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Early diagnosis of traumatic brain injury

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Traumatic brain injuries are characterized by high mortality, as well as the preservation of severe neurological or mental disorders [1,2].

Computed tomography (CT) and magnetic resonance imaging (MRI) can determine the localization of pathological processes. However, taking into account the dynamics of clinical indicators confirmed by data and other additional studies, the methods of computer and magnetic resonance imaging allow predicting the possibility of further rehabilitation [3,4,5].

The aim is to analyze the results of computed tomography in patients with acute traumatic brain injury .

Material and methods of research. From 2014 to 2016, CT results of 90 persons with TBI were studied. The age of the victims ranged from 20 to 50 years, the average age was 31.56 ± 2.09 years. There were 80 males (88.9%) and 10 females (11.1%). The criteria for inclusion in the study were: victims of all age groups with TBI regardless of gender, who underwent CT; patients with a score on the Glasgow coma scale (GCS) less than 15. The exclusion criteria were: patients with unstable hemodynamics, with penetrating injuries, with diabetes mellitus (DM) and arterial hypertension (AH), receiving anticoagulant therapy, with TBI, who suffered in childhood, pregnant women. In 54 (60.0%) victims, the cause of TBI was an accident, in 29 (32.2%) - a fall, in 6 (6.7%) - a sports injury and in 1 (1.1%) - a criminal injury. The patients were examined, taking into account the sex, age of the victim, the mechanism of injury, its severity. After initial care, the severity of TBI is assessed using the Glasgow coma scale (GCS). According to the Glasgow coma scale, the severity of the disorder is determined by the following scores: normal condition-15 points, mild impairment-12-14 points, average impairment-8-11 points, severe impairment - < 7 points. The main indicator for assessing the severity of TBI on GCS was the depression of the level of wakefulness.

Native computed tomography studies were performed on the Aquilion 16 Model TSX-101A computer tomograph of Toshiba (Japan). The studies were carried out on admission. Tomograms were used to assess the condition of the skull bones, soft tissues of the head, epidural, subdural, subarachnoid spaces and ventricular system. The data obtained were compared with the results of examination, traditional x-ray examination of the skull and neurological status. Tomograms assessed the main characteristics of TBI-the integrity of the skull bones (presence or absence of fractures), the density of brain matter, the state of the ventricular system of the brain, the presence and characteristics of intracranial hemorrhages, localization of the focus of brain injury relative to the sagittal plane.

The study was carried out in accordance with the principles of the Helsinki Declaration.

Research results and their discussion. The victims were identified a variety of brain damage. The most common lesion was a concussion (36.7 per cent). The bruising rate was 33.3%. A fairly high percentage were fractures-28.9%. In 23 (25.6%) victims, different combinations of types of TBI were simultaneously observed: bruise and compression by hematoma (10), bruise and subarachnoid hemorrhage (4), diffuse axonal injury and contusion (6), brain contusion with compression by hematoma and subarachnoid hemorrhage (3). Studies have shown that people with TBI as a result of an accident ($n=54$) were most often bruised-26 (48.1%) victims and concussion - 15 (27.8%). Those who received TBI as a result of a fall ($n=29$) were more likely to have fractures - 16 (55.2%) and mixed injuries - 11 (37.9%).

Bruises (n=30) (contusions) and concussions (n=33) of mild degree were detected respectively in 13 (43.3%) and 26(78.8%) patients, medium degree - in 15 (50.0%) and 6 (18.2%) and severe degree in 2 (6.7%) and 1(3.03%) victim. Linear fractures were diagnosed in 26 (28.80%) patients.

The study of damage types by GCS showed that individuals with single damage had a significantly higher average level of GCS than patients with mixed injuries.

A comparative analysis of the mean values of GCS showed that in patients with mixed lesions compared to single this indicator was statically significantly lower-by 24.1% ($p<0.05$). The average GCS score in patients with single lesion who were also diagnosed with fractures was 7.35 ± 1.46 points, which was lower by 43.0% ($p<0.01$) and 24.9% ($p<0.05$), respectively, compared with single and mixed lesions. The lowest average scores were observed in patients with mixed injuries in combination with fractures - 6.42 ± 1.33 , which was lower on average in patients with single damage and fractures by 12.7%, and in comparison with single and mixed lesions by 50.2% ($p<0.01$) and 34.4% ($p<0.05$), respectively.

The study showed that 39 (43.3%) were diagnosed with mild TBI, i.e. scores on GCS ranged from 12 to 14 points (average score - 13.14 ± 0.84). The average degree of TBI was observed in 40 (44.4%) patients, the indicators for GCS varied from 8 to 11 points (average score - 9.2 ± 1.28) and severe TBI - in 11 (12.2%), in whom the indicators for GCS ranged from 7 to 5 points (average score - 6.36 ± 1.27).

Based on the study, it was found that the main causes of TBI were road accidents (60.0%) and falls (32.2%). The most frequent were concussions in 33 patients and bruises in 30 patients. 26 victims suffered linear fractures.

Computed tomography is currently the main method of assessing patients with acute TBI. An important factor is the baseline GCS. Low GCS scores were found in combination with severe TBI. Victims with TBI and low GCS scores are more susceptible to devastating effects and tend to hemodynamic instability.

Victims with mixed injuries and fractures had a low score on the Glasgow coma scale, compared to patients diagnosed with a single lesion and fracture. Therefore, the more severe the TBI, the more reduced the level of scores on GCS. Classification of severity of craniocerebral injuries as light, moderate or severe, is carried out according to the scores of GCS.

Patients with mixed trauma had an average score of 9.78 ± 1.65 , with mixed trauma with fractures- 6.42 ± 1.03 , with single trauma- 12.89 ± 1.84 , with single trauma with fracture - 7.35 ± 1.46 .

Thus, an initial assessment of the patient with TBI should include information about the accident, the GCS and CT scan. This is necessary to determine the cause of the injury, the intensity of the impact, the presence of neurological symptoms, seizures and, in particular, to document any loss of consciousness, the time elapsed between the accident and the examination, the presence of vomiting and seizures. CT is one of the most important methods for early diagnosis of damage in acute TBI.

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