# 88 Brachioplasty

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## Abstract

The use of brachioplasty is rapidly increasing. Tremendous variability in presentations has led to different types of arm recontouring. From suction-assisted lipectomy, for appropriate candidates, to minimal incision brachioplasty and more extensive brachioplasty procedures, the objective is to reproduce a proportional and functional arm contour. Patient selection, preoperative assessment, and clear understanding of the arm's anatomical features are paramount. Preoperatively designed markings of four major groups of brachioplasty—minimal incision, standard, extensive, and thoracobrachioplasty—are based on the position and proximal and distal involvement of excess skin and fat and on preferred scar position in the posterior–medial axis. Two intraoperative approaches to a safe, predictable operation—the staple approximation technique and the sequential resection and approximation technique—are described. A three-pointed progressive closure reduces dead space and obviates the need for drains. As scarring continues to be a major concern, intraoperative and postoperative measures are taken to reduce tension and create a better environment for the eventual mature scar. Use of longer-absorbing sutures and silicone products, as well as the passage of time, are primary factors in the mature scar's appearance. Selective ancillary procedures, such as breast recontouring and upper body lifts, can be useful adjuncts to brachioplasty. Patients should be warned about various anatomical limitations, such as posterior elbow lipodystrophy and midarm constrictive bands, and the potential need for secondary operations with recurrent arm laxity. But with selection of the appropriate type of brachioplasty and a well-planned execution, this operation's results are predictable and highly gratifying for patients.

### Keywords

brachioplasty, drainless closure, extensive brachioplasty, hypertrophic scarring, intraoperative scar management, midarm constrictive bands, minimal incision brachioplasty, posterior elbow lipodystrophy, posterior–medial scar, postoperative scar management, sequential resection and approximation technique, standard brachioplasty, staple approximation technique, thoracobrachioplasty

## 88.1 Introduction

With the confluence of popular culture's quest for a shapely arm, and the rapid evolution of massive-weight-loss body contouring has come a rapid increase in brachioplasty that addresses excess skin and fat of the upper arm and its extension into the lateral chest wall. Considering the diverse presentations of excess skin, patterns of weight loss, and proximal and distal extension of the deformity, different types of brachioplasty are used to address this range of presentations. Brachioplasty has evolved primarily through development of progressive and efficient intraoperative techniques that translate into a harmonious and balanced arm shape, taking into account scar position and regional proximal defects, such as lateral chest wall excess. Also, a clear understanding of variability of presentation is paramount to produce consistent outcomes in the face of the wide-ranging variations in this patient population (**Fig. 88.1**).

Although suction-assisted lipectomy might be appropriate for a select group of patients who retain sufficient skin elasticity, an excisional approach to remove excess skin continues to be the most common operation for a majority of patients. Since its description in the mid-1950s in the literature, brachioplasty has been considered the operation of choice in individuals with significant excess skin and lipodystrophy of the arm. Various types of brachioplasty, based on an algorithmic description of defects, range from a minimal incision procedure, based on the axillary fossa, all the way to thorachobrachioplasty that extends the excision of the arm's excess into the lateral chest wall. At all times, the goal of treatment is to create a harmonious, proportional, and balanced arm with attention to aesthetics of the scar and, ultimately, safety and reproducibility.

## 88.2 Indications and Contraindications

Brachioplasty is indicated in patients who have significant excess skin of the upper arm. Such patients present with loss of anatomical features of the upper arm due to redundancy of skin. This is accompanied by various degrees of lipodystrophy in different regions of the upper trunk and arms. This skin redundancy can extend below the elbow and to the lateral chest wall. In cases where excess fat is present with minimal excess skin, usually in younger individuals or persons who have not sustained weight loss, liposuction alone can be used to contour the upper arm. However, most patients with excess skin will require brachioplasty. An appropriate candidate for this operation is someone with significant excess skin and fat, who is healthy, has stable weight, and understands the realistic outcomes of this operation. Candidates must also be familiar with the extent and nature of scarring that accompanies brachioplasty.

Brachioplasty should be avoided in patients with poor health and those who have not fully lost the necessary weight, are active smokers, or have unrealistic expectations. It should also be avoided in patients with a history of extensive lymphadenectomy of the axilla or lymphedema and compromise of vascular anatomy and function and in those with restricted arm movement and function due to immune, musculoskeletal, or traumatic disease processes.

**Fig. 88.1** Different presentations of arm excess skin and lipodystrophy in women of different ages: **(a)** 35, **(b)** 64, **(c)** 36, **(d)** 57, **(e)** 55.

## 88.3 Pertinent Anatomy

The arm, as it relates to its recontouring with brachioplasty, can be divided into three different regions (**Fig. 88.2**). Most excess arm skin and fat occurs in the upper arm (region II). However, rarely treatment must extend below the elbow (region I). More commonly there is a concomitant defect of excess arm skin and fat that extends toward the lateral chest wall and beyond (region III).

A harmonious and normal arm contour (**Fig. 88.3**) manifests in an athletic and well-balanced flow of the skin and the subcutaneous envelope over the musculoskeletal scaffolding. The lower arm has a remarkable and proportional consistency to the upper arm. The bicipital groove is more pronounced in the proximal upper arm. The transition of the upper arm to the chest is balanced by the deep axillary fossa, which is hair-bearing. In general, the posterior axillary fossa is lower and has a smooth and somewhat acute transition to the posterior chest. The anterior axillary fossa is higher as it follows the arc of the inferior border of the pectoralis major insertion onto the medial humerus.

The deep anatomy of the arm (**Fig. 88.4**) reveals that the subcutaneous layer, as with most of the body, is divided by a superficial fascial system (SFS) layer that separates superficial and deeper fat. The brachial fascia invests three compartments of muscles—the biceps brachii, the brachialis, and the three heads of the triceps brachii. The median and ulnar nerves travel medial to the humerus through a busy septum between the anterior and

posterior muscle groups. The radial nerve lies deeper and closer to the humerus below that intermuscular septum.

It is also important and pertinent to discuss the anatomy of the medial brachial cutaneous nerve (MBCN) and the medial antebrachial cutaneous nerve (MABCN). The MBCN originates from T1–T2 and the MABCN from C8–T1 (**Fig. 88.5**). The course of these nerves is superficial, as two to three branches supply the skin 7 cm proximal to the medial epicondyle. Other branches innervate the skin at about 15 cm proximal to the medial epicondyle. Injury to these nerves can cause sensory disturbances of the midarm to forearm and significant paresthesia and dysesthesia for the patient. Leaving a layer of brachial fascia is imperative for avoiding these cutaneous nerves.

## 88.4 Preoperative Assessment

All patients are seen for a detailed consultation. At this meeting the technical, artistic, and philosophical approach to arm recontouring is clearly explained. A detailed description of the variability of presentation and hence variations in types of recontouring of the arm is presented. Use of diagrams, audiovisual aids, and realistic before-and-after photographs are hallmarks of this meeting.

A thorough physical examination will determine the type of arm recontouring that the patient would benefit from. Once a clear plan is made, details of that particular procedure are clearly demonstrated and described (**Fig. 88.6**). In general, depending on the assessment, one of the following options is chosen:
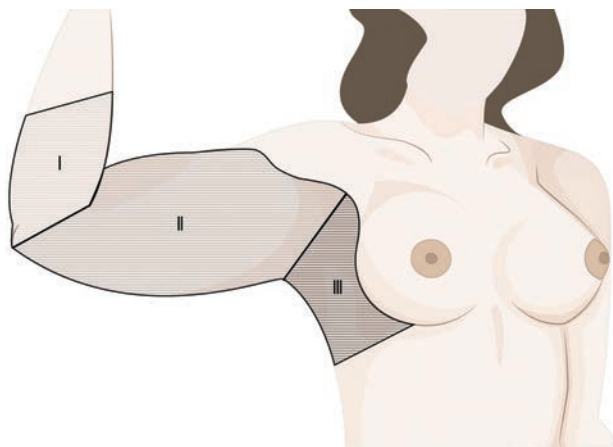
Fig. 88.2 Regions of the arm (I, II, III) as they relate to regions of defects of excess skin and fat.



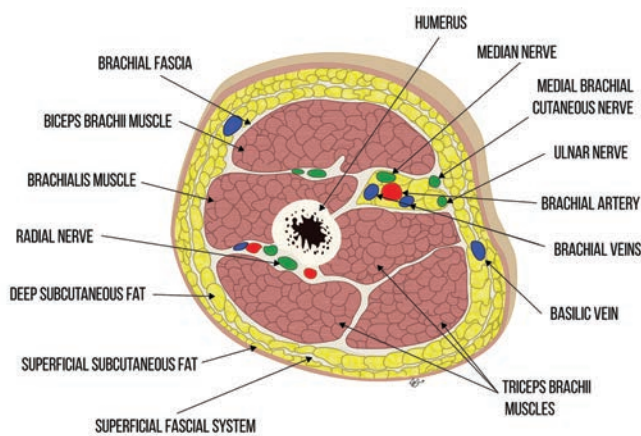Fig. 88.3 Normal arm anatomy in a 36-year-old woman.



Fig. 88.4 A midarm cross-sectional presentation of the deep anatomy of the arm.

- I. Minimal incision brachioplasty
- II. Standard brachioplasty
- III. Extensive brachioplasty with possible proximal or distal extension
- IV. Thoracobrachioplasty

Each of these procedures can be done with or without liposuction, depending on the extent of existing lipodystrophy. As previously noted, a select group of patients are candidates for liposuction only.

A determination is also made about additional procedures that might be included with the arm recontouring. These might be breast procedures or upper body lifts. In general, an attempt is made to create a logical strategy in multistage operations for the massive-weight-loss patients. Upper body recontouring—such as of arms, chest wall, upper back, and breast—is considered one stage and is generally done concomitantly and not combined with lower truncal or lower extremity operations.
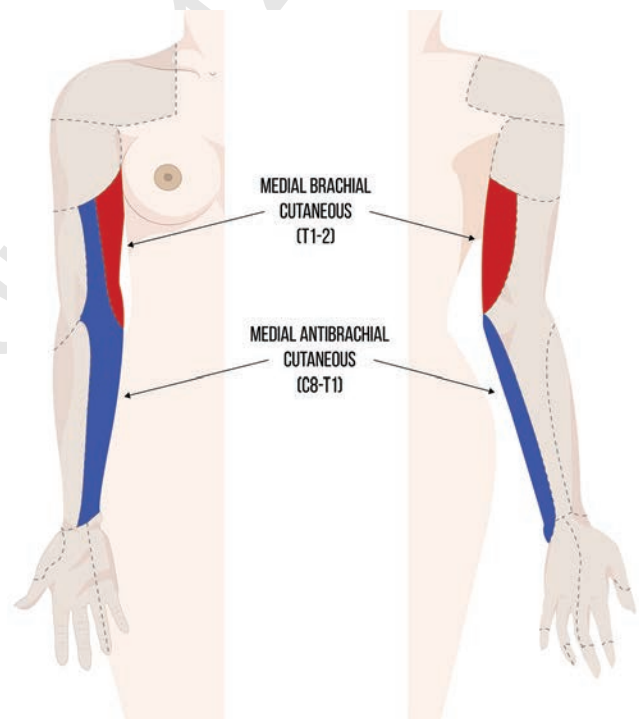


Fig. 88.5 Anatomical distribution of the medial brachial cutaneous nerve and the medial antebrachial cutaneous nerve.

## 88.4.1  Minimal Incision Brachioplasty

Patients who present with skin laxity of the proximal upper arm and mild to moderate lipodystrophy are candidates for minimal incision brachioplasty (**Fig. 88.6a1,a2**). It is imperative not to overpromise regarding correction of distal laxity and excess or the general effectiveness of this operation. Minimal-incision brachioplasty can be done with or without liposuction, depending on the extent of lipodystrophy of the proximal upper arm.
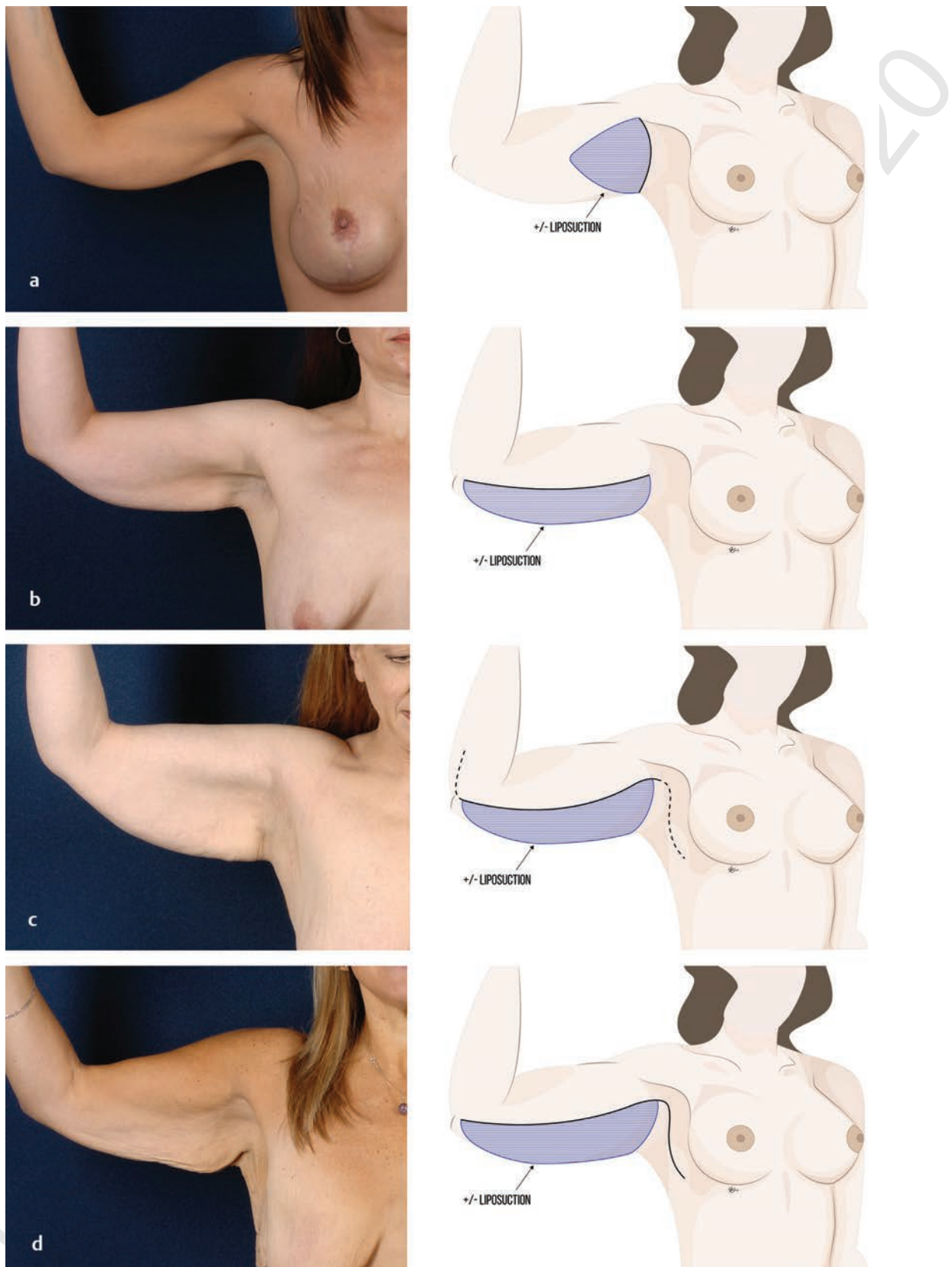
**Fig. 88.6** Preoperative presentation and illustration of types of arm recontouring to be selected. **(a)** A 39-year-old woman is evaluated for a minimum-incision brachioplasty. **(b)** A 39-year-old woman is evaluated for a standard brachioplasty. **(c)** A 47-year-old woman is evaluated for an extensive brachioplasty. **(d)** A 42-year-old woman is evaluated for a thorachobrachioplasty.

## 88.4.2  Standard Brachioplasty

This common operation is appropriate for a large group of patients with significant excess of skin of the upper arm with "bat wing deformity" (**Fig. 88.6b1,b2**). This effective operation addresses the skin laxity and can also be done with or without liposuction, depending on the presenting lipodystrophy. The extent of the excision is generally limited to the upper arm.

## 88.4.3  Extensive Brachioplasty

Patients whose excess is not simply limited to the upper arm and who have laxity of skin and lipodystrophy of the proximal forearm or proximal chest wall will require an extensive brachioplasty (**Fig. 88.6c1,c2**). The extension of the excision will depend on the presenting magnitude of excess in both the proximal forearm and the chest wall. This group will also be evaluated for the possibility of suction-assisted lipectomy as an adjunct to the recontouring.

## 88.4.4  Thoracobrachioplasty

This extensive operation (**Fig. 88.6d1,d2**) is reserved for patients who have not only a dramatic excess of arm skin but also significant excess on the lateral chest wall. This group often complains of excessive "bra rolls" and will need an overall recontouring of the arm and chest wall. These patients tend to need breast recontouring and occasionally will undergo an upper body lift.

Once a treatment plan is devised, based on the presentation, every effort is made to clearly describe the technical aspects of the operation along with the expected outcome. All patients undergo a very detailed evaluation of their history, and appropriate preoperative evaluations are obtained, including possible operative clearance. The course of recovery is also clearly described to the patient, including limitations on professional activity, travel, and intimate contact. The hazards of tobacco are described, and all patients who smoke are advised to stop immediately. All patients will undergo a nicotine test on the day of the procedure, and any trace will lead to cancellation of the operation and the potential logistical and financial implications. Patients meet with financial and patient coordinators who clearly explain all obligations of the proposed plan. This includes a very detailed discussion of the policy regarding possible revisionary operations.

Once the patient is scheduled for an operation, a system of communications is initiated that conveys the importance of preparation prior to the operation. This includes avoidance of herbal medications, nonsteroidal anti-inflammatory drugs, and any other agent that might interfere with blood clotting. Two weeks prior to the operation, the patients undergo a preoperative examination. At this point they receive final preparatory instructions, including their prescriptions and an antibacterial body wash that they will use prior to the operation. At this visit we undertake a very detailed review of the informed consent paperwork. Each patient receives an information booklet that summarizes and describes in detail the preoperative, operative, and postoperative elements of their procedure. As with all surgical procedures, a clear and concise transmittal of information is paramount in establishing a healthy medical and psychoemotional relationship between the patient and the physician.

## 88.5  Preoperative Planning, Including Markings

A well-executed brachioplasty is highly dependent on identification of the defects of excess skin in the described regions I–III (**Fig. 88.2**) and a subsequent decision about the four different types of treatment (**Fig. 88.6**). The planning also considers methodical, safe, and predictable areas of excision so that the operation can be performed efficiently without risk of overresection or excessive edema.

All patients are marked in a standing position shortly before the operation. The arms are evaluated, first while relaxed at the sides and then with shoulders abducted and extended at 90° at the shoulder joint and flexed 90° at the elbow joint. The patient is asked to assume this posture and release to a relaxed posture with arms at the sides multiple times in order to see the extent and position of the markings. The arms are so dynamic in their motion that such positional evaluations during markings are imperative for determining accurate boundaries of excision. Asymmetries are again recognized and pointed out to the patient.

The philosophical approach of the markings and preparation is based on a customized individual solution. Considering the extensive and variable presentations of different arms with different levels of lipodystrophy, excess skin, and regional involvement, it behooves the surgeon not only to understand the basics of these operations but also to have a totally open mind in positioning these markings.

Another important objective of the markings is the final position of the scar. The minimal incision brachioplasty (group I) will leave a scar between the anterior and posterior extent of the axilla in order to prevent visibility when the arm is in repose. The linear incision of the different full brachioplasty procedures (groups II–IV) is best placed in a posterior–medial position. There has been extensive discussion about optimal placement of the scar, and it is widely believed that the posterior–medial position is the most aesthetically pleasing, as the scar is not visible when the patient's arm is in repose (**Fig. 88.7**). Positioning the scar there is also believed to reduce the risk of injury to some of the sensory nerves of the upper arm.

### 88.5.1  Group I: Minimal Incision Brachioplasty

The anterior and posterior of the apex of the axilla are marked with the patient in the standing position (**Fig. 88.8**) and rechecked in repose. It is important not to extend the incision beyond these points (points A,B) so that the scar will not be visible when the patient is in a standing position with arms in repose. It is also important to recognize that the eventual closure of this elliptical defect will elongate this axillary scar and can theoretically extend the length of the final closure beyond the proposed points. Therefore, while the shoulders are abducted and the elbows flexed at 90°, a slightly shorter line is chosen (points A′, B′). The extent of skin excision on both the arm side and the axillary region is based on the patient's skin laxity. This is an arbitrary measurement, usually 3 to 5 cm from the most central axis of the scar. The area of liposuction is also marked; it is generally performed in the proximal posterior elements of the arm. As with other types of brachioplasty, it is important to
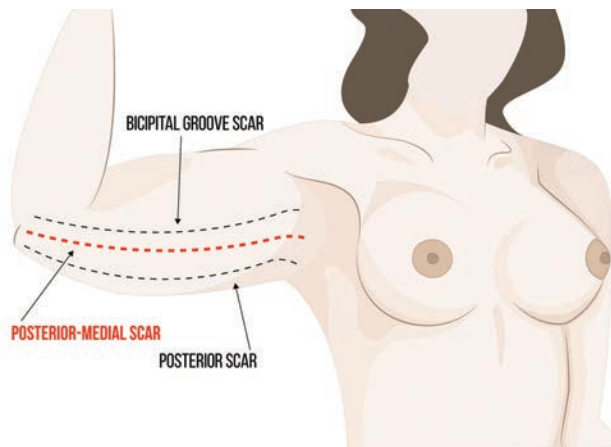
**Fig. 88.7** Various descriptions of the brachioplasty scar and the preferred posterior–medial position.
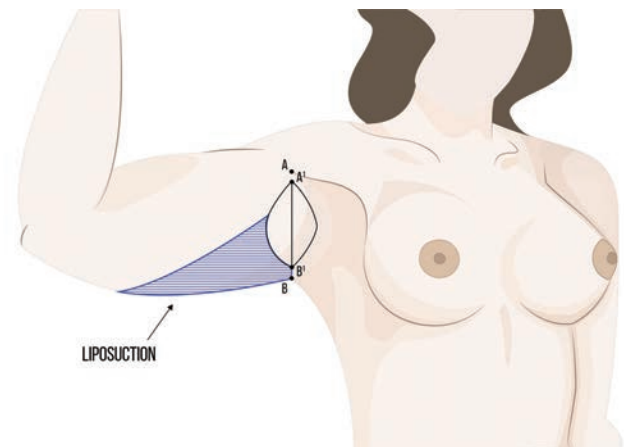


**Fig. 88.8** Minimal-incision brachioplasty markings.

always determine ease of closure and aesthetic outcome in the operating room by using forceps to approximate the result before committing to excision lines.

### 88.5.2 Groups II–IV: Brachioplasty—Standard, Extensive, and Thoracobrachioplasty

The core principle of the design of excision of these groups is similar; each is differentiated by the distal and proximal extension (**Fig. 88.9**). The patient is marked in a standing position. After a detailed analysis of the anatomy, while the patient's shoulders are abducted and elbows flexed at 90°, two central points—the medial epicondyle and the apex of the axillary fossa—are marked. First, the expected and predicted eventual position of the scar is marked in red on the posterior–medial axis. Distally, a slight upward line follows the natural curvature of the distal upper arm. If there is extension distally into the proximal forearm, a slight change in angle is designed to prevent a straight line through the elbow joint. Proximally, this line either ends at the axilla or continues toward the chest wall. When an extension is made in the chest wall, a fairly acute angle is created at the apex of the axillary fossa; the extension then ends in an appropriate position in the upper chest wall, or continues in a lazy **S** pattern toward the lower chest wall to end at the level of the lateral inframammary fold. This acute turn alleviates the need for a complicated, cumbersome, and distorting Z-plasty in the axilla. The techniques described here are based on adaptive and improvised intraoperative maneuvers and allow for tailor-tacking. This is done so that there is no chance of overexcision, which can have a devastating outcome. Therefore, a committed line is chosen approximately 1 cm above the expected line of the scar and marked with a solid line. The extent of this committed line depends on the choice of brachioplasty as necessitated by the presentation. A noncommitted inferior excision line is also marked, in a discontinuous hashtag marking, recognizing that, depending on the technique used, the extent of excision might vary. The placement of this inferior marking is determined by
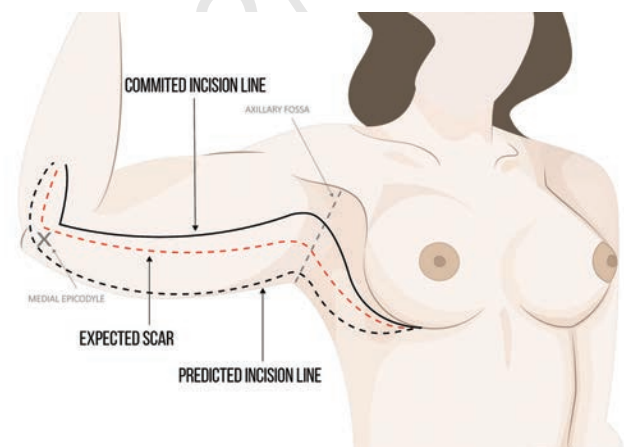


**Fig. 88.9** Brachioplasty markings.

manually pinching and visually approximating its path. The patient is then asked to raise the arm high so that the linear and geometric proportion of the upper and lower scar can be determined. At this point adjustments are made to prevent dog-ears and unequal scar approximation.

## 88.6 Operative Technique
### 88.6.1 Positioning

All operations are done with the patient under general anesthesia and placed in a well-padded supine position. Sequential compression garments are placed over the calves. The arms are abducted at 90° and circumferentially prepped. Each arm is addressed, and during the resection each side is rotated up to approximately 130° (**Fig. 88.10**). This maneuver is useful in establishing some tension for the eventual excision.

### 88.6.2 Operative Strategy and Resection

There are two essential brachioplasty techniques. They are both based on the need for control and efficiency, and they allow

**Fig. 88.10** Operative positioning of 130° abduction of the arm of a 61-year-old woman.

significant intraoperative improvisation. For thinner arms with copious skin excess, the intraoperative staple approximation technique is used. The sequential resection and approximation technique is often used in conjunction with suction-assisted lipectomy for arms with excess fat. The choice of these two techniques is determined preoperatively by physical and visual assessment. Manual grasping and pinching of the excess fat and skin can guide that assessment.

## Intraoperative Staple Approximation Technique

As the patient is positioned, the arm is rotated up (**Fig. 88.11a**) and the excess skin is examined circumferentially. Starting distally from the elbow and moving toward the axilla, the excess skin is grasped between forceps with fairly significant tension, recognizing that the eventual resection of the included skin will ease the closure. This staple line is carried to the axilla; at that point, a sharp turn is made toward the apex of the fossa and then carried toward the lateral chest, depending on the amount of excess (**Fig. 88.11b**). This technique can end at the axilla or can be taken farther down the chest wall, depending on the amount of excess skin. A marking pen is used to demarcate lines comfortably outside the row of staples (**Fig. 88.11c**). Cross-hatchings are then done for ease of approximation (**Fig. 88.11d**). The staples are removed, and the markings are solidified (**Fig. 88.11e**). Xylocaine with dilute epinephrine is injected into the new markings. The area of the axillary fossa is marked and distinguished. In this
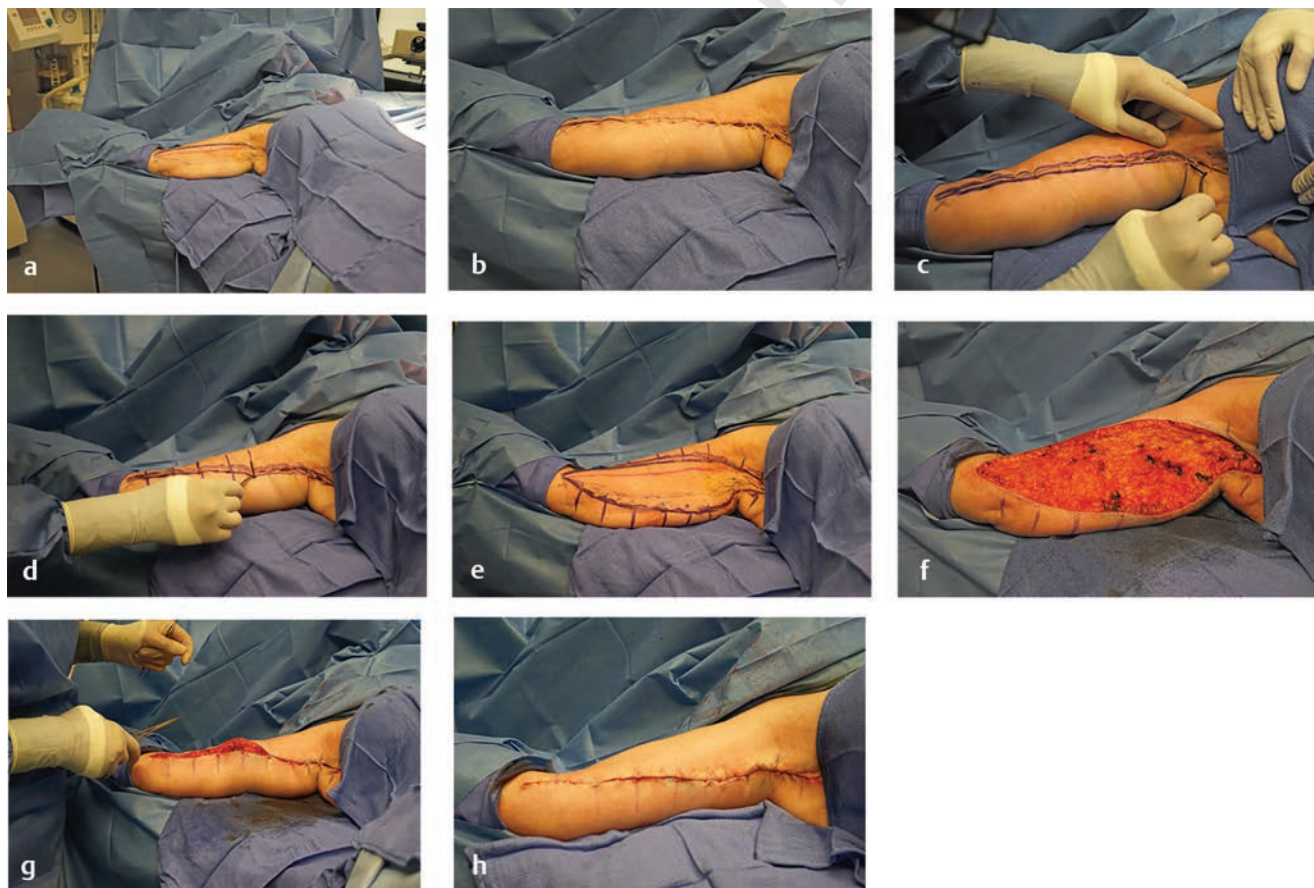


**Fig. 88.11** A 61-year-old woman with a history of massive weight loss undergoing a brachioplasty using the intraoperative staple approximation technique. **(a)** Arm abducted for a clear visual continuity of the entire scar line. **(b)** Tight closure using staples. **(c)** Demarcation of the outside of the staple line. **(d)** Segmental marking and cross-hatching. **(e)** Removal of staples and final excisional marking. **(f)** Removal of skin and maintenance of a healthy brachial fascia. **(g)** Closure of superficial fascial system. **(h)** Final closure.

area, a more superficial dissection should be made to avoid damage to lymphatics and vital structures. The incisions are made and deepened past the SFS. The flap is elevated off the brachial fascia and some subcutaneous tissue from the elbow to the lateral chest (**Fig. 88.11f**). A slight undermining is done to ease closure and grasp of the SFS (**Fig. 88.11g**). Care is taken to leave a healthy brachial fascia, which will serve as the bottom point of a three-pointed progressive closure and will also theoretically cover and hence protect the various lymphatic channels and sensory nerves.

## Sequential Resection and Approximation Technique

In this technique, the arm is also rotated. Most patients who undergo this technique will most likely have concomitant liposuction. An approximation of the excision is once again determined. A dilute standard wetting solution is injected through a small incision at the distal aspect of the scar. After the necessary time has elapsed, a liposuction device of choice is used to suction out the subcutaneous fat under the proposed area of resection (**Fig. 88.12a**). The cannula is advanced past the lower proposed line into the posterior compartment of lipodystrophy according to the preoperative markings. The area under the proposed resection is aggressively emptied to a point that the cannula is visible (**Fig. 88.12b**). This will serve as a plane for a quick and bloodless dissection toward the proposed and improvised lower resection line. Once the amount and extent of liposuction are determined to be appropriate, attention is turned to the sequential resection and closure technique. The entire upper committed incision is made and deepened past the SFS. The pocket of liposuction under the proposed resection paddle is then approached. With inferior traction, a bloodless and loose fibrous remnant of the area of liposuction is opened inferiorly slightly past the lower line of resection (**Fig. 88.12c**). This is performed from the elbow to whatever extent of the lateral wall has been previously determined, marked, and aspirated. As with the other technique, care is taken to leave a healthy layer of brachial fascia and subcutaneous fat on the floor of the resection. At this point, the inferior flap is advanced systematically and segmentally up to the committed line (**Fig. 88.12d**), and excess skin is determined, marked, and incised (**Fig. 88.12e**). Each excised segment is temporarily closed with staples (**Fig. 88.12f**). It is wise to establish hemostasis so that this will be the final reapproximation prior to closure of the defect. Once the entire defect is closed, cross-hatchings are marked (**Fig. 88.12g**) for an accurate approximation of the final closure.
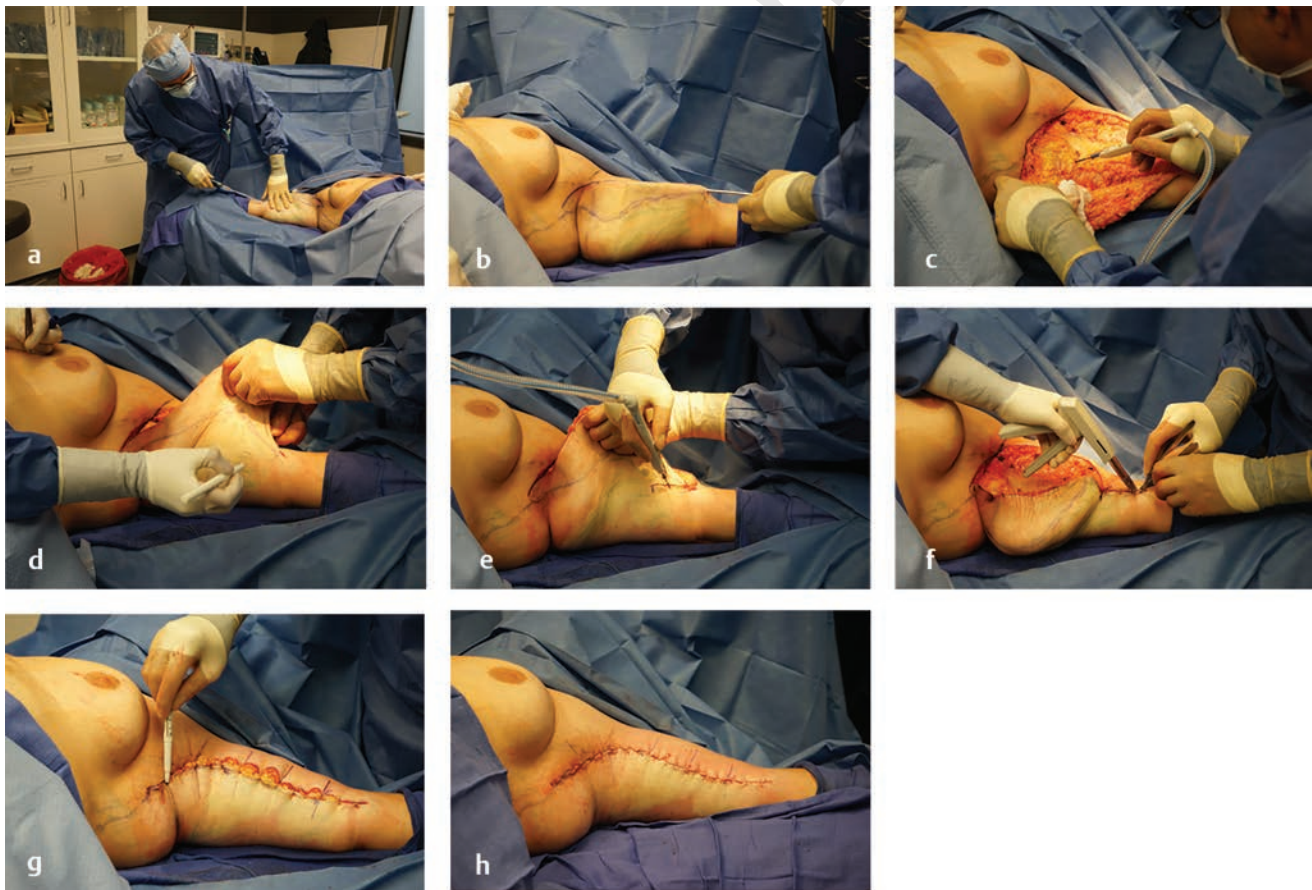


**Fig. 88.12** A 33-year-old woman with a history of massive weight loss undergoing a brachioplasty using the sequential resection and approximation technique. **(a)** Liposuction of the arm. **(b)** Complete liposuction of the area of excision with visualization of the cannula. **(c)** Dissection of the flap through the loose tissue of the zones of liposuction. **(d)** Sequential advancement and marking of the excess skin. **(e)** Excision of the excess skin. **(f)** Temporary closure and approximation with staples. **(g)** Marking and cross-hatching for eventual closure. **(h)** Final closure.

## 88.6.3 Closure

Once the basics of contour and hemostasis are confirmed to be appropriate, the closure of the arm is performed in a manner to reduce tension on the scar and also to alleviate the need for drains by closing the dead space. Approximation of the SFS of the
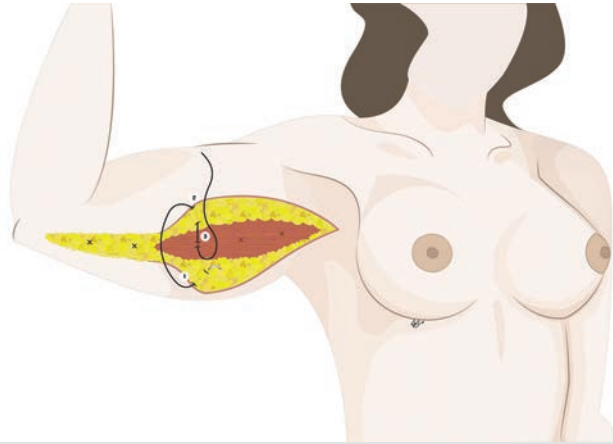


Fig. 88.13 The three-pointed progressive closure technique. Points 1 to 3 depict the three points of reapproximation—the superficial fascial system of the upper and lower flap and the brachial fascia.
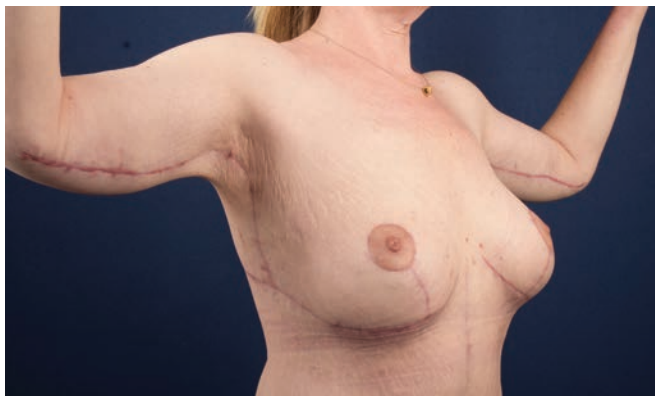


Fig. 88.14 A 40-year-old woman at 4.5 months postoperative after a composite augmentation mastopexy, thoracobrachioplasty, and upper body lift.
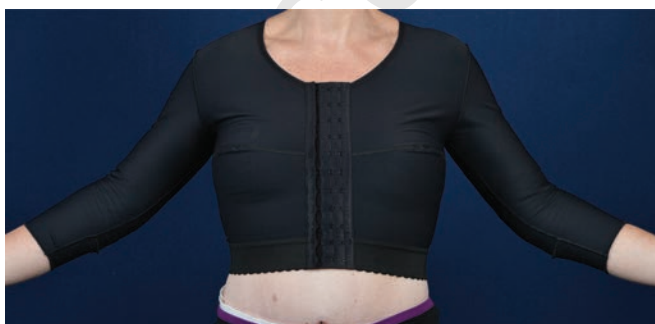


Fig. 88.15 A typical bolero garment worn by a 48-year-old woman after a brachioplasty.

arm has long been considered vital; as with the rest of the body, this layer reestablishes anatomical continuity and reduces tension. This fascial layer can be thin, especially in bigger arms that have significant lipodystrophy. It is imperative to use caution in identifying, preserving, and using this layer in this closure. The three-pointed progressive closure (**Fig. 88.13**) is a technique that reapproximates the SFS of the upper and lower resection lines and includes the floor of the brachial fascia to eliminate any dead space. Long-term absorbing polydioxanone sutures are used either in an interrupted manner or in a running barbed suture of equivalent composition and size for a continuous closure. This method of closure and the progressive elimination of any dead space makes drains unnecessary. The strength of this fascial closure reduces the tension and assists in the eventual approximation of the scar. The superficial dermal layers are also closed with long-term absorbing polydioxanone sutures and eventually a superficial layer of a running barbed Monocryl suture (**Fig. 88.11h, Fig. 88.12h**). Because scar widening and thickening is a significant sequela of brachioplasty, a meticulous low-tension closure is essential, as is the use of long-term absorbing sutures. Such closure of the brachioplasty defect is the first step in establishing a good scar line.

Prior to closure, the areas of excision and closure can be injected with either a long-acting local anesthetic or an extended-release formulation. This can provide a tremendous level of comfort for the difficult initial few hours and days, respectively.

# 88.7 Ancillary Procedures

Brachioplasty can be done concomitantly with other operations, the most common and important being liposuction. As described, appropriate use of liposuction in the execution of the operation can be important both as an adjunct for recontouring and in ensuring the technical success of the procedure. Liposuction has been determined to be a safe adjunctive operation.

Other logical concomitant procedures include an upper body lift. This operation is effective in excision and lift of the upper back and lateral chest wall. Breast recontouring, mostly in the form of a reduction or a lift, is another element of upper body recontouring that is done in conjunction with brachioplasty.

The upper body—consisting of arms, chest wall, breasts, and upper back—is an important anatomical subunit in body contouring. It is therefore wise to limit the ancillary operations to the regional area. The combined resection of arms and chest wall in the form of a thoracobrachioplasty, along with breast recontouring, with or without upper body lifting (**Fig. 88.14**), is a logical addition to the constellation of types of body contouring used for patients with excess skin and lipodystrophy of the upper body.

# 88.8 Postoperative Care

After the procedure, all incisions are covered with occlusive tape, such as Steri-Strips. A bolero garment (**Fig. 88.15**) is placed on the patient, who is instructed to elevate the arms on soft pillows for the first 48 hours after the procedure. Patients are warned against rapid and strong flexion of the elbow or abduction of the shoulder for the first 24 hours. They are also instructed not

to engage in vigorous activity for the first 2 weeks. Patients are advised that edema is common after a brachioplasty and are warned to refrain from wearing rings for the first 2 weeks after the operation.

Postoperative care is mostly based on confirming proper wound healing and also starting a regimented protocol of postoperative scar control. For the first 2 weeks the incisions are covered with Steri-Strips. For the third week, micropore brown tape is used. Subsequently, a rest period is recommended to allow the scar to dry and to verify that there are no separations of the incision. At this point, silicone gel sheeting is begun and continued for approximately 4 months. It is imperative to compress the sheeting with a garment. Given the difficulty of placing strips on a moving arm, occasionally silicone gel spray is provided to patients to improve compliance.

Patients receive specific instructions to stretch their arms at about 1 month. This tends to stretch the scar and can eliminate any axillary fibrosis of the scar. Patients are given the go-ahead to start their exercise regimen at 1 month and are totally cleared for any activity at 6 weeks.

Standardized photography to capture the postoperative results is done at 3 months, but given the prolonged maturity of brachioplasty scars, patients are asked to follow up at 6 to 9 months after the operation for a final photo.

## 88.9 Outcomes

With our expanding knowledge base of brachioplasty and the significant increase of this operation in plastic surgery, various contributions to the literature have addressed the complications of this procedure. Infection, bleeding, minor and major wound separations, seroma, edema, and sensory disruptions have all been described. However, the maturity and the quality of the scar continue to be the primary issues with this operation. There is no doubt that, regardless of any of the reported positions of the scar, a brachioplasty scar is not in an optimal position for tension-free and natural healing. The scars invariably thicken and form hypertrophic areas (**Fig. 88.16**). Various intraoperative and postoperative maneuvers are imperative to counteract this inherent tendency. As with other body contouring operations, proper closure of the SFS is imperative to reduce the eventual tension of the scar. Use of long-term absorbing polydioxanone sutures, in either an interrupted fashion or a continuous barbed suture of equivalent composition and size, is one of the first steps to achieving a secure and low-tension closure. The superficial layers of the skin—the dermal layers—are also closed with long-term absorbing polydioxanone sutures. This too contributes to a long-term tension-free closure. Postoperative strategies include the described regimen of taping and silicone products. Perhaps one of the most important elements of scar maturity and outcome is time. Maturing of a scar of the arm lags the maturing of scars elsewhere in areas of body contouring. This unavoidable reality should be explained to the patient in order to establish realistic expectations (**Fig. 88.17**) Steroid injections should be viewed with caution. As the skin of the arm is thin, steroid injections can further widen the scars, cause telangiectasias,
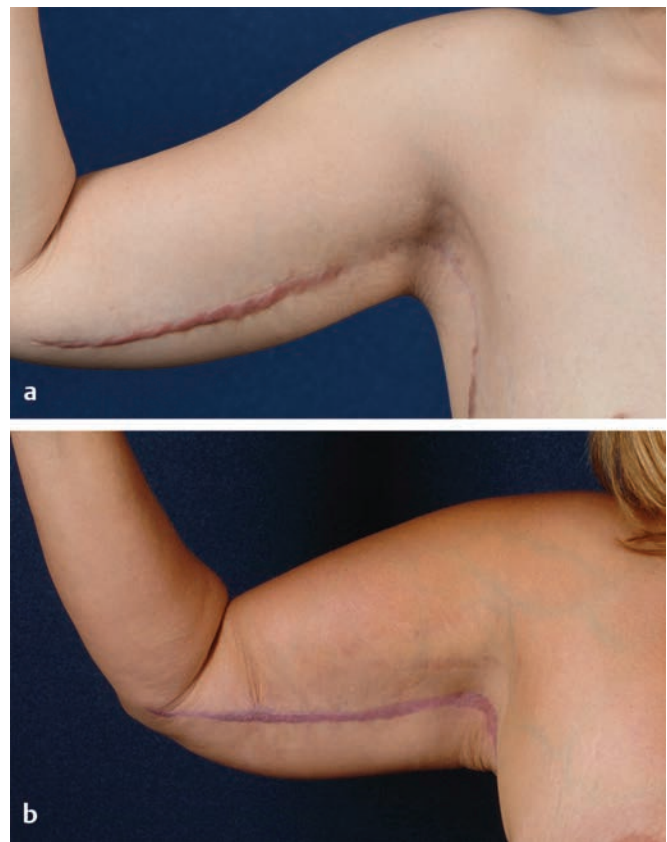


**Fig. 88.16 (a)** A hypertrophic scar in a 34-year-old woman 5 months postoperative from a brachioplasty and **(b)** a 55-year-old woman 6 months postoperative from a brachioplasty.

**Table 88.1** Overall scar control strategy

| |
|---|
| Deep intraoperative tension reduction by superficial fascial system closure |
| Meticulous dermal closure using long-term absorbing sutures |
| 2 weeks occlusive coverage with Steri-Strips |
| 1 week occlusive coverage with brown micropore tape |
| 1 week rest period to ensure a dry, well-healed scar |
| 4 months coverage with silicone gel sheeting or topical silicone |
| Compression during silicone coverage |
| Stretch exercises to soften deeper fibrosis |
| Patience |
| 1-year postoperative evaluation for possible revision |
| Cautious use of intracicatricial injection of steroids |

and also contribute to subcutaneous atrophy, which can cause contour deformity. Occasionally secondary revision of the scars is recommended, but with the cautious advice that there are no guarantees of improvement (**Table 88.1**).

As with many other body contouring procedures, especially in the massive-weight-loss population, the longevity of the results can be limited. The arm is ever moving, has a thin circular sleeve of skin, and has variable levels of lipodystrophy. This makes the results prone to a recurrence of laxity and redundancy despite execution with the best of techniques. Secondary operations and revision must be a part of any preoperative discussion and informed consent process (**Fig. 88.18**).
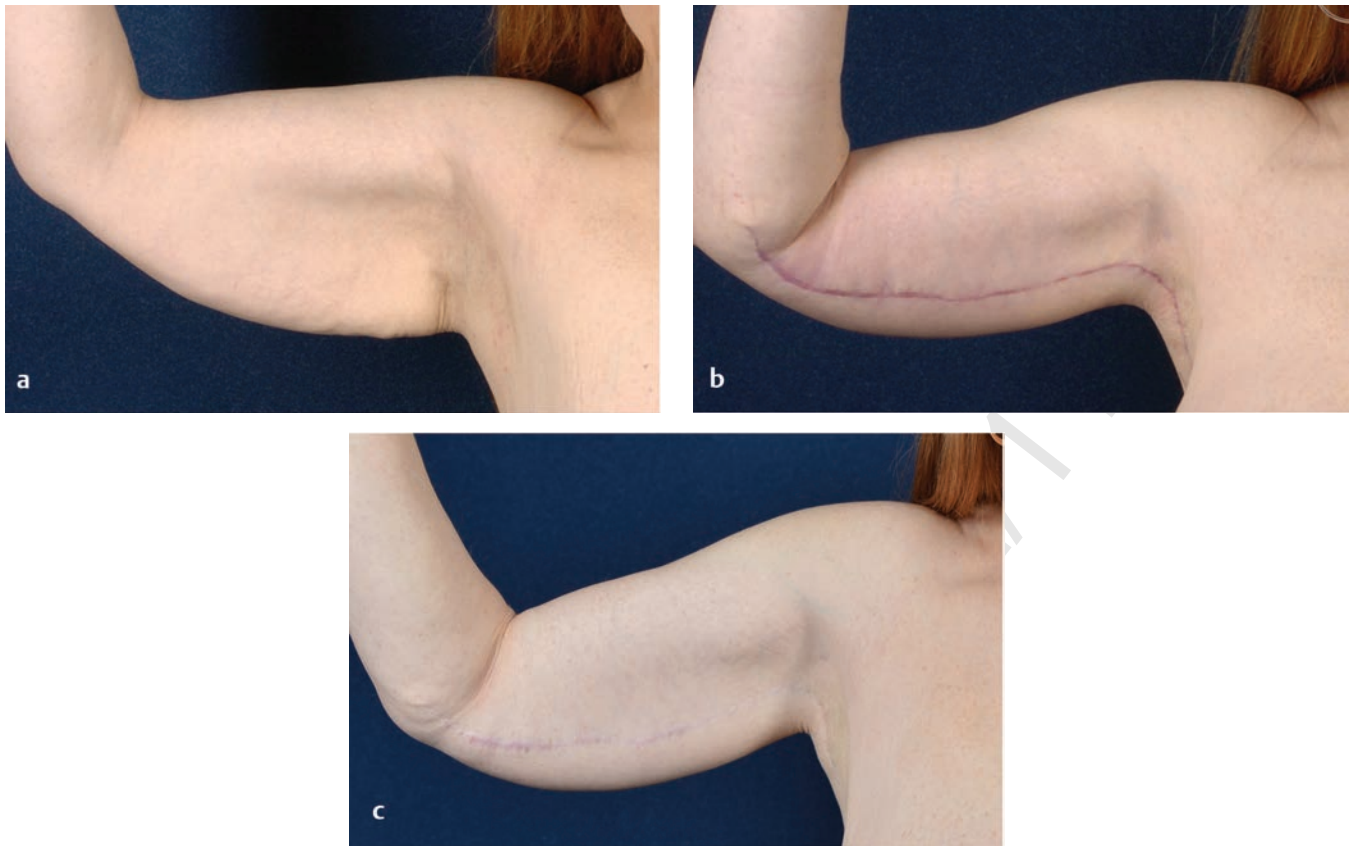
**Fig. 88.17 (a)** A 47-year-old woman with a history of massive weight loss presenting for upper body contouring. She underwent a staged body contouring, including a lower body lift and a two-stage augmentation mastopexy. **(b)** At 4 months after her brachioplasty. **(c)** Long-term follow-up at 4 years shows the maturity and fading of her brachioplasty scar.
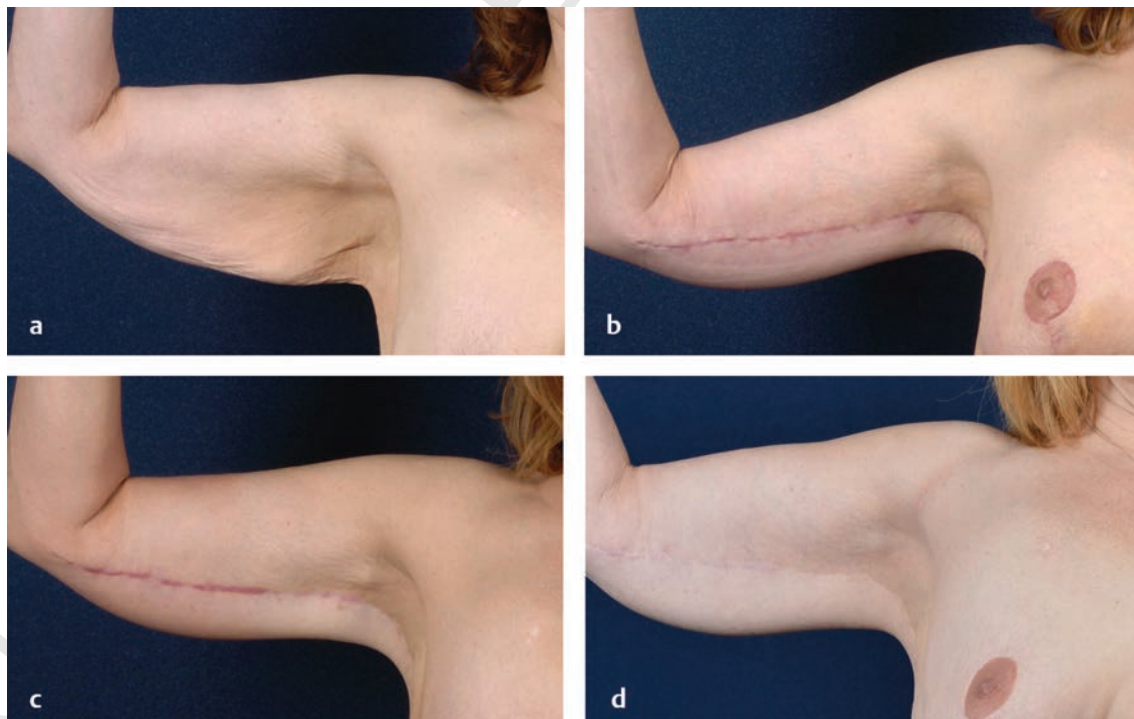


**Fig. 88.18 (a)** A 40-year-old woman with a history of weight loss presenting for a brachioplasty. **(b)** Three months after a brachioplasty and mastopexy. **(c)** Six months after the procedures. **(d)** Five years after her original operation, with clear recurrence of laxity of the arms.
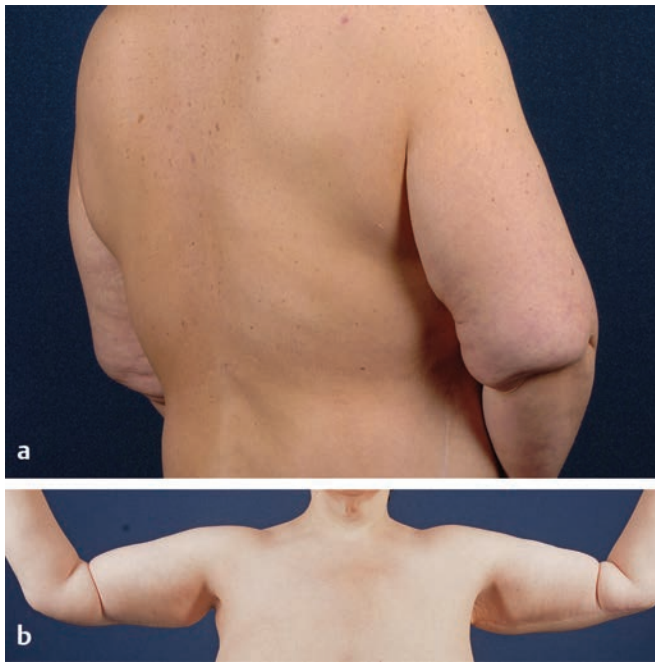
**Fig. 88.19 (a)** Elbow lipodystrophy in a 41-year-old woman presenting for an extensive brachioplasty, as well as **(b)** restrictive midarm band in a 48-year-old woman who presented with bilateral restrictive midarm bands after a brachioplasty done elsewhere.

Two distinct anatomical features are difficult to treat (**Fig. 88.19**). One is significant distal elbow lipodystrophy (**Fig. 88.19a**), which can be resilient after brachioplasty despite proper excision and liposuction. Another is occasional restrictive bands of the upper arms (**Fig. 88.19b**). These tend to be inherent in the structural definition of the arms and also tend to be resilient after brachioplasty. These restrictive bands can also be iatrogenic and can occur as a result of overzealous and tight closure in one segment of the arm. It is important to discuss these limitations with the patient.

## 88.10 Results

Minimal incision brachioplasty (**Fig. 88.20**)

Standard brachioplasty (**Fig. 88.21**)

Extensive brachioplasty (**Fig. 88.22**)

Thoracobrachioplasty (**Fig. 88.23**)

Combined thoracobrachioplasty, mastopexy, upper body lift (**Fig. 88.24**)

Brachioplasty in nonoptimal candidates (**Fig. 88.25**)

## 88.11 Concluding Thoughts

In the past half-century, brachioplasty has entered the mainstream of predictable and effective body contouring operations. As the powerful implications of toned arms have shaped demand, mostly in the massive weight loss population, brachioplasty has
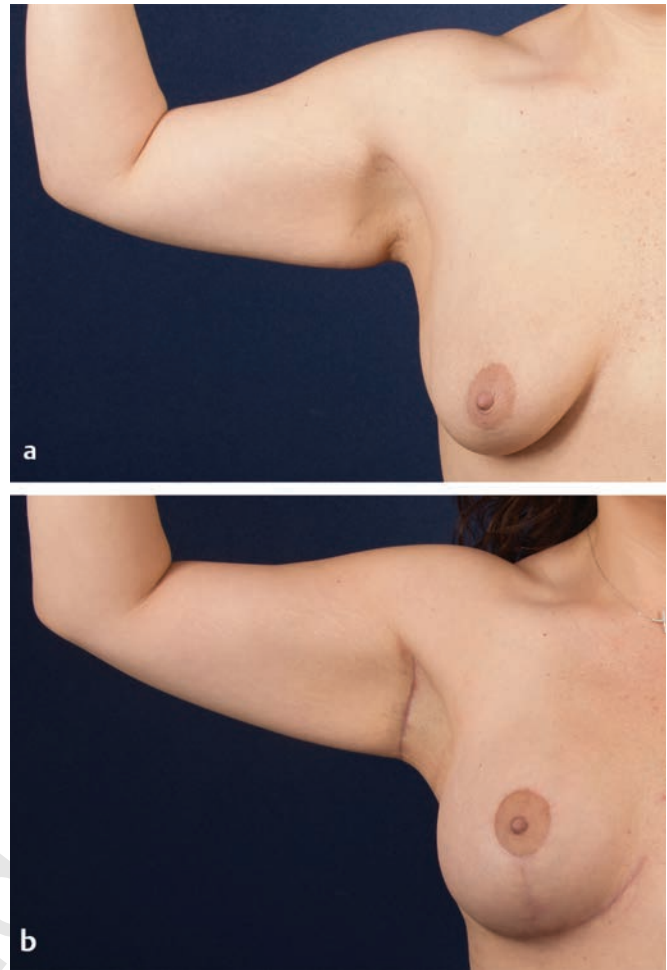


**Fig. 88.20 (a)** A 39-year-old woman with a history of weight loss underwent a minimal incision brachioplasty with concomitant suction-assisted lipectomy and augmentation mastopexy. **(b)** At 4 months after the procedures.

become increasingly popular. The variability of presentation allows the surgeon to address the existing anatomical defects. The choices of liposuction, minimal or extensive brachioplasty, and thoracobrachioplasty depend on the quality and excess of skin and the involvement of the regional upper body areas, such as the chest wall. Accurate and predictable preoperative marking, correct understanding of the anatomy of the layers and nerves, and an insightful prediction of the scar position can provide the baseline for a good outcome. Intraoperative techniques such as the intraoperative staple approximation technique and the sequential resection and approximation technique are guides for safe, effective, and reproducible results. Understanding of the mechanism of low-tension closure, progressive reduction of dead space by use of the three-pointed closure technique, use of long-term absorbing sutures, and postoperative scar control have made it possible to achieve predictable results with the best possible scar quality. The informed consent process, including demonstration of both the expected outcomes and some of the inherent limitations and risks, is essential to preparation for this operation.
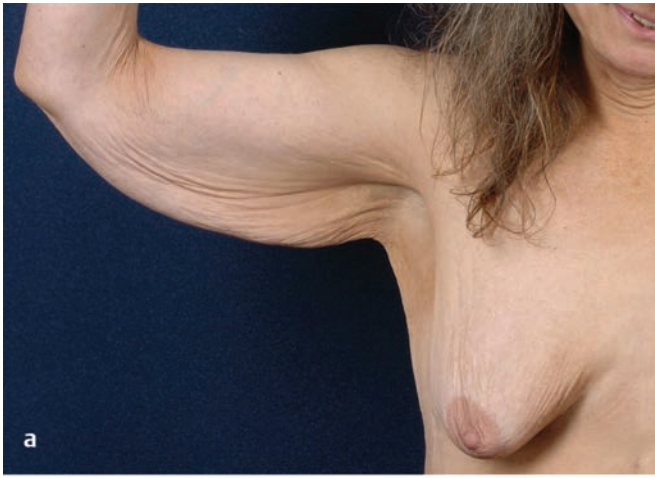
**Fig. 88.21 (a)** A 57-year-old woman with a history of weight loss underwent a standard brachioplasty. Her previous body contouring operations included lower body lift and augmentation mastopexy. **(b)** At 1 year after her brachioplasty.

**Fig. 88.22 (a)** A 45-year-old woman with a history of weight loss underwent an extensive brachioplasty. She has a history of a mastopexy and a lower body lift. **(b)** At 4 months after her brachioplasty.

**Fig. 88.23 (a)** A 37-year-old woman with a history of weight loss underwent a thoracobrachioplasty, augmentation mastopexy, and a lower body lift. **(b)** At 4 months after her thorachobrachioplasty.

**Fig. 88.24 (a)** A 36-year-old woman with a history of weight loss underwent a combined thoracobrachioplasty, mastopexy, and upper body lift. **(b)** At 4 months after the operation.

### Clinical Caveats

- A thorough physical examination leads to analysis of the myriad types of presentation of arm deformity.
- The choice of liposuction, minimal or standard brachioplasty, extensive brachioplasty, or thoracobrachioplasty depends on the anatomical presentation of the patient.
- A detailed informed consent should be a prerequisite of any brachioplasty. The limitations of the scar and the occasional need for secondary operations should be explained to the patient.
- Careful preoperative markings can assist in eventual placement of the scar in the posterior–medial axis of the arm.

- The techniques of staple approximation or sequential excision and reapproximation allow intraoperative flexibility and decision making, and prevent the serious complication of inability to close the defect.
- Progressive three-pointed closures alleviate the need for drains.
- Meticulous closure of the defect, using methods to reduce tension—namely, closure of the superficial fascial system and use of long-term absorbing sutures—improves the ultimate quality of the scar.
- Postoperative scar control (taping, silicone products, and compression) is one of the important determinants of a well-healed scar.

**Fig. 88.25  (a)** A 60-year-old woman with a body mass index of 38 desired a brachioplasty. She underwent a concomitant suction-assisted lipectomy of the arms (450 mL aspirated from the left and 425 mL aspirated from the right) and brachioplasty. **(b)** At 4 months after the operation.

## Suggested Reading

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