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Review Article

# Clinical outcomes of breast reconstruction using omental flaps: A systematic review

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ABSTRACT

*Background:* Breast cancer is the most common cancer in women, and breast reconstruction improves the patient's quality of life. Autologous breast reconstruction provides benefits of natural appearance, feel, and long-term results without implant-associated problems. However, thin patients are not always suitable for standard autologous reconstructions. In these patients, an omental flap could be a useful alternative. The aim of this review was to provide an overview of the literature regarding the clinical outcomes of omental flaps in breast reconstruction.

*Methods:* A systematic review was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using the Medline and Embase databases up to November 1, 2023. Study outcomes were type of flap, tissue transfer, cosmetic outcomes, and short- and long-term complications.

*Results:* Eleven studies covering 985 reconstructions in 969 patients were included. The omentum was mostly laparoscopically

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harvested (88.6%) and a pedicled reconstruction was mostly performed (91.2%). The most commonly reported short-term complications were wound infections at the donor site (5.8%), partial flap necrosis, and fat necrosis. In the long term, epigastric, umbilical and tunnel hernias, and epigastric bulging were observed. Satisfactory cosmetic results were reported by the patients (88.7%) and professionals (80.0%).

*Conclusion:* Breast reconstruction using an omental flap can be performed in unilateral reconstructions with acceptable donor-site morbidity if laparoscopically harvested. In general, satisfactory cosmetic outcomes were reported and it appears to be a suitable alternative for selected patients who prefer autologous, unilateral breast reconstruction. Further research is necessary to determine the ideal candidates for this reconstruction and the long-term effects of an omentectomy in young patients.



## Introduction

Breast cancer is the most common type of cancer in women. Breast reconstruction is performed in up to 63% of patients and contributes to a higher quality of life and mental rehabilitation.[1-3]

Implant-based breast reconstruction (IBBR) continues to be the most commonly performed reconstruction method.[4] However, breast implants have been criticized regularly for having a high-revision rate owing to the occurrence of leaking implants, capsular contractures, the rising awareness of "breast implant illness," and breast implant-associated anaplastic large cell lymphoma (BIA-ALCL)[5]. Therefore, the popularity of autologous breast reconstruction has increased. Autologous breast reconstruction provides the benefits of a natural appearance, feel, and long-term results without the disadvantages associated with an implant.

In thin patients, standard autologous reconstructions including a deep inferior epigastric perforator (DIEP) flap or autologous fat grafting (AFT) are not always possible owing to insufficient abdominal or body fat. In such patients, an omental flap breast reconstruction could be an alternative.

The omentum was first used for reconstruction after a (partial) mastectomy in 1963 by the surgeon Kiricuta.[6] However, the method of retrieving the omentum was via laparotomy, which caused considerable morbidity (e.g., infections and ventral hernias). With the increased use of laparoscopic techniques, the laparoscopically harvested omental flap (LHOF) was introduced, which resulted in fewer abdominal complications and better aesthetic results.

An LHOF reconstruction can be performed as a pedicled or free flap. If a pedicled reconstruction is performed, the right gastroepiploic artery usually remains intact.[7] The omentum will be lengthened and tunneled toward the breast, after which it can be embedded in the breast envelope. After the reconstruction, it should be fixed to prevent it from retracting into the abdomen. The second option is a free flap reconstruction.[8] The omentum will be dissected and extracted through a small Pfannenstiel incision. Subsequently, the free flap will be transferred into the breast envelope, where a new vascular anastomosis will be made using the gastroepiploic and internal mammary vessels. An advantage of a free flap reconstruction is its greater volume because all the omentum tissue is within the breast envelope. Additionally, diaphragmatic hernias do not occur in a free flap reconstruction. However, the disadvantages of free flap reconstructions include the occurrence of flap failure or embolisms as a consequence of compromised vessel patency.

Another problem of an omental reconstruction is the poorly predictability of preoperative volume. Correct estimation of the omental volume continues to be difficult with the currently available non-invasive techniques. Furthermore, predicting the volume via laparoscopy remains challenging and requires an additional surgery.

The aim of this review was to provide an overview of the current literature on omental flaps in breast reconstruction with regard to short- and long-term complications and cosmetic outcomes.

## Methods

### *Search strategy*

This systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.[9] A comprehensive search was performed in the bibliographic databases, Pubmed and Embase, from inception to November 1, 2023, in collaboration with a medical librarian. Search terms included controlled terms (Mesh in Medline and Emtree in Embase) and free-text terms. The following terms were searched (including synonyms and closely related words): ("omentectomy" or "omentum") and ("surgery" or "operation" or "harvest") combined with ("complications" "morbidity" or "infections" or "donor-site"). The search was performed without date, language, or publication status restriction. Duplicate articles were excluded. After cross-referencing, 4 more articles were considered relevant. Finally, 5 more articles were excluded owing to potential double data.

### *Eligible criteria*

Studies reporting on omental flap for breast reconstruction after (partial) mastectomy, short or long-term complications, and involving at least 30 patients were included in the study.

Articles were excluded when they were not focused on breast reconstruction (e.g., chest wall reconstruction), were animal studies, duplicate articles or duplicated data, reviews, conference abstracts, letters to the editor, and if no full text was available in English.

### *Screening*

Title and abstract of all identified citations were screened by 2 independent reviewers (VP and VN) and in case of disagreement, they were reviewed by a third researcher (JS). During the full-text screening, similar articles that were mentioned as references were then carefully assessed and if applicable, were included. Furthermore, excluded systematic reviews were checked for cross references.

### *Data extraction and definitions*

All eligible articles were carefully examined and the following data of each study were obtained: title, author, study design, number of included patients, operation technique (laparoscopy or laparotomy), flap-type (free or pedicled), short- and long-term complications, patient-reported cosmetic outcomes, physician-reported cosmetic outcomes, age, operation time, and length of hospital stay.

Early complications were defined as postoperative complications occurring within 30 days. Complications that occurred after 30 days postoperatively were defined as late complications. Furthermore, complications without a specific onset were included in the early complications group.

When the numbers of a specific endpoint were not provided in the article, an attempt was made to contact the authors for more information or to clarify the results.

### *Level of evidence*

All included articles were assessed on their level of evidence by 2 independent reviewers (VP and VN) using the Oxford Centre for Evidence-Based Medicine (OCEBM) levels of evidence.[10]

**Table 1**
Characteristics of the included articles.

| Author | Study design | Number | Follow-up | Free vs. pedicled flap | Laparoscopy vs. laparotomy | Indication | Study quality |
|---|---|---|---|---|---|---|---|
| Henderson, 2001[11] | Retrospective cohort | 61 | Median 21 months | Pedicle | Laparotomy | Mastectomy | IV |
| Zhang et al., 2015[12] | Prospective cohort | 40 | 15.6 months | Pedicle | Laparoscopy | Quadrantectomy | III |
| Zaha et al., 2017[13] | Retrospective cohort | 200 | Median 90 months | Free (10)<br>Pedicle (190)<br>Free (10) | Laparoscopy | BCS (154)<br>Mastectomy (46) | III |
| Sandbichler et al., 2018[14] | Prospective cohort | 65 | Max 37 months | Pedicle (55) | Laparoscopy | BCS (26)<br>Mastectomy (39) | IV |
| Shen and Yu 2019[15] | Retrospective cohort | 104 | N.R. | Pedicle | Laparoscopy (53)<br>Laparotomy (51) | Mastectomy | IV |
| Zhang et al., 2019[16] | Prospective cohort | 96 | 6-30 months | Pedicle | Laparoscopy | BCS | IV |
| Kim et al., 2020[17] | Prospective cohort | 129 | Median 38 months | Pedicle | Laparoscopy | BCS (23)<br>Mastectomy (106) | III |
| Shen et al., 2021[18] | N.R. | 63 | N.R. | Pedicle | Laparoscopy | Mastectomy | IV |
| Kahter et al., 2022[19] | Prospective cohort | 95 | Median 60 months | Pedicle | Laparoscopy | Mastectomy | III |
| Nguyen et al., 2022[20] | Retrospective cohort | 50 (34) | Mean 14.8 months | Free | Laparoscopy | Mastectomy | IV |
| Shen et al., 2023[21] | Retrospective cohort | 82 | 52 months | Free (n=17)<br>Pedicled (n=65) | Laparoscopy | Total or partial mastectomy | IV |

Abbreviations: N.R., Not reported; BCS, Breast conserving surgery

### *Statistical analysis*

The extracted data are summarized in Tables 1 and 2. Meta-analysis was not performed because of the heterogeneous nature of methodology included in the articles.

## Results

### *Study selection*

A total of 15,048 articles were identified; after duplicate removal, 11,072 articles remained. Subsequently, title and abstract screening yielded 34 eligible studies. Full-text assessment led to the exclusion of 22 articles, resulting to 11 studies (n=5 prospective, n=5 retrospective, and n=1 unknown) included for qualitative synthesis (figure 1).

Eleven articles reporting on 985 reconstructions in 969 patients were included (Table 1).[11-21] Follow-up ranged between 14.8 and 90 months.[11-21]

### *Surgical outcomes*

In most patients, laparoscopy was performed (n=873, 88.6%) and pedicled omentum was used (n=898, 91.2%). Operation time varied widely between 76.22 (±8.5) and 572.0 (±122.8) minutes and depended on whether laparotomy, pedicled or free flap reconstruction, and unilateral or bilateral reconstruction were performed (Table 2).

### *Complications*

Mainly short-term complications were reported, consisting of wound infection at the donor (5.8%, n=17 of 294 patients)[11,15,17] and recipient (0.9%, n=4 of 461 patients) sites.[11,13] One patient with an

**Table 2**
Characteristics of the included articles.

| Author | Age (years) | Operation time (minutes) | Length of hospital stay | Complications: short-term | Complications: long-term | Additional procedures to improve volume | Cosmetic outcomes |
|---|---|---|---|---|---|---|---|
| Henderson et al., 2001[11] | 57 (32-85) | N.R. | 18 (8-49)<br>Last 4 years the avg. was 8 days | 9.8% (n=6) Abdominal infection<br>3.3% (n=2) Breast infection<br>3.3% (n=2), 1.6% (n=1) LE | N.R. | N.R. | "The vast majority of patients are accepting the cosmetic appearance" |
| Zhang et al., 2015[12] | 39.3 (26-51) | 308<br>(210-420) | 9.5 (6-18) | 2.5% (n=1) Partial flap necrosis<br>2.5% (n=1) Omental fat liquefaction | N.R. | N.R. | Harris criteria[1] by N.R.<br>• Excellent (35)<br>• Good (4)<br>• Fair (1) |
| Zaha et al., 2017[13] | 51 (25-69) | 203<br>(125-665) | N.R. | 5.0% (n=10) Partial graft necrosis<br>5.0% (n=10) Partial skin flap necrosis<br>1.0% (n=2) Vascular injury<br>1.0% (n=2) Hemorrhage<br>1.0% (n=2) Breast infection<br>0.5% (n=1) Failed harvest | 1.0% (n=2) Epigastric hernia | Mini-LD or expander in 33.3% of mastectomy patients | 12.0% (n=24) Insufficient flap volume<br>Panel assessment by 3 professionals[2]<br>• 59.5% (n=113) excellent<br>• 20.5% (n=39) good<br>• 10.0% (n=19) fair<br>• 10.0% (n=19) poor<br>BCCT.core<br>• 36.3% (n=69) excellent<br>• 46.0% (n=92) good<br>• 12.1% (n=23) fair<br>• 4.7% (n=6) poor |
| Sandbichler et al., 2018[14] | 53 (26-72) | 154<br>(117-195) | N.R. | 13.8% (n=9) Insufficient volume<br>7.7% (n=5) Skin necrosis<br>1.5% (n=1) Omental flap necrosis<br>1.5% (n=1) Gastric perforation | N.R. | 13.8% (n=9) requiring AFT | "Excellent to good cosmetic results were achieved in the vast majority" |
| Shen and Yu 2019[15] | N.R. | Laparoscopy:<br>112.51 ± 16.43<br>Laparotomy:<br>76.22 ± 8.54 | Laparoscopy:<br>9.61 +- 2.52<br>Laparotomy:<br>14.93 +- 3.71 | Laparoscopy:<br>1.9% (n=2) skin flap necrosis<br>1.9% (n=2) subcutaneous effusion<br>1.9% (n=2) Abdominal infection<br>Laparotomy:<br>3.8% (n=4) Skin flap necrosis<br>6.7% (n=7) Subcutaneous effusion<br>5.8% (n=6) Abdominal infection | N.R. | N.R. | Patient satisfaction<br>Laparoscopy (n=53)<br>• 73.6% (n=39) excellent<br>• 15.1% (n=8) good<br>• 11.3% (n=6) acceptable<br>• 0% (n=0) poor<br>Laparotomy (n=51)<br>• 21.6% (n=11) excellent<br>• 25.5% (n=13) good<br>• 39.2% (n=20) acceptable<br>• 47.1% (n=24) poor |

(*continued on next page*)

**Table 2** (*continued*)

| Author | Age (years) | Operation time (minutes) | Length of hospital stay | Complications: short-term | Complications: long-term | Additional procedures to improve volume | Cosmetic outcomes |
|---|---|---|---|---|---|---|---|
| Zhang et al., 2019[16] | 39.7 (26-53) | 300 (191-410) | 5-17 | 2.1% (n=2) partial flap necrosis | N.R. | N.R. | Harris criteria[1] by N.R. (n=93)<br>• 85.4% (n=82) excellent<br>• 10.4% (n=10) good<br>• 1.0% (n=1) fair |
| Kim et al., 2020[17] | 45.4 (25-69) | 205 (134-316) | 7.1 (7-22) | 2.3% (n=3) abdominal infection<br>0.8% (n=1) pedicle injury<br>13.2% (n=17) fat necrosis | 0.8% (n=1) umbilical hernia<br>21.7% (n=28) epigastric bulging | N.R. | Panel assessment by 3 professionals[2]<br>• 85.0% (n=108) excellent<br>• 11.8% (n=15) good<br>• 0.0% (n=0) fair<br>• 3.2% (n=4) poor<br>BCCT.core<br>• 64.3% (n=81) excellent<br>• 34.9% (n=44) good<br>• 0.8% (n=1) fair<br>• 0.0% (n=0) poor |
| Shen et al., 2021[18] | 27-57 years | N.R. | N.R. | 3.3% (n=2) complete omentum necrosis<br>1.7% (n=1) necrosis skin margin<br>3.3% (n=2) necrosis of nipple and areola | 1.7% (n=1) tunnel hernia | N.R. | Patient satisfaction with post-operative appearance, feel, and movement of the breast, as well as expense, was over 75.0% |
| Kahter et al., 2022[19] | 43.6 ± 4.75 (27-51) | 129 ± 20.37 min (range: 105-164 min) | Mean 2 days | 3.16% (n=3) failure of flap retrieval<br>2.2% (n=2) partial flap loss<br>11.6% (n=11) fat necrosis of which<br>4.4% (n=4) requiring excision<br>4.4% (n=4) Flap hardness<br>1.1% (n=1) visceral injury | 4.4% (n=4) epigastric hernia | N.R. | Aesthetic outcome: sum of objective + subjective assessment[3] (n=92)<br>• 16.3% (n=15) excellent<br>• 67.4% (n=62) good<br>• 13.0% (n=12) fair<br>3.3% (n=3) poor |

(*continued on next page*)

**Table 2** (*continued*)

| Author | Age (years) | Operation time (minutes) | Length of hospital stay | Complications: short-term | Complications: long-term | Additional procedures to improve volume | Cosmetic outcomes |
|---|---|---|---|---|---|---|---|
| Nguyen et al., 2022[20] | 8.2 (range 23–73) years | Mean total OR time 572.0 (± 122.8) | N.R. | No flap or donor-site complications | No flap or donor-site complications | Simultaneously AFT and ADM | Median weight omentum: 161.7 g (interquartile range [IQR] 102 g) |
| Shen et al., 2023[21] | Mean 40.5 ± 7.85 | N.R. | N.R. | 3.8% (n=3) omental fat liquefaction necrosis<br>1.3% (n=1) hematoma of the breast<br>No donor-site complications | No donor-site complications | N.R. | Panel assessment by 3 professionals according to the Harris criteria[1]<br>• 60.8% (n=48) excellent<br>• 35.4% (n=28) good<br>• 1.3% (n=1) fair<br>• 2.5% (n=2) poor |

Abbreviations: N.R., Not reported; DVT, Deep venous thrombosis; LE, Lung embolism, AFT, autologous fat grafting.

[1] Harris criteria: (1) Excellent: size and shape of the reconstructed breast are almost the same as those of the original breast; (2) good: deformity of the reconstructed breast involves <1/4 of the original breast; (3) fair: deformity of the reconstructed breast involves 1/4–1/2 of the original breast; and (4) poor: breast deformity involves >1/2 of the original breast.

[2] Cosmetic outcomes were evaluated on a 4-point scale by 3 health professionals and by a computer-aided medical system (BCCT.core), which is based on semi-automatic extraction of features considered to have an impact on the overall cosmetic result (asymmetry, color differences, and scar visibility).

[3] A sum of subjective patients' satisfaction questionnaire from 1 to 10 and an objective score by a non-breast surgeon, which is based on a combination of Garbay & Calabrese scales that entails the volume, shape, symmetry, scars, nipple areola definition, and position with the final scoring was expressed as follows: excellent (9-10), good(7-8), fair (4-6), and poor (0-3), was used.

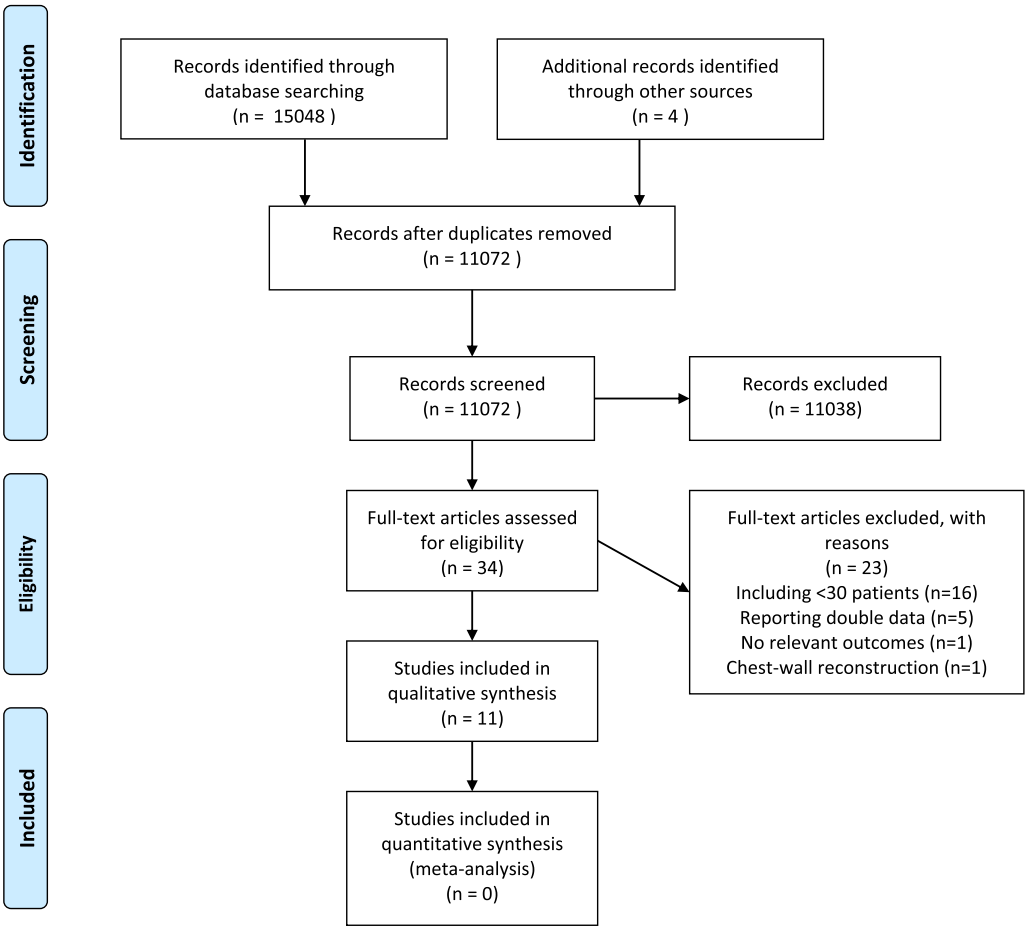


**Fig. 1.** PRISMA flow chart of article selection.

abdominal infection required ultrasound-guided percutaneous drain insertion and intravenous antibiotics and 2 patients with chest infection were treated with antibiotics.[11,17]

Failed harvest of the omentum was observed in 4 reconstructions (0.4%)[13,19] and vascular injury to the pedicle occurred in 1 reconstruction, resulting in conversion to implant breast reconstruction.[17]

Partial flap necrosis was observed in 3.2% (n=16 of 504 reconstructions); no total flap failure was reported.[12-14,16,19]

Other reported complications were fat necrosis (n=11 of 95 reconstructions, 11.6%) and flap hardness (n=4 of 95 reconstructions, 4.4%).[19]

In the long-term, umbilical, epigastric, and tunnel hernia's were reported in 1.6% (n=8 of 487 patients) and epigastric bulging in 21.7% (n=28 of 129 patients).[13,17-19]

### *Cosmetic outcomes*

The assessment of the cosmetic outcomes was very diverse and was scored by patients in 4 studies,[11,15,18,19] by professionals in 4 studies[13,17,19,21] and were unclear in 3 studies (Table 2).[12,14,16] In 2 studies, a computer program (BCCT.core) was also used for the assessment of the cosmetic outcome.[13,17]

In general, good cosmetic results were observed in most patients. A good or excellent cosmetic outcome was reported by patients in 88.7% and 80.0% to 96.8% by professionals, if a laparoscopy was performed.[13,15,17,21] In case of laparotomy, good or excellent patient satisfaction was reported in only 47.1%.[15]

Different classifications were used to assess the cosmetic outcomes, mainly consisting of a 3- or 4-point scale.[13,15,17,21] No validated patient-reported outcome measurements were reported.

### *Volume*

In all studies, only unilateral reconstructions were performed, except for the study reported by Nguyen et al.[20] They reported on 18 unilateral and 16 bilateral reconstructions (1.7% of all included patients), with the addition of omental augmentation with AFT and the use of an acellular dermal matrix (ADM).[20]

Insufficient flap volume was reported in 2 other studies in 12.6% (24 reconstructions) and 13.8% (n=9 reconstructions) requiring an latissimus dorsi (LD) mini-flap or tissue expander combined with the omental flap or AFT, respectively.[13,14]

No studies reported on preoperative (noninvasive) assessment of volume.

### *Study quality*

Study quality was moderate (level III and IV).[11-21] Outcome measurements were not comparable; therefore, meta-analysis could not be performed.

It is unclear if there was any overlap of the included patients reported by Shen et al.[15,18,21] The authors were contacted to prevent any double counting; however, there was no response.

## Discussion

This systematic review provides an overview of the best available current literature regarding the use of the omentum for breast reconstructions. A laparoscopically harvested omentum (performed in 88.6% cases) with a pedicled reconstruction (performed in 91.2% cases) provides good cosmetic results, as reported by patients (88.7%) and professionals (80.0%). The most reported short-term complications were wound infection at the donor site, partial flap necrosis, and fat necrosis. In the long term, hernias and epigastric bulging were observed.

The omentum flap presents a viable alternative for patients seeking autologous reconstruction, but are not suitable candidates for conventional methods such as the DIEP flap or AFT. The pliability and fatty structure provide a natural look and feel to the reconstructed breast.

### *Safety of omentectomy for breast reconstruction and oncological consequences*

Harvesting of the omentum is the cornerstone of the procedure. The greater omentum is considered a versatile organ with immunological and mechanical functions, and it stimulates wound healing.[22] An omentectomy could impair peritoneal defense mechanisms, but its precise clinical consequences are still unclear and not reported in the included studies.[23]

Moreover, the immunological effects of transferring the omentum to the breast are unknown. Logically, the physical defense mechanism will be impaired by the omentectomy. However, the immunological consequences of transferring the omentum to the breast need to be further investigated, especially if this remains (partially) intact by solely transferring the omentum to a different, extra-abdominal, location.

Furthermore, the oncological consequences of an omentum reconstruction are unclear. Other autologous tissue reconstructions are well-established and have known oncological outcomes. [24] There is a need for further research and clinical data on the oncological consequences of using an omental flap for breast reconstruction.

*Complications*

One of the major complications of the procedure is (partial) flap necrosis. It is not feasible to directly assess the viability of the omental flap owing to its inherent nature as a buried flap. Unlike flap reconstruction with a skin island, the omental flap cannot be easily visualized postoperatively. This presents a challenge in early detection of potential issues such as partial necrosis, which can result in significant volume loss of the flap. Consequently, meticulous surgical technique is imperative to mitigate the risk of flap compromise and optimize outcomes in patients undergoing omental flap breast reconstruction.

In the long term, a relatively high rate of epigastric bulging was reported by Kim et al., 2020 in 21.7% (n=28 of 129 patients). [17] However, they stated that >50% resolved in the next 2 years. Furthermore, they performed single–port LHOFs and modified their procedure by trimming some subcutaneous fat over the tunneling to reduce the tunnels thickness after which the epigastric bulging decreased significantly (from 22/60 patients [36.7%] before and 6/69 patients [8.7%] after adjustment to the technique).

Another concern regarding omentectomy is the formation of adhesions. It is known that omentectomy increases the risk of recurrence of adhesions in patients who undergo resection after small bowel obstruction.[25] However, the occurrence of adhesions in relatively healthy patients undergoing breast reconstruction with an omental flap remains largely unexplored and warrants further investigation.

*Surgical technique*

In most cases (91.2%), a pedicled reconstruction was performed. Advantages of a pedicled flap are shorter duration of surgery and less complexity as no anastomosis is required. The disadvantages include loss of volume due to remaining tissue in the tunnel, herniation of abdominal tissue, and possible bulging in the epigastric area. An advantage of a free flap is the use of the entire omentum without volume loss of tissue through the tunneling, but requires an anastomosis with increased risk of flap failure and prolonged operation time or a two-team approach.[26]

*Volume of the omentum*

One of the remaining obstacles experienced in obtaining the omentum is correctly estimating the weight or volume. Unfortunately, so far no noninvasive techniques (ultrasound, CT-scan, or MRI) appear to be sufficient to provide an accurate estimation. The only way to obtain an estimation of the volume is to perform diagnostic laparoscopy.[8] The downside of this procedure is the necessity of performing an additional operation, besides the actual harvesting. These operations could also be combined; however, the patients must be informed that if the volume appears insufficient, omental reconstruction cannot be performed.

Furthermore, the effects of weight gain and loss on the volume of breasts reconstructed with omental flaps are currently unknown. Presumably, the volume would remain relatively stable and predictable in line with the patient's natural fluctuations, given that it is an autologous reconstruction. However, future studies should prioritize clinical evaluation of this hypothesis to provide clarity and inform clinical practice.

*Patient selection: the ideal patient*

An omental flap could be a good alternative in thin patients and not suitable for other autologous reconstructions, including a DIEP flap or total-breast reconstruction with AFT. It offers the advantage of reconstructing a small, ptotic breast. However, the omentum does not have a well-defined average volume. Its size and volume can vary significantly among individuals, and it can also change in response to various pathological conditions. It seems that there is no linear relationship between body mass index or body weight and omental weight.[20,27] There is, however, a complex relationship between body fat percentage and omentum size but direct correlations might vary and are subject to

ongoing research.[28] Reported weights of the omentum are approximately 200 g (van Alphen et al. [8]) N=6 avg. 224 g (154-300 g) and Zaha et al.[13] N=200 avg. 181 g (22-770 g). If no AFT is used to augment the omentum, an omental flap is mainly suitable to be used in unilateral breast reconstruction.

In bilateral reconstruction, the combination with AFT can significantly improve the volume and contour of the breast. As the omentum is a well vascularized and lymphatic-rich tissue, it is an ideal recipient site for AFT.[20] In the included studies, additional AFT was only performed once simultaneously with the reconstruction or as an additional operation.

Nguyen et al., 2022 also reported the additional use of an ADM to create a mold to house the shapeless omentum to prevent contour deformation of the breast.[20] Although they reported no complications, the use of an ADM in IBBR increases the risk of surgical complications, reoperations, and implant removal.[29] Furthermore, the costs associated with using an ADM in IBBR are higher, and the advantages of universal ADM use, even in prepectoral breast reconstruction, are not conclusively proven.[30] Other alternatives for thin patients are the use of muscle or myocutaneous flaps, and "hybrid" breast reconstruction (with tissue expander and sessions of AFT, followed by replacing the expander to a definitive implant). These options lead to successful reconstruction with either no or minimal donor-site morbidity. It is important to highlight that in these combined reconstructions, patients still receive an implant, but with associated risks, including capsular contraction, autoimmune/inflammatory syndrome induced by adjuvants, and BIA-ALCL.

*Limitations*

In general, positive results were reported. However, one should be aware that there is an inherent bias for publication of positive results. Also, the evidence level of most studies was low to moderate, and the quality of the studies with regard to methodology was relatively weak. Furthermore, long-term studies of omentectomy consequences of >8.5 years are lacking.

## Conclusion

Breast reconstruction with an omental flap can be performed in unilateral reconstructions with acceptable donor-site morbidity if laparoscopically harvested. In general, good cosmetic outcomes were reported. It appears to be a suitable alternative for selected patients who prefer autologous, unilateral breast reconstruction. Further research is necessary to determine the type of patients who are most suitable for this type of reconstruction, influence of a lower body mass index on omental volume, and how to adequately and noninvasively determine the expected volume preoperatively.

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