

ORIGINAL STUDY

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Short-Term and Long-Term Outcomes of Breast-Conserving Surgery in Patients With Breast Cancer: A Non-Randomized Clinical Trial

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ABSTRACT

BACKGROUND: Surgical advances in breast cancer contribute to improving the postoperative quality of life.**AIM:** The study aimed to evaluate the short-term and long-term outcomes of breast-conserving surgery.**METHODS:** The study included the treatment outcomes reported for 194 patients diagnosed with breast cancer who had been admitted to the Samara Regional Clinical Cancer Hospital between 2011 and 2020. Group 1 ($n = 96$) included patients who had undergone conventional breast-conserving surgeries. For group 2 ($n = 98$), a modified approach, described as “Choosing the extent of surgery for patients diagnosed with breast cancer,” was used. This technique involved the placement of the lateral adipocutaneous flap in the axillary region, with the free edge positioned as close to the *nervus thoracicus longus* as possible. The analysis focused on operative time and intraoperative blood loss. The disease-free and overall survival probabilities were estimated using the Kaplan–Meyer method. The patients were also asked to complete the Breast-Q questionnaire prior to surgery and six months after the treatment. The statistical analysis was performed using the parametric (Student’s t test) and non-parametric (Mann–Whitney test, chi-squared test [χ^2], and Fisher’s exact test) methods. The significance level was set at $p < 0.05$.**RESULTS:** The short-term surgical outcomes were not significantly different between the groups. The mean operative time was 76.3 ± 23.3 minutes in group 1 and 65.5 ± 18.3 minutes in group 2 ($p < 0.001$), with the intraoperative blood loss recorded at 53.1 ± 26.2 mL and 49.0 ± 14.3 mL, respectively ($p = 0.18$). Postoperatively, persistent non-infected seroma (>14 days) was identified in 19 patients from group 1 and 7 patients from group 2 ($p = 0.009$).**CONCLUSION:** The proposed method provides a significant reduction in the incidence of complications, with long-term outcomes comparable to those observed in the conventional treatment group.**Keywords:** breast cancer; breast-conserving surgery; surgical treatment.

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ОРИГИНАЛЬНОЕ ИССЛЕДОВАНИЕ

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Результаты выполнения органосохранных операций у больных с диагнозом «рак молочной железы»: нерандомизированное клиническое исследование

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АННОТАЦИЯ

Обоснование. Совершенствование способов хирургического лечения пациентов с раком молочной железы позволяет сохранять высокое качество жизни пациенток после операций.

Цель исследования. Оценить ближайшие и отдалённые результаты применения варианта органосохраняющих операций.

Методы. В исследование включены данные о лечении 194 пациенток с диагнозом «рак молочной железы», проходивших терапию в Самарском областном клиническом онкологическом диспансере в 2011–2020 гг. В 1-й группе (n=96) выполняли стандартные органосохраняющие операции на молочной железе, во 2-й группе (n=98) применяли модифицированный способ «Выбор объёма хирургического лечения для больных с диагнозом рак молочной железы», заключающийся в фиксации свободного края латерального кожно-жирового лоскута в подмышечной области максимально близко к *nervus thoracicus longus*. Анализировали основные продолжительность операции и объём интраоперационной кровопотери. Безрецидивную и общую выживаемость оценивали методом Каплана–Мейера. Пациентки также заполняли опросник Breast-Q накануне операции и через 6 мес после окончания лечения. Статистическую обработку проводили с использованием параметрических (t-критерий Стьюдента) и непараметрических (критерий Манна–Уитни, критерий χ^2 и точный критерий Фишера) методов.

Результаты. Ближайшие результаты хирургического лечения в группах статистически значимо не различались. Средняя продолжительность операции составила $76,3 \pm 23,3$ мин в 1-й группе и $65,5 \pm 18,3$ мин во 2-й группе ($p < 0,001$); интраоперационная кровопотеря достигла $53,1 \pm 26,2$ и $49,0 \pm 14,3$ мл ($p = 0,179$) соответственно. В послеоперационном периоде длительная неинфицированная серома (> 14 дней) выявлена у 19 пациенток 1-й группы и у 7 пациенток 2-й группы ($p = 0,009$).

Заключение. Предложенный способ обеспечивает значимое снижение частоты осложнений, при этом отдалённые результаты сопоставимы с данными группы стандартного лечения.

Ключевые слова: рак молочной железы; органосохраняющие операции; хирургическое лечение.

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BACKGROUND

Breast cancer (BC) treatment is one of the key healthcare problems, as BC is the most commonly diagnosed type of tumor among women worldwide [1]. According to the World Health Organization, 2.3 million new cases of BC were reported in 2022, and approximately 670,000 women died of the disease.¹ Over the past decade, a significant amount of data has been collected, reflecting an in-depth understanding of the biology and treatment of early and advanced BC [2]. Due to the widespread use of screening mammography in many countries worldwide and greater access to effective medical treatment, the mortality of BC is decreasing [3]. BC is increasingly detected in the early stages, when breast-conserving surgeries are possible [4].

Based on the fact that the effectiveness of modern treatment of patients with BC should be assessed by the number and quality of years lived, more attention has recently been paid to assessing quality of life indicators [5]. The improvement of surgical approaches enhances quality of life after surgery [6].

This study aimed to assess the immediate and long-term results of using the proposed method of breast-conserving surgery.

METHODS

A non-randomized clinical study was performed to compare the outcomes of patients in the experimental group who received the intervention under study with those of the control group who did not receive it.

According to the *Clinical Guidelines of the Ministry of Health of the Russian Federation*, the preferred surgical treatment for BC is breast-conserving operations involving the removal of a tumor with a small amount of surrounding healthy tissue (grade of recommendation: A; evidence-based level—1a).² The control group included 194 patients who underwent breast-conserving surgery as part of a combined/multimodality treatment. The therapeutic approach was determined based on the main characteristics of the disease: stage and histological and molecular biological type of tumor growth. Group 1 patients ($n = 96$, historical control) underwent surgery between 2011 and 2015 and underwent standard breast-conserving interventions. Group 2 included 98 patients who underwent surgery between 2016 and 2020 according to the proposed approach [7].

All patients from the control group were marked in a standing position before the surgery, with a resection margin of ≥ 2 mm.

Intervention

After two preoperative showers with antiseptic, skin incisions were made along the marking line. Breast tissue was removed along with the tumor, and an urgent histological examination of the resection margins was conducted. The bed of the removed tumor was marked with X-ray positive clips (≥ 5 pieces) for subsequent visualization of the surgical area with adjuvant radiation therapy [8].

Then, the fiber was isolated in the medial part of the axillary vein, and a biopsy of the sentinel lymph node or regional lymph dissection was performed. The axillary and resection areas were drained using polyvinyl chloride tubes.

Subsequently, the lateral adipocutaneous flap was placed in the axillary region, as close to the *nervus thoracicus longus* as possible, with free-edge positioning excluding its deformation. Additionally, a similar suture fixation was performed 15–20 mm medial from the initial injection. The surgery was completed by checking hemostasis, excluding foreign bodies, closing the wound in layers, and applying an aseptic dressing.

The volume of lymph dissection was determined based on the involvement of peripheral lymph nodes in the tumor process. Thus, if the results of ultrasound and cytological confirmation showed axillary lymph node involvement, lymphadenectomy was conducted; otherwise, a biopsy of the sentinel lymph nodes was carried out.

Inclusion criteria:

1. Ductal carcinoma in situ (DCIS);
2. BC stage 1: cT1N0M0; stage 2A: cT2N0M0, cT1N1M0; and stage 2B: cT2N1M0;
3. BC stage 2A (cT2N0M0 and cT1N1M0) and 2B (cT2N1M0 and cT3N0M0) after neoadjuvant treatment with partial or complete regression (PR, CR);
4. Absence of BRCA1, BRCA2, CHECK mutations, and any malignant tumors in the first- and second-degree relatives;
5. Absence of an intraductal component according to biopsy data;
6. Absence of tumor at the resection margin;
7. Satisfactory functional status of the cardiovascular, respiratory, urinary, and other systems, allowing for surgical intervention;
8. Patient's desire for breast preservation;
9. Technical feasibility of performing a breast-conserving surgery;
10. Ratio of tumor size and breast volume is $\leq 1:8$ to avoid pronounced deformity and unsatisfactory cosmetic outcome.

Exclusion criteria:

¹ World Health Organization (WHO): Breast Cancer, 2024 Available at: <https://www.who.int/ru/news-room/fact-sheets/detail/breast-cancer> Accessed on January 6, 2024.

² The Gold Standard in Diagnosis and Management of Breast Cancer, 2021 Available at: https://cliniclancette.ru/docs/KR_ROOM_2021.pdf Accessed on: November 7, 2024.

- Locally advanced, primary inoperable invasive BC (cT1N2–3M0, cT2N2–3M0, cT3N1–3M0, and cT4N0–3M0–1);
- BC stage 2A (cT2N0M0 and cT1N1M0) and 2B (cT2N1M0 and cT3N0M0) after neoadjuvant therapy with no response (NR);
- Mutations of genes associated with BC or malignant tumors in the first- and second-degree relatives;
- Intraductal component in the biopsy material;
- Paget's disease;
- Multiple primary synchronous cancer;
- Tumor at the resection margin;
- Inability to perform breast-conserving surgery to achieve clean resection margins and an acceptable esthetic breast shape;
- Pathological microcalcifications extending beyond the tumor node or other signs of widespread intracurrent tumor growth visible on mammography and/or MRI, which prevent the removal of the entire tumor growth zone to achieve a clean resection margin of ≥ 2 mm and form a satisfactory cosmetic outcome;
- Severe concomitant diseases in the decompensation stage;
- Patient's refusal of breast-conserving surgery.

Control Group Analysis

The mean age in group 1 was 54.83 ± 0.934 years and 55.704 ± 1.998 years in group 2. The majority of patients (group 1, 70 [72.617%]; group 2, 58 [59.184%]) did not exceed 59 years of age at the time of surgery; this age was the most significant factor for maintaining their quality of life by performing breast-conserving surgeries².

Distribution of Patients Based on Pathomorphological Stage

The majority of patients in the control group were diagnosed with stage 2 BC (group 1, 52.085%; group 2, 51.769%). Nonetheless, breast-conserving surgeries could be performed due to the use of oncoplastic resection technique [9]. Table 1 shows that the groups are comparable in terms of disease stage ($\chi^2 = 0.722$).

The histological and biological types of the tumor were evaluated in the compared groups to determine the need for neoadjuvant therapy. Table 1 presents the distribution of patients by primary tumor histology in the study groups. Quantitative data from two independent groups were used for the analysis.

The predominant histological type of BC was invasive cancer of no special type, followed by invasive lobular cancer. The number of patients in groups 1 and 2 was compared. Based on the histological type of the primary tumor structure, the studied groups were comparable ($\chi^2 = 0.722$).

Table 2 reveals the distribution of patients according to the biological subtype of the malignant tumor. Quantitative data from two independent groups were evaluated.

The analyzed groups were predominated by luminal A subtype of tumor growth: 47 (48.96%) in group 1 and 51 (52.04%)

Table 1. Distribution of patients by primary tumor histology in the study groups

Histologic tumor type	Subgroup 1 (n = 96)		Subgroup 2 (n = 98)	
	Absolute number	%	Absolute number	%
Invasive of no special type	52	54,17	50	51,02
Invasive lobular	29	30,21	35	35,71
Other	15	15,63	13	13,27
Total	96	100	98	100

Note: $\chi^2 = 0.722$; $p > 0.865$.

Table 2. Distribution of patients by primary tumor subtypes

Biological subtype of cancer	Group 1, n = 120		Group 2, n = 79	
	Absolute number	%	Absolute number	%
Luminal A	47	48,96	51	52,04
Luminal B	34	35,42	35	35,72
Other (HER2+, basal-like)	15	15,66	12	12,24
Total	96	100	98	100

Note: $\chi^2 = 0.491$; $p > 0.783$.

in group 2. These indicators are comparable with published data on the distribution of histological subtypes of tumor growth [10]. Table 2 shows that the groups were comparable in biological subtypes of the primary tumor ($p > 0.783$).

All the study patients were treated according to the main characteristics of the disease: the stage and histological and molecular biological type of tumor growth.

The key criteria when choosing surgical access for performing breast-conserving surgery were the size of the breast and tumor (indicating the quadrant and affected area). When the appropriate resection method is selected, preoperative mapping is the key to achieving a good esthetic outcome of surgical treatment and patient satisfaction [8].

The patients were asked to complete the Breast-Q questionnaire prior to surgery and 6 months after the treatment.

All statistical estimates were performed using Statistica 10.0. Statistical analysis of the obtained data was conducted using the parametric (Student's *t* test) and non-parametric (Mann–Whitney test, chi-squared test [χ^2], and Fisher's exact test) methods. The significance level was set at $p < 0.05$.

RESULTS

The main parameters of surgical intervention, including the volume of lymph dissection, duration of surgery, and volume of intraoperative blood loss, were analyzed to assess the immediate results of treatment in the control group patients.

The drains were removed when the lymphorrhea was ≤ 50 ml, and no later than 7 days after surgery.

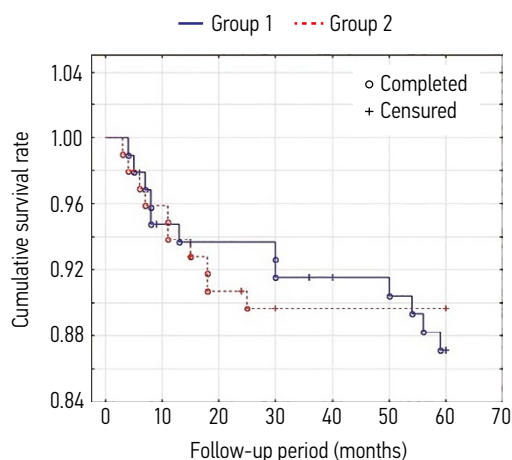


Fig. 1. Kaplan–Meier curves for disease-free survival in groups 1 and 2.

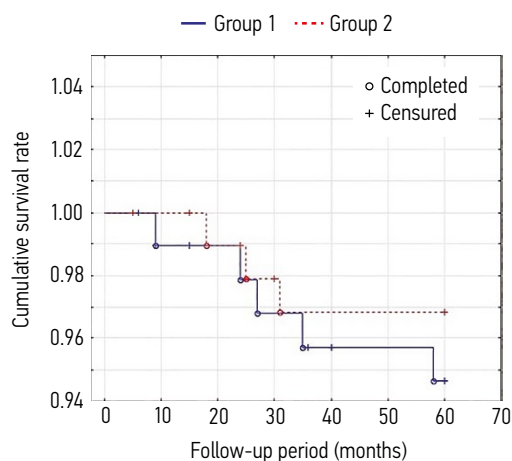


Fig. 2. Kaplan–Meier curves for overall survival in groups 1 and 2.

The results of treatment of control group patients after breast-conserving surgeries were investigated. The median follow-up was 39 months (IQR: 25–75 percentile) in the study group and 45 months (IQR: 25–75 percentile) in the control group.

Figure 1 shows the indicators of disease-free survival in the control subgroups.

The 5-year disease-free survival rate in group 1 was 87.14% and 89.74% in group 2. The event-free survival curves in the compared groups did not significantly differ (log-rank = 0.465; $p = 0.642$; 95% confidence interval: 83.3%–95.5%). The relapses and progression of the disease required treatment adjustments in group 1 patients (Table 3). Quantitative data from two independent groups were evaluated.

The probability of receiving treatment in group 1 was 1.26 times higher than in group 2; however, the 95% confidence interval includes 1, which confirms the absence of statistically significant differences.

The 5-year survival rate in group 1 was 94.71% and 96.74% in group 2 (95% confidence interval: 91.3%–99%). Figure 2 indicates that the survival curves in the comparison groups also did not differ (log-rank = 0.74; $p = 0.458$).

Table 3. Distribution of patients by treatment for disease progression and recurrence

Treatment options	Group 1 (n = 96)	Group 2 (n = 98)
	Absolute number	Absolute number
Surgical intervention combined with systemic therapy	6	8
Systemic treatment only	5	2
Integrated approach with radiation therapy	1	0
Total	12	10

Note: $\chi^2 = 2.143$; $p = 0.709$. Fischer’s exact test: $p = 0.501$ (differences are not significant). The odds ratio was 1.257 (95% confidence interval: 0.514; 3.074).

The second Breast-Q questionnaire was conducted at 6-month follow-up, a point which, according to the published data, is the endpoint of esthetic outcome assessment [11]. Each of the questionnaire scales could be used separately [11].

CONCLUSION

The developed method, “Choosing the extent of surgery for patients diagnosed with BC” (database filing code no. “2017621168”, dated October 9, 2017), applied in group 2 contributed to a significant decrease in the incidence of class 1 and 2 surgical wound complications compared to group 1 receiving standard treatment, with comparable long-term outcomes.

ADDITIONAL INFORMATION

Author contributions: O.A.E.: conceptualization, formal analysis, supervision; K.O.I.: conceptualization, supervision; T.M.V.: data curation, writing—review & editing, supervision; B.A.V.: data curation, writing—original draft, writing—review & editing. All authors approved the version of the manuscript to be published and agree to be accountable for all aspects of the work, ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethics approval: The study was approved by the Local Ethics Committee of the Samara Regional Clinical Cancer Hospital (Minutes No. 14 of August 02, 2010). All participants provided written informed consent prior to inclusion in the study (on the day of admission).

Informed consent: The authors have obtained the written informed consent of the patient [and/or the patient’s legal representatives] to publish personal data. The scope of the published data was approved by the patient.

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ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. О.А.Е. — концептуализация, анализ данных, руководство исследованием; К.О.И. — концептуализация, руководство исследованием; Т.М.В. — работа с данными, пересмотр и редактирование рукописи, руководство исследованием; Б.А.В. — работа с данными, написание черновика, пересмотр и редактирование рукописи. Все авторы одобрили рукопись (версию для публикации), а также согласились нести ответственность за все аспекты работы, гарантируя надлежащее рассмотрение и решение вопросов, связанных с точностью и добросовестностью любой её части.

Этическая экспертиза. Проведение исследования одобрено локальным этическим комитетом СОКОД (протокол № 14 от 02.08.2010). Все участники исследования подписали форму информированного добровольного согласия до включения в исследование (в день госпитализации).

Согласие на публикацию. Авторы получили письменное информированное добровольное согласие пациента [и/или законных

представителей пациента] на публикацию персональных данных. Объём публикуемых данных с пациентом согласован.

Источники финансирования. Отсутствуют.

Раскрытие интересов. Авторы заявляют об отсутствии отношений, деятельности и интересов за последние три года, связанных с третьими лицами (коммерческими и некоммерческими), интересы которых могут быть затронуты содержанием статьи.

Оригинальность. При создании настоящей работы были использованы фрагменты собственного текста, опубликованного ранее ([EDN: JQYMIV], распространяется на условиях лицензии CC-BY 4.0).

Доступ к данным. Редакционная политика в отношении совместного использования данных к настоящей работе не применима, новые данные не собирали и не создавали.

Генеративный искусственный интеллект. При создании настоящей статьи технологии генеративного искусственного интеллекта не использовали.

Рассмотрение и рецензирование. Настоящая работа подана в журнал в инициативном порядке и рассмотрена по обычной процедуре. В рецензировании участвовали три внешних рецензента, член редакционной коллегии и научный редактор издания.

REFERENCES

- Cardoso F, Paluch-Shimon S, Senkus E, et al. 5th ESO-ESMO International Consensus Guidelines for Advanced Breast Cancer (ABC 5). *Ann Oncol.* 2020;31(12):1623–1649. doi: 10.1016/j.annonc.2020.09.010 EDN: TAULMW
- Derouane F, van Marcke C, Berlière M, et al. Predictive biomarkers of response to neoadjuvant chemotherapy in breast cancer: Current and future perspectives for Precision Medicine. *Cancers.* 2022;14(16):3876. doi: 10.3390/cancers14163876 EDN: JGWWHE
- Burstein HJ, Regan MM, Winer EP, et al. Customizing local and systemic therapies for women with early breast cancer: the St. Gallen international consensus guidelines for treatment of early breast cancer 2021. *Annals of oncology.* 2021;32(10):1216–1235. doi: 10.1016/j.annonc.2021.06.023 EDN: YNWRTD
- Stankowski-Drengler TJ, Livingston-Rosanoff D, Schumacher JR, et al. Breast cancer outcomes of neoadjuvant versus adjuvant chemotherapy by receptor type: A scoping review. *J Surg Res.* 2020;(254):83–90. doi: 10.1016/j.jss.2020.04.011 EDN: JPAQRP
- Agostinetti E, Gligorov J, Piccart M. Systemic therapy for early-stage breast cancer: Learning from the past to build the future. *Nat Rev Clin Oncol.* 2022;19(12):763–774. doi: 10.1038/s41571-022-00687-1 EDN: ANMYM
- Volchenko AA, Pak DD, Usov FN. Repair plastic surgery in patients with breast cancer. *Tumors of female reproductive system.* 2011;3:29–32. EDN: PUJIT
- Certificate of state registration of the database No. 2017621170 Russian Federation. Tkachev MV. *Selection of the volume of surgical treatment for patients diagnosed with breast cancer.* No. 2017620899. declared 14.08.2017. published 09.10.2017. (In Russ.) EDN: JQYMIV
- Dines LM, Stellander AKL, Schmidt VJ, Rose M. Oncoplastic breast surgery for patients with breast cancer. *Ugeskr Laeger.* 2023;185(34):V11220669. Available from: <https://ugeskriftet.dk/videnskab/onkoplastisk-brystkirurgitil-patienter-med-brystkraeft>
- Thiessen FEF, Tjalma WAA, Tondu T. Breast reconstruction after breast conservation therapy for breast cancer. *Eur J Obstet Gynecol Reprod Biol.* 2018;230:233–238. doi: 10.1016/j.ejogrb.2018.03.04
- Timerbulatov VM, Timerbulatov ShV, Timerbulatov MV. Classification of surgical complications. *Pirogov Russian journal of surgery.* 2018;9:61–65. doi: 10.1016/j.ejogrb.2018.03.049.12 EDN: VKFVAF
- A Scoping Review of the Application of BREAST-Q in Surgical Research. *JPRAS Open.* 2023;37:9–23. doi: 10.1016/j.jprra.2023.04.005 EDN: AVAKAW

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