

TRAUMATIC BRAIN INJURY: MODERN APPROACHES TO DIAGNOSIS AND TREATMENT

Khakimov M. N.

Andijan State Medical Institute

Abstract

Traumatic brain injury (TBI) is one of the most pressing issues in modern medicine due to its high incidence, severity of consequences, and significant socioeconomic losses. According to the World Health Organization, TBI causes death and disability in millions of people worldwide each year. Traumatic brain injuries account for up to 40% of all injuries, making them one of the leading causes of disability in young people.

Keywords: Traumatic brain injury, diagnosis, treatment.

Introduction

Classification and pathogenesis

According to clinical and pathogenetic principles, a distinction is made between closed and open traumatic brain injuries. Closed traumatic brain injuries include concussion, contusion, and compression of the brain, while open traumatic brain injuries are subdivided into non-penetrating and penetrating. Severity is classified as mild, moderate, and severe, as determined by the level of consciousness on the Glasgow Consciousness Scale.

The pathogenesis of TBI is characterized by a combination of primary and secondary damage. Primary damage occurs immediately at the moment of injury and includes destruction of brain tissue, vascular ruptures, and axonal damage. Secondary damage is caused by a cascade of metabolic and inflammatory reactions leading to ischemia, edema, and increased intracranial pressure.

Clinical presentation

The clinical manifestations of TBI depend on the severity, location, and nature of the injury. The most common symptoms include loss of consciousness of varying duration, amnesia, headache, nausea, vomiting, and dizziness. In severe injuries, focal neurological symptoms are observed: paresis, aphasia, respiratory and cardiac dysfunction. Concussion is typically characterized by reversible functional impairment, while contusion and compression injuries are accompanied by structural changes and a high risk of death.

Diagnosis

Diagnosis of traumatic brain injury is based on a comprehensive assessment of clinical data, neuroimaging, and laboratory methods. The initial stage is an examination of the victim, determining the level of consciousness using the Glasgow Coma Scale, and assessing respiratory and cardiovascular function.





Of the instrumental methods, computed tomography (CT) is the key—the “gold standard” for acute TBI, allowing for the detection of hematomas, skull fractures, and contusions. Magnetic resonance imaging (MRI) is used to clarify the nature of axonal and microfocal injuries. If subarachnoid hemorrhage is suspected, a lumbar puncture is performed. Laboratory tests include an assessment of electrolyte balance, acid-base status, and coagulation profile.

Treatment

The main goals of TBI treatment are stabilization of vital functions, prevention of secondary brain damage, and elimination of intracranial hypertension. Treatment is performed in specialized neurosurgical departments.

Conservative therapy includes normalization of hemodynamics and respiration, ensuring adequate oxygenation, administration of osmotic diuretics (mannitol), glucocorticosteroids, neuroprotectors, and sedatives.

Surgical intervention is indicated for intracranial hematomas, fractures with impacted bone fragments, and severe brain compression. The main types of surgery are craniotomy, trepanation and hematoma removal, and decompressive craniectomy.

After stabilization, comprehensive rehabilitation is carried out with the participation of a neurologist, physiotherapist, speech therapist, and psychologist.

Complications and outcomes

The most common complications of TBI include intracranial hematomas, cerebral edema, post-traumatic epilepsy, and cognitive and emotional-behavioral disorders. Chronic headaches, sleep disturbances, depression, and cognitive decline are possible in the long-term. The prognosis largely depends on the severity of the injury, the timeliness of treatment, and the quality of subsequent rehabilitation.

Conclusion

Traumatic brain injury remains one of the leading causes of death and disability among people of working age. Modern diagnostic approaches, including the use of CT and MRI, as well as improved intensive care and neurosurgical technologies, can significantly reduce mortality. However, successful patient recovery requires a comprehensive, multidisciplinary approach, including early rehabilitation and long-term follow-up.

References

1. Gusev E.I., Konovalov A.N., Skvortsova V.I. Neurology. - M.: GEOTAR-Media, 2021. - 864 p.
2. Menon D.K., Schwab K., Wright D.W., Maas A.I.R. Position Statement: Definition of Traumatic Brain Injury. Archives of Physical Medicine and Rehabilitation. 2010;91(11):1637–1640.
3. Potapov A.A., Likhтерman L.B. Traumatic brain injury: a guide for doctors. - M.: GEOTAR-Media, 2019. - 720 p.
3. Maas A.I.R. et al. Traumatic Brain Injury: Integrated Approaches to Improve Prevention, Clinical Care, and Research. Lancet Neurology. 2017;16(12):987–1048.
4. Stocchetti N., Carbonara M., et al. Severe Traumatic Brain Injury: Pathophysiology and Management. Intensive Care Medicine. 2019;45(5):709–722.

