# How Does Autologous Breast Reconstruction Impact Downtime?

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## Abstract

**Background** Although autologous breast reconstruction is technically quite demanding, it offers the best outcomes in terms of durable results, patient perceptions, and postoperative pain. Many studies have focused on clinical outcomes and technical aspects of such procedures, but few have addressed the impact of various flaps on patient recovery times. This particular investigation entailed an assessment of commonly used flaps, examining the periods of time required to resume daily activities.

**Materials and Methods** Multiple choice questionnaires were administered to 121 patients after recovery from autologous reconstruction to determine the times required in returning to specific physical activities. To analyze results, the analysis of variance *F*-test was applied, and odds ratios (ORs) were determined.

**Results** Among the activities surveyed, recovery time was not always a function of free-flap surgery. Additional treatments and psychological effects also contributed. Adjuvant chemotherapy increased average downtime by 2 weeks, and postoperative irradiation prolonged recovery as much as 4 weeks. Patient downtime was unrelated to flap type, ranging from 2.9 to 21.3 weeks for various activities in question. Deep inferior epigastric perforator (DIEP) flaps yielded the highest OR and transverse upper gracilis (TUG) flaps the lowest.

**Conclusion** Compared with superior gluteal artery perforator and TUG flaps, the DIEP flap was confirmed as the gold standard in autologous breast reconstruction, conferring the shortest recovery times. All adjuvant therapies served to prolong patient recovery as well. Surgical issues, patient lifestyles, and donor-site availability are other important aspects of flap selection.

**Keywords**
- autologous breast reconstruction
- breast cancer treatment
- downtime
- recovery time

Breast reconstruction represents one of the most important steps in postmastectomy patient rehabilitation, enabling a stigma-free return to normal life.[1–3] At present, reconstructive measures generally involve either prosthetics or autologous tissue mobilization, each with known benefits and limitations. Although implant-based reconstruction is less invasive and more expedient, calling for shorter hospital stays, patients typically are faced with subsequent surgeries (e.g., implant exchanges) as a matter of lifetime maintenance.[4–6] On the other hand, the results of autologous reconstruction are enduring, despite the longer hospitalization necessitated by its technical demands and invasiveness.[7–9]

Several publications have documented cosmetic results in this setting, clinical outcomes in terms of hospitalization time, and pertinent patient input, but rarely has the downtime of each technique been assessed, thus reflecting the

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impact on quality of life.[10,11] Physicians generally expect complete recovery (i.e., healing of all wounds and no further visits) within 1 month. In reality, however, downtimes are considerably longer. Pain and fatigue may continue for extended periods before activity resumption is feasible.[10–12]

Our intent was to gauge the impact of autologous reconstruction on recovery time in a select patient population through ad hoc multiple-choice questionnaire administration, comparing downtimes among the flaps used.

## Materials and Methods

### Patient Selection

A retrospective study was conducted, examining patients undergoing autologous breast reconstruction between January 2013 and December 2014 at the Guy's and St. Thomas' Hospital. The study protocol was preapproved by the local ethics committee.

All patients were admitted for immediate or delayed reconstruction. Women with histories of previous implant-based or bilateral flap reconstruction were excluded. Women experiencing flap failures were disqualified as well. Only those patients receiving monopedicle deep inferior epigastric perforator (DIEP), superior gluteal artery perforator (SGAP), or unilateral transverse myocutaneous gracilis flaps were eligible for study.

### Data Collection

Using a standardized multiple-choice questionnaire to simplify response comparisons, we successfully amassed data on reconstructive protocols, cancer therapies, and time intervals involved in returning to daily activities. The questionnaire incorporated five topics, including timing of reconstruction, type of flap, and oncologic therapeutics (radio- or chemotherapy), and contained 11 questions aimed at resumption of various physical activities.

In the event that preoperative applicability of any activity was lacking, the "not done before" option served to selectively exclude extraneous responses from statistical analysis. To adjust for potential postoperative complications, the start of recovery time was fixed at day of discharge. All participants completing the anonymous questionnaire had completed 1 full year of follow-up monitoring. A researcher external to the study gathered the data, organized the database, and analyzed the results.

Our patients were also grouped according to other treatments received before and after surgery to assess therapeutic impacts on recovery time, and any complications encountered were similarly investigated.

### Statistical Analysis

Variables were expressed in percentage, mean, and range in patient descriptive data. The analysis of variance (ANOVA) *F*-test was applied to evaluate differences in sample distributions of targeted factors. Odds ratios (ORs) were then calculated to determine the relation between type of flap and likelihood of downtime inferior to the mean. All computations relied on standard software (SPSS v22; IBM Corp, Armonk, New York), setting statistical significance at $p < 0.05$.

**Table 1** Neoadjuvant and adjuvant therapy distribution

| Therapy | Timing | No. of patient | % |
|---|---|---|---|
| Chemotherapy | Neoadjuvant | 43 | 35.53 |
| | Adjuvant | 22 | 18.19 |
| | No systemic therapy | 56 | 46.28 |
| Radiotherapy | Neoadjuvant | 25 | 20.66 |
| | Adjuvant | 26 | 21.49 |
| | No radiation therapy | 70 | 57.85 |

## Results

In the 2-year recruitment period, a total of 121 patients satisfied our inclusion criteria and were enrolled in this study. Mean age was 51.4 years (range, 29–76 years). Reconstruction was immediate in 84 patients and delayed in 37 patients. DIEP flap was raised in 68 patients (56.19%), SGAP flap in 26 (21.49%), and transverse upper gracilis (TUG) flap in 27 (22.32%). ►**Table 1** contains a summary of oncologic treatments undertaken in these patients.

Our patient population showed no significant differences with respect to adjuvant therapy, type of flap, or timing of reconstruction. Forty-two patients (34.72%) developed complications, with 23 requiring further surgical management. Average recovery time overall and ANOVA of the various activities examined are reported in ►**Table 2**. The relation between type of flap and average recovery time is shown in ►**Table 3**. In ►**Fig. 1**, downtime distributions are presented according to nature of flap.

**Table 2** Mean time for returning to investigated activities and ANOVA analysis of patient distribution

| Activity | Mean time (wk) | *F*-test | *p*-Value |
|---|---|---|---|
| Strength recovery | 21.3 | 2.061 | 0.085 |
| Return to social life | 2.9 | 5.589 | 0.0006[a] |
| Return to work | 11.15 | 2.001 | 0.084 |
| Drive a car | 4.5 | 2.354 | 0.045[a] |
| Walking for long distance | 10.05 | 1.92 | 0.107 |
| Running | 15 | 9.277 | 0.00002[a] |
| Ride a bike | 11.23 | 3.1 | 0.016[a] |
| Swimming | 16.16 | 4.092 | 0.001[a] |
| Sexual activity | 14.4 | 1.849 | 0.12 |
| Sensation of foreign body | 19.64 | 3.995 | 0.003[a] |
| Pain relief | 13.71 | 0.462 | 0.896 |

Abbreviation: ANOVA, analysis of variance.
[a]Statistical significance *p*-value $< 0.05$

**Table 3** Relation between the used flap and the possibility to have a recovery time below the average time

| Activity | Flap | OR | CI (sl–il) |
|---|---|---|---|
| Strength recovery | DIEP | 2.11 | 95% (4.39–1.01) |
| | SGAP | 0.78 | 95% (1.68–0.32) |
| | TUG | 0.47 | 95% (1.13–0.2) |
| Return to social life | DIEP | 1.27 | 95% (2.69–0.6) |
| | SGAP | 1.25 | 95% (3.19–0.40) |
| | TUG | 0.59 | 95% (1.4–0.24) |
| Return to work | DIEP | 2.15 | 95% (5.89–0–78) |
| | SGAP | 0.65 | 95% (1.9–0.22) |
| | TUG | 0.6 | 95% (1.87–0.2) |
| Car driving | DIEP | 1.59 | 95% (4.12–0.62) |
| | SGAP | 0.82 | 95% (2.53–0.27) |
| | TUG | 0.64 | 95% (1.88–0.22) |
| Walking for long distances | DIEP | 1.07 | 95% (2.64–0.44) |
| | SGAP | 3.88 | 95% (17.5–0.84) |
| | TUG | 0.37 | 95% (0.99–0.14) |
| Running | DIEP | 1.55 | 95% (5.35–0.49) |
| | SGAP | 0.79 | 95% (2.83–0.22) |
| | TUG | 0.79 | 95% (2.83–0.22) |
| Cycling | DIEP | 3.22 | 95% (8.34–1.24) |
| | SGAP | 0.59 | 95% (1.51–0.23) |
| | TUG | 0.67 | 95% (1.87–0.24) |
| Swimming | DIEP | 2.27 | 95% (6.01–0.86) |
| | SGAP | 1.32 | 95% (4.59–0.38) |
| | TUG | 0.41 | 95% (1.08–0.15) |
| Sexual activity | DIEP | 0.9 | 95% (2.34–0.35) |
| | SGAP | 1 | 95% (3.1–0.32) |
| | TUG | 0.91 | 95% (2.87–0.29) |
| Foreign body sensation | DIEP | 0.92 | 95% (1.92–0.44) |
| | SGAP | 1.97 | 95% (5.14–0.76) |
| | TUG | 0.61 | 95% (1.47–0.26) |
| Pain relief | DIEP | 1.27 | 95% (2.93–0.55) |
| | SGAP | 1.42 | 95% (4.18–0.48) |
| | TUG | 0.54 | 95% (1.38–0.21) |

Abbreviations: CI, confidence interval; DIEP, deep inferior epigastric perforator; il, inferior limit; OR, odd ratio; sl, superior limit; SGAP, superior gluteal artery perforator; TUG, transverse upper gracilis.
*Note*: The average recovery time was selected as cut off to estimate the odd ratio.

Other treatments undertaken regularly affected the duration of downtime, adjuvant therapies more so than neoadjuvant treatments. Adjuvant chemotherapy prolonged downtime less than 3 weeks, whereas radiotherapy added as much as 4 weeks (►**Tables 4** and **5**). Severe wound dehiscence and other surgically treated complications developing during the follow-up period likewise increased recovery time up to 3 weeks. However, neither minor wound healing problems nor any complication (e.g., flap anastomotic revision, hematoma drainage, seroma) arising prior to patient discharge significantly impacted downtime.

## Discussion

Reconstruction represents the completion of surgical breast cancer care.[3] There are several viable options, all of which rightly should be discussed with patients before advocating a singular choice.[3,13] Although the individual needs of patients are paramount in the selection process, the bias of surgeons often proves unduly influential. As a host of publications will attest, implant-based reconstruction is the most popular approach worldwide, given its less onerous economic impact and surgical/hospitalization demands.[13,14] Autologous reconstruction is thus undoubtedly portrayed as difficult, demanding, and risky, making this route less palatable to patients.

Weichman et al have demonstrated that downtime in patients undergoing breast reconstruction is generally >3 months, regardless of technique. Furthermore, it seems that patients electing autologous reconstruction do not experience more pain or greater difficulty in recovering, compared with tissue expander/implant reconstruction.[10] In the present endeavor, we focused on the relation between type of flap and recovery time. According to several authors, the chief concern of patients during preliminary consultations is how soon their routines may be resumed and the extent to which reconstruction may interfere. Consequently, we made no attempt to gauge cosmetic surgical outcomes. Our goal was simply to gain insights into optimal reconstructive choices, so that patient lifestyles (not surgeon preferences) may be accommodated.

Ultimately, we concentrated on donor-site morbidity, assessing postoperative discomfort and functional impairment. Our patient population was homogeneous in terms of systemic therapy and timing of reconstruction (immediate vs. delayed) and devoid of confounding factors for statistical purposes. Despite disparities propagated in the literature, we recorded an average of 21 weeks for regaining of full strength postoperatively. Any related procedural differences failed to reach statistical significance ($p = 0.085$). However, recovery times in instances of DIEP flap reconstruction were comparatively shorter (OR = 2.11), the TUG flap being least conducive to prompt recovery (OR = 0.47). The average time needed to resume work activities was 11 weeks, again showing no significant procedural differences ($p = 0.084$) and perhaps linked to infeasibility of patient job standardization.

Other surveyed activities that did not differ significantly included resumption of sexual activity, pain relief, and long-distance walking capability. We feel that these end points (especially the first two) largely reflect patient psychological status. In the recovery time for sexual activity, which was 14 weeks, nonsurgical issues most certainly were influential. Some patients even refused to answer such questions, which

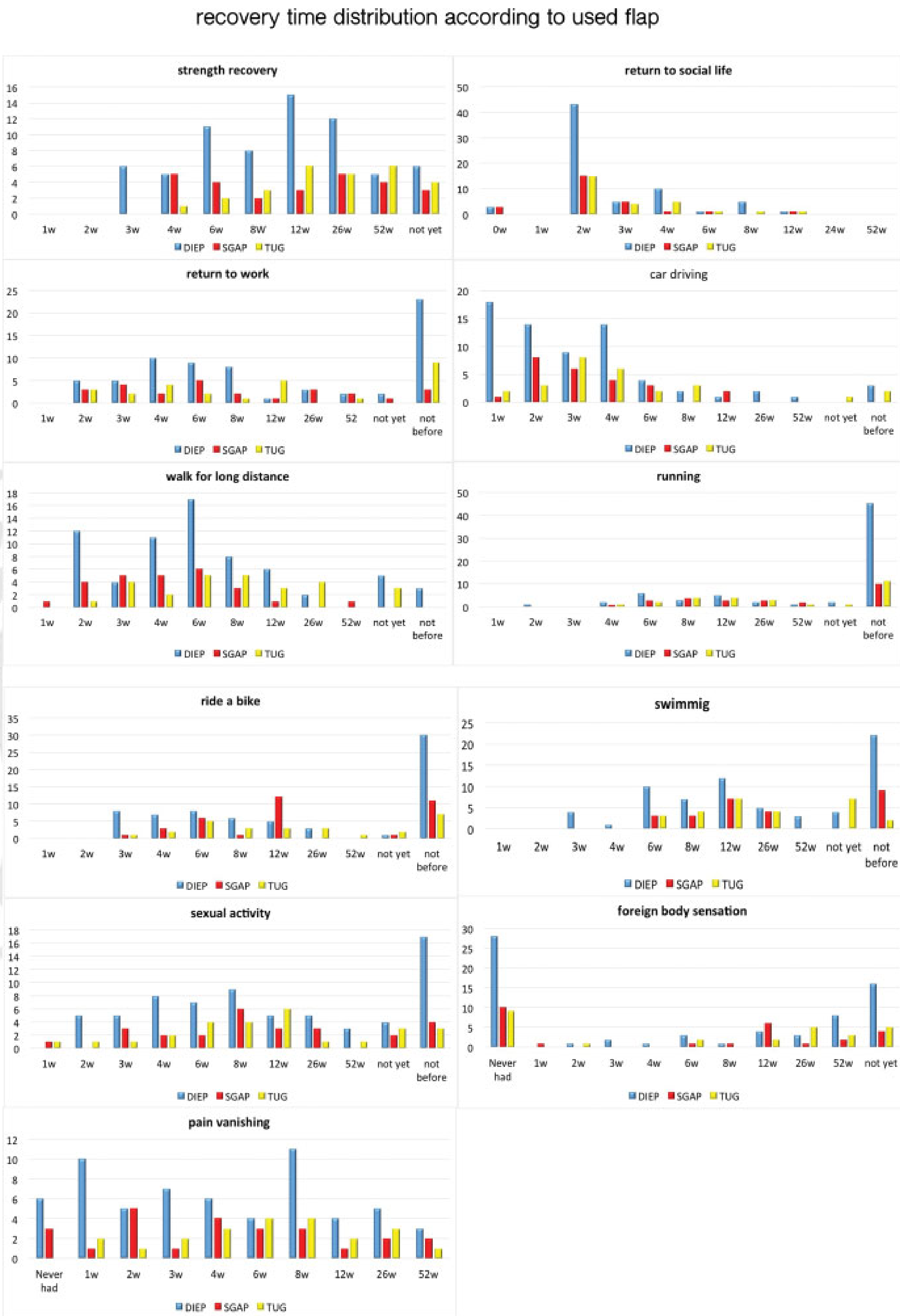


**Fig. 1** Graphic representation of recovery times for various activities according to harvested flap. DIEP, deep inferior epigastric perforator; SGAP, superior gluteal artery perforator; TUG, transverse upper gracilis.

reduced the sample size.[15,16] For obvious reasons, we did not record statistical differences among flaps if all ORs approached values of 1, but pain perception and the capacity to walk for long distances also seemed incumbent on individuals (e.g., perception threshold and preoperative training level), requiring average recovery times of 13 and 10 weeks, respectively.[15] The patient distributions were uniform for these parameters, without any relevant modal shifts.

**Table 4** Average recovery time in relation with systemic therapy administration

| Activity | Flap | Neoadjuvant | Adjuvant | No chemotherapy |
|---|---|---|---|---|
| Strength recovery | DIEP | 19.9 | 22.7 | 19.5 |
| | SGAP | 20.6 | 21.5 | 20.2 |
| | TUG | 21.7 | 24.3 | 21.3 |
| Return to social life | DIEP | 2.2 | 3.3 | 1.8 |
| | SGAP | 2.9 | 3.7 | 2.5 |
| | TUG | 3.1 | 4 | 3.2 |
| Return to work | DIEP | 9.4 | 11.3 | 9.3 |
| | SGAP | 11.3 | 13.1 | 11.1 |
| | TUG | 11.3 | 12.5 | 11.1 |
| Car driving | DIEP | 3.1 | 4.4 | 2.8 |
| | SGAP | 5.1 | 6.5 | 4.8 |
| | TUG | 4.4 | 5.1 | 4.3 |
| Walking for long distances | DIEP | 10.1 | 12.4 | 10.1 |
| | SGAP | 7.3 | 9.4 | 6.6 |
| | TUG | 10.7 | 13.5 | 10.4 |
| Running | DIEP | 13.4 | 15.3 | 13.3 |
| | SGAP | 15.7 | 17.3 | 15.4 |
| | TUG | 14.3 | 16.2 | 14.1 |
| Cycling | DIEP | 9.1 | 11.8 | 8.7 |
| | SGAP | 11.3 | 13.4 | 11.1 |
| | TUG | 11.6 | 13.2 | 10.9 |
| Swimming | DIEP | 14.4 | 16.9 | 14.4 |
| | SGAP | 15.2 | 16.7 | 14.9 |
| | TUG | 17.2 | 18.5 | 17.3 |
| Sexual activity | DIEP | 12.4 | 14.3 | 12.2 |
| | SGAP | 16.5 | 17.7 | 16.4 |
| | TUG | 13.6 | 13.8 | 13.5 |
| Foreign body sensation | DIEP | 19.6 | 21.2 | 19.3 |
| | SGAP | 17.4 | 19.4 | 17.1 |
| | TUG | 20.3 | 22.1 | 20.4 |
| Pain relief | DIEP | 13.1 | 14.7 | 12.9 |
| | SGAP | 11.8 | 14.5 | 11.7 |
| | TUG | 14.6 | 15.7 | 14.4 |

Abbreviations: DIEP, deep inferior epigastric perforator; SGAP, superior gluteal artery perforator; TUG, transverse upper gracilis.

**Table 5** Average recovery time in relation with radiotherapy

| Activity | Flap | Neoadjuvant | Adjuvant | No radiotherapy |
|---|---|---|---|---|
| Strength recovery | DIEP | 18.9 | 24.9 | 17.6 |
| | SGAP | 20.5 | 24.7 | 19.2 |
| | TUG | 20.8 | 24.4 | 20.7 |
| Return to social life | DIEP | 2.3 | 3.9 | 1.8 |
| | SGAP | 2.7 | 4.2 | 2.3 |
| | TUG | 2.7 | 4.1 | 2.1 |
| Return to work | DIEP | 10.2 | 13.3 | 8.3 |
| | SGAP | 10.2 | 13.4 | 9.6 |
| | TUG | 11.2 | 14.1 | 10.1 |
| Car driving | DIEP | 2.7 | 4.5 | 2.8 |
| | SGAP | 4.6 | 6.4 | 4.8 |
| | TUG | 4.8 | 5.6 | 4.3 |
| Walking for long distances | DIEP | 9.9 | 13.2 | 9.3 |
| | SGAP | 7.1 | 10.5 | 6.6 |
| | TUG | 10.3 | 13.5 | 10.1 |
| Running | DIEP | 13.6 | 15.3 | 13.3 |
| | SGAP | 15.8 | 17.2 | 15.4 |
| | TUG | 14.1 | 16.2 | 14.1 |
| Cycling | DIEP | 9.3 | 11.5 | 8.7 |
| | SGAP | 12.3 | 13.5 | 10.1 |
| | TUG | 11.6 | 13.3 | 10.8 |
| Swimming | DIEP | 14.7 | 16.2 | 13.2 |
| | SGAP | 15.7 | 16.6 | 14.6 |
| | TUG | 17.9 | 20.3 | 16.3 |
| Sexual activity | DIEP | 12.7 | 14.4 | 12.2 |
| | SGAP | 14 | 16.6 | 13.5 |
| | TUG | 14.4 | 17.7 | 14.1 |
| Foreign body sensation | DIEP | 19.5 | 22.3 | 18.6 |
| | SGAP | 16.4 | 19.7 | 16.1 |
| | TUG | 21 | 22.8 | 20.4 |
| Pain relief | DIEP | 12.9 | 14.7 | 12.6 |
| | SGAP | 12.2 | 13.8 | 11.5 |
| | TUG | 14.8 | 16.7 | 14.2 |

Abbreviations: DIEP, deep inferior epigastric perforator; SGAP, superior gluteal artery perforator; TUG, transverse upper gracilis.

In other activities we surveyed, the observed patient distributions did show significant differences, underscoring correlations between downtime and specific activities. Based on resumption of social activity, 73 patients (60%) were considered fully recovered by the second postoperative week. Among them, 43 received DIEP flaps (OR = 1.27), but results were roughly equivalent for the SGAP flap (OR = 1.25). From our perspective, postoperative improvement in flap donor sites is a prime factor in recovery. The scar of a well-planned DIEP flap is obscurely located (lower abdomen), is easily hidden by underwear, and may be further refined through cosmetic abdominoplasty.[17]

Recipients of DIEP (vs. other) flaps also showed faster recovery in the remainder of surveyed activities. ORs were consistently >1.50, confirming their associations with shorter than average recovery times. Hence, our findings support the consensus that DIEP flaps (if tenable) are the best choice for breast reconstruction. The abdominal wall injury inflicted is limited, and there is no compromise in muscular function, so patient recovery is unimpeded.[18] By comparison, the TUG flap fared worst in all questionnaire activities, routinely yielding ORs < 0.79. Gracilis muscle resection not only prolongs healing but by obliging other abductors to gradually compensate for its functional loss, several weeks of downtime are also imposed.

The impact of neoadjuvant and adjuvant treatments on recovery time was ancillary area of interest. Although patients often underwent both radio- and chemotherapy, making it impossible to properly address single-modality treatment, our data still provided important information. In terms of mean recovery time, recipients of neoadjuvant therapies were indistinguishable from untreated counterparts, whereas downtime was clearly prolonged by adjuvant therapies. In addition, radiotherapy seemed to impact patient recovery more than chemotherapy. Despite the localized nature of irradiation, our findings suggest a broader systemic effect, demanding more time for patients to recover. The shorter recovery generally conferred by DIEP flaps was nevertheless upheld in this context.

Minor or major complications (i.e., flap salvage procedures) arising during hospitalization remarkably had no influence on recovery time, perhaps due to immediate management. On the other hand, adverse events developing in the course of follow-up monitoring had significant effects on downtime. Severe wound dehiscence, regardless of management efforts, added up to 3 weeks on average, and late seromas extended recovery by several days. In our opinion, such outcomes appear rooted in further treatments or patient needs, rather than specific complications, and were not flap dependent.

A serious clinical problem in patients with breast cancer is lymphedema of the upper limb. As shown by Penha et al, lymphedema dramatically reduces the quality of life, nullifying the benefits that breast reconstruction bestows.[19] As more flaps are devised to deal with lymphedema, such patients may yet recover their quality of life. Unfortunately, we did not explore this problem for several reasons. It is primarily a surgical oncology issue and thus was beyond our scope of study. Also, the patients we followed were monitored for 1 year only. Typically, more time is needed for lymphedema to develop postmastectomy.

As a final note, it is important to emphasize that autologous breast reconstruction is a dynamic pursuit that is shaped by societal changes, according to Healy and Allen.[20] The flap of choice has indeed fluctuated during the past two decades in response to newer oncologic therapies and the needs of women.

## Conclusion

Contrary to prevailing impressions, autologous reconstruction represents the best solution for a great many women in the aftermath of breast cancer treatment. Recent inroads and advances in microsurgery have reduced operative and hospitalization times. Preoperative consultation plays a key role in flap selection and should take into account the occupations and habits of patients to ensure prompt resumption of normal routines. As shown herein, the impact on patient downtime proved least intrusive for DIEP flaps and greatest for TUG flaps.

**Conflict of Interest**
None of the authors have a financial interest in any of the products, devices, or drugs cited in this article.

## References

1 Algaithy ZK, Petit JY, Lohsiriwat V, et al. Nipple sparing mastectomy: can we predict the factors predisposing to necrosis? Eur J Surg Oncol 2012;38(02):125–129
2 Mallon P, Feron JG, Couturaud B, et al. The role of nipple-sparing mastectomy in breast cancer: a comprehensive review of the literature. Plast Reconstr Surg 2013;131(05):969–984
3 Cabral IV, Garcia ED, Sobrinho RN, et al. Increased capacity for work and productivity after breast reduction. Aesthet Surg J 2017; 37(01):57–62
4 Colwell AS, Tessler O, Lin AM, et al. Breast reconstruction following nipple-sparing mastectomy: predictors of complications, reconstruction outcomes, and 5-year trends. Plast Reconstr Surg 2014;133(03):496–506
5 Salgarello M, Visconti G, Barone-Adesi L. Nipple-sparing mastectomy with immediate implant reconstruction: cosmetic outcomes and technical refinements. Plast Reconstr Surg 2010;126(05): 1460–1471
6 De Vita R, Pozzi M, Zoccali G, et al. Skin-reducing mastectomy and immediate breast reconstruction in patients with macromastia. J Exp Clin Cancer Res 2015;34:120
7 Taghizadeh R, Moustaki M, Harris S, Roblin P, Farhadi J. Does post-mastectomy radiotherapy affect the outcome and prevalence of complications in immediate DIEP breast reconstruction? A prospective cohort study. J Plast Reconstr Aesthet Surg 2015;68(10): 1379–1385
8 Bensimon RH, Bergmeyer JM. Improved aesthetics in breast reconstruction: modified mastectomy incision and immediate autologous tissue reconstruction. Ann Plast Surg 1995;34(03): 229–233, discussion 233–235
9 Davies K, Allan L, Roblin P, Ross D, Farhadi J. Factors affecting postoperative complications following skin sparing mastectomy with immediate breast reconstruction. Breast 2011;20(01): 21–25
10 Weichman KE, Hamill JB, Kim HM, Chen X, Wilkins EG, Pusic AL. Understanding the recovery phase of breast reconstructions: Patient reported outcomes correlated to the type and timing of reconstruction. J Plast Reconstr Aesthet Surg 2015;68(10): 1370–1378
11 Davidge K, Armstrong KA, Brown M, et al. Shifting autologous breast reconstruction into an ambulatory setting: patient-reported quality of recovery. Plast Reconstr Surg 2015;136 (04):657–665
12 Batdorf NJ, Lemaine V, Lovely JK, et al. Enhanced recovery after surgery in microvascular breast reconstruction. J Plast Reconstr Aesthet Surg 2015;68(03):395–402
13 Chang JM, Kosiorek HE, Dueck AC, et al. Trends in mastectomy and reconstruction for breast cancer; a twelve year experience from a tertiary care center. Am J Surg 2016;212(06): 1201–1210
14 Aguiar IC, Veiga DF, Marques TF, Novo NF, Sabino Neto M, Ferreira LM. Patient-reported outcomes measured by BREAST-Q after implant-based breast reconstruction: a cross-sectional controlled study in Brazilian patients. Breast 2017;31:22–25
15 King MT, Winters ZE, Olivotto IA, et al. Patient-reported outcomes in ductal carcinoma in situ: a systematic review. Eur J Cancer 2017;71:95–108
16 Zhong T, Hu J, Bagher S, et al. A comparison of psychological response, body image, sexuality, and quality of life between immediate and delayed autologous tissue breast reconstruction: a prospective long-term outcome study. Plast Reconstr Surg 2016; 138(04):772–780

17 Eom JS, Kim DY, Kim EK, Lee TJ. The low DIEP flap: an enhancement to the abdominal donor site. Plast Reconstr Surg 2016;137(01):7e–13e
18 Uda H, Tomioka YK, Sarukawa S, et al. Abdominal morbidity after single- versus double-pedicled deep inferior epigastric perforator flap use. J Plast Reconstr Aesthet Surg 2016;69(09):1178–1183
19 Penha TR, Botter B, Heuts EM, Voogd AC, von Meyenfeldt MF, van der Hulst RR. Quality of life in patients with breast cancer-related lymphedema and reconstructive breast surgery. J Reconstr Microsurg 2016;32(06):484–490
20 Healy C, Allen RJ Sr. The evolution of perforator flap breast reconstruction: twenty years after the first DIEP flap. J Reconstr Microsurg 2014;30(02):121–125