Original Article

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Evaluation of the Results of Differentiated Treatment of Traumatic Intracranial Hematomas in the Early Period of Traumatic Brain Injury

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Abstract

The purpose of this study was to study the results of the treatment of traumatic intracranial hematomas after the application of algorithms for complex diagnostics and differentiated tactics for the treatment of various types of traumatic hematomas. From 2014 to 2019, 635 patients with traumatic intracranial hematomas were examined and treated at the Republican Specialized Scientific and Practical Medical Center of Neurosurgery. In a hospital, questions of indications for surgical or conservative treatment required a unique approach based on the principles of urgency, complexity, and interconnection at all stages of treatment. The outcomes of treatment of traumatic intracranial hematomas, both surgical and conservative treatment, differ significantly not only in different periods and phases of the course of traumatic brain injury but also in the age, type of hematoma, its localization and prevalence. Application of algorithms of complex diagnostics and differentiated treatment.

Keywords: Traumatic intracranial hematomas, treatment, outcomes.

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Introduction

Traumatic brain injury (TBI) is a complex problem of modern medicine and one of the most significant in the health care and social sphere.[1,2,3] Due to the scale of its distribution among children, young and middle-aged people, high mortality and disability of patients (world averages are 2-4 per 1000 population per year), the severity of complications and consequences with permanent or temporary disability, materially costly for the family, society and the state.[4,5]

Among the causes of death due to all types of injuries, severe TBI accounts for 50% of all cases. According to modern data, more than 10 million people get traumatic brain injury during the year.[6,7,8,9,10,11]

According to our data and data from foreign neurosurgical clinics, the overall mortality rate of traumatic intracranial hematomas (TICH) is about 4.0%, and postoperative mortality is up to 20% of cases.[3,9] Mortality from TBI in neurosurgical clinics and hospitals is about 6-7%, and postoperative mortality after severe TBI is 28-32%.[6,8]

Treatment of patients with traumatic intracranial hematomas, and prevention of its consequences and complications are within the competence of the healthcare system and, above all, neurosurgeons, neuro-traumatologists, resuscitators, neurologists, psychiatrists and rehabilitation specialists.[7,12]

Their qualified training in the treatment of traumatic brain injury in the acute and long-term periods is quite a complex and not fully resolved problem.[4]

This research aimed to study the outcomes of treating traumatic intracranial hematomas using complex diagnostic algorithms and differentiated tactics for treating different types of traumatic hematomas.

Subjects and Methods

An analysis was made of examination and treatment data of 635 patients with traumatic intracranial hematomas (acute and subacute epi- and subdural, intracerebral, multiple and chronic hematomas) who were treated at the Republican Specialized Scientific and Practical Medical Center for Neurosurgery from 2014-2019.

The patients were divided into groups II: group I - 245 (38.6%) underwent surgical treatment, and group II - 390 (61.4%) underwent conservative treatment.

Closed traumatic brain injury was in 397 (62.5%) patients, and open in 77 (12.1%) patients. According to the clinical phases of the course of traumatic brain injury, 346 (54.5%) patients were admitted to the hospital in the stage of clinical subcompensation, 115 (18.1%) in the stage of moderate clinical decompensation and 174 (27.4%) in the stage of gross clinical decompensation.

The age of the victims ranged from 1 month to 92 years. The mean age of the patients was 31.5 years. Men 501 (78.9%), women - 134 (21.1%), children 258 (40.6%) and elderly and senile patients - 88 (13.0%).

A significant part was patients aged 18 to 60 years - 304 (47.9%). The most numerous were the group of patients aged 30 to 44 years (17.9%), among children aged 1 month to 18 years this figure was 9.9%, among patients of elderly and senile age - 11.0%. According to our data, the majority (2/3) of patients with HTCH were men of working age.

All patients underwent clinical and neurological examination

at admission and in dynamics while assessing the level of depression of consciousness, the severity of the cerebral, focal, dislocation, stem symptoms and meningeal symptoms.

Results & Discussion

Acute epidural hematomas were observed in 174 patients (27.4%), and the vast majority were found in patients of childhood and adolescence - 101 (58.0%). The mean age of 106 (60.9%) operated patients for acute epidural hematoma was 22.1 years. Conservative therapy was performed in 68 (39.1%) patients.

In 96 (15.1%) patients with subacute epidural hematomas, the mean age was 17.4 years. The main part of them were children and adolescents under 18 years of age, which amounted to 63 patients (65.6%). Of the total number of patients with subacute epidural hematoma, more than half of the patients 54 (56.2%) were operated on, the rest were treated conservatively.

According to our data, acute subdural hematomas were observed in 87 patients (13.7%) and were more common in elderly and senile patients - 19 (21.8%). The mean age of 40 (46.0%) operated patients for acute subdural hematoma was 42.7 years. Conservative therapy was performed in 47 (54.0%) patients.

According to the conducted studies, in 43 (6.8%) patients with subacute subdural hematomas, the average age was 36.9 years. The main part consisted of patients older than 30 years, which amounted to 26 patients (60.5%). Of the total number of patients with subacute subdural hematoma, 23 (53.5%) were operated on, the rest were treated conservatively.

The total number of patients with traumatic intracerebral hematomas was 58 (9.1%), and their mean age was 40.6 years. At the same time, there were 39 (67.2%) acute hematomas, and 19 (32.8%) subacute hematomas. 33 (56.9%) were treated conservatively, and 25 (43.1%) underwent surgical treatment.

In the study of multiple traumatic intracranial hematomas, 111 (17.5%) patients were identified, while their average age was 40.0 years, and in the vast majority, they were observed among adults compared with children - 88 (79.3%). Of the total number of patients with multiple hematomas, 80 (72.1%) patients underwent surgery, and 31 (27.9%) underwent conservative tactics.

With chronic traumatic intracranial hematomas, 65 (10.2%) patients were identified, with an average age of 43.1 years and the vast majority at the age of 60-74 years. Of the total number of patients with multiple hematomas, 62 (95.4%) patients out of 65 underwent surgery.

The largest number of HTCH were patients with acute epidural hematomas - 174 (27.4%), the following types of hematomas were also recorded: multiple - in 111 (17.45%), subacute epidural - in 96 (15.1%), chronic - in 66 (10.4%), intracerebral - in 58 (9.1%), subacute subdural - in 43 (6.8%) patients.

According to the neurological examination, motor disorders (mono- or hemiparesis, paralysis) were distinguished from focal hemispheric neurological symptoms in 22.7%, sensory disorders (with a moderate head injury) in 15.4%, aphasic disorders, epileptic seizures in 9.6%, meningeal symptoms in 47.9%, as well as psychomotor agitation in 20%, visual disturbances in 57.6%, pathological reflexes in 30%, cerebral symptoms in 86%, etc. Violation of sensitivity, visual disturbances, as well as some cerebral symptoms to identify in some patients with a severe and terminal conditions, was not possible, due to the deep depression of the level of consciousness and the lack of contact.

Conservative treatment was carried out in the absence of gross focal symptoms, small hematomas that did not cause compression of the brain.

Surgical treatment was provided to patients: with acute and subacute epidurals - 107 (27.4%) and 54 (13.8%), respectively, acute and subacute subdural - 39 (10.0%) and 23 (5.9%), and also with intracerebral 25 (6.4%), multiple - 80 (20.5%) and chronic - 62 (15.9%) hematomas.

Questions of indications for surgical or conservative treatment in a hospital required a special approach and were based on the principle of urgency, complexity and interconnection at all stages of treatment.

Differentiated surgical treatment of patients with traumatic intracranial hematomas was carried out by choosing osteoplastic and decompressive craniotomy, as well as by performing minimally invasive operations.

The criteria for choosing conservative treatment of patients with traumatic intracranial hematomas were the severity of the patient's condition, the level of consciousness upon admission, and the volume, type, localization and prevalence of the hematoma.

Round-the-clock monitoring of the clinical and neurological picture of the patient by a neurosurgeon and MSCT / MRI, ultrasound and neurophysiological control were one of the mandatory conditions for conservative treatment. In addition, therapy was carried out using the methods of neurophysiological monitoring, cerebral, focal and stem symptoms, cardiovascular and respiratory activity, body temperature, and homeostasis. Conservative therapy also included the prevention of convulsive syndrome, psychomotor agitation and hyperthermia.

We analyzed the studied patients depending on the level of consciousness (according to the GCS) and its depression, as a result of which it was found:

In 174 (27.4%) patients with acute epidural hematoma, surgery was performed in 107 (61.5%) patients, and conservative therapy was performed in 67 (38.5%) patients. With a GCS level of consciousness of 14-15 points, the number of patients with conservative treatment was almost one-third (32.8%), and with surgical treatment – one-quarter (25.9%). Thirty-three (9.2-9.8%) patients underwent surgical treatment with a GCS level of consciousness of 11-13 points, and 29 (1.7-6.9%) patients had less than 11 GCS points.

In 96 (15.1%) patients with subacute epidural hematoma, patients with conservative and surgical treatment with a GCS level of consciousness of 14-15 points were divided equally, amounting to 39 (40.6%) patients. It was noted that with a GCS level of consciousness of 11-13 points, patients underwent surgery in 15 (7.3-8.3%) cases. It should be noted that among patients with subacute epidural hematoma, there

were no patients with a GCS level of consciousness below 9 points.

Among 87 (13.7%) patients with acute subdural hematoma without impairment of consciousness according to GCS score 14-15, 31 (35.6%) patients received conservative treatment, and only 2 (2.3%) received surgical treatment. 10 (5.7%) patients with GCS level of consciousness 11-13 underwent surgical treatment, and 12 (6.9%) – were conservative. Patients with a GCS level of consciousness of 5-10 points underwent surgical treatment in 27 (7-13.8%).

Among 43 (6.8%) patients with subacute subdural hematoma without impairment of consciousness according to GCS 14-15 points, conservative therapy was mainly carried out, which amounted to 19 (44.2%), and surgical - 11 (25.6%). With a level of consciousness on GCS less than 13 points, surgical treatment was mainly performed - 12 (2.3-9.3%).

Among 58 (9.1%) patients with intracerebral hematomas and depression of consciousness of 14-15 GCS points, 18 (31.0%) patients underwent conservative treatment, and 9 (15.5%) surgically, with a level of consciousness of 11-13 points 6 (10.3%) received surgical treatment, and 3 (5.2%) received conservative treatment. With a GCS level of consciousness of fewer than 11 points, surgical treatment was mainly performed, amounting to 6 (1.7-5.2%) patients.

Among 111 (17.5%) patients with multiple hematomas, 80 (72.1%) were operated on, while the number of patients with a consciousness level of 14-15 points according to the GCS was 20 (18.0%) and the same number were treated conservatively. In all other cases, with varying degrees of depression of consciousness, the number of patients with surgical treatment significantly prevailed over the number of patients treated conservatively.

In 66 (10.4%) patients with chronic hematomas, the vast majority - 62 (93.9%) were operated on, while the largest part was patients with a level of depression of consciousness of 14-15 points on the GCS - 52 (78.8%).

In our study, various methods of surgical treatment of traumatic intracranial hematomas were used, a total of 390 patients were operated on and 406 surgical interventions were performed, including decompressive craniotomy - 218 (53.7%) cases, osteoplastic craniotomy - 85 (20, 9%) and minimally invasive surgeries 103 (25.4%). Due to the severity of the injury and depending on the location, prevalence, and recurrence of traumatic intracranial hematomas, 15 patients underwent surgery on both sides or repeatedly.

Among 218 operations performed by decompressive craniotomy, the overwhelming majority were cases with subacute subdural, multiple, intracerebral and acute epidural hematomas - more than 65.7%, and the remaining cases were other traumatic intracranial hematomas - 38.9-45.8%.

Among 85 cases of osteoplastic craniotomy, the largest number of operated patients - 20.3-35.2% - were subacute epidural, intracerebral, acute epidural, chronic hematomas, and 10-3-14.1% were acute subdural and multiple hematomas.

Among 103 cases of minimally invasive surgery (removal of hematomas in the enlarged burr hole), the vast majority, 79.7%, were chronic hematomas, and 25.9-33.3% were subacute epi- and subdural hematomas.

It should be noted that we used, along with various types of surgical treatment, removal under microscopic assistance in 38 cases of traumatic intracerebral hematomas.

Treatment outcomes were assessed using the Glasgow Outcome Scale, and it was found that good recovery was registered in 426 (67.1%) patients, moderate disability in 80 (12.6%) patients, and severe disability in 50 patients (7.9% patients).), vegetative state - in 2 (0.3%), 77 (12.1%) died.

In the group of surgical treatment of patients (390 patients, 61.4%) with traumatic intracranial hematomas, good recovery was recorded in 221 (56.7%) patients, moderate disability - in 65 (16.7%), severe disability - in 34 (8.7%), vegetative state - in 1 (0.3%), died - 69 (17.7%).

In the group of conservative treatment (245 patients, 38.6%) patients with traumatic intracranial hematomas, good recovery was registered in 205 (83.7%), moderate disability - in 15 (6.1%), severe disability - in 16 (6 .5%), vegetative state - in 1 (0.4%), died - 8 (3.3%).

The total number of patients with an unfavorable outcome was 79 (12.4%).

During the entire period of application of the scale for predicting outcomes and algorithms for diagnosing and treating patients with traumatic intracranial hematomas, it led to a decrease in mortality rates, a decrease in disability and an improvement in the recovery of patients.

Thus, the mortality rate of the studied patients, both in the group with surgical and conservative treatment, in general, had a downward difference, while the average mortality rates in patients with conservative treatment were single - 1.3%. And in the group of patients with surgical treatment, the mortality rates changed in waves from year to year, while its highest value was in 2017 - 32.3%, and by 2019 it had halved - to 16.2%.

Of those treated conservatively (245 patients, 38.6%), the number of patients with good recovery generally increased from 6.5% to 13.5%, as did moderate disability from 0.4% to 2.0%. Gross disability and death also tended to decrease from 2.0% to 0.4% and from 1.2% to 0.4%. The total number of patients with a vegetative state was insignificant and single and amounted to -0.4%.

Of those treated surgically (390 patients, 61.4%), the number of patients with good recovery generally increased from 5.15% to 13.6%, as did moderate disability from 1.3% to 4.9%. The percentage of patients with a severe disabilities had an undulating course, reaching a peak value of 2.6 in 2016, and then decreasing to 0.8%. Mortality rates were similar, 5.4%, and then dropped to 2.8%. The total number of patients with a vegetative state was insignificant and single -0.3%.

Thus, the proportion of favorable outcomes in patients with traumatic intracranial hematomas in our study increased by an average of 2-5%.

The outcome of treatment largely depends on the period of TBI and the timing of the surgical intervention, as well as the severity of compression, concomitant bruising, crushing of the brain in traumatic intracranial hematomas.

Of the total number of 160 operated on with epidural

hematoma, good recovery in the acute period of TBI was observed in 225 (57.7%) patients operated on in the subacute period of TBI - 103 (26.4%), in patients with chronic hematomas over time.

Among 160 (41.0%) operated patients with epidural hematoma, good recovery was recorded in 119 (74.4%), of which in the acute period - in 74 (69.8%) and in the subacute - in 45 (83.3%), moderate disability was noted in 10 (9.4%) and 8 (14.8%), severe disability - in 9 (8.5%) and 1 (1.9%), respectively. Mortality was noted only in the acute period in 13 (12.3%) patients, no vegetative state was recorded.

Among 63 (16.1%) operated patients with subdural hematoma, good recovery was recorded in 24 (38.1%), of which in the acute period - in 12 (30.0%) and in the subacute - in 12 (52.2%), moderate disability was noted in 6 (15.0%) and 5 (21.7%), severe disability - in 5 (12.5%) and 2 (8.7%), respectively. Vegetative state - in 1 (2.5%) in the acute period. Mortality was observed in the acute period in 16 (40.0%) patients and in the subacute period in 4 (17.4%) patients.

Among 25 (6.4%) operated patients with intracerebral hematomas, good recovery was recorded in 13 (52.0%), of which in the acute period - in 6 (35.3%) and in the subacute - in 7 (87.5%), moderate disability was noted - in 7 (41.2%) only in the acute period, severe disability - in 1 (5.95%) also in the acute period. Mortality was noted in the acute period in 3 (17.6%) and in the subacute period in 1 (12.5%) patients, and no vegetative outcome was recorded.

Among 80 (20.5%) operated patients with multiple hematomas, good recovery was recorded in 27 (33.8%), of which in the acute period - in 17 (27.0%) and in the subacute - in 10 (58.8%), moderate disability was noted in 6 (9.5%) in the acute period and in 5 (29.4%) in the subacute period, severe disability in 9 (14.3%) in the acute period and in 1 (5.9%) %) - in the subacute. Mortality was noted in the acute period in 31 (49.2%) and in the subacute period in 1 (5.9%) patients, and no vegetative outcome was recorded.

Among 62 (15.9%) operated patients with chronic hematomas, good recovery was recorded in 38 (61.3%) patients, moderate disability was noted in 18 (29.0%) and severe disability in 6 (9.7%) patients. Vegetative state and lethality were not observed.

The highest percentage of favorable outcome (good recovery and moderate disability) was recorded among patients with traumatic intracranial hematomas admitted in the subacute period, amounting to 90.1% in general, and in the acute period the proportion of good outcomes was 61.0%.

Mortality in the acute period of TBI was 27.9%, which is explained by the severity of TBI in decompensated patients, the presence of a large volume of intracranial hematomas, including multiple ones, and concomitant severe somatic pathology in the group of elderly and senile patients. Mortality in the subacute period was significantly less - 5.9%.

In the group of patients with chronic hematomas, a favorable outcome was noted in 90.3% of cases, severe disability in 9.7%, and no mortality was recorded. This was due to the stable condition of patients in the stage of compensation and subcompensation.

Lethal outcomes were most often recorded in the group of patients with multiple hematomas, when 32.4% of 111 patients died, while the overall mortality among all the patients studied by us (635) was 12.1%, and good recovery was in 67.1%.

Thus, the mortality rate of the studied patients, both in the group with surgical and conservative treatment, in general, had a downward difference, while the average mortality rates in patients with conservative treatment were single - 1.3%. And in the group of patients with surgical treatment, the mortality rates changed in waves from year to year, while its highest value was in 2017 - 32.3%, and by 2019 it had halved - to 16.2%.

The analysis showed that the age of patients with traumatic intracranial hematomas had a significant impact on the outcome of surgical treatment. The worst results of treatment were in patients of elderly and senile age, while the highest mortality rate - up to 24.3% was registered in patients aged 60 years and older, which is explained by the presence of concomitant somatic pathologies and complications and the formation, as a rule, of larger hematomas. volume.

Among patients with good recovery after treatment, the best rates were at the age of 1-7 years, amounting to 87.3-93.1%, with moderate disability - the highest rates were at the age of 15-18 years (21.4%), and with severe disability - in the elderly and senile age - up to 22.2%.

Conclusion

The outcomes of the treatment of traumatic intracranial hematomas, both surgical and conservative treatment, differ significantly not only in different periods of the phases of the course of traumatic brain injury but also in age, type of hematoma, its localization and prevalence. The use of algorithms for complex diagnostics and differentiated treatment made it possible to improve not only the outcomes of treatment of patients with traumatic intracranial hematomas but also to reduce postoperative mortality.

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