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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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DETERMINATION OF THE SEVERITY OF TRAUMATIC BRAIN INJURIES BY METHODS OF RADIATION DIAGNOSTICS

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Abstract.

To study the specificity and sensitivity of X-ray research methods in the diagnosis of traumatic brain injury. Of the 969 injured for various reasons, 444 patients underwent CT and 34 patients underwent MRI. The obtained results were subjected to a comparative analysis. Traumatic brain injury was diagnosed in 197 people, of whom 192 (97.5%) underwent CT, 28 (14.2%) - MRI. Of these patients, 164 (83.2%) had a combined, 33 (16.8%) patients had an isolated traumatic brain injury. Based on the results of the study, CT can be considered a more effective examination method for detecting combined traumatic brain injuries due to CT sensitivity (95,3%) and specificity (96,4%), and MRI due to sensitivity (100%) in detecting traumatic brain injuries resulting from a car accident. It has been established that multidetector CT is of great importance in the timely and correct diagnosis of traumatic brain injuries.

Key words. Traumatic brain injury, isolated and combined trauma, computed tomography, magnetic resonance imaging, specificity, sensitivity.

Introduction.

Head and brain injuries account for more than 1/3 of all injuries, and according to the World Health Organization (WHO), their number increases by 2% annually. The prevalence of traumatic brain injury (TBI) ranges from 95 to 783 per 100,000 population annually, and mortality ranges from 18.5 to 49 in different countries. At the same time, 75-80% of patients have mild TBI (concussion), and the remaining 20-25% are people with moderate to severe TBI [1]. Mortality among all patients with TBI is 7-12%, and postoperative mortality in patients with severe TBI is 28-32%. In 2019, 223,135 deaths from TBI were registered, and in 2021 - 69,473 deaths. [2]. In most cases, injuries are found in people of working age (18-60 years old) - 59.9%, and in 36.9% of cases in children and adolescents, and men among them are 2.5-3 times more than women. Isolated TBI accounts for 30-40% of all injuries. About 2 million cases of traumatic brain injury (TBI) occur annually. Worldwide, about half of all injury deaths in people under 45 years of age are caused by traumatic brain injury. According to world statistics, 60% of TBI cases are caused by car accidents, 20-30% by falls, 10% by violence, 10% by industrial and sports injuries [3]. Among children aged 0-14 years, falls and head impacts are the main cause of TBI, whereas in other age groups – traffic accidents [1].

Traumatic brain injury (TBI) is a heterogeneous disease, although in most cases it is considered mild, about 15-25% of cases require special treatment. At the same time, TBI can cause post-traumatic seizures, deep vein thrombosis, hydrocephalus, behavioral and mood disorders, gait changes, decreased cognitive functions, post-traumatic headaches, and insomnia [4].

In general, TBI is classified as closed or penetrating. Penetrating TBI is characterized by damage to the skull and dura mater. Closed brain injuries are more common and include concussion, contusions, diffuse axonal damage and intracerebral hematomas (epidural hematoma, subdural hematoma, subarachnoid hemorrhage and intraparenchymal hemorrhage) [5].

Magnetic resonance imaging (MRI) and computed tomography (CT) are most often used in the diagnosis of brain damage from radiological methods, especially multidetector CT and multidetector CT angiography.

MRI of the brain is not usually used in the clinic for acute traumatic brain injury, despite the higher sensitivity in detecting TBI lesions and reducing the scan time to less than 15 minutes using ultrafast sequences. The only exception to this rule are patients with suspected intraspinal (spinal cord) injury or vascular dissection. In about 30% of patients with TBI with a negative head CT result, MRI confirmed this injury: in most cases, diffuse axonal injuries and traumatic axonal CT injuries are negative, but MRI positive cases are observed. Although comparative studies have shown that MRI is somewhat more sensitive than CT in detecting extraaxial hematomas, hematomas missed by CT are usually very small and do not require surgical intervention. CT is preferable to MRI even in patients with acute neurological impairment during subsequent treatment. If the neurological condition of TBI patients is not explained by CT results, then they should have an MRI scan. It has been shown that MRI allows for an accurate prognostic assessment in the subacute phase after injury. However, CT scans cannot reliably determine the prognosis after a traumatic brain injury. This is due to the fact that CT is less sensitive to stab wounds and brain stem injuries, which strongly affect the prognosis [1,6].

Thus, the initial examination for traumatic brain injury should quickly determine the volume of intracranial injuries and reliably identify injuries requiring immediate therapy, especially epidural and subdural hematomas, and compression fractures of the skull. It should be noted that mortality from severe forms of TBI decreased significantly after performing multispiral CT. However, the choice of CT or MRI to make the correct diagnosis of TBI remains controversial. Diagnostic and tactical errors are observed both before hospitalization and during surgery [7-9].

The aim of the study is to study the specificity and sensitivity of X-ray research methods in the diagnosis of traumatic brain injury.

Materials and Methods.

Of the 969 injured for various reasons, 383 (49.6%) patients underwent CT, and 73 (9.5%) patients underwent MRI. The obtained results were subjected to a comparative analysis. Traumatic brain injury was diagnosed in 197 people, of whom

192 (97.5%) underwent CT, 28 (14.2%) - MRI. Of these patients, 164 (83.2%) had a combined, 33 (16.8%) patients had an isolated traumatic brain injury.

To determine the severity of TBI, the patient's level of consciousness, changes in mental state, indicators of post-traumatic amnesia and the Glasgow Coma Scale (GCS) are used. According to the Glasgow Coma Scale, TBI is divided into 3 groups: mild (GG 13-15 points), medium (GG 9-12 points) or severe (GG 3-8 points). In most cases, mild TBI is called "concussion" and accounts for 80% of TBI, average TBI is 10% [1].

Various MRI sequences were examined during the TBI examination, including T2-weighted images, inversion recovery with attenuation of fluid (FLAIR), gradient echo images (GRE), susceptibility-weighted images (SWI) and diffusion-weighted images (DWI).

Recent studies have recommended using cognitive assessment scales in TBI as a potential indicator of long-term complications. One of these scales is the 8-level Ranchos Los Amigos scale. Maas et al. developed a predictive model based on data from 2,269 patients with moderate to severe TBI from a multicenter clinical trial to predict a 6-month outcome using data available at patient admission (Marshall CT scale). CT results using the Marshall CT scale included the presence or absence of lesions (hematomas), median dislocation greater than 5 mm, compressed or uncompressed cistern and evacuated mass lesions. This evaluation scale was modified to develop the Rotterdam CT Scale: it included compression of the basilar cistern, displacement of the median line of more than 5 mm, traumatic subarachnoid or intraventricular hemorrhage and the presence of various types of mass lesions. Using this simple Rotterdam scale based on CT, it is possible to predict 6-month mortality (AUC 0.77) more accurately than on the Marshall scale (AUR 0.67).

Grades range from 1 point (the easiest) to 6 points (the hardest). The actual mortality corresponding to the Rotterdam CT Score for the sum of scores 1, 2, 3, 4, 5 and 6 is 0%, 6,8%, 16%, 26%, 53% and 61%, respectively [6].

In the study, 444 CT was performed on the victims, 34 MRI was performed on the victims of 969 victims with various injuries. TBI was detected in 197 (149 (75.6%) men, 48 (24.4%) women)). Of these patients, 164 (83.2%) had combined and 33 (16.8%) isolated TBI.

Of the TBI victims, 6 (3.0%) patients were injured for unknown reasons, 105 (53.3%) were injured in a car accident, 72 (36.5%) fell from a height, 3 (1.5%) patients had narrowing, 11 (5.6%) patients received a shock injury (Figure 1).

Proven medical methods and the kappa test were used to evaluate the results. All calculations were carried out in computer programs Microsoft Excel-2013 and the SPSS-26.0 software package [9].

Results and Discussion.

Of the 444 patients who underwent CT scans, 444 had their brains examined. Based on various examination methods, 192 (43.2%) of these patients were diagnosed with TBI. In 183 (95.3%) patients with TBI, this diagnosis was confirmed by CT examination, and in 9 (4.5%) patients it was not determined.

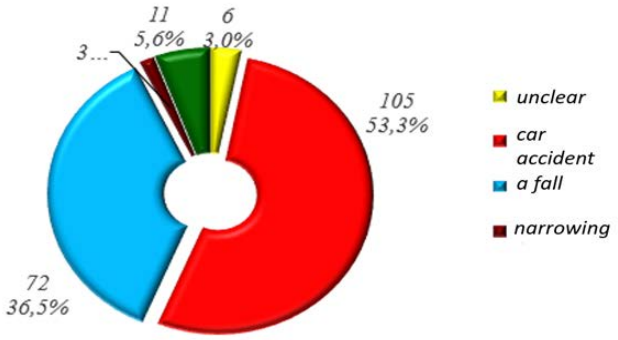

Figure 1. *Distribution of victims by causes of accidents.*

242 (96.4%) of the 252 people who did not have TBI had a true negative result, and 9 (3.6%) had a false positive result (κ=0.917; p<0.001). The specificity of CT in determining TBI was 96.4%, and its sensitivity was 95.3%.

Of the 73 patients who underwent an MRI examination of the head and brain area, 37 patients were diagnosed with TBI. 26 (92.9%) of the 28 victims with TBI were diagnosed with TBI according to MRI results. According to the results of the MRI examination, the diagnosis of TBI was confirmed in 26 (92.9%) patients, in 2 (7.1%) patients, the diagnosis of TBI was excluded. 5 (83.3%) of the 6 patients without TBI had a true negative MRI result, 1 (16.7%) had a false positive result. CT examination was statistically significant (k=0.715; p<0.001) in determining TBI, specificity was 83.3%, sensitivity was 92.9%.

Thus, a comparative analysis of the results of both surveys showed that the greatest informative value of the kappa coefficient was determined by CT examination. CT examination can be considered a more effective research method compared to MRI examination both due to its specificity and sensitivity.

We compared the results of our study to determine which of the examination methods is best suited for detecting head and brain injuries in accidents of various etiologies.

A CT scan of the head was performed in 208 (50.1%) victims of a car accident and an MRI scan was performed in 19 (4.6%) victims. Although TBI was diagnosed in 102 car accident victims, this diagnosis was confirmed only in 97 (95.1%) patients, and 5 (4.9%) patients had a head injury and CT scan did not reveal it. False positive results were given in 4 (3.8%) patients out of 106 patients without TBI. It was proved that 102 (96.2%) patients did not have TBI (κ=0.913; p<0.001). As can be seen from the results, the specificity of CT in detecting TBI in people affected by car accidents was determined at the level of 96.2%, sensitivity - at the level of 95.1%.

In 16 (84.2%) of those injured in a car accident, TBI was diagnosed according to MRI data, but 15 (93.8%) of them had the correct diagnosis, 1 (6.3%) had the wrong one (κ=0.826; p<0.001). As can be seen from the results, CT examination is more informative due to its sensitivity compared to MRI in determining traumatic brain injury in an accident (Table 1).

In order to identify head and brain injuries caused by a fall, 159 (43.6%) patients underwent brain CT, and 9 (2.5%) patients underwent MRI. Although TBI was in 71 patients who underwent CT examination, during examination this diagnosis was confirmed in 70 (98.6%) of the victims and refuted in 1

Table 1. *Informative value of CT and MRI studies in detecting head and brain injuries as a result of a car accident.*

Type of survey		number	Traumatic brain injury		κ	p
			no	there is		
CT	no	n	102	5	0,913	<0,001
		%	96,2%	4,9%		
	there is	n	4	97		
		%	3,8%	95,1%		
MRI	no	n	3	1	0,826	<0,001
		%	100,0%	6,3%		
	there is	n	0	15		
		%	0,0%	93,8%		

(1.4%) patient. Of the 88 patients without TBI, 86 (97.7%) had a true negative CT result, 2 (2.3%) had a false positive result (κ=0.962; p<0.001). Of 88 patients without TBI, 86 (97.7%) had a true negative CT result, 2 (2.3%) had a false positive result (κ=0.962; p<0.001). Based on the MRI examination, the diagnosis was confirmed in 6 (85.7%) of the 7 victims with TBI, and in 1 (14.3%) the victim was not identified. The MRI examination revealed the true absence of TBI in 2 (100.0%) of the victims (κ=0.727; p=0.003). The specificity of CT in detecting head and brain injuries during a fall was 97.7%, sensitivity was 98.6%; the specificity of MRI was 100.0%, sensitivity was 85.7%.

As can be seen from the results obtained, when detecting TBI in victims of a fall, a CT scan, due to its sensitivity, can provide more accurate information than an MRI scan. MRI is highly specific.

Of those injured as a result of the impact, 58 (54.7%) patients underwent brain CT, 4 (3.8%) patients underwent MRI. In 9 (81.7%) of the 11 victims with TBI, this injury was confirmed, and in 2 (18.2%) victims, on the contrary, it was excluded. However, 43 (93.6%) of the 47 patients who did not receive TBI had a true negative result, and 3 (6.4%) had a false positive result (k=0.729; p=0.693). An MRI examination revealed that 3 (100.0%) patients had a brain injury, and 1 (100.0%) patient had a false positive result. The specificity of CT in detecting TBI due to impact was 93.6%, sensitivity was 81.7%.

As can be seen, CT examination has a higher efficiency in detecting TBI in stroke victims, both due to specificity and sensitivity.

Of the victims with a combined injury, 130 (66.0%) had a head injury, 57 (28.9%) had a facial and jaw injury, 36 (18.3%) had a rib injury, 60 (30.5%) had a lung injury, 23 (11.7%) had a spine injury, 6 (3.6%) - spinal cord, 14 (7.1%) – pelvic bones, 40 (20.3%) – limb injury and 18 (9.1%) patients had joint fractures.

CT was performed in 110 (32.8%) patients with suspected TBI, MRI in 7 (2.1%) patients. According to CT data, this diagnosis was confirmed only in 28 (90.3%) of 31 patients with isolated TBI. In 3 (9.7%) of the victims, the existing TBI was not detected on CT. At the same time, it was shown that 77 (97.5%) of the victims had no TBI (κ=0.887; p<0.001). As a result of the MRI examination, it was found that all 7 (100.0%) of the victims had no TBI. As can be seen, CT has high specificity (97.5%) and sensitivity (90.3%) in detecting isolated head injuries.

In order to detect TBI in patients with combined trauma, 243 (55.9%) patients underwent CT scan, and 23 (5.3%) patients underwent MRI examination. CT examination of combined TBI confirmed the diagnosis in 155 (96.3%) of 161 patients, and in 6 (3.7%) patients it could not be determined, and 3 (3.7%) patients had false positive results. Among the victims with concomitant trauma, 79 (96.3%) of 81 patients without TBI had a true negative diagnosis (k=0.918; p<0.001). Although combined TBI during MRI examination was confirmed in 19 (90.5%) of the victims, it was not possible to determine this injury in 2 (9.5%) patients. Of the 2 patients without concomitant TBI, 1 (50.0%) of the victim had a truly negative diagnosis, 1 (50.0%) had a false positive (k=0.330; p=0.104) (Table 2).

Table 2. *Informative value of CT and MRI studies in the detection of traumatic brain injury in combined injuries.*

Type of survey		Number	Traumatic brain injury		κ	p
			no	there is		
CT	no	n	79	6	0,918	<0,001
		%	96,3%	3,7%		
	there is	n	3	155		
		%	3,7%	96,3%		
MRI	no	n	1	2	0,330	0,104
		%	50,0%	9,5%		
	there is	n	1	19		
		%	50,0%	90,5%		

As can be seen from the table, the sensitivity and specificity of CT in detecting common TBI was 96.3%; the sensitivity of MRI was 50.0%, the specificity was 90.5%.

Thus, according to the results of the study, when detecting combined traumatic brain injuries, CT examination has a higher sensitivity and specificity compared to MRI.

Examples of clinical manifestations of traumatic brain injury.

A clinical example. Patient E.E.A., 23 years old, male, I/b No. 221, was admitted to the Medical Center in 2017 with injuries sustained as a result of a fall. Given the severity of the clinical picture, an MRI scan was deemed necessary by a qualified doctor. The usual sequences were obtained in the axial, sagittal and coronary planes. Since the information obtained from the FLAIR, T2, T1 sequences does not reveal the depth of the clinical picture, the diagnosis was completed by a sequence of DWI images: in both hemispheres of the brain, in subcortical, bilateral brain tissue, deep white matter, around the lateral ventricles, in the corpus callosum (mainly in the knee and rollers) and in A large number of diffusely scattered foci are visible in subcortical nuclei with DWI mode restriction (Figure 2).

The noted changes were regarded as typical for diffuse axonal lesions and the severity of the clinical condition was obvious.

A clinical example. Patient M.S.M., 60 years old, female, I/b No. 6898, was admitted to the Medical Center in 2017 with combined injuries sustained as a result of a car accident. Initially, an X-ray examination was performed using the FAST protocol. However, X-ray and computer examinations did not reveal any serious damage. In order to clarify the clinical picture, the specialist doctor considered it necessary to conduct an additional MRI examination according to the protocol. Even if the presence of intraparenchymal damage was not accompanied,

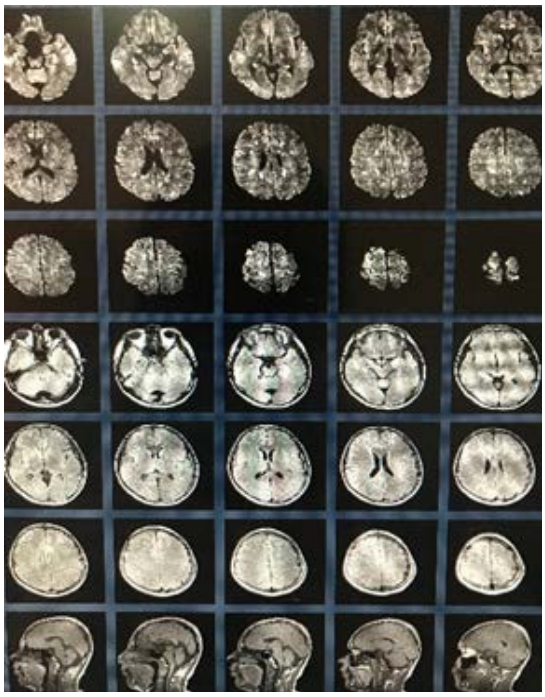

Figure 2. *The usual sequences were obtained in the axial, sagittal and coronary planes through MRI scan.*

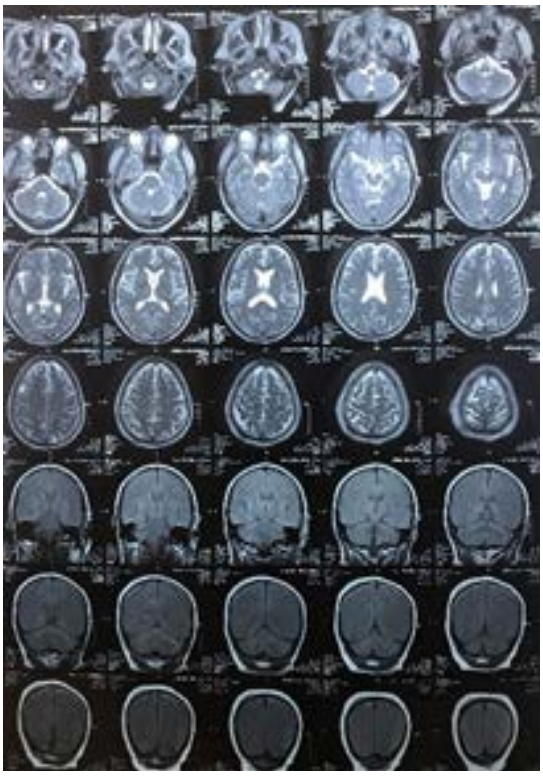

Figure 3. *The accumulation of subdural hemorrhages in the form of thin plaques in the frontal lobes and the severity of the patient's condition was assessed.*

attention was bilaterally paid to the accumulation of subdural hemorrhages in the form of thin plaques in the frontal lobes and the severity of the patient's condition was assessed (Figure 3).

Head and brain injuries are serious injuries and in most cases are accompanied by high mortality and disability. CT and MRI scans play an important role in the timely detection of both isolated and combined traumatic brain injuries in victims. From this point of view, the informative value of X-ray examination methods (CT and MRI) in determining traumatic brain injuries was evaluated based on their specificity and sensitivity. To this end, brain injury was detected in 197 victims who were injured for various etiological reasons (in particular, in car accidents and as a result of falls), of which 192 (97.5%) patients underwent CT and 34 (14.2%) - MRI studies. Due to its sensitivity (95,3%) and specificity (96,4%), CT can be considered a more effective examination method, and MRI due to its sensitivity (100%) in detecting head and brain injuries caused by a car accident. Due to its specificity (90.3%) and sensitivity (97,5%), CT can be considered a more informative examination method for detecting combined traumatic brain injury.

Conclusion.

Multidetector CT is of great practical importance for making the correct diagnosis at the initial stage, allowing you to get a tomography of traumatic brain injuries.

Conflicts of interest.

The authors declare no conflicts of interest.

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Определение степени тяжести черепно-мозговых травм методами лучевой диагностики

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Резюме

Цель. Изучение специфичности и чувствительности рентгенологических методов исследования в диагностике черепно-мозговой травмы.

Из 969 пострадавших по разным причинам 444 пациентам

выполнена КТ и 34 пациентам проведена МРТ черепа. Полученные результаты были подвергнуты сравнительному анализу. Черепно-мозговая травма диагностирована у 197 человек из которых 192 (97,5%) выполнена КТ, 28 (14,2%) - МРТ. Из этих пациентов 164 (83,2%) имели сочетанную, 33 (16,8%) пациента - изолированную черепно-мозговую травму. На основании результатов исследования КТ можно считать более эффективным методом обследования при выявлении сочетанных черепно-мозговых травм КТ за счет его чувствительности (95,3%) и специфичности (96,4%), а МРТ - за счет чувствительности (100%) при выявлении черепно-мозговых травм, полученных в результате автомобильной аварии. Установлено, что мультидетекторная КТ имеет большое значение в своевременной и правильной диагностике черепно-мозговых травм.

Ключевые слова: черепно-мозговая травма, изолированная и сочетанная травма, компьютерная томография, магнитно-резонансная томография, специфичность, чувствительность

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