 УДК 616-089.844.168.1-06-071/.079

POSTOPERATIVE COMPLICATIONS AFTER BREAST PLASTIC AND RECONSTRUCTIVE SURGERY: A COMBINED RETROSPECTIVE AND PROSPECTIVE STUDY

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Despite progress in surgical techniques, biomaterials, and perioperative care, postoperative complications remain a significant clinical issue, contributing to delayed recovery, higher healthcare costs, and potential reconstructive failure.

Objective *– to evaluate the incidence, structure, and morphological predictors of postoperative complications following breast plastic and reconstructive surgery using a combined retrospective and prospective study design.*

Material and methods*. Prospective longitudinal cohort study included 95 women, which underwent aesthetic breast surgery. The mean age was 35.48±6.61 years (range 19-57). The assessment included general clinical status, complaints, physical examination, ultrasound, the mammoplasty type performed. Retrospective cross-sectional study included analysis of 50 medical records of operated patients who met complications. The most common postoperative complication (capsular contracture) was included in the analysis. The study adhered to the principles of the Council of Europe Convention on Human Rights and Biomedicine and received approval from the Biomedical Ethics Committee of Bukovinian State Medical University (Protocol No. 1, dated 19 September 2024). All patients signed an informed consent to participate in the study. All women underwent preliminary screening for compliance with the inclusion-exclusion criteria. Inclusion criteria for the study: age 18 years and older; absence of mental disorders that make contact with the patient impossible; signed voluntary consent to participate in the study. Statistical analyses were performed using Statistica 7.0 (StatSoft Inc., USA) and Microsoft Excel 2016.*

This investigation was conducted within the framework of the ongoing research Study of the Family Medicine Department at Bukovinian State Medical University, titled "Improvement of diagnosis and prediction of hypertension-mediated target organ damage and symptom control in comorbid conditions considering clinical, metabolic, and molecular-genetic predictors" (State Registration No. 0124U002524; duration: 2024-2028).

Results. *In retrospective study capsular contracture demonstrated a strong time-dependent progression (r=0.85; p<0.001), with clinically significant forms (III-IV) predominating beyond 5 years, confirming its chronic and progressive nature, potentially reflecting suboptimal surgical techniques or inadequate postoperative care. In the prospective part of the study postoperative complications occurred in 12% of women, mainly due to severe contracture. Among patients with capsular contracture, the majority had a preoperative tubular breast shape (66.67%), while 33.33% had a hemispherical shape, suggesting that tubular morphology may represent an additional risk factor. Regarding surgical procedures, primary interventions predominated, with primary mammoplasty performed in 69.47% (n=66) of cases*

Conclusions. *Tubular breast morphology might identify as a potential additional risk factor for postoperative complications. Primary mammoplasty accounted for the majority of procedures in contemporary aesthetic breast surgery.*

Keywords: *plastic and reconstructive surgery, mammary gland, postoperative complications.*

Clinical and experimental pathology 2026. Vol. 25, № 2 (96). P. 92-97.

DOI 10.24061/1727-4338.XXV.2.96.2026.15

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ПІСЛЯОПЕРАЦІЙНІ УСКЛАДНЕННЯ ПІСЛЯ ПЛАСТИЧНОЇ ТА РЕКОНСТРУКТИВНОЇ ХІРУРГІЇ МОЛОЧНИХ ЗАЛОЗ: КОМБІНОВАНЕ РЕТРОСПЕКТИВНЕ ТА ПРОСПЕКТИВНЕ ДОСЛІДЖЕННЯ

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Незважаючи на прогрес у хірургічних техніках, біоматеріалах та періопераційному догляді післяопераційні ускладнення залишаються значною клінічною проблемою,

Key words: *пластична та реконструктивна хірургія, молочна залоза, післяопераційні ускладнення.*

Клінічна та експериментальна патологія. 2026; Т.25, № 2 (96). С. 92-97.

що сповільнює одужання, зумовлює вищі витрати на охорону здоров'я та потенційні невдачі реконструктивних операцій.

Мета роботи – *оцінити частоту, структуру та морфологічні предиктори післяопераційних ускладнень після пластичної та реконструктивної хірургії молочної залози, використовуючи комбіноване ретроспективне та проспективне дослідження.*

Матеріали та методи. *Проспективне поздовжнє когортне дослідження включало 95 жінок, яким виконано естетичні хірургічні втручання на молочній залозі. Середній вік – 35,48±6,61 років (діапазон 19-57). Оцінювали загальний клінічний стан, скарги, фізикальне обстеження, ультразвукове дослідження, тип проведеної мамопластики. Ретроспективне перехресне дослідження включало аналіз 50 медичних карток прооперованих пацієнток, які зіткнулися з ускладненнями. До аналізу включено найпоширеніше післяопераційне ускладнення (капсулярна контрактура). Дослідження виконане відповідно до принципів Конвенції Ради Європи про права людини та біомедицину і отримало схвалення Комісії з біомедичної етики Буковинського державного медичного університету (Протокол № 1 від 19 вересня 2024 року). Усі пацієнтки підписали інформовану згоду на участь у дослідженні та пройшли попередній відбір на відповідність критеріям включення-виключення. Критерії включення в дослідження: вік 18 років і старше; відсутність психічних розладів, що унеможливлюють контакт із пацієнткою; підписана добровільна згода на участь у дослідженні. Статистичний аналіз проводили за допомогою Statistica 7.0 (StatSoft Inc., США) та Microsoft Excel 2016. Дослідження виконувалось у рамках діючої науково-дослідної роботи кафедри сімейної медицини Буковинського державного медичного університету "Удосконалення діагностики та прогнозування гіпертензивно-опосередкованого ураження окремих органів-мішеней та контролю симптомів при коморбідній патології з урахуванням клініко-метаболічних та молекулярно-генетичних предикторів" (№ державної реєстрації 0124U002524; тривалість: 2024-2028 рр).*

Результати. *У ретроспективному дослідженні капсулярна контрактура продемонструвала сильний зв'язок залежний від часу ($r=0,85$; $p<0,001$), причому клінічно значущі форми (III-IV) переважали після 5 років, що підтверджує її хронічний та прогресуючий характер, потенційно відображаючи неоптимальні хірургічні методики або неадекватний післяопераційний догляд. У проспективній частині дослідження післяопераційні ускладнення виникли у 12% жінок, головним чином через контрактуру. Серед пацієнток із капсулярною контрактурою більшість мала доопераційну трубчасту форму грудей (66,67%), тоді як 33,33% мали напівсферичну форму, що свідчить про те, що трубчаста морфологія може бути додатковим фактором ризику. Щодо хірургічних процедур, переважали первинні втручання, причому первинна мамопластика виконана у 69,47% (n=66) випадків.*

Висновки. *Тубулярна морфологія грудей може бути потенційним додатковим чинником ризику післяопераційних ускладнень. Первинна мамопластика становить більшість процедур у сучасній естетичній хірургії молочної залози.*

Introduction

Breast plastic and reconstructive surgery has become an essential component of both oncologic management and aesthetic medicine, significantly improving patients' quality of life, body image, and psychosocial well-being. Despite advances in surgical techniques, biomaterials, and perioperative care, postoperative complications remain a clinically significant concern, contributing to morbidity, prolonged recovery, increased healthcare costs, and, in some cases, reconstructive failure [1, 2].

The spectrum of postoperative complications following breast surgery is broad and includes seroma formation, surgical site infection, hematoma, wound dehiscence, mastectomy flap necrosis, fat necrosis, capsular contracture, and chronic pain syndromes [3, 4]. These complications may arise early or late in the postoperative period and can adversely affect both functional and aesthetic outcomes.

Among these, seroma formation is one of the most frequent complications, with reported incidence rates varying widely from 3% to as high as 90% depending on surgical technique and patient-related factors [5]. Although often considered to be benign, seroma can predispose to secondary complications such as infection, delayed wound healing, and implant loss [6]. Other clinically relevant complications include flap necrosis, observed in up to 20% of cases in some cohorts, and surgical site infections, both of which significantly impact postoperative recovery and may necessitate reintervention [2, 7].

The risk of postoperative complications is multifactorial and influenced by patient-specific characteristics (e.g., age, obesity, smoking status, comorbidities), disease-related factors (e.g., cancer stage, prior irradiation), and surgical variables (e.g., type of reconstruction, use of implants or acellular dermal matrices, extent of dissection) [1, 8, 9]. Increasing evidence also highlights the role of biological and molecular mechanisms, including inflammatory responses

and tissue remodeling pathways, in determining individual susceptibility to adverse outcomes [10-12].

Given the heterogeneity of patient populations and surgical approaches, as well as the complex interplay of clinical and biological determinants, there remains a need for comprehensive studies integrating both retrospective and prospective data to better characterize complication profiles and identify predictive factors. Such approaches may improve risk stratification, guide personalized surgical planning, and ultimately reduce complication rates.

Objective

Therefore, the aim of this study was to evaluate the incidence, structure, and morphological predictors of postoperative complications following breast plastic and reconstructive surgery using a combined retrospective and prospective study design.

Material and methods

Clinical data were collected during 2024-2025 at the "Bukovinian Center of Plastic and Aesthetic Surgery" (Chernivtsi, Ukraine). The study was divided into two parts: a retrospective cross-sectional study and prospective longitudinal cohort study. Prospective part included 95 women, which underwent reconstructive or aesthetic breast surgery. The mean age was 35.48 ± 6.61 years (range 19-57). Prior to participation, all patients provided written informed consent and underwent a comprehensive evaluation comprising demographic and clinical assessment, imaging studies (breast ultrasound and/or mammography), and laboratory investigations (complete blood count and biochemical parameters).

For the retrospective analysis, 50 medical records of patients who presented to the Bukovinian Center of Plastic and Aesthetic Surgery between 2017 and 2024 were selected. These patients sought medical attention due to complaints or unsatisfactory outcomes following previous plastic or reconstructive breast surgeries performed at other healthcare institutions in Ukraine or were operated in other plastic and reconstructive surgery centers worldwide but unfortunately met complications. Medical records with the most common postoperative complication (capsular contracture) were included in the analysis. The timing of capsular contracture onset and its incidence were evaluated in relation to the type of primary breast surgical intervention.

All women underwent preliminary screening for compliance with the inclusion-exclusion criteria. Inclusion criteria: age 18 years and older; absence of mental disorders that make contact with the patient impossible; signed voluntary consent to participate in the study. Exclusion criteria: age younger than 18 years; presence of concomitant pathology of inflammatory genesis in the acute phase, or exacerbation of chronic inflammation of any location; chronic autoimmune diseases in the acute, sub-, decompensation phase; diseases of connective tissue and other organs and systems in the sub- or decompensation stage; severe metabolic disorders (diabetes mellitus type I or II – sub-, decompensation; obesity stage III and over); mental disorders; pregnancy or lactation period.

The assessment included general clinical status, patient complaints, findings of physical examination (visual and palpatory), ultrasound data, and information regarding the type of mammoplasty performed.

The study adhered to the principles of the Council of Europe Convention on Human Rights and Biomedicine and received approval from the Biomedical Ethics Committee of Bukovinian State Medical University (Protocol No. 1, dated 19 September 2024).

Statistical analyses were performed using Statistica 7.0 (StatSoft Inc., USA) and Microsoft Excel 2016. Categorical variables were analyzed using odds ratios (ORs) with 95% confidence intervals (CIs), applying the chi-square test (χ^2, df = 1) or Fisher's exact test when appropriate. Multivariate logistic regression was used to identify independent predictors. A p-value < 0.05 was considered statistically significant.

This investigation was conducted within the framework of the ongoing research Study of the Family Medicine Department at Bukovinian State Medical University, titled "Improvement of diagnosis and prediction of hypertension-mediated target organ damage and symptom control in comorbid conditions considering clinical, metabolic, and molecular-genetic predictors" (State Registration No. 0124U002524; duration: 2024-2028).

Results and Discussion

The majority of women reported changes in breast shape, asymmetry and/or induration, a sensation of tension and discomfort, as well as intermittent breast pain. Ultrasound examination was used to assess the thickness of the fibrous capsule surrounding the implant. Capsule thickness was ≤3 mm in 5 patients (10.0%), up to 4 mm in 21 (42.0%), and reached 5 mm in 24 women (48.0%). According to clinical classification, capsular contracture was diagnosed as grade I in 2 cases (4.0%), grade II in 14 patients (28.0%), grade III in 27 (54.0%), and grade IV in 7 (14.0%) (Fig. 1).

Analysis of the timing of complication onset demonstrated that clinically significant capsular contracture (grades III–IV), requiring revision surgery, typically developed 4-5 years after primary augmentation mammoplasty. Grade II contracture most frequently occurred within 3-4 years postoperatively. In the early postoperative period (within 1 year), capsular contracture was observed exclusively in mild form (grade I) in 1 case (2.0%), indicating a low incidence of clinically significant complications during this period. At 2 years, grade I contracture was also observed in one case (2.0%), while grade II cases began to emerge (2 patients; 4.0%), suggesting early progression of fibrotic changes in a subset of patients.

By the third postoperative year, no grade I cases were recorded; instead, an increase in grade II contracture (7 cases; 14.0%) and the emergence of grade III contracture (2 cases; 4.0%) were observed, indicating progression from subclinical to clinically significant forms. At 4 years, further progression was evident, with grade II contracture in 5 patients (10.0%), grade III in 7 (14.0%), and the first cases of grade IV (2 patients; 4.0%).

The most pronounced findings were observed in patients with a follow-up duration of ≥5 years, where severe forms predominated: grade III contracture was

identified in 18 patients (36.0%) and grade IV in 5 (10.0%), while mild and moderate forms (grades I-II) were no longer observed.

These findings demonstrate a strong time-dependent progression of capsular contracture, correlating with implant duration in situ ($r = 0.85$; $p < 0.001$). Early stages are characterized by minimal fibrotic changes (grades I-II), typically without significant clinical manifestations and not requiring surgical correction. In contrast, long-term follow-up (>5 years) is associated with an increased incidence of clinically significant contracture (grades III–IV), confirming the chronic and progressive nature of this complication, potentially related to suboptimal surgical techniques or inadequate postoperative care.

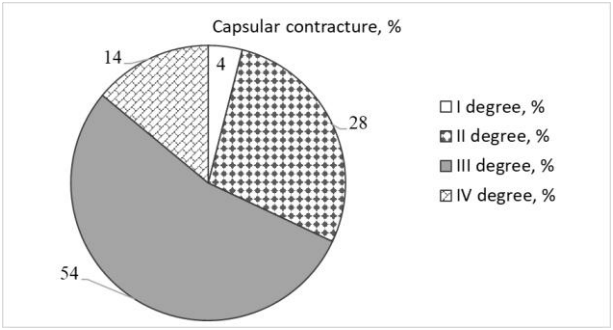

Fig.1. Frequency of capsular contracture of various severity degrees after surgical plastic and reconstructive interventions on the breast (retrospective analysis)

Probable mechanisms include a prolonged immune-inflammatory response (partially genetically determined and influenced by overall host resistance), microtrauma of the capsule, and age-related tissue changes. From a clinical perspective, these results emphasize the importance of long-term follow-up after aesthetic breast augmentation. Particular attention should be given to patients beyond 3-4 years' post-implantation, when the risk of progression to severe contracture significantly increases.

In the prospective part of the study, 95 women were examined and underwent surgery. Among them, 12 patients (12.63%) required revision surgery due to complications following previous plastic or reconstructive breast procedures.

Postoperative complications are generally classified as short-term and long-term [2]. Short-term complications include seroma, hematoma, infection, and superficial skin necrosis. Long-term complications include unfavorable aesthetic outcomes (implant malposition, contour deformities, rippling), severe reconstructive complications such as advanced capsular contracture or animation deformity, as well as rare systemic conditions such as breast implant-associated anaplastic large cell lymphoma (BIA-ALCL) and breast implant illness (BII).

Among women presenting with complaints of breast pain, tension, implant displacement, and breast deformity, the following complications were identified: short-term complications included unilateral seroma (2 patients; 16.67%) and implant rupture (1 patient; 8.33%), while the majority (9 patients; 75.0%) exhibited long-term complications associated with fibrotic capsule formation and development of grade III-IV contracture, resulting in aesthetic deformity and chronic pain of varying intensity.

Among patients with capsular contracture (n = 9; 75.0%), most had a preoperative tubular (cylindrical) breast shape (n = 6; 66.67%), while the remainder had a hemispherical (round) shape (n = 3; 33.33%). These findings suggest that tubular breast morphology may represent an additional risk factor for capsular contracture.

Regarding the types of surgical interventions, primary procedures predominated, with primary mammoplasty performed in 69.47% (n = 66) of cases. Other procedures included mastopexy combined with mammoplasty (8.42%; n = 8), mastopexy alone (6.32%; n = 6), and reduction mammoplasty (5.26%; n = 5). Revision procedures, including implant replacement (with or without combined techniques) or complete implant removal, were performed in 10 patients (10.53%).

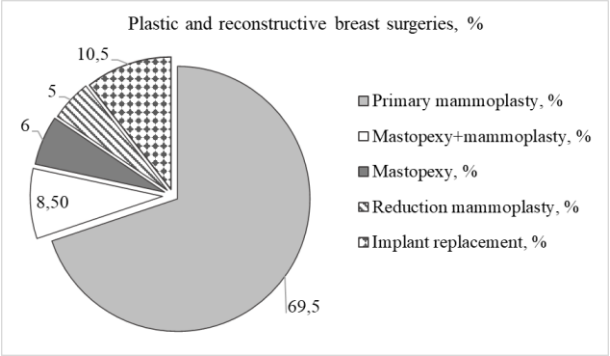

Fig. 2. Frequency of primary and repeated plastic and reconstructive breast surgeries (prospective analysis)

Analysis of postoperative complications showed that severe capsular contracture (grades III-IV) most frequently occurred in patients who underwent augmentation mammoplasty combined with areolar mastopexy and simultaneous implantation. This may be explained by both the higher prevalence of these procedures and specific surgical factors, including glandular tissue dissection with potential damage to lactiferous ducts, creating conditions for microbial contamination and subsequent fibrotic changes.

The choice of surgical management for capsular contracture was individualized based on contracture grade, anatomical characteristics, somatotype, age, and overall patient condition. The most commonly performed procedure was re-implantation, in some cases combined with reduction mammoplasty or periareolar/vertical mastopexy (n = 9). In two cases, implant removal without immediate replacement was performed. Re-implantation procedures were conducted in accordance with current clinical guidelines and recommendations in plastic and reconstructive surgery.

Conclusions

1. Retrospective analysis demonstrated a strong time-dependent progression of capsular contracture, significantly correlated with implant duration in situ ($r = 0.85$; $p < 0.001$). In the early postoperative period (1-2 years), minimal fibrotic changes (grades I–II) predominated, typically without clinical manifestations and not requiring surgical correction. In contrast, long-term follow-up (>5 years) was associated with an increased incidence of clinically significant contractures

(grades III–IV), confirming the chronic and progressive nature of this complication, potentially reflecting suboptimal surgical techniques or inadequate postoperative care.

2. Prospective analysis revealed postoperative complications in 12% of patients, including short-term complications such as unilateral seroma (2 patients; 16.67%) and implant rupture (1 patient; 8.33%), while the majority (9 patients; 75.0%) developed long-term complications associated with capsular fibrosis and clinically significant contracture (grades III–IV), resulting in aesthetic deformity and pain. Among patients with capsular contracture (n = 9), the majority had a preoperative tubular breast shape (66.67%), while 33.33% had a hemispherical shape, suggesting that tubular morphology may represent an additional risk factor.

3. Regarding surgical procedures (n = 95), primary interventions predominated, with primary mammoplasty performed in 69.47% (n = 66) of cases.

Prospects for further research

These data support the need for an individualized approach to prevention, early diagnosis, and timely surgical management of capsular contracture, as well as other postoperative complications.

Author Contributions. R.M. Gumennyi, L.P. Sydorchuk – conceptualization, writing – original draft, supervision and project administration; T.V. Kazanceva, M.M. Semianiv, Y.M. Yarynych – methodology, writing – review & editing, software; Y.V. Repchuk, K.O. Korotyi – writing – review & editing, visualization, funding acquisition. All authors have read and agreed to the published version of the manuscript.

Generative AI disclosure. No Generative AI tools were used in the preparation of this manuscript.

Conflict of interest. The authors declare no conflict of interest.

This investigation was conducted within the framework of the ongoing research program of the Family Medicine Department at Bukovinian State Medical University, titled “Improvement of diagnosis and prediction of hypertension-mediated target organ damage and symptom control in comorbid conditions considering clinical, metabolic, and molecular-genetic predictors” (State Registration No. 0124U002524; duration: 2024-2028).

Financing resources: Self-financing

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Дата першого надходження рукопису до видання: 18.03.2026
Дата прийнятого до друку рукопису після рецензування: 01.04.2026
Дата публікації: 29.05.2026