GEORGIAN MEDICAL NEWS

ISSN 1512-0112

NO 2 (347) Февраль 2024

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 2 (347) 2024

Содержание:

GEORGIAN MEDICAL NEWS
No 2 (347) 2024

THE EFFECT OF A MULTIMODAL APPROACH ON THE RESULTS OF TREATMENT IN SURGERY: INTEGRATION OF CHEMOTHERAPY, SURGERY, AND RADIOTHERAPY

Valerii Vovk[1], Igor Duda[2], Alla Vovk[3].

[1]*Surgeon, Doctor of Medical Sciences, Professor Trnava University Hospital, Surgery Clinic, Trnava, Slovak Republic.*

[2]*PhD in Medicine Head of Surgical Clinic Department of Nursing, Faculty of Health Care and Social Work, Trnava University in Trnava, Trnava, Slovak Republic.*

[3]*Anesthetist Trnava University Hospital, Clinic of Anesthesiology, and Intensive Medicine, Trnava, Slovak Republic.*

Abstract.

Aim: This study investigates the safety and efficacy of a multimodal approach, integrating radiotherapy, chemotherapy, and surgery for the management of cancer patients.

Methodology: This review systematically reviewed English-language literature from digital repositories, namely Web of Science, Scopus, Google Scholar, PubMed, and the Cochrane Library. The search strategy employed a targeted selection of keywords: "chemotherapy," "radiotherapy," "multimodal," and "surgery," encompassing publications published before January 2024. This comprehensive approach was designed to encapsulate the breadth of existing research on the integration of these therapeutic modalities in cancer treatment, ensuring a robust analysis of their collective efficacy and safety.

Scientific Novelty: While existing literature has examined the efficacy and safety of the multimodal approach in various cancer types, each study typically focuses on a single type, such as breast, brain, or bladder cancer. This review is distinguished by its evaluation of the approach's efficacy across different cancer types, including but not limited to breast, bladder, esophageal, salivary gland, and cervical cancers.

Conclusion: The integration of chemotherapy, surgery, and radiotherapy emerges as the optimal strategy for cancer management, irrespective of cancer type or location. This approach is linked to the highest rates of disease-free survival, overall survival, and the lowest complication rates. However, further high-quality randomized trials are necessary to accurately assess the efficacy of this integrated approach in managing various cancer types.

Key words. Multimodal, surgery, radiotherapy, chemotherapy, cancer.

Introduction.

Chemotherapy, surgery, and radiotherapy are important components of cancer treatments that can be used alone or in combination. According to estimates from 1992, radiotherapy was the main treatment used to cure 40% of cancer patients (Figure 1), compared to anticipated rates of 11% and 49 for chemotherapy and surgery, respectively [1]. These calculations made use of data from the previous ten years. But this estimate—which was the best at the time—of radiotherapy's contribution to cancer cures remains valid, appears in recent publications, and continues to shape policy (such as research literature, NHS strategy documents, and cancer information) [2].

For individuals with early stages of cancer, the best strategy to combine radiation and chemotherapy following conserving surgery is still up for debate. Delaying radiation therapy after surgery has been linked to higher risks of local-regional recurrence, according to several retrospective research [3]. This hasn't always been the case, either, with some retrospective series revealing no higher risk of local recurrence in cases where chemotherapy is administered before radiation therapy. Additionally, there is fear that postponing chemotherapy in favor of radiation therapy could raise the chance of distant metastases and ultimately reduce survival. However, the conclusions drawn from these studies may not be entirely true due to therapy selection biases and the variability of tumors and patient features [4].

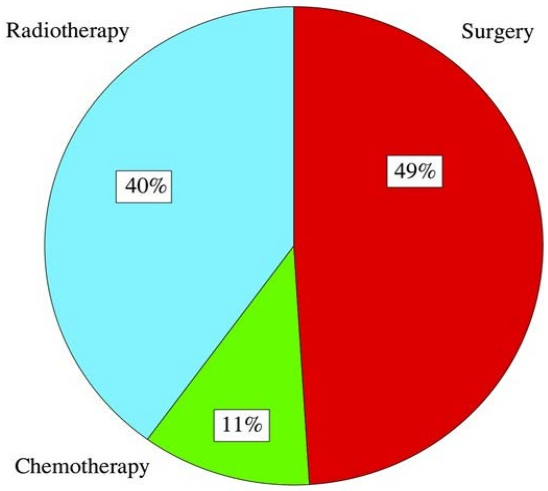

Figure 1. *The three primary methods of treating cancer and how much each modality contributes to the overall success of cancer cures [1].*

The treatment of cancer has advanced quickly thanks to amazing advancements in radiotherapy and surgery, as well as the discovery of novel medications, particularly immune response modifiers and cell-cycle checkpoint inhibitors [5]. Importantly, the growing integration of multimodality therapies has completely altered cancer care, with multidisciplinary groups serving as the basis for treatment determinations for specific patients [6].

Research focus.

In our review, we focused on studying the best treatment plan for different types of cancer and the integration between radiotherapy, chemotherapy, and surgery regarding the benefits and the complications.

Research problem.

Presently, over 12 million new cases and 7.6 million cancer-related deaths make cancer the third greatest cause of mortality

globally. Furthermore, the prevalence and distribution patterns of cancer around the world are constantly evolving, particularly in developing nations with weak economies. These days, breast, lung, prostate, and colon/rectum cancers are among the most prevalent cancers globally. For some cancer patients, there will be just one treatment. However, most patients have a combination of therapies, like radiation therapy and/or chemotherapy, after surgery. The identification of the best way to manage cancer depends on several factors such as location, age of the patient, stage of cancer, presence of metastases, and compliance of the patient.

Research questions.

1. What is the best plan for the treatment of different types of cancer?
2. What are the factors that affect the choice of treatment for cancer?
3. What are the benefits of the integration of chemotherapy, surgery, and radiotherapy for the management of cancer?
4. What are the challenges of integration of chemotherapy, surgery, and radiotherapy?

Objective of the Study.

The objective of the study is to investigate the safety and efficacy of a multimodal approach, which includes the integration of radiotherapy, chemotherapy, and surgery, for the management of cancer patients.

Literature review.

More than a hundred different types of cancer exist, and each has its own behaviour and reaction to treatment. Any kind of cell in the body can grow abnormally and develop into cancer. In cancer pathology, identifying malignant from benign tumors is the most important issue [7]. Any aberrant multiplication of cells, whether benign or malignant, is referred to as a tumor. Similar to a typical skin wart, a benign tumor stays where it is without causing damage to the surrounding healthy tissue or spreading to other areas of the body [8]. However, a malignant tumor has the ability to spread throughout the body via metastasizing, or invading nearby normal tissue, or by spreading through the circulatory or lymphatic systems. Strictly speaking, cancers are just malignant tumors; what makes them so deadly is their capacity to infiltrate and disseminate [9]. Although benign tumors may usually be surgically removed, malignant tumors can occasionally develop resistance to this type of focused treatment due to their spread to other parts of the body [10].

While there are many different types of cancer, only a select few are common (Table 1). In the US, there are more than a million new instances of cancer identified and more than 500,000 cancer-related deaths. Over 75% of all cancer cases are accounted for by cancers in ten distinct body locations. Breast, prostate, lung, and colon/rectum cancers are the four most prevalent cancer types, making up over half of all cancer cases. Approximately 30% of cancer-related deaths are attributable to lung cancer, which is by far the most deadly [11,12].

Table 1. *Ten most frequent cancers.*

Cancer site	Deaths per year	Cases per year
Breast	41,200 (7.5%)	184,200 (15.1%)
Leukemias	12,100 (2.2%)	30,800 (2.5%)
Prostate	31,900 (5.8%)	180,400 (14.8%)
Skin (melanoma)	7,700 (1.4%)	47,700 (3.9%)
Lung	156,900 (28.4%)	164,100 (13.4%)
Bladder	12,200 (2.2%)	53,200 (4.4%)
Colon/rectum	56,300 (10.2%)	130,200 (10.7%)
Uterus	11,100 (2.0%)	48,900 (4.0%)
Lymphomas	27,500 (5.0%)	62,300 (5.1%)
Kidney	11,900 (2.2%)	31,200 (2.6%)
Subtotal	368,800 (66.8%)	933,000 (76.5%)
All sites	552,200 (100%)	1,220,100 (100%)

Source: compiled by the authors based on [13].

Causes of cancer.

Carcinogens are substances that cause cancer. They have been identified through epidemiological analysis of cancer incidences in human populations and investigations conducted on experimental animals (e.g., the high incidence of lung cancer among cigarette users). It is unduly simplistic to discuss the sole causes of the majority of cancers because the development of malignancy is a complex multistep process that is influenced by a wide range of circumstances [14]. However, it has been discovered that a variety of substances, such as chemicals, radiation, and viruses, can cause cancer in both people and laboratory animals. Both radiation and a variety of chemical carcinogens cause mutations and damage to DNA. Since the generation of mutations in important target genes is thought to be the earliest event leading to cancer development, these carcinogens are typically referred to as starting agents [15].

Management of cancer.

The cornerstone of cancer therapy is combination therapy, a treatment approach that combines two or more therapeutic medicines. The cornerstone of cancer therapy is the combination of two or more therapeutic medicines to target pathways that sustain or cause cancer selectively. Even while monotherapy is still a fairly popular treatment option for a wide variety of cancer types, combination therapy is generally thought to be more effective than monotherapy [16]. Traditional monotherapy methods non-selectively attack cells that are actively multiplying, eventually resulting in the death of both malignant and healthy cells. Chemotherapy can have a number of harmful side effects and hazards for the patient. It can also significantly weaken the patient's immune system by damaging bone marrow cells and making them more vulnerable to host illnesses. Combination therapy can be hazardous; however, because different pathways will be addressed, the toxicity is considerably reduced if one of the medicines utilized is chemotherapeutic. In the end, this has an additive or synergistic effect; therefore, each drug's therapeutic dosage needs to be lowered. Furthermore, combination therapy has the potential to both produce cytotoxic effects on cancer cells and prevent harmful effects on normal cells [17].

This could happen if a medication in the combination regimen is less cytotoxic to normal cells than the other medication, therefore shielding normal cells from cytotoxic effects. Take into consideration a combination regimen consisting of an apoptosis-inducing drug and a caspase inhibitor, like Z-DEVD-

fmk. To be more precise, p-glycoprotein-expressing cancer cells that are resistant to Z-DEVD-fmk will produce Z-DEVD-fmk; nonetheless, the agent that causes apoptosis will cause the cancer cells to undergo apoptosis [18]. However, since the majority of normal cells do not express p-glycoprotein, Z-DEVD-fmk will directly damage them, and apoptosis will resume. Cancer therapy's therapeutic index would effectively rise with this technique, and its cytotoxic effect would become more potent. Furthermore, because cancer cells are constantly exposed to a single substance, monotherapy treatment makes them more vulnerable to drug resistance because it forces them to find additional salvage mechanisms. For instance, doxorubicin treatment of adenocarcinoma cells causes them to overexpress an ATP-dependent cassette pump in an attempt to get rid of the medication, which results in drug resistance [19]. On the other hand, combination therapy lowers the incidence of resistance because it can result in a more successful treatment response in fewer cycles. Finally, because of their non-selective treatment strategy, chemotherapeutics essentially fails to eradicate cancer stem cells (CSCs). This is a significant drawback since tumors contain a subset of CSCs that are responsible for the tumor's ability to proliferate, differentiate, and invade [20].

The use of targeted X-rays or subatomic particles for cancer treatment, both curative and palliative, is known as radiation therapy. It may be supplied internally or externally. The most popular type of radiation therapy, called "teletherapy," or external beam radiation, uses a radioactive source that is outside the patient and directs its energy towards the desired target [21]. Radiation therapy, systemic therapy, and surgery are the main components of definitive oncologic care. In contrast to surgery, which is normally a local strategy focused on removing gross disease, and systemic therapy, which is typically aimed to minimize metastatic spread, radiation is conceptually thought of as a loco-regional approach to cancer management [22]. Regional areas at risk of lymphatic dissemination and possible areas of spread close to the original tumor receive lower dosages of medication than areas with gross illness. Therefore, the construction of radiation fields requires a detailed understanding of the affected region's anatomy and patterns of spread for certain histologies [23].

Additionally, local tumor progression symptoms, including pain, blockage, bleeding, or compression, might be relieved with radiation therapy. Short courses are well suited to hospice and palliative care objectives since they can be quickly effective and have low toxicity profiles. This could improve the quality of life even in the very last stages of sickness [24]. Radiation therapy can also be used to treat a number of benign disorders, including keloids, trigeminal neuralgia, and heterotopic ossification. With the speed at which technology is developing, radiation is exploring an increasing number of applications and tactics that will improve tolerability and precision. The core of this area hasn't changed in over a century despite the rapid advancement of technology. Radiation therapy has sought to maximize tumor control while minimizing toxicity in order to provide cancer patients with both a cure and a high quality of life since the discovery of X-rays and their impact on the disease [25].

Methodology.

General background:

Evidence-based estimates of the contribution of radiotherapy, surgery, and chemotherapy to 5-year survival were obtained by analyzing the use of these three key modalities in cancer patients whose outcomes at that time were known. Five years of survival is an acceptable indicator for long-term survival or cure for certain types of tumors, but not all of them. Several retrospective, prospective studies and clinical trials were conducted to determine the best option for the management of cancer. Each study included a different population according to the type of cancer. They trying to find out the best way to treat this specific type and evaluate the response to their approach for different stages of this type of cancer. Recently, there have been increased efforts that aim to update and get the most benefits of a multimodal approach to the results of surgical treatment using the integration of radiotherapy, chemotherapy, and surgery.

Inclusion criteria.

1. All study designs of the articles were included, such as case series, randomized clinical trials, case-control, or systematic review.
2. We included studies evaluating the effect of the integration of chemotherapy, surgery, and radiotherapy.
3. Most included studies should be recent, from 2018 to 2023.

Exclusion criteria.

1. Studies and articles that were not peer-reviewed, as well as proposals, procedures, letters, and opinions.
2. Old studies that were conducted before 2010.
3. Studies unrelated to our topic or their aim were not related to ours.

Information sources.

We utilized the following online databases: Web of Science, Scopus, Google Scholar, PubMed, and the Cochrane Library using the following keywords “chemotherapy”, “radiotherapy”, “multimodal”, and “surgery” till January 2024. We collected studies using each set of keyword combinations to create an unbiased collection of publications. The references included in this paper were chosen because they are relevant to our topic.

Data collection.

Three steps were taken in the review process for the included studies. In the first, the results were imported into a Microsoft Excel sheet from electronic databases using EndNote Software. The second step involved screening the articles that were entered into the Excel sheet for titles and abstracts. In the third step, the full text citations from Stage 2 were screened. We also personally reviewed the references in the listed articles to make sure there were no research that might have been missed.

Statistical analysis.

A qualitative study was conducted on previously published studies. A quantitative analysis could not be undertaken due to the narrative review nature of this study. It is essential to specify the outcomes to be measured in the quantitative analysis, and it is necessary to locate and compare data from more than two

studies reporting on these outcomes to draw a conclusion. An attempt was made to conduct a quantitative analysis within this research; however, it was not possible to identify specific results relevant to the subject or to find papers presenting similar data. To gather strong evidence and current results and conclusions, a qualitative analysis of papers relevant to the topic was conducted, their findings presented, and comparisons made.

Results and Discussion.

Different modalities in cancer management

Most research examining treatment alternatives in conjunction with survival comes from clinical trials or analyses of trial data. Rather than including all cancer patients in the "real world," these trials only include a small number of carefully chosen patient cohorts, regardless of co-morbidities, age, performance status, or stage of the disease. Mee et al. performed a retrospective study that evaluated the efficacy of radiotherapy, chemotherapy, and surgery in curative cancer treatment [1]. They analyzed one million cancer patients; 28% of the included patients underwent surgical treatment only, 13% underwent surgical treatment and radiotherapy, 12% underwent surgical treatment, radiotherapy, and chemotherapy, 11% underwent surgical treatment and chemotherapy, 6% had radiotherapy only, 5% had chemotherapy only, and 4% had radiotherapy and chemotherapy. Their analysis revealed that 60% of patients who underwent surgical treatment, radiotherapy, and chemotherapy survived more than 5 years. 70% of patients who underwent surgery only, 45% in the radiotherapy group, and 33% in the chemotherapy group survived more than 5 years. The most serious limitation of this study is that it ignored many factors that may affect the response to the treatment, such as the location and the stage of the tumor and the presence of metastasis [1].

Treatment modalities in salivary gland tumors

Another retrospective study was performed by Aral et al. to compare radiotherapy and surgery versus surgical treatment, radiotherapy, and chemotherapy for the management of salivary gland tumors [26]. They included 34 patients who underwent surgery with radiotherapy and 13 patients who underwent surgical treatment, radiotherapy, and chemotherapy. They found that there were no significant variations between the combination group and the radiotherapy group regarding disease-free survival. Additionally, their analysis proved that the overall survival rate did not show any significant difference between the two groups [26]. Huang et al. compared surgery with radiotherapy versus surgical treatment, radiotherapy, and chemotherapy for the management of parotid gland tumors. They found that the multimodal approach was associated with 82.0% 5-year survival, 82.4% distant metastasis-free survival, 88.4% locoregional control, and 77.5% disease-free survival rates [27].

Treatment modalities in urinary bladder tumors

Andruska et al. is a clinical trial that evaluates radiotherapy only versus chemotherapy with radiotherapy for non-muscle invasive bladder cancer. They included 259 patients; 123 patients had radiotherapy only, and 136 had chemoradiotherapy. Their results demonstrate that the chemoradiotherapy group was accompanied by significantly higher four-year survival rates (36%) than the radiotherapy group (19%) $P < 0.008$ [28].

While not always accurate, five-year survival can serve as a surrogate for survival in certain cancer cases. However, we have data at a clearly defined time-point that is simple to interpret in a cohort treated with the most recent medicines available when we use the 5-year survival from initial diagnosis. It is evident from our examination of the data items that we have access to that we are unable to ensure that a patient was genuinely cured. During the 5-year follow-up, therapy events were not limited by a time frame from diagnosis, as this would have artificially reduced the number of treatments that could have improved a patient's prognosis. Incorporating all therapies into our calculations allows us to produce more accurate results than relying solely on initial primary management.

Treatment modalities in cervical cancer

Kenter et al. conducted a randomized controlled experiment to evaluate the effects of chemoradiation versus neoadjuvant chemotherapy followed by surgery in patients with stage IB2-IIB cervical carcinoma. They involved 626 patients: 314 in the chemotherapy cohort and 312 in the chemoradiation cohort. In the chemotherapy group, they found that the incidence of toxicity and progressive disease were (30 of 314; 9.6%) and (21 of 314; 6.7%). In the chemoradiation group, the incidence of the incidence of toxicity and progressive disease were (23 of 312, 7.4%) and (13 of 312, 4.2%), respectively [29].

Treatment modalities in esophageal cancer

Purkayastha et al. performed a randomized prospective comparative study that compared chemoradiotherapy with chemotherapy only after conservative surgery for the management of esophageal cancer. They found that the tumor downstaging was low in both groups; however, the incidence of postoperative complications was higher in the chemoradiotherapy group than in the chemotherapy group. Four-year median overall survival and disease-free survival were 38 months and 28.50 months in the chemoradiotherapy group versus 35.5 months and 28 months in the chemotherapy group, respectively [30].

The multimodal approach in cancer treatment involves using a combination of different therapies, such as surgery, chemotherapy, radiation therapy, targeted therapy, immunotherapy, and hormonal therapy, to effectively combat cancer while minimizing harm to healthy tissues. Studies have shown that this approach leads to improved survival rates, better tumor control, reduced treatment toxicity, and personalized treatment strategies for individual patients. Collaboration among healthcare professionals is crucial for optimizing treatment outcomes and improving the prognosis for cancer patients [31-35].

A systematic review and meta-analysis were conducted by Kumar et al. to compare neoadjuvant radiotherapy, neoadjuvant chemotherapy, neoadjuvant concurrent chemoradiation, and neoadjuvant sequential chemoradiotherapy for the management of resectable esophageal cancer [36]. Twenty-five randomized trials involving 5272 patients were included for quantitative analysis. Their analysis revealed that the chemoradiotherapy group was associated with the lowest failure rate and the highest 3-year disease-free survival ($p = 0.00001$), 3-year overall survival ($p = 0.007$), and 5-year disease-free survival

(p = 0.00001). Anderegg et al. [37] and von Döbeln et al. [38] are trials that compare chemoradiotherapy and chemotherapy only for treating resectable esophageal cancer and had the same results as Kumar et al. in favor of the chemoradiotherapy group.

Treatment modalities in breast cancer

In 2022, a randomized clinical trial was conducted by Chen et al. to compare chemotherapy with chemoradiotherapy after surgery for the management of breast cancer. They concluded that the chemoradiotherapy group was accompanied by a lower rate of complications and higher rates of overall survival and disease-free survival than the chemotherapy group [39].

Limitations.

Our study evaluates various types of cancer, not specific ones; however, we cannot cover all types of cancer due to their vast diversity. Additionally, the types of cancers we discussed in our study have different stages, so we could not discuss all of them. The primary issue with this article is that it is a narrative review. The included research results are presented in written paragraphs in a narrative review. They don't undertake any pooled analysis using the data from the summarized studies. Real objectivity and pooled analysis are therefore precluded. A narrative review serves as a collated source of the most widely accepted views at the time of publishing. This may be useful to understand a body of evidence fully. As it does not thoroughly consider the alternative hypothesis, it does not guarantee that the prevailing ideas are true.

Conclusion.

We discussed the effect of the integration of radiotherapy, chemotherapy, and surgery for the management of different types of cancer, such as breast cancer, cervical cancer, salivary gland cancer, esophageal cancer, and bladder cancer. We demonstrated controversial results among the published studies. However, there is a strong evidence from the majority of published studies suggesting that the integration therapy is the preferred choice for the management of cancer regardless of which type of cancer or the location of cancer, as this integration was associated with the highest rates of disease-free survival, overall survival, and the lowest rate of complications. However, further high-quality evidence randomized trials are required to properly estimate the efficacy of integrating radiotherapy, chemotherapy, and surgery for managing different types of cancer.

Conflict of interest: All authors declare no conflict of interest.

Acknowledgments: None

Ethical statement: Not applicable.

Funding: None

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