

Role of Lower Abdominal Flap Fixation in Abdominoplasty for Optimizing Scar Positioning

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ABSTRACT

Background: Abdominoplasty is one of the most commonly performed cosmetic procedures. Achieving functional and aesthetic outcome is a major goal. The scar's final position is affected by multiple factors, so it is important to attempt to decrease, the possibility of distortion in the outcome. Perfect scar is a main aim, and a hidden scar is one of the most desirable concerns.

Objective: Aim of study is to assess the result of fixation of lower abdominal flap in high lateral tension abdominoplasty and its long-term impact on scar positioning.

Patients and Methods: Thirty patients were enrolled in this study, divided into 2 groups with group (A) underwent high lateral tension abdominoplasty without lower flap fixation, and group (B) with lower abdominal flap fixation, objective and subjective assessments; including measurements and patients' satisfaction (VAS scale) was obtained. Statistical analysis of the collected data was done.

Results: Rise of scar was more in group (A) (without lower flap fixation) than group (B) (with lower flap fixation). Patients' satisfaction scores were excellent in (80%) cases in group (B) and (60%) in group (A).

Conclusion: Symmetry and proportion are essence of aesthetic surgery. Fixation of lower abdominal flap in abdominoplasty is highly advised according to our results to reach a cosmetic balance and patients' satisfaction with a hidden well designed symmetric scar.

Key Words: Abdominoplasty – Deep fascial anchoring – Scar shift – Hidden scar.

Disclosure: No conflict of interest.

Ethical Committee Approval: The study was approved by the Ethical Committee of the Faculty of Medicine.

INTRODUCTION

Abdominoplasty is considered one of the most common aesthetic operations performed all over the world [1]. Abdominoplasty was first described

in 1890 with many modifications since the beginning of the last century [2]. A continuous evolution of techniques and concepts for improving the surgical outcome was evidenced by many refinements that have been done over the last 50 years [3].

The contour, external appearance and symmetry with a natural looking umbilicus and insignificant scar remains the goal for abdominoplasty [4]. Where a perfect scar is small, thin, flat, and almost a hidden scar.

The aesthetic expectations of patients concerning the outcome of aesthetic surgical procedures are always high, therefore, scar asymmetry after abdominoplasty can have a significant impact on patient and surgeon satisfaction.

Aim of this study: To assess the ability of fixation of the lower abdominal flap by anchoring sutures, to avoid or minimize upwards scar rising post-operatively and hence increase the aesthetic outcome.

PATIENTS AND METHODS

A prospective randomized controlled study was carried in Ain Shams University Hospitals and in private practice for patients who underwent abdominoplasty in the period March 2020 to June 2022. The inclusion criteria are patients in the age range (25-65 years) with clinical indication for abdominoplasty, excluding patients with history of keloids or hypertrophic scarring or having connective tissue diseases or BMI >30, or history of bariatric surgery or medically suffering from uncontrolled hypertension or DM. Full examination, thorough history taking, and full laboratory investigations were routine steps to be fulfilled for all patients enrolled in this study.

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The patients were divided into two groups; Group (A) (odd numbers) where abdominoplasty technique was performed according to Lockwood 5 high lateral tension abdominoplasty. And group (B) (even numbers), the same technique was done but with lower abdominal flap fixation. In both groups the patients were blinded considering the technique applied.

Surgical technique:

The patients were marked in a standing position leaning against wall to decrease bias. Marking of midline was done passing through the xiphoid process and symphysis pubis, the lower incision was designed 7cm from the vulvar commissure and extended laterally to reach ASIS (anterior superior iliac spine). Skin pinch test was done to assess the excess skin to be excised. Areas of adiposities also were marked especially in the upper abdomen; love handles and back.

All patients had general anesthesia, perioperative antibiotic (third generation cephalosporin) was administered, patients were positioned supine with elastic bandage in both lower limbs, with urinary catheterizations. Liposuction was done first in the marked areas using super wet technique then high lateral tension abdominoplasty was performed in both groups

In group (B) lower abdominal fixation was performed by suturing Scarpa's fascia in the lower abdominal flap to rectus abdominus muscle aponeurosis in midline then into Scarpa's fascia in upper abdominal flap (Fig. 1), and (3-4) stitches equally distributed on either side with equal distance between external oblique muscle aponeurosis and Scarpa's fasciae of upper and lower flaps. The sutures used were 2/0 PDS sutures.

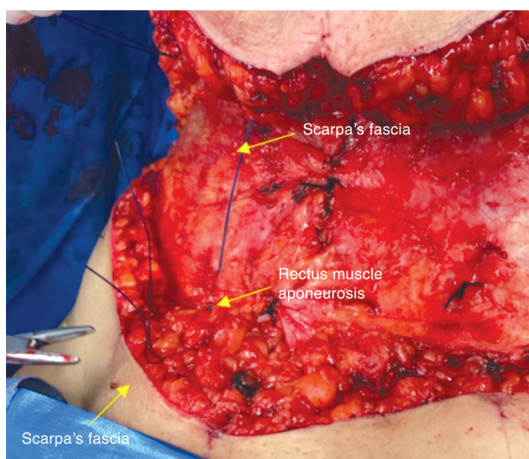


Fig. (1): Intraoperative photo showing lower flap fixation (group B); Scarpa's fascia of the lower flap sutured to the bed (rectus muscle aponeurosis), then sutured to Scarpa's fascia of the upper flap in midline.

Meticulous hemostasis was done all throughout the operation and the wound was closed in layers using PDS 3/0 and 4/0 for the umbilicus, and a negative suction drain (portovac drain) was inserted and followed-up and it was removed whenever the drain is minimal (less than 50cc).

Photography was done in all cases with the same digital camera and at same fixed distance, patients were followed-up for 6 months postoperative with weekly visit twice in the first month and once every following month.

Scar assessment was done subjectively: Patients' satisfaction score on a visual analogue scale (VAS scale) from 0 to 10 (where 0 represents not satisfied at all, and 10 represents very satisfied), and objectively: Marking of lower end of xiphoid process and center of symphysis pubis was done as fixed points of reference in measurements (Fig. 2). Taking measurements from xiphoid process to the scar line (midline and 5, 10, 15cm laterally on both sides) and from the scar to pubis (midline and 5, 10, 15cm laterally on both sides) at two weeks and six months postoperatively by measuring tape by three independent surgeons, where the three were not involved in the surgery (blinded), and the three measurements were recorded for each point of reference and an average for each measurement was recorded. Also, the patients in either group were blinded considering the technique used. Measurement of scar upward shifting (migration) for each patient was measured by subtracting the difference of the vertical distance measured at 2 weeks and at 6-months post-operative. All measurements were documented and statistically analyzed for both groups.

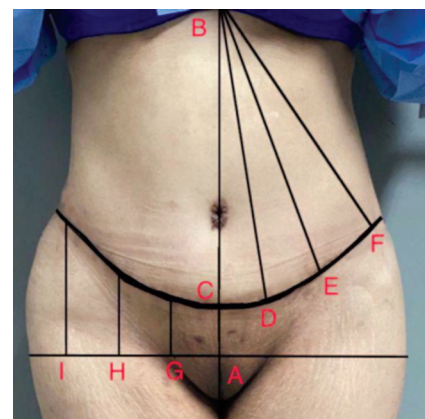


Fig. (2): Marking for measurements taken at 2 weeks and six months for both groups (by 3 independent surgeons); (A) Horizontal line passing through center of symphysis pubis (SP), (B) Xiphisternum (XS), (C) Point of midline, (D) Measurement from (XS) to 5cm laterally, (E) Measurement from (XS) to 10cm laterally, (F) Measurement from (XS) to 15 cm laterally, (G) Measurement from (SP) to 5 cm laterally, (H) Measurement from (SP) to 10cm laterally, (i) Measurement from (SP) to 15cm laterally.

RESULTS

Thirty patients were included in this study, fifteen patients in each group. Demographics of both groups weren't statistically significant ($p < 0.05$). Where in group (A); age ranged (25-60) with average 43 years with average weight 67kg and average height 1.72m, and average BMI:

22.6kg/m². Whereas in group (B); age ranged (27-57 years) with average 44 years with average weight 68.5kg, average height 1.65m and average BMI 25.2kg/m².

Fifteen patients were enrolled in group (A) (odd numbers), with high lateral tension abdominoplasty without flap fixation (Figs. 3,4, Group A).

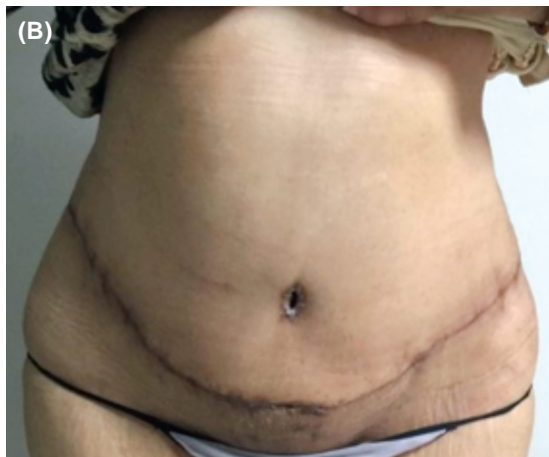
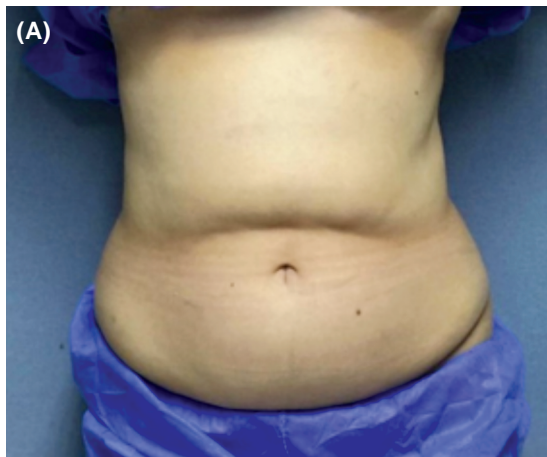


Fig. (3): (Group A): Preoperative (A) and 6 months postoperative (B), of a 42 years old female patient who underwent abdominoplasty without lower flap fixation.



Fig. (4): (Group A): Preoperative (A) and 3 weeks postoperative (B), of a 39 years male patient who underwent abdominoplasty without lower flap fixation.

Fifteen patients were enrolled in group (B) (even numbers) with high lateral tension abdom-

inoplasty with lower flap fixation (Figs. 4,5, Group B).

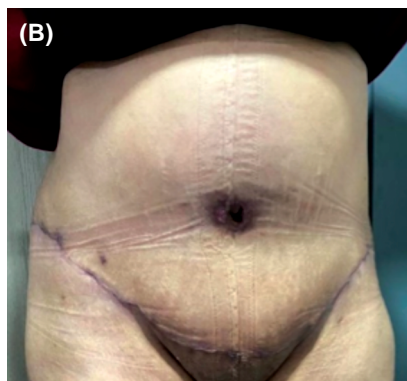


Fig. (4): (Group B): Preoperative photo (A) of 36 years old female patient, (B) 5 months postoperative of abdominoplasty with lower flap fixation.

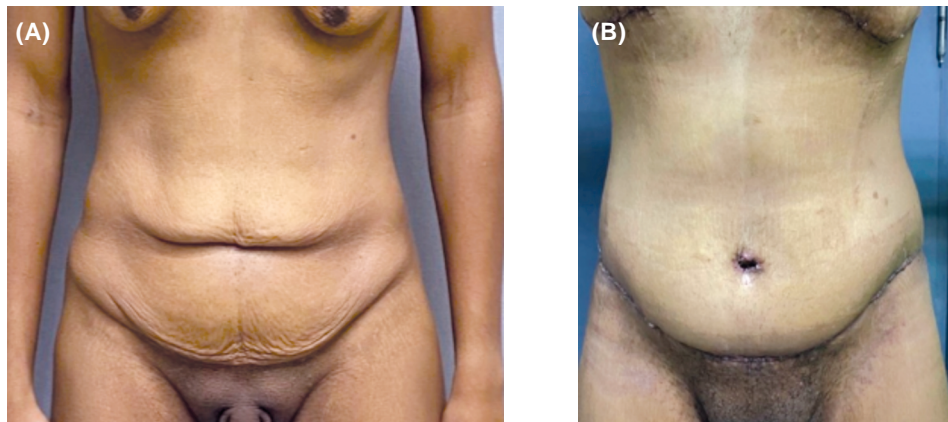


Fig. (5): (Group B): Preoperative (A), and 3 weeks postoperative (B) of a 43 years old male patient who underwent abdominoplasty with lower flap fixation.

Table (1): In group (A), average measurements from the scar to a horizontal line passing through symphysis pubis (SP) and from the scar to xiphisternum (XS) at 2 weeks and 6 months.

Group (A) (without lower flap fixation)	Central	(RT) 5 cm	(RT) 10 cm	(RT) 15 cm	(LT) 5 cm	(LT) 10 cm	(LT) 15 cm
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
<i>SP:</i>							
2 months	7.07±0.10	11.11±0.10	14.06±0.08	16.11±0.12	11.14±0.08	14.09±0.09	16.13±0.10
6 months	7.73±0.12	12.09±0.15	15.41±0.22	17.67±0.10	12.09±0.11	15.35±0.17	17.61±0.10
<i>XS:</i>							
2 months	39.47±1.25	37.80±1.66	35.40±1.40	33.40±1.59	37.73±1.67	35.40±1.40	33.27±1.79
6 months	38.63±1.34	36.68±1.70	34.05±1.42	31.85±1.60	36.70±1.72	34.14±1.37	31.78±1.78

*Paired *t*-test.

Table (2): Shows the average measurements from scar to a horizontal line passing through symphysis pubis and from scar to xiphisternum in group (B) at 2 weeks and 6 months.

Group (B) (without lower flap fixation)	Central	(RT) 5 cm	(RT) 10 cm	(RT) 15 cm	(LT) 5 cm	(LT) 10 cm	(LT) 15 cm
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
<i>SP:</i>							
2 months	7.06±0.07	11.19±0.13	14.19±0.16	16.21±0.10	11.21±0.13	14.14±0.13	16.19±0.12
6 months	7.35±0.10	11.88±0.12	14.77±0.12	17.09±0.12	11.91±0.15	14.83±0.14	17.06±0.15
<i>XS:</i>							
2 months	40.40±1.68	38.60±1.30	35.20±2.21	32.80±2.40	38.73±1.39	35.00±2.24	32.60±2.26
6 months	40.02±1.68	37.96±1.28	34.61±2.20	31.87±2.48	38.06±1.45	34.41±2.23	31.71±2.33

*Paired *t*-test.

Both groups show significant values, in difference between 2 weeks and 6 months for all measurements documented, with higher differences in measurements in group (A) more than group (B); the upward shifting of the scar in group (A) at different measurement points was higher than upward shifting of the scar at different measurement points in group (B).

There is a statistically significant difference between group (A) and group (B) as shown in (Fig.

6) regarding the increase in SP (symphysis pubis) to scar distance (central, 5, 10, 15cm) with more increase in group (A) than group (B).

Moreover, as shown in (Fig. 7), there is a statistically significant difference between group (A) and group (B) regarding the decrease in XS to scar distance (central, 5, 10, 15cm) with more decrease in group (A) than group (B); indicating that the shifting of the scar upwards was more in group (A) than group (B).

In all cases the operation passed uneventfully in the follow-up period except for four cases of seroma (1 case in group A and 3 cases in group B) which were managed conservatively, three cases had wound dehiscence (2 cases in group A and 1 case in group B), where all the 3 cases were managed by conventional dressings until healing and five cases had hypertrophic scarring managed by

silicon sheets and topical creams (3 cases in group A and 2 cases in group B).

Satisfaction scoring for both groups using the visual analogue scoring (VAS scale), shows in group (B) (80%) were very satisfied and (17%) satisfied and (3%) not satisfied, in comparison with group (A) (60%), (25%) satisfied and (15%) not satisfied, considering the final aesthetic outcome.

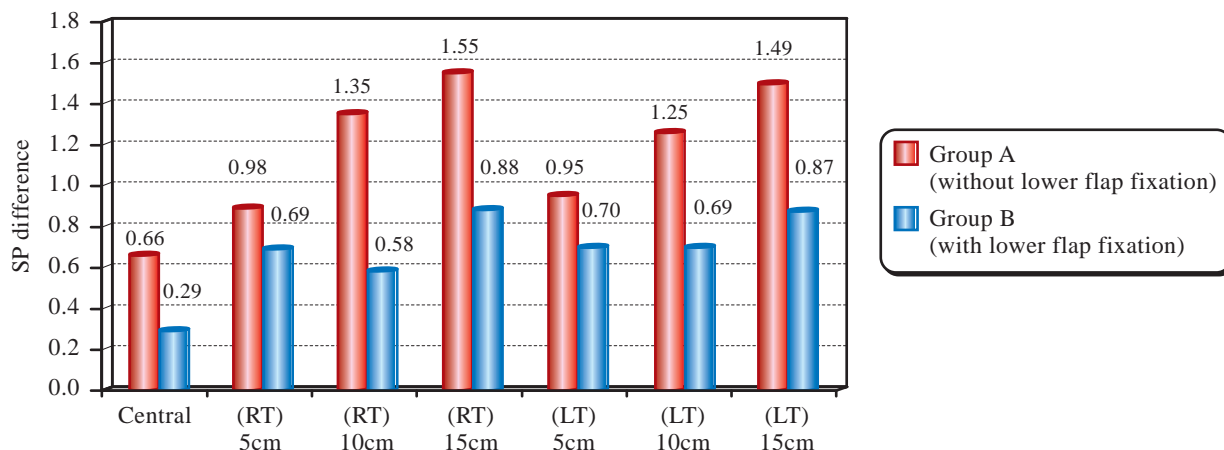


Fig. (6): Average distance of scar shifting upwards in group (A) Compared to group (B) (Concerning measurements from symphysis pubis to scar).

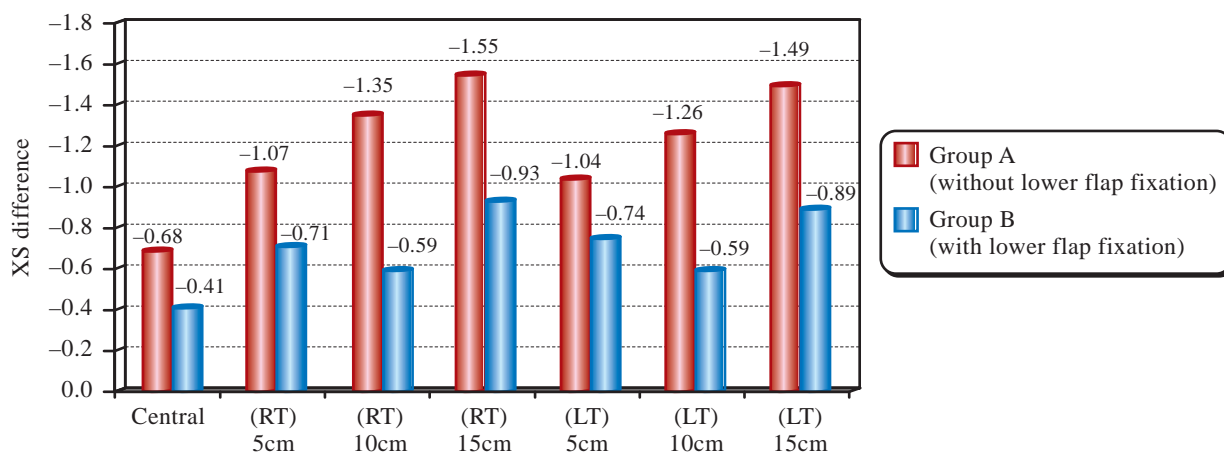


Fig. (7): Average distance of scar shifting upwards in group (A) Compared to group (B) (Concerning measurements from xiphisternum to scar).

DISCUSSION

Symmetry and proportion are the principles of aesthetic surgery. Abdominal scar asymmetry may have a major influence on both the patient and the surgeon's satisfaction; satisfying their prospects is essential for a positive outcome. Several techniques have been illustrated with the aim of maximum

symmetry and placing the final scar matching to trends of fashion and patient's desires [7,8].

Scar asymmetry occurrence and upward shifting may entail postoperative revisions and secondary procedures, adding to the cost, time and risk of patient's health and satisfaction.

In abdominoplasty, the final scar is dependent on multiple factors; the incision marking, the undermining, traction of the flaps and the shape and size of resected tissues [9]. Location of the incision at start of operation is a primary mainstay to reach optimal long-term positioning and symmetry.

Several authors proposed different site and design for the incision of abdominoplasty as Pitanguy placed in lower abdomen in a W manner [10], Baroudi and Moraes introduced the bicycle handlebar incision [11], Lockwood introduced the lateral tension abdominoplasty [5].

Meticulous preoperative marking is of ultimate importance for consistent postoperative results and minimizing the degree of scar asymmetry or scar shifting upwards. Imperfect marking can result in remarkable difference between the design and the actual resection, moreover, whether upright or supine positioning may also impact the results [12].

Healing process is also another variable that should be considered with a wide range of variation, which is beyond the control of the surgeon, however, tension on sutures represent an important role and is largely responsible for scar outcome, either shape, enlargement, or even migration. All these factors in addition to scar quality contribute to the final aesthetic outcome of the procedure [13].

All these factors, urges the establishment of maneuvers and techniques to optimize the final aesthetic outcome.

In 2001, Baxter [14] stated that the scar may shift upwards, with asymmetry, marked elevation of the pubic area with distortion and undesirable position of the scar due to seroma, so he introduced a technique of flap fixation through anchoring the superficial to deep fascia along the line of closure, however no objective assessment was done.

In our study, authors used anchoring sutures along line of closure as Baxter, as the applied high lateral tension technique is more liable to tension across the suture line and hence a greater possibility of scar migration, with more focus on objective assessment of the scar shift through documentation of measurements and according to this study and the results attained, there is a remarkable decrease in final scar shifting upwards in group (B) in comparison to group (A), and subsequently higher aesthetic outcome and satisfactory scores in group (B). The degree of scar rising on the lateral sides was greater than midline. It might be explained by

the greater laxity of lateral tissues, causing a greater rise with minimal traction.

Quilting sutures as proposed by Baroudi [15] to passively close the dead space and thus decrease the seroma formation and also other variations of progressive tension sutures as proposed by other authors [16,17] had significant effect on reducing the seroma and minimizing scar asymmetry.

However, in our study, authors relied on the designed fixing sutures of the lower abdominal flap across the suture line only with no quilting sutures to eliminate other factors that might affect the results of the study.

In another study, it was proposed to mark the mons pubis at 5cm above the vulvar commissure instead of 7-8cm as a compensation for the cephalic scar migration anticipated postoperatively of abdominoplasty [18].

In this study, authors placed the marking for incision at a standardized distance of 7cm vertical distance from the vulval commissure, with all patients in a standing position and leaning against a wall with fixation of lower abdominal flap hence minimal scar shift occurred as attained in results.

Moreover, in another study, the authors with the same aim of having a low positioned hidden scar with minimal upward shifting [19], applied a vertical component (inverted T) in abdominoplasty scar closure; to reduce tension on the scar and keep the transverse scar inferiorly, thus ending up with a hidden scar with minimal upward shifting. The disadvantage of visible vertical scar was overcome by the surgeons through keeping the vertical component 3-5cm in length.

Whereas, in our study we had the results of minimal scar shifting, but without the use of any vertical scar, only by lower abdominal flap fixation.

On basis of the results in this study, with the significant difference in upward shifting of the scars in both groups, as proved statistically by independent *t*-test (Figs. 6,7), and how this may represent the difference between a hidden and an unappealing scar, the authors recommend the application of this technique in abdominoplasty operations for optimal aesthetic outcome.

Conclusion:

Adequate planning for scar positioning by the surgeon; with an appropriate knowledge of anatomy, and understanding the natural evolution of scar migration are essential for an aesthetically appealing abdominoplasty. This study demonstrated

a vertical upward shift of up to 1.5cm laterally and 0.6cm at central line in group (A without lower flap fixation), and a vertical upward shift of 0.9cm laterally and 0.29cm at central line in group (B with lower flap fixation). A greater upward shift of scar laterally compared to central line was documented in both groups. With the results attained in this study, it is highly recommended to have fixation of the lower abdominal flap in abdominoplasty for a hidden satisfactory scar for both the patient and the surgeon.

REFERENCES

- 1- Richardson C., Mattison G., Workman A. and Gupta S.: Pricing of common cosmetic surgery procedures: Local economic factors trump supply and demand. *Aesthet. Surg. J.*, 35: 218-224, 2015.
- 2- Heidekrueger P.I., Juran S., Patel A., Tanna N. and Broer P.N.: Plastic Surgery Statistics in the US: Evidence and Implications. *Aesthet. Plast. Surg.*, 40: 293-300, 2016.
- 3- Friedland J.A. and Maffi T.R.: Abdominoplasty. *Plast. Reconstr. Surg.*, 121 (4 Suppl): 1-11, 2008.
- 4- Hensel J.M., Lehman J.A., Tantri M.P., Parker M.G., Wagner D.S. and Topham N.S.: An outcomes analysis and satisfaction survey of 199 consecutive abdominoplasties. *Ann Plast Surg.*, 46 (4): 357-363, 2001.
- 5- Lockwood T.: High-lateral-tension abdominoplasty with superficial fascial system suspension. *Plast. Reconstr. Surg.*, 96: 603-15, 1995.
- 6- Cumhuri Kilincer C. and Zileli M.: Visual Analogue Patient Satisfaction Scale. *Balkan Medical Journal*, 23 (3): 113-118, 2006.
- 7- Winocour J., Gupta V., Ramirez J.R., Shack R.B., Grotting J.C. and Higdon K.K.: Abdominoplasty: Risk factors, complication rates, and safety of combined procedures. *Plast. Reconstr. Surg.*, 136 (5): 597e-606e, 2015.
- 8- Gutowski K.A.: Evidence-based medicine: Abdominoplasty. *Plast. Reconstr. Surg.*, 141 (2): 286e-299e, 2017.
- 9- Nahas F.X.: A pragmatic way to treat abdominal deformities based on skin and subcutaneous excess. *Aesthetic Plast. Surg.*, 25 (5): 365-71, 2001.
- 10- Pitanguy I.: Abdominal plastic surgery. *Hospital (Rio J)*, 71 (6): 1541-56, 1967.
- 11- Ricardo Baroudi M.D. and Mario Moraes M.D.: A "bicycle-handlebar" type of incision for primary and secondary abdominoplasty. *Aesthetic Plastic Surgery*, Volume 19: 307-320, 1995.
- 12- Dini G.M.: A new position to hide the abdominoplasty scar. *Plast. Reconstr. Surg.*, 119 (4): 1391-2, 2007.
- 13- Di Summa P.G., Reto Wettstein R., Paolo Erba P., Raffoul W. and Kalbermatten D.F.: Scar Asymmetry After Abdominoplasty The Unexpected Role of Seroma. *Ann. Plast. Surg.*, 71: 461-463, 2013.
- 14- Baxter R.A.: Controlled Results with Abdominoplasty. *Aesth. Plast. Surg.*, 25: 357-364, 2001.
- 15- Baroudi R. and Ferreira C.A.A.: Seroma: How to avoid it and how to treat it. *Aesthetic Plas. Surg.*, 18: 439, 1998.
- 16- Pollock H.: Progressive tension sutures: A technique to reduce local complications in abdominoplasty. *Plast. Reconstr. Surg.*, 105: 2583, 2000.
- 17- Le Louarn C. and Pascal J.F.: High superior tension abdominoplasty. *Aesthetic Plast. Surg.*, 24: 313, 2000.
- 18- Jabbour S. and Schmitt T.: The Long-Term Evolution of the Pubis Scar in Body lifts and Abdominoplasties: Can We Anticipate the Scar Migration and the Pubis Elongation? *Aesthet. Surg. J.*, 38 (10): 150-151, 2018.
- 19- Sevgi Kurt Yazar and Merdan Serin: Comparison of Aesthetic Quality of the Final Scar in Abdominoplasty with Conventional and Mini Inverted t-Scar. *Medicina*, 55: 142-150, doi:10.3390/medicina55050142, 2019.