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Role of Scarpa's Fascia Advancement in Waist Definition during Abdominoplasty

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ABSTRACT

Background: Abdominoplasty is a type of plastic surgery that has evolved through time. It has undergone significant refining to meet the growing demand for aesthetics, as well as to address various difficulties such as rectus abdominis muscle diastasis, trunk rejuvenation, and the restoration of a normal defined waistline.

Purpose: To determine the value of Scarpa's fascia advancement in abdominoplasty waist definition.

Patients and Procedure: In a comparative analysis of 40 complete abdominoplasty patients, and regarding the infraumbilical plane of dissection, they were divided into two equal groups: Rectus sheath or Scarpa fascia plane. Abdominoplasty with Scarpa's fascia inferomedial advancement was performed on Group A, whereas standard abdominoplasty was performed on Group B. With a BMI of less than 30, all of the patients showed abdominal deformities indicated by extra abdominal skin and fat tissue, as well as Musculo-aponeurotic laxity.

Results: In terms of aesthetic results, there was a substantial difference between the two groups; most patients in group A (80%) reported good waist definition, while only 15% in the same group reported fair results, compared to 50% in group B with a significant decrease in the post-operative waist circumference in Scarpa's advancement group (*p*-value 0.02). According to the patient's satisfaction, three-quarters of patients in group A were extremely satisfied, but just 15% of patients in group B were (*p*-value 0.001). In group A, one case (5%) of seroma was observed, compared to six individuals (30%) in group B. All were treated conservatively, with recurrent needle aspiration every 4-5 days, and just few mild problems were mentioned, with no serious ones.

Conclusion: Scarpa's fascia inferomedial advancement flap is a useful way to improve the abdominal wall tension and to enhance the waistline during abdominoplasty. It also retains the original fascial system, being a component of the SFS, diffuses tension on the skin flap, and can lift and contour the waist area. The method can enhance surgical outcomes while preserving the benefits of abdominal wall lymphatic preservation in reducing postoperative sequelae, including seroma rates.

Key Words: *Scarpa's fascia – Waist definition – Seroma – Abdominoplasty.*

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INTRODUCTION

Abdominoplasty is a type of plastic surgery that has evolved through time. It has undergone significant refining to meet the growing aesthetic perception, as well as to address various issues such as rectus abdominis muscle diastasis, trunk rejuvenation, and the restoration of a normal defined waistline **[1-4]**.

The three essential defects of the abdominal wall (redundant skin with concomitant striae, excess subcutaneous fat, and musculoaponeurotic laxity) must always be considered and managed by the plastic surgeon while performing classic abdominoplasty. The waist, which is a component of the trunk's circumferential aesthetic unit, must be considered similarly as well **[5]**.

As a result, abdominoplasty has evolved from focusing on the skin flap and underlying rectus diastasis repair to include liposuction procedures and minimal undermining to improve the outcome **[6]**.

Although plication of the midline diastasis improves antero-posterior diameter, it has a limited effect on waist definition. Furthermore, as shown by Nahas and his colleagues in 2001, when the plication of the anterior rectus sheath is expanded in width, it might cause deformed abdominal shape, resulting in undesirable and unnatural contour **[6]**.

Various procedures have been recommended in order to accomplish reliable waist modification. Multi-directional abdominal musculature plication, L-shaped external oblique plication, and muscle flap advancement have also been documented **[7]**.

Lockwood reported the interconnected fibrous septa that extend from the dermal layer in different directions to the Scarpa's fascia, allowing pulling

forces to be directed to the skin even after liposuction, when tension is applied to the fascial flaps. It may be modified to meet a variety of aesthetic purposes, similar to SMAS in the facelifts **[8]**.

The use of bilateral Scarpa advancement flaps for waist definition during standard abdominoplasty can alter the waistline and enhance the result of waist liposuction **[9]**.

When supra-Scarpal dissection was conducted, roughly 17 percent of the lymph drainage of the abdominal wall was retained, according to Friedman and his colleagues **[10]**. Scarpa's fascia preservation has also been shown to reduce the risk of postoperative problems **[11]**.

In comparison to traditional abdominoplasty, the current study aimed to determine the value of Scarpa's fascia inferomedial advancement during abdominoplasty in patients with moderate to severe actual or potential laxity of the skin, fat, and muscles of the anterior abdominal wall in terms of waist definition and seroma rates.

PATIENTS AND METHODS

Between January 2020 and September 2021, 40 female patients were included in the study at the Plastic Surgery Unit, General Surgery Department, Faculty of Medicine, Benha University, after receiving clearance from the Ethics Research Committee. According to the following criteria, all of the patients had abdominal deformities indicated by extra abdominal skin and fat tissue, as well as musculoaponeurotic laxity.

Inclusion criteria:

- The candidate was not extremely overweight (BMI 30kg/m^2) and remained stable for more than 6 months if considerable weight loss occurred.
- Females who are very motivated and realistic.
- Major uncontrolled medical conditions such as labile hypertension, diabetes, coronary disease, nutritional deficiencies, and bleeding disorders are not present.

Exclusion criteria:

- BMI >30kg/m^2.
- Multiple abdominal scars or a large amount of abdominal protrusion (secondary to intra-abdominal fat accumulation).
- Females who are completely unrealistic.
- Patients on unreasonable diet, with excessive smoking or alcohol consumption.

According to the infraumbilical plane of dissection, either rectus sheath or Scarpa fascia plane, they were divided into two equal groups:

- Group A: Abdominoplasty with Scarpa's fascia inferomedial advancement was performed on Group A.
- Group B: Traditional abdominoplasty was performed on Group B.

They were given information regarding the operation, the type of anesthetic used, the risks, potential consequences, photos, and their participation in the research. Before surgery, all patients underwent a thorough medical history, general examination, and local examination, with evaluation of all layers of the abdominal wall, including skin laxity, the presence of striae and scars, subcutaneous fat and supraumbilical fullness by pinch technique (cases with more than 3cm of subcutaneous fat were targeted for supraumbilical liposuction), recti diastasis, and hernias defects as indicators of muscle weakness). In addition, the waist circumference was measured 4cm above the umbilicus prior to surgery and compared to the postoperative measures.

Pre-operative photography and marking:

Digital pictures of the anterior and lateral profiles were obtained in the standing posture before and after surgery.

The initial incision was represented by a central transverse line at the superior level of the symphysis pubis, within the hair line about 7-8cm away from the level of the vulval commissure, that line was slightly curved while extending laterally in both directions following the natural skin crease. In some individuals, the supraumbilical area was marked for liposuction to achieve sufficient contouring.

Surgical details:

In the traditional abdominoplasty group: In the chosen patients, deep and superficial liposuction (limited to the supraumbilical area) was done. The surgery began with tumescent fluid infiltration using the super-wet method (1mg adrenaline + 10ml 2% xylocaine per liter of saline). Xylocaine was administered to offer post-operative analgesia for a few hours. Lipoplasty was started using 4- and 3-mm Mercedes tip cannulas after tumescent infiltration. The thickness of the skin flap over the cannula was used to determine when the lipoplasty needed to be ended.

The skin incision was made according to the pre-operative markings and proceeded through the

subcutaneous fat and Scarpa's fascia all the way down to the rectus sheath level, the superficial inferior epigastric vessels were identified and managed. The flap was then elevated until it reached the level of the umbilicus, which was vertically excised and a sufficient amount of subcutaneous fat was applied to its stalk. Limited dissection was continued above that level up to the xiphoid process, establishing a central tunnel about 10cm wide to protect the lateral perforators. Following that, diastasis of the recti was repaired vertically from above with continuous locking Polypropylene 1 suture. With upper body flexed at (30°), excess abdominal flap was resected and the umbilicus was repositioned in its new site. Proper homeostasis was obtained throughout the whole procedure and two closed-system suction drains were placed under the abdominal flaps, fixed and secured. Then, interrupted 0 Vicryl suture was used for the Scarpa's closure which is the key layer for closure. It was closed under high tension, which allows for final skin closure to be performed under minimal tension and yields a high-quality fine-line scar. Finally, skin closure was done in two layers with deep dermal 2/0 Vicryl suture placed every centimeter and continuous intradermal polypropylene 4/0 suture was used for final closure.

In Scarpa's fascia advancement group: We followed the same steps as the other group, but with the following changes:

The initial incision was limited to the Scarpa's fascia level, which was identified by its gleaming white look. We continued the incision laterally over Scarpa's fascia after its central exposure, keeping its lateral parts and adjacent sub-Scarpal fatty areolar layer to preserve the lymphatics. Scarpa's fascia flaps were designed below the umbilicus by separating the fascia along the midline until it reached the level of the rectus muscle fascia.

To prevent supra-pubic bulge, a bilateral wedge-shaped excision from the Scarpa's central part was performed (with the base pointed upward or downward for better contour, measuring around 4 to 6cm width between its two limbs) after the Scarpa's were separated from the underlying loose tissues. The fascial flaps were then sutured together and to the linea alba or the underlying rectus fascia with continuous non-absorbable sutures under tension (Fig. 1).

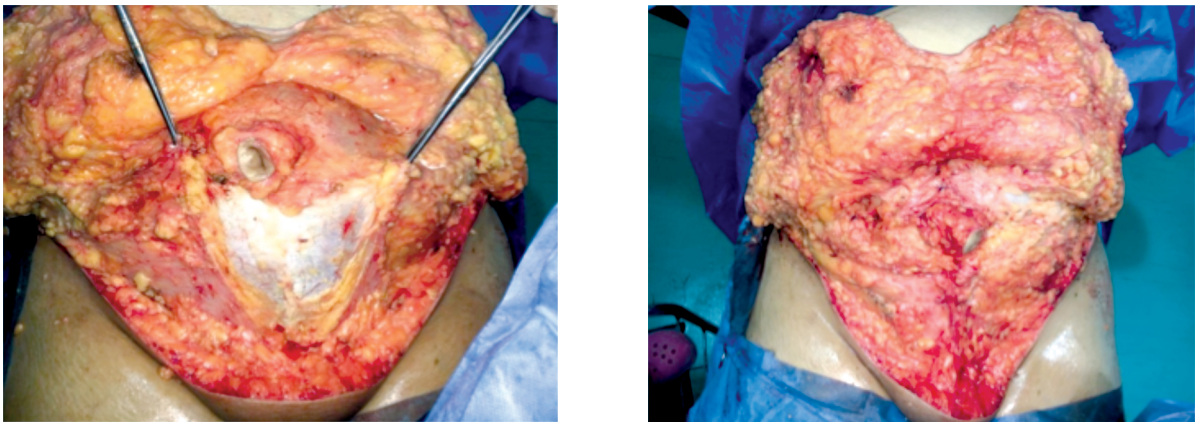

Fig. (1): Intraoperative view showing suprascarpal dissection till the umbilicus, Scarpa's fascia flaps are created below the umbilicus down to the rectus muscle fascia (right). The Scarpa's fascia inferomedial advancement flaps are sutured under tension together and to the rectus muscle fascia without overlap.

Post-operative management and follow-up:

Early ambulation was started after anesthesia recovery, a post-operative prophylactic parenteral third generation cephalosporin antibiotic (2gm/day) was given, patients were asked to keep their legs semi-flexed for the first week to ten days after surgery, hemoglobin levels were measured after surgery and repeated the next day for follow-up, and suction drains were noticed and removed when 24-hour collection was less than 30cc.

In all participants, a 6-month follow-up was performed to evaluate the aesthetic outcomes, the patient's feedback, and to detect and address any problems.

RESULTS

On 40 females, we conducted our study to assess waist definition. Both groups were similar in terms of general characteristics: Age (*p*-value =0.673), weight (*p*-value=0.479), height (*p*-value =0.679), and BMI (*p*-value=0.548). (Table 1).

When comparing multiple pregnancies to other factors such as weight gain, post bariatric, and weight reduction. It was identified as the most

prevalent etiological factor in both research groups (Fig. 2).

According to operative details, liposuction cases (*p*-value=difference. 0.736) and operating time (*p*-value=0.922) were practically same in both groups.

The *p*-value for post-operative blood transfusion was (0.231). The drain time in group B (10 days) was substantially longer than in group A (6 days); the *p*-value was 0.001 (Table 2).

Regarding aesthetic Outcome: (Table 4)

Waist definition was estimated objectively [by measuring pre and post-operative waist circumference (Table 3), the study reported that the mean postoperative waist circumference was significantly higher in group B (92) than group A (87); *p*-value was 0.02], and subjectively [by the interaction between the surgical team's judgment and patient satisfaction as good, fair, and bad]; most patients in group A (80%) were highly satisfied with their good waist definition while (15%) in group A reported fair result compared to 50% in group B.

There was a difference in post-operative waist circumference between the candidates of Scarpa's fascia advancement group who had liposuction (mean 89) and those who didn't (mean 87), but there was no significant variation in the outcome (*p*-value 0.541), since liposuction was restricted to the supraumbilical area.

Patients evaluated their satisfaction with the outcome as extremely dissatisfied, dissatisfied, happy, and extremely satisfied. There was a considerable difference in patient satisfaction, with three quarters of patients in group A being extremely happy, compared to just 15% in group B.

Accepted scar, hypertrophic, dog ear, or asymmetrical scars were documented as scar outcomes. For hypertrophic scars, an intralesional steroid was injected, and silicone gel was recommended. Three cases of small dog ear scars were recorded in group B, and two cases in group A, with only two of them requiring local anesthetic repair.

The umbilicus was seen and classified as complicated or not complicated based on its shape and location. In addition, two instances in group A and three cases in group B were recorded to have contour irregularities reported according to the presence of ill-defined midline depression from the xiphoid to the umbilicus, distorted thickness of subcutaneous fat above and below the scar and poorly defined waist.

The following complications were documented and managed: (Table 5)

After the suction drains were removed, there was clinically obvious seroma. Only one case of the 20 patients (5%) in group (A), compared to six cases among group (B). All of the patients were treated conservatively, with needle aspiration every 4-5 days and an average volume of 20cc to 200cc. After 2-3 aspirations.

At day 15 post-operative, only two individuals from each group experienced wound infection, and three cases of wound dehiscence were recorded in group B, two of which were healed by secondary intention and the third of which required scar revision under local anesthetic.

In one case in the Scarpa's group, a little hematoma developed and was resolved following continuous compression with another fitted garment. In both groups, there was no evidence of flap necrosis.

Table (1): General characteristics in both groups.

		Group A (n=20)	Group B (n=20)	*p*-value
Age (years)	Mean ± SD	37±6	38±7	0.673
Weight (kg)	Mean ± SD	77±5	76±8	0.479
Height (cm)	Mean ± SD	163±4	162±6	0.679
BMI	Mean ± SD	28.9±1.5	28.6±1.5	0.548

Independent *t*-test was used.

Table (2): Operative and post-operative details in both groups.

		Group A (n=20)	Group B (n=20)	*p*-value
Liposuction	n (%)	6 (30.0)	7 (35.0)	0.736
Operative time (h)	Mean ± SD	3.5±0.5	3.5±0.5	0.922
Post op. blood transfusion	n (%)	0 (0.0)	3 (15.0)	0.231
Drain duration (days)	Mean ± SD	6±1	10±2	<0.001

Independent *t*-test was used for numerical variables.
Fisher's exact test was used for categorical variables.

Table (3): Waist circumference pre and post-operative in both groups.

		Group A (n=20)	Group B (n=20)	*p*-value
WC Pre-operative	Mean ± SD	103±7	103±9	0.954
WC Post-operative	Mean ± SD	87±6	92±7	0.02

Independent *t*-test was used.

Table (4): Aesthetic outcome in both groups.

			Group A (n=20)	Group B (n=20)	*p*-value
Scar	Accepted scar	n (%)	15 (75.0)	11 (55.0)	0.631
	Hypertrophic	n (%)	2 (10.0)	4 (20.0)	
	Dog ear	n (%)	2 (10.0)	3 (15.0)	
	Asymmetric scar	n (%)	1 (5.0)	2 (10.0)	
Umbilicus	Uncomplicated	n (%)	16 (80.0)	17 (85.0)	1.0
	Complicated	n (%)	4 (20.0)	3 (15.0)	
Abdominal contour irregularity		n (%)	2 (10.0)	3 (15.0)	1.0
Waist definition	Bad	n (%)	1 (5.0)	6 (30.0)	0.001
	Fair	n (%)	3 (15.0)	10 (50.0)	
	Good	n (%)	16 (80.0)	4 (20.0)	
Patient Satisfaction	Highly unsatisfied	n (%)	0 (0.0)	5 (25.0)	<0.001
	unsatisfied	n (%)	3 (15.0)	8 (40.0)	
	Satisfied	n (%)	2 (10.0)	4 (20.0)	
	Highly satisfied	n (%)	15 (75.0)	3 (15.0)	

Chi-square or Fisher's exact test was used.

Table (5): Complications in both groups.

		Group A (n=20)	Group B (n=20)	*p*-value
Seroma	n (%)	1 (5.0)	6 (30.0)	0.037
Hematoma	n (%)	1 (5.0)	0 (0.0)	1.0
Wound dehiscence	n (%)	0 (0.0)	3 (15.0)	0.231
Wound infection	n (%)	2 (10.0)	2 (10.0)	1.0
Flap Necrosis	n (%)	0 (0.0)	0 (0.0)	–

Fisher's exact test was used.

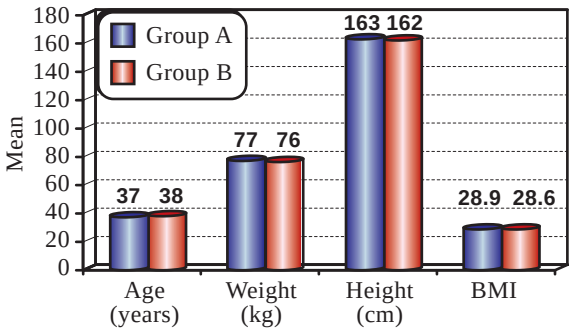

Fig. (2): General characteristics in both groups.

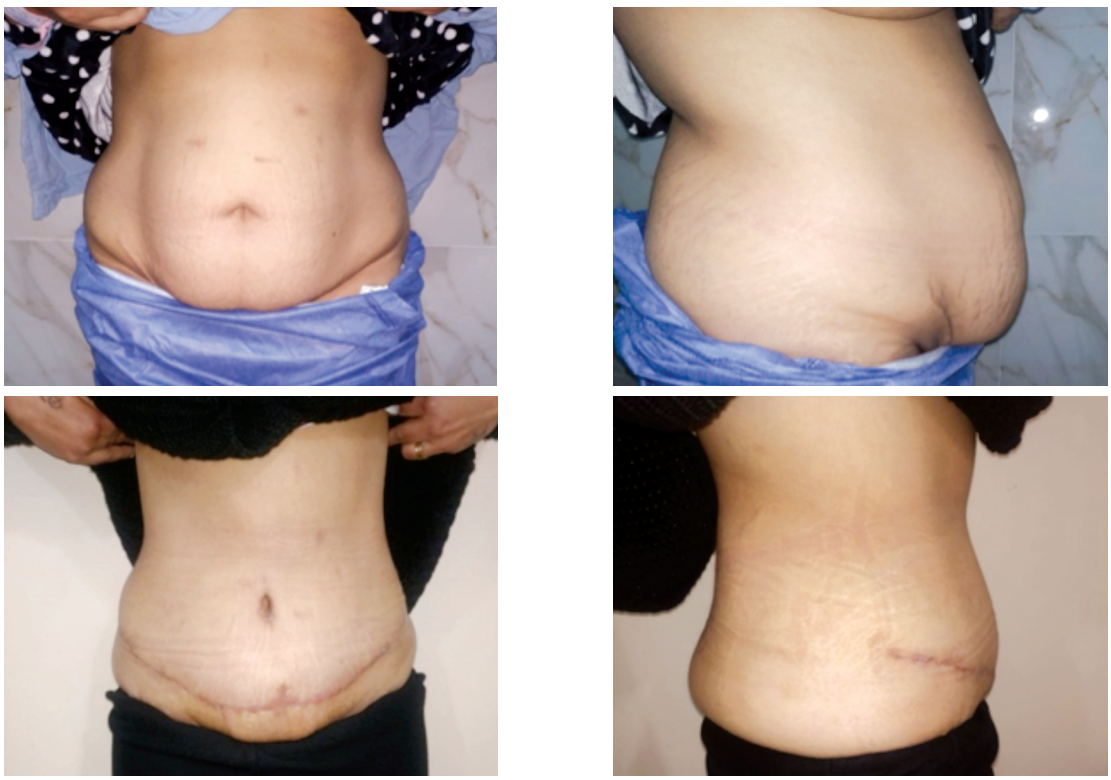

Fig. (3): Group (A) 29 yeas f. patient Pre-operative photographs, (Above) and post-operative good waist definition, (Below).

Fig. (4): Group (A) 38 yeas f. patient Pre-operative photographs, (Above) and post-operative good waist definition, (Below).

Fig. (5): Group (B) 42 yeas f. patient Pre-operative photographs, (Right) and post-operative waist definition, (Left).

DISCUSSION

One of the aims of trunk rejuvenation during abdominoplasty is to define the waist. Many variables, including abdominal shape, fat deposits, and the degree of muscular tension, which is frequently impacted by the combined effects of pregnancy and aging **[4,6]**, influence it.

In order to enhance the waist, several writers have published numerous procedures to deal with the deformities produced by excess fat and laxity of the skin and muscle structure of the anterior abdominal wall **[5]**. Avelar (1985) and Bozola (1988) were the first to introduce rectus plication and its variations. This plication has become a standard feature of abdominoplasty procedures to

reduce waist circumference and improving its definition **[12,13]**. However, this can be a difficult process.

Midline plication of the musculoaponeurotic layer seldom has the desired impact on the waist, and direct plication of this layer across the waist is frequently out of reach, due to restricted dissection over this area. Excess fat in the flanks can be easily removed with liposuction procedures; however, improving skin redundancy without further incisions and subsequent scarring, is more difficult **[14]**.

Nahas and his colleagues went on to describe L-shaped external oblique muscle plication, multidirectional abdominal wall plication, and advancement of the external oblique muscle flaps for achieving reliable waist modification **[7]**.

Many studies have been published on the Scarpa's fascia as a component of the superficial fascial system (SFS), because it allows pulling forces to be translated to the skin when tension is applied to the fascia flaps, even after liposuction **[8]**, and its advancement has a significant effect on waistline improvement **[9,15,16]**. According to the aesthetic outcome of the current study, the majority of Scarpa's advancement group had good waist definition with a considerable improvement in the postoperative waist circumference.

When it comes to post-abdominoplasty scar quality, some writers suggest that preserving the Scarpa fascia leads in better wound healing and better scars **[17]**. Many factors influence the final scar outcomes, including the patient's posture, the symmetry of the abdominal deformity, and the symmetry of the dissection and excision. It should be remembered that a scar that is perfectly symmetrical immediately after surgery may become asymmetrical later **[15]**. Therefore, all our patients were warned that it may be necessary to perform scar revision after six months. The scar result was classified as acceptable scar, hypertrophic, dog ear, or asymmetrical scars in the current study. For hypertrophic scars, an intralesional steroid was injected, and silicone gel was recommended. Three cases of small dog ear scars were recorded in group B, and two cases in group A, with only two of them requiring repair with local anesthesia. Novais in his randomized controlled trial proved that abdominoplasty with Scarpa fascia preservation could be used safely without compromising the aesthetic result **[18]**. Regarding umbilicus and abdominal contour irregularity in our study, no evident differences between both groups were found.

For the previously mentioned good aesthetic outcome, patient satisfaction showed three quarters of patients in group A were highly satisfied, compared to only 15% in group B.

Supra-scarpal dissection, according to Friedman and other writers, is critical for lymphatic preservation of the abdominal wall **[10]**, and lowering the risk of post-operative problems **[11]**. While several studies have shown that the conventional approach is associated with a number of problems, the most prevalent of which is seroma **[19,20]**. In our study, almost no difference was recorded between both groups regarding hematoma and wound infection, but wound dehiscence was reported in three cases of group B. The resulted widening required revision under local anaesthesia. That may be occurred because we ignored to reattach the Scarpa's fascia layer during wound closure in these cases. We had three cases of postoperative blood transfusion recorded in group B, the preoperative Hb % was borderline about 11 and half in two of them, as the need of blood transfusion after surgery can be affected by patient medical condition before surgery and his body inflammatory response. Also, there was no flap necrosis in any group was detected.

Regarding seroma formation, various authors found that preserving Scarpa fascia during an abdominoplasty reduced seroma incidence significantly **[9,19]**, as did Koller and his colleagues, who found that preserving Scarpa's fascia during an abdominoplasty reduced seroma incidence significantly **[21,22]**, based on a prospective study with 50 patients (25 undergoing abdominoplasty with Scarpa fascia preservation and 25 undergoing classical abdominoplasty). Seroma was recorded after drain removal in our study, and it was shown to be greater in group B (p0.037). It happened in early cases because the suction drains were removed too soon after surgery.

In a study comparing the traditional rectus sheath dissection plane with the supra Scarpa dissection plane, Elwakeel and his colleagues found that using the supra Scarpa dissection plane was associated with a significant reduction in drainage volume and early drain removal when compared to the other group **[23]**. The drain duration results in the study were greater in group B than in group A.

Conclusion:

During abdominoplasty, Scarpa's fascia inferomedial advancement flap is an effective way to improve the waistline. As part of SFS, it relieves

strain on skin flaps while also elevating and shaping the waist region. With just a few small issues and no serious difficulties, this technique was shown to be safe. It maintains the natural fascia system and can enhance surgical outcomes while preserving the benefits of abdominal wall lymphatic preservation, resulting in lower seroma rates.

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