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Original Research Article

Inferior pedicle with inverted-T procedure for bilateral reduction mammoplasty provided satisfactory surgical and aesthetic outcome

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ABSTRACT

Background: The objective of the study was to evaluate surgical and aesthetic outcomes of bilateral reduction mammoplasty (RM) through the inferior pedicle with inverted-T approach (PO).
Methods: 23 women with bilateral symptomatizing macromastia underwent preoperative breast measurements, calculation of breast volume (BV), determination of quality of life (QoL) and self-esteem scorings using the breast reduction assessed severity scale (BRASS) and the Rosenberg self-esteem scale (RSES). RM was performed and intraoperative and PO data were collected. At 3-m PO, aesthetic outcome was evaluated using the ABNSW score, which assesses breasts asymmetry and shape, nipple deformation, skin condition and wound scar, and QoL outcome and overall satisfaction were determined.
Results: Mean operative time was 240.4±39.7 min and mean weight of excised breast tissue was 2778.3±307.7 gm. Minor PO complications were managed conservatively and no patient required revision surgery. PO breast measurements were significantly improved with decreased BV and increased breast projection. Median ABNSW score was 10 and PO median BRASS and RSES scores were 9 and 17 with significant change in comparison to preoperative data. Preoperative BRASS score was negatively correlated age and body mass index, while RSES score was positively correlated with age. Nine women were highly satisfied by aesthetic outcome, 10 women were satisfied and 16 women were highly satisfied with overall outcome.
Conclusions: RM significantly improved women QoL, aesthetic appearance and psychological status. Inferior pedicle with inverted T-mammoplasty is a safe, and applicable pattern of mammoplasty, allow significant reduction of BV with improved breast measurements and projection and provide satisfactory aesthetic outcome.

Keywords: Macromastia, Reduction mammoplasty, Aesthetic outcome, Quality of life

INTRODUCTION

Macromastia is a health problem secondary to the negative physical and psychosocial effects imposed on the patients.[1,2] These effects can lead to restrictions in the patients' social and working lives with a reduced quality of life and this supports the need for early intervention.[2,3]

Reduction mammaplasty (RM) aimed to provide alleviation of physical, emotional and psychosocial discomforts with restoration of the conical-shaped breast through a scar that must be as short and invisible as possible.[1]

Several techniques for RM were applied to reduce large breasts, nipple sparing mastectomy is gaining popularity for its superior aesthetic results and positive impact on patients' psychological well-being.[4] Unfortunately, patients with high-grade breast ptosis are not good candidates for nipple sparing mastectomy that can cause vascular compromise to the nipple-areola complex (NAC)

and skin flaps, with decrease in NAC sensation.[5] Free nipple grafting as well as a variety of pedicled techniques were advocated for large reductions in obese patients, but the number of different approaches suggests that no single method is ideal.[6-9] The current study targets to present a series of women with macromastia who underwent bilateral reduction mammoplasty (RM) through the inferior pedicle with inverted-T (wise pattern reduction) approach and to evaluate the surgical and aesthetic outcomes and women' satisfaction 3-months postoperative (PO).

Design

The design of the study was a prospective interventional study.

Setting

The study was conducted at the Department of General Surgery, Mansoura Military Hospital, Mansoura, Egypt.

METHODS

This study was conducted since June 2017 till January 2020 to allow a minimum follow-up 3 month period for the last case operated upon. The study protocol was approved by the local ethical committee and both partners signed written fully informed consents for study participation and acceptance of the shown photos for the presumed PO breast size and measurements. Inclusion criteria included bilateral macromastia, age younger than 60 years, grade I-II according to the American Society of Anesthesiology (ASA). Exclusion criteria included age older than 60 years, ASA grade >II, uncontrolled systemic diseases, unfitness for surgery and/or anesthesia for any cause. Demographic information including age, height, and weight were obtained and body mass index (BMI) was calculated according to the equation BMI (kg/m^2) = weight (kg)/height (m^2) and then, all women underwent clinical evaluation to ascertain the inclusion and exclusion criteria. All patients underwent cervical and thoracic radiological examination to exclude the possibility of radicular pain and then had mammographic examination as preliminary exclusion of malignancy and patients with co-morbidities were adjusted preoperatively to the optimum level and continued on their control lines after surgery.

Preoperative breast measurements

Front view measurements included: the distances from suprasternal notch to nipple (SN-N), mid-point of clavicle to nipple (C-N) and nipple to the mid-point of infra mammary fold (N-IMF) were estimated.

Lateral view measurements included: the vertical distance from the chest on the anterior axillary line to the highest point of the breast mound (BP). Nipple projection (NP) was estimation as the difference between the vertical distances from the chest on the anterior axillary line to the highest point of the nipple minus BP length.

Breast volume was calculated according to the validated equation reported by Longo et al.[10]

$$BV(ml) = -231.66 + 0.5747 \times (SN - N)2 + 18.5478 \times (BP) + 14.5087 \times (N - IMF)$$

Preoperative surgical-line markings

Preoperative surgical-line markings including the C-N, SN-N and N-IMF lines were drawn were applied with the patient was standing without forward-bending, and another line was dropped from the angle of the suprasternal notch towards the umbilicus. The assumed new position for the new nipple areola complex (NAC) was marked on the C-N line nearly at the mid-humoral point with the site of the nipple was marked as the center of a circle of a diameter nearly equal to that of the areola. The area to be de-epithelialized was marked by two sides of a triangle which base is 2 cm wider than the diameter of the original areola. The base of the triangle was extended in both directions to represent the new IMF as shown in Figure 1.

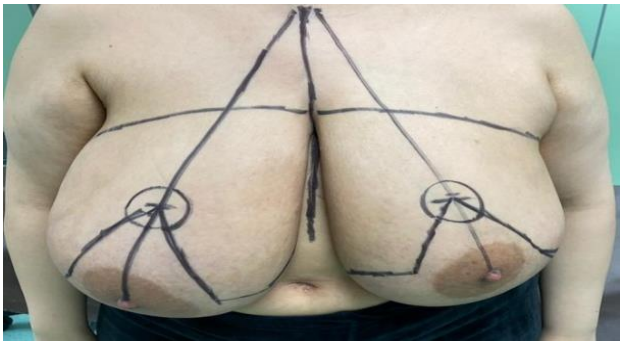

Figure 1: Surgical markings for bilateral RM.

Surgical technique

Skin of the new NAC and the distal triangle of skin was de-epithelialized and skin pliability was tested for easy approximation after de-epithelialization. Then, an inverted T-incision was made with its transverse limb at the original IMF and fibrofatty tissue of the breast was dissected from its bed with preservation of blood and nerve supply as possible. After removal of the sufficient weight to reduce the breast size, the original NAC was trans-positioned upwards and fixed at the predetermined new position by 0/4 vicryl interrupted stitches and skin at the predetermined new IMF were released from that of the back of the breast and used to envelop the remnant breast tissue and to fashion the new IMF as a transverse line, so that no incision mark was present between the new IMF and the transposed NAC and the only incision mark is that was hided underneath of the new breast as an IMF. Vacuum drainage was inserted in the bed of the dissected area and wound was closed using 0/4 vicryl interrupted

stitches. The same procedure was applied to the other breast with adjustment of the levels of nipples. The removed tissues were weighed and sent for histopathological examination for confirmation of benignity.

Crib bandage was applied for one week and supporting bra suitable for the new breast size was wear for 2 months. All patients were followed up till complete wound healing and stitch removal and then two weekly for three months.

Surgical outcomes

Intraoperative data including operative time, amount of blood loss, hemoglobin deficit that equals preoperative hemoglobin concentration minus immediate PO one, need for blood transfusion, and weight of the resected breast tissue.

Postoperative data including length of hospital stay, duration of wound drainage and duration till complete stitch-removal. PO complications including delayed wound healing, wound dehiscence, scarring, or infection, development of seromas, hematomas, nipple necrosis, or skin necrosis were reported.

Breast measurements were re-estimated at 3-m PO and compared to preoperative measurements.

Aesthetic outcome was evaluated using deidentified pre- and postoperative patients' photos that were scored by two surgeons, who were not included as authors, using the ABNSW score, assesses five variables evaluating asymmetry of the breasts, breast shape, nipple deformation, skin condition and wound scar.[11] Each variable was scored on 4-point Likert scale from 0-3 and higher scores indicate better aesthetic outcomes.

Quality of life and self-esteem outcomes

Quality of life (QoL) of patients with mammary hypertrophy was evaluated pre- and postoperatively using the breast reduction assessed severity scale (BRASS), which consists of five domains pertain physical implications, poor self-concept, body pain, negative social interactions, and physical appearance. Responses to BRASS are scored on a 5-point Likert scale ranging between very little to very much with numerical correspondence was 1-5 for a total BRASS of 0-25**.**

Patients self-esteem was evaluated using the Rosenberg self-esteem scale (RSES) that included 10 questions to address the self-esteem using a 4-point Likert scale ranging from zero to 4 to evaluate the response that may be strongly agree, agree, disagree or strongly disagree.

Response to questions number 1, 2, 4, 6 and 7, strongly agree was scored by three, while for questions number 3, 5, 8, 9 and 10; strongly agree as a response was scored by 0. Total score was calculated and ranges between 0 to 30.

Satisfaction outcomes

Aesthetic satisfaction was evaluated using on a 5-point Likert scale ranging from 1 to indicate very dissatisfied and 5 indicates very satisfied.

Overall patients' satisfaction was evaluated using the following questions; did the applied RM alleviated your preoperative complaints, are you happy for having RM, and did you have any complications after RM; each of these three questions must be answered by yes (=1 for the 1st two questions and 0 for the 3rd question). The 4th and 5th questions are scored on a 5-point Likert scale with 1 indicated very unsatisfactory and 5 indicated very satisfactory, these two questions entail the extent of bra size reduction after RM and the extent if the satisfaction by the results. The sum of patients' scoring of their response to these questions was calculated and the higher the score the higher is the satisfaction by outcome.

Statistical analysis

Obtained data were presented as mean, standard deviation, numbers, percentages, median and interquartile range. Comparison between preoperative and PO scorings were compared using paired t-test and correlation with age, BMI and education level was evaluated using Pearson's correlation analysis. Statistical analysis was conducted using the SPSS (version 26, 2015) for Windows statistical package. P value <0.05 was considered statistically significant.

RESULTS

Thirty-four women were eligible for evaluation; 11 women were excluded for not fulfilling the inclusion criteria and 23 women were enrolled in the study. Demographic and preoperative clinical data of enrolled women are shown in Table 1.

Data are presented as mean, standard deviation (SD), numbers, ranges, percentage; BMI: body mass index; ASA: American Society of Anesthesiology; p value indicates significance of the result; p<0.05 indicates significant difference; p>0.05 indicates non-significant difference.

All surgeries were conducted uneventfully without intraoperative complications within a mean operative time of 240.4±39.7 min. Mean weight of the excised breast tissue was 2778.3±307.7 gm, mean intraoperative blood loss was 169.6±2.3 ml, and mean hemoglobin deficit was 9.14±3.6%, but no patient required blood transfusion. All patients were discharged within 24 to 72 hour after surgery to re-visit the outpatient clinic for follow-up. Wound drainage was continued for a mean duration of 10 (±1.8) days and stitches were removed after 15 (±2.3) PO days. The reported PO complications were minors and managed conservatively and during PO follow-up no patient required revision surgery (Table 2).

Postoperative breast measurements (Figure 1b) were significantly improved in comparison to preoperative measurements; SN-N, C-N and N-IMF distances (Figure 1a and b) were significantly decreased by a median % ranging between 27.8 and 32.8%, with concomitant decrease of calculated BV by a median % of 38.7%. On the other hand, projection of breast mound and nipple projection (Figure 1c) were significantly increased with subsequent significant increase of breast projection (Table 3).

Aesthetic outcome using ABNSW score that ranges between zero and 15, was evaluated by a median score of 11 and 10 with a total median score of 10 and non-significant differences between items' scores as determined by both judge surgeons with non-significant difference regarding the total score (Table 4).

Data are presented as median; interquartile range is in parenthesis; p value indicates significance of difference between preoperative and postoperative measurements; $p<0.05$ indicates significant difference; $p>0.05$ indicates non-significant difference

Median value of postoperative BRASS score was 9 (IQR: 8-11) and was significantly ($p<0.0001$) lower in comparison to median value of preoperative score that was 18 (IQR: 17-20). On contrary, median value of PO RSES score was 17 (IQR: 14-17) and was significantly ($p<0.0001$) higher in comparison to median value of the preoperative score that was 12 (IQR: 11-14). Preoperative BRASS score was negatively correlated, while was positively correlated with education level, and the correlation was significant with age and BMI, but was non-significant with education level. On contrary, PO BRASS was positively correlated with age and BMI, was negatively correlated with education level, and the correlation was significant only with age. Preoperative RSES score showed positive, while PO RSES showed negative significant correlation with age, and despite being correlated with BMI and education level, the correlation was non-significant (Table 5).

Median value of aesthetic satisfaction scoring was 3 (IQR: 3-4) and 9 women were highly satisfied by aesthetic outcome, 10 women were satisfied and 4 women found the outcome is good. Median value of patients' overall satisfaction was 10 (IQR: 9-11) and 16 women were highly satisfied with median score ranged between 10 and 12 and 6 women had median score range of 6-9, while a woman had an overall satisfaction score of 5 (Table 5).

Data are presented as numbers, percentage, median; interquartile range is in parenthesis.

Table 1: Patients' demographic and clinical enrollment data.

Data		Findings (%)
Age (years)		
<30		6 (26.1)
>30-40		14 (60.9)
>40		3 (13)
Total	Mean (SD)	33±4.6
	Range	26-43
Body weight (kg)		
Mean (SD)		96 (8.7)
Range		80-121
Body height (cm)		
Mean (SD)		169.6 (2.3)
Range		166-175
BMI (kg/m^2)		
Overweight (<30)		2 (8.7)
Obese (30-35)		12 (82.6)
Morbid obese (>35)		2 (8.7)
Total	Mean (SD)	32.9 (3.2)
	Range	28-32.4
Number of living offspring		
1-2		16 (69.6)
3-4		6 (26.1)
>4		1 (4.3)
Total	Mean (SD)	2.2 (1.1)
	Range	1-5
Educational status		
Illiterate		3 (13)
Primary-secondary school		4 (17.4)

Continued.

Data		Findings (%)
High school		6 (26.1)
College graduate		10 (43.5)
Co-morbidities		
No		13 (56.5)
Type-2 Diabetes mellitus		9 (39.1)
Hypertension		7 (30.4)
Respiratory		5 (21.7)
Total	Mean (SD)	0.9 (1.1)
	Range	0-3
ASA grade		
I		17 (73.9)
II		6 (26.1)
Blood glucose level (mg/dl)		
Fasting	Mean (SD)	132.4 (43.9)
	Range	95-245
Postprandial	Mean (SD)	189.6 (59.3)
	Range	125-335
Blood pressure (mmHg)		
Systolic	Mean (SD)	125.2 (18.1)
	Range	100-165
Diastolic	Mean (SD)	82.3 (10.8)
	Range	65-100

Table 2: Operative and immediate PO data.

Data			Findings (%)
Operative time (min)			
150-200			4 (17.4)
>200-250			10 (43.5)
>250-300			6 (26.1)
>300			3 (13)
Total		Mean (SD)	240.4±39.7
		Range	180-324
Weight of the excised breast tissue (kg)			
<2500			4 (17.4)
2500-3000			12 (52.2)
>3000			7 (30.4)
Total		Mean (SD)	2778.3 (307.7)
		Range	2185-3205
Intraoperative blood loss (ml)			
<500			96 (8.7)
500-100			80-121
Total		Mean (SD)	169.6 (2.3)
		Range	166-175
Hemoglobin concentration (gm/dl)			
Preoperative			11.82 (0.77)
Postoperative			10.74 (0.9)
Deficit* (%)	<10		14 (60.9%)
	>10		9 (39.1%)
	Total	Mean (SD)	9.14 (3.6)
		Range	3.53-15.89
Duration of postoperative hospital stay (hours)			
24			3 (13)
>24-47			8 (34.8)

Continued.

Data		Findings (%)
48-60		10 (43.5)
>60		2 (8.7)
Total	Mean (SD)	45.9 (14.8)
	Range	24-72
Duration of wound drainage (days)		
7-8		13 (56.5)
9-10		9 (39.1)
11-12		7 (30.4)
13-14		5 (21.7)
Total	Mean (SD)	10 (1.8)
	Range	7-14
Duration till stitch removal (days)		
≤15		14 (60.9)
>15		9 (39.1)
Total	Mean (SD)	15 (2.3)
	Range	12-20
Wound complications		
Edema		9 (39.1)
Collection of	Seroma	2 (8.7%)
	Hematoma	0
Infection		3 (13)
Sloughing		2 (8.7)
Dehiscence		0
Delayed healing		8
NAC complications		
Color change		3 (13)
Sloughing		0

Data are presented as mean, standard deviation (SD), numbers, ranges, percentage; NAC: nipple-areola complex; *: deficit; PO-preoperative hemoglobin concentration

Table 3: Postoperative breast measurements in relation to preoperative measurements.

Measurements	Preoperative	Postoperative	% of change
SN-N distance (cm)	38.5 (36.3-43.2)	27.9 (26.1-29.8)	27.8 (21.8-31.3)
P value	<0.0001		
C-N distance (cm)	34 (32.1-38.25)	23 (21.5-24.65)	32.75 (27.1-35.9)
P value	<0.0001		
N-IMF distance (cm)	27.9 (26.3-31.35)	19.4 (17.55-20.15)	32.8 (28.4-36.1)
P value	<0.0001		
Breast projection			
Mound*	10.5 (9.3-12.05)	13.7 (12.7-15.25)	31.4 (23.15-35.3)
P value	<0.0001		
Nipple*	0.7 (0.6-0.8)	1 (0.8-1.1)	35.4 ([-5.6]-[48.6])
P value	<0.0001		
Total*	11.2 (9.9-12.85)	14.9 (13.55-16.4)	29.9 (23.2-35.4)
P value	<0.0001		
Breast volume (ml)	1255 (1081.5-1483.3)	769 (680.6-833.9	38.7 (30.9-44.5)
P value	<0.0001		

Data are presented as median; interquartile range is in parenthesis; SN-N: suprasternal notch to nipple distance; C-N: mid-clavicular to nipple distance; N-IMF: nipple to inferior mammary fold; *: indicates increased measurements; p value indicates significance of difference between preoperative and postoperative measurements; p<0.05 indicates significant difference; p>0.05 indicates non-significant difference

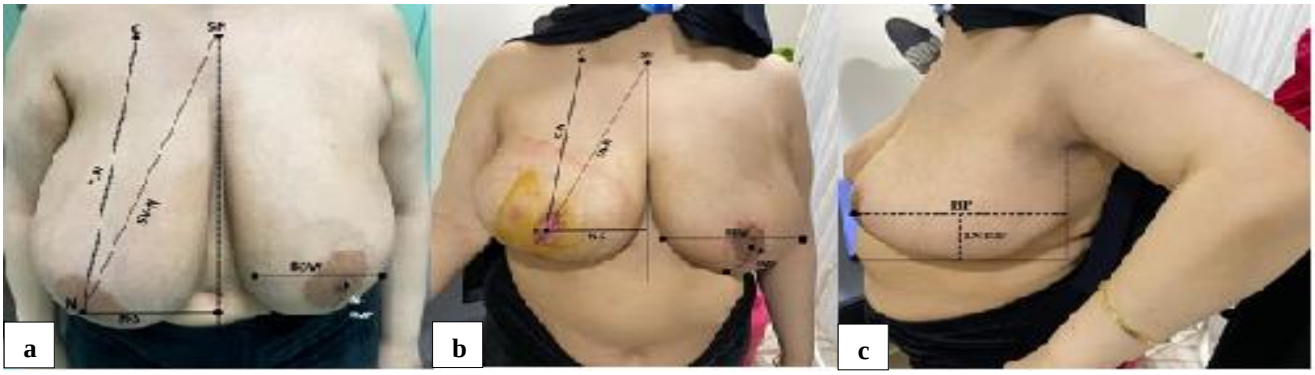

Figure 2: (a) and (b) Preoperative breast measurements (note the level of nipple in relation to the umbilicus), and (c) postoperative breast projection and nipple to inferior mammary fold (lateral view).

Table 4: Scores of items of ABNSW score of aesthetic outcomes.

Item	Evaluation scoring 1	Evaluation scoring 2	P value	Total score
Asymmetry of breasts	3 [2; 3]	3 [2; 3]	0.787	3 [2; 3]
Breast shape	3 [2; 3]	3 [2; 3]	0.555	3 [2; 3]
Nipple deformation	0 [0; 2]	0 [0; 2]	0.961	0 [0; 2]
Skin condition	2 [2; 3]	2 [1; 3]	0.418	2 [1; 3]
Wound scar	2 [2; 3]	2 [2; 3]	0.689	2 [1; 3]
Total score	11 [9; 11]	10 [9; 11]	0.575	10 [9; 11]

Table 5: Pearson's correlation between age, BMI and education level and preoperative and PO BRASS and RSES scores.

Score time	BRASS score				RSES score			
	Preoperative		Postoperative		Preoperative		Postoperative	
Variables	r	p	r	p	r	P	r	P
Age (years)	-0.566	0.005	0.533	0.009	0.618	0.002	-0.625	0.001
BMI (kg/m^2)	-0.424	0.044	0.221	0.310	0.113	0.607	0.119	0.588
Education levels	0.392	0.064	-0.142	0.518	-0.522	0.011	0.278	0.198

BRASS: breast reduction assessed severity scale; RSES: Rosenberg self-esteem scale; BMI: body mass index

Table 6: Postoperative patients' satisfaction scorings.

Measurements and score	Number (%)	Median (IQR)
Aesthetic satisfaction		
3	4 (17.4)	3 [3-4]
4	10 (43.5)	
5	9 (39.1)	
Overall patients' satisfaction		
5	1 (4.3)	10 [9-11]
6-9	6 (26.1)	
10-12	16 (69.6)	

DISCUSSION

All mammoplasties were conducted using the inferior pedicle with inverted-T (wise pattern reduction) which allowed removal of the redundant breast tissue through hidden scar. The approach also allowed removal of a mean weight of breast tissue of 2778.3 (±307.7) gm without compromising the NAC vasculature and with minimal mild PO wound-related complications. Concerning breast measurements, the applied surgical procedure allowed significant reduction of preoperative breast measures and volume by about 38.7% with subsequent reduction of the size of the bra. The significantly reduced SN-N (by 27.8%) and C-N (by 32.75) measurements lead to elevation of the breast with reduction of N-IMF by 32.8% and increased projection of the breast mound by 31.4% and nipple by 35.4%. These changes in measurements regained the feminine appearance of the anterior chest which significantly improved women's satisfaction by the aesthetic outcome.

In support of the efficacy of the applied approach, Antony et al considered wise pattern inferior pedicle reduction mammaplasty (RM) as the gold standard for comparison and found superomedial pedicle vertical scar breast reduction resulted in excellent functional and aesthetic outcomes without significant difference in complication rates in comparison to the inferior pedicle RM.[12] Also, in a comparative study, Kemaloğlu and Özocak, reported that both inferior and superomedial pedicle RM in

gigantomastic patients provided acceptable aesthetic outcomes with no significant differences.[13] In another series, Baslaim et al found inferior pedicle RM is safe procedure for patients with significant macromastia.[14] Thereafter, Kulkarni et al documented that RM is a safe, effective treatment for macromastia even in adolescents with non-significant differences between Wise and vertical patterns as regards complication and satisfaction rates.[15] Recently, Bustos et al documented the efficacy of the inferior pedicle RM for patients with macromastia as it offers low risk of necrosis and can be safely performed regardless of the N-IMF distance.[8]

Macromastia, irrespective of etiology, represented both physical and psychological burden for women especially young females and during active life period as evidenced by the negative significant correlation between patients' age, educational status and education level, on one-side and scores of Rosenberg self-esteem scale (RSES) and breast reduction assessed severity scale (BRASS) on the other side. In support of this assumption, the reported significant difference between preoperative and postoperative RSES and BRASS scores and the inverted correlations. Moreover, PO aesthetic outcome using the ABNSW score, as objective evaluation, was good and patients' satisfaction scorings of aesthetic outcome were high indicating that patients were satisfied by overall outcome of reduction mammoplasty and the applied surgical procedure.

These findings indicated the positive feedback effect of RM on patients' psychological status and go in hand with Lewin et al who reported that RM alleviates or minimizes macromastia-associated pain, improves or normalizes health and psychosocial self-esteem especially in women with high preoperative breast volumes and long SN-N distances who documented more satisfaction with the PO cosmetic result than women slightly obese or had average weight with breast volume about 1000 ml.[16] Moreover, Krucoff et al and Nuzzi et al found RM patients especially young women experience excellent breast-related QoL with high satisfaction with breasts and sexual well-being.[17,18] Crittenden et al reported statistically significant improvements in satisfaction with breasts, psychosocial well-being, sexual well-being and physical well-being scorings of patients with breast hypertrophy after RM in comparison to preoperative scores.[19] Recently, Silhol et al reported an inverse correlation between breast volume and sensibility in the preoperative evaluation, but disappeared after RM and Lin et al found the QoL of women underwent RM is significantly improved with special regard to pain, physical function and psychological function, and concluded that RM is an effective treatment for symptomatic breast hypertrophy.[20,21]

Limitations

Limitations of this study are being it is a single center and need multicenter study for comparisons.

CONCLUSION

Breast hypertrophy constitutes a physical and psychological burden on women especially young women. RM significantly improved women QoL, aesthetic appearance and psychological status. Inferior pedicle with inverted T-mammoplasty is a safe, and applicable pattern of mammoplasty, allow significant reduction of breast volume with improved measurements and projection and provide good-to-satisfactory aesthetic outcome that was well satisfactory.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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