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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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

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

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

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

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

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

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

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

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

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

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

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

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

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

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

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

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

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

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

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

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

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

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

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

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

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

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

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

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

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

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

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

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

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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APPLICATION OF IMPROVED AUTODERMOPLASTY TECHNIQUE IN GRANULATING WOUNDS TREATMENT

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Abstract.

This prospective study was conducted at the Department of Surgery of the Pavlodar branch of the NCJSC "SMU" (Non-profit joint-stock company "Medical University of Semey" based on the city hospital No. 1, surgical hospital of Pavlodar, Kazakhstan.

Purpose: The purpose of research is to evaluate the results of improved autodermoplasty technique for granulating wounds of different origin.

Study design: Non-randomized controlled clinical trial

Materials and methods: The study included a total of 100 patients with granulating purulent wounds of various origins aged 20 to 70 years. In the period from 2022-2024. The average age was 41.03 ± 1.14 years. In the main group, 50 patients with granulating wounds were treated using an improved technique of free split autodermoplasty. The study also included a comparison group, represented by 50 patients who underwent traditional local treatment of wounds after autodermotransplantation using wet-drying gauze dressings impregnated with antiseptic agents. To include patients in the study groups regarding the state of the wound surface before autodermoplasty, the following criteria were selected: wounds of various origins with active granulation and the presence of signs of marginal epithelialization after complete cleansing of the wound surface from purulent-necrotic tissues. The wound surface areas ranged from 50 to 200 cm2. Accordingly, the criteria for excluding patients from the study regarding the state of the wound surface were patients with flaccid granulation of wounds, the presence of purulent-necrotic tissues, and the absence of marginal epithelialization. Informed consent was obtained from all patients to participate in the study.

Results: Surgical diseases with the occurrence of purulent wounds accounted for 25%, of which after the treatment of phlegmon - 10 (40%) cases, abscesses - 6 (24%), suppuration of postoperative wounds - 9 (36%) cases. Burn wounds of the IIIb degree occurred in 45%, wounds of traumatic origin 18% and frostbite of the III degree in 12%. The bottom of the wounds was represented by muscles and subcutaneous fat tissue.

The engraftment rate of autodermal grafts relative to the initial area of the transplanted skin flap for surgical, burn and traumatic wounds in the main group of patients was 97.15±0.28%, 95.35±0.28% and 96.89±0.37%, respectively, which corresponded to the criterion of complete engraftment. For frostbite wounds, it was 81.2±1.14%, which was assessed as partial engraftment. In the comparison group, in surgical, burn and traumatic wounds, the degree of engraftment of autodermal grafts relative to the initial area of the transplanted skin flap was characterized as partial engraftment (78.75±0.41%, 76.0±0.28%, 80.0±0.9%, respectively), and as non-engraftment - in wounds due to frostbite (50.0±0.58%).

After autodermoplasty of granulating wounds in 100 patients, wound complications were observed in 14 (14%) patients (Table 7). Of these, there were 2 (4%) cases in the main group of patients and 12 (24%) in the comparison group ($\chi 2 = 6.728$; $p = 0.01$).

Key words. Granulating wounds, autodermoplasty, purulent surgery.

Introduction.

Treatment of patients with vast purulent wounds and soft tissue deformities formed after traumatic, thermal injuries and surgical debridement of focal infections occupies an important place in purulent surgery. Their spread does not tend to decrease. In the USA, 2.5 million patients suffer from chronic surgical wounds, and in Western Europe they occur in 1-4% of the population [1,2].

One type of purulent wounds is burning wounds. Given the rapid pace of technological progress, an increase in hospitalization of patients due to thermal injury is expected. Data from individual authors indicate that in the USA, about 2 million people annually suffer a burning injury, and of these, 20% are treated in specialized hospitals [3]. Autodermoplasty is the most effective method of treating acute burning injury, as well as preventing post-burn scars and contractures [4].

Improving treatment outcomes for patients with trauma-related skin defects also requires studying. This is also due to the fact that concomitant trauma to integumentary tissue calls for plastic surgery [5]. Patients with open bone fractures complicated by soft tissue deformities are mainly relatively young people of working age [6]. Despite medicine achievements, the results of such patients' treatment cannot always be considered satisfactory [7-9]. It is necessary to find the ways to perform delayed operations to restore integumentary tissue, including autodermoplasty.

It is known that some patients with granulating wounds

after traumatic, thermal injuries and surgical debridement of focal infections require free split autodermoplasty. The main condition for autodermoplasty is the development of healthy granulation tissue. It is formed regardless of wound mechanism, since it is a pathophysiological process irrespective of wound etiology. Despite technical simplicity, the results of free split autodermoplasty are far from satisfactory ones. The main problems in the early postoperative period after autodermoplasty are the development of infectious complications and wound abscess, rejection and lysis of autodermic graft. In general, skin graft engraftment accounts for 50-70% of cases, which suggests the need for reoperation and prolongation of treatment time for patients [10].

The efficiency criteria of split autodermoplasty for granulating wounds are skin autograft engraftment and uncomplicated course of wound after skin flaps transplantation. Since, in the postoperative period, the rate of autodermic graft engraftment decreases due to flap suppuration, lysis or rejection. Repeated autodermoplasty interventions will be required. As a result, treatment periods for patients are extended and significant economic damage is caused due to rising treatment costs.

To improve the results of granulating wounds healing with autodermoplasty, search for the ways to combine it with new therapeutic technologies continues [11]. Thus, a combination of classical autodermoplasty and cellular technologies has been proposed, it represents an interesting direction in plastic surgery for purulent-septic lesions. There is a promising development of biotechnological methods for temporary replacement of skin, in particular the use of decellularized cadaveric skin [12]. However, despite successful development of regenerative biology and medicine, most developments are at the stages of preclinical and clinical trials and cannot yet be used in widespread clinical practice. As a result, complete engraftment of skin graft on the wound surface is not always possible. In addition, surgical wounds of different origin develop with distinctive courses and require selection of special treatment approaches. Thus, an analysis of existing methods of surgical wounds autodermoplasty shows the need for further searches in optimizing the results of its use.

The purpose of research is to evaluate the results of improved autodermoplasty technique for granulating wounds of different origin.

Materials and Methods.

A total of 100 patients with granulating septic wounds of different origin aged from 20 to 70 years were treated under controlled clinical observation. The average age was 41.03±1.14 years. Median age is 41 years. Among the patients, 62% were men and 38% were women.

In the main group, 50 patients with granulating wounds were treated using an improved technique of free split autodermoplasty. For this purpose, a skin flap 0.3 mm in thickness was taken with an electric dermatome. After applying perforative insections, autoskin graft was placed on the prepared surface of granulating wound. A dosing stretched knotless polypropylene mesh was placed over the graft. Propylene mesh was fixed with interrupted sutures along the perimeter to the healthy skin around wound for 7 days. The first dressing was performed on the third day by replacing a gauze layer of the dressing, leaving polypropylene mesh on the autograft surface. On the seventh day after autodermoplasty, polypropylene mesh was removed from the wound surface with autoskin graft. Then a thin layer of ointment was applied daily to the wound surface, together with open wound management until complete epithelization of wound occurred.

The research also included a comparison group of 50 patients who underwent traditional local treatment of wounds after autodermal transplantation using wet-dry gauze dressings impregnated with antiseptics.

To include patients in the research groups regarding the condition of the wound surface before autodermoplasty, the following criteria were selected: wounds of different origin with active granulation and the presence of signs of marginal epithelization after complete cleansing of the wound surface from purulent-necrotic tissue. The wound surface areas ranged from 50 to 200 cm2. Accordingly, the criteria for excluding patients from the research regarding the condition of the wound surface were patients with hyposthenic granulation of wounds, the presence of purulent-necrotic tissue, and the absence of marginal epithelialization. All patients provided their informed consents to participate in the research.

Patients' distribution according to the causes of granulating wounds is shown in Table 1.

Table 1. *Patients' distribution according to the causes of wounds.*

Research group	Surgical diseases, n	IIIb degree burns, n	Traumatic wounds, n	Frostbites, n	In all
Main	13	23	9	5	50
Comparison	12	23	8	7	50
χ^2 p	0.053 0.818	0.000 1.000	0.071 0.791	0.379 0.539	
Total, n	25	45	18	12	100
%	25	45	18	12	100

Surgical diseases with purulent wounds accounted for 25%, among them 10 cases (40%) – after treatment of phlegmon, 6 cases (24%) – abscesses and 9 cases (36%) – pyesis of postoperative wounds. IIIb degree burn wounds occurred in 45%, traumatic wounds in 18%- and III-degree frostbite in 12%. The wound bed was represented by muscles and subcutaneous adipose tissue.

In 41% of cases, the wounds were localized in the lower extremities, in 25% - in the upper extremity, and in 34% on the body. Concomitant diseases were present in 37% of patients with the following frequency (Table 2): arterial hypertension was established in 9 patients, coronary heart disease and chronic heart disease – in 14, chronic pyelonephritis – in 6, adipositas – in 5 and compensated diabetes – in 3 patients. The distribution of concomitant pathologies in the research groups of patients was comparable (χ^2 = 0,043; p = 0,836).

Engraftment of 90% of grafted skin flap was taken as complete autograft engraftment, from 50 to 90% as partial, and engraftment below 50% of flap was not considered as engraftment.

During the statistical analysis of the research material, the following indicators of variation statistics were determined:

arithmetic mean (M), standard error (±m), standard deviation (SD). For the statistical analysis of nominal data, the Pearson Chi2 test was used, and with an expected frequency of less than 5, the Fisher test was used. Statistical analysis was performed using SPSS software version 20.0, with $p<0.05$, the results were considered statistically significant.

Table 2. *Structure and frequency of concomitant pathologies in groups.*

Nosologies	**Main group**	**Comparison group**	**Total**
	n = 50	**n = 50**	**n = 100**
Arterial hypertension	5	4	9
χ^2 p	0.122 0.727		
Coronary heart disease	4	3	7
χ^2 p	0.154 0.696		
Chronic heart diseases	3	4	7
χ^2 p	0.154 0.696		
Chronic pyelonephritis	3	3	6
χ^2 p	0.000 1.000		
Adipositas	2	3	5
χ^2 p	0.211 0.647		
Diabetes	1	2	3
χ^2 p	0.344 0.558		
Total	18	19	37
χ^2 p	0.043 0.836		

Table 3. *Results of autograft engraftment depending on the granulating wounds autodermoplasty technique.*

Patient groups	**Total number of patients, n**	**Among them, the number of patients with complete autograft engraftment**		**χ^2 /p**
		n	**%**	
Main	50	48	96	χ^2=6.728 p=0.01
Comparison	50	38	76	

Results.

Table 3 presents the results of treatment of granulating purulent wounds depending on the autodermoplasty technique.

Out of 50 patients in the main group, 48 (96%) of 50 patients had complete engraftment of grafted skin flap at the recipient site, while in the comparison group of 50 autodermoplasty cases, engraftment was achieved in 38 (76%) patients (χ^2=6.728; p=0.01).

The rate of autodermic grafts engraftment differed depending on the causes of granulating wounds (Table 4). In the main group of patients during surgical wound healing, grafted skin flaps completely (100%) survived at the donor sites, while in the comparison group, out of 12 cases of autodermotransplantation, autodermic graft engraftment was established in 10 cases (83.3%). A similar picture was also observed in traumatic wounds healing in 9 out of 9 (100%) patients in the main group and in 7 out of 8 (87.5%) patients in the comparison group.

Table 4. *Results of autodermoplasty depending on the causes of wounds.*

Patient groups	**Surgical wounds, n**			**Burn wounds, n**			**Traumatic wounds, n**			**Frostbite wounds, n**		
	n_1	**n_2**	**%**	**n_1**	**n_2**	**%**	**n_1**	**n_2**	**%**	**n_1**	**n_2**	**%**
1st	13	13	100	23	22	95.7	9	9	100	5	4	80
2nd	12	10	83.3	23	18	78.3	8	7	87.5	7	3	42.3
Note: n is the number of patients by nosology, among them. n_1 is the number of patients in the research groups. n_2 is the number of patients with complete engraftment of autodermic graft.												

These indicators were somewhat lower in the patient group with burn wounds. And in the patient group with frostbite wounds, the rate of skin graft engraftment in the main group of patients is the lowest – 80% and 42.3% in the comparison group, respectively. The last-mentioned is associated with pervasive changes in tissues under the influence of low temperatures, which will require significant efforts to treat patients.

Thus, in the main group of patients, in relation to cases of autodermoplasty, the results of graft engraftment by 7 days after transplantation were assessed as complete engraftment of graft, and in the comparison group – as its partial engraftment to the recipient site. The best results were in the group of patients with granulating wounds of surgical and traumatic origin, the worst ones – with frostbite wounds.

The degree of autodermic grafts engraftment relative to the initial area of grafted skin flap was higher in the main group of patients compared to the comparison group (Table 5). When using improved autodermoplasty technique, preservation of 96.06±0.2% of the initial area of grafted skin flap was achieved, and in the comparison group this indicator was 77.34±0.33 (t = 48.51; $p<0.05$).

Table 5. *The degree of autodermic graft engraftment relative to the initial area, depending on the type of granulating wounds autodermoplasty technique.*

Patient group	**Degree of autograft engraftment (%)**	**t-criterion, p**
Main	96.06±0.2	t = 48.51 p<0.05
Comparison	77.34±0.33	

The degree of autodermic grafts engraftment relative to the initial area of grafted skin flap differed depending on the causes of granulating wounds (Table 6).

The degree of autodermic grafts engraftment relative to the initial area of grafted skin flap for surgical, burn and traumatic wounds in the main group of patients was 97.15±0.28%, 95.35±0.28% and 96.89±0.37%, respectively; this met the criterion of complete engraftment. For wounds due to frostbite, it was 81.2±1.14%, which was assessed as partial engraftment. In

Table 6. *The degree of autodermic grafts engraftment relative to the initial area of grafted skin.*

Patient group	Surgical wounds	Burn wounds	Traumatic wounds	Frostbites
	The degree of graft engraftment, (%)	The degree of graft engraftment, (%)	The degree of graft engraftment, (%)	The degree of graft engraftment, (%)
Main	97.15±0.28	95.35±0.28	96.89±0.37	81.2±1.14
Comparison	78.75±0.41	76.0±0.28	80.0±0.9	50.0±0.58
t-criterion	37.06	48.87	17.36	24.39
p	<0.05	<0.05	<0.05	<0.05

Table 7. *Structure and frequency of wound complications after closure of skin deformities after using various autodermoplasty techniques.*

Patient group	Type of complication			In all	
	Pyesis	Necrosis	Lysis/rejection		
	n	n	n	n	%
Main (n=50)	1	-	1	2	4
Comparison (n=50)	4	2	6	12	24
Total	5	2	7	14	14
Note: - reliability of complications development in groups: $\chi^2 = 6.728$; $p = 0.01$					

the comparison group, for surgical, burn and traumatic wounds, the degree of autodermic grafts engraftment relative to the initial area of grafted skin flap was characterized as partial engraftment (78.75±0.41%, 76.0±0.28%, 80.0±0. 9%, respectively), and for wounds due to frostbite – as non-engraftment (50.0±0.58%).

After granulating wounds autodermoplasty in 100 patients, wound complications were observed in 14 patients (14%) (Table 7). Among them, there were 2 cases (4%) in the main group of patients and 12 cases (24%) in the comparison group ($\chi^2 = 6.728$; $p = 0.01$).

Of 14 cases of wound complications, 7 cases (50%) were the cases of graft lysis/rejection. Of 7 cases, 5% lysis/rejection of autograft was established in 1 case, 10% in 2 cases, and 25% in 4 cases. Wound abscess occurred in 5 cases, and in two cases there was partial necrosis of graft.

Thus, the best results of autodermoplasty in granulating surgical wounds treatment with the use of developed algorithm for perioperative protection of skin graft after granulating wounds autodermoplasty are ensured by frame protective function of polypropylene mesh to autodermic graft, the presence of pressing (compression) effect on transplanted skin autograft at the recipient site of wound, ensuring "the effect of tight contact of graft with the wound surface" with the possibility of using an early first dressing on the fifth day, improving the drainage function due to water-repellent function of mesh polypropylene material, increasing the sorption function of the dressing and wound aeration, nonivasiveness.

Discussion.

As we have indicated, the main method of treating granulating wounds is free skin grafting with a split autodermal graft [13]. Its main advantages are the possibility of one-stage closure of large wounds, low trauma and technical simplicity of execution.

Autodermoplasty can be performed with healthy granulation tissue. It is formed regardless of the mechanism of wound occurrence, as it is a consequence of a single pathophysiological process. The main problems in the early postoperative period after autodermoplasty are the development of infectious complications with wound suppuration, rejection and lysis of the autodermograft. In general, the engraftment of the skin graft is no more than 50-70% of cases, which suggests the need for a second operation and an extension of the treatment period for patients [10]. To improve the results of treating granulating wounds with autodermoplasty, the search for ways to combine it with new treatment technologies continues [11]. Thus, a combination of classical autodermoplasty and cellular technologies has been proposed, which is an interesting direction in plastic surgery of purulent-septic lesions. The prospects for the development of biotechnological methods for temporary replacement of the skin, in particular the use of decellularized cadaveric skin, are noted [12]. However, despite the successful development of regenerative biology and medicine, most developments are at the preclinical and clinical trial stages and cannot yet be used in widespread clinical practice. As a result, complete engraftment of the skin graft on the wound surface is not always possible.

Thus, the analysis of existing methods of autodermoplasty of surgical wounds shows the need for further searches in optimizing the results of its application. It is noteworthy that we have not found an analogue of the applied method of autodermoplasty of wounds in the literature.

Despite the successful development of regenerative biology and reconstructive medicine, most developments in wound autodermoplasty are at the preclinical and clinical trial stages and cannot yet be used in widespread clinical practice. Complete engraftment of the skin graft on the wound surface is not always possible, as indicated in the introductory part of the article.

The technique of autodermoplasty used by us for granulating wounds is simple to use, economically advantageous and improves the results of engraftment of skin autografts at the recipient site. In the future, it is planned to study the remote results, paying attention to the cosmetic and functional consequences.

Conclusion.

1. The improved free split autodermoplasty technique is an effective treatment method for granulating wounds with a high flap survival rate. Its use increases the percentage of autodermic graft engraftment relative to the amount of performed autodermoplasty to 96% in comparison with the group of patients (76%) treated with traditional method of wound management (χ^2=6.728; p=0.01).

2. In the main group of patients, the degree of transplanted autodermic graft engraftment relative to the initial area also increases from 77.34±0.33% to 96.06±0.2% ($t = 48.51$; $p<0.05$) in comparison with patients treated with traditional method of granulating surgical wounds autodermoplasty.

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REFERENCES

1. Bekara F, Vitse J, Fluieraru S, et al. New techniques for wound management: A systematic review of their role in the management of chronic wounds. Arch Plast Surg. 2018;2:102-110.

2. Han G, Ceilley R. Chronic Wound Healing: A Review of Current Management and Treatments. Adv Ther. 2017;34:599-610.

3. Mc Manus W.F, Goodwin C.W, Pruitt B.A. Subeschar treatment of burn wound infection. Arch Surg. 1983;118:291-194.

4. Orgill D.P. Excision and skin grafting of thermal burns. N Engl J Med. 2009;36:893-901.

5. Clough T.M, Bale R.S. Audit of open tibial diaphyseal fracture management at district accident centre. Ann K Coll Surg Engl. 2000;82:436-440.

6. Court-Broun C.M, Bugler K.E, Clement N.D, et al. The Epidemiology of Open Fractures in adults. A 15 - year review. Injury. 2012;43:891-897.

7. Huh J, D. Stinner D, Burns T.C, et al. Infectious complications and soft tissue injury contribute to late amputation after severe lower extremity trauma. J Trauma. 2011;71:47-51.

8. Gopal S, Majumder S, Batcjelor A.G.B, et al. Fix and Flap: the radical orthopaedic and plastic treatment af severe open fractures of the tibia. J Bone Joint Surg. 2000;82:959-966.

9. Gustilo R.B, Mendoza R.M, Williams D.N. Problems in the management of type III (severe) open fractures: a new classification of type III open fractures. J Trauma. 1984;24:742-746.

10. Imangazinov S.B, Omarov N.B, Andasbekov N.K, et al. Optimization of the results of treatment of surgical wounds with free autodermoplasty. Literature review. Science & Health care. 2022;24:170-186.

11. Kumar R.J, Kimble R.N, Boots R, et al. Treatment of partial -thickness burns: A prospective, randomized using Transcyte. ANZ J Surg. 2004;74:6.

12. Li X, Meng X, Wang X, et al. Human acellular dermal matrix allograft: A randomized, controlled human trial for the longterm evaluation of patients with extensive burns. Burns. 2015;41:689-699.

13. Beschastnov VV, Pavlenko IV, Bagryantsev MV, et al. Modern Approaches to the Technical Aspects of Split-skin Grafting. Journal of experimental and clinical surgery. 2018;11:59-69.