Original Article

# Comparing complications and perioperative teams in microsurgical breast reconstruction: retrospective cohort study

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**Background:** Subspecialization with dedicated perioperative teams has become common practice in some surgical disciplines. While surgeon experience, the number of surgeons involved, and enhanced recovery after surgery (ERAS) pathways are known factors affecting the outcome after microsurgical breast reconstruction, the impact of the perioperative team has not been studied.

**Methods:** We conducted a retrospective cohort study consisting of a chart review of all patients who underwent microsurgical breast reconstruction from January 2019–April 2020. Surgery was performed by three microsurgeons at two institutions with different perioperative teams—one being a small clinic [private clinic (PC), 33 beds] and the other being a larger hospital [corporate hospital (CH), 335 beds]. Patients were grouped into two cohorts according to the institution where surgery was performed. The primary outcomes studied were frequency of revision surgery, flap loss and patient length-of-stay (LOS).

**Results:** One hundred and fifty microsurgical breast reconstructions were performed in 125 patients. Demographic data [age, body mass index (BMI), current tobacco use, donor site] was found statistically comparable between both cohorts. In the PC cohort with fewer perioperative care providers, lower rates of revision surgery and flap loss were observed (P value =0.009 and 0.04, respectively). LOS was not significantly different between the two cohorts (P value =0.44).

**Conclusions:** The outcome of microsurgical breast reconstruction depends on multiple factors. In this study, fewer flap complications occurred at the small clinic. One reason among others might be the lower number of perioperative care providers involved and hence higher likelihood of sharing microsurgical cases, which facilitates routine and ensures less variability in care. The value of perioperative team subspecialization in microsurgical breast reconstruction needs to be assessed in prospective studies.

**Keywords:** Mammaplasty; microsurgery; postoperative complications; patient care team; subspecialization

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## Introduction

Subspecialization with dedicated perioperative teams has been common practice in some surgical disciplines or centers (1). In cardiothoracic surgery, a focused team- and program-approach has been shown to improve outcomes and reduce mortality after isolated coronary bypass grafting (2). In gynecological surgery, increased familiarity of the surgical team has been associated with a reduced risk of adverse events (3).

Reconstructive surgeons have traditionally been considered generalists. However, recently, some subspecializations have formed, such as microsurgical breast reconstruction (4). Several studies have identified factors that influence the outcome after microsurgical breast reconstruction. A co-surgeon approach has been shown to reduce postoperative complications and length-of-stay (LOS) after bilateral microsurgical breast reconstruction (5,6). Teotia *et al.* demonstrated that the percentage of flaps for breast reconstruction requiring at least one revision of the original anastomosis was significantly higher in less experienced residents, reflecting the influence of microsurgery training (7). On a more general note, enhanced recovery after surgery (ERAS) protocols which streamline perioperative care have been shown to reduce opioid consumption and LOS (8). Using process mapping, Haddock *et al.* furthermore identified eight critical maneuvers which maximize efficiency and safety for deep inferior epigastric perforator (DIEP) flaps (9,10). Yet, besides these known factors influencing postoperative outcomes after microsurgical breast reconstruction, the impact of the perioperative team has not been studied.

The senior author's practice has focused on microsurgical breast reconstruction. These procedures are performed by three reconstructive microsurgeons at two institutions with different perioperative teams. The aim of this study was to compare complications and patient LOS after microsurgical breast reconstruction between these two institutions with the same surgical protocol but different perioperative teams. We present the following article in accordance with the STROBE reporting checklist (available at https://gs.amegroups.com/article/view/10.21037/gs-22-295/rc).

## Methods

### *Study design/sample*

A retrospective cohort study consisting of a chart review was performed, including all patients who underwent microsurgical breast reconstruction from January 2019–April 2020. The flap types used included unilateral or bilateral DIEP, superficial inferior epigastric artery (SIEA), superior gluteal artery perforator (SGAP) and transverse myocutaneous gracilis (TMG) flaps. Patients were grouped into two cohorts depending on the institution where the reconstructive procedure was performed: either at a small clinic with 33 beds (private clinic, PC) or at a larger hospital with 335 beds (corporate hospital, CH), both situated in the same city in Switzerland. The two institutions differed in several ways, which are outlined below ("Institution-specific processes").

### *Outcomes*

The primary outcomes studied were difference in the rate of revision surgery and flap loss between both cohorts as well as LOS.

### *Statistical analysis*

Deidentified data was analyzed using the software Python (version 3.5). General demographic data between the patients in both cohorts was compared with descriptive statistics. The Kolmogorov-Smirnov (KS) test was performed for continuous variables and the chi-square test for categorical variables. The data was analyzed separately for the number of patients and number of flaps, as some patients underwent bilateral breast reconstruction. The data set was first analyzed including all patients. To stratify for surgeon experience, a separate data set was analyzed including only the senior surgeon's cases.

### *Ethical statement*

This study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). As this study was conducted in the context of an audit, the regional ethics committee exempted ethical approval (registration number Req-2022-01050). Informed consent was taken from all the patients.

### *Standardized surgical protocol*

Preoperatively, all cases were discussed at the breast cancer diagnostic conference. CT angiography of the abdominal wall was performed if a DIEP flap was planned (10). The patient's general practitioner carried out a physical exam, electrocardiogram, and basic laboratory tests (complete blood cell count, electrolytes, creatinine, prothrombin time, activated partial thromboplastin time) before surgery.

All procedures were performed by one of three board-certified reconstructive microsurgeons following the standard operating procedure (SOP). The microsurgeons operated as affiliated doctors at both institutions. The perioperative team for each case consisted of one anesthesiologist, two scrub nurses and one operating room (OR) technician. Identical (micro-)surgical instruments and microscopes were used at both institutions. Veins were anastomosed using a venous coupling device (Synovis, Inc., Birmingham, AL, USA), and coupler size was measured intraoperatively (11). Arteries were hand-sewn using Dafilon 9-0. Redon drains were inserted at the donor site and recipient site to drain excessive fluid and monitor hematoma formation. General anesthesia was managed with total intravenous anaesthesia (TIVA), using intravenous (IV) disoprivan [Propofol MCT Fresenius®, Fresenius Kabi (Schweiz) AG, Kriens, Switzerland], IV remifentanil (Ultiva®, Aspen Pharma Schweiz GmbH, Zug, Switzerland), and IV sufentanil citrate (Sufenta®, Janssen-Cilag AG, Zug, Switzerland). Muscle relaxation was ensured using IV atracurium (Atracurium Labatec®, Labatec Pharma SA, Meyrin, Switzerland). All patients received IV tranexamic acid (Cyklokapron®, MEDA Pharma GmbH, Wangen-Brüttisellen, Switzerland) 1 g during induction of anesthesia. If increased bleeding was noted during surgery, 1 g of IV tranexamic acid was repeated 8 hours after starting surgery (12). IV cefazolin 2 g (Cefazolin Labatec®, Labatec Pharma SA, Meyrin, Switzerland) was started as antibiotic prophylaxis after induction and continued until postoperative day (POD) 3. Intraoperative monitoring included the following at both institutions: electrocardiogram (ECG), pulse-oximetry, blood pressure, bispectral index and urinary catheter. Only crystalloids were infused, in most cases Ringer-Acetate/Maleate (Ringerfundin®, B. Braun Medical AG, Sempach, Switzerland). Fluid management was goal-directed, considering diuresis and blood pressure (13). Anesthesiologists were advised to avoid hypervolemia to prevent oedema and damage to glycocalyx. Transfusion threshold was a hemoglobin concentration <8 g/dL. Vasodilation due to disoprivan was treated with boluses of IV ephedrine (Ephedrin Sintetica®, Sintetica SA, Mendrisio, Switzerland) (5–10 mg bolus) or perfusion of noradrenaline (Noradrenalin Sintetica®, Sintetica SA, Mendrisio, Switzerland) (1–3 mcg/min using a separate IV line). Phenylephrine was not used.

Postoperative monitoring was performed as described previously; every 15 min during the first 3 hours; every hour thereafter until the evening of POD 1; every 3 hours thereafter until the evening of POD 2; and once per shift thereafter, in the case of an uncomplicated previous course (14). Parameters included were color and temperature of the skin monitor island as well as Doppler-signal (15). An identical Doppler probe was used at both institutions (Huntleigh Healthcare Ltd., Cardiff, UK). If flap perfusion was considered questionable, indocyanine green fluorescence angiography (ICG-FA) was performed (16). In case of flap compromise, return to theatre was scheduled within one hour at both institutions. Primary medical thrombosis prophylaxis was started 6 hours postoperatively using subcutaneous (SQ) nadroparin (Fraxiparine®, Aspen Pharma Schweiz GmbH, Baar, Switzerland) once daily. The dose was weight dependent (<50 kg of b.w., 0.2 mL; 50–70 kg of b.w., 0.3 mL; 70–100 kg of b.w., 0.4 mL, and >100 kg of b.w., 0.6 mL). All patients wore compression stockings, and mobilization was started on POD 1 or 2, depending on the type of flap. Postoperative wound care and drain management were identical at both institutions. The patients were rounded on once daily by one of three microsurgeons. The microsurgeons covered a 24-hour on-call service for postoperative complications or emergency revisions.

### *Institution-specific processes*

Several processes differed between both institutions. PC is a small clinic (33 beds, 5 ORs) with a limited elective surgical spectrum focusing on plastic and aesthetic surgery, maxillofacial surgery, and orthopedic surgery. The number of affiliated doctors ranges from 100 to 120 at this institution. CH is a larger hospital (335 beds, 14 ORs) offering a comprehensive list of surgical procedures, ranging from neurosurgery to cardiothoracic surgery. Five hundred and ten doctors have been accredited at this institution. In-hospital distances are shorter at PC than at CH. The total number of perioperative staff involved in microsurgical breast reconstruction cases—including anesthesiologists, scrub nurses, OR technicians and nursing staff in the post-anesthesia care unit (PACU) and on the ward—was lower at PC (27 care providers) than at CH (pool of >83 care providers) (*Table 1*). Due to the larger pool of staff at CH, the likelihood of the same perioperative team being involved in more than one case of microsurgical

**Table 1** Number of staff involved in microsurgical breast reconstruction by hospital

| Member of staff | PC, n | CH, n |
|---|---|---|
| Anesthesiologist | 5 | Pool of >30 |
| Scrub nurse | 5 | Pool of >8 |
| OR technician | 3 | Pool of >10 |
| Nurse in PACU | 4 | Pool of >15 |
| Nurse on ward | 10 (1 floor) | Pool of >20 (2 floors) |
| Total | 27 | Pool of >83 |

PC, private clinic; CH, corporate hospital; OR, operating room; PACU, post-anesthesia care unit.

breast reconstruction was smaller at CH. OR staff including scrub nurses and OR technicians are organized in shifts at CH to cover a 24-hour-emergency service, while OR staff at PC work during daytime and on an on-call basis at night for emergency revisions. At PC, anesthetic care is provided by a private practice consisting of five anesthesiologists. At CH, anesthesiologists are grouped into different areas of expertise but may be scheduled for cases outside their specialty depending on demand and resources available.

On a technical note, intraoperative blood pressure was measured conventionally with cuffs (non-invasive blood pressure) at PC, while at CH invasive blood pressure monitoring with arterial catheters (intra-arterial blood pressure) was used.

## Results

A total of 150 breast reconstructions were performed in 125 patients during the study period. Baseline demographic data was found statistically comparable between both cohorts. The average age of the study population was 52.4±10.8 years, and the average body mass index (BMI) was 24.1±4.0 kg/m$^2$ (*Table 2*).

There were 87 flaps in 68 patients in the PC cohort and 63 flaps in 57 patients in the CH cohort. The flap type performed most often was the DIEP flap, followed by the SGAP and TMG flap (relative frequency 80%, 10.7% and 9.3% respectively).

Regarding flap complications, there were significantly different rates of revision surgery and flap loss between both cohorts, with a lower complication rate at PC (P value <0.01 and P value =0.04, respectively). Most reoperations were due to a venous problem of the flap. No significant difference in the patient LOS was observed (P value =0.44) (*Table 3*).

To account for surgeon experience, the data set was further analyzed using the senior surgeon's cases only. There remained a significant difference in the rate of revision surgery and relative frequency of flap loss with a lower complication rate at PC (P value <0.01 and P value =0.02, respectively) (*Table 4*).

Further analysis revealed no correlation between the type of flap and relative frequency of complications. However, the data set for some flap types was quite small (*Table 5*). The mean LOS tended to be longer in patients with bilateral breast reconstruction, but this was not statistically significant (unilateral 5.3±0.9 nights *vs.* bilateral 5.8±1.0 nights, P value =0.06).

## Discussion

This study identified a significant difference in the rate of revision surgery and relative frequency of flap loss between two institutions with the same surgical protocol but different perioperative teams, with lower rates of revision surgery and flap loss at the smaller clinic. The smaller number of perioperative staff at PC—including anesthesiologists, scrub nurses, OR technicians and nursing staff in the PACU and on the ward—are exposed to microsurgical procedures more regularly. The authors hypothesize that this favors routine and possibly leads to a smoother perioperative workflow with less variability in care.

The reason for revision surgery and its potential correlation with the perioperative team warrants further discussion. In both cohorts, most anastomotic revisions were due to venous stasis, followed by arterial thrombosis. Venous stasis can have various causes, including (I) technical error in flap planning, anastomotic technique or kinking of the pedicle, (II) suboptimal blood pressure management and volume overload leading to stasis as well as (III) patient factors including thrombophilic disorders (17). Prolonged venous stasis may ultimately lead to venous thrombosis, and—if untreated—flap loss. In this study, most venous revisions were caused by pedicle malpositioning, compression by the flap or by a hematoma. Inadvertent twist of the pedicle can occur at the time of raising, transferring, or insetting the flap, and it may go unnoticed until venous stasis becomes evident (18,19). The authors hypothesize that disruptions in the surgical workflow, i.e., because of a change of the perioperative team during the microsurgical phase due to shift work or lacking familiarity with the surgical steps due

 

**Table 2** Demographic characteristics for patients and by cohort

| Parameter | All patients (n) | PC (%) | CH (%) | P value |
|---|---|---|---|---|
| No. | 125 | 68 | 57 | – |
| Mean age ± SD, years | 52.4±10.8 | 52.6±10.3 | 52.3±11.3 | 0.91 |
| Mean BMI ± SD, kg/m$^2$ | 24.1±4.0 | 23.9±3.9 | 24.4±4.2 | 0.73 |
| Current smoker | 10 | 6 (8.8) | 4 (7.0) | 0.69 |
| Diabetes mellitus | 1 | 0 (0.0) | 1 (1.8) | 0.28 |
| BRCA gene mutation | 20 | 13 (19.1) | 7 (12.3) | 0.42 |
| Unilateral reconstruction | 92 | 49 (72.1) | 43 (75.4) | 0.59 |
| Immediate autologous reconstruction | 69 | 43 (63.2) | 26 (45.6) | 0.06 |

PC, private clinic; CH, corporate hospital; SD, standard deviation; BMI, body mass index; BRCA, breast cancer.

**Table 3** Flap complications for breasts and by cohort

| Parameter | All flaps (n) | PC (%) | CH (%) | P value |
|---|---|---|---|---|
| No. | 150 | 87 | 63 | – |
| DIEP/SIEA | 120 | 65 (74.7) | 55 (87.3) | 0.09 |
| SGAP | 16 | 11 (12.6) | 5 (7.9) | 0.34 |
| TMG | 14 | 11 (12.6) | 3 (4.8) | 0.09 |
| Revision surgery | 28 | 10 (11.5) | 18 (28.6) | 0.009 |
| Anastomosis or pedicle problem | 19 | 6 (6.9) | 13 (20.6) | 0.01 |
| Arterial problem | 3 | 0 | 3 | – |
| Venous problem | 16 | 6 | 10 | – |
| Hematoma | 9 | 4 (4.6) | 5 (7.9) | 0.40 |
| Flap loss | 3 | 0 (0.0) | 3 (4.8) | 0.04 |
| Mean duration of hospital stay ± SD, nights | 5.5±0.9 | 5.5±1.0 | 5.5±0.9 | 0.44 |

PC, private clinic; CH, corporate hospital; DIEP, deep inferior epigastric perforator; SIEA, superficial inferior epigastric artery; SGAP, superior gluteal artery perforator; TMG, transverse myocutaneous gracilis; SD, standard deviation.

to infrequent exposure may impair overall concentration and indirectly contribute to such errors. The higher rate of reversible venous problems compared with data from the literature is likely explained by the fact that minor flap changes prompt immediate revision at our center (20). Regarding patient factors, thrombophilic disorders were known preoperatively in two patients. One patient with heterozygous factor V Leiden required revision of a DIEP flap with successful removal of a venous microthrombus and flap salvage, while reconstruction was uneventful in another patient with a prothrombin mutation G20210A. In contrast, arterial thromboses are most often due to a technical error of the anastomosis. In this cohort three arteries were revised at CH. The authors hypothesize that stress and cognitive distraction, i.e., due to lacking OR team familiarity with microscopic surgery leading to interruptions could impair technical performance of the surgeon. This would be along the lines of a recent experimental study, which observed increased efficiency under stress but reduced anastomotic accuracy in the simulated setting (21).

The reason for the three observed flap losses warrants further discussion. One flap loss occurred after serial arterial thrombosis of a DIEP flap. The second flap loss was due to serial venous thrombosis of an SGAP flap. The third flap loss was noted three weeks after SIEA breast reconstruction in postoperative clinics.

 

**Table 4** Flap complications including only the senior author's cases for breasts and by cohort

| Parameter | All flaps (senior author) (n) | PC (%) | CH (%) | P value |
|---|---|---|---|---|
| No. | 110 | 81 | 29 | – |
| DIEP/SIEA | 85 | 62 (76.5) | 23 (79.3) | 0.99 |
| SGAP | 16 | 11 (13.6) | 5 (17.2) | 0.68 |
| TMG | 9 | 8 (9.9) | 1 (3.4) | 0.26 |
| Revision surgery | 19 | 9 (11.1) | 10 (34.5) | 0.006 |
| Anastomosis or pedicle problem | 15 | 6 (7.4) | 9 (31.0) | 0.002 |
| Arterial problem | 3 | 0 | 3 | – |
| Venous problem | 12 | 6 | 6 | – |
| Hematoma | 4 | 3 (3.7) | 1 (3.4) | 0.93 |
| Flap loss | 2 | 0 (0.0) | 2 (6.9) | 0.02 |
| Mean duration of hospital stay ± SD, nights | 5.5±1.0 | 5.5±0.9 | 5.6±1.2 | <0.001* |

*, similar mean values but different distribution. PC, private clinic; CH, corporate hospital; DIEP, deep inferior epigastric perforator; SIEA, superficial inferior epigastric artery; SGAP, superior gluteal artery perforator; TMG, transverse myocutaneous gracilis; SD, standard deviation.

**Table 5** Flap complications for breasts and by type of flap

| Parameter | All flaps (n) | DIEP/SIEA (%) | SGAP (%) | TMG (%) |
|---|---|---|---|---|
| No. | 150 | 120 | 16 | 14 |
| Revision surgery | 28 | 26 (21.7) | 1 (6.25) | 1 (7.1) |
| Flap loss | 3 | 2 (1.7) | 1 (6.25) | 0 (0.0) |
| Mean duration of hospital stay ± SD, nights | 5.5±0.9 | 5.5±0.9 | 5.1±0.9 | 5.4±0.6 |

DIEP, deep inferior epigastric perforator; SIEA, superficial inferior epigastric artery; SGAP, superior gluteal artery perforator; TMG, transverse myocutaneous gracilis; SD, standard deviation.

In this study, LOS was similar at both institutions (5.5±1 days at PC and 5.5±0.9 days at CH, mean ± SD). While LOS was longer compared with other studies, it was within the range reported by another Swiss center (22-24). The authors hypothesize that the difference compared with centers in other countries may be due to insurance policies or preoperative counseling and expectation setting (25). Unfortunately, this is difficult to measure. While the authors did not perform a sub-analysis of LOS in patients with and without revision surgery, another study identified return to OR for flap compromise as a risk factor for increased LOS (24).

This study has notable strengths. This is the first study comparing complications after microsurgical breast reconstruction between two institutions with a shared surgical protocol but different perioperative teams.

There are several limitations to this study. First, we did not quantify and compare the number of team interactions for the different combinations of perioperative care providers at both hospitals. Also, we did not analyze team interaction or communication mechanisms. More specifically, communication has been shown to be a vital component in complex team settings such as ORs (26). Communication analysis tools like real-time observation could be part of a future study (27,28). Furthermore, we did not assess institutional differences in scheduling and timing of emergency reoperations, which has been found to impact flap salvage rates (29). That said, the authors have the possibility to return to theatre within one hour at both institutions in case of flap compromise. A retrospective study performed by the senior author showed that most revisions occurred during the first 48 hours after surgery (14).

 

**Table 6** Key tasks of the different perioperative team members specific to microsurgical breast reconstruction at the authors' center

| Care provider | Task |
|---|---|
| Anesthesiologist | Performing anesthesia according to a standardized protocol. Specifically, maintaining full muscle relaxation throughout flap dissection. Maintaining systolic blood pressure >100 mmHg with minimal fluctuation. Administering analgesia proactively before painful stimuli, e.g., before rib resection |
| Scrub nurse | Preparing OR table with all (micro-) instruments needed. Being aware of the surgical steps and the material needed during each step |
| OR technician | Positioning the patient correctly on the OR table, including repositioning during surgery before the period under the microscope with arms resting at the side. Maintaining and preparing the OR microscope. Setting up the Fluoptics® device |
| Nurse in PACU | Performing flap monitoring according to the protocol. Maintaining systolic blood pressure >100 mmHg. Managing pain |
| Nurse on ward | Performing flap monitoring according to the protocol. Managing pain. Changing dressings and drains. Organizing discharge |

OR, operating room; PACU, post-anesthesia care unit.

Also, comparing the perioperative team setup between scheduled surgery and emergency free flap revisions could be an interesting research question of a future study. Furthermore, the American Society of Anesthesiologists (ASA) physical status classifications, the detailed anesthetic protocols and the perioperative fluid management were not compared between both institutions. Of note, a retrospective study found that the perioperative fluid volume was significantly higher in patients who underwent revision surgery due to venous thrombus formation at the anastomosis (17). Moreover, we did not assess the impact of previous irradiation and neoadjuvant chemotherapy on the rate of revision surgery. In a retrospective study, there was a higher trend for flap loss and anastomosis failure in patients with previously irradiated internal mammary artery nodes. However, this was not statistically significant (30). The complication and reoperation rates were similar between patients who received neoadjuvant chemotherapy and patients who did not in a retrospective study (31). Interestingly, most of the cases were performed by the senior author at PC. This potential bias is explained by the fact that the senior author received more referrals from attending breast surgeons at PC than the other surgeons. To account for this potential bias and difference in expertise, we analyzed a separate data set including only the senior author's cases. However, the same trends for revision surgery and flap loss were observed in this separate analysis. Finally, the data set for subgroup analyses was quite small. Larger patient numbers would be needed to draw more generalizable conclusions.

There are two mechanisms from earlier team research that could explain the observed better outcomes in the clinic with a smaller pool of care providers: team familiarity and shared mental models (1). First, teams whose members have a history of working together do better than those that do not (32,33). At the small clinic, the lower number of care providers share patient cases more often and become familiar with each other, their own tasks, and the specifics of the perioperative planning and procedure. This knowledge gained by temporal summation possibly contributes to a smoother workflow. Second, teams that share mental models, i.e., have a shared or complementary understanding of the task to be performed, do better than others (34). In a previous study, barriers to effective perioperative teams included confusion in tasks and responsibilities, existing hierarchies, and lack of understanding among the team members (35). Confusion in tasks might be more prominent at the larger hospital, where exposure to microsurgery of the individual team member is infrequent. Hierarchies might also appear more prominent due to lacking team familiarity and hence more inhibitions in communication.

A subspecialized service for microsurgical breast reconstruction would require the formation of a perioperative core team (1). The core team members need to be instructed about the perioperative process and key tasks of each member to generate a shared mental model. *Table 6* provides an overview of key tasks for each perioperative team member. Also, they should be exposed to microsurgical procedures regularly to ensure that focused temporal summation results in routine. The specifics of the implementation process will need to be adjusted to the respective National Health service. Providing a detailed implementation plan is beyond the scope of this article. On a general note, proactive pain management, in which the anesthetic team closely follows the surgical steps and applies analgesics in anticipation of painful stimuli might lead to less variation in blood pressure (36). A scrub nurse who is familiar with the surgical steps will anticipate the instruments needed, and an experienced OR technician will know how to best position the patient and prepare additional tools like the microscope or ICG-FA software. Both might contribute to a swift workflow with fewer interruptions, and possibly shorter total duration of surgery (37). Of note, reduced operative time has been associated with fewer complications after microsurgical breast reconstruction (38). Duration of surgery tended to be shorter at PC, but this was not statistically significant (222±52 min at PC *vs.* 240±82 min at CH, P value =0.19). Nursing staff with routine in postoperative flap surveillance will identify complications related to flap perfusion early. Importantly, longer delay to revision surgery has been associated with worse outcomes of compromised flaps (29).

The detrimental effect of cognitive distraction and external stressors on surgical performance is well-known and has been described in laparoscopic and urologic surgery research (39,40). Also, a recent experimental study observed an objectively measurable effect of distraction on simulated microsurgical performance (21). With the introduction of realistic operative room distractions and interruptions, study participants were more efficient but had reduced anastomotic accuracy. Consequently, mental skills training and taught coping mechanisms for intraoperative stress and distraction could be beneficial to microsurgery training (21). Yet, clinical studies on the effect of the perioperative team environment in microsurgery are lacking. Prospective studies with larger patient numbers are needed to assess the impact of different perioperative care providers in microsurgical breast reconstruction.

## Conclusions

The outcome of microsurgical breast reconstruction is determined by multiple factors. In this study, significantly lower rates of revision surgery and lower relative frequency of flap loss occurred at the small clinic. Among other reasons, this might be due to the lower number of perioperative staff involved at the small clinic, which leads to more frequent exposure of the different team members to microsurgical cases. The authors hypothesize that this facilitates routine and ensures less variability in care. The value of perioperative team subspecialization in microsurgical breast reconstruction needs to be assessed in prospective studies.


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## Footnote

*Reporting Checklist:* The authors have completed the STROBE checklist. Available at https://gs.amegroups.com/article/view/10.21037/gs-22-295/rc

*Data Sharing Statement:* Available at https://gs.amegroups.com/article/view/10.21037/gs-22-295/dss

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*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at https://gs.amegroups.com/article/view/10.21037/gs-22-295/coif). JF serves as an unpaid Editorial Board Member of *Gland Surgery* from August 2021 to July 2023. AF is a member of staff at the company D ONE Solutions AG. The other authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. The study was conducted in accordance with the Declaration of Helsinki (as revised in 2013). As this study was conducted in the context of an audit, the regional ethics committee exempted the ethical approval (registration number Req-2022-01050). Informed consent was taken from all the patients.



 

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