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«Innovative Education:  
Problems and Prospects of  
Scientific Research»**

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<b>Головко Т.О.</b> ФУНКЦІЯ ЛЕГЕНЬ У ДІТЕЙ ІЗ ЮВЕНІЛЬНИМ ІДІОПАТИЧНИМ АРТРИТОМ З УРАХУВАННЯМ АКТИВНОСТІ ЗАХВОРЮВАННЯ.....	222
<b>Шаніна В.В., Ставицька О.Ф., Колісник В.О.</b> ВПЛИВ КИШКОВОГО МІКРОБІОМУ НА РИЗИК РОЗВИТКУ АЛЕРГІЇ У ДІТЕЙ.....	224
<b>Фіщук С.М., Бурма Я.І.</b> КОРЕЛЯЦІЯ МІЖ РІВНЕМ ОБІЗНАНОСТІ ЩОДО ВАЖЛИВОСТІ ВАКЦИНОНОПРОФІЛАКТИКИ ТА ЇЇ ПРОВЕДЕННЯМ СЕРЕД ПРАЦІВНИКІВ СФЕРИ ОХОРОНИ ЗДОРОВ'Я.....	226
<b>Казаков Ю., Муравльова О., Настрога Т., Кітура О.</b> ТЕРАПЕВТИЧНИЙ МЕНЕДЖМЕНТ ПАЦІЄНТІВ ПОХИЛОГО ВІКУ З КОМОРБІДНОЮ ПАТОЛОГІЄЮ – НА АРТЕРІАЛЬНУ ГІПЕРТЕНЗІЮ І ЦУКРОВИЙ ДІАБЕТ 2-ГО ТИПУ В ЗАГАЛЬНОЛІКАРСЬКИЙ ПРАКТИЦІ.....	228
<b>Sukhonosov R., Shchebetun S., Ushakova M., Halycha M.</b> RADIOLOGICAL DIAGNOSTICS OF MULTIPLE COMBINED MECHANICAL INJURIES OF THE STRUCTURES IN THE FRONTAL-PARIETAL-OCCIPITAL REGION.....	233
<b>Кучук О., Назарук В., Педурару С., Матей Е.</b> МЕНЕДЖМЕНТ АТОНІЧНОГО ВИВОРОТУ ПОВІК.....	236
<b>Крупа В., Дорошак М.</b> ЗОРОВО-МОТОРНА КООРДИНАЦІЯ У ДІТЕЙ З РОЗЛАДАМИ АУТИСТИЧНОГО СПЕКТРУ ДОШКІЛЬНОГО ВІКУ.....	239
<b>Гончарова Н.М., Алієва В.Д.</b> СИНДРОМ МЕХАНІЧНОЇ ЖОВТЯНИЦІ: СУЧАСНІ МЕТОДИ ДІАГНОСТИКИ ТА ЛІКУВАННЯ.....	243
<b>SECTION: OIL AND GAS TECHNOLOGIES, ENGINEERING AND THERMAL POWER ENGINEERING</b>	
<b>Козлов Я., Ковальов С., Подолинний І.</b> ЕНЕРГООЩАДНІ ТЕПЛИЧНІ КОМПЛЕКСИ.....	246

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## **RADIOLOGICAL DIAGNOSTICS OF MULTIPLE COMBINED MECHANICAL INJURIES OF THE STRUCTURES IN THE FRONTAL-PARIETAL- OCCIPITAL REGION**

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Relevance: Trauma to the frontal-parietal-occipital region is one of the most common injuries, with a persistent trend of increasing incidence. Over the past three years, the number of injuries to the structures of the cranial vault has nearly tripled,

increasing by approximately 2.5 times. Patients in this group are usually classified as severe cases because injuries to the bones of the cranial vault are often accompanied by damage to the head organs, brain, nasal sinus appendages, and other structures. Furthermore, in any type of mechanical cranial injury (especially penetrating wounds), foreign bodies may be present in the head. Clinical examination does not always provide complete information regarding damage to the bony structures of the cranial skeleton or the precise location of foreign bodies in the frontal-parietal-occipital region. This underscores the importance of radiological diagnostics in such patients. Its task is to refine or verify the clinical diagnosis, determine the prognosis, and assist in developing the optimal treatment strategy.

**The aim:** To examine the significance of radiological diagnostics in traumatic injuries of the cranial vault in individuals who were on the frontline of combat while performing their duties.

**Materials and Methods:** To optimize the scope and nature of the radiological diagnostic stage in patients with multiple and combined cranio-cerebral injuries, a comprehensive clinical and radiological examination was conducted on 110 patients with fractures involving multiple bones within a single zone (multiple) or several zones (combined) of the cranial vault. The radiological diagnostic stage included the following methods: radiography (X-ray, tomography), spiral computed tomography (CT), and ultrasonography (US).

**Results and Conclusions:** The majority of patients were men — 100 cases (90.9%), while women accounted for 10 cases (9.09%). The average age of the patients was 32–33 years. The most common cause of injury was firearm-explosive trauma, accounting for 63.6% (70 patients), followed by traffic accidents at 14.5% (16 cases). Most patients were admitted on the 2nd or 3rd day post-injury — 38.0% (42 patients), likely due to underestimation of the severity of injuries during the preclinical assessment stage. Various surgical interventions were performed during the treatment process for most patients. A total of 74 patients (67.7%) underwent surgery, with operative treatment typically performed on the 10.3rd day on average.

The general condition of the patients was usually of moderate severity, primarily due to the significant extent of traumatic injuries. The most common complaints among this group of patients included frontal pain — 73 cases (66.3%), numbness in the frontal region — 58 cases (52.7%), headaches — 48 cases (43.6%), and vision impairments caused by trauma to the posterior region of the cranial vault — 22 cases (20%). During specialist examinations, significant pathological changes were frequently observed, including frontal-parietal-occipital deformation in 75 patients (69.0%), soft tissue hematomas in 47 cases (43.0%), the “step-off” symptom in 32 cases (29.1%), pain during palpation in 31 cases (27.8%), and wounds of the covering tissues in 22 patients (32.2%).

Radiographic studies without the use of other radiological methods were primarily performed in patients suspected of having multiple injuries to the middle zone of the frontal-parietal-occipital region — 91 patients (82.3%). Comprehensive examinations, which included various diagnostic methods, were performed on 44 patients (39.9%) with suspected multiple injuries in the anterior zone of the frontal-parietal-occipital region of the cranial vault and complex injuries.

The most commonly observed injuries were multiple injuries to the anterior zone of the frontal-parietal-occipital region — 55 cases (50.0%), combined trauma of the middle and anterior zones — 28 cases (25.9%), and combined injuries of the posterior, middle, and anterior zones — 7 cases (6.3%). Other traumatic changes were significantly less frequent, comprising 17.7% (28 cases) in total.

Trauma to the bony structures was identified in all 110 patients in this group. Both direct (presence of a fracture line, displacement of bone fragments, presence of bone splinters, bone defects) and indirect (soft tissue densification in the cranial vault at the site of injury, radiolucency against the background of soft tissues, changes in the frontal sinuses) radiological signs of bone damage were observed. Fracture signs, such as a fracture line, bone densification, or defect, were more often found in combination with each other or with other direct signs, such as fragment displacement, presence of splinters, or divergence of bone edges. The following complications were most prevalent: fracture lines with fragment displacement in 38 patients (34.8%), fracture lines with displacement and the presence of bone splinters in 15 cases (14.0%), and fracture lines with splinters in 10 observations (9.09%).

Traumatic brain changes were diagnosed in 19 patients (17.7%). In 18 out of these 19 patients (95.0%), brain trauma was associated with damage to the bones in the anterior zone of the frontal-parietal-occipital region (either multiple or combined with injuries to other zones). The most common brain injury signs were contusion foci and hemorrhagic changes. In many cases, foreign bodies were also detected in the patients. Among the etiological factors of traumatic injuries in these cases, mine-explosive firearm trauma prevailed, accounting for 8 cases (42.0%), while in only one case, the presence of a foreign body was due to a road traffic accident.

Analysis of the study results indicates significant challenges in identifying multiple and combined injuries of the cranial vault. Only the use of a comprehensive approach involving modern high-tech methods, with spiral computed tomography playing a leading role in terms of informativeness, allows for an objective assessment of the nature of injuries and the development of an adequate treatment strategy based on the findings.

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