Role of crescent shaped external oblique plication in waist definition during lipoabdominoplasty

Original Article

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ABSTRACT

Introduction: Lipoabdominoplasty is considered one of the most common operations in aesthetic surgery performed worldwide. Although a simple dermolipectomy usually yields satisfactory results, more and more women are now seeking waist definition. In this study, crescent-shaped plication of the external abdominal oblique aponeurosis will be incorporated with classical conservative abdominoplasty and liposuction to improve abdominal contour and enhance waist definition.

Patients and Methods: Sixty female patients, aged 20–55 years, attending Plastic Surgery Clinics at Suez Canal University Hospitals and Al Galaa Military Medical Complex were included in this study. Patients were randomly allocated into either group [A] (crescent-shaped plication of the external abdominal oblique aponeurosis with classical conservative lipoabdominoplasty), or group [B] (classical conservative lipoabdominoplasty without crescent-shaped plication of the external abdominal oblique aponeurosis). The preoperative and postoperative waist circumference was measured 4 cm above the umbilicus.

Results: The mean waist circumference was significantly lower (*P value < 0.001*) in group [A] (87.4±1.1) than group [B] (96.8±1.8). There was a considerable difference in patient self-assessment, with more than 85% of the participants in group [A] being extremely satisfied, while only 15% of the patients in group [B] were extremely satisfied.

Conclusion: Crescent-shaped plication of the external oblique aponeurosis achieved significant waist precision and patient satisfaction when incorporated with classical conservative dermolipectomy.

Key Words: Definition, lipoabdominoplasty, waist.

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INTRODUCTION

Lipoabdominoplasty is considered one of the most common operations in aesthetic surgery performed worldwide. It addresses not only the aesthetic element but also the reinforcement of the anterior abdominal wall. Aesthetic factors are the contouring of the abdominal wall, the natural shape and position of the umbilicus, and scar placement. Repairing the proper anatomical position of the fascia and abdominal musculature is part of the reconstructive component[1–4].

The rationale of this study was to evaluate the effect of incorporating crescent-shaped plication of the external oblique aponeurosis into classical conservative abdominoplasty and liposuction for enhancing waist definition.

PATIENTS AND METHODS:

This study was approved by the local Institutional Review Board and the Research Ethics Committee with permission code 5410. This randomized clinical trial was accomplished at Suez Canal University Hospitals and Al Galaa Military Medical Complex from October 2023 to March 2024.

Inclusion criteria

A total of 60 consecutive female patients with type D (Nahas's classification) musculoaponeurotic deformity of the anterior abdominal wall (poor waistline definition; rectus diastasis; and external oblique muscle laxity)[4] attending the outpatient clinics of the plastic surgery units of Suez Canal University Hospitals and Algalaa Military Medical Complex, presented with redundant abdomens, aged 20–55 years, were included in this study.

Patients were randomly allocated into one of two equal groups:

(a) Group (A): classical conservative lipoabdominoplasty with upper and lower midline plication of the rectus abdominus muscle in conjunction with crescent-shaped external oblique plication group.

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(b) Group (B): classical conservative lipoabdominoplasty with upper and lower midline plication of the rectus abdominus muscle alone group.

To calculate the safe plication distance (PD) that can be done without a marked reduction of the intraabdominal volume that causes diaphragmatic excursion leading to abdominal compartmental syndrome. The difference between the two preoperative abdominal circumference measurements was determined before the application of abdominal binder (BB) and after the application of abdominal binder (AB). The safe plication distance (PD) in centimeters equals (BB) - (AB), which is 13.5 cm.

Exclusion criteria: Patients who had a history of any chronic disease, such as diabetes mellitus, a liver or kidney disorder, or a known bleeding disorder, were smokers, had a BMI greater than 35, patients with respiratory comorbidities, and had poor pulmonary function tests [to prevent postoperative pulmonary complications] were excluded from this study.

Methodology

The following data were obtained: age, sex, height, weight, BMI, previous abdominal operation, operation time, volume of lipoaspirate, weight of tissue resected, total volume of drain output per day, duration required for drain removal, hospital stay, and the presence of any postoperative adverse effects such as seroma formation, partial dehiscence of the abdominal wound, partial necrosis of the edge of the umbilical wound, and partial necrosis of the edge of the umbilical wound. Furthermore, before surgery, the waist circumference was measured 4 cm above the umbilicus and compared with the postoperative circumference measurements as an objective measure for the assessment of the aesthetic outcome of the procedure and the patient satisfaction as a subjective method for the assessment of the aesthetic outcome of the procedure as extremely dissatisfied, dissatisfied, satisfied, and extremely satisfied.

Operative technique

All patients, in both groups, were laid in the supine position for preoperative surgical marking. The procedures were done under general anesthesia [Pulmonary functions were evaluated by pulmonary compliance (P-Comp) and detected through different parameters provided by the mechanical ventilator that was calculated before and after plication to avoid the possibility of compartmental syndrome], with prophylactic antibiotic medication during the induction of anesthesia. Compression elastic stockings and a venous compression device with a pressure of 60 mmHg were used. Obese patients (BMI greater than 30) were given a prophylactic anticoagulant until the patient was ambulant.

Tumescent solution (saline 0.9% solution with epinephrine 1 : 1 000 000 or 1 mcg/cc) was infused. Then, liposuction of the flanks and/or back was performed in all cases in both groups. A 15-blade scalpel was used to make an incision in the periumbilical and the lower abdomen. Then, using electrocautery the anterior abdominal wall skin was separated from the musculoaponeurotic layer and the umbilicus. The flap was dissected laterally from the aponeurosis of the external oblique muscles and then superiorly all the way up to the xiphoid process. The myofascial plication was completed: the superior limit was the xiphoid process and the inferior limit was the symphysis pubic.

After tissue demarcation and excision, the relocated umbilicus was represented by a vertical ellipse of skin. The skin and subcutaneous tissue below the skin's surface around the new site of the umbilicus were removed vertically.

In group A, the lateral crescent-shaped plications for the external oblique aponeurosis were done using polypropylene sutures that began at the costal margins and ended at the top of an imaginary line connecting the anterior superior iliac spines. (Fig. 1).

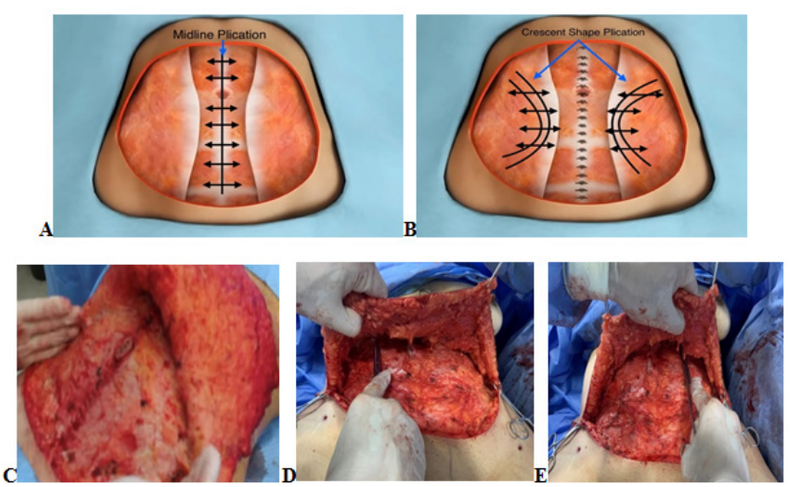

Fig. 1: (a, b) is a diagrammatic illustration of midline rectus muscle plication and crescent-shaped plication of the external oblique aponeurosis. (c, d, e) Intraoperative plication of both midline and crescent-shaped plication.

Two suction drains (18 F) were laterally held in place with a 2/0 silk suture in both groups. Finally, skin closure was performed using a 3/0 Monocryl suture. A compression garment was applied.

The patients were informed to rest for one day in a semi-flexed position. The urinary catheter was removed on the first day postoperatively. Patients were taught to move with a forward lean under observation. In order to decrease pulmonary complications, chest physiotherapy, and respiratory exercises in the form of incentive spirometry were done in the first week postoperatively. After one week, patients were directed to continue wearing compression garments for three months to avoid their effect on reducing pulmonary compliance.

Statistical analysis of the data

Data were entered into the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp.) Categorical data were introduced as numbers and percentages. A chi-square test was used to determine the association between the categorical variables. Alternatively, Fisher's exact test was used when more than twenty percent of the cells had an expected count of less than five. For continuous data, they were investigated for normality by the Shapiro–Wilk test. Quantitative data were introduced as range (minimum and maximum), mean, standard deviation, and median. The student t test was applied to compare two groups for normally distributed quantitative variables; on the other hand, the Mann–Whitney test was applied to compare two groups for not normally distributed quantitative variables. The significance of the results was evaluated at the level of 5%.

RESULTS:

Among the 60 female patients included in this study, both groups showed no statistical difference regarding their demographic data and BMI (Table 1).

The mean operative time of group [A] was significantly longer ((3.6±0.4 h) than group [B] (3.3±0.4 h). Hospital stay between both groups was statistically not significant (Table 2).

The mean waist circumference after the operation was significantly less (*p-value* less than 0.001) in group [A] (87.4±1.1) (Figs 2–5) than group [B] (96.8±1.8). (Figs 4 and 5)

There was a statistically significant difference in patient self-satisfaction, with more than 85% of patients in group [A] being extremely satisfied, while only 15% of the patients in group [B] were extremely satisfied.

The incidence of postoperative partial wound dehiscence was significantly higher in group [B] than group [A] (10% vs. 6.7%). One case of postoperative seroma was recorded in each group, and there were two cases of partial umbilical necrosis in each group (Table 3).

There were no infections, mortalities, serious problems, or deep venous thrombosis recorded in either group of patients.

Table 1: Comparison between both groups according to their demographic data

	Group A intervention group (*n*=30)	Group B control group (*n*=30)	Test of significance	*P*
Sex				
Female, *N* (%)	30 (100)	30 (100)	2.963	0.195
Age (years)				
Mean±SD	41.5±4.9	42.4±5.8	*t*=0.620	0.538
Median (min–max)	41 (34–50)	42 (30–52)		
BMI (kg/m^2)				
Mean±SD	31.4±2.7	31.4±3.4	*t*=0.042	0.967
Median (min–max)	32 (25–35)	32 (25–35)		

SD, Standard deviation; t, Student t test.
P: P value for comparing between the two studied groups.
*: Statistically significant at *P* less than or equal to 0.05.

Table 2: Comparison between both groups according to their operative data

	Group A intervention group (*n*=30)	Group B control group (*n*=30)	Test of significance	*P*
Operation time (hours)				
Mean±SD.	3.6±0.4	3.3±0.4	*t*=2.213*	0.031*
Median (min–max)	3.5 (3–4)	3.5 (3–4)		
Lipoaspirate volume (ml)				
Mean±SD	1756.7±493.2	1823.3±521.7	*t*=0.509	0.613
Median (min–max)	1900 (800–2500)	1950 (900–2700)		
Resected weight (gm)				
Mean±SD.	1696.7±431.1	1920±402.1	*t*=2.075*	0.042*
Median (min–max)	1700 (1000–2500)	2000 (1300–2800)		
Postoperative hospital stays (days)				
Mean±SD	2.4±0.7	2.6±0.6	*t*=0.992	0.325
Median (min–max)	3 (1–3)	3 (1–3)		
Total drain output per day (ml)				
Mean±SD	380.8±33.9	382.3±36.3	*t*=0.166	0.869
Median (min–max)	390 (325–450)	390 (300–450)		
Time of drain removal (days)				
Mean±SD	3.9±0.8	4±0.8	*t*=0.167	0.868
Median (min–max)	4 (3–5)	4 (3–5)		

SD, Standard deviation; t, Student t test.
P: P value for comparing between the two studied groups.
*: Statistically significant at *P* less than or equal to 0.05.

Table 3: Comparison between both groups according the incidence of postoperative complications

	Group A intervention group (*N*=30) [*n* (%)]	Group B control group (*N*=30) [*n* (%)]	Test of significance	*P*
Complication				
No	25 (83.3)	24 (80)	χ^2=0.577	^{FE}P=0.706
Yes	5 (16.7)	6 (20)		
Seroma	1 (3.3)	1 (3.3)	χ^2=0.0	^{FE}P=1.000
Partial abdominal wound dehiscence	2 (6.7)	3 (10)	χ^2=0.218	^{FE}P=1.000
Partial necrosis of the Abdominal flap	0	0	–	–
Partial necrosis of the umbilical wound edge	2 (6.7)	2 (6.7)	χ^2=0.0	^{FE}P=1.000
Wound infection	0	0	–	–

χ^2, Chi square test; FE, Fisher exact; SD, Standard deviation; t, Student t test.
P: P value for comparing between the two studied groups
*: Statistically significant at *P* less than or equal to 0.05.

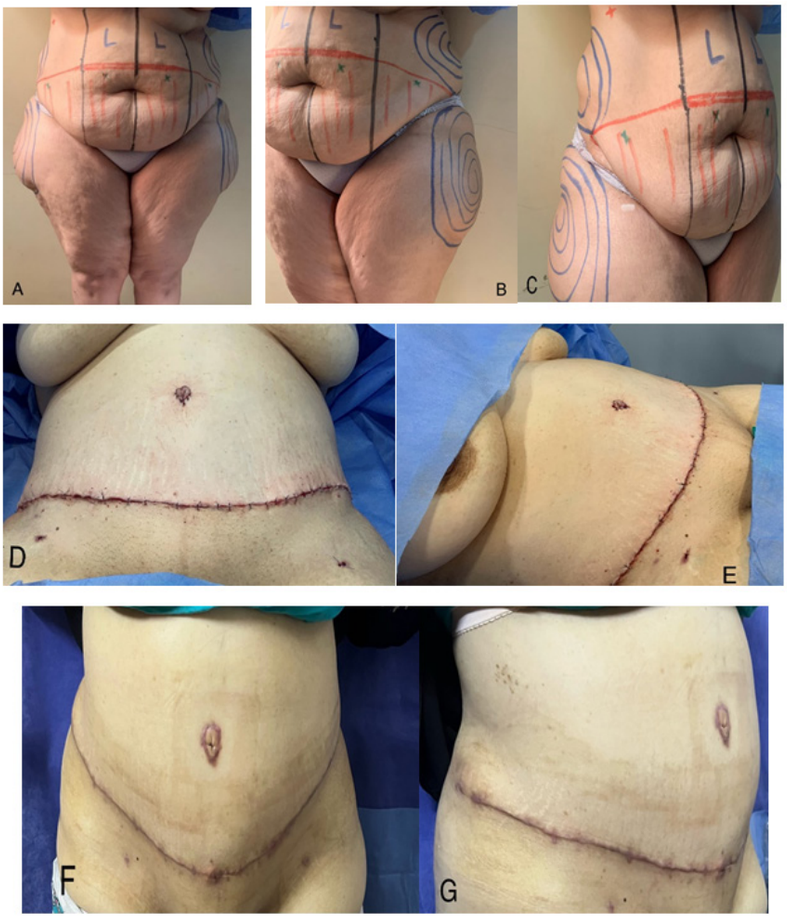

Fig. 2: Case 1, shows the preoperative and postoperative photos for an example of a patient in the study group [A]. A, B, and C represent the preoperative marking; D, E represent the immediate postoperative result; and F, G represent the result after 3 months of intervention.

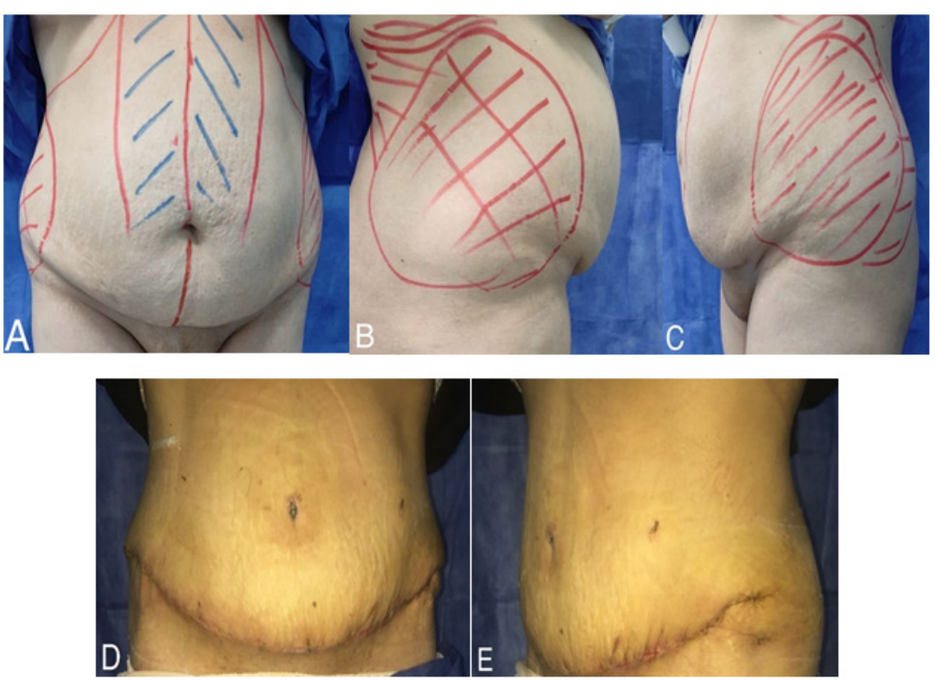

Fig. 3: Case 2, shows the preoperative and postoperative photos for another example of a patient in the study group [A]. A, B, and C represent the preoperative marking, and D and E represent the result after 1 month of intervention.

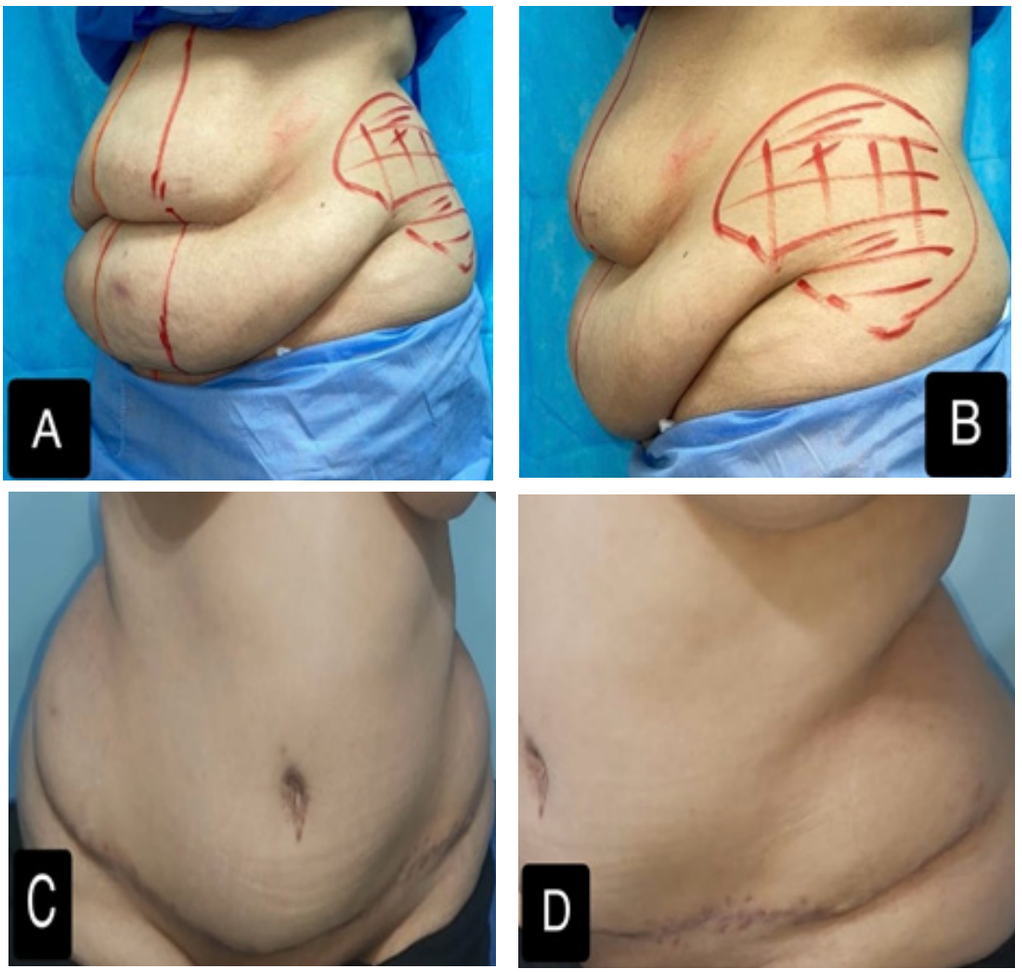

Fig. 4: Case 3, shows the preoperative and postoperative photos for an example of a patient in the control group [B]. A-B represents the preoperative marking, and C-D represents the result after 3 months of intervention.

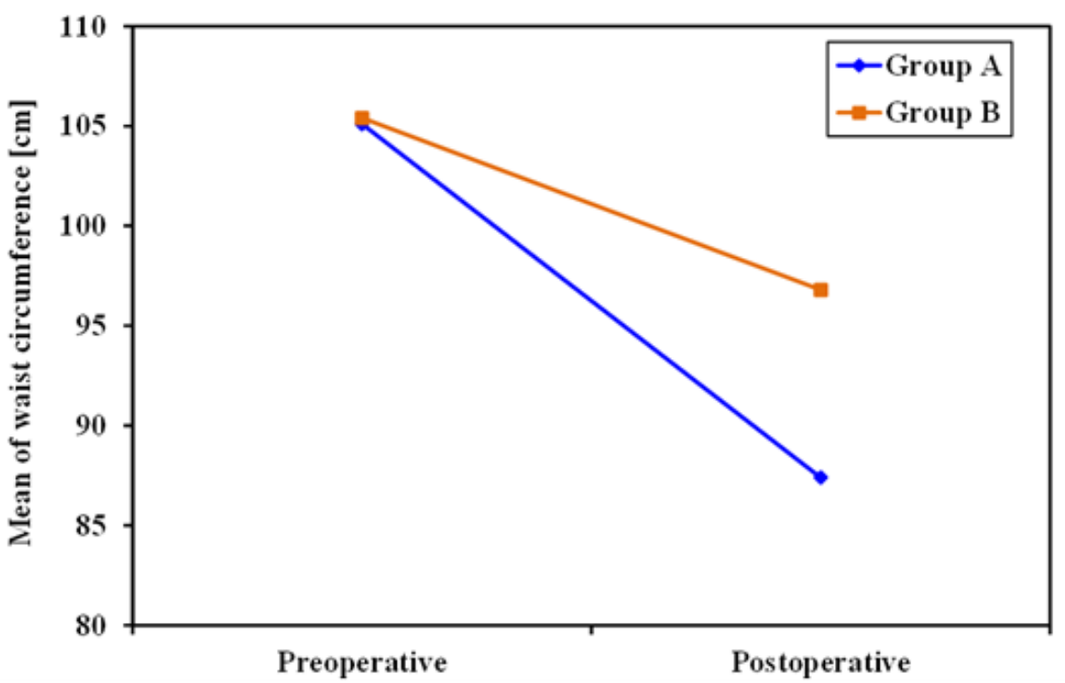

Fig. 5: Comparison between both groups according to waist circumference.

DISCUSSION

One of the most important goals during lipoabdominoplasty is to define the waistline. Variables such as the shape of the entire abdomen, localization of fat, and muscle strength, are sometimes influenced by the frequencies of pregnancy and ageing and can all have an impact on the results[5,6].

Several authors have reported several techniques to improve the waist shape by addressing excess fat, skin laxity, and the anterior abdominal wall muscle structure[7].

This study supported two main indications for incorporating crescent-shaped plications of the external oblique aponeurosis into the midline plication:

(a) Multiparous women with abdominal wall laxity and persistent redundancy after midline plication.

(b) Patients with abdominal wall laxity without excess fatty tissue who have a projection of skin and fatty tissue above the umbilicus after midline plication. Incorporating crescent-shaped external oblique plications into midline plication improves skin and fatty tissue distribution while also enhancing abdominal wall strengthening and waist definition.

Adding liposuction to this technique helps to make the upper flap more consistent with the pubis. Furthermore, it most likely preserves many musculocutaneous perforating arteries, preserving appropriate blood supply and lymphatic drainage of the detached flap to minimize interruption of its blood supply[8].

Pitanguy reported that midline plication of the rectus abdominis muscles without aponeurotic opening improved the anatomical and aesthetic results of the abdominoplasty[3]. Psillakis also documented the reinforcement of the muscle-aponeurotic laxity through suturing the oblique muscle to the rectus abdominis muscle fascia[9].

A randomized controlled experiment in the cadavers by Nahas and his colleagues showed that abdominoplasty with external oblique muscle advancement can be performed successfully without compromising aesthetics[4], which matches the same finding in this study.

Incorporating liposuction into the procedure offered superior aesthetic results in the waist definition, which matched the same findings of this study. The large volume of lipoaspirated fat can reduce the tension and metabolic need of the abdominal flap, improving its blood flow and venous return[10], as evidenced by the low incidence of complications such as wound dehiscence and flap necrosis in this study. On the contrary, it appears to promote postoperative drainage and decreasing the incidence of seroma formation.

Also, preserving the Scarpa's fascia during abdominoplasty has been shown to significantly reduce seroma formation[11,12]. Koller and colleagues also found this to be true[13,14], according to a prospective study of 50 female patients (25 undergoing abdominoplasty with preservation of the Scarpa's fascia and 25 undergoing traditional abdominoplasty). In this study, only 1 case of seroma was reported in each group following drain removal. This occurred in early cases due to the early removal of the suction drains.

Regarding the postoperative scar, it was recommended that preservation of the Scarpa's fascia after lipoabdominoplasty may enhance wound healing and scar quality, as many authors suggest[9,15,16]. Scar results are influenced by a variety of parameters, including patient posture, abdominal deformity symmetry, and dissection/excision symmetry[17]. Remember that a perfectly symmetrical scar after surgery can turn asymmetrical with time. So, keep in mind to inform all patients that scar revision may be necessary later on.

Plication of the rectus abdominis and external oblique aponeurosis generates considerable physiological changes, such as an increase in the intra-abdominal pressure and a decrease in pulmonary compliance that does not have a significant clinical impact on healthy individuals[18].

Therefore, the end result of this study was that it had a better aesthetic waist definition and a lower postoperative waist circumference, as there was a marked improvement in waist circumference in patients in group [A] in comparison with patients in group [B].

CONCLUSION

Incorporating crescent-shaped plication of the external oblique aponeurosis into classical conservative lipoabdominoplasty was effective for aesthetic contouring of the abdominal area and enhancing the waist circumference. Candidates for traditional abdominoplasty with excess fat accumulation in the upper abdomen and/or significant muscular-aponeurotic laxity benefit from this procedure.

CONFLICT OF INTEREST

There are no conflicts of interest.

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