GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 1 (370) Январь 2026

ТБИЛИСИ - NEW YORK

ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

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. Published since 1994. Distributed in NIS, EU and USA.

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.

GEORGIAN MEDICAL NEWS
NO 1 (370) 2026

Содержание:

CLOSED HEALING OF THE PALATE MUCOSA: INDEX ASSESSMENT AND CLINICAL SIGNIFICANCE

Yusup A. Bakaev, Mariya E. Makarova, Zurab S. Khabadze, Nikita A. Dolzhikov, Gor G.Avetisian, Dzhandet F. Rasulova, Anastasya A. Ivina, Ekaterina E. Starodubtseva, Daria A. Pervozvanova, Alisa A. Vavilova, Khalid Yu. Halituev, Oleg S. Mordanov, Anastasiya V. Mordanova.

Peoples' Friendship University of Russia named after Patrice Lumumba, Moscow, Russian Federation.

Abstract.

Introduction: Assessment of wound healing in the oral cavity is essential for clinical decision-making after soft tissue surgical procedures. In palatal donor sites managed with wound coverings, direct visual evaluation of epithelialization is limited, creating the need for a dedicated and standardized closed-healing assessment tool.

Objective: To describe and clinically validate the Closed Palatal Mucosal Healing Index (CPMHI) for the assessment of palatal donor site healing under conditions of wound coverage.

Materials and Methods: A total of 192 patients undergoing surgical treatment involving palatal donor tissue harvesting were initially enrolled as part of a broader clinical dataset. For the purposes of CPMHI validation, the present study specifically analyzed two groups (Groups 3 and 4; n = 64) in which the donor site was managed using a collagen sponge fixed with sutures and covered with either ethyl or butyl cyanoacrylate adhesive. Clinical evaluation of healing was performed on postoperative days 7 and 14 using the CPMHI. Statistical analysis was conducted to compare healing dynamics between the two groups.

Results: On postoperative day 7, the majority of patients in both groups demonstrated satisfactory healing (CPMHI score 3), with no statistically significant differences between Group 3 and Group 4 ($p > 0.05$). By day 14, most patients achieved good or excellent healing (CPMHI scores 4–5), indicating effective integration of the wound covering and minimal inflammatory response. No statistically significant intergroup differences were detected at either time point ($p > 0.05$).

Conclusion: The Closed Palatal Mucosal Healing Index demonstrated clinical applicability, objectivity, and convenience for assessing palatal wound healing in the presence of wound coverings. CPMHI represents a reliable tool for standardized evaluation of closed healing dynamics in clinical practice and research settings.

Key words. Palatal mucosa, wound healing, donor site, collagen sponge, cyanoacrylate adhesive, healing index.

Introduction.

Monitoring of wound healing after any surgical intervention plays an important role in the successful outcome of the operation [1]. An integral part of most surgical procedures in the oral cavity is the removal of a donor autograft [2]. The response of wound healing after removal from the donor site to any tissue damage is extremely important. The body's primitive defense mechanism is aimed at restoring tissue integrity. The first weeks after surgery are of paramount importance to maintain wound stability. The factors influencing the quality of healing are the nature of the tissue damage and the circumstances surrounding the wound closure. Wound healing is a complex phenomenon; the operating surgeon must have deep scientific knowledge and understand the mechanisms of restoring normal tissue and, thus, be able to intervene in case of any complications in order to promote a favorable outcome. For this reason, it would be useful to use scales or clear indexes to monitor wound healing [2,3].

The concept of wound healing: a wound occurs because of a violation of the integrity of the skin, mucous membrane, or organ tissue. After tissue damage, several consecutive but overlapping intracellular and extracellular pathways are activated, aimed at restoring tissue integrity. Any deviation or change from this sequence can lead to impaired wound healing [4-7]. The wound healing process is conventionally divided into the following phases: (a) coagulation and hemostasis; (b) inflammation; (c) proliferation; and (d) remodeling of the wound to form scar tissue [8-11]. Immediately after tissue damage, coagulation and hemostasis occur in the wound. The main purpose of these mechanisms is to prevent exsanguination and protect the vascular system, and in the long term, to provide a temporary matrix bed for penetrating cells that are needed at later stages of wound healing. All the indicators proposed in the literature in the field of maxillofacial surgery are used only to assess the condition of the soft tissues of the gums and periodontium. Unfortunately, so far no special literature or indicators have been found regarding the assessment of the healing of the mucous membrane of the palate after any surgical interventions. This article proposes a modified method for the index assessment of the healing of the palate mucosa, based on the nature of the rupture of the mucous membrane, the divergence of the wound edges, pallor, erythema, flap instability and infection.

Aim: To describe and clinically validate the Closed Palatal Mucosal Healing Index in patients with palatal wounds managed under wound coverings.

Materials and Methods.

This study was conducted at the Department of Therapeutic Dentistry, RUDN University, 192 patients were examined and surgically treated with a diagnosis: 96 with localized gum recession (ICD-10: K06.0) and 96 with tooth loss due to trauma, extraction, or localized periodontitis (ICD-10: K08.1). The present manuscript focuses on the methodological validation of the Closed Palatal Mucosal Healing Index (CPMHI) under conditions of wound coverage, where direct visual assessment of epithelialization is limited. After the examination and diagnosis, patients who met the inclusion criteria were randomly divided into 6 study groups (n = 32 per group):

1. Group 1: donor site covered with ethyl-cyanoacrylate adhesive.

2. Group 2: donor site covered with butyl-cyanoacrylate adhesive.

3. Group 3: donor site covered with collagen sponge, fixation sutures, and ethyl-cyanoacrylate adhesive.

4. Group 4: donor site covered with collagen sponge, fixation sutures, and butyl-cyanoacrylate adhesive.

5. Group 5: donor site covered with collagen sponge and fixation sutures.

6. Group 6: donor site covered with a polypropylene obturation mouthguard.

Although six clinical groups were initially formed as part of a broader prospective clinical dataset (n = 192), the present study specifically analyzes Groups 3 and 4. These groups were selected because they represent wound management strategies involving stable wound coverings (collagen sponge with fixation), which preclude direct visualization of epithelialization and therefore require a dedicated closed-healing assessment tool. Groups 1, 2, 5, and 6, despite being part of the overall clinical cohort, were not included in the CPMHI validation analysis presented in this manuscript. These groups were managed using open-healing or alternative wound management strategies and are part of a broader clinical dataset not analyzed in the present study.

Palatal wound healing after graft harvesting was assessed using the Closed Palatal Mucosal Healing Index (CPMH), adapted from the Landry, Turnbull, and Howley healing index (1988). The modified index incorporated additional clinical parameters relevant to palatal tissue, including hemostasis, inflammation, and wound coverage.

Clinical evaluation was performed on postoperative days 7 and 14, corresponding to the proliferative phase of secondary healing. The groups 1,2,5,6 were evaluated using the Palatal Mucosal Open-Healing Index. Examinations were carried out under natural or artificial illumination with a headlamp and dental mirrors. To ensure reproducibility, standardized macrophotographs of the wound surface were taken with a Canon EOS 550D camera and 100 mm macro lens at a fixed distance. Evaluator calibration was performed prior to the start of the study. Two independent clinicians were trained using a reference set of standardized clinical photographs representing CPMHI scores 2, 3, 4, and 5. Calibration was repeated until inter-examiner agreement reached a Cohen's kappa coefficient ≥ 0.80, indicating substantial agreement. All subsequent assessments were performed independently, and disagreements were resolved by consensus.

A modified healing index was used to evaluate the healing of the palate mucosa after surgery (removal of a donor tissue site). In the framework of this study, an independent clinical index was developed and proposed for a standardized quantitative assessment of the healing of the donor palate: the index of closed healing of the palate mucosa (CPMHI), designed to assess healing in the presence of a coating (for example, a collagen sponge fixed with suture materials, etc.), which makes it difficult to directly visualize epithelialization.

The index was developed based on the Landry, Turnbull, and Howley scale (1988) and adapted for the palate mucosa to include additional clinical parameters such as signs of hemostasis and inflammation, and the condition of the wound covering. The assessment was performed on the 7th and 14th days after surgery, which corresponds to the stage of proliferation of secondary wound surface healing [5].

The examination was carried out under natural or artificial lighting using a headlamp and dental mirrors. To increase the objectivity of the assessment, a standardized macro photograph of the wound surface (Canon EOS 550D camera with a 100 mm macro lens) was taken from a single fixed distance. To assess the healing of the donor area while maintaining the wound coating, the CPMHI was proposed and tested, a modified scale based on visual and palpatory clinical signs of the coating condition, wound edges and inflammation. The assessment was based on four clinical signs: the condition of the coating, the wound edges, the inflammatory reaction and the overall impression using five points (0-5). The scale of the index of closed healing of the palate mucosa is shown in Table 1. The obtained scores were used to analyze the dynamics of healing over time, as well as for comparative analysis between the study groups. Representative clinical photographs are provided for the

Table 1. *The index of closed healing of the palate mucosa.*

Score	The coating condition	The condition of the wound edges	Signs of inflammation	General conclusion
0	The coating is partially or completely lost, with necrosis of the underlying tissues	The edges of the wound are bleeding, macerated	Purulent exudate, marked edema and hyperemia	Decompensated, pathological healing
1	The coating is peeled off, loose, with signs of destruction	The edges are swollen, with maceration or hyperemia > 2 mm	Obvious inflammation (swelling, exudate, pain)	Extremely poor healing
2	The coating is partially fixed, with areas of peeling, wet	Hyperemia/edema of the edges < 2 mm	Moderate inflammation	Delayed healing
3	The coating is well fixed, partially moistened, and does not cause irritation.	The edges are pink, minimal edema	Minor inflammation (edema, erythema < 1 mm)	Satisfactory healing
4	The coating is dry, adheres tightly, visually without detachable	The edges are pink, minimal swelling	No or minimal inflammation	Good healing, epithelialization is expected
5	The coating is fully integrated, with signs of organization (retraction, sealing), there is no detachable	Edges without signs of inflammation	No inflammation	Excellent healing, epithelialization with invagination into the submucosal layer is likely.

most clinically relevant CPMHI scores observed in the study cohort (Scores 3 and 5). Scores 2 and 4 are described in detail in Table 1 to ensure full interpretability of the scale.

Evaluation criteria were presented for ease of understanding the index scale:

A score of 0 reflects a severe, pathological course of healing with signs of severe decompensation. The coating of the wound surface is either completely or partially lost, and areas of necrosis are visualized in the underlying tissues, indicating deep damage and impaired repair. The edges of the wound are macerated and bleeding, which indicates the destruction of the vascular and cellular structure. Purulent exudate is present, pronounced edema and hyperemia, which confirms the presence of an active inflammatory process. In general, the clinical picture is characterized as extremely unfavorable, with obvious signs of complicated healing and no signs of tissue repair.

A score of 1 corresponds to extremely unfavorable, pathological healing. The coating of the wound surface is detached, loose, with signs of destruction, which indicates a violation of regeneration processes and insufficient fixation of tissues. The edges of the wound are noticeably swollen, with maceration or hyperemia of more than 2 mm, indicating significant inflammation. Clinically, there are obvious signs of an inflammatory reaction – intense edema, exudation, possibly soreness. This condition requires special attention, as it indicates a pronounced violation of reparative processes and a high risk of complications.

A score of 2 characterizes the healing state as slow and unstable. The coating of the wound surface is partially fixed, but areas of its detachment remain, the wound surface is wet, which indicates insufficient tissue organization. The edges of the wound are moderately hyperemic or edematous, while the signs of inflammation are moderate – mild soreness, serous discharge, or edema are possible. This condition indicates that the healing process is underway, but lagging the normal pace, and requires monitoring to rule out a transition to a complicated course.

A score of 3 is given when the formed integument (fibrin plaque, granulation tissue, or early epithelium) adheres securely to the underlying tissues, does not peel off, and is not mobile during visual or instrumental examination. "Partially moistened" means that the surface is not completely dried, or there may be a slight moisture typical of early granulation tissue, there is no pronounced discharge (exudate), but the surface is not yet completely covered with mature epithelium. The absence of irritation means that the coating does not cause itching or flushing and also does not show signs of inflammation during visual or tactile contact. This condition reflects a favorable course of reparative processes and corresponds to a satisfactory level of healing.

A score of 4 is given in the presence of a dry coating that fits snugly, visually without separating – in the absence of an exudative or macerated surface, the absence of discharge on palpation, as well as the presence of a visually compacted, partially dehydrated coating that does not change its shape upon contact. The clinical significance of the "dry coating" is the absence of active exudation, that is, there is no serous, hemorrhagic or purulent discharge under the coating and on its surface, and with careful palpation, the coating remains dry, does not stick and does not get wet. Maceration of the wound edges manifested itself in the form of swelling, whitening and softening of the mucous membrane tissues along the periphery of the defect, which was regarded as a negative factor indicating an excess of exudate and a slowdown in regeneration. The beginning of material dehydration: for example, a collagen sponge may dry out, thicken, or lose its looseness after 5-7 days – this is a sign of the beginning of its natural degradation or integration. No signs of infection: dryness of the coating, which indicates the absence of inflammatory fluid, which is a positive sign of healing. Normal consistency of the tissue around the wound covering: a dry covering is usually accompanied by a dry, moderately dense mucosa around it.

A score of 5 is given when the coating is integrated, that is, a condition in which the coating material (for example, a collagen sponge) adheres tightly and evenly to the wound, without signs of detachment or mobility; fixed biologically, and not only mechanically (for example, fibrin, tissue matrix); began to participate in repair – this can manifest itself as retraction coating deep into the wound (it is "pulled in" by the forming granulation tissue); compaction and drying of the material, while keeping it in place; absence of an inflammatory reaction around the coating; replacement of the material by host tissues (in the case of biodegradable materials). This coating does not irritate the tissues and does not serve as a barrier to epithelialization. That is, the complete integration of the coating is characterized by its tight fixation without signs of detachment, absence of separable, retraction and/or sealing, indicating its participation in the reparative process. This condition is considered as an excellent clinical sign of the healing stage.

Groups 3 and 4 were evaluated using the index of closed healing. Accordingly, all statistical analyses in this manuscript were performed exclusively on data obtained from Groups 3 and 4, which constituted the validation cohort for the Closed Palatal Mucosal Healing Index. The statistical analysis was performed using the IBM SPSS 26 program. The nonparametric Kruskal–Wallis criterion (Dunn's test for pairwise comparisons) and Mann–Whitney were used to assess the significance of differences between the analyzed groups in terms of the CPMHI scale. Data from the remaining clinical groups will be addressed in separate analyses focusing on open-healing dynamics and alternative wound management approaches.

Results.

As an illustration, a table of the joint distribution of groups by points is provided (Table 2). The differences were considered statistically significant at $p < 0.05$.

CPMHI was used to evaluate healing under the wound coating. The scale includes 5 points (0-5), where 5 corresponds to the complete integration of the coating and the absence of inflammation. On day 7 in group 3: 18.8% - score 2 (poor healing: the coating is partially fixed, there are areas of detachment, moderate inflammation), 56.2% – score 3 (satisfactory healing: the coating is well fixed, but partially moistened, minimal swelling), 25.0% – score 4 (good healing: the coating is dry, adheres tightly, and there is no inflammation). Group 4 showed

Table 2. *Joint distribution of groups according to the scores of the CPMHI in groups 3 and 4.*

CPMHI scale score on day 7	Group 3	Group 4
2 – delayed healing	18,8%	18,8%
3 – satisfactory healing	56,2%	71,8%
4 – good healing, epithelialization expected	25,0%	9,4%

Table 3. *Aggregated data on the distribution of CPMHI scale scores on day 14 for groups 3 and 4.*

CPMHI scale score on day 14	Group 3	Group 4
4 - good healing, epithelialization expected	31,2%	28,2%
5 – excellent healing, epithelialization with invagination is likely.	68,8%	71,8%

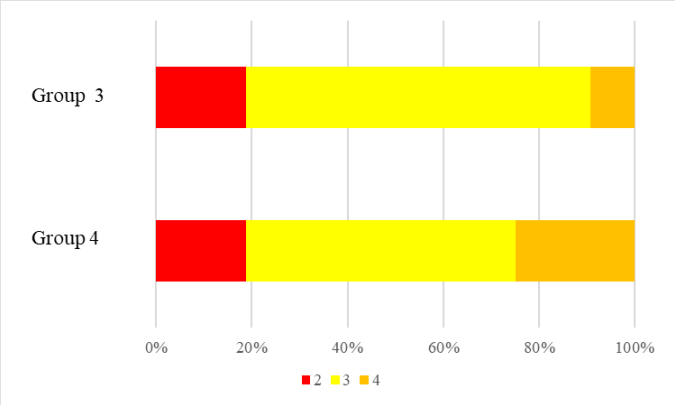

Figure 1. *Aggregated data on the distribution of the CPMHI scale scores on day 7 for groups 3 and 4.*

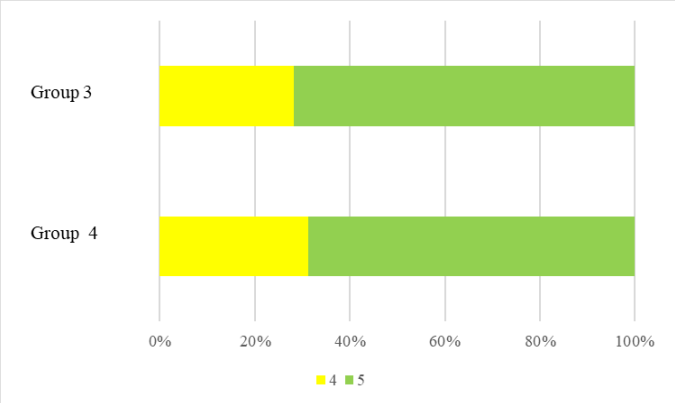

Figure 2. *Aggregated data on the distribution of the scale scores on day 14 for groups 3 and 4.*

the following results: 18.8% – score 2, 71.8% – score 3, 9.4% – score 4. In both groups, a score of 3 prevails, which corresponds to satisfactory healing with minimal signs of inflammation. No statistically significant differences in CPMHI scores between Group 3 and Group 4 were observed on postoperative day 7 (Mann–Whitney U test, p = 0.306).

When using a wound coating, most patients experience satisfactory healing by day 7, and complete integration of the material by day 14. This confirms that wound coverings (for example, collagen sponges fixed with sutures and coated with medical glue) effectively support healing, preventing infection and accelerating regeneration. The aggregated data on the distribution of the CPMHI scale scores on day 7 for groups 3 and 4 are shown graphically in Figure 1.

By day 14, most patients had achieved good or excellent healing. The differences between the groups are insignificant (p = 0.786), which indicates a similar healing dynamic in the long term (Table 3). No statistically significant differences were found (Mann–Whitney U 447,000; p = 0.306). The results of the comparative analysis showed that on day 14, the groups were comparable in terms of CPMHI scale scores (Mann -Whitney U 528,000; p = 0.786).

On day 7, the majority of patients in both groups showed moderate healing (score 3). By day 14, most patients had good (score 4) or excellent (score 5) healing, which indicates a positive trend (Figure 2).

Examples of the clinical application of the closed healing index are presented in clinical cases.

Clinical case 1.

Group 3: collagen sponge fixed with seams and adhesive application based on ethyl cyanoacrylate. After the examination, the patient was diagnosed with gum recession (ICD-06.00). Gum recession surgery was performed on the lower jaw in the frontal region using a collagen sponge coating as a method of managing the donor area, followed by the application of fixing

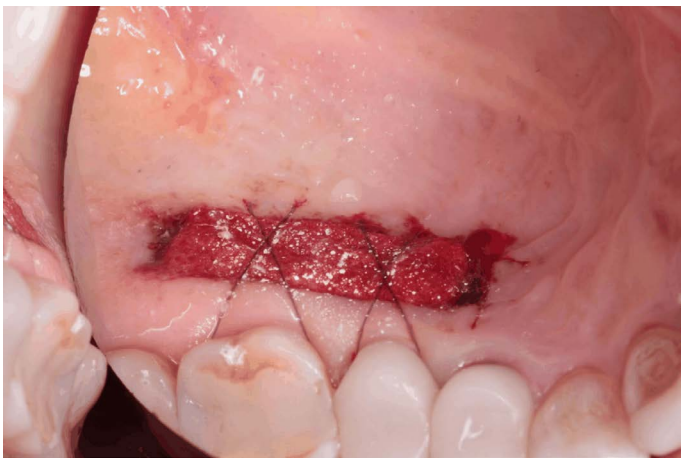

Figure 3. *The state of the donor area on the day of surgery.*

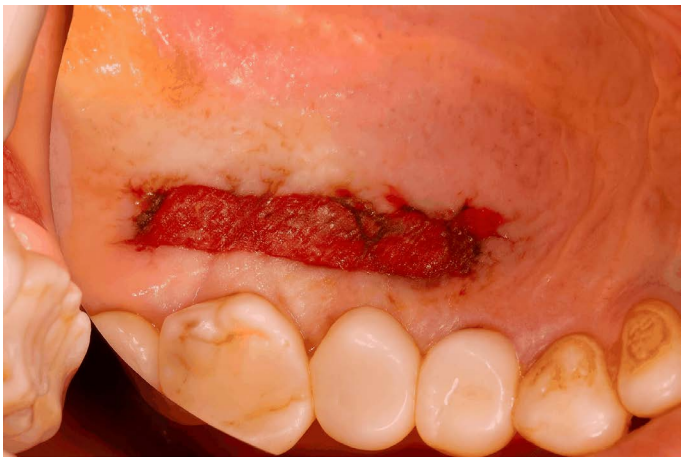

Figure 4. *Donor area on the 7th day. Score 3 on the CPMHI (the wound covering is well fixed, partially moistened, does not cause irritation, minimal swelling, minor inflammation-satisfactory healing).*

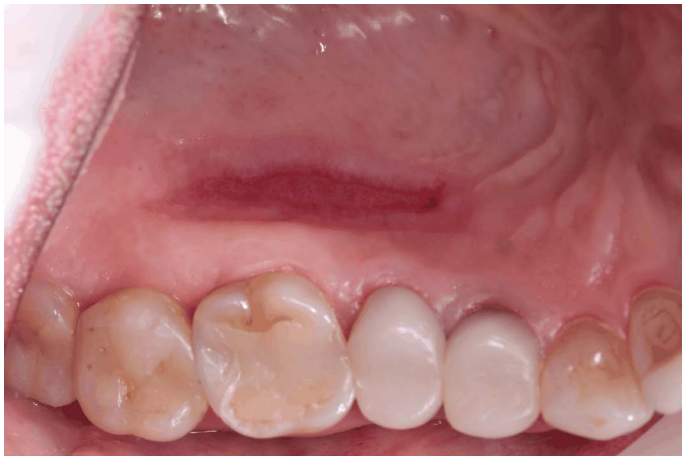

Figure 5. *Donor area on the 14th day. Score 5 on the CPMHI (the coating is fully integrated with the signs of organization, the edges without signs of inflammation – excellent healing).*

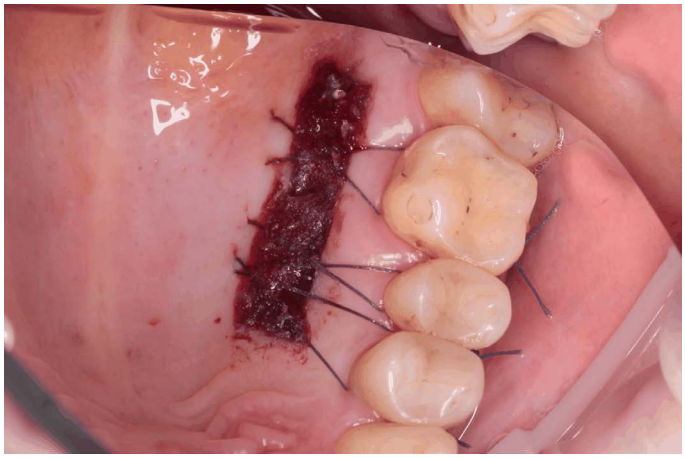

Figure 6. *The state of the donor area on the day of surgery.*

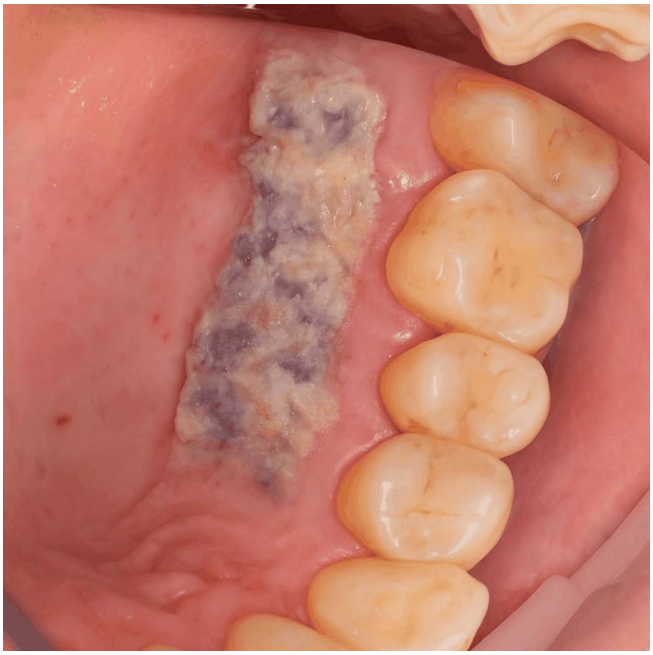

Figure 7. *Donor area on the 7th day. Score 3 on the CPMHI (the wound covering is well fixed, partially moistened, does not cause irritation, minimal swelling, minor inflammation-satisfactory healing).*

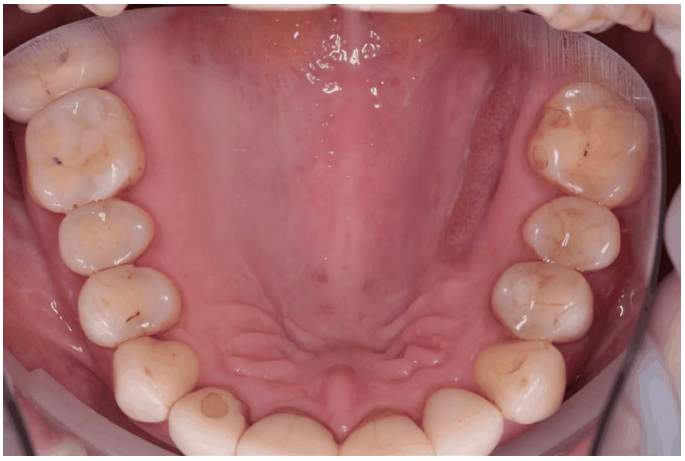

Figure 8. *Donor area on the 14th day. Score 5 on the CPMHI (the coating is fully integrated with the signs of organization, the edges without signs of inflammation – excellent healing).*

sutures and medical glue based on ethyl cyanoacrylate (Figures 3,4 and 5).

Clinical case 2.

Group 4: collagen sponge fixed with sutures and application of medical glue based on butyl cyanoacrylate. The patient was referred by an orthodontist for gum recession surgery on the lower jaw in the frontal region. After the examination, the gum recession was diagnosed (ICD-06.00). A gum recession surgery was performed using a collagen sponge coating as a method of managing the donor area, followed by the application of fixing sutures and medical glue based on butyl cyanoacrylate (Figures 6,7 and 8).

Discussion.

The index of closed healing of the palate mucosa is a modified clinical index for assessing the healing of the palate mucosa against the background of persistent, obstructive visual assessment of epithelialization [12,13].

Cyanoacrylate-based adhesives differ in their biological behavior depending on the length of the alkyl side chain, which influences polymerization dynamics, degradation rate, and tissue response. Ethyl cyanoacrylate is known to polymerize rapidly and degrade faster, releasing by-products that may induce a more pronounced initial inflammatory reaction. In contrast, butyl cyanoacrylate possesses a longer alkyl chain, resulting in slower degradation, reduced cytotoxicity, and improved biocompatibility, which has been reported in both experimental and clinical studies.

Despite these theoretical differences, the present study did not demonstrate statistically significant differences in healing outcomes between ethyl and butyl cyanoacrylate when used in combination with a collagen sponge and fixation sutures. This finding suggests that, within the clinical conditions studied, both adhesives provide a comparable biological environment for palatal wound healing. Importantly, the CPMHI proved capable of consistently assessing healing dynamics irrespective of the specific cyanoacrylate used, supporting its applicability as a standardized tool for closed-healing evaluation.

The results obtained confirmed the clinical validity of the use of CPMHI for monitoring reparative processes in the donor region

of the palate. On day 7, satisfactory healing prevailed in both groups, which is consistent with the phase of active granulation and early epithelialization. By day 14, a clear positive trend was recorded – most patients had a good or excellent result, reflecting the completion of the proliferation stage and the beginning of tissue remodeling. A comparative analysis between the groups using different types of medical adhesives (ethyl and butyl cyanoacrylate) did not reveal statistically significant differences in the rate and quality of healing. This indicates the comparable effectiveness of these methods of managing the donor zone. Thus, the proposed index makes it possible to objectively record the dynamics of healing and can be used both in clinical practice to assess the condition of patients and in scientific research to compare different methods of closing donor wounds [14,15]. Its advantages are ease of use, reproducibility, and the possibility of standardized analysis.

Conclusion.

The CPMHI which considers the specifics of the use of wound coverings, is a reliable clinical tool that allows an objective assessment of the quality of healing according to key criteria. The use of CPMHI can be recommended for clinical practice and scientific research as an objective index for assessing the healing of the donor palate. The use of this index will make it easier to monitor and evaluate postoperative wound healing and will help identify any early signs of wound layers diverging and infection. Further clinical studies are also needed to evaluate all the characteristics of the developed index.

Conflict of interests.

The authors declare no conflict of interests.

Acknowledgements.

There are no financing and individual acknowledgements for declaration.

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