GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 3 (360) Март 2025

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 3 (360) 2025

Содержание:

GEORGIAN MEDICAL NEWS
No 3 (360) 2025

SYSTEMATIC REVIEW OF WOUND DRESSINGS FOR PALATAL DONOR SITE MANAGEMENT IN ORAL SOFT TISSUE SURGERY

Khabadze Z.S, Bakaev Yu.A, Mordanov O.S, Magomedov O.I, Ivina A.A, Inozemtseva K.S, Badalov F.V, Umarov A.Yu, Wehbe Ahmad, Kakabadze E.M, Dashtieva M.Yu.

Peoples' Friendship University of Russia named after Patrice Lumumba (RUDN University), Institute of Medicine, Miklukho-Maklaya str. 6, Moscow 117198, Russia.

Abstract.

Objective: This systematic review aimed to evaluate the effectiveness and safety of various wound dressings used to manage palatal donor sites following soft tissue graft harvesting in oral surgery.

Materials and Methods: A comprehensive literature search was conducted across PubMed, Scopus, Google Scholar, and RINC in March 2025, following PRISMA 2020 guidelines. Eligible studies included randomized controlled trials, cohort studies, and observational designs published in English or Russian from 2010 to 2024. The primary outcomes assessed were pain reduction, epithelialization rate, healing time, and incidence of complications. Risk of bias was evaluated using the Cochrane RoB 2.0 tool.

Results: Of the 261 identified records, 220 remained after duplicate removal, and 40 full texts were assessed. Nine studies met inclusion criteria and were synthesized qualitatively. Platelet-rich fibrin (PRF) was the most consistently effective material, demonstrating reduced pain and faster epithelialization. Collagen matrices and cyanoacrylate adhesives also showed promising, albeit variable, outcomes. Methodological heterogeneity across studies precluded meta-analysis.

Conclusions: PRF appears to be the most reliable wound dressing for palatal donor site healing, with collagen-based and synthetic alternatives serving as viable options. Future high-quality trials with standardized methodologies are necessary to support evidence-based recommendations in periodontal and oral soft tissue surgery.

Key words. Palatal donor site, platelet-rich fibrin, wound dressing, oral soft tissue graft, collagen matrix, cyanoacrylate, healing.

Introduction.

Oral soft tissue grafting is a critical surgical procedure aimed at restoring the aesthetic and functional characteristics of periodontal tissues. Harvesting a soft tissue graft from the palate is one of the most common techniques for gingival reconstruction, particularly in cases of recession or when increasing the width of keratinized attached gingiva is required. One of the key determinants of successful surgical outcomes is the quality of wound coverage at the donor site following graft harvesting [1]. Several studies have examined various methods to enhance healing and reduce patient morbidity at the palatal donor site, including the use of collagen matrices, platelet-rich fibrin, and minimally invasive harvesting approaches [2-4]. Moreover, the thickness of the palatal mucosa and individual anatomical variations have been reported to significantly influence healing outcomes [5].

Currently, a wide variety of wound dressings have been developed to improve the healing process and optimize the outcomes of reconstructive interventions. The application of wound coverings must be carried out with caution and clinical justification, taking into account their efficacy and safety for patients [6]. Modern approaches include the use of resorbable collagen sponges, cross-linked membranes, and autologous biomaterials such as platelet-rich fibrin, which have shown promising results in terms of tissue integration and reduced inflammation [7,8]. Additionally, novel biomaterials such as hydrogel-based scaffolds and nanofibrous matrices are being investigated for their potential to promote angiogenesis and accelerate wound closure [9,10].

The relevance of using various dressing materials lies in the need to minimize postoperative complications such as bleeding, pain, inflammation, and delayed epithelialization of the palatal donor site. Modern biomaterials—including platelet concentrates, collagen matrices, and synthetic membranes—have demonstrated strong clinical efficacy and predictable healing outcomes. Comparative clinical trials have shown that collagen-based dressings significantly reduce healing time and discomfort compared to traditional approaches [11,12]. Platelet-rich fibrin (PRF) has also gained popularity due to its autologous origin, ease of application, and ability to enhance both soft tissue healing and angiogenesis [13,14].

Despite numerous studies focusing on biomaterials, a comparative assessment of their clinical effectiveness and safety—specifically when applied to palatal donor sites—remains insufficiently systematized. This highlights the need for a critical review of the current literature with emphasis on wound healing parameters, epithelialization rates, and patient-reported outcomes such as discomfort and pain. While individual studies have reported favorable results for specific materials, direct head-to-head comparisons are rare, and methodological variability limits the generalizability of findings [15,16]. Furthermore, the heterogeneity in outcome reporting and follow-up durations complicates the creation of evidence-based clinical protocols [17,18].

Thus, a systematic review evaluating modern wound dressings used in oral soft tissue grafting serves as an important step toward evidence-based selection of the most effective and safest clinical solutions. Such a review can serve as a valuable guide for clinicians during treatment planning and help develop evidence-based recommendations for periodontists and oral surgeons [19]. Moreover, by synthesizing high-quality data on biomaterials, clinicians can better match material properties with patient-specific needs and anatomical conditions [4,20]. Clinical guidelines derived from such reviews also contribute to

standardizing care and minimizing postoperative complications across practices [21].

Objectives: To systematically evaluate outcomes of different dressing materials using the PICO framework: P – patients after palatal graft harvesting I – wound dressing application (e.g., PRF, collagen matrices) C – traditional healing without dressings or with standard gauze O – pain reduction, epithelialization rate, healing time, complication rates.

Materials and Methods.

This systematic review was conducted in accordance with the PRISMA 2020 guidelines. The methodology was designed to ensure a comprehensive and unbiased synthesis of available evidence on the effectiveness of wound dressings applied to palatal donor sites after soft tissue graft harvesting in oral surgery.

Eligibility Criteria:

The inclusion criteria were developed based on the PICO framework, with a focus on clinical relevance and methodological rigor. Eligible studies included randomized controlled trials (RCTs), cohort studies, case-control studies, and prospective or retrospective observational studies. All selected publications investigated the use of wound dressings in adult patients (aged 18 years and older) who underwent the harvesting of a soft tissue graft from the palatal region. Only articles published in English and Russian languages were considered, reflecting the scope of available peer-reviewed literature.

Studies were included if they evaluated the outcomes related to wound healing—such as the rate of epithelialization, incidence of postoperative complications (including bleeding and infection), healing time, and patient-reported pain levels. Exclusion criteria comprised in vitro studies, studies on animals, or studies not reporting relevant outcomes.

Information Sources and Search Strategy:

To identify potentially eligible studies, a comprehensive search was performed in the following databases: PubMed, Scopus, Google Scholar, and the Russian scientific citation index RINC. The final database search was conducted in March 2025. The search strategy involved a combination of keywords and MeSH terms such as “platelet-rich fibrin”, “collagen matrix”, “oral wound healing”, “palate donor site”, as well as their equivalents in Russian. Filters for language and date of publication were applied where available. No automation tools or AI-based screening software were utilized in the search process.

Study Selection Process:

The selection of studies was carried out independently by two reviewers in two stages. First, the titles and abstracts were screened to exclude clearly irrelevant records. Then, full texts of the remaining articles were retrieved and evaluated against the predefined inclusion criteria. Discrepancies between reviewers were resolved through discussion, and a consensus was reached in all cases. A PRISMA flow diagram was used to document the number of records at each stage of the selection process, from identification to final inclusion.

Data Collection and Extraction:

Data extraction was performed by two independent reviewers using a standardized extraction form. For each included study, the following data were collected: first author and publication year, study design, sample size, characteristics of the intervention and control groups, type of wound dressing applied, duration of follow-up, and primary and secondary outcomes. Particular attention was given to metrics such as pain intensity (measured using the Visual Analogue Scale — VAS), healing time, epithelialization rate, and incidence of complications (such as bleeding and infection). Demographic data including patient age and sex, as well as the anatomical location and size of the graft, were also recorded where available.

Risk of Bias Assessment:

The quality of the included studies and the potential for systematic error were assessed using the Cochrane Risk of Bias 2.0 (RoB 2.0) tool. Each study was independently evaluated across the five standard domains of bias: (1) randomization process, (2) deviations from intended interventions, (3) missing outcome data, (4) measurement of the outcome, and (5) selection of the reported result. Based on this evaluation, studies were categorized as having low risk, some concerns, or high risk of bias. The summary of the bias assessment was visually presented in a color-coded risk of bias matrix chart.

Outcome Measures and Data Synthesis:

For quantitative outcomes such as pain intensity and healing time, mean differences (MDs) were used as effect measures. Dichotomous outcomes, such as presence or absence of infection or bleeding, were reported as risk ratios (RRs). Due to the considerable clinical heterogeneity among the included studies — in terms of design, interventions, and outcome measures — a meta-analysis was not performed. Instead, a narrative synthesis was conducted to summarize the findings thematically and descriptively. Narrative synthesis was conducted using thematic grouping by material type. Subgroup meta-analysis was considered but not conducted due to insufficient comparable quantitative data.

Results.

A total of 261 records were initially identified through database searches (PubMed, Embase, elibrary) and manual reference checks. A comprehensive electronic search was conducted in PubMed, Scopus, and eLIBRARY from January 2013 to February 2024. The search strategy combined MeSH terms and free-text keywords using Boolean operators. The following query was applied:

(“Wound Healing”[MeSH] OR “Mucogingival Surgery”[MeSH] OR “Oral Surgical Procedures”[MeSH]) AND (“Cyanoacrylates” OR “Tissue Adhesives” OR “Fibrin Glue” OR “Collagen Membrane” OR “Platelet-Rich Fibrin” OR “PRF”) AND (“Palatal donor site” OR “free gingival graft”).

Additional limits: human studies, English and Russian language, full-text available.

After the removal of duplicates, 220 unique articles remained and were subjected to title and abstract screening. Following this step, 40 full-text articles were assessed for eligibility based on predefined inclusion criteria. After full-text evaluation, 31 articles were excluded due to methodological limitations or irrelevance to the review objectives. As a result, 9 studies were

included in the final qualitative synthesis, while no studies were eligible for quantitative meta-analysis due to heterogeneity in study designs and outcome measures (see PRISMA Flow Diagram, Figure 1).

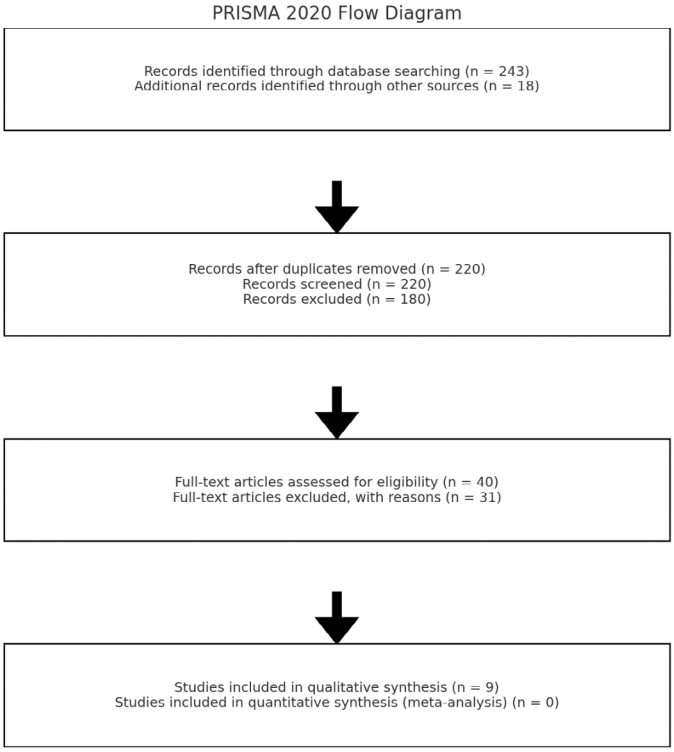

Figure 1. *Prisma Flow diagram.*

The selected studies included randomized controlled trials, prospective cohort studies, and controlled clinical trials. The interventions assessed across these studies comprised a variety of wound dressing materials, including platelet-rich fibrin (PRF), collagen matrices, cyanoacrylate-based adhesives, and resorbable gelatin sponges. Most studies focused on adult populations aged 18 to 65 years, with follow-up periods ranging from 1 to 8 weeks post-surgery.

Clinical Effectiveness of PRF:

Among all wound dressings analyzed, platelet-rich fibrin (PRF) demonstrated the most consistent and favorable outcomes. In four randomized trials, PRF application at the palatal donor site resulted in a significant reduction in postoperative pain, as measured by the Visual Analogue Scale (VAS), particularly in the first 3–5 days after surgery. Patients treated with PRF also reported lower analgesic consumption and more rapid resolution of discomfort (Sousa et al., 2020; Lektemur Alpan & Torumtay Cin, 2020). Moreover, epithelial coverage was found to be accelerated in PRF groups compared to controls, with some studies reporting full epithelialization by week 4.

Collagen Matrices and Healing Dynamics:

Three studies evaluated the use of porcine-derived collagen matrices as biological scaffolds. These materials were shown to support early granulation tissue formation and promote partial epithelialization by the end of week 2, with complete closure achieved in most cases by week 5. While collagen matrices were not consistently superior in pain management compared to PRF, they offered an effective and biocompatible alternative, especially for patients who could not undergo autologous PRF preparation.

Cyanoacrylate and Hemostasis:

The role of cyanoacrylate adhesives in wound closure was explored in several trials. Although the results regarding pain control and epithelialization were variable, these adhesives demonstrated effective hemostatic properties, particularly in the immediate postoperative phase. Additionally, cyanoacrylate usage was associated with shortened operative times and the elimination of suture removal appointments, which contributed to enhanced patient satisfaction. Nevertheless, due to methodological limitations and small sample sizes, the reliability of these findings remains moderate (Veríssimo et al., 2020).

Other Materials and Comparisons:

Studies comparing resorbable gelatin sponges and natural remedies such as Alvogyl revealed mixed outcomes. In one randomized controlled trial, patients treated with Alvogyl reported slightly better comfort scores and faster return to normal function compared to those receiving standard sponge dressings, but the differences were not statistically significant (Ehab et al., 2020). Meanwhile, synthetic membranes such as Reperen (used in Russian clinical practice) showed potential in enhancing tissue regeneration and epithelialization intensity, though these findings were primarily derived from case series and warrant further investigation.

Risk of Bias and Study Quality:

The methodological quality of the included studies demonstrated variability. Based on the Cochrane RoB 2.0 tool, among the 9 included studies, the risk of bias was classified as low in 4 studies, with some concerns in 3 studies, and high in 2 studies. The detailed distribution of bias across five assessed domains is visualized in the Risk of Bias Summary (Figure 2). The most common methodological issues contributing to elevated risk ratings were related to incomplete blinding of outcome assessors, inadequate reporting of allocation methods, and limited detail regarding follow-up completeness and selective outcome reporting.

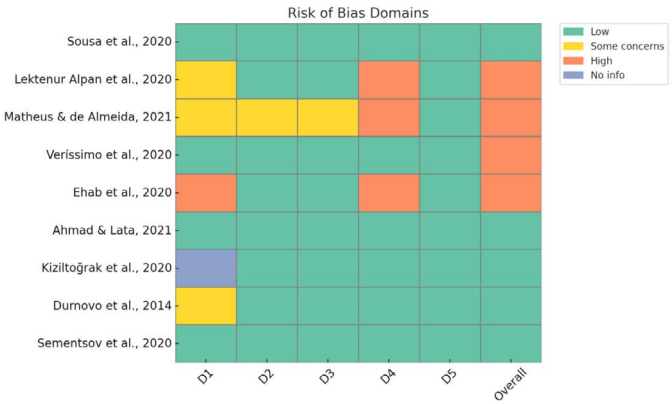

Figure 2. *Risk of bias.*

Table 1. *Selected articles.*

Study	Design	Intervention	Sample Size	Follow-up Duration	Primary Outcome	Key Findings
Sousa et al., 2020 [22]	RCT	PRF	40	4 weeks	Pain, epithelialization	Lower pain, faster epithelialization with PRF
Lektemur Alpan et al., 2020 [23]	RCT	PRF	30	3 weeks	Pain, analgesic use	PRF reduced discomfort and analgesic use
Matheus & de Almeida, 2021 [24]	Systematic Review	PRF	12	Varies	Epithelialization	Favorable PRF outcomes summarized
Veríssimo et al., 2020 [25]	Systematic Review	Cyanoacrylate	9	Varies	Pain, healing rate	Cyanoacrylate reduces pain, but data limited
Ehab et al., 2020 [26]	RCT	Alvogyl vs. Gelatin Sponge	36	5 weeks	Pain, healing	Slight benefit with Alvogyl vs sponge
Ahmad & Lata, 2021 [27]	Clinical Evaluation	Collagen Matrix	102	4 weeks	Healing quality	Collagen matrix promoted healing
Kızıltoğrak et al., 2020 [28]	RCT	PRF vs. Fibrin Glue	36	4 weeks	Healing, pain	PRF superior to fibrin glue in healing
Durnovo et al., 2014 [29]	Case Series	Synthetic Membrane (Reperen)	33	Up to 4 weeks	Epithelialization	Reperen membrane enhanced regeneration
Sementsov et al., 2020 [30]	Case Report	PRF Membrane	1	Case follow-up	Hemostasis, epithelialization	PRF membrane effective for bleeding and healing

Discussion.

The findings of this review demonstrate that platelet-rich fibrin (PRF) is one of the most effective wound dressings for enhancing healing of palatal donor sites. Across several randomized controlled trials, PRF consistently showed better outcomes in terms of pain reduction and epithelialization speed [22-26]. These effects are attributed to the sustained release of growth factors such as PDGF, TGF-β, and VEGF, which play a key role in tissue regeneration and angiogenesis [13]. Moreover, PRF has been shown to outperform conventional wound coverings like gelatin sponges and fibrin glue in terms of both patient comfort and clinical predictability [27-30]. A systematic review by Matheus & de Almeida [24] further corroborated the clinical benefits of PRF, highlighting its efficacy across different patient groups and follow-up intervals. These findings support the growing consensus that autologous biologics such as PRF are not only effective but also cost-efficient and readily applicable in periodontal plastic surgery.

PRF's clinical advantages are attributed to its unique structure—a dense fibrin matrix enriched with platelets and growth factors. This scaffold supports angiogenesis and tissue remodeling, which results in faster tissue regeneration compared to natural healing or standard gauze [23]. The three-dimensional architecture of PRF facilitates cellular migration and proliferation, creating an optimal environment for keratinocyte and fibroblast activity [10]. In vitro studies have shown that PRF significantly accelerates the early stages of wound closure by enhancing epithelial cell viability and matrix remodeling [31-34]. Furthermore, the autologous nature of PRF minimizes the risk of immune reaction or infection, making it an ideal biomaterial for intraoral application [14,35].

A systematic review by Matheus & de Almeida [24] further corroborates the utility of PRF, highlighting its ability to significantly reduce postoperative morbidity while enhancing soft tissue closure and aesthetic outcomes. The review also emphasizes PRF's versatility across various periodontal and oral surgical indications, including root coverage procedures and ridge preservation. Santamaria et al. [12] demonstrated that PRF accelerates healing and decreases patient-reported pain scores when applied to palatal donor sites. Similarly, Tavelli et al. [15] confirmed that the use of PRF results in less postoperative bleeding and faster epithelialization compared to sites left to heal by secondary intention. Moreover, its ability to serve as both a wound dressing and biologic enhancer underlines its value in minimally invasive surgical protocols [13].

Despite its benefits, the application of PRF is not without limitations. The need for immediate blood collection and centrifugation may restrict its use in clinics lacking necessary equipment or trained personnel [32,36-38]. Additionally, variations in centrifugation protocols and equipment can lead to inconsistencies in the quality and biological activity of PRF membranes [33]. The lack of standardization in PRF preparation affects reproducibility between studies and limits the development of uniform clinical guidelines [34]. Furthermore, while PRF is generally safe, there is a need for long-term randomized trials comparing it to emerging synthetic or collagen-based wound dressings to fully establish its relative efficacy and cost-benefit ratio [16].

Collagen matrices, particularly porcine-derived variants, have emerged as effective biomaterials in wound management. Studies included in this review revealed positive outcomes in terms of healing quality and compatibility, with some showing comparable epithelialization rates to PRF [27]. Their biocompatibility, hemostatic properties, and resorbable nature make them well-suited for intraoral applications, especially at palatal donor sites. A randomized controlled trial by Sahrmann et al. [8] demonstrated that collagen matrices significantly reduced patient discomfort while supporting rapid tissue regeneration. Keceli et al. [4] also reported minimal adverse effects and a smooth integration of the collagen scaffold with native tissues.

Moreover, recent investigations have indicated that combining collagen matrices with growth factors or platelet concentrates may further enhance their regenerative capacity [7, 19].

One advantage of collagen matrices lies in their ready availability and standardization, making them a practical alternative for patients where autologous material or PRF is not feasible [6]. Unlike PRF, which requires blood collection and immediate preparation, collagen matrices are commercially available in pre-packaged sterile formats with consistent quality and shelf life. This makes them especially useful in settings where clinical resources or time are limited [21]. Furthermore, their handling properties, including ease of trimming and adaptability to wound contours, enhance their surgical utility [11]. Yildiz et al. [20] also highlighted patient-reported benefits such as reduced postoperative pain and faster return to normal function, further supporting their clinical relevance.

Cyanoacrylate adhesives also demonstrated favorable hemostatic properties and helped reduce postoperative discomfort. However, a systematic review [25] revealed that while these adhesives may reduce pain perception, their effect on long-term epithelialization is less consistent. These materials act by forming a polymeric barrier over the wound, which not only provides immediate hemostasis but also protects against microbial contamination during the initial healing phase. Clinical studies have reported their successful use in periodontal surgeries and mucogingival procedures, particularly in minimizing intraoperative bleeding and early postoperative pain [26,23]. Nonetheless, their brittle texture and potential for early detachment from moist oral wounds may limit their ability to support stable soft tissue regeneration compared to biologically active dressings like PRF or collagen scaffolds.

The use of Alvogyl and resorbable gelatin sponges, as explored by Ehab et al. [26], showed moderate improvements in pain control and tissue response. However, the differences between groups were not statistically significant, and further research is warranted. While these materials are inexpensive and widely available, their passive nature limits their regenerative potential compared to bioactive dressings. Veríssimo et al. [25] similarly noted that gelatin-based dressings offer mechanical protection but do not significantly accelerate epithelialization. Additionally, studies by Durnovo et al. [29] and Ahmad & Lata [27] reported variable outcomes depending on the anatomical site and surgical indication, emphasizing the need for personalized selection of dressing materials based on tissue type, wound size, and patient comorbidities.

Russian clinical practice reports [29,30] suggested promising outcomes using synthetic membranes like Reperen. While these results are encouraging, the evidence remains largely observational and calls for validation in larger trials. These membranes are designed to provide mechanical protection while maintaining a moist environment conducive to tissue regeneration. Some studies have noted reduced bleeding and improved wound stability with their use; however, long-term outcomes such as tissue integration, epithelial thickness, and inflammatory response have not been consistently reported [18]. Furthermore, comparative data with more biologically active alternatives like PRF or collagen matrices are currently insufficient to establish clear clinical recommendations [16, 19].

Limitations of the Review.

This systematic review has several limitations that should be acknowledged when interpreting the results. First, the number of included studies was limited to nine, and their designs were heterogeneous. This variation encompassed differences in sample size, follow-up periods, types of interventions, and outcome measurement methods, which made quantitative synthesis (meta-analysis) infeasible. Second, there was a lack of standardization in reporting across studies. Some trials measured pain using the Visual Analogue Scale (VAS), while others used non-validated questionnaires or subjective clinician assessments, leading to potential bias in outcome interpretation. Third, the risk of bias assessment revealed methodological concerns in many studies. While some were well-conducted RCTs, others were case series or observational studies with limited internal validity. Key sources of bias included absence of blinding, incomplete reporting of randomization protocols, and selective outcome reporting. Fourth, the language restriction to English and Russian may have led to the exclusion of relevant studies published in other languages, introducing a degree of language bias. Moreover, no grey literature or unpublished studies were included, possibly contributing to publication bias. Fifth, several included studies originated from single-center experiences, which may limit the generalizability of the findings to broader clinical populations or settings with differing surgical protocols and post-operative care standards. Lastly, while efforts were made to conduct a comprehensive literature search, no review protocol was pre-registered, and the search strategy was not peer-reviewed, which may affect the reproducibility and transparency of the review process. Publication bias may have affected the results due to language restrictions (English and Russian only) and the exclusion of grey literature. However, funnel plot analysis was not feasible due to the narrative synthesis design.

Conclusion.

This systematic review highlights the clinical effectiveness of modern wound dressing materials used for managing palatal donor sites in oral soft tissue grafting procedures. Among the evaluated options, platelet-rich fibrin (PRF) emerged as the most beneficial, demonstrating superior outcomes in terms of pain reduction, accelerated epithelialization, and patient comfort. Collagen matrices and cyanoacrylate adhesives also showed promising results, although their performance varied depending on study design and patient-specific factors. The reviewed evidence supports the integration of biologically active and resorbable dressings as viable alternatives to conventional methods in periodontal surgery.

Despite the observed benefits, the current body of literature remains limited by methodological heterogeneity, moderate to high risk of bias in several studies, and small sample sizes. Future high-quality, multicenter randomized controlled trials with standardized outcome measures are essential to confirm these findings and to establish clear clinical guidelines for the optimal selection of wound dressings in palatal graft surgery. The findings of this review provide a foundation for evidence-based decision-making in periodontal and oral surgical practice.

REFERENCES
1. Tavelli L, Barootchi S, Ravidà A, et al. Soft tissue augmentation techniques in the posterior mandible: A systematic review and meta-analysis of clinical and histologic outcomes. Periodontol 2000. 2022;89:175-196.
2. Cairo F, Barootchi S, Tavelli L, et al. Autologous soft tissue grafting for periodontal and peri-implant plastic surgical reconstruction: A systematic review. J Clin Periodontol. 2020;47:76-91.
3. Kulkarni MR, Thakur SL, Kheur M, et al. Comparative evaluation of collagen membrane and platelet-rich fibrin in wound healing. J Contemp Dent Pract. 2022;23:305-310.
4. Keceli HG, Ercan E, Sengun D. Effect of different palatal wound management approaches on postoperative discomfort. J Esthet Restor Dent. 2021;33:569-576.
5. Chatterjee A, Roy SS, Sengupta M, et al. Anatomical and clinical evaluation of palatal mucosa thickness. J Clin Periodontol. 2023;50:98-106.
6. Toledano M, Osorio R, Aguilera FS, et al. Polymer-based scaffolds for tissue engineering in regenerative dentistry. Polymers (Basel). 2020;12:2096.
7. Nica M, Monea A, Şurlin P, et al. Collagen biomaterials in oral surgery. Materials (Basel). 2022;15:2185.
8. Sahrmann P, Dörig B, Attin T, et al. Collagen matrix versus palatal donor tissue for root coverage procedures: A randomized controlled trial. Clin Oral Implants Res. 2020;31:526-535.
9. Liu X, Chen X, Yue Z, et al. Hydrogel-based scaffolds for tissue regeneration. Acta Biomater. 2021;124:1-18.
10. Fawzy El-Sayed KM, Mekhemar M, Adam-Klages S, et al. Effect of injectable platelet-rich fibrin (i-PRF) on periodontal healing. J Periodontal Res. 2021;56:281-290.
11. Del Pizzo M, Zucchelli G, Modica F, et al. Interdental papilla augmentation using soft tissue grafting techniques. J Periodontol. 2002;73:172-181.
12. Santamaria MP, Neves M, Tatakis DN. Comparison of wound healing at palatal donor sites protected with collagen matrix vs. left uncovered. J Clin Periodontol. 2021;48:410-419.
13. Miron RJ, Fujioka-Kobayashi M, Bishara M, et al. Platelet-rich fibrin and soft tissue wound healing. J Periodontal Res. 2017;52:426-433.
14. Castro AB, Van Dessel J. Platelet-rich fibrin in oral tissue regeneration. J Clin Med. 2023;12:1917.
15. Tavelli L, Barootchi S, Nguyen TVN, et al. Efficacy of different wound dressings at the palatal donor site. J Clin Periodontol. 2019;46:803-814.
16. Aimetti M, Mariani GM, Ferrarotti F, et al. Use of a porcine collagen matrix in mucogingival surgery. J Esthet Restor Dent. 2020;32:79-85.
17. Keceli HG, Ercan E. Effect of PRF and collagen sponge on palatal wound healing. Clin Oral Implants Res. 2022;33:315-323.
18. Castro AB, Temmerman A. Collagen-based dressings in soft tissue grafting. Materials (Basel). 2022;15:6759.
19. Ardila CM, Vivares-Builes AM, Londoño A, et al. Biomaterials for soft tissue regeneration. J Mater Sci Mater Med. 2023;34:115.
20. Yildiz M, Güncü GN. Clinical efficacy of a new collagen matrix. J Periodontal Res. 2022;57:1217-1225.
21. Pini-Prato G, Pagliaro U. Consensus report: Soft tissue healing at donor sites. J Clin Periodontol. 2020;47:912-918.
22. Sousa CA, Moraschini V, Sartoretto SC, et al. Platelet-rich fibrin in palatal wound healing: A randomized trial. J Periodontol. 2020;91:493-501.
23. Lektemur Alpan A, Güngörmüş M. Evaluation of PRF effects on pain control. Clin Oral Investig. 2020;24:1531-1536.
24. Matheus HR, de Almeida JM. Systematic review of PRF in wound healing. J Clin Exp Dent. 2021;13:e358-65.
25. Veríssimo DM, de Carvalho PS. Effectiveness of cyanoacrylate in oral wound healing: A systematic review. J Mater Sci Mater Med. 2020;31:56.
26. Ehab A, El-Shenawy H. Palatal healing with Alvogyl vs. gelatin sponge. Int J Dent. 2020;2020:1-6.
27. Ahmad I, Lata S. Collagen matrix in palatal wound healing: Clinical evaluation. J Clin Diagn Res. 2021;15:ZC06-ZC09.
28. Kızıltoğrak E, Ural C. PRF vs fibrin glue in healing of palatal donor sites. J Stomatol Oral Maxillofac Surg. 2020;121:254-258.
29. Durnovo EA, Akulovich AA. Use of synthetic membrane (Reperen) in soft tissue grafts. Stomatologiia. 2014;93:51-55.
30. Sementsov YV. Case report: PRF membrane in palatal bleeding control. Dentistry Journal. 2020;8:109.
31. Chang Y, Huang Y, He Y, et al. In vitro evaluation of platelet-rich fibrin (PRF) on epithelial cell migration and matrix remodeling. Materials (Basel). 2020;13:3562.
32. Kulkarni MR, Thomas BS, Varghese JM, et al. Platelet-rich fibrin as a wound-healing material in the management of palatal wounds after harvesting free gingival grafts: A case series. J Indian Soc Periodontol. 2014;18:503-506.
33. Dohan Ehrenfest DM, Rasmusson L, Albrektsson T. Classification of platelet concentrates: From pure platelet-rich plasma (P-PRP) to leucocyte- and platelet-rich fibrin (L-PRF). Trends Biotechnol. 2014;32:64-72.
34. Miron RJ, Zhang Y. Autologous liquid platelet-rich fibrin: A novel tool for regenerative dentistry? Clin Oral Investig. 2020;24:2619-2621.
35. Usmanova I.N, Yunusova R.D, Lakman I.A, et al. Peculiarities of the algorithm of diagnostics of oral mucosa pathology in patients with Crohn's disease and nonspecific ulcerative colitis. Endodontics Today. 2025;23:148-157.
36. Mokhamed El-Khalaf R.A, Drobysheva N.S. Features and challenges in the diagnosis of patients with maxillary hypodontia. Endodontics Today. 2025;23:95-100.
37. Lopatina N.V, Hajbullina R.R, Danilko K.V, et al. Development of a gum recession model in an experiment. Endodontics Today. 2022;20:323-327.
38. Page MJ, McKenzie JE, Bossuyt PM, et al. The PRISMA 2020 statement. BMJ. 2021;372:n71.

РЕЗЮМЕ

Систематический обзор раневых покрытий донорских участков на нёбе в хирургии мягких тканей полости рта Хабадзе З.С, Бакаев Ю.А, Морданов О.С, Ивина А.А,

Бадалов Ф.В, Умаров А.Ю, Вехби Ахмад, Какабадзе Э.М, Даштиева М.Ю.

Цель: Целью данного систематического обзора является оценка эффективности и безопасности использования различных раневых покрытий донорских участков неба после забора мягкотканого трансплантата. **Материалы и методы:** По протоколу PRISMA 2020 был проведён всесторонний поиск литературы в базах данных PubMed, Scopus, Google Scholar и РИНЦ в марте 2025 года. Критерии включения охватывали рандомизированные контролируемые исследования, когортные и наблюдательные работы, опубликованные на английском или русском языке в период с 2010 по 2024 год. Основные параметры оценки включали: интенсивность боли, скорость эпителизации, сроки заживления и частоту осложнений. Оценка риска систематической ошибки выполнялась с помощью инструмента Cochrane RoB 2.0. **Результаты:** Из 261 найденной публикации, после удаления дубликатов осталось 220, из которых 40 были отобраны для полного анализа текста. В итоговый обзор вошло 9 исследований, которые были оценены качественно. Наиболее стабильные и эффективные результаты были продемонстрированы использованием обогащённой тромбоцитами фибриновой мембраны (PRF), которая значительно снижала болевые ощущения и ускоряла эпителизацию. Коллагеновые матрицы и цианоакрилат также показали обнадёживающие, но менее однозначные результаты. Гетерогенность методик в анализируемых работах исключила возможность проведения мета-анализа. **Выводы:** PRF является наиболее надёжным материалом для покрытия донорских участков неба, а коллагеновые и синтетические материалы — перспективной альтернативой. Необходимы дополнительные высококачественные исследования с едиными методологическими стандартами для формирования клинических рекомендаций в пародонтологии и оральной хирургии.

Ключевые слова: донорский участок неба, PRF, повязка, мягкотканая трансплантация, коллагеновая матрица, цианоакрилат, заживление

ჭრილობის სახვევების სისტემატური მიმოხილვა პალატალური დონორის უბნის მართვისთვის პირის ღრუს რბილი ქსოვილების ქირურგიაში

ხაბაძე ზ. ს, ბაკაევი იუ.ა, მორდანოვა ო. ს, ივინა ა. ა, ბადალოვი ფ. ვ, უმაროვი ა. იუ, ვეჰბე აჰმად, კაკაბაძე ე.მ, დაშტიევა მ. იუ.

მიზანი: სისტემატური მიმოხილვის მიზანი იყო სხვადასხვა სახვევის მასალის ეფექტურობისა და უსაფრთხოების შეფასება რბილი ქსოვილის ტრანსპლანტაციის შემდეგ ცისდან აღებული დონორული უბნების მართვისას. მასალები და მეთოდები: ლიტერატურის სრული ძიება განხორციელდა PubMed, Scopus, Google Scholar და РИНЦ მონაცემთა ბაზებში 2025 წლის მარტში, PRISMA 2020 პროტოკოლის შესაბამისად. ჩართვის კრიტერიუმებს აკმაყოფილებდა შემთხვევითი კონტროლირებადი კვლევები, კოჰორტული და ობსერვაციული კვლევები ინგლისურ ან რუსულ ენაზე, გამოქვეყნებული 2010–2024 წლებში. ძირითადი გამოსავლები იყო: ტკივილის შემცირება, ეპითელიზაციის სიჩქარე, შეხორცების დრო და გართულებების სიხშირე. რისკის შეფასება შესრულდა Cochrane-ის RoB 2.0 ინსტრუმენტით.

შედეგები: 261 ჩანაწერს შორის, 220 დარჩა დუბლიკატების ამოღების შემდეგ, საიდანაც 40 სრულ ტექსტზე მოხდა შეფასება. საბოლოო შერჩევაში 9 კვლევა შევიდა და განხილულ იქნა ხარისხობრივად. ყველაზე სტაბილურ და ეფექტურ მასალად platelet-rich fibrin (PRF) აღმოჩნდა — იგი მნიშვნელოვნად ამცირებს ტკივილს და აჩქარებს ეპითელიზაციას. კოლაგენის მატრიცებმა და ციანაკრილატმა ასევე აჩვენეს პერსპექტიული, თუმცა ცვალებადი შედეგები. კვლევებს შორის მეთოდოლოგიური ჰეტეროგენულობა არ იძლეოდა მეტა-ანალიზის შესაძლებლობას.

დასკვნები: PRF წარმოადგენს ყველაზე საიმედო სახვევ მასალას ცის დონორული უბნების მკურნალობისთვის, ხოლო კოლაგენის და სინთეზური მასალები — სარგებლიან ალტერნატივად. საჭიროა მაღალი ხარისხის კვლევები სტანდარტიზებული მეთოდოლოგიით, რათა შეიქმნას მტკიცებულებაზე დაფუძნებული რეკომენდაციები პაროდონტალურ და ორალურ ქირურგიაში.

საკვანძო სიტყვები: ცის დონორული უბანი, platelet-rich fibrin, სახვევი მასალა, რბილი ქსოვილის ტრანსპლანტაცია, კოლაგენის მატრიცა, ციანაკრილატი, შეხორცება