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Breast

Closed Incision Negative Pressure Therapy in Oncoplastic Surgery Prevents Delays to Adjuvant Therapy

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Background: Breast reductions, including oncoplastic breast surgery (OBS), have high postoperative wound healing complication (WHC) rates, ranging from 17% to 63%, thus posing a potential delay in the onset of adjuvant therapy. Incision management with closed incision negative pressure therapy (ciNPT) effectively reduces postoperative complications in other indications. This retrospective analysis compares postoperative outcomes and delays in adjuvant therapy in patients who received ciNPT on the cancer breast versus standard of care (SOC) after oncoplastic breast reduction and mastopexy post lumpectomy.

Methods: Patient demographics, ciNPT use, postoperative complication rates, and time to adjuvant therapy were analyzed from the records of 150 patients (ciNPT = 29, SOC = 121). Propensity score matching was used to match patients based on age, body mass index, diabetes, tobacco use, and prior breast surgery.

Results: In the matched cohort, the overall complication rate of ciNPT-treated cancerous breasts was 10.3% (3/29) compared with 31% (9/29) in SOC-treated cancerous breasts ($P = 0.096$). Compared with the SOC-treated cancerous breasts, the ciNPT breasts had lower skin necrosis rates [1/29 (3.4%) versus 6/29 (20.7%); $P = 0.091$] and dehiscence rates [0/29 (0%) versus 8/29 (27.6%); $P = 0.004$]. In the unmatched cohort, the total number of ciNPT patients who had a delay in adjuvant therapy was lower compared to the SOC group (0% versus 22.5%, respectively; $P = 0.007$).

Conclusion: Use of ciNPT following oncoplastic breast reduction effectively lowered postoperative wound healing complication rates and, most importantly, decreased delays to adjuvant therapy. *(Plast Reconstr Surg Glob Open 2023; 11:e5028; doi: 10.1097/GOX.0000000000005028; Published online 26 May 2023.)*

INTRODUCTION

The surgical management of breast cancer has significantly advanced, improving aesthetic results and optimizing oncological outcomes. In particular, oncoplastic techniques have become increasingly utilized in breast conservational therapy (BCT), combining oncologically sound cancer resection concepts with aesthetically maximized breast reduction/mastopexy approaches.[1–4] This technique is ideal for women with preoperative macromastia or ptosis and a high tumor-to-breast ratio in which resection could lead to disfiguring results.[1,4–6] Oncoplastic breast surgery (OBS) also enables wide tumor resections, improved efficacy of radiation therapy due to smaller breast size, reduced symptoms related to larger breasts, and enhanced aesthetic outcomes.[1,3–5,7] In fact, oncoplastic breast reductions have decreased rates of unfavorable aesthetic results to below 7%.[8]

Despite these advantages, as in nononcologic breast reduction surgery, OBS can result in skin necrosis and delayed wound healing (DWH), with reported rates ranging between 17% and 63%.[5,8–13] However, in oncoplastic patients where radiation is an integral part of BCT, wound healing complications (WHCs) can be detrimental as they

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potentially delay the timely onset of adjuvant cancer therapy (chemotherapy or radiation).[5] Improved evidence-based wound management approaches are necessary to minimize the risk of postoperative wound complications and maximize outcomes in patients with breast cancer undergoing OBS.

Closed incision negative pressure therapy (ciNPT) has proven effective in managing surgical wound incisions in various specialties, including postmastectomy prosthetic-based reconstruction.[14,15] A growing body of literature suggests that ciNPT reduces postoperative complications and infections.[16–20] Use of ciNPT provides a favorable wound healing environment by assisting with incision edges approximation, protecting surgical incisions from contaminants, removing infectious fluids and materials, and increasing blood flow at surgical sites.[14,21,22]

Here, we introduce ciNPT in oncoplastic mammoplasty as an adjunct therapy to reduce postoperative complications.

Takeaways

Question: Does ciNPT reduce postoperative complications in oncoplastic surgery?

Findings: Use of ciNPT significantly lowered rates of wound healing complications and led to significantly shorter intervals between surgery and initiation of adjuvant cancer therapy when compared to standard of care dressings.

Meaning: Use of ciNPT in oncoplastic surgery is an effective strategy to decrease postoperative complications and alleviate the risk of delaying adjunctive cancer therapies.

METHODS

Patients

The institutional review board approved this single-site, retrospective study. The patients included were adult female patients with a breast cancer diagnosis and underwent oncoplastic bilateral mammoplasty or mastopexy immediately post lumpectomy between 2011 and 2023. Patients who underwent intraoperative radiation therapy were excluded from the adjuvant therapy analysis. Patients were divided into two groups for comparative analysis: patients who received standard of care (SOC) dressings versus patients who received ciNPT only on the cancerous breast. Breasts were also divided into two groups for comparative analysis: breasts that received SOC dressings versus ciNPT. SOC dressings included DERMABOND PRINEO Skin Closure (Ethicon U.S., LLC, Somerville, N.J.) and skin adhesive tape. The ciNPT system was delivered by Prevena (KCI USA, Inc. San Antonia, Tex.).

Surgical Procedure

Tumor removal and oncoplastic reconstructions were performed via a two-team approach. Re-excision for positive margins was also performed with both the breast and plastic surgeon. The oncoplastic breast reduction technique chosen depended on tumor location, defect, and breast size. All patients underwent matching reduction mammoplasty or mastopexy of the noncancerous side at the time of the oncoplastic breast reduction. Based on surgeon preference, 15-French round Jackson-Pratt drains were placed on a case-by-case basis. Most patients received no drains, some had drains in the cancer breast only, and some had drains in both breasts. The drains were removed when output was less than 30 mL per 24 hours for two consecutive days. Based on surgeon preference, patients either had standard dressings or ciNPT over the closed incision. Patients in the control group received standard dressings over the closed incision consisting of skin glue or adhesive tape. For the ciNPT group, patients received 3M Prevena Plus Customizable Incision Management System (KCI USA, Inc.) ciNPT over the closed incision on the cancer side only, providing a continuous −125 mm Hg pressure for an average of 7.6 days (range: 7 to 14 days), and skin glue over the closed incision on the contralateral breast. Length of ciNPT application depended on which ciNPT version (seven day or fourteen day) was available at the surgical site.

A team of a breast surgical oncologist, a plastic surgeon, and physician-assistants assessed the conditions of all patients on the follow-up visits for at least 90 days after surgery, but usually incrementally until 1-year postoperation and yearly after that.

Statistical Analysis

Patient characteristics were recorded in a database, including age, race, body mass index (BMI), comorbidities, surgical technique, neoadjuvant chemotherapy, and resection weight. The number of drains placed, time to drain removal, and complications within 90 days postsurgery were also recorded. Patients were noted to have complications if at least one of the following occurred: infection, hematoma, seroma, skin necrosis, nipple areolar complex (NAC) necrosis, or wound dehiscence. Infection was defined as erythema, signs or symptoms of systemic infection, and clinical need for antibiotics as determined by the lead investigator. In addition, the total number of days to initiation of radiation therapy or chemotherapy treatment from postoperative day zero was recorded. A delay in radiation therapy (XRT) or chemotherapy was defined as starting treatment 9 weeks after tumor resection.[23–25] At our institution, the preferred time to start XRT without adjuvant chemotherapy is 4 to 6 weeks postoperatively. Patients who underwent adjuvant chemotherapy before adjuvant XRT were excluded from the XRT delay analysis but were included in the chemotherapy delay group. Analyses were performed using the R statistical software package (V.4.1.1). Continuous variables were expressed as mean ± standard deviation, median, interquartile range (IQR), and range. Categorical variables were expressed as the number of patients or number of breasts and their proportion to the group under study. *P* values are the results of Mann-Whitney tests for continuous variables or Fisher exact tests for categorical variables. A significant finding was defined as a *P* value of less than or equal to 0.05.

Propensity score matching was also used to reduce bias and equilibrize the covariates. Logistic regression with ciNPT (yes or no) as outcome and age, BMI, diabetes

mellitus, tobacco use (ever vs. never), and prior breast surgery as covariates was used to assign each patient a likelihood (propensity score) of receiving ciNPT. Nearest-neighbor propensity score matching was used to find the patients who did not receive ciNPT that most closely matched those who did on these five factors. The R package "MatchIt" was used to perform this matching process, which resulted in 29 pairs. Fisher exact tests and Mann-Whitney tests were used to assess the balance between groups after matching.

For dichotomous outcomes, logistic regression was used to compare the matched ciNPT and no ciNPT groups. Cluster-robust standard errors, with matched pair as the clustering variable, were used to derive confidence intervals and *P* values for the estimated effects of ciNPT.

RESULTS

Patient Demographics

Records of 150 female patients (ciNPT = 29, SOC = 121) accounting for 300 reconstructed breasts (ciNPT = 29, SOC = 271) were analyzed. Demographics and types of breast reduction surgery performed are displayed in Table 1. SOC and ciNPT groups had similar resection size ($P = 0.262$) and neoadjuvant chemotherapy rates ($P = 1$). There were significant imbalances between the two cohorts regarding race, BMI, oncoplastic breast reduction type, prior breast surgery, and drains used. Patients in the ciNPT group had a lower BMI (ciNPT = 27, SOC = 32.2; $P = 0.0003$) and drain usage (0 drains on cancer side: ciNPT = 28/29, SOC = 67/121; 1 drain on cancer side: ciNPT = 1/29, SOC = 52/121; $P \leq 0.0001$; drain on contralateral side: ciNPT = 1/29, SOC = 42/121, $P = 0.0004$). More patients in the ciNPT group had previous breast surgery compared to the SOC group (ciNPT = 5/29, SOC = 4/121; $P = 0.014$). Mammoplasty was performed more in the ciNPT group (ciNPT = 19/22, SOC = 66/121; $P = 0.005$), and mastopexy was performed more in the SOC group (mammoplasty: ciNPT = 25/29, SOC = 42/121; mastopexy: ciNPT = 4/29, SOC = 47/121; $P = 0.006$). For this reason, patients were matched based on age, BMI, diabetes mellitus, tobacco use, and prior breast surgery (Table 2). After adjustment for propensity score matching, imbalance remained in oncoplastic reduction surgery type and drains. More patients in the ciNPT group had reduction mammaplasty versus mastopexy compared to the SOC group (mastopexy: ciNPT = 4/29, SOC = 15/29; mammaplasty: ciNPT = 25/29, SOC = 12/29, $P = 0.001$).

Table 1. Demographics and Baseline Characteristics

Characteristics	ciNPT (n = 29)	SOC (n = 121)	*P*
Age	58.0 (12.8); 58 [49, 69] (31, 80)	59.9 (10.0); 62 [53, 67] (30, 79)	0.391
Race			
White	27 (93.1)	84 (69.4)	0.009*
Black	2 (6.9)	26 (21.5)	0.109
Other	0 (0)	11 (9.1)	0.124
Hispanic	3 (10.7)	4 (3.3)	0.125
BMI (kg/m^2)	27.0 (5.0); 26 [24, 31] (19, 37)	32.2 (6.9); 32 [27, 37] (21, 50)	0.0003†
Comorbidities			
Smoker	0 (0)	2 (1.7)	1
Former smoker	8 (27.6)	43 (35.5)	0.684
Diabetes	4 (13.8)	19 (15.7)	1
CAD/previous MI	0 (0)	6 (5.0)	0.597
Prior breast surgery	5 (17.2)	4 (3.3)	0.014‡
Neoadjuvant chemo	7 (24.1)	28 (23.1)	1
Oncoplastic breast reduction type			0.006*
Mastopexy	4 (13.8)	47 (38.8)	
Reduction mammoplasty	25 (86.2)	66 (54.5)	
Both	0 (0)	8 (6.6)	
Drains on the cancer side			<0.0001§
0	28 (96.6)	67 (55.4)	
1	1 (3.4)	52 (43.0)	
>1	0 (0)	2 (1.7)	1
Drain on the contralateral side	1 (3.4)	42 (34.7)	0.0004†
Drain days (among those with drain)	1 obs = 12	8.7 (6.3); 7 [5,10] (1,29)	0.290
Maximum resection weight (g)	334 (419); 273 [74, 362] (37, 1679)	363 (335); 220 [117, 506] (22, 1800)	0.262
RTOR for margins	5 (17.2)	23 (19.0)	1
ciNPT duration (d)	7.7 (2.1); 7 [7,7] (7,14)	–	–

Continuous variables are presented as mean (Standard Deviation), median [Interquartile Range] (range), and categorical variables are presented as numbers (percentage). *P* values are the results of Mann-Whitney test (continuous variables) or Fisher exact tests (categorical variables).
*$P < 0.01$.
†$P < 0.001$.
‡$P < 0.05$.
§$P < 0.0001$.
CAD, coronary artery disease; Chemo, chemotherapy; RTOR, return to the operating room.

Table 2. Demographics and Baseline Characteristics of the Matched Cohort, Patient, and Procedure Characteristics by ciNPT Status

Characteristics	ciNPT (n = 29)	SOC (n = 29)	*P*
Age	58.0 (12.8); 58 [49, 69] (31, 80)	57.8 (12.2); 58 [50, 67] (30, 79)	0.975
Non-White race	2 (6.9)	7 (24.1)	0.144
Hispanic	3 (10.7)	0 (0)	0.112
BMI (kg/m^2)	27.0 (5.0); 26 [24, 31] (19, 37)	26.8 (5.0); 25 [23, 30] (21, 40)	0.630
Comorbidities,			
Tobacco use	8 (27.6)	9 (31.0)	1
Diabetes mellitus	4 (13.8)	4 (13.8)	1
CAD/previous MI	0 (0)	1 (3.4)	1
Prior breast surgery	5 (17.2)	2 (6.9)	1
Oncoplastic breast reduction type			0.001*
Mastopexy	4 (13.8)	15 (51.7)	
Reduction mammoplasty	25 (86.2)	12 (41.4)	
Both	0 (0)	2 (6.9)	
Drains	1 (3.4)	10 (34.5)	0.005*
Maximum resection weight (g)	146 (115); 120 [59, 190] (22, 501)	334 (419); 273 [74, 362] (37, 1679)	0.081
Bilateral cancer	1 (3.4)	4 (13.8)	0.353

Continuous variables are presented as mean (standard deviation); median [interquartile range] (range). Categorical variables are presented as numbers (percentage).
P values are the results of Mann-Whitney tests (continuous variables) or Fisher exact tests (categorical variables).
*$P < 0.01$.

Table 3. Postoperative Complication Rates of ciNPT- versus SOC-treated Breasts (Irrespective of Cancer Status)

Complications	ciNPT (n = 29)	SOC (n = 271)	*P*
Any complication, n (%)	3 (10.3)	83 (30.6)	0.029*
Infection, n (%)	1 (3.4)	16 (5.9)	1
Dehiscence, n (%)	0 (0)	50 (18.5)	0.007†
Skin necrosis, n (%)	1 (3.4)	60 (22.1)	0.014*
Nipple areolar complex necrosis, n (%)	0 (0)	4 (1.5)	1
Seroma, n (%)	1 (3.4)	11 (4.1)	1
Hematoma, n (%)	1 (3.4)	9 (3.3)	1

P values are the results of Fisher exact tests.
*$P < 0.05$.
†$P < 0.01$.

Table 4. Postoperative Complication Rates of ciNPT- versus SOC-treated Cancerous Breasts

Complications	ciNPT (n = 29)	SOC (n = 128)	*P*
Any complication, n (%)	3 (10.3)	54 (42.2)	0.001*
Infection, n (%)	1 (3.4)	14 (11.0)	0.307
Dehiscence, n (%)	0 (0)	34 (26.6)	0.0007†
Skin necrosis, n (%)	1 (3.4)	41 (32.0)	0.0009†
Nipple areolar complex necrosis, n (%)	0 (0)	3 (2.3)	1
Seroma, n (%)	1 (3.4)	6 (4.7)	1
Hematoma, n (%)	1 (3.4)	5 (3.9)	1

P values are the results of Fisher exact tests.
*$P < 0.01$.
†$P < 0.001$.

More patients in the SOC group had drains compared to the ciNPT group (ciNPT = 1/29, SOC = 10/29; $P = 0.005$).

Postoperative Complication Rates

At the breast level, irrespective of cancer status, the ciNPT breasts had significantly lower rates of postoperative complications ($P = 0.029$), dehiscence ($P = 0.007$), and skin necrosis ($P = 0.014$) than the SOC breasts (Table 3). There was no significant difference in the rates of other postoperative complications, such as NAC necrosis, seroma, hematoma, and infection (Table 3).

At the breast level respective to cancer status, ciNPT breasts had significantly lower rates of overall postoperative complications ($P = 0.001$), skin necrosis ($P = 0.0007$), and dehiscence ($P = 0.0009$) (Table 4). However, there was no significant difference in the rates of postoperative NAC necrosis, seroma, hematoma, and infection (Table 4). Among patients who received ciNPT on the cancer side and SOC on the contralateral side, there was no significant difference in the rates of postoperative complications, skin necrosis, dehiscence, NAC necrosis, seroma, hematoma, and infection (Table 5).

Table 5. Postoperative Complication Rates among ciNPT Patients, Comparing Their ciNPT-treated Cancer Breasts versus Their SOC-treated Contralateral Breast

Complications	ciNPT (n = 29)	SOC (n = 29)	*P*
Any complication, n (%)	3 (10.3)	3 (10.3)	1
Infection, n (%)	1 (3.4)	0 (0)	1
Dehiscence, n (%)	0 (0)	0 (0)	1
Skin necrosis, n (%)	1 (3.4)	1 (3.4)	1
Nipple areolar complex necrosis, n (%)	0 (0)	1 (3.4)	1
Seroma, n (%)	1 (3.4)	0 (0)	1
Hematoma, n (%)	1 (3.4)	1 (3.4)	1

P values are the results of Fisher exact tests.

After propensity score matching, ciNPT cancer breasts had significantly lower rates of dehiscence ($P = 0.004$) and a lower rate of skin necrosis (ciNPT: 3.4%, SOC: 20.7%; $P = 0.091$) as compared to SOC cancer breasts

Table 6. Matched Cohort Postoperative Complication Rates of ciNPT- versus SOC-treated Cancerous Breasts

Complications	ciNPT (n = 29)	SOC (n = 29)	*P*
Any complication, n (%)	3 (10.3)	9 (31.0)	0.096
Infection, n (%)	1 (3.4)	2 (6.9)	0.577
Dehiscence, n (%)	0 (0)	8 (27.6)	0.004*
Skin necrosis, n (%)	1 (3.4)	6 (20.7)	0.091
Nipple areolar complex necrosis, n (%)	0 (0)	0 (0)	1
Seroma, n (%)	1 (3.4)	3 (10.3)	0.345
Hematoma, n (%)	1 (3.4)	0 (0)	1

P values are the results of logistic regression with cluster-robust standard errors and matched pair as the clustering variable.
*$P < 0.01$.

(Table 6). However, there was no significant difference in the rates of the other postoperative complication rates, such as NAC necrosis, seroma, hematoma, and infection (Table 6).

Time to Adjuvant Therapy

In the unmatched cohort of patients who received XRT, the average time to initiation of adjuvant XRT was shorter in the ciNPT group (6.4 weeks) compared to the SOC group (8.6 weeks), although not statistically significant ($P = 0.087$) (Table 7). In addition, ciNPT patients had a significantly lower rate of delay of adjuvant radiotherapy compared to SOC patients (ciNPT = 0%, SOC = 20.5%; $P = 0.022$). In the unmatched cohort of patients that underwent adjuvant chemotherapy before adjuvant XRT, there was no significant difference in the initiation of adjuvant chemotherapy and rate in the delay of chemotherapy (Table 7).

In a combined analysis of unmatched patients with adjuvant XRT or chemotherapy, the average time to initiation of radiation or chemotherapy was significantly shorter in the ciNPT group (6.3 weeks) compared to the SOC group (8.5 weeks) ($P = 0.026$) (Table 7). In addition, the ciNPT group had a significantly lower rate of delay of adjuvant radiotherapy and chemotherapy ($P = 0.007$) (Table 7).

In the matched cohort, patients who received XRT had no significant difference in the average time to initiation of XRT and rate in the delay of XRT (Table 8). In matched patients who received chemotherapy, there was also no significant difference in the initiation of adjuvant chemotherapy and rate in the delay of chemotherapy (Table 8). In a combined matched analysis of matched patients with adjuvant XRT or chemotherapy, there was no significant difference in the initiation of adjuvant therapy and rate in the delay of adjuvant therapy (Table 8).

DISCUSSION

An oncoplastic mammoplasty is a powerful tool in breast conservation patients. Applying the principles of breast reduction/mastopexy, it offers superior aesthetic outcomes and improved patient-reported outcomes compared to conventional breast surgery.[4,26,27] In fact, delaying reconstruction is associated with decreased mental health outcomes.[28] Unfortunately, risks of complications, specifically as they pertain to DWH, are increased with this modality compared to traditional BCT alone.[29]

Given the numerous wound healing benefits reported with ciNPT in other indications,[30] we investigated its use in OBS, specifically on the cancerous breast, whereby the contralateral breast would serve as an internal control.

Table 7. Time to Initiation of Adjuvant Therapy

Adjuvant Therapy	ciNPT	SOC	*P*
Weeks PO XRT (N = 108)	6.4 (1.3); 6.9 [5.7, 7.7] (3.7, 8.4)	8.6 (5.8); 7.1 [5.7, 8.6] (2.7, 41.7)	0.087
XRT delay (N = 108)	0 (0)	18 (20.5)	0.022*
Weeks PO chemotherapy (N = 18)	5.6 (1.2); 6.0 [5.2,6.3] (3.9,6.5)	7.4 (3.0); 6.7 [6.1,9.8] (1.9,11.9)	0.240
Chemotherapy delay (N = 18)	0 (0)	5 (35.7)	0.278
Weeks PO XRT or chemotherapy (adjuvant therapy) (N = 126)	6.3 (1.3); 6.4 [5.7,7.2] (3.7,8.4)	8.5 (5.5); 7.1 [5.7,8.7] (1.9,41.7)	0.026*
Adjuvant therapy delay (N = 126)	0 (0)	23 (22.5)	0.007†

Continuous variables are presented as mean (standard deviation); median [interquartile range] (range); categorical variables are presented as number/total number of patients (percentage). *P* values are the results of Mann-Whitney tests (continuous variables) or Fisher exact tests (categorical variables).
*$P < 0.05$.
†$P < 0.001$.
TX, treatment.

Table 8. Matched Cohort Time to Initiation of Adjuvant Therapy

Adjuvant Therapy	ciNPT	SOC	*P*
Weeks PO XRT (N = 41)	6.4 (1.3); 6.9 [5.7, 7.7] (3.7, 8.4)	6.4 (1.4); 6.0 [5.6, 7.6] (4.3, 9.0)	0.972
XRT delay (N= 41)	0 (0)	1 (4.8)	1
Weeks PO chemotherapy N =8)	5.6 (1.2); 6.0 [5.2, 6.3] (3.9, 6.5)	7.0 (3.4); 6.1 [5.5, 7.7] (4.0, 11.9)	0.427
Chemotherapy delay (N = 8)	0 (0)	1 (4.8)	0.278
Weeks PO XRT or chemotherapy (adjuvant therapy) (N = 49)	6.3 (1.3); 6.4 [5.7, 7.2] (3.7, 8.4)	6.5 (1.8); 6.0 [5.6, 7.6] (4.0, 11.9)	0.609
Adjuvant therapy delay (N = 49)	0 (0)	2 (8.0)	0.490

Continuous variables are presented as mean (standard deviation); median [interquartile range] (range); categorical variables are presented as the number/total number of patients (percentage). *P* values are the results of logistic regression with cluster-robust standard errors and matched pair as the clustering variable.
TX, treatment.

We used propensity score stratification analysis to obtain an unbiased estimate of the ciNPT effect adjusted for the impact of confounding variables in this nonrandomized observational study. This method reduced bias in our background covariates and increased the precision of our research.

Indeed, ciNPT significantly lowered rates of WHCs when compared to matched SOC. This is particularly powerful as patients in the ciNPT group were more likely to have true reductions versus mastopexy, as true reductions are usually associated with greater dissection and thus disruption of blood supply.[11,31] No difference was found between the ciNPT breast and the SOC breast within the same patient, but this was likely a result of the small sample size.

Our results compare favorably to previous reports of ciNPT use in other breast reconstruction procedures. Kim et al. demonstrated that ciNPT effectively minimizes mastectomy flap necrosis in immediate expander-based breast reconstruction.[15] Use of ciNPT was further shown to reduce the complication rate and shorten the time to drain removal in patients following postmastectomy breast reconstruction.[32] Additionally, Ferrando et al. showed that ciNPT could reduce postsurgical complications and improve scar outcomes in oncological breast surgery patients.[33] Like our study, Holt and Murphy found a reduction in the duration of healing and wound breakdown in patients undergoing OBS treated with ciNPT compared with the contralateral side where a reduction mammaplasty was performed.[34] Additionally, Iqbal et al. indicated in their review of OBS that prophylactic ciNPT following breast surgery could help prevent DWH, which has been linked to poor cosmesis and delays in adjuvant treatment.[35] However, when DWH in OBS is compared to conventional breast surgery, there is no difference in patient-reported outcomes.[36]

The harmful effects on cancer outcomes when the timely administration of adjuvant therapies is delayed are well documented.[24,37,38] In fact, an interval between extirpative breast surgery and initiation of adjuvant XRT of greater than 9 weeks is associated with an increased likelihood of recurrence and mortality.[39] As adjuvant radiation is an integral part of BCT, the potential delay in the timely initiation of adjuvant cancer treatments due to WHC is of great concern. In fact, Kapadia et al. demonstrated that when postoperative complications occur after OBS, the time to adjuvant therapy increases.[40] It is thus incumbent on plastic surgeons to be aware of, anticipate, and mitigate potential postsurgical complications while carefully weighing the mental health burden of delayed reconstruction. Maintaining this delicate balance calls for innovative complication mitigation strategies.

Indeed, in the current study, we demonstrated that the ciNPT mitigates DWH, significantly decreasing the risk of delaying the timely onset of adjuvant therapy. In addition, in the unmatched cohort, prophylactic use of ciNPT led to considerably shorter intervals between surgery and initiation of adjuvant cancer therapy than the SOC. However, in the matched cohort, the use of ciNPT did not significantly change the interval between surgery and initiation of adjuvant cancer therapy compared to SOC. The major difference between ciNPT and SOC groups in the unmatched cohort was BMI, with the ciNPT group having a lower BMI compared to the SOC. This was corrected with the matched analysis. As high BMI is associated with DWH which is a primary cause of delayed adjuvant therapy, the lower BMI in the ciNPT group compared to the SOC is a limitation in our study and demonstrates that ciNPT may be particularly useful in higher risk for WHC patient populations, that is, those with high BMI. Randomized control trials are necessary to circumvent this limitation. Although the ciNPT is undoubtedly associated with increased cost than conventional dressings (cost of PREVENA = ~$600 versus DERMABOND PRINEO Skin Closure = ~$140), this is quickly eclipsed by the potential costs associated with DWH, such as increased office visits, a potential return to the operating room for debridement and closure and cancer-related expenses. In addition, Bloom et al. found that despite the added device cost of ciNPT in femoral-popliteal bypass surgery, ciNPT is more cost-effective.[41]

Although ciNPT use did not affect the rate of infection, hematoma, seroma, and NAC necrosis, the rates of these complications were already very low in both groups in our study, and the number needed to treat to see the potential benefit, too large. To our knowledge, this is the first study evaluating the effect of ciNPT on time to adjuvant therapy in oncoplastic breast reduction surgery.

The main limitation of this study is its retrospective nature and the imbalance in sample size between the two groups. Another limitation is that the study examined a cohort of 29 patients treated with ciNPT that had a significantly smaller BMI, mainly required mammoplasty, and had lower drain use. However, matched analysis was used to control these background variables. It is also possible that the study suffered from regional or institutional selection bias, as it was performed at a single academic center. Differences in surgical techniques and postoperative clinical management among the plastic surgeons within the institution could also introduce variation in outcomes. Variable losses to follow-up and incomplete data on confounding factors between the two groups are potential sources of bias. As breast size has been implicated as a risk factor in WHCs,[42] we were unable to control for this risk factor due to lack of information in patient records. Randomized controlled trials comparing the efficacy of ciNPT versus SOC are underway.

CONCLUSION

Use of ciNPT in oncoplastic breast reduction surgery is an effective strategy to decrease postoperative WHCs and alleviate the risk of delaying adjunctive cancer therapies.

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DISCLOSURES

Dr Sorice-Virk is a consultant for Sientra Inc. Dr Kanchwala is a consultant for Allergan Inc., Axogen Inc., RTI Surgical, Inc., Sientra Inc., and Surgical Innovation Associates Inc. The other authors have no financial interest to declare.

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