TURUN YLIOPISTO

Impact of Prolonged Operative Time on Complications in DIEP Flap Breast Reconstruction: A Single-Center Retrospective Study

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Syventävien opintojen opinnäyte

Kevätlukukausi 2026

Turku

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TURUN YLIOPISTO
Lääketieteellinen tiedekunta

Oppiaine: Kliininen laitos, plastiikkakirurgia

Tekijä: Anniina Grönroos

Otsikko: Impact of Prolonged Operative Time on Complications in DIEP Flap Breast Reconstruction: A Single-Center Retrospective Study
Ohjaajat: Professori Salvatore Giordano
Sivumäärä: 19 sivua

Päivämäärä: Maaliskuu 2026

Autologous breast reconstruction is associated with superior long-term satisfaction and quality of life compared with implant-based approaches. Among autologous techniques, the deep inferior epigastric perforator (DIEP) flap is widely regarded as the gold standard; however, its microsurgical complexity may result in prolonged operative times. Extended surgical duration may contribute to higher complication rates, yet the specific impact of operative time on outcomes in DIEP reconstruction remains insufficiently defined. This study aimed to evaluate the effect of prolonged operative time on postoperative complications and to identify independent predictors of risk in a large single-center cohort.

A retrospective analysis was performed of consecutive patients who underwent elective unilateral or bilateral DIEP flap breast reconstruction at a single center center between 2009 and 2024. Patients were divided into standard and prolonged operative time groups, with prolonged time defined as greater than the 75th percentile of the cohort. Comparative analyses were conducted. Demographic characteristics and comorbidities were assessed as secondary predictor variables. The primary outcome was the occurrence of any postoperative complication, while secondary outcomes included specific wound-healing and late complications.

A total of 270 patients were included in this study. Although the overall complication rates did not differ significantly between groups, prolonged operative time was associated with higher rates of total flap loss and seroma formation. Patients in the prolonged group more often had higher-risk characteristics, such as neoadjuvant chemotherapy, higher BMI, higher ASA scores, greater blood loss, and more frequent bilateral reconstructions. Multivariable analysis identified higher BMI as an independent predictor of postoperative complications. These findings suggest that while overall morbidity may be similar, prolonged operative time is linked to severe complications, highlighting the importance of careful preoperative optimization and surgical planning, especially in high-risk patients.

Avainsanat: Leikkausaika, vapaa kudossiirre, rintarekonstruktio, DIEP-rekonstruktio, postoperatiivinen komplikaati

Abstract

Introduction

Autologous breast reconstruction is associated with superior long-term satisfaction and quality of life compared with implant-based approaches. Among autologous techniques, the deep inferior epigastric perforator (DIEP) flap is widely regarded as the gold standard; however, its microsurgical complexity may result in prolonged operative times. Extended surgical duration may contribute to higher complication rates, yet the specific impact of operative time on outcomes in DIEP reconstruction remains insufficiently defined. This study aimed to evaluate the effect of prolonged operative time on postoperative complications and to identify independent predictors of risk in a large single-center cohort.

Methods

A retrospective analysis was performed of consecutive patients who underwent elective unilateral or bilateral DIEP flap breast reconstruction at a single center between 2009 and 2024. Patients were divided into standard and prolonged operative time groups, with prolonged time defined as greater than the 75th percentile of the cohort. Comparative analyses were conducted. Demographic characteristics and comorbidities were assessed as secondary predictor variables. The primary outcome was the occurrence of any postoperative complication, while secondary outcomes included specific wound-healing and late complications.

Results

A total of 270 patients were included, of whom 67 (24.8%) had prolonged operative times. The mean follow-up was 56.9 ± 56.6 months. Baseline characteristics differed between groups. The prolonged operative time cohort had significantly higher rates of neoadjuvant chemotherapy and a trend toward higher mean body mass index (BMI). This cohort also had significantly higher American Society of Anesthesiologists (ASA) scores, greater intraoperative blood loss, and higher rates of bilateral reconstruction.

Overall postoperative complication rates were comparable between groups (53.7% vs. 45.8%, $p = 0.261$). However, the prolonged operative time group demonstrated significantly higher rates of total flap loss (4.5% vs. 0.5%, $p = 0.048$) and seroma formation (17.9% vs. 7.9%, $p = 0.020$).

Rates of early (<30 days) and late reoperation did not differ significantly between groups. On multivariable analysis, higher BMI was identified as a significant independent predictor of postoperative complications ($p = 0.018$), while diabetes showed a non-significant trend toward increased risk (odds ratio 8.2).

Conclusions

Prolonged operative time was associated with higher rates of severe surgical complications, including flap loss and seroma formation, despite similar overall morbidity. Prolonged procedures were more common in patients with higher-risk characteristics and more complex reconstructions, reflecting a challenging clinical cohort. Higher BMI was confirmed as an independent risk factor for complications. Careful preoperative optimization and meticulous operative planning may help mitigate risk and improve outcomes in high-risk patients.

Level of Evidence: III

Keywords: Operative time, Free tissue transfer, Breast reconstruction, DIEP breast reconstruction, postoperative complications

Introduction

The deep inferior epigastric perforator (DIEP) flap surgery is a microsurgical breast reconstruction operation technique that was first described in 1989 and subsequently popularized in the mid-1990s. Since then, DIEP flap has become one of the most popular techniques for breast reconstruction, now considered the gold standard in autologous breast reconstruction when sufficient donor-site tissue is accessible and there is no previous abdominal surgery compromising its viability. (1–3) Especially over the last decades, free flap breast reconstruction caseload has shown a consistent rise due to improvements in microsurgical methods, strengthened safety standards, and increased support from healthcare professionals and advocacy groups. (4)

This method of free tissue transfer from the abdomen doesn't require taking the rectus abdominis muscle as part of the flap, unlike the conventional approach using the free transverse rectus abdominis musculocutaneous (TRAM) flap (5). This difference leads to quicker recovery, reduced postoperative pain, and lower donor-site morbidity (6–8). Also, compared to implant-based reconstructions, the DIEP flap offers several benefits, including the absence of prostheses, a reduced risk of capsular contracture, achieving a more natural aesthetic appearance, and higher rates of patient satisfaction. (9–11) Furthermore, free flap breast reconstruction provides notable psychological advantages such as enhanced self-confidence, a more positive body image, and an overall improvement in quality of life. (12,13) In general, autologous breast reconstruction is associated with superior long-term satisfaction and quality of life compared with implant-based approaches. (14) Despite these advantages, the technical complexity of DIEP flap reconstruction remains a notable limitation.

Across multiple surgical specialties, it is widely recognized that longer operations are linked to increased rates of postoperative complications. (15–17) DIEP flap surgery is no exception; it is known that operative time in DIEP flap surgery can potentially extend up to 8-12 hours, so despite the aforesaid advantages there have been some concerns regarding prolonged operative time as a possible risk factor for postoperative complications. Some studies have already demonstrated a correlation between prolonged surgical duration and complications, both in unilateral and bilateral DIEP flap surgeries. (9,18,19)

Although the association between operating time and postoperative complications in DIEP flap breast reconstruction is a topic of increasing interest, existing studies are limited by sample sizes, heterogenous patient populations, and in some cases, a lack of comprehensive multivariable adjustment. Additionally, majority of the data that is now accessible originate from the United States (18–20) and the United Kingdom (9), whereas evidence from mainland Europe, particularly from Northern Europe, remains limited. Furthermore, definitions of "prolonged operative time" differ significantly across studies, complicating direct comparison of results and interpretation of risk. Clarifying whether prolonged operative time independently increases complication risk is essential for preoperative patient counselling, operative planning, and resource allocation, particularly as DIEP flap reconstruction continues to increase in complexity and volume.

The objective of this study was to evaluate the impact of prolonged operative time on postoperative complications following DIEP flap breast reconstruction and to identify independent predictors of risk in a large single-center cohort of Finnish patients. We hypothesized that prolonged operative duration would be associated with increased rates of postoperative complications.

Materials and Methods

This retrospective observational cohort study included consecutive patients who underwent elective unilateral or bilateral deep inferior epigastric perforator (DIEP) flap breast reconstruction at a single Academic center. All procedures were performed at Turku University Hospital, Turku, Finland, between January 2009 and December 2024.

Patients were identified through the institutional surgical registry. Inclusion criteria comprised adult patients undergoing elective DIEP flap breast reconstruction. Patients with incomplete operative time data or missing postoperative follow-up information were excluded. No additional exclusion criteria were applied.

Operative time was defined as the interval from skin incision to wound closure. Prolonged operative time was defined a priori as operative duration exceeding the 75th percentile of the

operative time distribution within the study cohort. Patients were categorized into standard operative time and prolonged operative time groups accordingly.

Demographic, clinical, and operative data were extracted from electronic medical records. Collected variables included age, body mass index (BMI), smoking status, and comorbidities (hypertension, dyslipidemia, diabetes mellitus, pulmonary disease, and depression). Oncologic treatment variables included neoadjuvant and adjuvant chemotherapy and prior radiotherapy. Intraoperative variables included operative time, American Society of Anesthesiologists (ASA) physical status classification, estimated blood loss, reconstruction laterality (unilateral vs. bilateral), flap weight, and perforator characteristics.

The primary outcome was the occurrence of any postoperative complication, particularly partial or total flap loss. Secondary outcomes included specific early and late complications, such as superficial or deep wound infection, wound dehiscence, hematoma, seroma, fat necrosis, early (<30 days) and late reoperation, hospital readmission, and secondary revision procedures.

To minimize selection bias, all consecutive eligible patients during the study period were included. Standardized institutional definitions for postoperative complications were used to reduce misclassification bias.

Statistical Analyses

Continuous variables are presented as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. The normality of continuous variables was assessed using histograms, skewness, kurtosis, and the Kolmogorov-Smirnov test. Group comparisons (prolonged vs. standard operative time) were made using Student's t-test for normally distributed continuous variables or the Mann–Whitney U test. Categorical variables were compared using Pearson's chi-square or Fisher's exact test, as appropriate. To identify independent risk factors for complications, a multivariable logistic regression analysis was performed, with results reported as adjusted odds ratios. The Hosmer-Lemeshow test confirmed good model fit ($p = 0.866$). A two-sided p-value of ≤ 0.05 was considered statistically significant for all tests. All analyses were conducted using IBM SPSS Statistics, Version 31.0 (Armonk, NY, USA).

Results

A total of 270 consecutive patients were included during study period, 67 (24.8%) of whom had a prolonged operative time (defined as >75th percentile) and 203 (75.2%) of whom were in the standard operative time group (defined as <75th percentile). The mean follow-up was 56.9 ± 56.6 months.

Patient demographics differed between groups. The mean age in the prolonged operative time group was 51.5±8.4 and 51.0±7.5 in the standard operative time group. The prolonged operative time cohort had significantly higher rates of neoadjuvant chemotherapy use (17.9% in the prolonged time group vs 6.9% in the standard operative time group, p=0.008). In the prolonged operative time group, there was also a trend toward a higher BMI (27.0±2.7 vs. 26.3±3.1, p=0.085). There was no significant difference in the total amount of comorbidities between the groups (26.9% in the prolonged time group vs 33.5% in the standard time group, p=0.312). Furthermore, no significant difference was found in the prevalence of any single comorbidity: diabetes (p=0.342), hypertension (p=0.897), pulmonary disease (p=0.371), lipid disease (p=0.742), depression (p=0.333), smoking (p=0.672). The demographics of the patients are presented in Table 1.

The prolonged operative time group had a significantly higher ASA score (1.94±0.34 vs. 1.81±0.50, p=0.030) and greater intraoperative blood loss (374.8±175.1 vs. 314.7±143.9, p=0.011). Flap weight was also significantly higher in prolonged operative time group (787.8±230.4 vs. 685.2±200.6, p=0.004). Prolonged operative time group had higher rates of bilateral reconstructions (9.0% vs. 2.5%, p=0.020). In contrast, the standard operative time cohort had significantly higher rates of immediate symmetrization procedures (13.4% vs. 25.1%, p=0.046). Duration of hospital stay was similar between the two groups. Comparison of peri-operative parameters is presented in Table 2.

Overall postoperative complication rates were comparable between the cohorts (53.7% vs. 45.8%, p=0.261). However, the prolonged operative time cohort demonstrated significantly higher rates of total flap loss (4.5% vs. 0.5%, p=0.048) and seroma formation (17.9% vs. 7.9%, p=0.020). There was no significant difference found in the occurrence of other postoperative

complications that were taken into consideration in this study: wound infections (superficial p=0.786, deep p=1.000), wound dehiscence (p=0.400), fat necrosis (p=1.000), hematoma (p=0.635). Rates of early (<30 days) and late reoperation were similar between groups. Reoperation for dog-ear / scar revisions were slightly more common in the prolonged time group (p=0.106). Re-admissions to hospital were similar between groups. Postoperative complications at follow-up are shown in Table 3.

Multivariable logistic regression was used to assess independent risk factors for complications based on prolonged operative time group, with adjusted odds ratios provided (Table 4). On multivariable analysis, higher BMI was identified as a significant independent predictor of postoperative complications (p=0.018), while diabetes demonstrated a trend toward significance (odds ratio 8.20, p=0.091).

Discussion

In this study, prolonged operative time was not associated with an increased rate of overall postoperative complications. However, extended operative duration was significantly associated with a higher incidence of severe complications, particularly total flap loss, while rates of partial flap loss were comparable between groups. In addition, seroma formation occurred significantly more frequently among patients with prolonged operative times. Patients in the prolonged operative time cohort also demonstrated a higher-risk clinical profile, characterized by increased use of neoadjuvant chemotherapy, higher body mass index (BMI), and higher American Society of Anesthesiologists (ASA) scores. On multivariable analysis, elevated BMI emerged as a significant independent predictor of postoperative complications.

Across surgical specialties, prolonged operative time has been consistently identified as a risk factor for adverse postoperative outcomes, likely due to increased tissue trauma, prolonged anesthetic exposure, hypothermia, blood loss, and cumulative physiological stress. (15–17) Extended surgical duration may also contribute to systemic inflammatory responses, impaired immune function, and reduced tissue perfusion, all of which can compromise wound healing and increase susceptibility to postoperative complications. In the context of microsurgical breast

reconstruction, prolonged operative time has similarly been reported as an independent predictor of postoperative complications following DIEP flap surgery. (9)

One important mechanism linking operative duration to flap-related complications is the extension of ischemia time during free tissue transfer. Prolonged ischemia may exacerbate ischemia–reperfusion injury, leading to endothelial dysfunction, microvascular thrombosis, and impaired perfusion of the transferred tissue. Experimental and clinical studies have demonstrated that ischemia times exceeding approximately 60 minutes are associated with significantly increased risks of major complications, including partial or total flap loss. (21,22) In addition, longer operative times may reflect greater procedural complexity, such as technically challenging perforator dissection, difficult recipient vessel preparation, or bilateral reconstruction, all of which may increase the risk of intraoperative vascular compromise. Furthermore, prolonged surgery can contribute to tissue edema and microcirculatory disturbances, potentially impairing flap perfusion and increasing the likelihood of postoperative complications.

Many studies about the impact of prolonged operative time in DIEP flap surgery have been made in the recent decade. In both unilateral and bilateral DIEP flap procedures, research has already shown a link between longer surgery times and postoperative complications. (9,18–20,23–26) Shtarbanov et al. demonstrated extended operative time as an independent predictor for adverse postoperative outcomes in unilateral DIEP flap surgery, whereas Haddock et al. found prolonged operative time a risk factor in bilateral DIEP flap surgeries (9,19). Similarly, Knoedler et al. demonstrated in a large retrospective cohort study including 5,826 patients that extended operative time significantly increases complication risk in both unilateral and bilateral DIEP flap surgeries (18). Additionally, according to a study by Ye et al., longer hospital stays, abdominal donor site morbidity, and treatment-requiring complications were all associated with longer surgical times (20).

In contrast to several of these previous studies, we did not observe a statistically significant increase in overall complication rates. However, the significantly higher rate of total flap loss in the prolonged operative time cohort observed in our study suggests that prolonged surgery may specifically predispose to severe complications. Previous studies have demonstrated that increasing operative time is associated with higher odds of flap failure or flap loss in microsurgical reconstruction (19,26). Haddock et al. reported that prolonged operative time was

an independent predictor of total flap loss in bilateral DIEP flap reconstruction (19). Kwok et al. also found a strong correlation between flap failure and operating time, with the risk rising by 17% for every extra hour of operation (26). Thus, our findings add nuance to existing studies by suggesting that longer surgical times may not universally increase overall postoperative complication risk but might increase the risk of microsurgical failure. Similar overall complication rates suggest modern perioperative care mitigates minor morbidity while severe complications – total flap loss for example – remain sensitive to prolonged surgical stress

In our study prolonged operative time was associated with several baseline and intraoperative differences which collectively point to a more complex and high-risk patient population. Patients in the prolonged operative time cohort had higher ASA scores, greater intraoperative blood loss, larger flap weights, a trend toward higher BMI ($p = 0.086$), higher rates of neoadjuvant chemotherapy exposure, and a greater proportion of bilateral reconstructions. Individually, neoadjuvant chemotherapy has not consistently been associated with increased postoperative complications in DIEP flap surgery (27,28). Studies about the association between ASA scoring and postoperative complications are sparse. However, it is possible that these factors, when combined with prolonged operative time, contribute to an increased risk of postoperative complications, as reflected in our findings. High BMI on the other hand is known to be an independent predictor of postoperative complications (29–31). When considered collectively, these findings support the interpretation of prolonged operative time as a marker of surgical and patient complexity rather than merely an indicator of surgical inefficiency and should therefore be be interpreted in the context of cumulative patient- and treatment-related risk.

In multivariable analysis, higher BMI emerged as a significant independent predictor of postoperative complications. Existing literature consistently identifies higher BMI as a risk factor for postoperative complications in autologous breast reconstructions (29–31). For example, in their retrospective single-center analysis Teitler et al. concluded that patients with obesity (BMI ≥ 30 kg/m²) demonstrated higher rates of postoperative complications, including reconstruction loss, than patients with a body mass index below 30 kg/m². (30) In addition to being an independent risk factor, higher BMI also contributes to longer operative times and increased perioperative complexity in autologous breast reconstruction, thereby increasing morbidity indirectly. (30) Furthermore, increased flap weight, which correlates with higher BMI, is

associated with higher rates of donor site wound healing problems. (32) Diabetes also demonstrated a strong trend toward significance in our cohort, with a high odds ratio (8.20), although statistical significance was likely limited by sample size. Together, these findings highlight the need for metabolic optimization before undertaking autologous breast reconstruction.

In our cohort, we did not observe a significant association between postoperative complications and smoking history, hypertension, or several other comorbidities. This may reflect institutional selection criteria and optimization practices, as patients who are actively smoking are not offered DIEP flap breast reconstruction at our center, and hypertension is very common but generally well controlled preoperatively. These findings suggest that when managed appropriately, certain comorbidities might not independently increase postoperative complications in DIEP flap surgery. In contrast, high BMI – a modifiable risk factor – emerged as a significant independent predictor for postoperative complications in multivariable analysis, highlighting the importance of preoperative optimization, for example weight loss before surgery in this case.

Although prolonged operative time was not associated with an increase in overall postoperative complication rates in our study, some complications – most notably total flap loss – were significantly more common in the prolonged time cohort. Patients in this group also more commonly had higher ASA scores, higher BMI, and prior exposure to neoadjuvant chemotherapy, indicating a higher-risk and more clinically complex patient population. Given that DIEP flap breast reconstruction is a lengthy and technically demanding microsurgical procedure, these findings underscore the importance of meticulous surgical optimization and preoperative planning, particularly in patients anticipated to require prolonged operative times. From clinical perspective, our findings may support preoperative counseling for patients with higher BMI or prior chemotherapy exposure and assist in planning case scheduling and surgical team allocation for anticipated long procedures. Additionally, staged or alternative strategies can be considered for selected high-risk patients.

This study has several important strengths. First, it includes a relatively large cohort of consecutive patients undergoing DIEP flap breast reconstruction over an extended study period, providing robust real-world data from routine clinical practice. The single-center design ensured consistency in surgical techniques, perioperative protocols, and postoperative follow-up, thereby

minimizing inter-institutional variability that may influence outcomes. In addition, the comprehensive clinical dataset enabled detailed evaluation of both patient- and procedure-related factors, including multivariable analysis to identify independent predictors of postoperative complications. Finally, the long follow-up period allowed assessment of both early and late postoperative outcomes, strengthening the clinical relevance of the findings.

This study has several limitations. First, the retrospective design introduces the potential for selection bias and unmeasured confounding. As a single-center study, institutional practices may limit the generalizability of the findings; however, this design also ensured consistency in surgical technique, perioperative management, and complication assessment. In our analysis, prolonged operative time was defined as greater than the 75th percentile of the cohort, which may limit comparability with previous studies that have used alternative thresholds or definitions of prolonged operative duration. Additionally, surgeon experience and potential learning-curve effects were not specifically evaluated and may have influenced operative times and outcomes.

Some older patient and operative records were incomplete, which may have limited the availability of certain variables, and introduces the possibility of information bias. Furthermore, operative time likely functions partly as a surrogate marker of surgical complexity rather than representing a direct causal factor for postoperative complications. Despite these limitations, the relatively large cohort size, extended follow-up period, and the use of multivariable adjustment strengthen the validity of the findings. Moreover, the inclusion of a Nordic patient population adds geographic diversity to the existing literature on DIEP flap reconstruction outcomes.

Future prospective studies are needed to define clinically meaningful operative time thresholds and to evaluate strategies aimed at mitigating risk during prolonged DIEP flap operations. Two-team approach has been proposed as one potential strategy, as it has been shown to significantly shorten operative duration compared to single-surgeon reconstructions (33–35), which may in turn decrease postoperative complication risk. Mericli et al. demonstrated that two-team approach also improved outcomes and reduced costs (33). Another previous study confirmed that a simultaneous co-surgeon approach in bilateral DIEP flap reconstruction did not result in higher complication rates, underscoring the safety of this approach. (34) In addition, it has been demonstrated that implementing enhanced recovery after surgery (ERAS) protocols considerably

shortens hospital length of stay and is associated with lower rates of flap necrosis and seroma formation (36). Further research should also explore surgeon-level factors, workflow optimization and targeted prehabilitation strategies, especially in high-BMI patients to better reduce risk and improve outcomes in prolonged and technically challenging DIEP flap reconstructions.

Conclusions

Prolonged operative time was associated with significantly higher rates of severe surgical complications, including total flap loss and seroma, despite similar overall morbidity. Higher BMI was confirmed as an independent risk factor for complications. Prolonged operative duration was more frequently observed in patients with additional high-risk features, including prior neoadjuvant chemotherapy, elevated BMI and higher ASA scores. Together with the technical complexity of the procedure, these findings highlight the importance of strategic preoperative optimization and tailored operative planning to mitigate risk and improve outcomes in high-risk patients.

Tables

Table 1. Demographics of patients at time of study.

Table 2. Comparison of peri-operative parameters in the two groups of patients.

Table 3. Postoperative complications at follow-up.

Table 4. Multivariable logistic regression was used to assess independent risk factors for complications based on prolonged operative time, with adjusted odds ratios provided.

Table 1. Demographics of patients at time of study.

	Prolonged operative time group (≥75th percentile, n=67)	*Standard operative time group (≤ 75th percentile, n=203)*	*p-value*
Age (mean ± SD)	51.5±8.4	51.0±7.5	0.712
Mean BMI (kg/m^2)	27.0±2.7	26.3±3.1	0.086
Any comorbidity	18 (26.9%)	68 (33.5%)	0.312
Diabetics	0 (0.0%)	6 (3.0%)	0.342
Hypertension	10 (14.9%)	29 (14.3%)	0.897
Pulmonary disease	2 (3.0%)	13 (6.4%)	0.371
Lipid disease	4 (6.0%)	9 (4.4%)	0.742
Depression	4 (6.0%)	20 (9.9%)	0.333
Smokers	11 (16.4%)	39 (19.2%)	0.672
Herbal supplement	1 (1.5%)	5 (2.5%)	1.000
Neo-Adjuvant radiotherapy	0	1 (0.5%)	1.000
Neo-Adjuvant chemotherapy	12 (17.9%)	14 (6.9%)	**0.008**
Radiotherapy	46 (68.6%)	144 (70.9%)	0.805
Chemotherapy	51 (76.1%)	164 (80.7%)	0.526
Follow-up (months)	32.8±38.5	65.0±59.5	<0.001

Table 2. Comparison of peri-operative parameters in the two groups of patients.

	Prolonged operative time group (≥75th percentile, n=67)	*Standard operative time group (≤ 75th percentile, n=203)*	*p-value*
ASA Score (mean ± SD)	1.94±0.34	1.81±0.50	**0.030**
Operative time (min, mean ± SD)	517.1±63.5	354.0±175.1	**<0.001**
Bilateral Reconstructions	6 (9.0%)	5 (2.5%)	**0.020**
Resection weight (g, mean ± SD)	678.4±345.5	575±350.0	0.191
Immediate Symmetrization	9 (13.4%)	51 (25.1%)	**0.046**
Blood loss (ml, mean ± SD)	374.8±175.1	314.7±143.9	**0.011**
Flap Weight (g, mean ± SD)	787.8±230.4	685.2±200.6	0.004
Number of perforators per Flap (mean ± SD)	2.3±0.8	2.4±0.8	0.149
Hospital stay (days, mean ± SD)	5.27±1.59	5.02±1.54	0.299

Table 3. Postoperative complications at follow-up.

	Prolonged operative time group (≥75th percentile, n=67)	*Standard operative time group (≤ 75th percentile, n=203)*	*p-value*
Patients with complications (medical included)	36 (53.7%)	93 (45.8%)	0.261
Complications			
Superficial wound infection (received antibiotics <30 days)	9 (13.4%)	30 (14.8%)	0.786
Deep wound infection (revision in local anaesthetics or general)	2 (3.0%)	5 (2.5%)	1.000
Wound dehiscence (need for revision -local/general)	11 (16.4%)	25 (12.4%)	0.400
Fat necrosis (need for operation)	5 (7.5%)	16 (7.9%)	1.000
Hematoma (need for operation)	5 (7.5%)	21 (10.3%)	0.635
Seroma (requiring aspiration after drains removal)	12 (17.9%)	16 (7.9%)	**0.020**
Reoperation (including re-explorations) <30 days	14 (20.9%)	42 (20.7%)	0.928
Partial flap necrosis	5 (7.5%)	9 (4.4%)	0.346
Total flap loss	3 (4.5%)	1 (0.5%)	**0.048**
Reoperation at follow up, more than 30 days post operatively	63 (48.5%)	147 (54.4%)	0.286
Re-admissions <30 days	5 (7.5%)	11 (5.4%)	0.555
Reoperation for dog-ear / scar revisions	14 (20.9%)	26 (12.8%)	0.106

Table 4. Multivariable logistic regression was used to assess independent risk factors for **complications** based on Prolonged operative time group, with adjusted odds ratios provided.

	Odd Ratios	*95% Confidence Interval*	*p-value*
Diabetes	8.20	0.72-93.90	0.091
Bilateral Reconstruction	3.19	0.53-19.06	0.204
Smoking	1.97	0.76-5.10	0.163
Prolonged operative time	1.63	0.51-5.28	0.411
ASA score	1.44	0.67-3.07	0.348
Radiotherapy	1.33	0.60-2.95	0.488
Depression	1.18	0.39-3.60	0.766
BMI	1.16	1.02-1.32	**0.018**
Operative time	1.00	1.00-1.01	0.127
Blood loss	1.00	0.99-1.00	0.474
Age	0.99	0.95-1.03	0.642
Pulmonary disease	0.92	0.20-4.24	0.920
Hypertension	0.85	0.27-2.62	0.774
Axillary Lymphadenectomy	0.80	0.38-1.68	0.555

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