

Inverted T versus Classical Abdominoplasty after Massive Weight Loss

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Abstract

Background: Obesity is a morbid condition that deeply impacts the social lifestyle and health of individuals.

Aim: To compare the inverted T-abdominoplasty (Fleur-de-lis) and traditional abdominoplasty techniques following weight loss and to select the most suitable technique for removing excess abdominal skin and subcutaneous tissue for improved function and aesthetics.

Patients and methods: This was prospective research including 40 patients aged between 25 and 50 years old with BMI up to 40kg/m² were admitted to the plastic surgery department of Al-Zahraa University Hospital during the Period from September 2019 to September 2022.

Results: The 4 patients (20%) had complications in the form of: hypertrophic scar (5%), lower abdomen flap necrosis (5%) and wound infection + dehiscence (10%) in FDL group, comparing to 5 patients (25%) had complications in the form of: hypertrophic scar (5%), seroma (10%) and wound infection + dehiscence (10%) within classic group, statistically insignificant variance was discovered among groups, with $p\text{-value} > 0.05$. Also showed that statistically insignificant variance was discovered among groups according to Drains off (days) and Period of hospital stay (day) with $p\text{-value} > 0.05$, and statistically insignificant variance was discovered among groups regarding the creation of waist, with $p\text{-value} > 0.05$.

Conclusion: Inverted T abdominoplasty is recommended for post-mass weight loss cases with significant upper midline abdominal excess. It offers comparable safety and contouring to classic abdominoplasty, with similar improvements in waist-hip ratio. FDL abdominoplasty is preferred for vertical and horizontal excess skin.

Keywords: Obesity; Inverted T; Classical; Abdominoplasty

1. Introduction

Obesity is a morbid condition that deeply impacts the social lifestyle and health of individuals.^{1,2}

1st -line therapies consist of lifestyle modifications, improved physical activity, and low-calorie diets with little fat. Bariatric surgery is the only viable approach in the most severe and complicated cases.^{3,4}

An elevated risk of mortality and morbidity is correlated with obesity, which is characterized as a body mass index (BMI) equal to or higher than thirty. Massive weight loss (MWL), which is defined as a weight decline of one hundred pounds (around 45.45 kilograms) or more, is frequently the result of bariatric surgery.

Excess skin and fatty tissue redundancy in

the trunk, buttocks, breasts, thighs, and arms are the result of weight loss. The dramatic weight loss leads to a reduction of fat in various compartments of the body.⁵

The most prevalent complaint among cases considering plastic surgery following massive weight loss is abdominal contour deformities. Abdominoplasty is the 5th most frequently performed cosmetic surgical method, as per the American Society of Plastic Surgeons. The anterior redundancy can involve both horizontal and vertical components, particularly in the epigastric region. Additionally, in traditional abdominoplasty, this region can necessitate a vertical skin excision for correction. This procedure is frequently referred to as inverted T (fleur-de-lis) abdominoplasty.⁶

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In the fleur-de-lis (FDL) method, supra umbilical horizontal excess skin should be removed by vertical excision, in addition to the skin designed to be removed in traditional abdominoplasty infra umbilically. The surgery derived its name from the first stitch, bringing the flaps together with a supra pubic incision in the midline, giving the appearance of an FDL pattern (lily flower). The FDL technique used following massive weight loss improves abdominal girth as well as upper abdominal contour.⁷

Contouring techniques shouldn't be started till weight loss is completed and has maintained a consistent level for at least six months. This usually occurs 12 months after bariatric surgery or dieting and exercises.⁸

The aim of this research was to compare inverted T-abdominoplasty (fleur-de-lis) and traditional abdominoplasty techniques following massive weight loss. Also, to choose the proper technique suitable for removing excess abdominal skin and subcutaneous tissue with increased musculoaponeurotic strength after massive weight loss for improving function and aesthetic result.

2. Patients and methods

This was prospective research, including 40 patients aged between 25-50 years old with a BMI up to 40 kg/m² who were admitted to the plastic surgery department of Al-Zahraa University Hospital during the Period from September 2019 to September 2022. The cases have been classified into two groups: Group A, which involved 20 cases suffering from vertical and horizontal excess skin and subcutaneous tissue correlated with anterolateral abdominal wall musculofascial laxity following MWL. Fifteen patients lost weight by sleeve operation and gastric banding, and the other 5 patients lost weight through diet and exercise. This group was subjected to inverted T abdominoplasty (FDL); group B Included 20 cases suffering from vertical skin and subcutaneous tissue excess associated with anterolateral abdominal wall musculofascial laxity following MWL. Ten patients lose weight through sleeve operation and gastric banding, and the other 10 patients lose their weight through diet and exercise. This group was subjected to classic (traditional) abdominoplasty. All cases of both groups were followed up for 6 months postoperatively.

Inclusion Criteria: Healthy individuals with their age ranging between 25 and 50 years, male or female patients, BMI up to 40 kg/m², and weight should have been stable for at least 1 year.

Exclusion criteria: BMI above 40 kg/m², patients with weight fluctuation, chronic diseases

such as diabetes mellitus (DM), cardiac, liver, and renal diseases, patients with endocrinal diseases, and patients with bleeding disorders.

Methods

All patients were subjected to preoperative history, clinical, physical examination, investigations, and evaluation. All patients were photographed in anteroposterior, lateral, and diverging position views pre- and postoperatively.

Inverted T Abdominoplasty (FDL) technique

Preoperative markings were performed with the case standing and confirmed in the supine position. The midline was extended, a transverse incision was determined, and the vertical component of abdominoplasty was noticed as an inverted "V" triangle for reducing abdominal girth and creating a beautiful waist. The patient underwent a surgical procedure, which involved infiltrating skin and subcutaneous tissue with saline adrenaline solution. The procedure began 20-30 minutes after infiltration, and the umbilical stock was circumscribed and isolated. The skin and subcutaneous fat flap were divided along the midline, and the operating table was flexed to 20-30 degrees. The redundant skin and subcutaneous tissue were excised, and a midline plication was performed to tighten the fascia and narrow the waistline. Good hemostasis was achieved using electrocautery and ligation of large perforators. The umbilicus was brought out in the standard midline vertical closure, and the umbilicus was secured with 3/0 vicryl sutures. Compressive dressing has been utilized after the procedure.

Traditional abdominoplasty technique

Markings were done with the patient standing. A vertical line was drawn from the xiphoid process above to the vulvar commissure below in females or the root of the penis in males in the midline. The patient underwent a surgical procedure, which involved incisions and infiltration of skin and subcutaneous tissue. The procedure began with an infiltration of the umbilical stock, followed by a lower curvilinear incision in the suprapubic region. The weakened area of the anterior rectus sheath has been marked and plicated utilizing non-absorbable sutures. Excess skin and subcutaneous tissue were excised, and stay sutures were made in the midline. The umbilicus was pulled out through a V-shaped incision and sutured with 3/0 vicryl sutures. Two closed suction drains were used, and wound closure was performed in two layers without tension. The umbilicus was packed with vaselinated gauze. A sterile dressing and pressure garment have been utilized.

Postoperative care: The case has been placed in a semi-sitting position for the first week, and antibiotics have been continued for the first five

days. Early ambulation was encouraged after 6 hours. Suction drains were monitored and removed after 5-7 days. Postoperatively, patients were given an abdominal corset, which they were instructed to wear 24 hours a day. Stitches were removed, and patients were instructed to return to normal activity after one month.

Postoperative monitoring: All cases have been followed up every week during the 1st month and every month for the next 6 months. During the follow-up visit, the following items were observed and documented for infection and seroma, wound dehiscence, flap and umbilicus viability, scar quality, patient satisfaction, and physical and psychological outcomes.

Ethical consideration

The ethical committee of the university approved the study protocol in 2019. Informed consent was taken after discussion of the procedure and its implications for all of them.

Statistical Analysis

We used the statistical package for social sciences, version 23.0 (SPSS Inc., Chicago, Illinois, USA), to analyze the recorded data. If the distribution of the quantitative data had been parametric (normal), it would have been expressed as mean \pm standard deviation and ranges. Conversely, non-parametric parameters have been expressed as median with inter-quartile range (IQR). Additionally, qualitative parameters have been expressed as percentages and numbers. The Kolmogorov-Smirnov and Shapiro-Wilk tests have been utilized to investigate the normality of the data. The following tests were carried out: The chi-square test and Fisher's exact test were applied to compare the qualitative data among the groups utilizing an independent-sample t-test. The confidence interval has been set to 95%, and the probability (P-value) has been calculated.

3. Results

Table 1 demonstrates statistically insignificant variance among groups regarding general characteristics about age and sex, with p-value > 0.05.

Table 1. Comparison among FDL group and Classic group regarding general characteristic.

GENERAL CHARACTERISTIC	FDL GROUP (NUMBER=20)	CLASSIC GROUP (NUMBER=20)	TEST VALUE	P-VALUE
AGE (YEARS)				
MEAN \pm STANDARD DEVIATION	39.90 \pm 7.19	39.45 \pm 5.92	0.216	0.83
RANGE	25-50	29-48		
SEX				
FEMALE	18 (90.0%)	16 (80.0%)	0.784	0.376
MALE	2 (10.0%)	4 (20.0%)		

Using: t-Independent Sample t-test for Mean \pm SD; when appropriate p-value >0.05 is insignificant, χ^2 : Chi-square test for Number (%) or Fisher's exact test

Table 2 showed that the FDL group had a significantly higher pre-weight loss than the classic group, with a weight loss of 144.90 \pm 23.73 compared to 130.30 \pm 16.70. The FDL group also had a significantly higher pre-weight loss in BMI (51.76 \pm 6.88) and excess weight (77.75 \pm 20.00) compared to the classic group (61.55 \pm 13.84). The weight loss percentage in the FDL group was 44.81 \pm 5.67 compared to 41.28 \pm 5.61 within the classic group. However, insignificant variance in weight at the time of abdominoplasty, height, BMI at the time of abdominoplasty, or obesity.

Table 2. Comparison among FDL group and Classic group regarding Baseline Features.

BASELINE CHARACTERISTICS	FDL GROUP (NUMBER=20)	CLASSIC GROUP (NUMBER=20)	TEST VALUE	P-VALUE
WEIGHT PRE LOSS				
MEAN \pm SD	144.90 \pm 23.73	130.30 \pm 16.70	2.25	0.030*
RANGE	110-197	108-160		
WEIGHT AT TIME OF ABDOMINOPLASTY				
MEAN \pm SD	79.60 \pm 13.47	76.90 \pm 14.54	0.609	0.546
RANGE	63-110	57.5-104		
HEIGHT				
MEAN \pm SD	1.67 \pm 0.08	1.69 \pm 0.06	-0.703	0.487
RANGE	1.5-1.86	1.58-1.8		
BMI PRE WEIGHT LOSS				
MEAN \pm SD	51.76 \pm 6.88	45.69 \pm 4.60	3.28	0.002*
RANGE	44.1-65.1	38.3-54.1		
BMI AT TIME OF ABDOMINOPLASTY				
MEAN \pm SD	28.48 \pm 4.21	26.95 \pm 4.56	1.099	0.279
RANGE	23-38	19.4-35.2		
OBESEITY				
HEALTHY	5 (25.0%)	9 (45.0%)	3.153	0.369
WEIGHT 18.5-24.9				
OVERWEIGHT 25-29.9	6 (30.0%)	7 (35.0%)		
OBESE GRADE 1 30-34.9	7 (35.0%)	3 (15.0%)		
OBESE GRADE 2 35-39.9	2 (10.0%)	1 (5.0%)		
WAY OF WEIGHT LOSS				
DIET	0 (0.0%)	8 (40.0%)	16.000	<0.001**
DIET AND EXERCISE	4 (20.0%)	0 (0.0%)		
GASTRIC BANDING	4 (20.0%)	0 (0.0%)		
SLEEVE	12 (60.0%)	12 (60.0%)		
EXCESS WEIGHT				
MEAN \pm SD	77.75 \pm 20.00	61.55 \pm 13.84	2.978	0.005*
RANGE	52-120	40-88		
WEIGHT LOSS				
MEAN \pm SD	65.30 \pm 16.02	53.40 \pm 7.60	3.002	0.005*
RANGE	45-107	46-72		
WEIGHT LOSS%				
MEAN \pm SD	44.81 \pm 5.67	41.28 \pm 5.61	2.08	0.047*
RANGE	35.6-58.3	35-50.9		

*p-value <0.05 is significant; **p-value <0.001 is highly significant

Table 3 showed a statistically significant greater mean value of weight of excised part "gm" in the FDL group was 2787.50 \pm 1206.33 compared to the classic group, which was 2015.00 \pm 430.45, with p-value=0.010. We discovered a statistically insignificant variance among groups regarding the time of operation "hrs", with a p-value of p > 0.05.

Table 3. Comparison among FDL group and Classic group regarding intraoperative.

INTRAOPERATIVE	FDL GROUP (NUMBER=20)	CLASSIC GROUP (NUMBER=20)	TEST VALUE	P-VALUE
TIME OF OPERATION/ HOURS				
MEAN±SD	3.01±0.31	2.83±0.42	1.565	0.126
RANGE	2.45-3.45	2.15-3.45		
WEIGHT OF EXCISED PART (GM)				
MEAN±SD	2787.50±1206.33	2015.00±430.45	2.697	0.010*
RANGE	800-5200	1200-2800		

Table 4 showed a statistically significant higher frequency of low waist grade in the FDL group, which was 12 patients (60%), compared to the classic group, which was 7 patients (35%), with p-value = 0.048. Also, there was statistically insignificant difference between groups in the number of days drains were off and the length of hospital stay (in days), with a p-value greater than 0.05. There was also statistically insignificant difference between groups in the number of days waists were made, with a p-value greater than 0.05.

Table 4. Comparison among FDL group and Classic group regarding Post Operative and according to Creation of waist and waist grade.

POST-OPERATIVE	FDL GROUP (NUMBER=20)	CLASSIC GROUP (NUMBER=20)	TEST VALUE	P-VALUE
DRAINS OFF (DAYS)				
MEAN±SD	6.50±2.09	6.30±1.03	0.384	0.703
RANGE	3-10	5-8		
PERIOD OF HOSPITAL STAY (DAY)				
MEAN±SD	6.50±2.09	6.30±1.03	0.384	0.703
RANGE	3-10	5-8		
CREATION OF WAIST				
BAD	1 (5.0%)	3 (15.0%)	1.444	0.486
EXCELLENT	15 (75.0%)	12 (60.0%)		
GOOD	4 (20.0%)	5 (25.0%)		
WAIST GRADE				
LOW	12 (60.0%)	7 (35.0%)	5.649	0.036*
MODERATE	5 (25.0%)	7 (35.0%)		
HIGH	3 (15.0%)	6 (30.0%)		

Table 5 showed that the 4 patients (20%) had complications in the form of hypertrophic scar (5%), lower abdomen flap necrosis (5%), and wound infection + dehiscence (10%) in the FDL group, compared to 5 patients (25%) who had complications in the form of hypertrophic scar (5%), seroma (10%), and wound infection + dehiscence (10%) within the classic group; statistically insignificant variance is discovered between groups, with p-value > 0.05.

Table 5. Comparison among FDL group and Classic group regarding Complications.

COMPLICATIONS	FDL GROUP (NUMBER=20)	CLASSIC GROUP (NUMBER=20)	TEST VALUE	P-VALUE
HYPERTROPHIC SCAR	1 (5.0%)	1 (5.0%)	3.032	0.552
LOWER ABDOMEN FLAP NECROSIS	1 (5.0%)	0 (0.0%)		
WOUND INFECTION AND DEHISCENCE	2 (10.0%)	2 (10.0%)		
SEROMA	0 (0.0%)	2 (10.0%)		
NO	16 (80.0%)	15 (75.0%)		

Table 6 showed that the higher frequency of excellent in the FDL Group was 15 patients (75%) compared with the classic group, which was 12 cases (60%); nevertheless, there was an insignificant variance between groups, with a p-value of 0.486.

Table 6. Comparison among FDL group and Classic group regarding to patient satisfaction.

PATIENT SATISFACTION	FDL GROUP (N=20)	CLASSIC GROUP (N=20)	TEST VALUE	P-VALUE
BAD	1 (5.0%)	3 (15.0%)	1.444	0.486
GOOD	4 (20.0%)	5 (25.0%)		
EXCELLENT	15 (75.0%)	12 (60.0%)		

Group (A) Inverted T Abdominoplasty (FDL

Obesity; Inverted T; Classical; Abdominoplasty

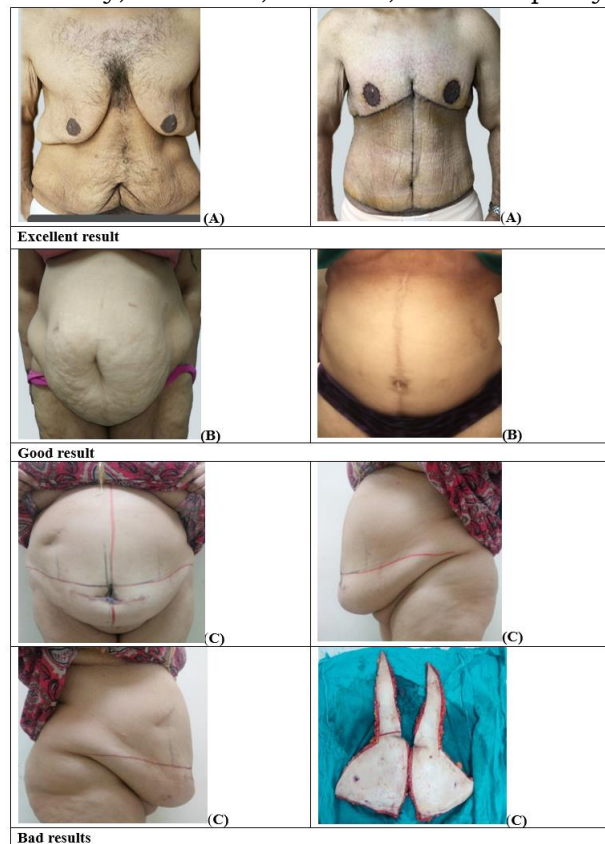


Figure 1. (A): Male patient, 31 years old, with BMI 25.54 kg/m². He weighed 197 kg before the sleeve procedure and lost 117 kg afterward. Excised part: 3100 gm. The image on the right shows the preoperative anterior view, while the image on the left shows the postoperative anterior view. The image was taken one month after the surgery. (B): Female patient, 52 years old, with a BMI of 33.87 kg/m². She weighed 135 kg and lost 45 kg after the sleeve procedure. Excised part: 4300 gm. (right) anterior view preoperatively the image was taken 6 months post-operatively. The image was taken 6 months post-operatively. (C): Female patient, 49 years old, with a BMI of 38 kg/m². She weighed 173 kg before and lost 72 kg after the sleeve procedure. Excised part: 5200 gm.

(right) anterior view preoperative (above), right lateral view preoperative (below). (left) left lateral view preoperative (above), excised part (below).

Group (B) Traditional abdominoplasty



Figure 2. (A): Female patient, 44 years old, with a BMI of 26.56 kg/m². She was 133 kg and lost 65 kg after dieting. The excised part weighed 1750 grams. The preoperative anterior view is on the right, while the postoperative anterior view is on the left. The image was taken 6 months post-operatively. (B): Female patient, 37 years old, with a BMI of 31.25 kg/m². She was 126 kg and lost 46 kg after the diet. The excised part weighed 2400 gm. (right) anterior view preoperative, (left) anterior view The image was taken 6 months post-operatively. (C): Female patient, 36 years old, with a BMI of 24.97 kg/m². She weighed 115 kg before the sleeve procedure (right anterior view preoperatively and left anterior view postoperatively). Six months had passed since the sleeve procedure. Excised part: 1800 gm.

4. Discussion

Obesity is a morbid condition that deeply affects people's health and social lifestyle. First-line treatments include low-calorie, low-fat diets, increased physical activity, and modification of lifestyle. In the most severe and difficult cases, bariatric surgery becomes the only viable approach.^{3,4}

In our study, we showed that there was no statistically significant difference between groups according to demographic data about age and sex.

In our study, we showed that the FDL group had a significantly higher pre-weight loss than

the classic group, with a weight loss of 144.90±23.73 compared to 130.30±16.70. The FDL group also had a significantly higher pre-weight loss in BMI (51.76±6.88) and excess weight (77.75±20.00) compared to the Classic group (61.55±13.84). The weight loss percentage in the FDL group was 44.81±5.67 compared to 41.28±5.61 in the classic group. However, there was no significant difference in weight, height, BMI, or obesity at the time of abdominoplasty, height, BMI at the time of abdominoplasty, or obesity.

In our study, 28 patients (70%) lose weight by bariatric surgery (gastric banding and sleeve gastrectomy), and 12 patients (30%) lose weight by dieting and exercising.

Bariatric surgery frequently results in a massive weight loss of one hundred pounds (around 45.45 kilograms) or more.

Shermak et al.⁹ reported massive weight loss as fifty percent or higher loss of excess weight. Toninello et al.⁴

Patients undergoing bariatric surgery have redundant skin and subcutaneous tissue all over the body, not just the abdomen. Therefore, the patient had to undergo more than one surgical procedure to correct their deformities and obtain the best body contour— either in the same operation or a series of operations. Martin et al.¹⁰

In our study, we showed that the statistically significant higher mean value of the weight of the excised part, "gm," in the FDL group was 2787.50±1206.33 compared to the classic group, which was 2015.00±430.45. While statistically insignificant variance was discovered among groups regarding time of operation "hrs."

In our study, there was a statistically significant higher rate of low waist grade in the FDL group (12 patients, or 60%) than in the classic group (7 cases, or 35%). Additionally, we showed statistically insignificant variance among groups regarding drains off (days) and Period of hospital stay (days), and statistically insignificant variance was discovered among groups regarding the creation of waste.

In our study, the FDL technique resulted in a pleasing and fantastic waist for the majority of our patients compared with the traditional technique.

In our study, we found that 4 patients (20%) in the FDL group had complications like hypertrophic scar (5%), lower abdomen flap necrosis (5%), and wound infection + dehiscence (10%). In the classic group, 5 patients (25%) had complications like a hypertrophic scar (5%), wound infection + dehiscence (10%), and seroma (10%). A statistically insignificant variance was discovered among the groups.

In our study, one case of flap necrosis occurred

at the T meeting.

The overall complication rate was twenty percent in the most current and largest research on one hundred post-bariatric patients who underwent fleur-de-lis surgery. Eight cases developed seroma, nine cases developed hematoma, three cases developed cellulitis, one case experienced partial umbilical necrosis, and one case experienced wound dehiscence. O'Brien et al.¹¹

The results of our study were comparable to those of O'Brien¹¹ we had no seroma rates and no hematoma postoperatively after FDL, only 2 cases of infection and minor wound dehiscence.

FDL abdominoplasty has become a suitable procedure for patients after MWL. Its advantage is the capacity to eliminate extra tissue in both the vertical and horizontal directions as well as to highlight the waistline, even though a little bit more undermining is required. Hensel et al.¹²

The overall complication rate for all patients undergoing either traditional abdominoplasty or FDL abdominoplasty was 26.3 % (131 patients), with a 5.0 % rate of major complications. Persistent seroma formation occurred following drain removal in 8.4% (42 patients); of these patients, 69% were treated successfully with serial percutaneous drainage. In the remainder, excision of the seroma capsule and primary closure were performed.

There were no cases of DVT when comparing overall abdominal complication rates by type of surgery; the FDL abdominoplasty group had a higher complication rate (30.5 percent versus 24.6 percent), but this difference was not statistically significant. Friedman et al.⁶

In our study, the higher frequency of "excellent" ratings among patients was 15 in the FDL group (75%), compared to 12 in the classic group (60%). However, the difference between the groups was not statistically significant.

4. Conclusion

The inverted T (fleur-de-lis) abdominoplasty surgery is the best way to shape the abdomen in people who have lost a lot of weight, especially those who have a lot of extra skin in the upper middle of their abdomen. It has been shown to be just as safe and effective as the classic abdominoplasty when done on the right candidates, resulting in the same improvement in the waist-to-hip ratio. There is no difference between both methods in spite of complications, but in the case of excess skin and subcutaneous tissue, vertically and horizontally, FDL abdominoplasty is preferable and gives the best results. In cases of excess skin vertically only, FDL or classic abdominoplasty can be used, but classic

abdominoplasty is preferred to avoid longitudinal incision of inverted T.

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All authors have a substantial contribution to the article

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