

Incidence and Outcomes of Completion Mastectomy following Oncoplastic Reduction: A Case Series

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Background: Patients occasionally need completion mastectomy (CM) following oncoplastic reduction for various reasons necessitating definitive reconstructive techniques. The purpose of this study was to evaluate those patients who required CM following oncoplastic reduction and evaluate indications, technique, and outcomes.

Methods: Patients who underwent a completion mastectomy at some time point following the oncoplastic reduction were identified. Factors that influenced CM and additional reconstruction were analyzed. All statistical analysis was conducted using the IBM SPSS Statistics 27.0 (IBM Corp.).

Results: A total of 29 patients (5.3%) underwent CM during the study period with an average follow-up of 3 years since the original procedure. The most common reasons were positive margins (20/29, 69.0%) and recurrence (8/29, 27.6%). Twenty-two had reconstructive procedures (75.9%) and seven did not (24.1%). The patients who underwent CM and reconstruction were significantly younger (49.2 years) than those who had no reconstruction (64.3 years, $P = 0.004$). The most common type of reconstruction was transverse rectus abdominis myocutaneous (TRAM)/deep inferior epigastric perforator (DIEP) flap (12/22, 54.5%), followed by latissimus (6/22, 27.3%) and tissue expander (3/22, 13.6%). The complication rate in the CM group was 24% ($N = 7/29$), which included two seromas (6.9%), followed by infection, fat necrosis, mastectomy skin necrosis, and donor site necrosis (3.4% each).

Conclusions: Completion mastectomy is indicated typically for positive margins or recurrence. Reconstruction is performed more frequently in younger patients, with the TRAM/DIEP flap and latissimus dorsi reconstruction being the most common technique. (*Plast Reconstr Surg Glob Open* 2022;10:e4151; doi: 10.1097/GOX.0000000000004151; Published online 2 March 2022.)

INTRODUCTION

Breast conserving therapy aims to remove cancer while preserving aesthetic appearance and reducing risk of recurrence.¹ Oncoplastic reduction techniques are a subset of breast conserving therapy combining tumor removal with mastopexy or breast reduction techniques.² The goal of this approach is to avoid mastectomy while maintaining shape, symmetry, and aesthetic appearance.³ Oncoplastic reductions are particularly suited for women with breast cancer who have large or ptotic breasts. Patients with larger breasts often have poor results with lumpectomy

alone and present challenging cases for reconstruction following skin sparing mastectomy (SSM). Compared with SSM and immediate reconstruction, a reduction mammoplasty at the time of lumpectomy leads to better aesthetic and functional results in larger breasts.^{4,5} The oncoplastic reduction technique also has improved margin control, with fewer surgical re-excisions, and wider margins.⁶ Furthermore, the oncoplastic approach is associated with fewer breast complications and increased patient satisfaction.^{7,8} Finally, this technique has been shown to reduce the need for completion mastectomy (CM) compared with lumpectomy alone, likely due to the benefit of generous resections.^{4,9}

However, although the goal is to minimize additional or extensive surgical procedures in higher risk patients, unfortunately there are some instances when CM is required, often necessitating definitive postmastectomy reconstruction with its associated disadvantages. A recent systematic review of oncoplastic breast surgery showed a reoperation rate of between 14% and 49%,¹⁰ with 7%–22% of patients having surgery for positive margins,

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3%–16% having CM, and 4%–9% having reoperation for complications.¹¹ Despite re-excision rates being lower in the oncoplastic cohorts, it is often felt that following the more generous oncoplastic resection, if margins are positive, the tumor biology has dictated that patients are more likely to undergo CM compared with re-excision. The goal of this review was to determine the incidence and indications for CM in these patients and to evaluate the reconstructive options available, factors contributing to reconstruction at the time of CM, and outcomes.

METHODS

All patients (n = 547) with breast cancer who underwent immediate oncoplastic breast reduction following tumor extirpation between March 1998 and April 2020 at Emory Hospitals were queried from a prospectively maintained database. Patient demographics, diagnosis, and disease course were considered. The primary end points of interest to be included in this series were those patients who underwent a completion mastectomy following the oncoplastic reduction. In addition to information from the original procedure, data points queried included indications for the completion mastectomy, time since the original procedure, type of reconstruction if indicated, complications, and follow-up. Factors that influenced CM as well as additional reconstruction were analyzed by Chi-square (categorical variables) or independent T-tests (categorical and continuous) with significance set at a *P* value less than 0.05. All statistical analysis was conducted using the IBM SPSS Statistics 27.0 (IBM Corp., Armonk, N.Y.).

RESULTS

There were 29 patients who underwent completion mastectomy following an oncoplastic reduction for an incidence of 5.3% (n = 29/547) at a mean follow-up of 3 years. The average age of patients was 52.9 ± 12.7 years and average body mass index (BMI) was 34.1 (Table 1).

Reason for Completion Mastectomy

The most common reason for CM was positive margins (20/29, 69.0%) followed by recurrence (8/29, 27.6%). One patient elected to undergo CM because of difficulty tolerating chemotherapy. Of patients who had positive margins, ductal carcinoma in situ (DCIS) was the most frequently occurring pathology (9/20, 31%), followed by invasive ductal carcinoma (IDC) (6/20, 30%), lobular carcinoma in situ (LCIS) and ILC (three each, 15.0%) (Table 2).

Table 1. CM Patient Demographics

	Average	
Age	52.9	12.651
BMI	34.1	10.3416
Total specimen weight, ipsilateral (g)	635.42	594.027
Specimen weight, contralateral (g)	633.22	580.319
Distance from closest margin (cm)	0.4738	0.67076
Tumor size (cm)	2.682	2.5084

Takeaways

Question: What are the reconstructive options following completion mastectomy (CM) after oncoplastic reduction?

Findings: In patients who needed completion mastectomy, most were because of tumor recurrence or positive margins. Age was the only significant factor associated with an additional reconstructive procedure. Furthermore, our data suggests that the transverse rectus abdominus myocutaneous (TRAM)/deep inferior epigastric perforator (DIEP) flap is the most common reconstructive procedure.

Meaning: Completion mastectomy is indicated typically for positive margins or recurrence. Reconstruction is performed more frequently in younger patients, with the TRAM/DIEP flap reconstruction being the most common technique.

Timing of CM

CM was performed on average at 57.2 weeks (range: 1.0–536.7 weeks) following original surgery. Patients with positive margins underwent CM on average 6 weeks (range: 1–15 weeks) from the oncoplastic reduction, and those who experienced tumor recurrence, the average timing between original surgery and CM was 182 weeks (range: 34–536.7) (Table 3). One hundred percent of patients who experienced recurrence had received radiation therapy as recommended.

Demographic Differences between Patients Who Had Subsequent Reconstruction

Of the 29 patients who had a CM, 22 had reconstructive procedures (75.9%) and seven did not have reconstruction (24.1%). Patients who had reconstruction following mastectomy were significantly younger with an average age of 49.2 compared with an average age of 64.3 (*P* = 0.004) for those who did not have reconstruction. There was no significant difference in the BMI, specimen weight, specimen size, or distance from margins of those with and without reconstruction (Table 4). CM with reconstruction was associated with higher rates of DCIS, though this did not reach significance (*P* = 0.057).

Type of Reconstruction following CM

Twenty-two patients had both CM and a subsequent reconstructive procedure, with the most common reconstruction being transverse rectus abdominis myocutaneous (TRAM)/deep inferior epigastric perforator (DIEP) flap (12/22, 54.5%), followed by latissimus (6/22, 27.3%)

Table 2. Mastectomy Pathology

	N = 29 (%)
LCIS	3 (10.3)
DCIS	9 (31.0)
IDC	7 (24.1)
ILC	3 (10.3)
Fat necrosis	2 (6.9)
Benign/other	5 (17.2)

Table 3. Timing of Completion Mastectomy

	Average Time to CM (wk)	Range (wk)
All patients	57.2	1–536.7
Margins	6	1–15
Recurrence	182	34–536.7

and tissue expander (TE, 3/22, 13.6%) (Table 5). The average follow-up for CM with reconstruction was 3.3 years, whereas the follow-up in patients who did not have reconstruction was 5 months.

Complications following CM

Overall, seven CM patients experienced a complication (Table 6). Of these patients, two experienced seromas (6.9%), followed by infection, fat necrosis, mastectomy skin necrosis, and donor site necrosis (3.4% each). Six were patients with additional reconstruction. Of those who did not have additional reconstruction, one patient developed a hematoma. There was no significant difference in complications between patients who additionally had reconstruction and those who did not.

Case Presentation

Latissimus Dorsi Flap

This patient has a history of breast cancer and underwent oncoplastic reduction. Figure 1A–C demonstrates her breasts preoperatively and postoncoplastic reduction. She was found to have positive margins and as a result had a completion mastectomy with latissimus dorsi flap reconstruction (Fig. 1D).

DISCUSSION

Oncoplastic breast surgery is often used to treat breast cancer by aiming to preserve native breast parenchyma while also promoting cosmesis.¹² Although the number of secondary surgeries following oncoplastic reduction has been shown to be significantly lower than SSM with reconstruction in women with large breasts,¹³ we have demonstrated in previous studies that the overall secondary surgery rate in the oncoplastic cohort is around 22%.⁹ Women with breast cancer who chose breast conservation therapy often are selecting to preserve their breasts with

Table 4. Demographics with and without Additional Reconstruction

	Completion Mastectomy with Reconstruction (n = 22) (%)	No Reconstruction (n = 7) (%)	P
Age	49.2	64.3	0.004
BMI	33.3	36.3	0.655
Total specimen weight	595.8	742.71	0.408
Tumor size (cm)	2.93	1.90	0.35
Distance from nearest margin	0.509 ± 0.76	0.363 ± 0.250	0.624
Reason for completion mastectomy			0.429
Recurrence	6 (27.3)	2 (42.9)	
Margins	15 (68.2)	5 (71.4)	
Other	1 (4.5)	0 (0)	

Table 5. Reconstruction Type

	No. Patients (n = 22) (%)
TE	2 (9.09)
Latissimus dorsi	5 (22.7)
Latissimus + TE	2 (9.09)
TRAM/DIEP	12 (54.5)
Performed at outside hospital	1 (4.5)

a less invasive approach, and partial breast reconstruction, although adding more surgery, has become acceptable since it has many advantages.¹⁴ However, despite the goals of breast preservation and undergoing less surgery, there are unfortunately situations where completion mastectomy and additional reconstructive surgery is required. Although this is not common (5.3%), it does exist and needs to be understood since most patients do elect to undergo reconstructive surgery. Women who underwent reconstruction tended to be younger and all surgical options were still available.¹³

Recently, we have demonstrated a 22% secondary surgery rate, which included margin control, completion mastectomy, and aesthetic revision.⁹ Our studies have demonstrated that oncoplastic patients on the whole undergo less secondary surgeries when compared with total breast reconstruction. A study published in 2019 suggests up to a 63% reoperation rate in patients undergoing implant-based or autologous breast reconstruction.¹⁵ A separate review of 888 total breast reconstructions found that for unilateral reconstruction patients needed an average of 3.99 secondary procedures to complete nipple reconstruction, and 5.4 procedures for bilateral reconstructions.¹⁶ In a previous report of patients with macromastia and breast cancer, those in the oncoplastic group went to the operating room an average of 1.3 times, although those in the SSM and immediate reconstruction group went on average 2.7 times.¹⁷ In our series with both affected breast and contralateral breast being treated in the same procedure, most patients (79%) were able to have their breast cancer treated and shape reconstructed in one surgery.⁹

Though studies have shown that the oncoplastic approach reduces the number of times patients need to go back to the operating room, occasionally patients will need to have a secondary procedure. To prevent this from occurring, a surgeon must pay careful attention to surgical technique, patient selection limited to those with moderately sized breasts with a defect that is suspected to be moderate in size, more aggressive resection, and even delayed immediate reconstruction. Confirmation of margin status before reconstruction may be beneficial for some patients. Preoperative breast imaging (ie, MRI, ultrasound, or mammography) is often helpful in determining the extent of the disease to guide the necessary resection.¹⁸

A major concern and criticism for the oncoplastic approach is for positive margins. Studies have suggested positive margins are significantly lower with this approach,^{13,19} and our own work has shown a 6.2% margin rate associated with larger tumors and resections.¹⁴ In this subset of patients who underwent CM, we identified that the majority were due to either tumor recurrence or positive margins. In

Table 6. Complications

		No. Patients (n = 29)		
Total complications		7 (24.1)		
	Infection	1 (3.4)		
	Seroma	2 (6.9)		
	Hematoma	1 (3.4)		
	Fat necrosis	1 (3.4)		
	Mastectomy skin necrosis	1 (3.4)		
	Donor site necrosis	1 (3.4)		
Total complications	Completion mastectomy with reconstruction (n = 21)	No reconstruction (n = 7)		<i>P</i>
	6 (28.6)	1 (14.3)		0.450

cases of recurrence, tumor pathology was most frequently DCIS followed by IDC. Of these cases that needed CM, only a subset underwent subsequent reconstruction. The only significant association between patients who were able to have a reconstructive procedure compared with those who were not was age. Patients who did not undergo reconstruction at the time of CM were found to be significantly older than patients who did undergo reconstructive procedures. This is not surprising as high-risk patients with concern for margin status may have more aggressive disease that, if shown to be positive, may necessitate more aggressive surgical treatment. In high-risk patients, we have previously suggested that completion mastectomy be delayed until confirmation of clear margins.¹²

The types of reconstruction in patients who undergo SSM compared with oncoplastic reduction are similar,

though the latissimus dorsi flap is the most commonly performed after SSM, followed by the abdominally based flap.²⁰ The type of reconstruction following mastectomy depends on the timing after the oncoplastic surgery and whether the patient had previously undergone radiation therapy. We found that autologous tissue was more common in our series with abdominally based flaps in 55%, latissimus dorsi in 27%. If the skin quality is good and the patient had not previously been irradiated then a vertical incision mastectomy can be performed followed by a prosthetic-based reconstruction with either a tissue expander if the skin is too tight, or direct to implant. We found that prosthetic-based reconstruction was utilized in 14% of the patients in our series. The type of reconstruction will depend on many of the same factors involved in regular decision-making with the obvious

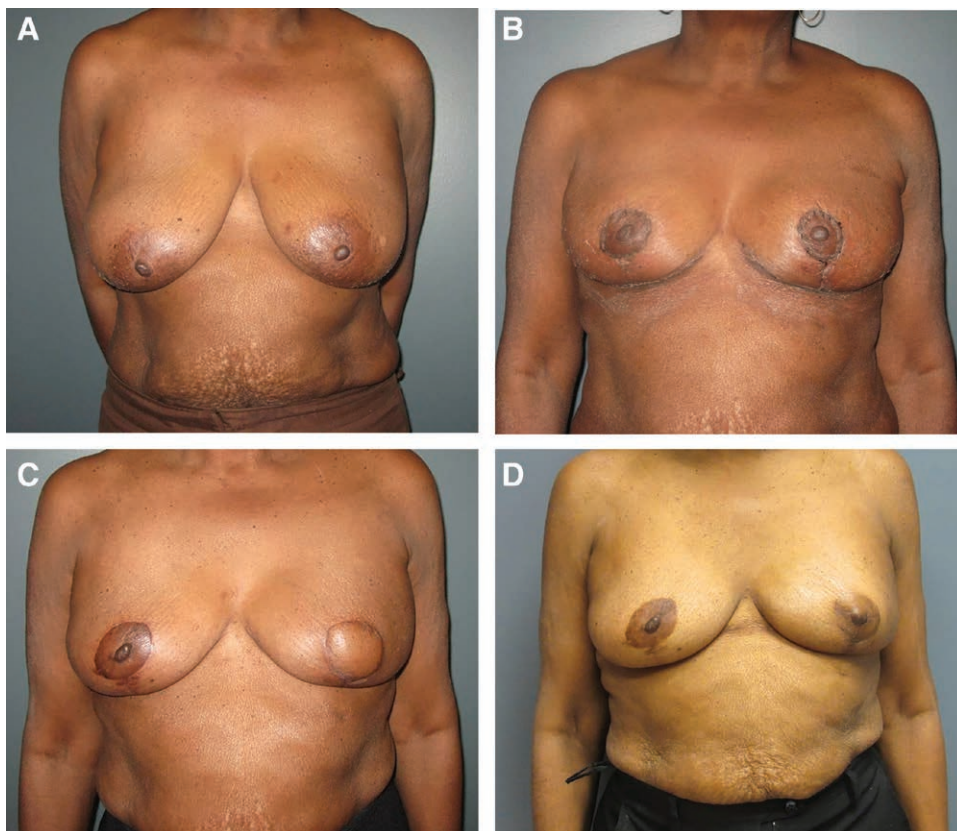


Fig. 1. This 66-year-old female patient presented with left breast cancer (A) and underwent segmental mastectomy and oncoplastic reduction (B). Due to positive margins, a completion mastectomy was performed with latissimus dorsi flap reconstruction (C-D).

additional variable of the reduction pattern scars and occasionally irradiation therapy. When total breast reconstruction is needed in these patients who are often obese, the reconstruction is often easier because the breast is smaller, the contralateral procedure has already been performed, and all options remain available. It is also possible in patients with involved margins who had not been irradiated with sufficient time following the oncoplastic procedure (>2 months) for the patient to have a nipple sparing mastectomy and subsequent direct to implant reconstruction.

Limitations of this study include a small sample size of patients. However, we believe this highlights the success of the oncoplastic reduction technique in managing breast cancer in challenging and high-risk cases. Furthermore, this was a retrospective study and may be prone to selection bias.

CONCLUSIONS

Completion mastectomy is infrequently performed after oncoplastic reduction, indicated typically for positive margins or recurrence. Reconstruction is performed more frequently in younger patients, with abdominally based flaps commonly performed. Factors that guide surgical decision-making with regard to reconstructive options include skin quality and prior radiation.

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