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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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RECENT TRENDS IN THE USE OF CELL SALVAGER FOR ORTHOPAEDIC TRAUMA AND ELECTIVE SURGERIES-A NARRATIVE REVIEW

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Abstract.

Intraoperative blood loss management is a critical concern in orthopaedic surgeries, particularly in trauma and complex elective procedures. Traditionally, allogeneic blood transfusions have been used to manage significant blood loss, but they carry risks such as transfusion reactions, infections, and increased healthcare costs. Cell salvage, or autotransfusion, offers a safer alternative by collecting, processing, and reinfusing the patient's own blood during surgery. This article explores recent trends in the use of cell salvage in orthopaedic trauma and elective surgeries, highlighting its growing adoption in high-blood-loss procedures such as pelvic fractures, long bone injuries, and revision arthroplasties. We discuss the indications, including use in patients with rare blood types, religious objections to donor blood, and pre-existing anaemia. The advantages of cell salvage, such as reducing dependency on allogeneic transfusions, minimizing transfusion reactions, and providing cost-effectiveness, are weighed against its limitations, including high initial costs, contraindications in certain procedures, and the need for specialized training. Recent advances in cell salvage technology, which enhance the safety and efficiency of the process, are also examined. As orthopaedic practices evolve toward more patient-centered, cost-effective care, the role of cell salvage is expected to grow, making it a valuable tool in modern blood management strategies.

Key words. Cell salvage, autotransfusion, orthopaedic surgery, blood management, trauma surgery, elective surgery.

Introduction.

Managing intraoperative blood loss is crucial in orthopaedic surgeries, especially in trauma cases and complex elective procedures. Historically, this has been handled using allogeneic (donor) blood transfusions. However, allogeneic transfusions come with risks such as transfusion reactions, immune suppression, infection transmission, and higher healthcare costs. These concerns, along with efforts to reduce allogeneic blood use globally, have led to the increasing adoption of intraoperative cell salvage systems in both orthopaedic trauma and elective surgeries. Cell salvage, also known as autotransfusion, is a technique that enables the collection, processing, and reinfusion of a patient's own blood during or after surgery [1]. This paper explores recent trends in the use of cell salvage in orthopaedic trauma and elective surgeries, highlighting its indications, benefits, limitations, and implications for clinical practice.

Recent Trends in the Use of Cell Salvager.

In recent years, the use of cell salvage technology in orthopaedic surgeries has grown rapidly. Originally utilized primarily in cardiovascular and vascular procedures, it has now become a valuable tool in orthopaedic trauma and elective surgeries, especially in cases where significant blood loss is anticipated. Recent studies highlight several emerging trends in its use:

Growing Use in Trauma Surgeries: Orthopaedic trauma surgeries, particularly those involving high-energy injuries like pelvic fractures, long bone fractures, and polytrauma, are often linked to significant blood loss. Recent studies show a rising adoption of cell salvage in orthopaedic trauma centers worldwide, especially for managing pelvic fractures and long bone injuries where bleeding control is critical to preventing shock and death. These findings align with trends observed in various trauma centers, where autotransfusion is increasingly being incorporated into resuscitation protocols to reduce transfusion-related complications and improve patient outcomes in acute trauma setting. The blood lost during trauma surgeries can be auto-transfused back without any hazards of allogenic blood transfusion and also reducing the demand for allogenic blood transfusion [2,3].

Cell Salvage in Elective Surgeries: In elective orthopaedic procedures, such as total joint arthroplasty, revision surgeries, and complex spinal operations, cell salvage is increasingly becoming a standard practice. Recent studies show a significant rise in the use of cell salvage in elective orthopaedic cases, particularly in revision total hip and knee arthroplasties, which are often associated with higher blood loss due to the complexity of the procedures [4]. Similarly, scoliosis correction and other complex spinal fusion surgeries are employing cell salvage to minimize intraoperative blood loss, reduce reliance on donor blood, and promote faster postoperative recovery [5]. These trends reflect a broader shift toward patient-centered care, emphasizing reduced complications from allogeneic transfusions and improved surgical outcomes.

Advances in Cell Salvage Technology: Recent innovations in cell salvage technology have significantly improved both its efficiency and safety. Modern cell salvage machines now feature advanced filtration systems and faster blood processing capabilities, making them more effective in trauma settings where immediate blood recovery is critical. Studies have demonstrated that these advancements result in higher red blood cell recovery and reduced contamination, making the technique safer and more reliable in orthopaedic surgeries [6,7]. With these improvements and the growing focus on personalized patient care, the use of cell salvage in orthopaedic procedures is expected to continue rising [6,7].

Indications for Use of Cell Salvager in Orthopaedic Surgery.

The use of cell salvage in orthopaedic surgeries has expanded with advancements in technology and evolving clinical guidelines. Key indications include:

Surgeries with High Anticipated Blood Loss: Procedures with expected blood loss exceeding 500-1000 mL, such as pelvic fractures, revision arthroplasties, and multi-level spinal fusions, are prime candidates for cell salvage due to the extensive tissue dissection and significant blood loss involved [4-6,8].

Patients with Rare Blood Types or Religious Objections to Blood Transfusions: Cell salvage is especially valuable for patients with rare or difficult-to-match blood types, or those who refuse allogeneic blood transfusions for religious reasons (e.g., Jehovah's Witnesses). Autotransfusion using cell salvage is often acceptable to these patients, allowing them to receive their own blood without ethical or religious concerns [9].

Patients with Pre-existing Anaemia: For patients with preoperative anaemia, cell salvage can reduce the need for allogeneic transfusions during surgery. This is particularly important in elderly or comorbid patients, who may not tolerate anaemia well and are at higher risk of postoperative complications [10].

Emergency Trauma Cases: In emergency trauma situations, where rapid blood loss control is critical, cell salvage allows for immediate reinfusion of the patient's own blood, reducing reliance on blood bank supplies and improving survival rates. This is especially advantageous in rural or resource-limited settings with limited access to blood banks [11].

Pros of Using Cell Salvager.

Reduced Dependency on Allogeneic Blood: One of the key benefits of cell salvage is the decreased reliance on allogeneic blood transfusions, reducing the risks of transfusion-transmitted infections, transfusion reactions, and immunosuppression associated with donor blood [12].

Lower Risk of Transfusion Reactions: Since autotransfusion uses the patient's own blood, it avoids risks like febrile reactions and haemolysis that can occur with allogeneic transfusions. Additionally, it eliminates the risk of alloimmunization, a critical consideration for patients requiring multiple surgeries, as repeated transfusions increase the chances of developing antibodies against foreign blood antigens [13,14].

Cost-Effectiveness: While cell salvage systems involve upfront and maintenance costs, they have proven to reduce overall healthcare expenses in high-blood-loss surgeries by minimizing the need for expensive donor blood products. For instance, studies have shown that cell salvage in revision hip arthroplasty decreases overall costs compared to traditional blood transfusions, thanks to reduced blood product use, fewer transfusion-related complications, and shorter hospital stays. Hospitals are also integrating cell salvage into broader patient blood management (PBM) strategies to improve resource allocation and cost-efficiency [15].

Immediate Blood Availability in Trauma Settings: In trauma surgeries where rapid blood loss is common, cell salvage provides the critical advantage of immediate access to autologous blood, which can be reinfused during surgery. This is especially valuable in cases where blood bank supplies are limited or when the urgency of the situation requires a swift solution to stabilize the patient [16].

Cons of Using Cell Salvager.

High Initial Costs and Maintenance: The initial investment required to acquire and maintain cell salvage systems, along with the cost of disposable supplies, can be prohibitive, especially for smaller hospitals or those in low-resource settings. While cell salvage can reduce long-term costs associated with transfusions, the upfront expenses remain a barrier to widespread adoption, particularly in developing countries. Additionally, these costs must be justified by the expected volume of surgeries with significant blood loss.

Not Suitable for All Patients or Procedures: Cell salvage is contraindicated in certain cases, such as surgeries involving active infections or malignancies, where reinfusing blood could spread infection or tumour cells. In contaminated environments, like open fractures with debris, the salvaged blood may not be suitable for reinfusion due to the risk of contaminants. In such cases, alternative blood management strategies must be considered.

Risk of Dilutional Coagulopathy: Although cell salvage effectively recovers red blood cells, it does not restore clotting factors. In surgeries with massive blood loss, reinfusing salvaged blood may lead to dilutional coagulopathy, necessitating the use of supplemental clotting factors or fresh frozen plasma to maintain haemostasis.

Need for Specialized Training and Protocols: Cell salvage systems require specialized training for surgical teams, which may be a limiting factor in some hospitals. Inadequate training can result in improper use, increasing the risk of blood contamination or insufficient blood recovery. As cell salvage becomes more common, establishing standardized training protocols and competency assessments will be crucial for its safe and effective use across different clinical settings [12].

Discussion.

The use of cell salvage in orthopaedic trauma and elective surgeries represents a major advancement in blood management, aligning with efforts to reduce dependence on allogeneic transfusions. The growing adoption in high-blood-loss elective procedures and emergency trauma surgeries highlights the recognition of autotransfusion's benefits in reducing transfusion-related complications and improving patient outcomes. Its cost-effectiveness, especially in complex surgeries, further supports its integration into clinical practice as part of a comprehensive patient blood management strategy [1,3].

Recent advancements in cell salvage technology, such as enhanced filtration systems and faster processing, have made the technique safer and more efficient. However, challenges persist, including high implementation costs, contraindications in specific clinical scenarios, and the risk of coagulopathy in cases of massive blood loss. These issues emphasize the need for ongoing research to optimize cell salvage use, particularly for trauma and high-risk patients.

Additionally, while cell salvage in minimally invasive surgeries is still in its early stages, it presents potential for growth, especially for high-risk patients or those prone to postoperative anaemia. Future studies on its efficacy in this population could expand its application to low-blood-loss procedures [10].

As hospitals increasingly prioritize patient-centered care and cost-effective solutions, the role of cell salvage in orthopaedic surgery is expected to grow. However, careful consideration of clinical context, patient risk factors, and the cost-benefit balance will be essential in determining its optimal use. Continued technological advancements, along with enhanced education and training, will likely expand its role in improving patient outcomes in both trauma and elective orthopaedic surgeries [4-6,8].

Conclusion.

Cell salvage technology offers a valuable alternative to allogeneic transfusions in orthopaedic trauma and elective surgeries, reducing the risks associated with donor blood, enhancing patient outcomes, and providing immediate access to autologous blood in trauma settings. Its integration into modern blood management strategies reflects a growing shift toward safer, more effective practices. While challenges such as cost and contraindications persist, the increasing adoption of cell salvage demonstrates its expanding role in clinical practice. As technology continues to evolve, cell salvage is poised to become an even more essential component in the future of orthopaedic surgery.

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