomas, 123 (53 %) had ICH of deep localization and 43 (19 %) patients had cortical one. A favorable functional outcome according to the Rankin scale was found almost equally often in cases of deep and cortical localization.

In patients with a small ICH, the indicators of neurological deficit according to the NIHSS differed significantly already on the 7th day of the disease. No significant differences on the NIHSS were registered in patients with medium-sized ICH.

To predict recovery from the disease, we evaluated clinical and paraclinical indicators, which may have prognostic value for determining the risk of a fatal outcome in the acute period of supratentorial ICH.

For this, we used the receiver operator characteristic analysis with the calculation of sensitivity and specificity for certain indicators (GCS score, NIHSS score, leukocytes, blood glucose, ICH volume). Prognostic value of age for the survival of patients in the acute period of ICH turned out to be insignificant. Likewise, no significant effect of gender on patient survival was found.

The highest mortality was registered in young and older patients (48.6 and 46.9 %, respectively). A total of 92 people died.

To date, there is no strategy for the treatment of patients with hypertensive hemorrhages. The choice of treatment method mostly depends on the experience of a neurologist and the skills of a neurosurgeon and is not based on standardized medical protocols. We operated 84 patients. Surgical activity was 37 %, 94 interventions were performed. Overall mortality was 42 %, postoperative mortality was 43 %. Patients with compression-dislocation syndrome and hydrocephalus were operated on.

We attributed to the factors that cause unfavorable results: coma, the volume of intracerebral hemorrhage > 50 cm³, massive ICH, dislocation of midline structures (> 10 mm), postoperative recurrence of hemorrhage.
Conclusions

1. It was found that the clinical picture of acute supratentorial intracerebral hemorrhages against the background of hypertension is characterized by polymorphic neurological symptoms, and hematomas (deep, cortical), their volume, cerebral edema and intracranial hypertension. Also, among the clinical manifestations of intracerebral hemorrhages of medial localization (including in the thalamus), in most cases there are movement disorders in the form of paresis and paralysis, and hyperkinesis is not characteristic of lateral localization.

2. Treatment outcomes in hypertensive patients with intracerebral hemorrhages indicate the need for early hospitalization and early CT scan, a differentiated approach to surgical removal of hematomas (lobar, lateral with dislocation syndrome), intensive care for patients in a coma even with massive hematomas.

3. In patients with supratentorial hemorrhages against the background of hypertension, treatment outcomes depend on the localization of the hemorrhage and the severity of the patient’s condition, the term of hospitalization in specialized stroke departments, the terms of neuroimaging, the dynamics of cerebral hemorrhage disorders.

4. It was found that a favorable functional outcome according to the modified Rankin scale and the Barthel index in the acute period of supratentorial intracerebral hemorrhage on the background of hypertension is more characteristic for patients with initial mild and medium neurological symptoms in the case of ICH volume < 30 cm³.

5. The presence of blood breakthrough into the ventricular system increases the risk of death in patients with supratentorial ICH by 35 times. In addition, the lethal consequences occur more often in patients with depression of consciousness (less than 8 points on the GCS), severe neurological deficit; with a displacement of the middle structures by more than 6 mm, an ICH volume of more than 50 cm³.

References


ня в стаціонарі до 21-го дня. На 21-шу добу встановлювали ступінь втрати працездатності. Усім пацієнтам проводили неврологічне обстеження з оцінкою свідомості за шкалою коми Глазго, шкалою внутрішньомозкових крововиливів, індексом Бартел, модифікованою шкалою Ренкіна, шкалою інсультів Національних інститутів охорони здоров’я. Застосовували такі методи нейрорадіології, як комп’ютерна томографія, магнітно-резонансна ангіографія при необхідності. Проведено клініко-лабораторні дослідження.

Результати. Путамінальний супратенторіальний крововилив діагностовано в 127 (57 %) хворих, таламічний — у 24 (10 %), підкірковий (у білій речовині півкуля великого мозку) — у 34 (15 %), змішаний — у 47 (20 %). Сімдесят сім (33 %) пацієнтів госпіталізовано в коматозному стані (оцінка за шкалою коми Глазго ≤ 8 балів), 36 (16 %) в стані одурманювання, 81 (35 %) в оглушеному стані, 31 (13 %) пацієнт перебував у свідомості. В осіб віком понад 60 років виявлялися ВМК глибокої локалізації, у молодих — кортикальні. Виконано 94 оперативних втручання у 84 хворих із лобарними та бічними гематомами, а також з проривом у шлуночкову систему (операція рідинного дреїкування). Загальна летальність становила 39,5 %, хірургічна — 46,4 %. Протипоказаннями до оперативних втручань були тяжкий коматозний стан, нестабільна гемодинаміка, необхідність постійного введення вазопресорів, а також тяжкі супутні захворювання. Висновки. Встановлено, що клінічна картина гострих супратенторіальних внутрішньомозкових крововиливів на фоні артеріальної гіпертензії характеризується поліморфною неврологічною симптоматикою за локалізацією гематом, їх обсягом, набряком мозку, внутрішньочерепною гіпертензією. Результати лікування хворих на гіпертензивний ВМК свідчать про необхідність ранньої госпіталізації, ранньої комп’ютерної томографії та диференційованого підходу до хірургічного видалення гематоми. Сприятливий результат супратенторіального ВМК більш характерний для пацієнтів із початковим легким та помірним неврологічним дефіцитом при крововиливі об’ємом менше 30 см³. Наявність прориву крові в шлуночкову систему підвищує ризик смерті в 35 разів.

Ключові слова: гостре порушення мозкового кровообігу; гіпертензивна внутрішньомозкова гематома; гіпертензія.