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SURGICAL MANAGEMENT AND OUTCOMES OF MULTIPLE TRAUMATIC INTRACRANIAL HEMATOMAS IN SEVERE TRAUMATIC BRAIN INJURY

Saidov Komron Jumanazarovich
The specialized scientific and practical center for neurosurgery and neurorehabilitation at SamSMU

Abstract.

Background. Multiple traumatic intracranial hematomas represent one of the most severe complications of traumatic brain injury and are associated with high mortality rates. Despite advances in neuroimaging and neurosurgical techniques, optimal surgical strategies for this pathology remain controversial.

Objective. To analyze the outcomes of intensive care and surgical treatment in patients with severe traumatic brain injury caused by multiple traumatic intracranial hematomas.

Materials and Methods. A retrospective analysis of 103 patients with multiple traumatic intracranial hematomas was performed. Clinical status, hematoma localization and combinations, surgical approaches (resection craniotomy, osteoplastic craniotomy, and enlarged burr holes), and treatment outcomes were evaluated.

Results. The most common combinations were subdural–subdural and subdural–epidural hematomas. Resection craniotomy was the predominant surgical approach, particularly in patients admitted in severe or extremely severe condition. Postoperative mortality reached 62.1% and was strongly associated with the depth of impaired consciousness and the severity of primary brain injury.

Conclusion. Early and adequate surgical intervention remains the cornerstone of management for multiple traumatic intracranial hematomas. Surgical strategy should be individualized based on patient condition, hematoma characteristics, and the degree of brainstem involvement.

Key words: traumatic brain injury; multiple intracranial hematomas; bilateral hematomas; neurosurgical treatment; mortality.

ХИРУРГИЧЕСКАЯ ТАКТИКА И ИСХОДЫ ЛЕЧЕНИЯ МНОЖЕСТВЕННЫХ ТРАВМАТИЧЕСКИХ ВНУТРИЧЕРЕПНЫХ ГЕМАТОМ ПРИ ТЯЖЁЛОЙ ЧЕРЕПНО-МОЗГОВОЙ ТРАВМЕ

Саидов Комрон Жуманазарович
Специализированный научно-практический центр нейрохирургии и нейрореабилитации при СамГМУ

Аннотация.

Актуальность. Множественные травматические внутричерепные гематомы являются одной из наиболее тяжёлых форм осложнений черепно-мозговой травмы и сопровождаются высокой летальностью. Несмотря на развитие нейровизуализации и нейрохирургических технологий, вопросы оптимальной хирургической тактики при данной патологии остаются дискутабельными.

Цель. Проанализировать результаты интенсивной терапии и хирургического лечения пациентов с тяжёлой черепно-мозговой травмой, обусловленной множественными травматическими внутричерепными гематомами.

Материалы и методы. Проведён ретроспективный анализ 103 пациентов с множественными травматическими внутричерепными гематомами. Оценивались

клинические проявления, локализация и сочетание гематом, методы хирургического лечения (резекционная и остеопластическая краниотомия, расширенные фрезевые отверстия) и исходы лечения.

Результаты. Наиболее часто встречались сочетания субдуральных и эпидуральных гематом. В большинстве случаев применялась резекционная краниотомия, особенно у пациентов в тяжёлом и крайне тяжёлом состоянии. Послеоперационная летальность составила 62,1% и напрямую коррелировала с глубиной нарушения сознания и тяжестью первичного повреждения мозга.

Заключение. Своевременное и адекватное хирургическое вмешательство является ключевым фактором выживаемости пациентов с множественными травматическими внутричерепными гематомами, при этом выбор метода операции должен быть строго индивидуализирован.

Ключевые слова: черепно-мозговая травма; множественные внутричерепные гематомы; двусторонние гематомы; нейрохирургическое лечение; летальность.

OG‘IR BOSH MIYA JAROHATLARIDA KO‘P SONLI TRAVMATIK INTRAKRANIAL GEMATOMALARNI JARROHLIK YO‘LI BILAN DAVOLASH VA NATIJALARI

Saidov Komron Jumanazarovich
SamDTU huzuridagi neyroxirurgiya va neyroreabilitatsiya ixtisoslashtirilgan ilmiy-amaliy markazi

Annotatsiya.

Dolzarblik. Ko‘p sonli travmatik intrakranial gematomalar bosh miya jarohatlarining eng og‘ir asoratlaridan biri bo‘lib, yuqori o‘lim ko‘rsatkichlari bilan kechadi. Zamonaviy neyroxirurgik texnologiyalarga qaramay, jarrohlik taktikasi masalalari hanuz dolzarb bo‘lib qolmoqda.

Maqsad. Og‘ir bosh miya jarohati natijasida yuzaga kelgan ko‘p sonli travmatik intrakranial gematomalarda intensiv terapiya va jarrohlik davolash natijalarini tahlil qilish.

Materiallar va usullar. 103 nafar bemorda klinik holat, gematomalarning joylashuvi va kombinatsiyasi, jarrohlik usullari hamda davolash natijalari retrospektiv tahlil qilindi.

Natijalar. Eng ko‘p subdural va epidural gematomalar kombinatsiyasi uchradi. Og‘ir ahvoldagi bemorlarda ko‘pincha rezeksion kraniotomiya qo‘llanildi. O‘lim ko‘rsatkichi 62,1% ni tashkil etdi va u ong buzilishining chuqurligi bilan bevosita bog‘liq edi.

Xulosa. Ko‘p sonli travmatik intrakranial gematomalarda erta va to‘g‘ri tanlangan jarrohlik muolajasi davolashning asosiy omili bo‘lib, yondashuv individual tarzda belgilanishi lozim.

Kalit so’zlar: bosh miya jarohati; ko‘p sonli intrakranial gematomalar; ikki tomonlama gematomalar; neyroxirurgik davolash; o‘lim ko‘rsatkichi

Introduction. The increasing incidence of traumatic brain injury (TBI) leading to damage to the brain, the primary coordinator of all physiological functions, makes neurotrauma one of the key scientific and practical challenges in neurosurgery. Modern neurotrauma is characterized by an increasing incidence of multiple traumatic intracranial injuries, among which bilateral hematomas occupy a special place. The diagnosis and treatment of traumatic brain injury (TBI), a pressing issue in traumatology and neurosurgery, has become even more important in recent years [1-15]. According to the World Health Organization (WHO), mortality from TBI in individuals of prime working age (under 45 years) ranks first in the overall mortality structure [4-7]. According to the same WHO statistics, TBI tends to increase by an average of 2% per year [7-15]. Due to the increasing severity of road traffic injuries, the increasing incidence of bilateral subdural hematomas is increasingly being addressed in clinical practice. Despite numerous reports, the methods and techniques of surgical interventions for multiple hematomas have not been summarized in the literature; there is virtually no data on the specifics of surgical treatment of this pathology.

The aim of the workwas an analysis of the results of intensive therapy of patients with severe traumatic brain injury caused by multiple traumatic intracranial hematomas.

Material and methods of research: This study is based on an analysis of the clinical syndromes and neurosurgical treatment of 103 patients with multiple traumatic intracranial hematomas. We defined multiple traumatic intracranial hematomas as the simultaneous presence of two or more subdural, epidural, and intracerebral hematomas, located unilaterally or bilaterally. Based on location and relative position, we observed bilateral hematomas and bilateral "stage-by-stage" hematomas. Therefore, we believe it is appropriate to distinguish between bilateral "stage-by-stage" and bilateral hematomas in diagnosis and treatment. The group of "story-by-story" bilateral hematomas included epidural, subdural, and intracerebral hematomas located one above the other (23 observations) located in both cerebral hemispheres, and the group of bilateral hematomas included cases in which epidural, subdural, and intracerebral hematomas were located above both cerebral hemispheres (80 patients). The most common were subdural + subdural (40.8%) and subdural + epidural (22.3%), less common were intracerebral + intracerebral (9.7%), and even less common were other types of combinations of intracranial hematomas located on both sides of the brain. A comprehensive clinical examination of admitted patients, conducted in the hospital, included a thorough general and neurological examination, a neuro-ophthalmologist examination, as well as skull radiography, lumbar puncture, echoencephalography (EchoEG), electroencephalography (EEG), computed tomography (CT) and magnetic resonance imaging (MRI) of the brain, and diagnostic exploratory freseotomy (DEF). Analysis of Table 1 shows that DEFGs were most frequently observed in individuals under 40 years of age (57 cases), 29 cases in those aged 40 to 59 years, and 17 cases in those aged 60 and older.

Table 1 - Distribution of patients by age and gender

Gender	Under 19 years	20–39 years	40–59 years	60 years and older	Total
Men	6	48	23	15	92
Women	2	1	6	2	11
Total	**8**	**49**	**29**	**17**	**103**

Surgery was the final stage of diagnosis and the initial treatment for patients with intracranial hematomas. In the treatment of multiple traumatic intracranial hematomas, the timeliness and completeness of surgical intervention were paramount. Resection craniotomy (RC) and osteoplastic craniotomy (OPC) were used in the surgical treatment of patients with multiple traumatic intracranial hematomas. Only in extremely critical conditions was hematoma removal through an enlarged burr hole the method of choice. The need to expedite surgical intervention as much as possible in critically ill patients in the acute phase of TBI often forced us to resort to resection craniotomy and hematoma removal through an enlarged burr hole.

Research results. Our objective was to determine the influence of clinical status, injury location, skull fracture morphology, hematoma volume, and other factors on the frequency of use of a particular approach, as well as to identify the characteristics of the postoperative course of the process depending on the treatment strategy employed. To remove multiple traumatic intracranial hematomas, we used three established neurosurgical approaches: osteoplastic craniotomy, resection craniotomy, and burr holes. In our study, the RCT method predominated, primarily due to patients admitted to the hospital in the acute phase of TBI, in severe and extremely severe conditions. RCT was most frequently performed in young and middle-aged patients. It was less frequently performed in patients over 60 years of age. RCT was performed more frequently in young patients than in older patients, while the enlarged burr hole method was more frequently used in older patients than in younger patients. As a rule, CBT was performed in patients without severe brainstem dysfunction, as well as in most cases where hematoma localization was established using CT or MRI. We used CBT as both the first and final stages of surgical intervention, as well as a subsequent stage preceded by partial hematoma removal through an enlarged burr hole. CBT is highly effective for bilateral hematomas, as epidural hematomas contain dense blood clots already in the first hours after injury, and their removal often leads to renewed bleeding. CBT was performed more frequently in younger patients with multiple traumatic intracranial hematomas. The use of CBT in young patients creates the anatomical and physiological prerequisites for early and complete restoration of impaired functions and relieves patients of "trepanned skull" syndrome. This method is absolutely indicated

for patients in moderate or satisfactory condition. The RTC method was used in severely ill patients with pronounced general cerebral and brainstem symptoms, comminuted fractures, and progressive cerebral edema and dislocation. RTC was performed in 98 patients (95.1%). In 12 cases with signs of incipient herniation, bilateral infratemporal decompression was performed, which allowed us to preserve not only the lives but also the mental health of the victims. The RTC method was used in 54 young and middle-aged patients and in 34 elderly and older patients. We confirmed that this method, while technically relatively simple, allows for revision of the epi- and subdural spaces, although in this regard it is inferior to the KPTCH method. Removal of multiple traumatic intracranial hematomas through an enlarged burr hole was used in 30 patients (29.1%): 10 young and middle-aged individuals and 20 elderly and senile individuals.After creating burr holes enlarged to 5 cm in diameter, epidural hematomas were removed by suction. A spatula and suction were used to flush out blood clots and aspirate the fluid portion of the hematoma. This method was primarily used in critically ill patients, when a more extensive surgical procedure was not possible. Two burr holes were created. In most cases, burr holes were created. In most cases, burr holes were used as the first stage of a more radical procedure. This method has several significant drawbacks: the inability to remove large, extensive basal hematomas, difficulty removing foci of brain contusion/crush injury, difficulty in locating the source of bleeding, and insufficient decompression. The advantages of this method include its high diagnostic value, rapid technical execution, and the fact that it is the most gentle on the patient.

Treatment outcomes. Of the 103 patients with multiple traumatic intracranial hematomas operated on by us, 39 (37.9%) were discharged from the hospital, and 64 died. The postoperative mortality rate was 62.1%. The main causes of mortality in multiple traumatic intracranial hematomas were brain injuries incompatible with life, severe brain contusion-crushing, incomplete or partial ablation of hematomas, and secondary brainstem hemorrhages. The degree of impaired consciousness determined the likelihood of a favorable or unfavorable outcome in multiple traumatic intracranial hematomas. The mortality rate increases with the degree of impaired consciousness (stupor-soporcoma), and, conversely, the rate of a favorable outcome (improvement) decreases with increasing degree of impaired consciousness. The overall mortality rate for multiple traumatic intracranial hematomas in individuals under 40 years of age is 54.7%, while in individuals aged 40-59 years it is 25.0%, and in patients over 60 years of age it is 20.3%. The best results, naturally, were obtained with wide trepanation and less favorable ones with the use of enlarged burr holes, when the severity of the victim's condition did not allow for a more extensive intervention.

Conclusion. Multiple traumatic intracranial hematomas remain one of the most challenging forms of traumatic brain injury due to their rapid progression, complex pathophysiology, and extremely high mortality rates. The results of this study demonstrate that patient outcome is primarily determined by the initial level of consciousness impairment, the severity of primary brain damage, and the timeliness and adequacy of surgical intervention. Resection craniotomy proved to be the most frequently employed and effective method in critically ill patients, while osteoplastic craniotomy provided better functional recovery in selected cases with stable neurological status. Minimally invasive techniques using enlarged burr holes may serve as a life-saving option in extremely severe conditions but are associated with less favorable outcomes. An individualized surgical approach based on clinical condition, neuroimaging data, and hematoma characteristics is essential to improve survival and neurological outcomes in patients with multiple traumatic intracranial hematomas.

References.

1. Bullock, M. R., Chesnut, R., Ghajar, J., Gordon, D., Hartl, R., Newell, D. W., … Wilberger, J. E. (2006). Surgical management of acute subdural hematomas. *Neurosurgery, 58*(3 Suppl), S16–S24. https://doi.org/10.1227/01.NEU.0000210364.29290.C9

2. Bullock, M. R., Povlishock, J. T. (2007). Guidelines for the management of severe traumatic brain injury. *Journal of Neurotrauma, 24*(Suppl 1), S1–S106. https://doi.org/10.1089/neu.2007.9999

3. Maas, A. I. R., Stocchetti, N., & Bullock, R. (2008). Moderate and severe traumatic brain injury in adults. *The Lancet Neurology, 7*(8), 728–741. https://doi.org/10.1016/S1474-4422(08)70164-9
4. Roozenbeek, B., Maas, A. I. R., & Menon, D. K. (2013). Changing patterns in the epidemiology of traumatic brain injury. *Nature Reviews Neurology, 9*(4), 231–236. https://doi.org/10.1038/nrneurol.2013.22
5. Wilson, M. H., Kolias, A. G., Hutchinson, P. J. (2014). Surgical management of traumatic intracranial hematomas. *Current Opinion in Critical Care, 20*(2), 169–176. https://doi.org/10.1097/MCC.0000000000000067
6. Servadei, F., Nasi, M. T., Giuliani, G., Cremonini, A. M., Cenni, P., & Zappi, D. (2000). Traumatic subdural hematomas: Prognostic factors. *Neurosurgery, 47*(2), 298–305. https://doi.org/10.1097/00006123-200008000-00010
7. Unterberg, A. W., Stover, J., Kress, B., & Kiening, K. L. (2004). Edema and brain trauma. *Neuroscience, 129*(4), 1021–1029. https://doi.org/10.1016/j.neuroscience.2004.06.046
8. World Health Organization. (2014). *Neurological disorders: Public health challenges*. WHO Press.
9. Teasdale, G., & Jennett, B. (1974). Assessment of coma and impaired consciousness: A practical scale. *The Lancet, 304*(7872), 81–84. https://doi.org/10.1016/S0140-6736(74)91639-0
10. Коновалов, А. Н., Лихтерман, Л. Б., & Потапов, А. А. (2001). *Черепно-мозговая травма: Клиническое руководство*. Москва: Антидор.
11. Лихтерман, Л. Б. (2012). *Нейротравматология*. Москва: ГЭОТАР-Медиа.
12. Крылов, В. В., & Талыпов, А. Э. (2015). Современные подходы к хирургическому лечению внутричерепных гематом. *Вопросы нейрохирургии им. Н. Н. Бурденко, 79*(4), 5–12.
13. Потапов, А. А., Захарова, Н. Е., & Корниенко, В. Н. (2010). Роль нейровизуализации в диагностике черепно-мозговой травмы. *Лучевая диагностика и терапия, 1*, 7–15.
14. Jennett, B., & Bond, M. (1975). Assessment of outcome after severe brain damage. *The Lancet, 305*(7905), 480–484. https://doi.org/10.1016/S0140-6736(75)92830-5
15. Stocchetti, N., & Zanier, E. R. (2016). Chronic impact of traumatic brain injury on outcome and quality of life. *Critical Care, 20*(1), 148. https://doi.org/10.1186/s13054-016-1318-1