

GEORGIAN MEDICAL NEWS

ISSN 1512-0112

№ 6 (327) Январь 2022

ТБИЛИСИ - NEW YORK



ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии
საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

No 6 (327) 2022

Published in cooperation with and under the patronage
of the Tbilisi State Medical University

Издается в сотрудничестве и под патронажем
Тбилисского государственного медицинского университета

გამოიცემა თბილისის სახელმწიფო სამედიცინო უნივერსიტეტთან
თანამშრომლობითა და მისი პატრონაჟით

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ
ТБИЛИСИ - НЬЮ-ЙОРК

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 and The International Academy of Sciences, Education, Industry and Arts (U.S.A.) 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 и Международной академией наук, образования, искусств и естествознания (IASEIA) США 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 ВИНТИ 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 ВИНТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებშიდან.

МЕДИЦИНСКИЕ НОВОСТИ ГРУЗИИ

Ежемесячный совместный грузино-американский научный электронно-печатный журнал
Агентства медицинской информации Ассоциации деловой прессы Грузии,
Международной академии наук, индустрии, образования и искусств США.
Издается с 1994 г., распространяется в СНГ, ЕС и США

ГЛАВНЫЙ РЕДАКТОР

Николай Пирцхалаишвили

НАУЧНЫЙ РЕДАКТОР

Елене Гиоргадзе

ЗАМЕСТИТЕЛЬ ГЛАВНОГО РЕДАКТОРА

Нино Микаберидзе

НАУЧНО-РЕДАКЦИОННЫЙ СОВЕТ

Зураб Вадачкориа - председатель Научно-редакционного совета

Александр Геннинг (Германия), Амиран Гамкрелидзе (Грузия),

Константин Кипиани (Грузия), Георгий Камкамидзе (Грузия),

Паата Куртанидзе (Грузия), Вахтанг Масхулия (Грузия),

Тенгиз Ризнис (США), Реваз Сепиашвили (Грузия), Дэвид Элуа (США)

НАУЧНО-РЕДАКЦИОННАЯ КОЛЛЕГИЯ

Константин Кипиани - председатель Научно-редакционной коллегии

Архимандрит Адам - Вахтанг Ахаладзе, Амиран Антадзе, Нелли Антелава, Георгий Асатиани,
Тенгиз Асатиани, Гия Берадзе, Рима Бериашвили, Лео Бокерия, Отар Герзмава, Лиана Гогиашвили,

Нодар Гогебашвили, Николай Гонгадзе, Лия Дваладзе, Тамар Долиашвили, Манана Жвания,

Тамар Зерекидзе, Ирина Квачадзе, Нана Квирквелия, Зураб Кеванишвили, Гурам Кикнадзе,

Димитрий Кордзаиа, Теймураз Лежава, Нодар Ломидзе, Джанлуиджи Мелотти, Марина Мамаладзе,

Караман Пагава, Мамука Пирцхалаишвили, Анна Рехвиашвили, Мака Сологашвили, Рамаз Хецуриани,

Рудольф Хохенфеллнер, Кахабер Челидзе, Тинатин Чиковани, Арчил Чхотуа,

Рамаз Шенгелия, Кетеван Эбралидзе

Website:

www.geomednews.org

The International Academy of Sciences, Education, Industry & Arts. P.O.Box 390177,
Mountain View, CA, 94039-0177, USA. Tel/Fax: (650) 967-4733

Версия: печатная. **Цена:** свободная.

Условия подписки: подписка принимается на 6 и 12 месяцев.

По вопросам подписки обращаться по тел.: 293 66 78.

Контактный адрес: Грузия, 0177, Тбилиси, ул. Асатиани 7, IV этаж, комната 408

тел.: 995(32) 254 24 91, 5(55) 75 65 99

Fax: +995(32) 253 70 58, e-mail: ninomikaber@geomednews.com; nikopir@geomednews.com

По вопросам размещения рекламы обращаться по тел.: 5(99) 97 95 93

© 2001. Ассоциация деловой прессы Грузии

© 2001. The International Academy of Sciences,
Education, Industry & Arts (USA)

GEORGIAN MEDICAL NEWS

Monthly Georgia-US joint scientific journal published both in electronic and paper formats of the Agency of Medical Information of the Georgian Association of Business Press; International Academy of Sciences, Education, Industry and Arts (USA).
Published since 1994. Distributed in NIS, EU and USA.

EDITOR IN CHIEF

Nicholas Pirtskhalaishvili

SCIENTIFIC EDITOR

Elene Giorgadze

DEPUTY CHIEF EDITOR

Nino Mikaberidze

SCIENTIFIC EDITORIAL COUNCIL

Zurab Vadachkoria - Head of Editorial council

Alexander Gënning (Germany), Amiran Gamkrelidze (Georgia), David Elua (USA),
Konstantin Kipiani (Georgia), Giorgi Kamkamidze (Georgia), Paata Kurtanidze (Georgia),
Vakhtang Maskhulia (Georgia), Tengiz Riznis (USA), Revaz Sepiashvili (Georgia)

SCIENTIFIC EDITORIAL BOARD

Konstantin Kipiani - Head of Editorial board

Archimandrite Adam - Vakhtang Akhaladze, Amiran Antadze, Nelly Antelava,
Giorgi Asatiani, Tengiz Asatiani, Gia Beradze, Rima Beriashvili, Leo Bokeria,
Kakhaber Chelidze, Tinatin Chikovani, Archil Chkhotua, Lia Dvaladze, Tamar Doliashvili,
Ketevan Ebralidze, Otar Gerzmava, Liana Gogiashvili, Nodar Gogebashvili,
Nicholas Gongadze, Rudolf Hohenfellner, Zurab Kevanishvili, Ramaz Khetsuriani,
Guram Kiknadze, Dimitri Kordzaia, Irina Kvachadze, Nana Kvirkvelia, Teymuraz Lezhava,
Nodar Lomidze, Marina Mamaladze, Gianluigi Melotti, Kharaman Pagava,
Mamuka Pirtskhalaishvili, Anna Rekhviashvili, Maka Sologhashvili, Ramaz Shengelia,
Tamar Zerekidze, Manana Zhvania

CONTACT ADDRESS IN TBILISI

GMN Editorial Board
7 Asatiani Street, 4th Floor
Tbilisi, Georgia 0177

Phone: 995 (32) 254-24-91
995 (32) 253-70-58
Fax: 995 (32) 253-70-58

CONTACT ADDRESS IN NEW YORK

NINITEX INTERNATIONAL, INC.
3 PINE DRIVE SOUTH
ROSLYN, NY 11576 U.S.A.

Phone: +1 (917) 327-7732

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. Корректур авторам не высылаются, 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 computer-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 საქურაღებოლ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დაიცვათ 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. რენტგენოგრაფიების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალებების შედეგების 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 ფხიხლებში 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.

Содержание:

Gogunskaya I.V. ¹ , Zaikov S.V. ¹ , Tkhorovskiy M.A. ² , Plykanchuk O.V. ² , Bogomolov A.Ye. ² . STATUS OF THE COMPOSITION OF ALLERGENIC EXTRACTS FOR SKIN TESTING IN UKRAINE AND THE WAYS TO OPTIMIZE IT	7
Kopchak O., Hrytsenko O. FEATURES OF GUT MICROBIOTA IN PATIENTS WITH MIGRAINE AND HEALTHY INDIVIDUALS.....	13
Olena A. Hryhorieva ¹ , Tetiana M. Matvieishyna. ¹ , Yuri Y. Guminskiy. ² , Oleksandra L. Lazaryk. ¹ , Andrii O. Svetlitsky ¹ . GENERAL MORPHOLOGICAL CHARACTERISTICS OF GASTRO-INTESTINAL TRACT OF RATS WITH EXPERIMENTAL UNDIFFERENTIATEDDYSPLASIAOFCONNECTIVETISSUE.....	18
Trofimov N. ¹ , Kryshen V. ¹ , Korpuseenko I. ¹ , Nor N. ¹ , Korpuseenko E. ¹ , Makarenko A. ² PREOPERATIVE DONOR ZONES PREPARATION OF PERFORANT FLAPS BY TRAINING PERFORANT VESSELS WITH NEGATIVE PRESSURE.....	27
Olha S. Yurtsenyuk. PECULIARITIES OF DIAGNOSTICS AND TREATMENT OF NONPSYCHOTIC PSYCHIC DISORDERS AMONG THE STUDENTS OF HIGHEREDUCATIONALESTABLISHMENTS.....	32
Dubivska SS., Hryhorov Yu.B., Lazyrskiy V.O., Goloborodko M.M. DYNAMICS OF CHANGES IN 2,3 DIPHOSPHOGLYCERATE AND COGNITIVE DYSFUNCTION IN THE POSTOPERATIVE PERIOD IN PATIENTS WITH ABDOMINAL NEOPLASMS.....	36

DYNAMICS OF CHANGES IN 2,3 DIPHOSPHOGLYCERATE AND COGNITIVE DYSFUNCTION IN THE POSTOPERATIVE PERIOD IN PATIENTS WITH ABDOMINAL NEOPLASMS

Dubivska SS., Hryhorov Yu.B., Lazyrskiy V.O., Goloborodko M.M.

Kharkov National Medical University, Kharkov, Ukraine.

Connection with scientific programs, plans and topics.

The article is a fragment of research work of the Department of Emergency Medicine, Anesthesiology and Intensive Care of Kharkov National Medical University of the Ministry of Health of Ukraine "Prevention of stress-induced organ damage" (№ state registration 0113U002284, 2013-2015), "Choice of intensive care and anesthesia patients with systemic inflammatory response syndrome "(№ state registration 0116U005232, 2016-2018)," Anesthesia and intensive care in patients with damage to the oxygen transport system "(№ state registration 0120U102018, 2020-2022).

Introduction.

The number of surgeries using general anesthesia is increasing every year worldwide, this trend is observed in patients of all ages. Anesthetics and general anesthesia are considered as a risk factor for the occurrence or acceleration of changes in cognitive function [1-10]. Information about the presence of cognitive dysfunction after general anesthesia appeared in 1955 [7,11,12]. Risk factors for cognitive dysfunction in this group of patients include: the patient's attitude to his underlying disease, especially the psychological stress of the cancer patient, the effects of general anesthesia, surgical stress and trauma, the presence of concomitant chronic cerebrovascular disease, duration of general anesthesia and time of surgery. age and education of the patient [7,10,11,13-16]. The occurrence of changes in higher brain activity, in particular, cognitive function, in this group of patients is influenced by many biochemical and pathophysiological mechanisms: metabolic, hemorheological, hypoxic, toxic, leading to damage to the cerebral vessel wall at the level of microcirculation [7,12,17-19].

Of great importance is the process of human aging. Scientific studies show a discrepancy between the subjective complaints of elderly patients with memory impairment and the actual ability to remember. In various states of depression, especially when patients are aware of cancer, secondary cognitive impairment may develop [6,13,20,21]. During human aging and especially in the oncological process, there are corresponding violations of metabolic, structural and functional changes in the human psyche and behavior [21,22].

We know that erythrocytes take part in the transport of oxygen and carbon dioxide. It is important for us to point out that the peculiarity of the structure and condition of erythrocyte functioning is the absence of the nucleus, ribosomes and mitochondria and the non-use of oxygen in metabolism. Also, the integrity of the cytoplasmic cell membrane and energy supply of erythrocyte transport function systems takes place under conditions of anaerobic glycolysis (90%) and pentose

phosphate shunt (10%) [23].

An important and basic compound in human erythrocytes is 2,3-diphosphoglycerate, which accounts for about 64% of total phosphorus. Due to this functional value, the transport of oxygen in erythrocytes is regulated, namely the affinity of hemoglobin for oxygen. There is a natural change in the content of erythrocytes 2,3 - diphosphoglycerate depending on the body's need for oxygen. The authors note that in erythrocytes there is an inverse relationship between the level of 2,3 - diphosphoglycerate and the affinity of hemoglobin for oxygen. The connection of 2,3 - diphosphoglycerate with three HbO₂ chains facilitates the release of oxygen from HbO₂ and its transfer to tissues. The activity of this biochemical dependence is determined by the amount of reduced hemoglobin, which indicates the body's oxygen supply. Oxygen binding to hemoglobin is influenced by various factors: pO₂, temperature, pH, carbon dioxide, metabolites of anaerobic glycolysis. The affinity of hemoglobin for oxygen can be influenced by many factors: changes under the action of ligands, in particular the glycolysis metabolite 2,3-diphosphoglycerate, which can be reverse bound to the hemoglobin molecule. The formation of 2,3-diphosphoglycerate in erythrocytes is carried out in a Rapoport-Lubering shunt, which is a branch of glycolysis and bypasses the reaction catalyzed by the enzyme phosphoglycerate kinase.

It has been scientifically confirmed that the concentration of 2,3-diphosphoglycerate increases in hypoxic conditions and increases the degree of dissociation: HbO₂ in the tissues will compensate for the decrease in oxygen, which will bind hemoglobin in the lungs under hypoxia. An important intracellular adaptation in various hypoxic conditions is the increase in erythrocytes in the content of 2,3 - diphosphoglycerate, the concentration of which depends on the state of the glycolytic system [24, 25].

It is known that increasing the concentration of 2,3 - diphosphoglycerate in blood erythrocytes in hypoxic conditions is one of the adaptive mechanisms that improves oxygen transport to tissues. The peculiarity of the functioning of red blood cells is the use of glycolysis reactions for energy purposes. The formation of 2,3-diphosphoglycerate is associated with the peculiarities of energy metabolism in erythrocytes and the main purpose of this metabolite is to change the affinity of hemoglobin for oxygen.

It is known from the scientific literature that the increased affinity of hemoglobin for oxygen in embryos and newborns is largely due to the low concentration of 2,3 - diphosphoglycerate [26, 27].

The concentration of 2,3 - diphosphoglycerate in the

erythrocytes of adult blood is a functionally dynamic value, which naturally varies depending on the body's need for oxygen. With changes in the oxygen regime, the content of 2,3 - diphosphoglycerate in erythrocytes can decrease or increase quite rapidly [24, 28].

Thus, the problem of diagnosing hypoxia and the consequences of its impact on the degree and structure of changes in higher brain activity, in particular postoperative cognitive dysfunction, especially in cancer patients, remains unresolved, which determines its relevance.

Purpose. The influence of the dynamics of 2,3 diphosphoglycerate content, as the main indicator of hypoxia, on the occurrence of cognitive dysfunction in the postoperative period in patients with neoplasms of the abdominal cavity.

Materials and methods. The research is a fragment of the research work of the Department of Emergency Medicine, Anesthesiology and Intensive Care of the Kharkiv National Medical University of the Ministry of Health of Ukraine.

The study was conducted on the basis of departments for patients of the surgical profile of the municipal institution "Kharkiv City Clinical Hospital of Ambulance and Emergency Care named after Professor OI Meshchaninov". To achieve the goal of the study, we examined 80 patients with neoplasms of the abdominal cavity, who underwent surgery under general anesthesia using propofol and fentanyl in the period from 2009 to 2019. All patients were divided into 2 groups depending on the age of patients on the WHO scale, who underwent surgery using general anesthesia: Group 1 (n = 39) - middle-aged patients (50-59 years); Group 2 (n = 41) - elderly and senile patients (60-80 years).

Surgical intervention in the studied patients was performed for acute intestinal obstruction caused by malignant tumors of the colon of various localizations. They underwent palliative and radical surgery in an urgent manner.

The assessment of the condition of patients before surgery was ASA II, according to the classification system of the physical status of patients of the American Society of Anesthesiologists (ASA, 1941). According to the classification of surgical and anesthesiological risk (VA Gologorsky, 1982), the assessment of patients was 2 B.

The design of our study: the study included determining the state of cognitive function in these patients by conducting neuropsychological tests and 2,3 diphosphoglycerate at all control points of the survey; the control points of the examination were the day before the operation and the 1st, 7th, 30th day from the moment of the operation.

To assess the state of cognitive function of patients, neuropsychological tests were used: MMSE scale (Mini-Mental State Examination, MMSE), the method of memorizing 10 words AR Luria, frontal dysfunction battery (FAB), Schulte technique [28,29].

To assess the state of energy metabolism in patients, the level of erythrocytes and hemoglobin in the blood analysis was determined by well-known methods, the level of 2,3 diphosphoglycerate in erythrocytes and its ratio to hemoglobin.

The determination of 2,3-diphosphoglycerate in blood erythrocytes was as follows: hemolysis of erythrocytes was

performed by adding chilled distilled water with a volume of 2 ml. In the hemolysate spectrophotometrically determined the hemoglobin content by determining the optical density at a wavelength of 540 nm in a cuvette 1 cm thick. Hemolysate in the amount of 0.02 was made in 5 ml of ammonia solution, shaken to saturate with air. The hemoglobin content was calculated in g/ml. Protein precipitation in the hemolysate was performed by adding two volumes of 1 normal HClO₄, the samples were stirred and left on ice for 20 minutes. The precipitate was separated by centrifugation. Determination of 2,3 - diphosphoglycerate was performed by adding a non-enzymatic method based on the determination of phosphates in hydrochloric extracts after isolation of nucleotides on carbon. The phosphorus content was determined by a modified Fiske - Subbarou method. Determination of total phosphorus was performed in 0.1 ml of perchloric extract. Content 2,3 diphosphoglycerate was calculated by the difference: total phosphate - inorganic phosphorus [5].

All values are given as $M \pm m$. Student's t-test was used to assess the significance of differences, at $p = 0.05$ the differences were considered statistically significant. All mathematical operations and graphical constructions were performed using the software packages "Microsoft Office XP": "Microsoft XP Home" and "Microsoft Excel XP" (license numbers: 00049 153 409 442 and 74017 640 0000106 57664, respectively).

Results and discussions. According to the MMSE test in the preoperative period, a decrease of 9.7% from the maximum probable value of the test was found in all patients: group 1 - by 9.6%, group 2 - by 15.4%. At 1 day after surgery, the results of the MMSE test deteriorated, especially significantly ($p < 0.01$) in patients of group 2 - by 23.3% of the values before surgery. Within 30 days, the MMSE test significantly improved ($p < 0.01$) but was 5.92% lower than before surgery. A slight decrease for 1 day was observed in patients of group 1 - 1.4% of the values before surgery, which recovered within 30 days after surgery.

According to the FAB test before surgery, the results were 7.5% lower than the maximum probable value of the test: group 1 - by 3.8%, group 2 - by 16.1%. At day 1, the result of the FAB test significantly ($p < 0.01$) deteriorated compared with the values before surgery, more in patients of group 2, at day 30 significantly ($p < 0.01$) improved. FAB test scores after surgery were proportional to age in all periods of the study - for 1 day (by groups) 10.0% and 37.7%, for 7 days 5.0%, 30.5% and after 30 days 5, 0%, 20.0% respectively.

Test results 10 words AR Luria had a significant dependence ($p < 0.02$) and were lower in patients of group 1 by 19.0%, group 2 - by 38.0%. Significant ($p < 0.01$) deterioration of results was observed on day 1, and recovery of parameters in patients of both groups was significant ($p < 0.01$) on day 30. The results of the test after surgery in all periods of the study were proportional to the age of patients on day 1: 32.0% and 51.0%, on day 7: 26.0% and 44.0%, on day 30: 21.0% and 40.0%.

The results of the Schulte test were significantly ($p < 0.01$) 5.5% lower than the maximum probable value on the test, in patients of group 1 - 8.2%, group 2 - 18.3% lower. On day 1, the results of the Schulte test significantly ($p < 0.01$) deteriorated from the values before surgery, more clearly in patients of group

2 (51.2%). Schulte test parameters were gradually restored in each group from day 1 but were almost completely restored ($p < 0.01$) in patients of group 2. Schulte test scores after surgery differed from the most probable test result in all study periods and were proportional to the age of the patients. Thus, on the 1st day: 40.2% and 78.8% - by groups), on the 7th day: 24.8% and 64.8%, on the 30th day: 7.8% and 38.2% (Table 1.).

Anemia was observed in patients of group 1, one day after surgery: the content of erythrocytes and hemoglobin decreased by 28.6% and 25.5%, respectively, compared with healthy people. On day 7: the content of erythrocytes decreased by 28.6% and hemoglobin - by 31.4%. On the 30th day, these indicators were restored. The content of 2,3 diphosphoglycerate significantly increased by 19.2% in the first week after general anesthesia and surgery compared with this indicator in the control group.

With regard to the content of these indicators in the blood of people of group 2 before surgery, there was a decrease in erythrocytes by 21.4% and a tendency to decrease the content of hemoglobin. One day after surgery, the anemia was more pronounced: the content of erythrocytes in the blood of patients decreased by 30.9% and hemoglobin - by 25.3%. This condition worsened over time, after 7 days the erythrocyte content

decreased by 40.5% and hemoglobin - by 23.8%. In erythrocytes of patients of this age group there was a significant probability decrease of 2,3 diphosphoglycerate by 35.9% for 1 day and by 31.6% 7 days after surgery. Signs of anemia were also observed 30 days after surgery: erythrocytes remained low - 26.2% less than in the control group (Table 2).

Thus, under conditions of hypoxia in the elderly, gluconeogenesis is disrupted, and anaerobic glycolysis is stimulated. The liver is converted into an organ that will produce lactate. The relative deficiency of enzymes that catalyze glycolysis reactions: hexokinase, glucose phosphatisomerase, phosphofruktokinase, may also be the cause of insufficient synthesis of 2,3 diphosphoglycerate. Also, long-term disturbance of energy metabolism and changes in the activity of glycolysis enzymes in erythrocytes reduce the concentration of 2,3 diphosphoglycerate, increase the affinity of hemoglobin for oxygen, and promote the development of tissue hypoxia.

A very important indicator that reflects the intensity of the formation of 2,3 diphosphoglycerate at a given concentration of hemoglobin is to determine the ratio of 2,3 diphosphoglycerate to hemoglobin content.

The analysis of this ratio shows that in patients of group 1 there is a more pronounced intensity of the formation of 2,3

Table 1. Indicators of cognitive function in patients with neoplasms of the abdominal cavity.

Index	Stages	1 group	2 group
MMSE, bali	Before the operation	26,9±0,9	25,3±1,5
	1 day	25,6±1,1	19,2±1,7*
	7 days	26,6±1,1	21,3±1,6*
	30 days	26,9±1,1	23,6±1,3
FAB,bali	Before the operation	17,4±0,7	15,2±1,5
	1 day	16,3±1,0	11,2±1,7*
	7 days	17,0±0,9	12,5±1,1*
	30 days	17,1±0,2	14,6±1,7
Test 10 words AR Luria	Before the operation	8,0±0,6	6,1±0,6*
	1 day	6,8±0,5*	4,9±0,6*
	7 days	7,6±0,3*	5,6±0,8*
	30 days	7,9±0,1*	6,0±0,5*
Schulte's test, seconds	Before the operation	54,2±1,4*	58,9±1,4*
	1 day	70,0±1,1*	89,1±1,5*
	7 days	62,6±1,4*	82,2±1,4*
	30 days	54,0±1,1*	59,9±1,2*

Notes: * - $p < 0,01$ when compared with indicators before surgery.

Table 2. The content of erythrocytes, hemoglobin in the blood and 2,3 - diphosphoglycerate in erythrocytes in patients with neoplasms of the abdominal cavity in the postoperative period.

Groups	Stages	Erythrocyti, 10 ¹² / l	Hemoglobin, g / l	2,3-DFG, μmol / g Hb
1 (n=39)	Before the operation	3,7±0,4	138,2±14,1	13,5±0,4
	1 day	3,0±0,3*	100,2±11,5*	16,1±0,5*
	7 days	3,0±0,3*	92,2±8,7*	16,1±0,7*
	30 days	3,6±0,3	135,0±14,6	14,1±1,1
2 (n=41)	Before the operation	3,3±0,3*	126,4±13,1	14,8±0,7
	1 day	2,9±0,3*	100,4±9,9*	8,9±1,0*
	7 days	2,5±0,3*	102,3±9,1*	9,5±0,7*
	30 days	3,1±0,3*	116,1±10,6	12,2±1,2
Control group		4,2±0,4	134,5±12,6	13,9±0,74

Note: * - $p < 0,05$ according to control

diphosphoglycerate, which is necessary to ensure the transport of oxygen to tissues, in particular the nervous system. In patients of group 2, the failure of adaptation mechanisms is determined, the intensity of the formation of 2,3 diphosphoglycerate decreases in response to hypoxia. Thus, in the elderly there is an insufficient supply of functioning cells with oxygen, anesthesia and surgery can initially cause a hypoxic state, under conditions of dysfunction of oxygen transport and autoregulatory systems of the body. This condition is accompanied by hypoergosis - a decrease in the production and accumulation of macroergic phosphates, which disrupts cell viability. Under conditions of decreasing concentration of adenosine triphosphate, erythrocytes lose water, potassium ions, damage the spectra of the actin cytoskeleton, and change the erythrocyte membrane.

Thus, our study confirms and details the knowledge about postoperative cognitive dysfunction, which was obtained during neuropsychological testing of patients with abdominal tumors. This allows further formation of perioperative diagnosis of cognitive function in patients with neoplasms of the abdominal cavity, paying special attention to the confirmed in previous studies of subclinical anxiety and depression, which in turn suppresses the ability of higher brain activity.

The novelty of our study is also to determine for the first time a marker of hypoxia 2,3 diphosphoglycerate in cancer patients. The obtained results indicate the interdependence of postoperative cognitive dysfunction and the level of this marker and allow to continue research in the direction of determining biochemical beacons in the study of postoperative cognitive dysfunction in cancer patients to improve quality of life.

Conclusion.

According to the results of neuropsychological tests, we found postoperative cognitive dysfunction in patients with neoplasms of the abdominal cavity.

Anemia in the first week after surgery in middle-aged patients contributes to the development of a hypoxic state, in erythrocytes there is an increase in the content of 2,3 diphosphoglycerate, which promotes the transport of oxygen to tissues. During the week there is an increase in the intensity of the formation of 2,3 diphosphoglycerate, as evidenced by the ratio of 2,3 diphosphoglycerate to hemoglobin.

In elderly and senile patients, the changes are more pronounced: anemia with a significant decrease in erythrocytes and hemoglobin in the blood, a decrease in 2,3 diphosphoglycerate in erythrocytes, reflects changes in erythrocyte metabolism, namely a decrease in the biosynthesis of important organophosphorus compounds, in particular 2,3 diphosphoglycerate by reducing the basic enzymes of glycolysis.

Decreased energy metabolism in the elderly contributes to impaired cell function. With age, the content of adenosine triphosphate, 2,3 diphosphoglycerate decreases, thus increasing the affinity of hemoglobin for oxygen, impaired transport of oxygen to tissues, which leads to the development of hypoxia.

Disruption of energy metabolism and changes in the activity of glycolysis enzymes in erythrocytes contributes to a decrease in the concentration of 2,3 diphosphoglycerate, increase the affinity of hemoglobin for oxygen and the development of tissue hypoxia.

The obtained results indicate the interdependence of these processes and allow to continue research in this direction with the development of appropriate clinical and diagnostic measures and areas of intensive care to improve the condition of patients with abdominal tumors and their quality of life after surgery.

Prospects for further research.

Further study of the relationship of the main markers of pathogenetic processes affecting the occurrence of postoperative cognitive dysfunction in cancer patients at different stages of their treatment, the study of the dependence of changes in cognitive function, biochemical disorders at different stages of surgical treatment. It is promising to study cognitive function at all stages of the treatment protocol of each patient to achieve quality of life.

Conflict of interest.

The authors of the manuscript knowingly acknowledge the absence of actual or potential conflict of interest regarding the results of this work with pharmaceutical companies, manufacturers of biomedical devices, other organizations whose products, services, financial support may be related to the subject matter or sponsored.

Funding information.

Financing by expenditures of the State Budget of Ukraine.

REFERENCES

1. Vojckehovskij D. V., Aver'yanov D. A., SHCHegolev A. V., Svistov D. V. Vliyanie glubokoj anestezii na vozniknovenie posleoperacionnoj kognitivnoj disfunkcii. Vestnik anesteziologii i reanimatologii. 2018;15:5-9.
2. Dubiv'ska S. S., Grigorov YU. B. Viddaleni naslidki pislyaoperacijnoï kognitivnoï disfunkcii. Visnik problem biologii ta medicini. 2019;3:93-97.
3. Dubiv'ska S. S., Grigorov YU. B. Stan kognitivnoï funkicii v pershij tizhden' pislya operacii z vikoristannyam zagal'noï anestezii. Psihosomaticzna medicina ta zagal'na praktika. 2019;4:4-10.
4. Lisnij I. I., CHastota i korekciya kognitivnoï disfunkcii pislya hirurgichnih vtruchan'. Pain, anaesthesia and intensive care.:recenzovaniy naukovij medichnij zhurnal. Asociaciya anesteziologiv Ukraïni, Nacional'nij medichnij universitet imeni O.O. Bogomol'cya. - Kiïv : Nash format. 2018;1:88-89.
5. Luganova I.S., Blinov M.N. Opredelenie 2,3-difosfoglicerinovej kisloty neenzimaticeskim metodom i sodержaniya 2,3 difosfoglicerata i ATF v eritrocitah bol'nyh hronicheskim limfolejkozom. Laboratornoe. 1975;11:652-655.
6. SHaripova V.H., Valihanov A.A. Metody profilaktiki posleoperacionnoj kognitivnoj disfunkcii. Vestnik ekstretnoj mediciny. 2017; 1:84-91.
7. SHnajder N. A., Salmina A. B. Nevrologicheskie oslozhneniya obshchej anestezii. Krasnoyarsk: KrasGMA. 2004;383.
8. Avelino-Silva T. J., Campora F., Curiati J. A., Jacob-Filho W. Association between delirium superimposed on dementia and mortality in hospitalized older adults: a prospective cohort study. PLoS medicine. 2017;14:e1002264.
9. Evered L., Silbert B., Knopman D. S., Scott D. A., DeKosky S. T., Rasmussen L. S., Oh E. S., Crosby G., Berger M.,

Eckenhoff R. G. Nomenclature Consensus Working Group. Nomenclature Consensus Working Group. Recommendations for the nomenclature of cognitive change associated with anaesthesia and surgery – 2018. *British journal of anaesthesia*. 2018;121:1005-1012.

10. Urits I., Orhurhu V., Jones M., Hoyt D., Seats A., Viswanath O. Current Perspectives on Postoperative Cognitive Dysfunction in the Ageing Population. *Turkish journal of anaesthesiology and reanimation*. 2019;47:439-447.

11. Bunyatyan A. A., Trekova N.A., Eremenko A.A. Rukovodstvo po kardioanesteziologii i intensivnoj terapii. Moskva: Medicinskoe informacionnoe agentst. 2015;704.

12. Usenko L. V. Posleoperacionnaya kognitivnaya disfunkciya v praktike vracha - anesteziologa *Medicina neotlozhnyh sostoyanij*. 2017;4:9-15.

13. Volkov O. O. Vpliv zagal'noi anestezii na piznaval'ni funkcii porodil' pislya kesareva rozтину. *Bukovinsk'ij medichnij visnik*. 2015;2:35-40.

14. Ovechkin A. M. Hirurgicheskij stress – otvet, ego patofiziologicheskaya znachimot' i sposoby modulyacii. *Regionarnaya anesteziya i lechenie ostroj boli*. 2008;2:49-62.

15. Berger M., Nadler J., Browndyke J. et al. Postoperative Cognitive Dysfunction: Minding the Gaps in our Knowledge of a Common Postoperative Complication in the Elderly. *Anesthesiology clinics*. 2015;33:517-550.

16. Bi J., Shan W., Luo A., Zuo Z. Critical role of matrix metalloproteinase 9 in postoperative cognitive dysfunction and age-dependent cognitive decline. *Oncotarget*. 2017; 8:51817-51829.

17. YAho N. N., Zaharov V. V., Koberskaya N. N. «Predumerennye» (sub"ektivnye i legkie) kognitivnye rasstrojstva. *Nevrologicheskij zhurnal*. 2017;22:198-204.

18. Brown C., Deiner S. Perioperative cognitive protection. *British journal of anaesthesia*. 2016;117:1152-1161.

19. Ghosh S. The possibility of postoperative cognitive dysfunction in obstetric anaesthesia following caesarean section. *Eropean Jornal of Anaesthesiology*. 2012;29:61-63.

20. Lyashenko E. A., Ivanova L. G., CHimagomedova A. SH. Postoperacionnaya kognitivnaya disfunkciya. *ZHurnal nevrologi i psihiatrii im. S.S. Korsakova*. 2020;120:39-45.

21. Pavlov O.O., Lucik S.O. Pislyaoperacijnij delirij u pacientiv pohilogo viku. *Medicina nevidkladnih staniv*. 2016;7:115-119.

22. Maleva O. V., Trubnikova O. A., Kuhareva I. N. i dr. Dinamika kognitivnogo statusa pri odnomomentnom vypolnenii koronarnogo shuntirovaniya i karotidnoj endarterektomii. *Grudnaya i serdechno-sosudistaya hirurgiya*. 2018;60:317-324.

23. Gons'kij YA. I. Biohimiya lyudini. Ternopil': Ukrmedkniga. 2019;732.

24. Dubiv'ska S.S. Znachennya 2,3-difosfogliceratu yak indikatoru gipoksii, shcho vplivae na perebig pislyaoperacijnoi kognitivnoi disfunkcii /S.S. Dubiv'ska. *Visnik problem biologii ta medicini*. 2020;1:128-131.

25. MacDonald R. Red cell 2,3-diphosphoglycerate and oxygen affinity. *Anaesthesia*. 1977;32:544-553.

26. Bajshukurova A.K. Obrazovanie 2,3- DFG v eritrocitah pri eksperimental'nyh vozdeystviyah izmenyayushchihsya uslovij transporta kisloroda. Avtoreferat dissertacii na soiskanie nauchnoj stepeni k.b.n.,1983;24.

27. Ploszczyca K, Czuba M, Chalimoniuk M, Gajda R, Baranowski M. Red Blood Cell 2,3-Diphosphoglycerate Decreases in Response to a 30 km Time Trial Under Hypoxia in Cyclists. *Front Physiol*. 2021;12:670977.

28. Tihonova A.D. Toksicheskoe dejstvie beta-amiloidnogo peptida 25-35 na eritrocitah raznyh vozrastnyh populyacij. Avtoreferat dissertacii na soiskanie uchenoj stepeni kandidata biologicheskikh nauk. –Pushchino.2017;24.

29. Luriya A. R. Vysshie korkovye funkcii cheloveka. SPb.: Piter. Seriya Mastera psihologii. 2020:768.

DYNAMICS OF CHANGES IN 2,3 DIPHOSPHOGLYCERATE AND COGNITIVE DYSFUNCTION IN THE POSTOPERATIVE PERIOD IN PATIENTS WITH ABDOMINAL NEOPLASMS
Dubiv'ska SS., Hryhorov Yu.B., Lazyrskyi V.O., Goloborodko M.M.

Kharkov National Medical University, Kharkov, Ukraine.

Abstract.

Background. The problem of analysis of clinical - diagnostic and biochemical criteria of postoperative cognitive dysfunction in abdominal oncosurgery, depending on the degree and structure of disorders, remains unresolved, which determines its relevance. The role of 2, 3-diphosphoglycerate is essential, because its increase in the concentration of red blood cells in hypoxic conditions is one of the adaptive mechanisms that improve oxygen transport to tissues.

Purpose. The influence of the dynamics of 2,3 diphosphoglycerate content, as the main indicator of hypoxia, on the occurrence of cognitive dysfunction in the postoperative period in patients with neoplasms of the abdominal cavity.

Materials and methods. The study was conducted on the basis of departments for patients of the surgical profile of the municipal institution "Kharkiv City Clinical Hospital of Ambulance and Emergency Care named after Professor OI Meshchaninov ". To achieve this goal, we examined 80 patients with abdominal neoplasms who underwent surgery under general anesthesia using propofol and fentanyl. All patients were divided into 2 groups depending on the age of patients on the WHO scale, who underwent surgery using general anesthesia: Group 1 (n = 39) - middle-aged patients (50-59 years); Group 2 (n = 41) - elderly and senile patients (60-80 years). The control points of the examination were the day before the operation and the 1st, 7th, 30th day from the moment of the operation. The state of cognitive function in these patients was determined by conducting neuropsychological tests. To assess the state of cognitive function of patients, neuropsychological tests were used: MMSE scale (Mini-Mental State Examination, MMSE), the method of memorizing 10 words AR Luria, frontal dysfunction battery (FAB), Schulte technique. To assess the state of energy metabolism in patients, the level of erythrocytes and hemoglobin in the blood analysis was determined by well-known methods, the level of 2,3 diphosphoglycerate in erythrocytes and its ratio to hemoglobin.

Results and discussion. Anemia in the first week after surgery in patients of group 1 contributes to the development of a hypoxic state, in erythrocytes there is an increase in the content of 2,3

diphosphoglycerate, which promotes the transport of oxygen to tissues. During the week there is an increase in the intensity of the formation of 2,3 diphosphoglycerate, as evidenced by the ratio of 2,3 diphosphoglycerate to hemoglobin. In patients of group 2, the changes are more pronounced: anemia with a significant decrease in erythrocytes and hemoglobin in the blood, a decrease in 2,3 diphosphoglycerate in erythrocytes, reflects changes in erythrocyte metabolism, namely a decrease in biosynthesis of important organophosphorus compounds, in particular 2,3 diphosphogly by reducing the basic enzymes of glycolysis. Decreased energy metabolism in the elderly contributes to impaired cell function. With age, the content of adenosine triphosphate, 2,3 diphosphoglycerate decreases, thus increasing the affinity of hemoglobin for oxygen, impaired transport of oxygen to tissues, which leads to the development of hypoxia.

Conclusions. According to the results of neuropsychological tests, we found postoperative cognitive dysfunction in patients with neoplasms of the abdominal cavity. Disruption of energy metabolism and changes in the activity of glycolysis enzymes in erythrocytes contributes to a decrease in the concentration of 2, 3 diphosphoglycerate, increase the affinity of hemoglobin for oxygen and the development of tissue hypoxia. The obtained results indicate the interdependence of these processes and allow continuing research in this direction with the development of appropriate clinical and diagnostic measures and areas of intensive care to improve the condition of patients with abdominal tumors and their quality of life after surgery.

Keywords. Oncosurgery, anesthesia, cognitive function, hypoxia, 2, 3-diphosphoglycerate, surgical concussion.

Резюме

Актуальність. Проблема аналізу клініко - діагностичних та біохімічних критеріїв післяопераційної когнітивної дисфункції при абдомінальній онкохірургії в залежності від ступеня та структури порушень, залишається невирішеною повною мірою, чим і визначається її актуальність. Роль 2,3 дифосфогліцерату є невід'ємною, тому що його підвищення концентрації в еритроцитах крові при гіпоксичних станах є одним з адаптивних механізмів, що забезпечує покращення транспорту кисню до тканин.

Мета роботи – вплив динаміки вмісту 2,3 дифосфогліцерату, як головного індикатора гіпоксії, на виникнення когнітивної дисфункції у післяопераційному періоді у хворих з новоутвореннями черевної порожнини.

Матеріали та методи. Дослідження було проведено на базі відділень для пацієнтів хірургічного профілю комунального закладу «Харківська міська клінічна лікарня швидкої та невідкладної медичної допомоги імені професора О.І. Мещанінова». Для досягнення мети дослідження було обстежено 80 пацієнтів з новоутвореннями черевної порожнини, яким проводили оперативне втручання під загальною анестезією з використанням пропофолу та фентанілу. Всі пацієнти розподілялись на 2 групи в

залежності від віку пацієнтів за шкалою ВООЗ, яким проводиться оперативне втручання з використанням загальної анестезії: 1-ша група (n=39) – пацієнти середнього віку (50-59 років); 2-га група (n=41) – пацієнти похилого та старечого віку (60-80 років). Точками контролю обстеження були доба до операції та 1-ша, 7-ма, 30-та доба від моменту операції. Визначали стан когнітивної функції у даних хворих шляхом проведення нейропсихологічних тестів. Для оцінки стану когнітивної функції пацієнтів були використані нейропсихологічні тести: шкала MMSE (Mini-Mental State Examination, MMSE), методика запам'ятовування 10-ти слів А.Р. Лурія, батарея лобної дисфункції (FAB), методика Шульте. Для оцінки стану енергетичного обміну у хворих визначали рівень еритроцитів та гемоглобіну у аналізі крові загальновідомими методами, рівень 2,3 дифосфогліцерату в еритроцитах та співвідношення його до гемоглобіну.

Результати та їх обговорення. Анемія на першому тижні після операції у хворих 1 групи сприяє розвитку гіпоксичного стану, в еритроцитах спостерігається підвищення вмісту 2,3 дифосфогліцерату, що сприяє транспорту кисню до тканин. Протягом тижня спостерігається підвищення інтенсивності утворення 2,3 дифосфогліцерату, про що свідчить співвідношення показника 2,3 дифосфогліцерату до гемоглобіну. У хворих 2 групи зміни носять більш виразний характер: анемія зі значним зниженням кількості еритроцитів та гемоглобіну в крові, зниження вмісту 2,3 дифосфогліцерату в еритроцитах, відображає зміни в метаболізмі еритроцитів, а саме зниження біосинтезу важливих фосфорорганічних сполук, зокрема 2,3 дифосфогліцерату за рахунок зниження основних ферментів гліколізу. Зниження енергетичного обміну у людей похилого віку сприяє порушенню функціональної здатності клітин. З віком у людини знижується вміст аденозинтрифосфату, 2,3 дифосфогліцерату, таким чином підвищується спорідненість гемоглобіну до кисню, порушується транспортування кисню до тканин, що призводить до розвитку гіпоксії.

Висновки. За отриманими результатами нейропсихологічних тестів нами встановлена післяопераційна когнітивна дисфункція у хворих з новоутвореннями черевної порожнини. Порушення енергетичного обміну та зміни активності ферментів гліколізу в еритроцитах сприяє зниженню концентрації 2,3 дифосфогліцерату, підвищенню спорідненості гемоглобіну до кисню та розвитку тканинної гіпоксії. Отримані результати вказують на взаємозалежність цих процесів та дозволяють продовжити дослідження в цьому напрямку з розробкою відповідних клініко-діагностичних заходів та напрямків інтенсивної терапії для покращення стану хворих з новоутвореннями черевної порожнини та якості їх життя після операції.

Ключові слова: онкохірургія, анестезія, когнітивна функція, гіпоксія, 2,3 дифосфогліцерат, хірургічний струс.