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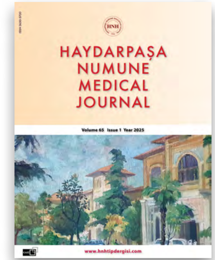

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ORIGINAL ARTICLE

Medial Scar Fish-Tail Brachioplasty with Ultrasound and Power-Assisted Liposuction in Arm Ptosis

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Abstract

Introduction: This paper discusses the surgical outcomes and complications of the medial scar fish-tail brachioplasty technique used with UAL (LIPOSAVER, LHbiomed Co., Korea) and PAL (Microaire, USA) in treating Teimourian grade III to IV arm ptosis.

Methods: A retrospective study was conducted using patient data and chart reviews from the authors' private cosmetic practice. It focused on patients who underwent fish-tail (FT) brachioplasty combined with UAL/PAL from October 2020 to April 2023. The study comprised 31 healthy participants. A comprehensive review of all patients' demographic data, surgical records, complications, lipoaspirate volumes, and patient satisfaction was undertaken.

Results: From October 2020 to April 2023, a total of 31 fish-tail brachioplasty procedures using UAL/PAL were carried out. The mean age was 36.3±15.2 years, the body mass index (BMI) was 27.3±4.3 kg/m^2, and all patients were female. Of the patients, 9 (29%) underwent isolated fish-tail brachioplasty with UAL/PAL, while 22 patients (71%) opted for additional procedures. Regarding complications, 7 patients (22.5%) experienced issues. The most common complications seen with fish-tail brachioplasty with UAL/PAL were minor wound dehiscence at the T-junction in 3 patients (9.6%), hypertrophic scar in 2 patients (6.4%), seroma in 1 patient (3.2%), and surgical site infection in 1 patient (3.2%). The overall complication rate was 22.5%.

Discussion and Conclusion: Medial scar fish-tail brachioplasty, combined with UAL/PAL, is a safe and efficient method. This combination provides a viewpoint on defining the aesthetic components of the arm.

Keywords: Arm lift; brachioplasty; liposuction; PAL; UAL.

Ancient sculptors viewed the arms of a sculpture as more than just a physical component, recognizing them as essential for conveying movement, emotion, and the overall narrative of the piece. They meticulously considered how the arms interacted with the rest of the body and the surrounding space, ensuring consistency in perspective and proportions from every angle. The gestures of the arms could convey various states and emotions, such as power, grace, or aggression. Every person has a unique physique, and achieving the perfect arm shape requires a keen artistic eye. Contemporary brachioplasty approaches aim not just to remove excess skin but also to create a harmonious aesthetic balance with the rest of the body.

Brachioplasty, originally coined as brachial dermolipectomy by Itturaspe and Fernandez in 1954, has observed numerous alterations over the years [1]. Despite these changes, the final scar placement and appearance, as well as the precise amount of tissue removal, continue

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to present challenges for plastic surgeons. Past research has incorporated the use of energy-based tools like ultrasound-assisted liposuction (UAL), laser-assisted liposuction (LAL), power-assisted liposuction (PAL), and radiofrequency-based devices in cases of Teimourian grade I, IIa, IIb, and III arm ptosis [2–4]. However, surgical removal of excessive skin and fat deposits remains the go-to method for treating Teimourian grade IIb, III and IV arm ptosis. Better cosmetic results for arm contouring can be achieved through the use of various energy-based liposuction techniques in conjunction with the brachioplasty procedure. However, there is no consensus on the most effective approach, scar placement, and the appropriate length of incisions [5]. Teimourian and Malekzadeh published a comprehensive classification of arm ptosis in 1998 [6]. Many patients seeking upper arm contouring fall into the categories of stage IIb, III, or IV, and for these patients, brachioplasty is typically recommended [7,8]. This paper discusses the surgical outcomes and complications of the medial scar fish-tail brachioplasty technique used with UAL (LIPOSAVER, LHbiomed Co., Korea) and PAL (Microaire, USA) in treating Teimourian grade III to IV arm ptosis.

Materials and Methods

A retrospective study was conducted using patient data and chart reviews from the authors' private cosmetic practice. The study was conducted in accordance with the principles of the Helsinki Declaration, and informed consent was obtained from the subjects. Ethical approval was obtained from the Clinical Research Ethical Board of Medipol University. The study focused on patients who underwent fish-tail (FT) combined with UAL/PAL from October 2020 to April 2023. The study comprised 31 healthy participants (Fig. 1). Patients were excluded if they had conditions impacting microcirculation, such as diabetes mellitus, cardiopulmonary diseases, hereditary bleeding, or thrombotic disorders. Those using herbal products and patients who had previously undergone revision brachioplasty were also ruled out. A comprehensive review of all patients' demographic data, surgical records, complications, lipoaspirate volumes, and patient satisfaction was undertaken. Surgeries were performed under general anesthesia, with a mean follow-up period of 12 months (Figs 2–5). The evaluation of outcomes was conducted through an online patient satisfaction survey 1 year post-operation. Satisfaction was gauged at the one-year mark to assess the results of medial scar FT brachioplasty combined with UAL/PAL, using a simple Likert scale. The scale ranged from 1 (very satisfied), 2 (satisfied), 3 (dissatisfied), to 4 (very unsatisfied), and was administered by an independent observer.

Surgical Technique

All procedures were completed under general anesthesia while patients were in a supine position with their arms outstretched at a 90-degree angle on the table. The arms were sterilized and draped, and a small incision was made above the medial epicondyle at the front of the arm to administer the tumescent fluid. This fluid, a super-wet solution, was made up of one liter of Ringer's lactate, 10 cc of 2% lidocaine, and 1 cc of 1:1000 epinephrine.

Following this, UAL was implemented, focusing on the deep and superficial planes of the fish-tail excision area beneath the bicipital groove, the posterior aspect of the arm, and the anterolateral arm. Ultrasound energy, set on the superficial mode at 60% power with a 3-grooved tip probe, was applied. The duration was determined by the amount of tumescent fluid used, one minute for every 100 cc.

Next, PAL was carried out with a 4 mm blunt aspiration cannula. This was focused on the areas for brachioplasty excision, the posterior aspect of the arm, and the anterolateral arm. In the operating room, all patients were given antibiotic prophylaxis, which continued for ten days after the operation. Drains were removed 24 hours later. Lastly, patients were instructed to wear a compression arm garment for at least 4 weeks.

Figure 1. Preoperative drawing of the medial scar fish tail brachioplasty technique.

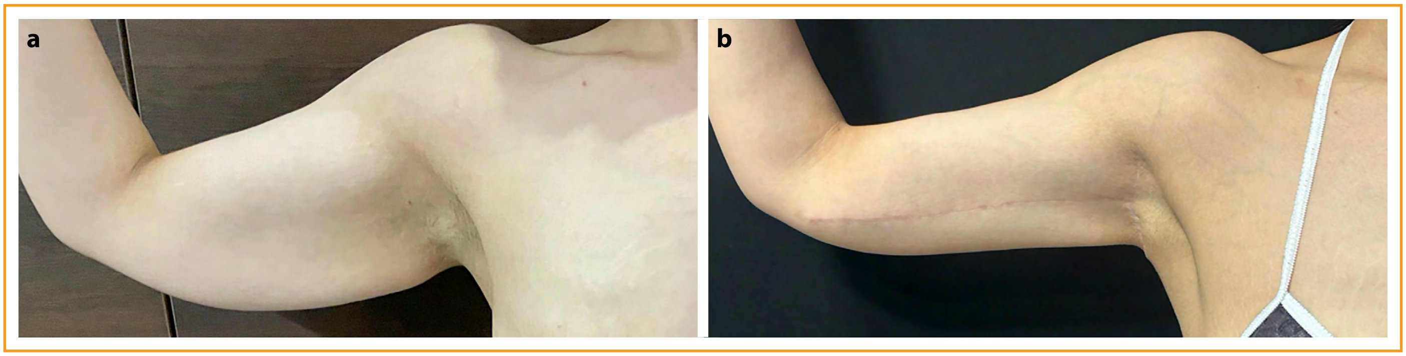

Figure 2. Preoperetive anterior view of the case **(a)** and postoperative anterior view of the case after one year **(b)**.

Figure 3. Preoperetive anterior view of the case **(a)** and postoperative anterior view of the case after one year **(b)**.

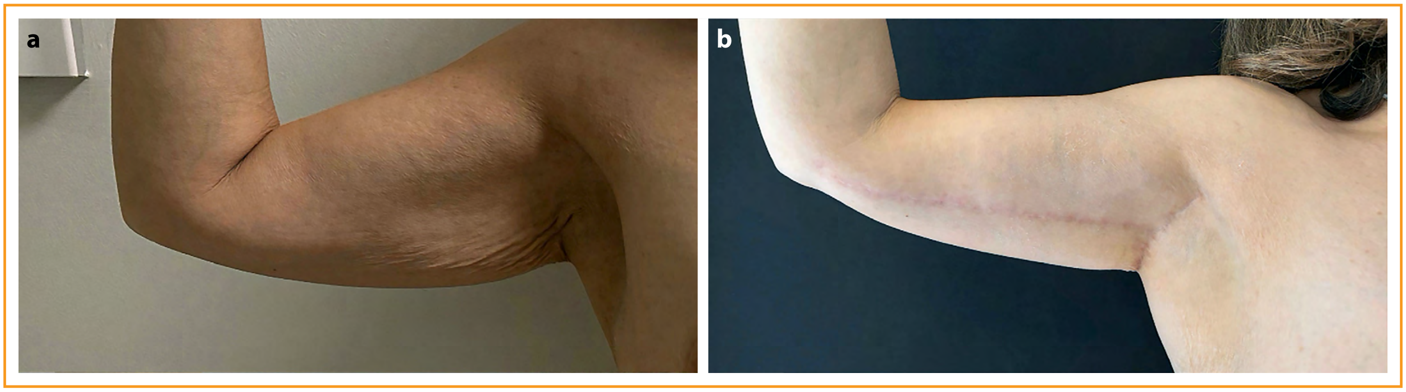

Figure 4. Preoperetive anterior view of the case **(a)** and postoperative anterior view of the case after one year **(b)**.

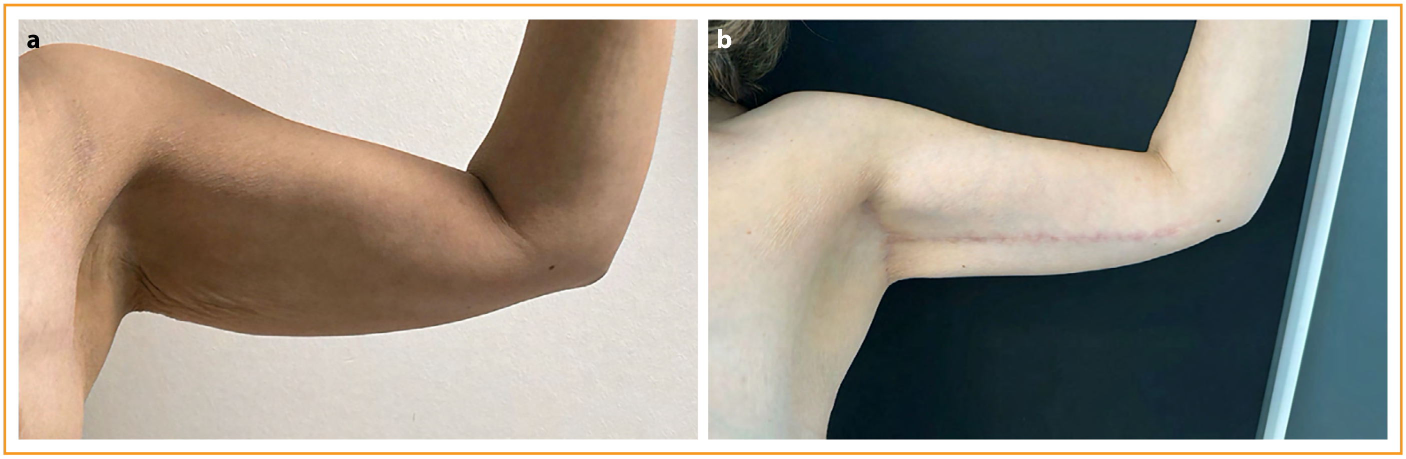

Figure 5. Preoperetive anterior view of the case **(a)** and postoperative anterior view of the case after one year **(b)**.

Table 1. Patient demographics

Total number of cases	31
Mean age (±SD)	36.3±15.2 years
Mean BMI (±SD)	27.3±4.3 kg/m^2
Sex	31 Female
Isolated fishtail brachioplasty	9 pts (29%)
Brachioplasty with additional procedures	22 pts (71%)
Patients with complications	7 pts (22.5%)

SD: Standard deviation; BMI: Body mass index.

Results

From October 2020 to April 2023, a total of 31 fish-tail brachioplasty procedures using UAL/PAL were carried out. The mean age was 36.3±15.2 years, the body mass index (BMI) was 27.3±4.3 kg/m^2, and all patients were female. Of the patients, 9 (29%) underwent isolated fish-tail brachioplasty with UAL/PAL, while 22 patients (71%) opted for additional procedures. Regarding complications, 7 patients (22.5%) experienced issues (Table 1).

The most common complications seen with fish-tail brachioplasty with UAL/PAL were minor wound dehiscence at the T-junction in 3 patients (9.6%), hypertrophic scar in 2 patients (6.4%), seroma in 1 patient (3.2%), and surgical site infection in 1 patient (3.2%). The overall complication rate was 22.5%. The patients were followed up for an average of 12 months (9–24 months). Generally, the surgery duration for a UAL/PAL brachioplasty was 140 minutes (ranging from 98 to 155 minutes), and the average amount of aspirated fluid was 380 cc (ranging from 250 to 650 cc). Most of the patients (87.1%) were satisfied with their overall surgical outcome from the fish-tail brachioplasty with a combination of UAL/PAL. The patient with seroma, the patient with wound dehiscence, and the 2 patients with hypertrophic scar were the only patients who did not report a satisfactory surgical outcome (12.9%).

Discussion

The rise in popularity of bariatric surgery has significantly altered the reasons why patients seek arm lift procedures. In the past, most of these procedures were primarily related to lipodystrophy in the arm area from weight loss caused by diet and exercise or senile elastosis. Today, however, a considerable patient group comprises those who have undergone bariatric surgery. Roughly 63% of all arm lifts are conducted on patients who have experienced massive weight loss [9]. In particular, cases related to senile elastosis or bariatric surgery, especially severe ones (Grade III and IV), show that despite reduced skin elasticity and postoperative scarring, arm lifts continue to play a critical role in aesthetic surgery.

Lockwood is recognized for popularizing the modern method of brachioplasty. This method focuses on eliminating excess skin through a T-shaped incision across the arm and axilla. According to the author of the study, adjustments were made to the brachioplasty procedure to ensure the arm flap is firmly attached to the axillary fascia and to reinforce incision repairs in the superficial fascial system. This adjustment is aimed at reducing the chances of scar widening or shifting and preventing the creation of unnatural contours [10]. Modern brachioplasty techniques and their adaptations have inspired many surgeons to devise new methods, particularly in the pursuit of the perfect brachioplasty. The goal of these techniques is to minimize scar length, enhance concealment, and aim for low complication rates. Some of these techniques include the sinusoidal pattern scar, a posterior scar accompanied by a Z-plasty, a fish-like design, L-brachioplasty, the short-scar method, and S-shaped incisions [8,11–14].

In a meta-analysis by Albraa and colleagues, 29 brachioplasty studies involving 1,578 patients were analyzed. The authors highlighted that all these studies were observational. Complication rates identified were 9.9% for abnormal scarring, 7.79% for sagging or recurrence, 6.81% for wound separation, 5.91% for seroma, 3.64% for infection, 2.47% for nerve-related issues, 2.46% for lymphedema or lymphocele formation, 2.27% for skin necrosis or delayed healing, and 2.06% for hematoma [15].

Commonly seen complications in our study, such as seroma, wound healing problems, and hypertrophic scar, aligned with the findings from the meta-analysis. We did not identify any cases of hematoma, nerve damage, or thromboembolism.

Rohrich and colleagues used the short-scar brachioplasty technique on 165 patients, ranging from 3 to 58 months. Complications included two cases of superficial wound separation (managed with wound care within 7 to 10 days), one lymphocele, and three instances of scar widening, with two needing revision. The study noted a 3.6% complication rate for short-scar medial brachioplasty cases. The authors emphasized that this procedure is specifically for type IIa and IIb patients and is not a substitute for traditional brachioplasty. Candidates for this procedure should have moderate skin excess and limited lipodystrophy in the upper third to half of the arm [16].

There are varying views on the ideal scar placement following brachioplasty procedures [1,6,17,18]. Some surgeons prefer the posterior scar method, some the posteromedial approach, and others the medial scar approach. However, according to a study by Samra et al. [19], it is widely agreed that the straight medial scar is the preferred choice among the general population, plastic surgeons, and brachioplasty patients. This scar placement ranks highest among both males and females across all ages.

Arm liposuction has been elaborately discussed in scientific literature. Some have identified it as the main technique for arm reduction, while others have proposed it as an initial step before undertaking excision surgery [14,20–22]. Although diverse liposuction techniques have been widely reported with satisfactory outcomes, eliminating the requirement for brachioplasty in arm ptosis of grade I, IIa/b, and III, it is crucial to acknowledge gaps in objective data concerning long-term results for grade IIb, III, or IV arm ptosis. It is also important to note that postoperative scars are a serious concern for some patients, while others deal with sagging arm skin and soft tissue [2,23,24].

Elderly patients dealing with senile elastosis or those with diminished skin quality post-bariatric surgery, particularly those in grade III and IV arm ptosis categories, present significant challenges to plastic surgeons. Energy-assisted liposuction is frequently used in these patients, though modern brachioplasty methods remain the primary surgical consideration.

In their research on arm contouring using PAL and fat transfers, Abboud and colleagues elucidate their approach for grade I, II, and III arm ptosis. This involves expanding the recipient site through vibration and creating layered tunnels. By introducing the cannula into the arm's superficial subcutaneous spaces, tethered tissues are released, hence facilitating skin retraction post-surgery [23]. They argue that liposuction and fat transfers may provide sound results for patients with mild to moderate brachial ptosis while stating that further investigations are needed to confirm the effectiveness of this technique for grade IV brachial ptosis cases.

Bossert et al. [25] used traditional liposuction techniques for brachioplasty to treat arm deformities resulting from significant weight loss. Their method involved excising tissue from the medial part of the upper arm and lateral chest wall, using liposuction to reduce the remaining fat on the back of the arm. Their research demonstrates that this combination of arm liposuction and excision is a safe and effective strategy for treating upper arm deformities following significant weight loss. In their study, the complication rate for brachioplasty was approximately 46%. They found no notable difference in complication rates between patients who only underwent excisional brachioplasty and those who had both excisional brachioplasty and arm liposuction. The rates were 43.6% and 49.2%, respectively. The most common complication they observed was seroma [25].

In our study, apart from the excision areas, deep plane UAL/PAL was applied to the posterior arm and anterolateral arm for FT brachioplasty. Our current study found a complication rate of 22.5% for FT brachioplasty. Comparatively, De Ruz et al.'s [26] study found a 41.7% total complication rate among patients who underwent traditional suction-assisted liposuction with medial brachioplasty (single ellipse). Nguyen's study of 21 UAL-assisted posterior brachioplasty procedures reported complications in only two cases, indicating liposuction-assisted posterior brachioplasty as an effective and consistent method for patients with extenuated arm skin and fat redundancy [8]. A review by Sisti et al. [27] showed an overall 28.9% complication rate with a varying range of 0–21% for surgical revisions in brachioplasty, though no major complications such as thromboembolic events or sepsis were reported.

In their article, Di Pietro et al. [28] compared the outcomes of traditional brachioplasty with liposuction-assisted brachioplasty. They noted an early surgical complication in one of the 11 patients (9%) from the liposuction-assisted brachioplasty group. Despite this, they found a significantly lower complication rate in this group ($p<0.01$). Nevertheless, the study pointed out cosmetic complications in two instances.

In a different study, Zomerlei et al. [29] evaluated the experiences of 96 patients who underwent brachioplasty. They aimed to identify factors that might influence positive or negative results. According to their findings, 53.7% of patients (n=51) had simultaneous circumferential arm liposuction. No correlation was found between this procedure, incision type, pre-surgery changes in BMI, postoperative use of closed suction drains, and complication or revision rates. Through logistic regression analysis, the study found no statistically significant increase in complications when additional procedures were concomitantly performed with brachioplasty.

This study has several limitations. First, the relatively low mean BMI and younger average age of the cohort may have contributed to more favorable aesthetic outcomes and lower complication rates. Second, the absence of a control group limits the ability to draw direct comparisons with other techniques. The high rate of concomitant procedures may confound the interpretation of outcomes specifically attributable to the brachioplasty technique. The current study did not explore the application of posterior or posteromedial scar patterns. A more exhaustive examination involving various excision patterns and brachioplasty techniques could reveal contrasting findings. Additionally, evaluating different liposuction techniques alongside medial scar brachioplasty might yield diverse outcomes.

Conclusion

Despite the growing demand for lipobrachioplasty after massive weight loss or senile elastosis, no universally accepted brachioplasty technique has been established to significantly enhance surgical outcomes. However, medial scar fish-tail brachioplasty combined with UAL/PAL is a safe and efficient method. This combination provides a viewpoint on defining the aesthetic components of the arm. The study shows that using UAL/PAL on areas outside of the excision area is a safe and effective way to address upper arm deformities.

Ethics Committee Approval: The study was approved by Medipol University Ethics Committee (No: 367, Date: 28.03.2024).

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