The popularity of arm-contouring procedures, once coveted by the massive weight loss population, has grown among society at large. Arm lifting is the fastest growing cosmetic plastic surgery procedure of the past decade.1 Although liposuction can be a stand-alone treatment for certain patients, those with or who will have excess skin after liposuction are best treated by brachioplasty.2,3

The usual scar placement options for brachioplasty are either medially along the bicipital groove4 or posteriorly overlying the triceps muscle,5 although some have modified the technique to a scar location between the two, described as posteromedial,6 or even traversing both areas as an S-shaped final scar.7

Having experience with both types of scar placements, patient feedback has led to our current technique, which is placement in a posteromedial location. This scar is seldom noticed during animated speech, and it cannot be seen from behind, a common complaint of patients who have undergone brachioplasty with a posterior scar. Regarding scar healing, it has also not been our experience that any scar technique heals better or worse than another with regard to widening or dehiscence.8

The technique in our practice for patients requiring brachioplasty has evolved with the goal of producing a predictable and thin scar in a location that is acceptable for interpersonal interaction, while limiting complications such as seroma,
contour deformity, and dehiscence. The design can be extended onto the lateral chest or forearm if the deformity demands.

We believe that aggressively liposuctioning the planned resection pattern preserves lymphatics, blood vessels, and nerves, which improves swelling and minimizes neuroma formation. After aggressive liposuction, the skin can be incised and avulsed in a proximal to distal direction to minimize shearing of vessel branches. Avulsion brachioplasty is quicker and more predictable than dissecting through the fat of the arm.

METHODS

All consecutive brachioplasty patients from May of 2008 to May of 2013 were reviewed retrospectively at a private surgery center. Data collected included age, body mass index, concurrent surgery, amount of fat removed by liposuction, weight of resected tissue, hematoma or seroma requiring intervention, wound dehiscence, revision procedures within 1 year, change in typical postoperative antibiotic course, and length of follow-up.

All procedures were performed by one of two surgeons. Complications included wound dehiscence, hematoma, seroma, required intervention for wide or hypertrophic scars, infection, or revisional surgery within 1 year.

Operative Technique

Markings begin by drawing the ideal position for the resultant scar. This is along a line from the medial epicondyle to the midaxillary line. If the deformity is solely in the arm, then the planned scar ends in the axilla; however, if the deformity extends onto the lateral chest, the planned scar is drawn down the lateral chest wall and tapered toward the lateral inframammary fold. A notch is drawn in the apex of the axilla to prevent webbing of the scar across the axilla as it extends down the lateral chest and to minimize tension in the axilla, the most common location of wound breakdown (Fig. 1).

The planned excision is estimated by gentle skin pinch and tapered at the ends to prevent standing cutaneous deformity. Realignment marks are made to assist in closure.

Once the patient is anesthetized, the markings are rechecked before any local infiltration. A penetrating towel clamp is used to confirm the preoperative markings approximate with appropriate tension. If the towel clamp is difficult to close because of tension, the lines are simply moved inward a small distance and re-marked. This is a subjective test, and through experience the surgeon will become confident with confirming markings. These markings are then tattooed with methylene blue and a 30-g needle.

Before preparation and draping, tumescent is infiltrated through a blunt cannula under the area of planned resection using Hunstad solution. The solution is diluted if the amount of planned tumescent to be injected exceeds lidocaine concentrations of 35 mg/kg. The warmed tumescent is injected using a pneumatic compression pump. The endpoint of tumescent is tense tissue turgor. While liposuction may be safely performed outside the area of planned resection, for the purposes of this article, we are discussing our standard brachioplasty technique, and the tumescent solution is infiltrated only under the area of planned resection.

After preparation and draping, a very thorough and aggressive liposuctioning of the area to be excised is conducted. The edges of the liposuctioned area are not tapered, and there should be a very distinct, dished-out deformity after completion of the liposuction. Once all of the subcutaneous fat has been removed beneath the area of planned resection, the marks are again checked with a penetrating towel clamp (Fig. 2). The elliptical incisions are made through the superficial fascial system, which then springs open. A Kocher clamp is used to grasp the tissue proximally. The tissue is avulsed proximally to distally. The direction of pull is important because blood vessels, cutaneous nerves, and lymphatics branch proximally to distally. Avulsion in this manner decreases the likelihood of avulsing vessel branches along with the skin. The preservation of blood vessels decreases bleeding compared with sharp dissection of the tissue for excision (Fig. 3). The preservation of lymphatics minimizes swelling and seroma risk.
After removal of the resected specimen, the wound is inspected for hemostasis. The base of the wound is typically dry with excellent preservation of vasculature. The skin edges are temporarily stapled and then closed in two layers with 3-0 poliglecaprone (Monocryl, Ethicon Inc., Somerville, N.J.) in the superficial fascial system/deep dermis and 4-0 running subcuticular poliglecaprone (Monocryl, Ethicon Inc., Somerville, N.J.) in the skin.

RESULTS

Over 5 years at a private surgical center with two surgeons, 44 consecutive brachioplasties were reviewed. All patients were female, with an average age of 53 years (range, 33 to 75 years). Body mass index ranged from 18.6 to 38.6, with an average of 26.1. Of the patients in the series, 25 percent had avulsion brachioplasty as an isolated procedure. The average amount of tumescent used per arm was 867 ml, and the average volume of fat aspirated per arm was 342 ml. This was calculated by allowing the total lipoaspirate to settle in a graduated cylinder and then measuring the volume of just fat after separation of the tumescent fluid and blood. The resected tissue weighed 90 g per arm on average.

Follow-up averaged 446 days, ranging from 3 to 1626 days, with 93 percent of patients having at least 1-month follow-up data. Of the three patients with fewer than 30 days of data, two could be reached. Both reported no wound healing issues and no further revision surgeries. Fourteen patients had wound dehiscence requiring dressing changes. One patient had a seroma requiring serial aspirations for resolution. Nine patients underwent scar revision within 1 year for widened or hypertrophic scars. There were no return trips to the operating room for serious concerns such as bleeding or infection. No patients required a change in the typical 7-day postoperative course of antibiotics. Overall complication rate was 50 percent. Overall revision rate was 21 percent.

DISCUSSION

Avulsion brachioplasty with posteromedial scar has come about through the evolution of the senior author’s (J.P.H.) practice. Problems with wound separation, seroma, and patient dissatisfaction with scar placement led to the current, described technique. It is worth mentioning that no scar location on the arm is perfect, but the posteromedial one has been best accepted by patients at our practice. It allows for minimal visibility during expressive conversation, and patients frequently wear sleeveless clothing (Fig. 4).

A complication rate of 50 percent is substantial but not out of the realm of published data. Hurwitz and Jerrod reported seroma, wound dehiscence, tip necrosis, or minor scar revisions in 11 of 15 patients (73 percent) in his series from 2010.11 Nguyen and Rohrich reported a 14 percent complication rate in 21 patients with no scar revisions required.5 Zomerlei and colleagues reported a 53 percent complication rate in 96 patients, with most of those complications being minor and a reported revision rate of 23 percent, similar to that in our study.12

Our inclusion criteria for complications included any dehiscence, however minor. Because this was a retrospective study, this information was compiled by reviewing nursing notes from follow-up visits. If a patient was noted as having any dehiscence
or requiring any sort of dressing changes, then her case was counted as a complication. There were frequently not wound measurements listed, so it was not possible to rank the degree of dehiscence into a minor or major category.

The surgical technique has been modified to its present form to minimize complications. Early on, there was unacceptable dehiscence in the axilla, which was judged to be a result of excess tension. Placing a notch directly in the axilla has minimized the tension in this area and minimized any large dehiscence. For those who are less experienced with the towel-clamp technique to assess tension along the resection margin, it is advised to be

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**Fig. 4.** (Left) During animated speech, the posteromedial scar is well hidden. (Right) From behind, the scar is less noticeable than a posterior brachioplasty scar.

**Fig. 5.** A 40-year-old woman is seen preoperatively (above) and 7 months postoperatively (below). She was unhappy with her scar at 7 months and went on to have a scar revision shortly thereafter.
conservative—grasp with only one towel clamp at a time, and mark slightly inside the edges of tissue to be excised. If multiple towel clamps are used simultaneously during marking, the tension is distributed along several clamps and the surgeon will be given a false sense of security. Too much skin can then be easily resected and closure becomes difficult.

While almost all complications such as dehiscence or scar widening can be managed with dressing changes or scar revision under local anesthesia, this should be discussed preoperatively. From our data, the risk of needing dressing changes for small wound complications is nearly 1 in 3, and the risk of needing a future scar revision is nearly 1 in 5. We attribute a revision rate of 21 percent largely to our willingness to perform a scar revision for anything but a perfect scar (Fig. 5). We have tried multiple different suture types to improve

Fig. 6. A 66-year-old woman seen preoperatively (above), 3 months postoperatively (center), and 4.5 years postoperatively (below).
the surgical scar and balance the complex interaction of wound tension, potential suture exposure, ease of use, and material cost, with poliglecaprone (Monocryl) currently meeting our needs the best. The low seroma rate is attributed to lymphatic and vessel-preserving liposuction of the resection area before avulsion. To minimize the shearing of lymphatics and small vessels, the skin avulsion should be done only from proximally to distally, and only after complete and thorough evacuation of fat via liposuction.

CONCLUSIONS

Avulsion brachioplasty is a rewarding procedure with consistent results and low risk of serious complications (Fig. 6). The final scar placement has evolved in our practice to a posteromedial location. The potential for minor complications is substantial and patients should be counseled preoperatively regarding this risk. In our 5-year study, 50 percent of patients needed dressing changes for small wound dehiscence and/or scar revision within 1 year.

REFERENCES