

85. Brachioplasty

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ANATOMY (Fig. 85-1)

- Subcutaneous fat in the arms tends to collect **posteriorly** and **inferiorly**; very little subcutaneous fat is found medially.
 - The upper humeral fat deposits are particularly troublesome for patients when they wear fitted blouses or jackets.
- The fat and skin of the upper arm are supported by **two fascial systems**.
 - **Superficial fascial system**
 - ▶ Encases the fat of the upper arm circumferentially from axilla to elbow
 - The **longitudinal fascial system**
 - ▶ Begins at the clavicle as the clavipectoral fascia
 - ▶ Extends to the axillary fascia
 - ▶ Connects to the superficial fascial system
- With age and weight gain, the superficial fascial system and the axillary fascia loosen.
 - Creates a loose hammock-like effect
 - Results in significant ptosis of the posteromedial arm
- Muscles of the arm are enveloped by a deep investing fascia.
- All major neurovascular bundles lie deep to the deep investing fascia.

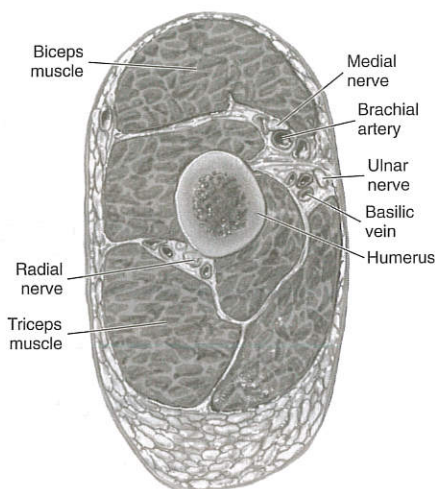


Fig. 85-1

NOTE: The only nerves found superficial to the deep investing fascia are small branches of the medial brachial cutaneous nerve or the intercostobrachial nerve.

TIP: The entire dissection in excisional or liposuction brachioplasty should remain superficial to the deep investing fascia. If this plane is not violated, then all of the important neurovascular structures in the upper extremity are preserved.

PATIENT EVALUATION

ASSESSMENT

- A complete history should be obtained, including weight loss/gain, tobacco use, and all other medical problems.
- Physical examination should be performed.
- General evaluation of the arms including range of motion at shoulder, elbow, and hand, and grip strength.
- Assess for excess fat, excess skin, location of any skin laxity, and overall skin quality and tone.
- **Upper arm rejuvenation** patients can be divided into **three types** (Table 85-1).²
 - **Type I:** Relative excess of fat in the upper arm with good skin tone and minimal laxity
 - ▶ Best treated with liposuction alone
 - **Type II:** Skin laxity that can be **horizontal, vertical, or both**
 - ▶ **Type IIA:** Only **proximal** arm redundancy
 - ◆ If redundancy is **strictly horizontal**, then a vertically oriented wedge or an elliptical **excision of skin** can be made that is isolated to the axillary fold (Fig. 85-2).
 - ◆ If there is **vertical and horizontal laxity**, then a **T-shaped resection** along the proximal upper arm is required (Fig. 85-3).

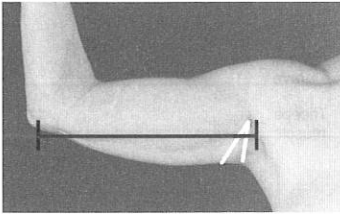


Fig. 85-2

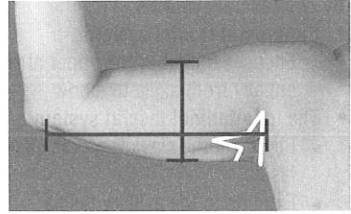


Fig. 85-3

- ▶ **Type IIB:** Skin redundancy of the **entire upper arm** from elbow to chest wall.
 - ◆ If there is isolated **vertical** skin redundancy, a **horizontal excision** can be performed along the brachial groove (Fig. 85-4).
 - ◆ If there is **horizontal and vertical excess**, an **L-shaped excision** is made in the axilla (Fig. 85-5).
 - Extends into the arm as far as the excess skin in the arm does.
 - The L may extend all the way to the elbow if necessary.

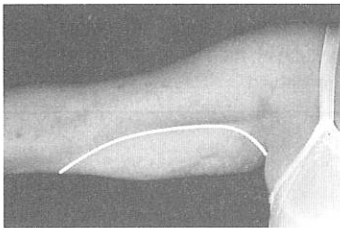


Fig. 85-4

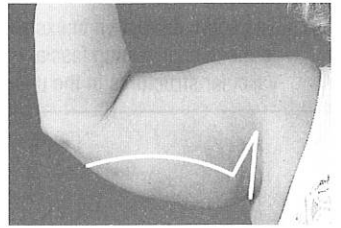


Fig. 85-5

- ▶ **Type IIC:** Laxity that may extend **onto the lateral chest wall** (Fig. 85-6).
 - ◆ An **extended brachioplasty** is needed that extends onto the chest wall.
 - ◆ **These are typically massive-weight-loss patients.**
- **Type III:** Both **significant excess fat** and **redundant skin** in the arm; several options:
 - ▶ Further weight loss before surgery
 - ▶ Staged treatment with liposuction first, followed by subsequent excisional brachioplasty
 - ▶ Combined single-stage liposuction and excisional brachioplasty
 - ▶ Subtypes A, B, and C: Specific locations of the skin excess
 - ◆ A: Proximal
 - ◆ B: Entire arm
 - ◆ C: Arm and chest

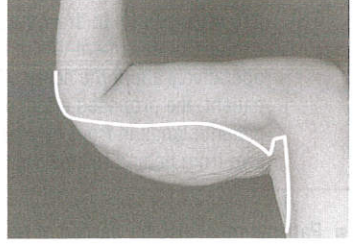


Fig. 85-6

Table 85-1 Classification of Upper Arm Contouring

Type	Skin Excess	Fat Excess	Location of Skin Excess
I	Minimal	Moderate	N/A
IIA	Moderate	Minimal	Proximal
IIB	Moderate	Minimal	Entire arm
IIC	Moderate	Minimal	Arm and chest
IIIA	Moderate	Moderate	Proximal
IIIB	Moderate	Moderate	Entire arm
IIIC	Moderate	Moderate	Arm and chest

From Appelt EA, Janis JE, Rohrich RJ. An algorithmic approach to upper arm contouring. *Plast Reconstr Surg* 118:237-246, 2006.

CONTRAINDICATIONS

■ Absolute

- Neurologic or vascular disorders of the upper extremity
- Lymphedema of the arms secondary to previous axillary lymph node dissection
- Unrealistic patient expectations

■ Relative³

- Symptomatic Raynaud's disease
- Connective tissue disorders
- Advanced rheumatoid arthritis

PATIENT EDUCATION

- Because of their location (which is frequently exposed by everyday clothing), the scars from excisional brachioplasty *are probably the most noticeable scars in all aesthetic surgery.*
- Given the prominence of the scars, they **must** be discussed with the patient preoperatively.

TIP: It is often helpful to draw the scars on the patient's arm during the preoperative consultation and to document this in the medical record. This may help prevent complaints post-operatively about the scars. At the same time that the scars are being demonstrated to the patient, the proposed effect of an excisional brachioplasty can be demonstrated. While the patient stands in front of a mirror with the arms out, the surgeon pinches the skin of the arm from behind to show the tightening effect a brachioplasty could have.

- Patients must also be warned of temporary areas of numbness in the upper arm secondary to transection of branches of medial brachial cutaneous nerves or intercostobrachial cutaneous nerves.

ALGORITHM FOR TREATMENT (Fig. 85-7)

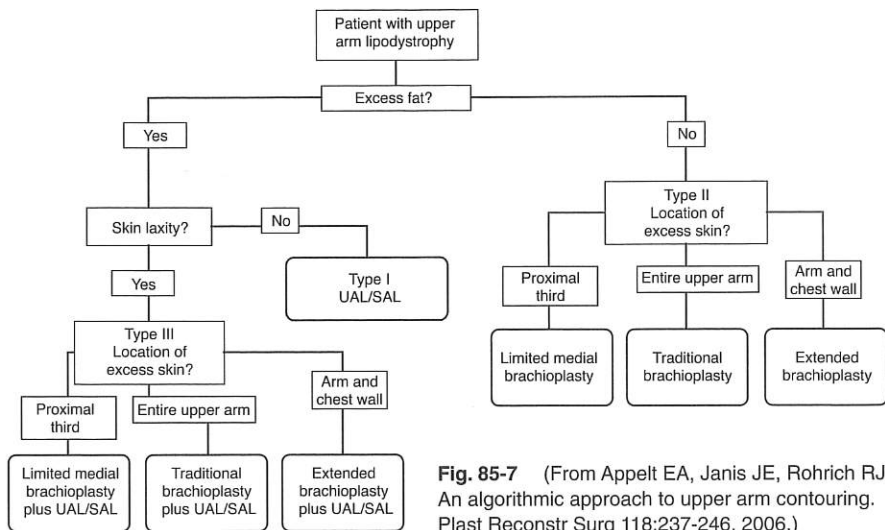


Fig. 85-7 (From Appelt EA, Janis JE, Rohrich RJ. An algorithmic approach to upper arm contouring. *Plast Reconstr Surg* 118:237-246, 2006.)

OPERATIVE TECHNIQUE

LIPOSUCTION

- Liposuction may be performed as a stand-alone procedure for arm rejuvenation.
- It may also be performed as the first step in excisional brachioplasty.
 - Decreases arm bulk
 - Increases the amount of skin that can be successfully resected
- Suction should be concentrated in the medial and posterior quadrants of the proximal half of the upper arm.

- Incisions should be made in posterior lateral elbow region and in superior portion of axilla anteriorly for infiltration of wetting solution and liposuction.

CAUTION: Care must be taken to keep the cannula away from the axilla and the posteromedial elbow to avoid damaging the nerves of the brachial plexus or the ulnar nerve.

- Liposuction should be performed at an intermediate depth.
- Approximately 0.5 cm of subcutaneous fat should be left on the skin to prevent contour irregularities.³

CIRCUMFERENTIAL PARA-AXILLARY SUPERFICIAL TUMESCENT (CAST) LIPOSUCTION

- Developed as alternative to traditional liposuction in the upper extremities^{4,5}
 - Traditional liposuction of the posterolateral arm frequently left patients with sagging skin.
- Attempts to maximize skin retraction with circumferential liposuction of the arm, including superficially and in the subdermal regions
- Realistic goals to suggest when advising patients contemplating CAST liposuction:
 - Decrease in brachial fat and creation of a straighter inferior brachial border will help the patient feel better in clothes.
 - CAST liposuction **will not improve skin wrinkling.**
- **Principles**
 - Incisions are made at the olecranon, anterior axilla, posterior axilla, and middle third of the arm at the boundary of the medial and posterolateral regions.
 - Occasionally incisions are made in the dorsoradial arm and the midaxillary line at the areolar level.
 - Wetting solution is infiltrated into the arm as with traditional liposuction.
 - Wetting solution is also infiltrated superficially posterolaterally to create a **peau d'orange** appearance.
 - The arm is conceptually divided into three regions: **Anterolateral**, **medial**, and **posterolateral** (Fig. 85-8).
 - The **medial** region is treated by pretunneling from the olecranon and axillary sites longitudinally.
 - ▶ If the preoperative pinch test in this region is **10 mm or less**, only pretunneling is done.
 - ▶ If the preoperative pinch test is **greater than 10 mm**, superficial pretunneling and deep suctioning are performed.

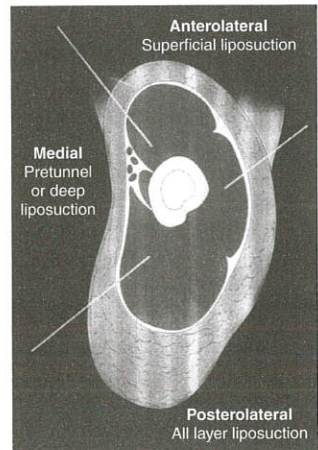


Fig. 85-8 Conceptual division of the arm into three parts. (From Strauch B, Greenspun D, Levine J, et al. A technique of brachioplasty. *Plast Reconstr Surg* 113:1044-1049, 2004.)

TIP: Do not liposuction under thin anteromedial skin, especially near the axilla, because of the propensity for wrinkling in this region.

- The anterolateral arm is treated with superficial liposuction to remove superficial and dense subdermal fat.
 - ▶ Gilliland and Lyos^{4,5} believe that this creates a sheet of confluent scar that will aid in skin retraction.
 - The posterolateral arm is treated with deep, superficial, and subdermal liposuction to maximize skin retraction.
 - In addition, a serrated cannula is used without suction to internally dermabrade the flap undersurface.
 - ▶ This theoretically creates a confluent sheet of scar extending circumferentially around the arm and onto the trunk.
 - ▶ Care must be taken not to curette more than once in a given area to prevent indentations.
 - ▶ If any indentations occur, Gilliland and Lyos advise fat grafting immediately.
 - The paraaxillary region is treated with serrated cannulas.
 - ▶ Disrupts osteocutaneous ligaments
 - ▶ Allows for the most complete fat extraction possible
 - Jackson-Pratt drains are placed postoperatively.
- **Outcomes**
- 84.6% of patients were satisfied or very satisfied with the results in two studies.^{4,5}
 - 11.5% had an excisional brachioplasty to help treat redundant skin that persisted postoperatively.
 - 38.5% seroma rate occurred.
 - 100% of patients develop fine skin wrinkling.

MINIBRACHIOPLASTY (Fig. 85-9)

- For patients with **mild skin laxity** and **mild-to-moderate excess fat** in the upper arm, a **minibrachioplasty** can be performed.
- Combines removal of excess fat through liposuction with removal of skin laxity through an incision limited either to the axilla or to the axilla and the proximal portion of the upper arm.
- **Preoperative markings**
 - Areas of excess fat are marked as described earlier.
 - Liposuction should concentrate on the excess fat found in the **posteromedial** region of the upper arm.
 - After being marked, the patient should abduct the arm 90 degrees at the shoulder and flex the arm 90 degrees at the elbow.
 - Use a **pinch test** to mark an ellipse of skin in the axilla that can be resected to help restore an aesthetic contour of the upper arm.
 - If the proposed elliptical resection does not appear to correct the skin laxity, then a T-shaped extension of the incision can be planned, confined to the upper third of the arm.
 - The elliptical excision is designed to limit the scar to the axilla to prevent visibility.



Fig. 85-9 Preoperative markings. (From Strauch B, Greenspun D, Levine J, et al. A technique of brachioplasty. *Plast Reconstr Surg* 113:1044-1049, 2004.)

■ Principles

- The first step is **liposuction** of excess upper arm fat, concentrated in the posteromedial regions, as described earlier.
- After liposuction, an elliptical skin excision is performed transversely in the axilla.
 - ▶ The elliptical skin excision in the axilla has a **high potential for scar widening or dehiscence**.
 - ◆ Lockwood¹ advocates using permanent stitches to anchor the superficial fascial system of the arm to the dense axillary fascia and clavipectoral fascia (a tough structure firmly attached to the periosteum of the clavicle).
 - ◆ Anchoring the superficial fascial system to the axillary and clavipectoral fascia helps correct the laxity of the longitudinal fascial sling that develops with age.

TIP: The biggest key to a successful minibrachioplasty is patient selection. A minibrachioplasty with superficial fascial suspension to the axillary and clavipectoral fascia can be a highly effective operation if the patient has mild-to-moderate skin excess in addition to excess fat; however, if the patient has moderate-to-severe skin excess with or without excess fat, a standard brachioplasty should be performed to achieve the desirable contour.

STANDARD BRACHIOPLASTY

- A standard brachioplasty should be used for patients with moderate-to-severe excess skin with or without excess fat.
- If there is a significant amount of excess fat in addition to excess skin, then the procedure should begin with liposuction.
- **Preoperative markings for standard brachioplasty are as follows³:**
 - With the patient sitting or standing, have the patient abduct the arm 90 degrees at the shoulder and flex 90 degrees at the elbow.
 - Place a dotted line in the bicipital groove extending from the apex of the axilla down to the elbow.
 - ▶ This dotted line represents the proposed scar location.
 - Place a solid line 1 cm above and parallel to the line in the bicipital groove.
 - ▶ This line marks the proposed upper incision for the brachioplasty.
 - The surgeon should place his or her index and long fingers along the proposed upper-line incision and use the thumb to pinch the inferomedial skin up toward the upper incision.
 - ▶ This pinch test signals how much skin can be excised, and marks should be placed inferiorly to delineate the proposed lower incision.
 - Three to five vertical lines should be drawn perpendicular to the longitudinal lines.
 - ▶ This divides the proposed resection into thirds or fifths.
 - ▶ These lines assist in lining up the closure (see later).
- **Operative principles**

TIP: To help minimize edema, communicate your concerns to the anaesthesiologist preoperatively and request that the intravenous line not be placed in the upper extremity.

- Incisions should be made in the posterolateral elbow region and in the superior portion of the axilla anteriorly for the infiltration of wetting solution and for liposuction.

TIP: Even if liposuction is not going to be performed, wetting solution should be infiltrated to decrease blood loss and assist with dissection.

To prevent ulnar nerve injury, avoid placing liposuction access incisions medially at the elbow.

- Liposuction is performed leaving a **minimum of 0.5 cm of fat** on the skin.
 - A No. 10 blade is used to incise through the proximal portion of the upper incision.
 - Bovie electrocautery is used to dissect down to the deep investing fascia.
 - Dissection is taken over the deep investing fascia toward the inferior mark.
 - Towel clips are placed along the skin flap to be excised, and the flap is advanced toward the upper incision.
 - Confirm that the wound will close if the proposed inferior incision is made; if not, the inferior incision is redrawn and incised.
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TIP: The arm should be divided into three to five segments, and each segment should be treated sequentially, including closure. This is critical because the arm tends to become very edematous during this procedure. The edema can be severe, and it is not uncommon for surgeons to not be able to close portions of the brachioplasty incision because of it. These portions can generally be closed if performed immediately instead of closing only after dissecting the entire wound.

- Closure begins with reapproximation of the superficial fascial system, followed by closure of the deep dermal and subcuticular layers.
 - ▶ The superficial fascial system should be closed with either long-lasting absorbable sutures or permanent sutures to help relieve tension.
-

TIP: To avoid postoperative numbness, leave some fat on the deep investing fascia at the junction between the middle and lower third of the upper arm. This helps protect the medial antebrachial cutaneous nerve, which exits the deep investing fascia here, often with the basilic vein.³

- **If the wound crosses the axilla, a Z-plasty** must be performed to prevent scar retraction and axillary banding.
- Drains should be placed to prevent seroma formation.
- After skin closure, the wound is dressed and an Ace bandage is wrapped beginning distally at the hands and traveling up to the axilla to assist with edema.

BRACHIOPLASTY IN MASSIVE-WEIGHT-LOSS PATIENTS

- Massive-weight-loss patients often develop a “bat-wing” appearance to their arms with severe skin laxity that extends from the olecranon across the axilla to the chest wall (Fig. 85-10).⁶



Fig. 85-10 (From Strauch B, Greenspun D, Levine J, et al. A technique of brachioplasty. *Plast Reconstr Surg* 113:1044-1049, 2004.)

- A standard brachioplasty addresses skin laxity from the olecranon to the axilla.
 - Does not significantly affect excess skin of the axilla or the lateral chest wall.
 - To affect this skin in this zone, a brachioplasty must extend across the axilla and onto the chest wall.
- As in a standard brachioplasty, the patient is marked with the arms abducted 90 degrees and the elbow flexed 90 degrees.
- An elliptical incision is planned as in a standard upper arm brachioplasty.
 - However, instead of terminating the incision in the axillary dome, the incision is carried further into the axilla and even down on to the chest wall as necessary.
 - The incision is continued as far as the skin laxity continues.
- To help make the scar less noticeable, a sinusoidal variation can be added to the proposed excision; this avoids the final scar lying in a straight line.
- **An axillary Z-plasty *must* be added to the proposed skin excision to prevent contracture across the axilla and to restore the appearance of the axillary dome** (Fig. 85-11).
 - Should be designed with 60-degree angles to the longitudinal incision.
 - Central transverse limb of the Z should lie in transverse axis of axillary dome.
- The intraoperative technique is similar to the standard brachioplasty described previously.
- **Minimal undermining of the skin flaps** should be necessary given the already lax nature of the skin.
- As with standard brachioplasty, it is critical to divide the incision into thirds, fourths, or fifths.
 - Perform the operation segmentally to ensure that edema will not prevent closure of appropriately designed skin flaps.



Fig. 85-11

POSTOPERATIVE CONSIDERATIONS

- Postoperative complications include seroma, hematoma, infection, lymphocele, numbness, peripheral nerve pain, and wound dehiscence, especially in the axilla.
- Ace wraps should be maintained for at least 2 days postoperatively to help minimize edema.
- After 2 days, the patient may continue to use Ace wrap bandages or switch to a surgical sleeve or a long-sleeved surgical vest.
- Gabapentin, 100-300 mg/day, can be used to treat peripheral nerve pain, if needed.³

KEY POINTS

- ✓ Successful rejuvenation of the arm requires accurate assessment of the deformity and appropriate treatment selection.
- ✓ Patients with mild-to-moderate excess fat but good skin quality should have traditional or CAST liposuction performed.
- ✓ Patients with mild-to-moderate amounts of excess skin and fat should have a minibrachio-
plasty performed with skin excision confined to the axilla.
- ✓ Patients with moderate-to-severe amounts of excess skin should have a traditional brachio-
plasty performed with a longitudinal skin excision planned from the axilla to the elbow.
- ✓ Patients with severe excess skin, such as massive-weight-loss patients with bat-wing deformity, should have an extended brachio-
plasty performed with the skin excision from the elbow to the axilla and extending onto the lateral chest wall.

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