

Evaluation of central quadrantectomy with immediate nipple–areola complex reconstruction for centrally located malignant breast lesions

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Background

Breast cancer, according to National Cancer Institute, is the commonest cancer in women in Egypt, representing ~39% of total malignancies among Egyptian women. It is a leading cause of mortality among them as well.

Objective

To cure patients with preservation of breast tissue as much as possible with satisfactory physical and psychological outcome. This goal has led to the introduction of a new scope of surgery into our clinical practice called oncoplastic breast surgery, with the advantage of combining oncological safety and satisfactory cosmetic outcome.

Patients and methods

This prospective study was conducted on patients with centrally located breast tumors at the General Surgery Department at Ain Shams University Hospitals starting from November 2017. Approval of the Ethical Committee and written informed consent from all participants were obtained.

Results

Our study included 30 patients who underwent central quadrantectomy with immediate reconstruction of the nipple–areola complex (NAC) for retroareolar breast cancer. Patients' mean age was 44.1 ± 7.51 years (30–62 years). Of 30 patients, five (16.6%) had a positive family history of mammary cancer, four (13.3%) patients were diabetic, four (13.3%) patients were hypertensive, 20 (66.6%) patients received neoadjuvant chemotherapy. The mean lesion size was 1.32 ± 0.56 cm (0.5–2.5 cm). Operation timing was longer in inferior pedicle mammoplasty, being 2.60 ± 0.47 h, than Grisotti mastopexy, being 1.67 ± 0.56 h. Contralateral surgery was higher in inferior pedicle (10/15) than Grisotti mastopexy (2/15). The overall percentage of complications was 26.7%. Overall, 93.3% in Grisotti mastopexy group had good to excellent outcomes compared with 80% with good to excellent outcomes in inferior pedicle mastopexy. High cosmetic outcome was obtained thanks to the presence and shape of the breasts relatively to the esthetic outcome of modified radical mastectomy.

Conclusion

Central quadrantectomy with immediate NAC reconstruction is a good choice for patients with centrally located malignant lesions involving the NAC. These patients are no longer abutted from breast conservative surgery. Moreover, they are offered immediate reconstruction, resulting in lower rates of reoperations and recurrence and also better cosmetic appearance and higher levels of satisfaction.

Keywords:

central quadrantectomy, centrally located breast cancers, nipple–areola complex reconstruction

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Introduction

Carcinoma of the breast is the commonest carcinoma in women, as it accounts for 29% of cancers in women and is the commonest cause of mortality after lung cancer [1].

The WHO has approved breast conservative surgery besides mastectomy in the treatment of malignant breast lesions in 1996 [2], which is the entire removal of the tumor with safety margin and preservation of as

much breast tissue as possible (confirmed by frozen section followed by adjuvant radiotherapy) [3].

This provided hope for patients with breast cancer, considering the importance of the breast as a sexual

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organ, hence having a good psychological effect on the female [3].

However, not all patients were candidates for breast conservation, taking in consideration many factors such as breast size, multicentricity, and adjacency to the nipple–areola complex (NAC), as there was some esthetic inconvenience [4].

The evaluation of oncoplastic surgery in 1997 has expanded the spectrum of breast conservation in surgery. It has although achieved the difficult equation of both oncological safety and cosmesis, leading to patient satisfaction [2].

Early mammary reconstruction was only delayed after mastectomy. Objections against immediate reconstruction were justified by the likelihood of hiding local recurrence, tumor seeding, and interference with chemotherapeutic and radiotherapeutic management; around 20–30 of breast conservative techniques had unsatisfactory results and 10–40% of reoperations were due to invaded margins, which is further accentuated after radiotherapy [5].

Central breast cancer accounts for 5–20% of malignant breast lesions. These cases used to be excluded from breast conservation and were invariably offered mastectomy as the sole treatment as the NAC was resected [6].

Furthermore, it was not until the development of Grisotti and inferior pedicle mammoplasty that the central quadrantectomy began to be advocated for breast conservation in centrally located breast cancer. So, the development of oncoplastic techniques in the immediate mammary reconstruction has potentiated central quadrantectomy as the gold standard in the management of centrally located breast lesions [7].

Aim

The aim was to evaluate the oncoplastic outcomes of central quadrantectomy operation with immediate NAC reconstruction in the treatment of central breast cancers regarding cosmetic and oncological outcomes.

Patients and methods

This prospective study was conducted on 30 patients with early breast cancer in the central quadrant at the General Surgery Department of Ain Shams University Hospitals starting from November 2017. Approval of the Ethical Committee and written informed consent from all participants were obtained.

Inclusion criteria

Female patients ranging from age of 30 to 70 years old, stages I and II breast cancer, central breast lesions to less than 3 cm, Paget's disease of the nipple, cooperative patients, and psychologically stable patients were included.

Exclusion criteria

Patients with multicentric breast lesions, recurrence after conservative breast surgery, previous breast irradiation, and patients refusing surgery were excluded.

Methods

Patients with centrally located breast lesions who underwent central quadrant resection with immediate NAC reconstruction were included and were divided as follows: group I included 15 patients who underwent Grisotti mastopexy technique, and group II included 15 patients who underwent inferior pedicle mammoplasty technique with skin patch.

All patients included in our study were subjected to the following:

Clinical assessment, including history (past medical, surgical, family history, and history of hormone replacement or oral contraceptive pills intake), as well as clinical examination of both breasts and axillae.

Investigations: routine laboratory investigations, bilateral sonomammography, and metastatic workup.

Intervention: patients were subjected to central quadrantectomy and immediate NAC reconstruction

Operative techniques

Grisotti mastopexy technique: It is done for patients with moderate breast size and relatively small tumor size. Preoperative marking is made around the NAC and the disk of skin 5 cm diameter that will be the future NAC. Resection of the NAC down to the pectoral fascia is done. Deepithelialization of inferior flap, except for a disk of skin that will be the future NAC, is done (

Fig. 1). Mobilization of the dermoglandular flap from the pectoralis major is done and approximate for breast tissue and skin then closure in layers. The resected NAC specimen is sent for frozen section meanwhile axillary management is done. The neo-NAC is formed using the C-V flap, as shown in Fig. 3. Figure 2 shows Grisotti technique after NAC reconstruction.

Technique of nipple–areola complex reconstruction

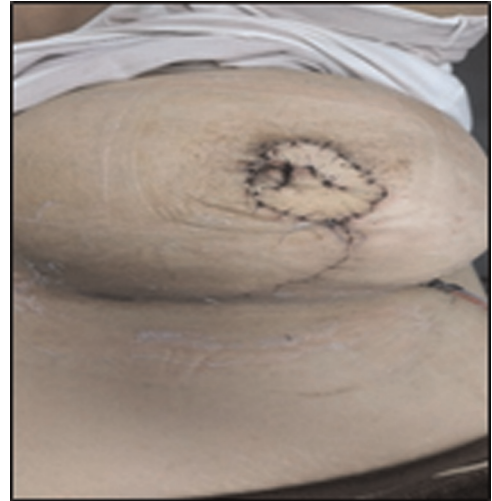
A 3-winged skin flap is elevated in the region of the future NAC in the skin island with the base attached to

Figure 1



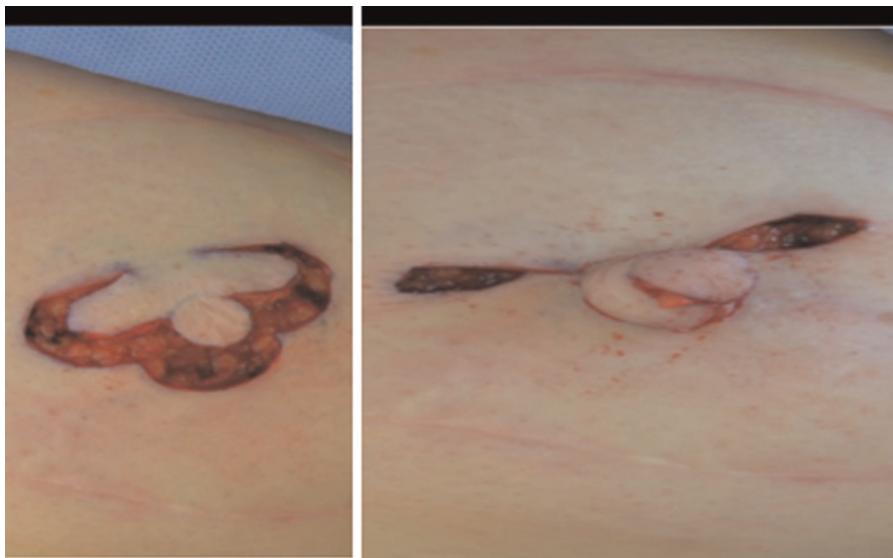
Deepithelialization of the dermoglandular flap with a skin disk is preserved for reconstruction of the areola.

Figure 2



Grisotti technique after NAC reconstruction. NAC, nipple-areola complex.

Figure 3



Closure of the C-V flap and formation of the new nipple.

the pedicle to maintain the blood supply for the nipple. The wings are approximated together to close the defect and form the nipple (Fig. 3).

Inferior pedicle

It is done for patients with relatively large breasts. Preoperative marking is done (Figs 4 and 5) around NAC and the inferior pedicle flap that will form the desired volume replacement. Resection of the NAC is done down to the pectoral fascia. Deepithelialization of the flap is done except for a disk of skin 5 cm diameter that will be the future NAC. Mobilization of the flap is done to cover the pectoralis major muscle. The specimen is sent for frozen section meanwhile axillary management is done. Approximation of the breast tissue and skin and

closure in layers is done. Finally, NAC reconstruction is done as previously described.

Follow-up

Patients were followed up every week till removal of stitches and then 3 monthly followed up for 13.03 ± 3.80 months (6–24 months) for any complications and to evaluate the cosmetic appearance and satisfaction of patients with the outcomes.

Results

Preoperative findings

Patient characteristics

Our study included 30 patients who underwent central quadrantectomy with immediate NAC reconstruction

for retroareolar breast cancer. Their age ranged from 30 to 62 years (mean=44.1±7.51 years).

Of 30 patients, five (16.6%) had a positive family history of breast carcinoma, four (13.3%) patients were diabetic, four (13.3%) patients were hypertensive, and 20 (66.6%) patients received neoadjuvant chemotherapy. The mean tumor size was 1.32±0.56 cm (0.5–2.5 cm). Patient characteristics are shown in Table 1.

Intraoperative and postoperative data were interpreted and compared as follows.

Figure 4



Preoperative marking while the patient is standing.

Operative time

The operative timing in group I (Grisotti mastopexy) ranged from 1 to 2.5 h, with the mean timing of 1.67 ±0.56 h. In group II (inferior pedicle mammoplasty), it ranged from 1.5 to 3 h, with mean timing of 2.60 ±0.47 h (Table 2).

There is a significant statistical difference between both groups regarding the operative timing, being longer in inferior pedicle mammoplasty than Grisotti mastopexy.

Intraoperative blood loss

The intraoperative blood loss was estimated by the number of blood-stained gauzes; each blood-stained gauze measured ~50 ml. In group I (Grisotti mastopexy), blood loss ranged from 150 to 350 ml

Figure 5



Postoperative wound closure.

Table 1 Patient characteristics

	Grisotti group N=15	Inferior pedicle group N=15	Test value	P value	Significance
Age					
Mean±SD	43.73±6.75	44.47±8.43	-0.263 ^a	0.794	NS
Range	30–59	30–62			
FH [n (%)]					
No	13 (86.7)	12 (80.0)	0.240 ^b	0.624	NS
Yes	2 (13.3)	3 (20.0)			
Comorbidities [n (%)]					
No	12 (80.0)	11 (73.3)	1.710 ^b	0.635	NS
HTN	1 (6.7)	2 (13.3)			
DM	1 (6.7)	2 (13.3)			
HTN and DM	1 (6.7)	0			
Neoadjuvant [n (%)]					
No	4 (26.7)	6 (40.0)	0.600 ^b	0.439	NS
Yes	11 (73.3)	9 (60.0)			

DM, diabetes mellitus; FH, family history; HTN, hypertension. ^aIndependent t test. ^bχ² test. P value more than 0.05: nonsignificant (NS). P value less than 0.05: significant. P value less than 0.01: highly significant

(mean=206.67±70.37 ml). In group II (inferior pedicle mammoplasty), blood loss ranged from 100 to 300 ml (mean=203.33±61.61 ml) (Table 2).

No significantly different statistical finding between the two groups was noted regarding the intraoperative blood loss.

Contralateral symmetrization

We offered all the patients contralateral breast surgery for symmetrizations. In group I (Grisotti mastopexy), two patients underwent contralateral surgery, whereas in group II (inferior pedicle mammoplasty), 10 patients accepted contralateral breast surgery for symmetrization.

A significant statistical difference between the two groups was found regarding the number of patients who underwent contralateral surgery.

Hospital stay

Regarding the stay in hospital, in group I (Grisotti mastopexy), patients stayed from 1 to 2 days

postoperatively and from 1 to 3 days in group II (inferior pedicle mammoplasty).

There is a significant statistical difference between the two groups regarding the postoperative stay in hospital.

Postoperative surgical complications

Considering surgical site infection, one (6.7%) patient had wound infection in group II (inferior pedicle), with no surgical site infection in group I (Grisotti). Moreover, one (6.7%) patient (1/15) developed wound hematoma in inferior pedicle. In addition, three (10%) of 30 patients developed seroma formation: one (6.7%) patient in Grisotti (1/15) and two (13.3%) patients (2/15) in inferior pedicle. In the inferior pedicle group, two (13.3%) patients developed partial NAC necrosis, whereas no patients in the Grisotti group developed NAC necrosis (Fig. 6). Overall, two (6.7%) of 30 patients developed wound dehiscence, one (6.7%) in each group (1/15) (Fig. 7). The overall percentage of complications was 26.7% (Table 3).

Table 2 Intraoperative time, blood loss, and rate of contralateral surgery

	Grisotti (group I) N=15	Inferior pedicle (group II) N=15	Test value	P value	Significance
Operation time (h)					
Mean±SD	1.67±0.56	2.60±0.47	-4.961 ^a	0.000	HS
Range	1–2.5	1.5–3			
Blood loss (ml)					
Mean±SD	206.67±70.37	203.33±61.61	0.138 ^a	0.891	NS
Range	100–350	100–300			
Contralateral surgery [n (%)]					
No	13 (86.7)	5 (33.3)	8.889*	0.003	HS
Yes	2 (13.3)	10 (66.7)			

^aIndependent *t*-test. *Chi-square test.

Figure 6



Partial NAC necrosis. NAC, nipple–areola complex.

Figure 7



Postoperative wound dehiscence.

Cosmetic outcome

A scoring system made up of three independent grading parties (surgeon, patient, and MDT of breast surgery department) was used to evaluate cosmetic outcome. Considering the overall shape postoperatively, the nipple site and direction, residual volume, and the scar resulting from the skin incision, a checklist is made to make the evaluation rather objective.

Hence, a grading from 0 to 3 was given as follows:

- 3 (excellent).
- 2 (good).
- 1 (fair).
- 0 (poor).

Of 30 patients, 18 (60%) were signed as excellent, comprising 12 (80%) of 15 in Grisotti and six (40%) of 15 in inferior pedicle.

Of 30 patients, eight (26.7%) were signed as good, comprising two (13.3%) of 15 in Grisotti and six (40%) of 15 in inferior pedicle.

Of 30 patients, three (10%) were signed as fair, comprising one (6.7%) of 15 in Grisotti and two (13.3%) of 15 in inferior pedicle.

Only one (3.3%) patient was signed as poor in inferior pedicle.

Regarding patient satisfaction, 28 (93.3%) of 30 were satisfied by the outcomes and two (6.7%) of 30 patients were not (Table 4).

No statistical difference between both groups was found regarding esthetic outcome or patient satisfaction (Table 5).

Pathological results

The mean tumor size was 1.32±0.56 (0.5–2.5). A total of 27 (90%) patients were invasive duct carcinoma, comprising 13 cases in the Grisotti group and 14 cases in the inferior pedicle group; one (3.3%) patient was invasive lobular carcinoma; and two (6.7%) patients were Paget’s disease, one patient in each group. Pathological results are illustrated in Table 6.

Of 30 patients, 23 (76.7%) were ER positive, 13 (43.3%) patients were PR positive, whereas 10 (33.3%) patients were Her 2 positive (Table 7).

The spectrum of safety margin ranged from 0.8 to 2.7 cm in Grisotti (mean=1.52±0.73) and 1–7 cm in inferior pedicle (mean=3.65±2.07); so, there was a marked difference statistically between both groups.

Table 4 Esthetic outcome and patient satisfaction

		N=30 [n (%)]
Cosmetic outcome by MDT		
Poor		1 (3.3)
Fair		3 (10.0)
Good		8 (26.7)
Excellent		18 (60.0)
Patient satisfaction		
Satisfied		28 (93.3)
Not satisfied		2 (6.7)

Table 3 Postoperative complications

	Grisotti (group I) N=15	Inferior pedicle (group II) N=15	Test value	P value	Significance
Hospital stay (days)					
Mean±SD	1.67±0.49	2.13±0.74	-2.033 ^a	0.052	NS
Range	1–2	1–3			
Seroma formation [n (%)]					
No	14 (93.3)	13 (86.7)	0.370 [*]	0.543	NS
Yes	1 (6.7)	2 (13.3)			
Development of hematoma and infection [n (%)]					
No	15 (100.0)	14 (93.3)	1.034 [*]	0.309	NS
Yes	0	1 (6.7)			
Wound dehiscence [n (%)]					
No	14 (93.3)	14 (93.3)	0.000 [*]	1.000	NS
Yes	1 (6.7)	1 (6.7)			
Partial nipple/flap necrosis [n (%)]					
No	15 (100.0)	13 (86.7)	0.000 [*]	1.000	NS
Yes	0	2 (13.3)			
Final pathological diagnosis [n (%)]					
Invasive duct carcinoma	13 (86.7)	14 (93.3)			
Invasive lobular carcinoma	1 (6.7)	0	1.037 [*]	0.595	NS
Paget’s disease	1 (6.7)	1 (6.7)			

^aIndependent t-test. ^{*}Chi-square test.

Table 5 Comparison between esthetic outcome and patient satisfaction in both groups

	Grisotti (group I) N=15	Inferior pedicle (group II) N=15	Test value	P value	Significance
Cosmetic outcome [n (%)]					
Poor	0	1 (6.7)			
Fair	1 (6.7)	2 (13.3)	5.333*	0.149	NS
Good	2 (13.3)	6 (40.0)			
Excellent	12 (80.0)	6 (40.0)			
Patient satisfaction [n (%)]					
Satisfied	14 (93.3)	14 (93.3)	0.000*	1.000	NS
Not satisfied	1 (6.7)	1 (6.7)			

*Chi-square test.

Table 6 Pathological results

	Grisotti group N=15	Inferior pedicle group N=15	Test value	P value	Significance
Side of the tumor [n (%)]					
Left	8 (53.3)	7 (46.7)	0.133*	0.715	NS
Right	7 (46.7)	8 (53.3)			
Size (cm)					
Mean±SD	1.26±0.59	1.38±0.54	-0.584 ^a	0.564	NS
Range	0.5–2.5	0.5–2.2			
Safety margin					
Mean±SD	1.52±0.73	3.65±2.07	3.746 ^a	0.001	HS
Range	0.8–2.7	1–7			
Histopathological results [n (%)]					
IDC	13 (86.7)	14 (93.3)	1.037*	0.595	NS
Mammary carcinoma	1 (6.7)	0			
3	1 (6.7)	1 (6.7)			

^aIndependent t-test. *Chi-square test.**Table 7 ER, PR, HER2 receptor status of cases in this study as reported in histopathology**

	n (%)
ER+	
Negative	7 (23.3)
Positive	23 (76.7)
PR+	
Negative	17 (56.7)
Positive	13 (43.3)
HER2+	
Negative	20 (66.7)
Positive	10 (33.3)

Local recurrence

No cases in our study had local recurrence during our period of postoperative follow-up of 14.83±5.43 months (6–24 months).

Therefore, a significant difference, between the two groups, was found regarding operative time, postoperative stay in hospital, rate of contralateral symmetrization, and the spectrum of safety margin.

Discussion

Breast cancer has threatened human health for a long time, and many trials have been carried out to

discover the mechanism of its occurrence and its treatment [8].

Oncoplasty has recently succeeded to achieve the difficult equation of patient recovery and optimal cosmetic outcome without jeopardizing oncological safety [9].

A total of 30 patients in our study underwent central quadrantectomy with immediate NAC reconstruction for retroareolar tumors.

The rate of surgical site complications was 26.7%, which is similar to that reported by Crown *et al* [10] (26.1%).

All the complications occurred on the ipsilateral side and in diabetics. This is similar to what was published by Urban and Rietjens [11], showing the effect of diabetes mellitus in oncoplastic surgery.

Two (6.7%) patients experienced partial necrosis of the neo-NAC, with one patient requiring local debridement. One other patient required operative

debridement of a dehiscence wise incision involving the triple point. The remainder did not require any interventions, and no patients required readmission for these complications.

We divided the study sample into two groups, Grisotti mastopexy (group I) and inferior pedicle mammoplasty (group II), in the treatment of central breast lesions involving NAC, and evaluation of both groups was done.

No significant statistical difference between the two groups was found regarding patients' age [mean=43.73 ±6.75 years (range, 30–59 years) and 44.47±8.43 years (range, 30–62 years) in group I (Grisotti mastopexy) and group II (inferior pedicle mammoplasty), respectively], which is consistent with the demographic data published by National Cancer Institute at 2013 by Zeeneldin *et al.* [12], who claimed that the peak incidence of breast carcinoma is between 40 and 59 years old.

Relatively, young age of our patients increased the cosmetic and esthetic demands. This made patient satisfaction a more challenging goal.

There was a positive first-degree family history in two patients in group I (Grisotti mastopexy) and three patients in group II (inferior pedicle mammoplasty). Unfortunately, BRCA gene test, which is related to significantly positive family history, was not available in our hospitals during this study.

There was a significant statistical difference in both groups regarding the operative timing, the percentage of contralateral surgery, and the spectrum of safety margin. These are comparable to some studies as follows: the operative timing in Grisotti mastopexy (group I) ranged from 1 to 2.5 h (mean timing=1.67 ±0.56 h), and in inferior pedicle mammoplasty (group II), it ranged from 1.5 to 3 h (mean timing=2.60 ±0.47 h), being longer in group II.

In Grisotti mastopexy (group I), two patients underwent contralateral surgery, whereas in inferior pedicle mammoplasty (group II), 10 patients accepted contralateral breast surgery for symmetrization. So, contralateral symmetrization was more in group II. The spectrum of safety margin was wider in inferior pedicle (group II), as it ranged from 1 to 7 cm (mean=3.65±2.07), than Grisotti (group I), as it ranged from 0.8 to 2.7 cm (mean=1.52±0.73).

In our study, 86.7% of the patients attained good to excellent cosmetic outcomes (60% as excellent and 26.7% as good) with high rate of satisfaction (93.3%). This was similar to Denewer *et al.* [13] who reported 64% as excellent and 30% as good.

Overall, 93.3% in group I (Grisotti mastopexy) had good to excellent outcomes compared with 80% with good to excellent outcomes in group II (inferior pedicle mastopexy). High cosmetic outcome was obtained, as the patients were satisfied with presence and shape of their breasts relatively to the cosmetic outcome of the patients who underwent modified radical mastectomy.

In our study, there was no local recurrence during our period of follow-up for 14.83±5.43 months (6–24 months). Niinikoski *et al.* [14] reported local recurrence rate as 2.3% during a median of 75 months follow-up. This is comparable to other studies. Romics *et al.* [15] reported a 2.7% recurrence during a median of 30 months follow-up, and Clough *et al.* [16] reported 2.2% during a median of 55 months of follow-up.

Conclusion

The choice of the oncologic technique is mainly based upon the location of the tumor, size of the breast, and distance of the tumor from the NAC. So, the decision is tailored for every single case. In our study, on centrally located breast tumors, central quadrantectomy and immediate reconstruction were done using two techniques: inferior pedicle mammoplasty and Grisotti mastopexy technique. There was a high level of patient satisfaction regarding the cosmetic results and no recurrence was detected during 14.83±5.43 months (6–24 months). Operative time was longer in inferior pedicle mammoplasty (group II) than in Grisotti mastopexy (group I). Contralateral symmetrization was more in inferior pedicle mammoplasty (group II) than in Grisotti mastopexy technique (group I). Both techniques proved to be safe oncologically within our period of follow-up, as there was no local recurrence. However, a wider safety margin was needed in inferior pedicle than Grisotti. Immediate NAC reconstruction was done in all patients with excellent cosmetic outcome. However, two of them experienced partial sloughing of the NAC within the first week. Therefore, central quadrant resection for centrally located breast lesions involving the NAC with immediate reconstruction with either inferior pedicle mammoplasty or Grisotti mastopexy technique with a neo-NAC formation is a good choice, achieving good cosmetic and oncological outcomes, as well as high rates of satisfaction for the patient.

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Conflicts of interest

There are no conflicts of interest.

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