Clinical and Experimental Evaluation of Delayed Lipomodelling after Breast Cancer Surgeries

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ABSTRACT

Background: *The sequelae of conservative treatment of breast cancer are difficult to treat. Lipomodelling offers a new treatment option, consisting of transferring to the deformed breast, fatty tissue that has been meticulously harvested and prepared. We evaluated the efficacy, complications and esthetic outcomes of lipomodelling after breast cancer surgeries and the oncological safety on experimental level.* ***Material and Methods:*** *The study included 50 female patients undergoing delayed lipomodelling after breast cancer surgery using the Coleman technique. Patients, after mastectomy or breast conservative surgery with tissue defect and/or deformities, will undergo delayed lipomodelling at least 6 months after completion of radiotherapy. Experimental study on Balb C white female mice, included lipofilling after mastectomy of induced breast cancer.* ***Results:*** *Sixty five sessions were carried out on 50 patients from September 2013 to June 2015.The mean of total amount of pure fat injected was 179.31 ± 99.17 ml for all sessions. The mean follow up duration was 15.38 ± 5.37 months. Complications were minimal; mainly fat necrosis after 15 sessions. Local recurrence occurred in one case. Patients' and doctor satisfaction were evaluated and esthetic outcomes were assessed by the BCCT.core (Breast Cancer Conservation Treatment. cosmetic results) software program. On experimental pre-clinical study, no local recurrence occurred in Balb C mice in all lipofilling specimens excised after mastectomy for breast cancer.* ***Conclusion:*** *Lipomodelling of the breast is safe, simple, cheap and feasible technique with low rate of complications and does not affect the radiological follow up after breast cancer surgery.*

Keywords: *Breast cancer, Lipomodelling, Local recurrence, Coleman's technique.*

INTRODUCTION

The indication of lipofilling technique for breast reconstruction is extending and evolving. Most authors favor this procedure in delayed breast reconstruction to correct secondary defects after breast cancer reconstruction or to treat tissue damages and deformities after radiotherapy. [(1)]

The psychological impact of surgery in breast cancer patients is multi-factorial; the cosmetic result and body image being as important as the fear of cancer recurrence. Better cosmetic result usually produces a better psychological outcome. Lipomodelling offers a fresh and promising cosmetic solution to these patients. [(2)]

Fat is viewed as the ideal filler, it is soft, non-allogenic, widely available, easily collected, and transplantation is straightforward with minimal morbidity. Early experience noted that graft re-absorption was the main drawback, with 50-90% graft loss.[(3,4)] First, a direct reduction in the number of viable adipocytes occurs, followed by further volume loss with resorption of oil cysts from non-viable adipocytes.[(5)]

A degree of fat resorption occurring in almost all cases of lipomodelling, constitutes a major disadvantage, and may necessitate repeating the procedure. Experimental studies have found that up to 90% of transplanted adipose tissue could be lost,[(6)] while clinically reported figures range between 40 and 60 %.[(4, 7)] Most of the volume loss occurs within the first 4-6 months following surgery.[(7, 8)]

In recent years, advanced radiologic screening techniques have made it easier for radiologists to distinguish between the changes associated with benign necrosis of breast tissue and changes associated with cancer. Knowledge of the appearance of the breast on mammography and ultrasonography and the evolution of patterns of

fat necrosis in patients who have undergone breast fat injection is mandatory in the evaluation of post-lipofilling breast lesions. [9]

Lipomodelling is based on introducing a transplanted graft capable of encouraging angiogenesis into a tissue bed that might harbor cancer cells. These could be residual cells following the original surgery or other microscopic foci of invasive or in situ disease. A new primary is also a possibility especially in those younger women with a history of previous breast cancer who are known to be at higher risk.[10]

The aim of this study was to evaluate the efficacy, complications and esthetic outcomes of delayed lipomodelling after mastectomy and breast conservative surgery and to determine the oncological safety of lipomodelling on experimental level.

MATERIAL AND METHODS

This study was carried out on 50 female patients admitted to the surgical department of Medical Research Institute Hospital, Alexandria University, from September 2013 to June 2015, after mastectomy and after breast conservative surgery with tissue defects and/or deformities at least 6 months after completion of radiotherapy.

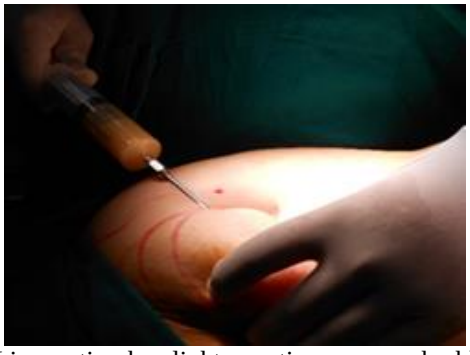
Preoperative assessment:

Complete clinical and radiological assessment (mammography and breast ultrasonography) of all cases was done. Moreover, the study was approved by the local Institutional Ethical Committee. Preoperative markings of both donor and recipient areas was done in the standing position.

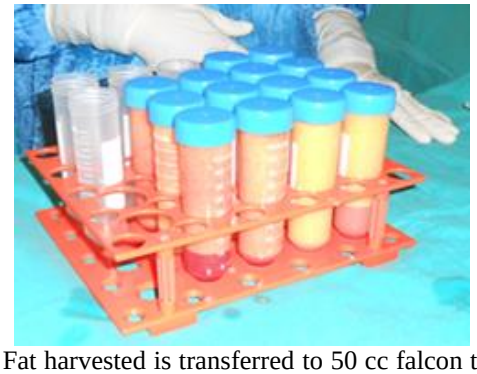
Surgical technique:

The technique used was Coleman's technique[11] consisting of 3 main steps: **(Figure 1)**

I. Fat harvesting. **(Figure 1 (A, B))**
II. Fat processing. **(Figure 1(C- E))**
III. Fat injection. **(Figure 1(F))**

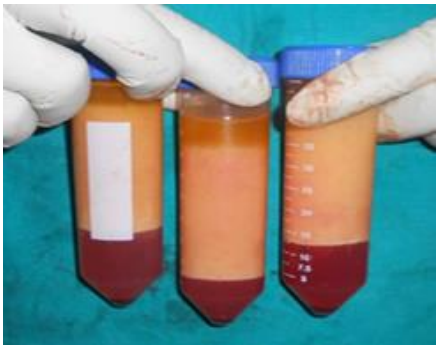


A- Liposuction by slight negative pressure by blunt tipped Coleman's cannula 2 mm mounted over 50 cc Luer Lock syringe.

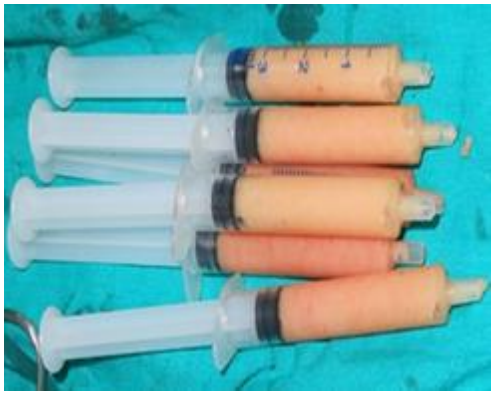


B- Fat harvested is transferred to 50 cc falcon tube ready for centrifugation

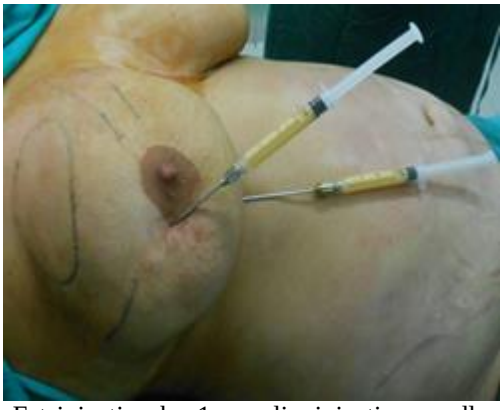
C- centrifugation at 3000 rpm for 3 minutes.



D- Fat is separated into 3 layers: upper oily layer, middle purified fat and lower blood and debris.



E- Purified fat is separated and transferred to 3 cc Luer Lock syringes



F- Fat injection by 1 mm lipoinjection needle on 3ml syringes on multiple levels and different directions.

Fig. 1: Coleman's Technique: is composed of three steps: I: Fat harvesting (A, B); II: Fat processing (C- E); III: Fat injection (F)

The need for a contralateral procedure was explained to the patients to get more symmetrical shape and more aesthetic results. Nipple Areola Complex (NAC) reconstruction was done either with the last session of lipofilling or separately as an outpatient procedure several months after lipofilling.

Clinical follow up:

To detect early post-operative complications such as infection, necrosis and hematoma to both donor and recipient areas. Also clinical examination at 3 and 6 months to detect any palpable lesions.

Radiological follow up:

Ultrasound and mammogram were performed after six months for assessment of breast to detect any complication such as oil cyst, fat necrosis, microcalcifications or local recurrence.

Patients' satisfaction: Was evaluated after 6 months by a questionnaire fullfilled by all patients.

Doctor satisfaction: The results were assessed by two surgeons by clinical examination and from the photographic records of each patient before and after the procedure.

Esthetic outcomes were evaluated by a computer system (BCCT.core) [12, 13] developed to evaluate the aesthetic results objectively and automatically, and this system is a standard method for assessing the cosmetic outcomes.

Animal laboratory work:

The aim of this experimental study was to identify the oncological safety of fat grafting on level of experimental animals as a pre-clinical study. The experimental animal study was done in the Animal Care Unit, Medical Technology Center, Alexandria University.

Step I- Breast cancer inoculation: (Figure 2 (A-D))

- 50 Balb C white female mice, at 3 months of age, were subcutaneously injected underneath the second left nipple by 0.1 ml of Ehrlich Ascites tumor cells (EAC) [14, 15] containing approximately 15-20 X 10^6 cells.
- The second and third mammary glands on the right side (contralateral) served as controls.
- Then, after apparition of tumor, mastectomy was done under general anesthesia.
- Mice were anaesthetized with ketamine 100 mg/kg BW and xylazine 10 mg/kg BW injected intraperitoneally.
- All mastectomy specimens were histopathologically examined.

Step II- Fat graft and analysis: (Figure 2 (E-H))

- All mastectomized mice were divided into 2 equal groups:

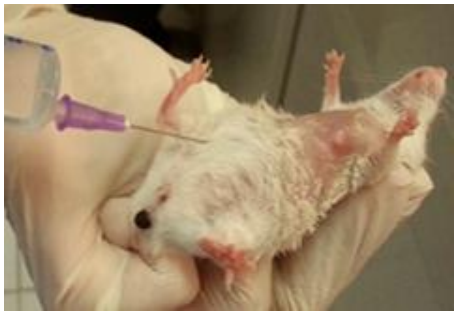
  Group A: mice have undergone autologous fat graft transplantation under the scar of mastectomy.

Group B: mice after mastectomy without fat graft transplantation for detection of local recurrence.

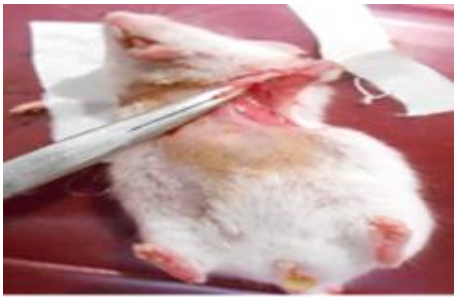
- In group (A) mice, one week after wound healing, mice were anaesthetized with ketamine 100 mg/kg BW and xylazine 10 mg/kg BW injected intraperitoneally and mice inguinal fat pads were isolated and 60 milligrams of the minced fat mixed with saline in a final volume of 0.1 ml was put in insulin syringe and injected subcutaneously under the scar of previous tumor site.
- Both groups were followed up for 3 months.
- Fat grafts in group (A) were followed up for graft survival, rejection, infection or local recurrence of breast cancer.
- The mice were killed using CO2 asphyxiation and cervical dislocation 12 weeks after grafting, after which grafted fat was excised from the mice and sent to pathological assessment for checkup the presence of malignancy or not at the injection site. The grafts were cut into 2 sections (cranial and caudal) and each placed in 10% neutral buffered formalin and gently shaken for approximately 48 hours, allowing for the tissue to fix. The samples were then embedded with paraffin, sectioned, and stained with H&E.

The incidence of local recurrence was compared between both groups.

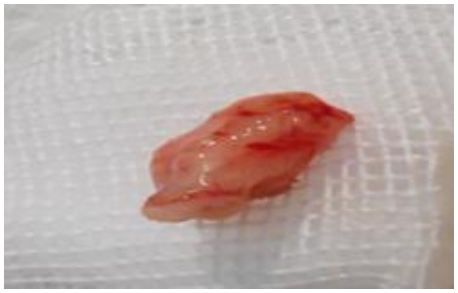
A- 0.1 ml of Ehrlich Ascites tumor cells (EAC) subcutaneously injected underneath the second left nipple.



B-Mouse 2 weeks after EAC injection and tumor apparition under the left second nipple were anaesthetized for mastectomy.



C- After mastectomy, wound was closed with 3/0 silk suture.

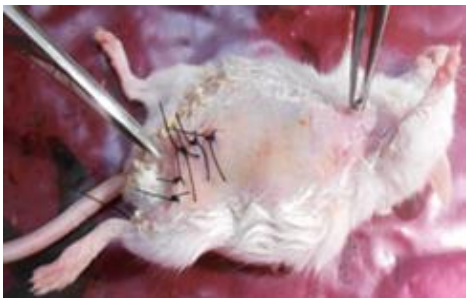


D- The mastectomy specimen prepared and sent to pathology department.

Fig. (2) Step I- Breast cancer inoculation (A-D)

E- Inguinal pad of fat isolated from mastectomized mouse.

F-Subcutaneous injection of prepared fat under the scar of previous mastectomy.



G- Donor site closed with 3/0 silk suture.

H- 3 months after fat injection the mouse was killed and excision of the fat graft was done, note the viability of fat and the neovascularization.

Fig. (2) Step II- Fat graft and analysis (E-H)

RESULTS

65 sessions were carried out on 50 patients from September 2013 to June 2015. The mean age of the studied patients was 39.94 years and the mean BMI was 29.42. According to the original operation, patients were grouped in 4 categories: Group I: 10 cases after BCS (Breast Conservative Surgery), Group II: 9 cases after Mastectomy, Group III: 16 cases after Mastectomy + Flap, Group IV: 15 cases after Mastectomy + Prosthesis. The pathology of the primary tumor was: invasive ductal carcinoma grade II in 80%, invasive ductal carcinoma grade III in 18% and invasive lobular carcinoma grade II in 2%.The stage was: 50 % stage IIB, 26% IIA, 12% IIIA, 8% I and 4% IIIB. The mean time from oncologic surgery to lipofilling was: 19.97 ± 12.74 months; the shortest period was 3 months, while the longest one was 102 months.88% have taken adjuvant radiotherapy, while 12% have not. The mean time after last radiotherapy setting prior to lipofilling was 14.26 ± 13.04 months.62% only have undergone previous breast reconstruction; 52% with immediate reconstruction, while 10% delayed reconstruction. Type of breast reconstruction was: 14% TRAM flap, 18% LD flap, 24% Prosthesis, 6% LD flap + prosthesis.

Operative evaluation of lipomodelling:

Indications for lipomodelling were: contour remodeling in 52.3%, symmetrization in 41.5%, post-surgical defect correction in 27.7%, mask implant rippling in 6.2%, complete breast reconstruction by lipofilling 30.8%, complete breast reconstruction by prosthesis and lipofilling in 32.3%. Most patients needed only one session of lipofilling 82%, two sessions in 12%, while three sessions were needed in 6%.The mean interval between sessions was 4.42 ± 2.35 months. The mean duration of operation was 128.54 ± 46.63 minutes. The donor site was the abdomen in 47.7%, the thigh in 21.5% and both thigh & abdomen in 30.8%.The mean of total amount of fat harvested was 504.69± 266.60 ml, while the mean of total amount of pure fat injected was 179.31 ± 99.17 ml for all sessions.

There was a statistically significant correlation in different groups between the amounts of fat harvested (P= 0.015) and the amount of pure fat injected (P= 0.010). The amount of fat harvested and injected for each session are demonstrated in table 1

Table 1 – Comparison between amount of fat harvested and amount of pure fat injected for each session.

Mean ± SD	**No.**	**Amount of fat harvested in ml**	**Amount of pure fat injected in ml**
Session 1	51	522.25±255.74	182.84±88.74
Session 2	10	497.00±318.82	184.50±140.29
Session 3	4	300.0 ± 244.95	121.25 ± 121.27

Lipomodelling after breast conservative surgery (BCS): for defect correction, contour remodeling and symmetrization.(**Figure 3)**

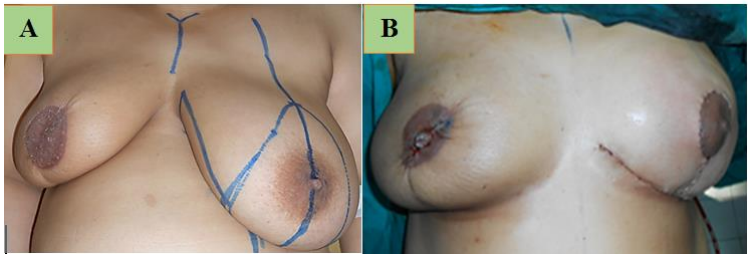


Figure (3) – A- Preoperative frontal view with central defect of right breast after BCS. **B-**Postoperative frontal view after lipomodelling and injection of 130 ml of fat in one session and right NAC reconstruction and contralateral superior pedicle reduction mammoplasty for symmetrization.

II- Lipomodelling after mastectomy (staged)

1. **Lipomodelling after modified radical mastectomy (MRM):** for complete breast reconstruction. (**Figure 4 (Sessions 1, 2, 3))**

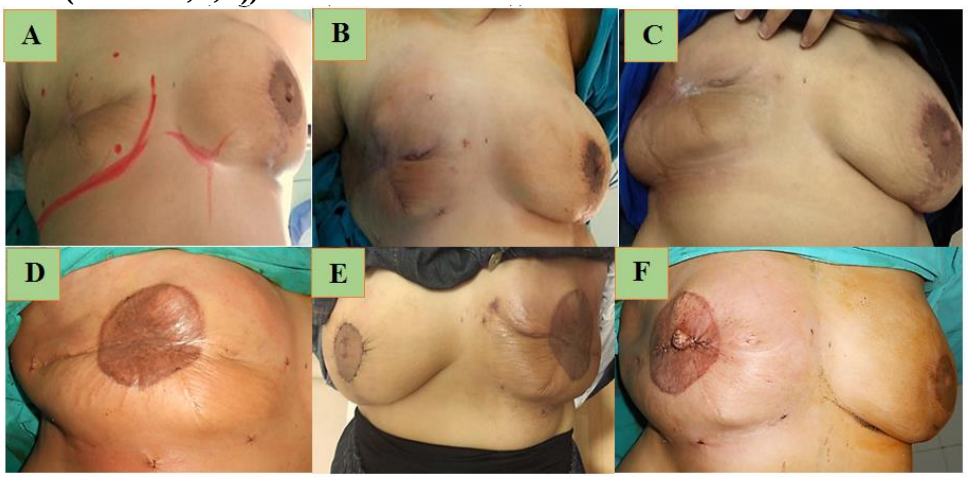


Figure (4) – (session 1) - A- Preoperative frontal view after right SSM and removed prosthesis. **B-** Postoperative frontal view immediately after lipomodelling and injection of 200 ml of fat. **C-**Postoperative frontal view after two months.

(Session 2) – three months later D- Postoperative frontal view immediately after lipomodelling and injection of 410 ml of fat and areola tattoo. **E-** Postoperative frontal view after one month and left Lejour mastopexy.

(Session 3) - F- Postoperative frontal view immediately after lipomodelling and injection of 240 ml of fat.

2. **Lipomodelling after mastectomy with previous reconstruction with musculocutaneous flap:** for symmetrization and contour remodeling.(**Figure 5, 6)**
3.

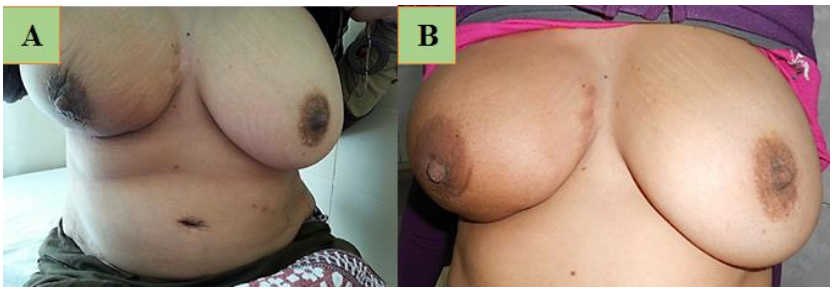


Figure (5) – A- Preoperative frontal view after right NSM and TRAM flap. **B-** Postoperative frontal view, after three months after, lipomodelling and injection of 200 ml of fat in one session.

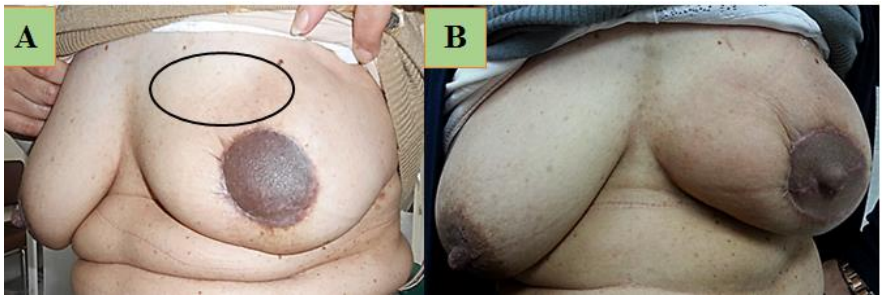


Figure (6) – A-Preoperative side view with smaller volume of left breast and defect at the upper half after left SSM and LD flap and areola tattoo.
B-Postoperative frontal view, after three months after, lipomodelling and injection of 210 ml of fat in one session and NAC reconstruction.

4. **Lipomodelling after nipple sparing mastectomy with implant reconstruction:** for symmetrization and contour remodeling and to mask implant rippling **(Figure 7)**
5.

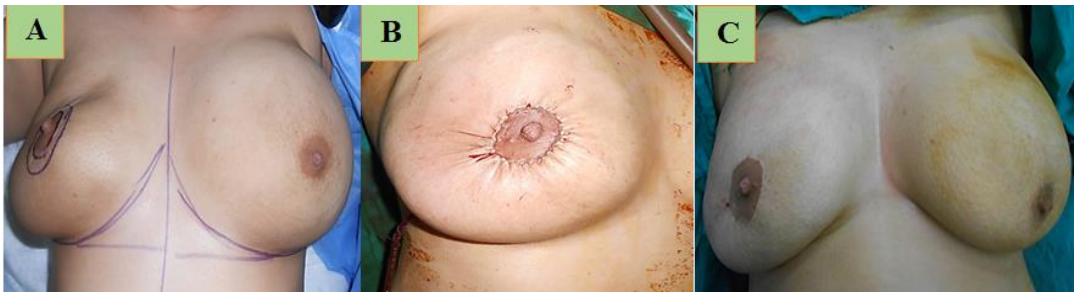


Figure (7) (session 1) – A- Preoperative frontal view after right NSM and prosthesis and capsular contraction and defect at UOQ. **B-**Postoperative frontal, after first session and injection of 400 ml of fat and removal of prosthesis and capsulotomy. **(Session 2) – three months later C-** Preoperative frontal view with defect at UOQ after second session and injection of 150 ml of fat.

Follow up:

The mean follow up duration was 15.38 ± 5.37 months; the minimum period was 6 months and the maximum period was 24 months.

Complications: (Table 2)

The mean time from lipomodelling to appearance of fat necrosis was 4.27±1.16 months. Fat necrosis was excised after its appearance in 12 sessions (18.5%) of lipofilling.

Table 2 – Donor and recipient complications.

Complications	**Group I (n= 13)**		**Group II (n= 12)**		**Group III (n= 20)**		**Group IV (n= 20)**		**Total (n= 65)**	
	No.	**%**	**No.**	**%**	**No**	**%**	**No**	**%**	**No.**	**%**
Donor site										
Ecchymosis	13	100	12	100	18	90.0	18	90	61	93.8
Altered sensation	0	0.0	1	8.3	4	20.0	2	10	7	10.8
Hematoma	0	0.0	0	0.0	1	5.0	1	5.0	2	3.1
Recipient site										
Fat necrosis	0	0.0	4	33.3	5	25.0	6	30	15	23.1
Seroma	0	0.0	0	0.0	0	0.0	2	10	2	3.1
Infection	0	0.0	0	0.0	0	0.0	1	5.0	1	1.5
Local recurrence	0	0.0	1	8.3	0	0.0	0	0.0	1	1.5
Ecchymosis	1	7.7	1	8.3	2	10.0	0	0.0	4	6.2

Radiological follow up:

Radiological findings were: microcalcifications in 3 sessions (4.6%), oil cysts in 6 sessions (9.2%) and fat necrosis in15 sessions (23.1%) (11 cases).**(Table 3)**

Table 3 –Radiological follow up.

Radiological follow up	**Group I (n= 13)**		**Group II (n= 12)**		**Group III (n= 20)**		**Group IV (n= 20)**		**Total (n= 65)**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Microcalcifications	0	0.0	1	8.3	1	5.0	1	5.0	3	4.6
Oil Cyst	0	0.0	1	8.3	2	10.0	3	15.0	6	9.2
Fat necrosis	0	0.0	4	33.3	5	25.0	6	30.0	15	23.1

Local Recurrence:

Local recurrence, with the same histologic subtype of the primary tumor, occurred in 1 case (2%) which performed 2 sessions of lipofilling (10 months in-between) 27 months post MRM and after 5 months of the second session of lipofilling.**(Table 4)**

Table 4 –Local Recurrence and Distant metastasis.

Local Recurrence	**Group I (n= 10)**		**Group II (n= 9)**		**Group III (n= 16)**		**Group IV (n= 15)**		**Total (n= 50)**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
No	10	100	8	88.9	16	100	15	100	49	98
Yes	0	0.0	1	11.1	0	0.0	0	0.0	1	2.0

Esthetic evaluation:

- **Patients' satisfaction:** by a questionnaire full filled by all patients. **(Table 5)**

Table 5 – Patients' satisfaction.

Patients' satisfaction	Group I (n= 10)		Group II (n= 9)		Group III (n= 16)		Group IV (n= 15)		Total (n= 50)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Very satisfied	6	60.0	3	33.3	5	31.3	2	13.3	16	32.0
Satisfied	2	20.0	3	33.3	7	43.8	8	53.3	20	40.0
Unsatisfied	1	10.0	2	22.2	4	25.0	2	13.3	9	18.0
Very unsatisfied	1	10.0	1	11.1	0	0.0	3	20.0	5	10.0

- **Doctor satisfaction** was evaluated by two different surgeons by clinical examination and from the photographic records of each patient before and after the procedure. **(Table 6)**

Table 6 –Doctor satisfaction.

Doctor satisfaction	Group I (n= 10)		Group II (n= 9)		Group III (n= 16)		Group IV (n= 15)		Total (n= 50)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Excellent	5	50.0	1	11.1	4	25.0	3	20.0	13	26.0
Good	3	30.0	6	66.7	8	50.0	5	33.3	22	44.0
Fair	2	20.0	1	11.1	3	18.8	3	20.0	9	18.0
Insufficient	0	0.0	1	11.1	1	6.3	4	26.7	6	12.0

- There was a statistically significant correlation between patients' satisfaction and doctor satisfaction (P value <0.001).
- Using the BCCT.core program, there was a statistically significant correlation between the esthetic results in different groups of patients (P value = 0.007).**(Table 7)**

Table 7 –Esthetic results by BCCT core program.

Esthetic results by BCCT core program	Group I (n= 10)		Group II (n= 9)		Group III (n= 16)		Group IV (n= 15)		Total (n= 50)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Excellent	4	40.0	0	0.0	0	0.0	1	6.7	5	10.0
Good	4	40.0	3	33.3	11	68.8	5	33.3	23	46.0
Fair	2	20.0	6	66.7	5	31.3	5	33.3	18	36.0
Poor	0	0.0	0	0.0	0	0.0	4	26.7	4	8.0
χ^2(^{MC}p)	18.125*(0.007*)									

Results of animal laboratory work:

- The mean time of tumor appearance was10.75 days ranging from 7-14 days.
- 5 mice (10%) didn't develop any tumor after injection of EAC and 5 mice (10%) developed advanced tumor attached to chest wall and were excluded from the study.
- All mastectomy specimens of 40 mice (80%) showed malignant transformation in breast tissues excised.**(Figure 8)**
- 6 mice died during the first postoperative week after mastectomy.
- All mastectomized mice (34 mice) 68% were divided into 2 equal groups:
- **Group A:** 17 mice (34%) have undergone autologous fat graft transplantation under the scar of mastectomy.

- **Group B:** 17 mice (34%) after mastectomy without fat graft transplantation for detection of local recurrence.
- No local recurrence or rejection after fat graft transplantation was clinically detected over 3 months in both groups. Infection occurred in 2 mice (11%) and graft survival clinically observed revealed decrease in size by 50% over 3 months in 7 mice (41.1%).
- Histopathological examination of fat grafts (of 17 mice of group A) excised after 3 months of fat injection revealed no malignancy in all specimens.**(Figure 8)**.

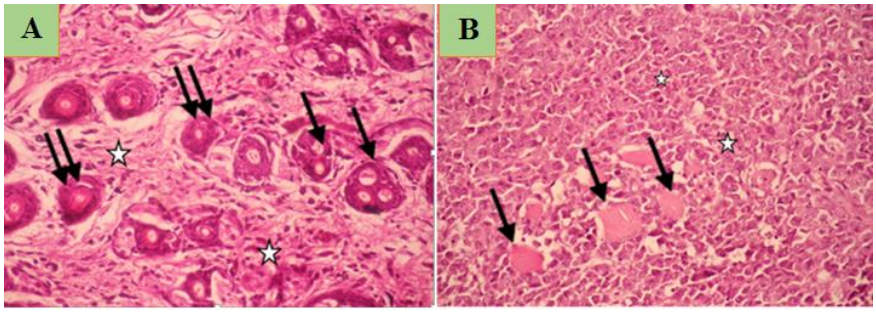


Figure (8) – A- Histopathological section of malignant breast tumor induced by Ehrlich tumor cells showing malignant polyadenoid nests (↓) and ductular units (*) lined by pleomorphic and hyperchromatic cells forming infiltrating ductal carcinoma Grade I. Intervening stroma (↓) is fibrocellular with mild lymphocytic infiltrate. (H&E X300) **B–** Histopathological section of breast tissue post-excision of lipofilling showing extensive tissue infiltration by nests of foamy histiocytes (↓↓) entangling scattered multinucleated giant cells (*) No residual tumor cells are identified (H&E X300)

DISCUSSION

The lipofilling technique has been used since many years and becomes rapidly popular especially in esthetic surgery. Breast reconstruction is also widely proposed to reduce the disabling effects of the mutilation. [16-18] Lipofilling can be associated to the usual techniques of breast reconstruction to improve the symmetry and the final cosmetic result. Fat grafting can also be performed to improve the cosmetic results of the conservative treatment, particularly in case of defect resulting from the tumorectomy followed by the radiotherapy. [8,19-21]

The main drawback after lipomodelling is fat resorption that occur in almost all cases, constituting a major disadvantage, and may necessitate repeating the procedure. In our study, the mean absorption rate subjectively measured by the patient and the doctor after 6 months was 36.30 ± 10.87%. In the work of Coleman [8] and Delay [7] the clinically reported absorption rate was 40-60% occurring almost in the first 4-6 months. This can be addressed through:

Replacing the lost volume. Repeated procedures have proven to be effective with intervals of 4-5 months necessary to the maximum volume resorption to occur. [22]

(b) Following the standardized procedure proposed by Delay and Coleman including the basic principles: minimal trauma, low aspiration pressures and small pulses of injections. [23]

In our study, the donor complications were: ecchymosis 93.8%, altered sensation 10.8% and hematoma 3.1%. The recipient complications were: fat necrosis 23.1%, ecchymosis 6.2%, seroma 3.1 %, infection 1.5% and local recurrence 1.5%.Complications appear to be minimal with proper use of the technique. Delay [7] & Gutowski [24] showed that acceptable complication rates in current experienced and competent practice are infection 0.6-1.1%, calcifications 4.9%, and fat necrosis 3-5.7-15%.

Our radiological findings were: microcalcifications 4.6%, oil cysts 9.2% and fat necrosis 23.1%. Fat necrosis may occur, and can be due to over-injection and/or pooling of fat and resultant ischemia. Palpable masses resulting from fat necrosis may be difficult to distinguish

clinically from local recurrence in breast cancer patients, and lead to a need for additional imaging and needle biopsy.

In the work of Delay[25] over 14 years and following 1440 procedures showed that imaging in the majority of reconstructed breasts was normal, with some images of oily cysts and fat necrosis. All of the images demonstrated benign lesions that could be easily distinguished from suspicious lesions.

Several clinical and experimental studies have been conducted evaluating the safety of fat grafting to a breast after breast cancer treatment. In our study, local recurrence, with the same histologic subtype of the primary tumor, occurred in 1 case (2%) which performed 2 sessions of lipofilling (10 months in between) post modified radical mastectomy (MRM) and local recurrence occurred as small nodule after 5 months of the second session of lipofilling and 27 months after MRM.

The 2011 Milan–Lyon–Paris multicenter study by Petit et al. [26] reported the oncological outcome of 513 breast cancer patients who underwent lipomodelling from 2000 to 2010. This study reported a locoregional recurrence (LRR) incidence rate of 1.50 % per year for all patients and 1.38 vs. 2.07 % when analyzing the mastectomy and BCS patients separately. In addition, higher LRR incidence rates were also found when confining the analysis to carcinomas-in-situ versus invasive carcinoma— 2.33 vs. 1.44 %, respectively.

The retrospective cohort by Petit et al.[27] represents the highest level of evidence currently available on the oncological safety of lipomodelling performed in breast cancer patients (level 2b). Ultimately there were no significant differences between the lipomodelling and control groups in terms of locoregional or distant cancer recurrence events.

Illouz [9] evaluated 820 patients over 25 years undergoing breast fat grafting and found no recurrences in the group of 30 patients with previous BCT.

Long term oncological follow up by Delay [25] over 14 years (1440 procedures) concluded no increased risk of local recurrence after mastectomy or after conservative management.

The aim of lipomodelling was to maximize the esthetic outcomes; we estimated Patients' satisfaction by a questionnaire full filled by all patients, 32% were very satisfied, 40% satisfied, 18% unsatisfied and 10% very unsatisfied. Patients' self-evaluation of results score was: better in 68%, unchanged in 28% and worse in 4% by a questionnaire including: consistency, size, shape, sensitivity, quality of skin and irregularities. Doctor satisfaction were evaluated by two different surgeons by clinical examination and from the photographic records of each patient before and after the procedure. The results were: excellent in 26%, good in 44%, fair in 18% and insufficient in 12%.For better assessment of esthetic results, we used the BCCT.core program; the esthetic results were: excellent in 10%, good in 46%, fair 36% and poor in 8%. In the work of Zheng et al. [29] including 66 patients, patients' satisfaction was: 40.9% very satisfied 39.4% satisfied, 19.7% not satisfied and doctor satisfaction was: 42.4% significant improvement, 36.4% moderate, 21.2% none. Our results were close to the results of Zocchi & Zuliani[30] including 181 patients, patients' satisfaction was:23% Excellent, 72% good, 6% fair, 3% insufficient and doctor satisfaction was:13% Excellent, 69% good, 12% fair, 6 % insufficient.

In our expermintal study, we used mice because mice are a good model for human breast cancer because they have naturally occurring mammary tumors that can be studied. Mice also share similar hormones and enzymes that function in the same manner as in humans such as COX-2; this enzyme is involved in the processes of malignant transformation and tumor progression.[31] Fat injections in Balb C white mice didn't show local recurrence after fat graft transplantation in the mastectomy bed of induced breast cancer in all mice (17 mice), although this was a small sample size, but gave us trust about the oncological safety of lipofilling after breast cancer surgery.

CONCLUSION

Lipomodelling of the breast is safe, simple, cheap and feasible technique presenting a good alternative to muscle flaps and implant breast reconstruction. Although, complete breast reconstruction by lipomodelling after mastectomy is possible, it needs multiple sessions and patient compliance. Post-operative radiological images of calcifications or fat necrosis frequently occur after lipomodelling and expert radiologist can

differentiate them from local recurrence to avoid unnecessary biopsies. Lipomodelling is a safe procedure with no clinical evidence of increased cancer recurrence.

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