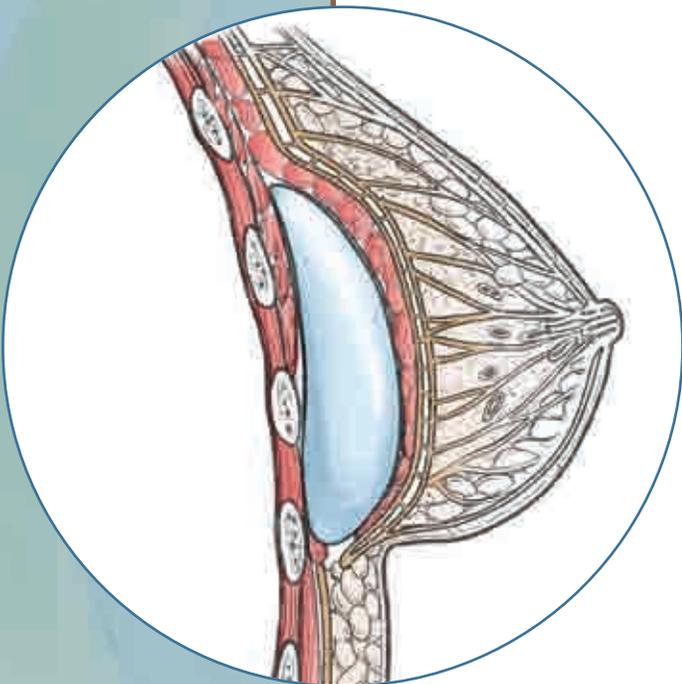


Chapter 13

Axillary Approach for Endoscopically Assisted Breast Augmentation

Henry Delmar



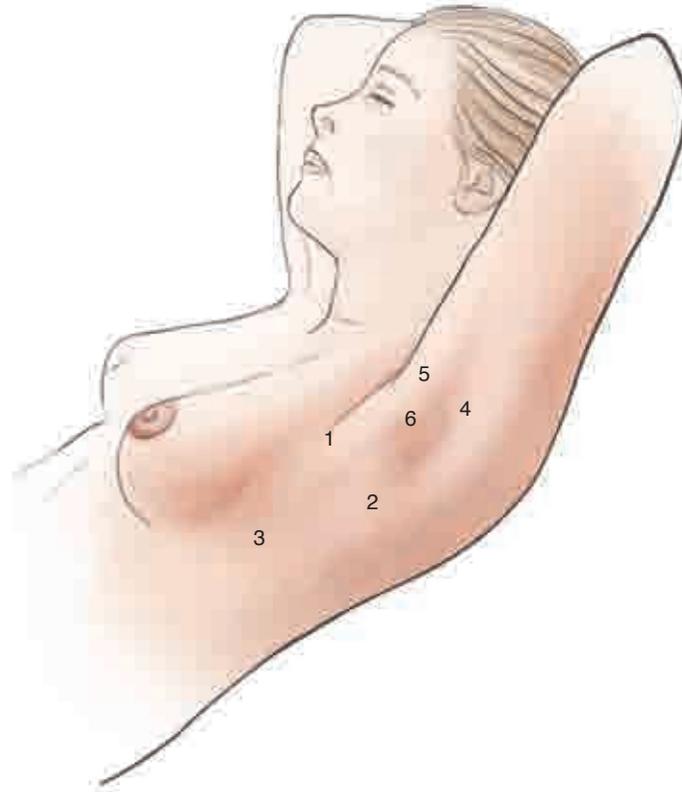
The axillary approach for breast augmentation has always held significant appeal for our patients. Its major advantage is the scar concealed at the apex of the axillary fossa. In the past, however, this route of access, with retropectoral implant placement, sustained legitimate criticism because of its reliance on blind dissection with the potential for associated secondary problems, such as the introduction of sepsis to the site, possible secondary implant ascension or distortion, implant misplacement, Mondor's axillary syndrome, inner brachial paresthesia, or postoperative pain in the axillary region. However, with the use of endoscopy for axillary breast augmentation combined with meticulous surgical technique, many of these problems have been eliminated and this approach has gained widespread acceptance. Today, the endoscopically assisted axillary approach is considered a first-line surgical choice for women seeking breast augmentation, because it eliminates the breast scar while producing high-quality results that are equal to those that can be obtained with the submammary route.

Advantages of the endoscopically assisted axillary approach include the following:

- Reduced operating time with, as corollaries, reduced anesthesia, drug effect, and recovery times in the immediate postoperative period
- Minimized surgical trauma because of disruption of the “inflammation–pain–decreased tissue oxygen supply” vicious circle
- A rigorous operating methodology, a precisely defined operating plane, and a well-honed operative technique allowing elimination of cumbersome devices, drains, bandages, and restraining devices commonly used in breast augmentation surgery
- Endoscopically aided optimization of the axillary route with rigorous anti-septic control and early scapula mobilization
- Short (24-hour) hospitalization
- Preoperative, perioperative, and postoperative assessment of endoscopic axillary breast augmentation provides early return to active life within 3 days and more predictable results and outcomes

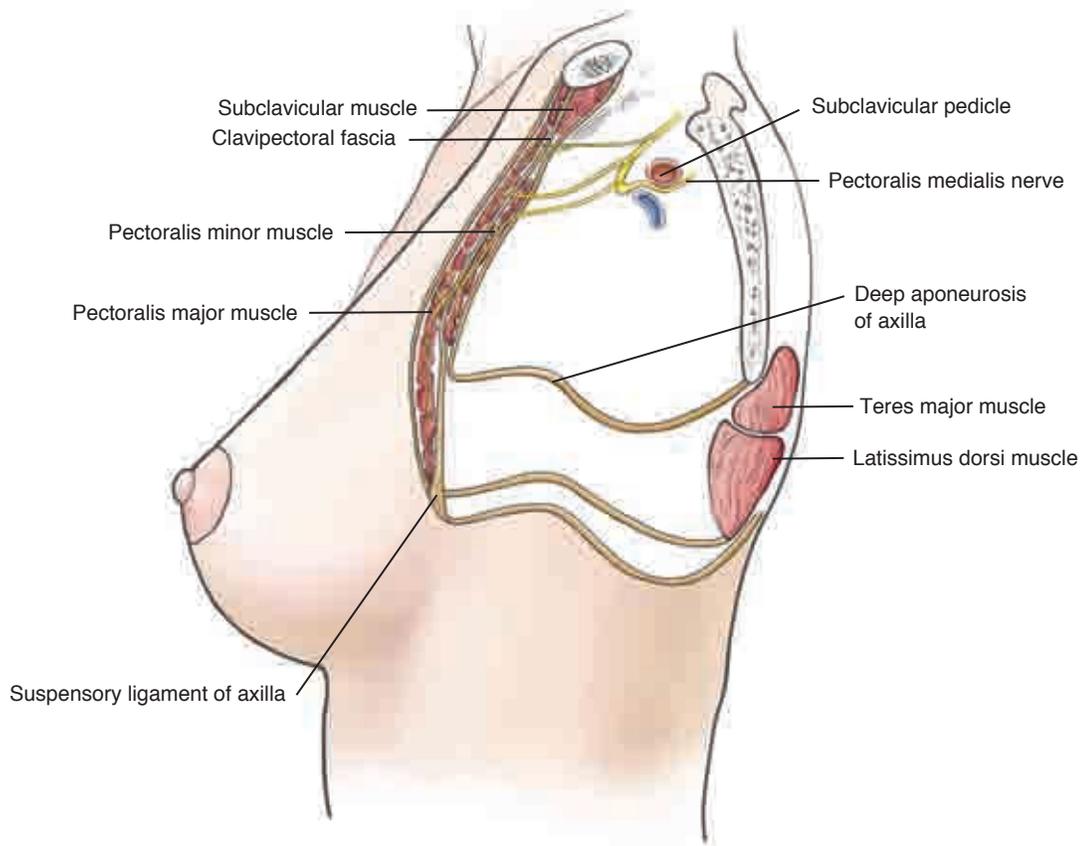
ANATOMIC CONSIDERATIONS

When performing an endoscopic axillary breast augmentation, the surgeon must understand the pertinent anatomy to avoid potential problems and ensure the best results. The axillary area is one of the three shoulder regions. Usually described as a quadrangular pyramid truncated at its inferior aspect, the axillary region can change its shape according to the degree of arm abduction, collapsing and opening up when abducted.



In its external topography, the axillary region is bounded ventrally by the prominent pectoralis major (1), dorsally by the latissimus dorsi and teres major muscles (2), caudally by the serratus anterior muscle (3), and on its lateral aspect by the triceps brachii anteriorly (4), and the coracobrachialis posteriorly (5). These two “pillars” culminate at the axillary apex at some distance from each other, wherein they form an anterior-posterior line, marked by one or several parallel cutaneous folds. These folds indicate the apparent apex of the region (6).

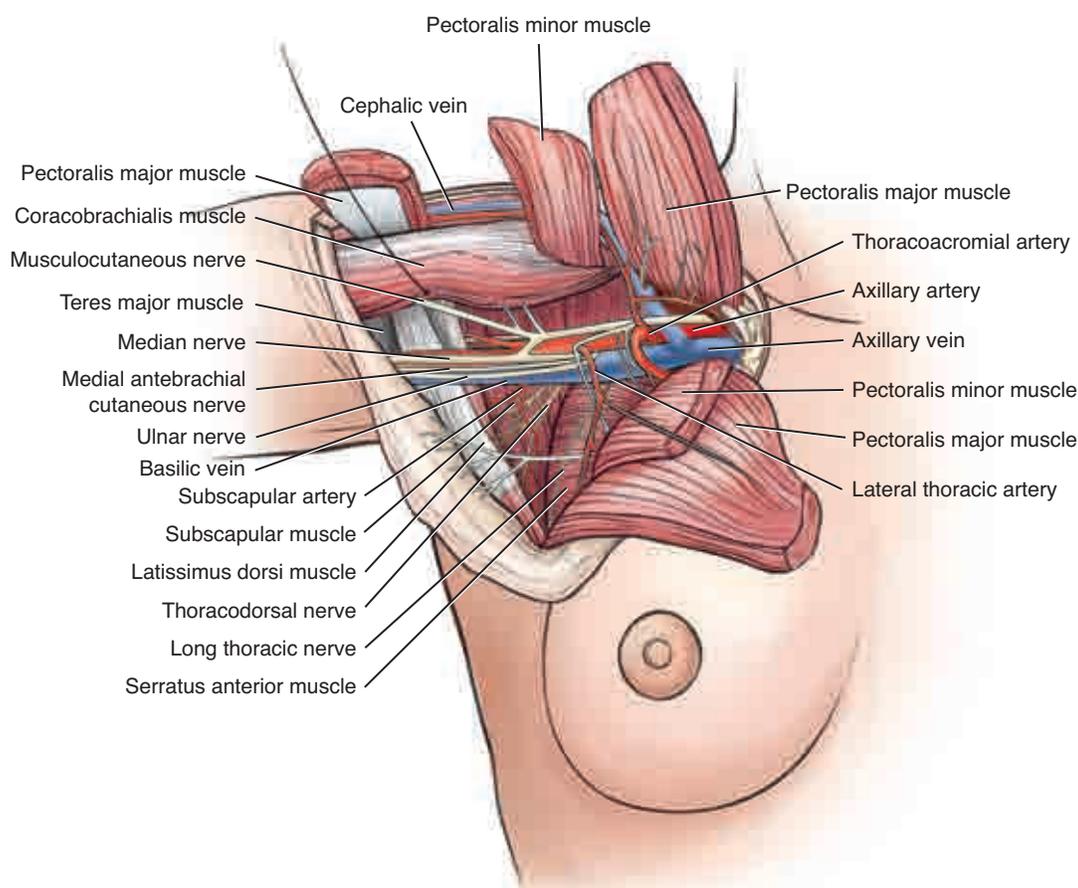
The prominent coracobrachialis, in the arm’s axis, indicates the direction of the vascular bundle. The inner topography of this region has four walls, a base, and a superior apex, which is deep and difficult to access. Special emphasis will be given to the anterior, the inner walls, and the base of the axilla, and their surgical implications.



The anterior wall forms three planes:

- *The skin and fascia superficialis.* The latter is separated from the pectoralis major aponeurosis by loose cell tissue containing a few nerve filaments derived from the lateral intercostal cutaneous branches.
- *The superficial muscular plane* formed by the pectoralis major and the corresponding aponeurosis. The pectoralis major spreads out in a fanlike manner and is attached to the lower surface of the clavicle, to the anterior surface of the sternum, to the third, fourth, fifth, and sixth costal cartilages, to the seventh rib, and to the sheaths of the recti muscles. During retropectoral implant placement, the inferior muscular insertion has to be released flush or 2 cm from costal insertion, depending on the situation. The aponeurosis divides into one superficial lamina and one deep lamina around the pectoralis major. The superficial lamina determines the boundaries of the anterofascial or retrofascial spaces on prepectoral implant placement.
- *The deep plane* is formed by the subclavicularis (see the illustration above) and the pectoralis minor. The pectoralis minor spreads out in a fanlike manner to the third, fourth, and fifth ribs, thereby forming the boundaries of the subpectoral, retropectoral, and suprapectoral regions. The claviopectoral fascia is a solid aponeurotic layer adherent to the inferior aspect of the clavicle, which divides to form sheaths for the two muscles. It continues deep to the pectoralis minor as two laminae running side by side through to the deep surface of the axillary coverings to form the suspensory ligament of the axilla.

- The *interpectoral space* is a potential cellular space through which run pectoralis major-bound vascular-nervous rami; the interpectoral space also often contains a lymphatic station (Rotter's interpectoral ganglion). According to Rouvière and Delmas, the risks of iatrogenic denervation are slim and are related to the abundant innervation of the pectoralis muscles through the nerve to the pectoralis major (pectoralis lateralis nerve) arising from the superior primary trunk, and the nerve to the pectoralis minor (pectoralis medialis nerve) arising from the anterior branch of the middle primary trunk, as described by Rouvière and Delmas, and represented in the illustration below.



The lateral pectoral nerve runs downward lateral to the medial pectoral nerve, winds around the lower aspect of the acromiothoracic artery and then splits into two branches: a muscular branch that accompanies the thoracic branch of the acromiothoracic artery, and an inferior, anastomotic branch, to form the pectoralis (plexiform) loop.

The medial pectoral nerve passes deep to the clavicle downward and forward, behind the axillary artery, and then between the artery and the vein. It splits into two branches, a muscular branch to the pectoralis minor muscle and another anastomotic branch that participates in the formation of the pectoralis loop.

The loop gives off two nervous rami, one to the pectoralis minor and one to the lower portion of the pectoralis major. These rami perforate and/or pass around the lateral aspect of the pectoralis minor muscle (they are then accompanied by the external mammary pedicle) to supply the deep surface of the pectoralis major. Although the sectioning of the rami perforantes in the course of retropectoral detachment is nonconsequential, salvaging the greater part of the rami could prevent any unusual atrophy of the lower portion of the lateral pectoralis muscle. To this end, when using the axillary approach, it is prudent to mark out the lateral border of the pectoralis major and to pass around it through the back. Likewise, retropectoral detachment (intermuscular) is safer than subpectoral detachment (passing under the pectoralis minor).

The upper branch of the lateral pectoral nerve supplies the superior head of the pectoralis major. It is of no special surgical importance.

The inner or thoracic wall is composed of two layers: a deep costal and intercostal plane, corresponding to the first five ribs and intercostal spaces, and a superficial plane, formed by the large serratus anterior muscle. This large, sheetlike muscle is inserted into the vertebral border of the scapula and spreads over the first nine ribs, winding around the chest and terminating at the middle portion of the ribs. The long thoracic nerve innervates it. The inner wall is pierced by the rami perforantes laterales springing from the intercostobrachial nerves. The most frequently identified nerve is the second intercostal ramus perforans, which emerges posterior to the lateral thoracic artery and anterior to the long thoracic nerve. It passes through the region horizontally, crossing the subscapularis pedicle anteriorly and terminating in the tissues that cover the surface of the medial arm, where it penetrates forward with respect to the latissimus dorsi tendon at the point at which the latter intersects the axillary vein. There the intercostal ramus perforans gives off an anastomotic ramus to the medial cutaneous nerve of the arm (the cutaneous brachii medialis nerve), participating with the latter in the sensory nerve supply to the floor of the armpit and to the medial surface of the arm. *This branch may be damaged in the course of an axillary approach, resulting in hypoesthesia or even complete anesthesia of the region.* Hence it is important to detach the superficial axillary aponeurosis flush to its deep surface as far as the lateral border of the pectoralis major.

The floor corresponds to the cutaneous surface extending between the upper portion of the arm and the lateral part of the chest wall. It has four planes:

1. The skin, which is furnished with hair and sweat glands and forms several natural folds.
2. The subcutaneous cellular tissue consists of small ball-like adipose masses separated from one another by fibrous bands that extend from the deep dermal surface to the underlying aponeurotic layers; these reinforce the adherence of the dermis to the aponeurosis.
3. The superficial aponeurosis is reduced to a few thin strands extending from the lower border of the pectoralis major to the lower border of the latissimus dorsi.
4. The deep aponeurosis runs continuous with the posterior lamina of the suspensory ligament of the axilla, then invests the floor of the armpit and proceeds backward behind the scapula. Its external border becomes fused with the coracobrachial aponeurosis anteriorly.



Mondor's syndrome, a recurring postoperative problem, occurs in 10% of cases; it is often found in connection with the axillary approach. It presents as a superficial adhesive band extending from the coracobrachial aponeurosis to the superficial pectoralis major aponeurosis lamina. Strict subcutaneous detachment exacerbates this syndrome, giving rise to an adherent retractile cutaneous bridle. This seems to be related to the sectioning of the suspensory ligament of the axilla, with subsequent retraction of the superficial aponeurosis.

INDICATIONS AND CONTRAINDICATIONS

Endoscopic surgery has changed the scope of indications for axillary breast augmentation. The preoperative protocol for the endoscopically guided axillary approach has removed most obstacles and criticisms regarding this route of access. Moreover, the axillary approach is the preferred choice of most patients, because the scars are placed in areas other than the breast. Eighty percent of our female patients spontaneously choose this incision approach, because it allows the scar to be hidden and leaves the gland unaltered by surgery.

The endoscopically guided axillary approach permits any type of first-line breast augmentation; 550 cc anatomic cohesive gel-based implants have been carried out without altering the cohesiveness of these implants. In fact, the axillary skin is quite elastic compared with that covering the submammary region. All implant placements are feasible: retroglandular, subfascial, or retropectoral. With the endoscopically guided axillary approach, it is also possible to carry out technical maneuvers or to use slings or other suspensory techniques on the mammary gland. Naturally, surgical know-how and experience guide the surgeon in determining the best choice for each individual patient. To avoid being dogmatic, we offer patients a variety of approaches to breast augmentation surgery. Of course, the submammary approach is an easy, anatomic route that is still an excellent option for our patients, with 15% of breast augmentation surgeries carried out by means of this route.

When the patient declines the submammary approach, we propose the endoscopic axillary route, except in cases of:

- Enhanced shoulder muscle tone
- Preexisting periareolar or submammary scars
- Concurrent, even minor, septic disease involving the armpit
- Lack of compliance to the perioperative protocol specific of the endoscopic axillary approach, as described later

We never propose the periareolar approach, with its attendant areolar scarring, unless the patient requests it or when other surgery has to be carried out on the areola.

Ultimately, the choice of approach for breast augmentation is guided by the following criteria:

- Feasibility: For example, a small areola of less than 3 cm in diameter does not permit atraumatic placement of a cohesive silicone gel implant; a Puckett-type glandular transection procedure, even endoscopically guided, is particularly difficult by means of the axillary route.
- Safety: What is the risk of implant contamination through the lactiferous ducts, and what is the increased risk for capsular shell formation? What potential problems are associated with changes affecting the lymphatic drainage from the mammary gland and the size of the custodian ganglion on one's ability to assess the breast for cancer?

Regarding the latter, several additional points are worth discussing. Today, according to Marchal, a negative sentinel node in cancer mapping always heralds a favorable outcome. Therefore, in the course of axillary dissection, salvaging the axillary lymphatic bundle is essential. However, a change in lymphatic drainage is possible following the division of the lymphatic ducts when passing from the armpit into the mammary region (although Munhoz et al demonstrated no change actually taking place in the axillary lymphatic drainage network on a small series of cases). Finally, an oncologist must take into account any history of breast cancer when appraising the therapeutic strategy. Today there is no argument against the axillary approach in terms of safety; it does not destroy the anatomy of the axillary region. Therefore the oncologist's strategy need not change.

PREOPERATIVE ASSESSMENT

The first part of the consultation is focused on the patient's expectations in terms of volume, shape, and dimensions of the future breast. What is the patient's true motivation for breast enlargement: femininity, self-esteem, or frustration? The patient's weight, height, history of pregnancy, number of children, medical history (immune disease), family history of breast cancer, smoking history, and nutritional behavior are noted in the record. Also included is the preoperative bra size, sensitivity of the breast and nipple, and the position or prominence of the nipple.

The examiner determines whether there is any spinal column deviation in relation to the shoulder and breast position on the chest wall and to the shape of the torso (a heavier, rounder torso will require more breast projection and a broader intermammary space than a thinner, flatter torso).

Skin elasticity is evaluated from toned to flaccid, and this is correlated to the patient's age and pregnancy history.

The breasts are examined for volume, firmness, ptosis, asymmetry, their position on the torso (height and laterality), level of nipple, nipple symmetry, and the dimensions of the areolas.

The following measurements are taken: sternum-nipple, nipple-nipple, midbreast-nipple, segment III, areolar diameter, and base and height of the breast, as well as the dimension of the torso: nipple level, inframammary fold level, and the circumference of the hips. Any differences in the weight of the breasts, nipple level, and inframammary fold are noted.

The surgeon explores the patient's expectations for future breast size; width, height, projection, and the position of the implants in relation to the torso are discussed.

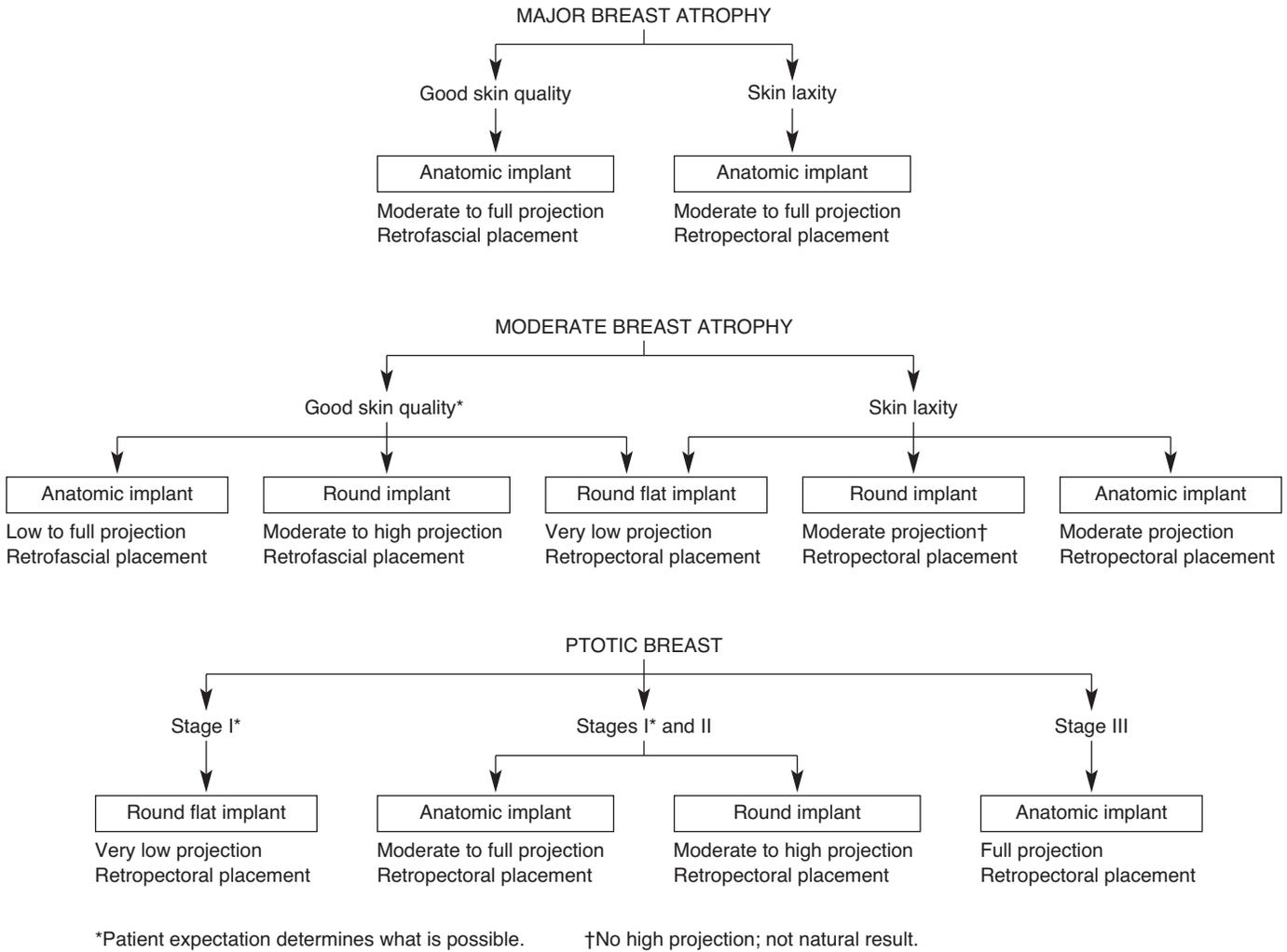
The patient is photographed preoperatively with her arms raised, arms at her sides, one frontal view, two lateral views, two oblique perspectives, and a frontal view with the arm elevated at 90 degrees.

PLANNING

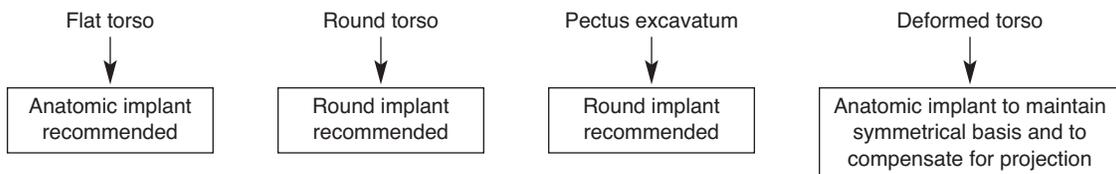
CHOICE OF IMPLANT

The appropriate implant is selected based on the considerations outlined in the algorithm below.

I. NORMAL TORSO



II. DISTORTED TORSO

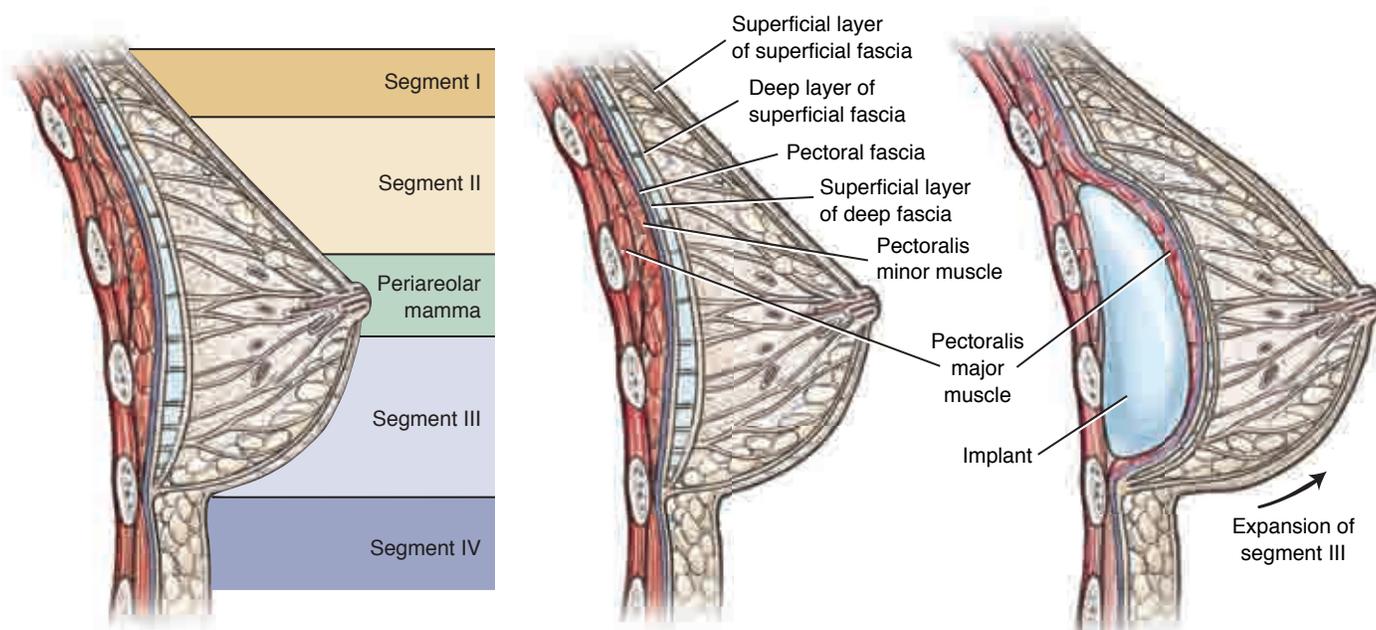


III. BREAST ASYMMETRY

Same proposition as I. Normal Torso, with asymmetric implant in size or projection or asymmetric pocket retrofascial dual plane 1, 2, 3

IMPLANT PLACEMENT

The location of the implant pocket has a bearing on the marking of the upper pole of the breast. The main factor influencing this choice is mandated by the quality of the skin covering the breast. Because the implant causes some progressive thinning of the overlying skin that is intensified with tissue aging, a retromuscular implant placement is recommended when there is less than 20 mm pinch-thickness in the upper pole of the breast.



The presence of ptosis also influences the choice of implant location. Some authors recommend subglandular implant placement to promote segment III expansion; however, the subglandular compartment accelerates such ptosis. Type III dual plane retropectoral implant placement, as described by Tebbets, prevents the problem from occurring by causing the implant to be maintained by the pectoralis major muscle while promoting segment III expansion. A low-placed implant with pectoralis major disinsertion has no functional consequence, as isokinetic studies have confirmed, with rapid, complete function recovery of the pectoralis major in more than 50% of the patients as early as the second postoperative week postoperatively with no significant long-term impairment.

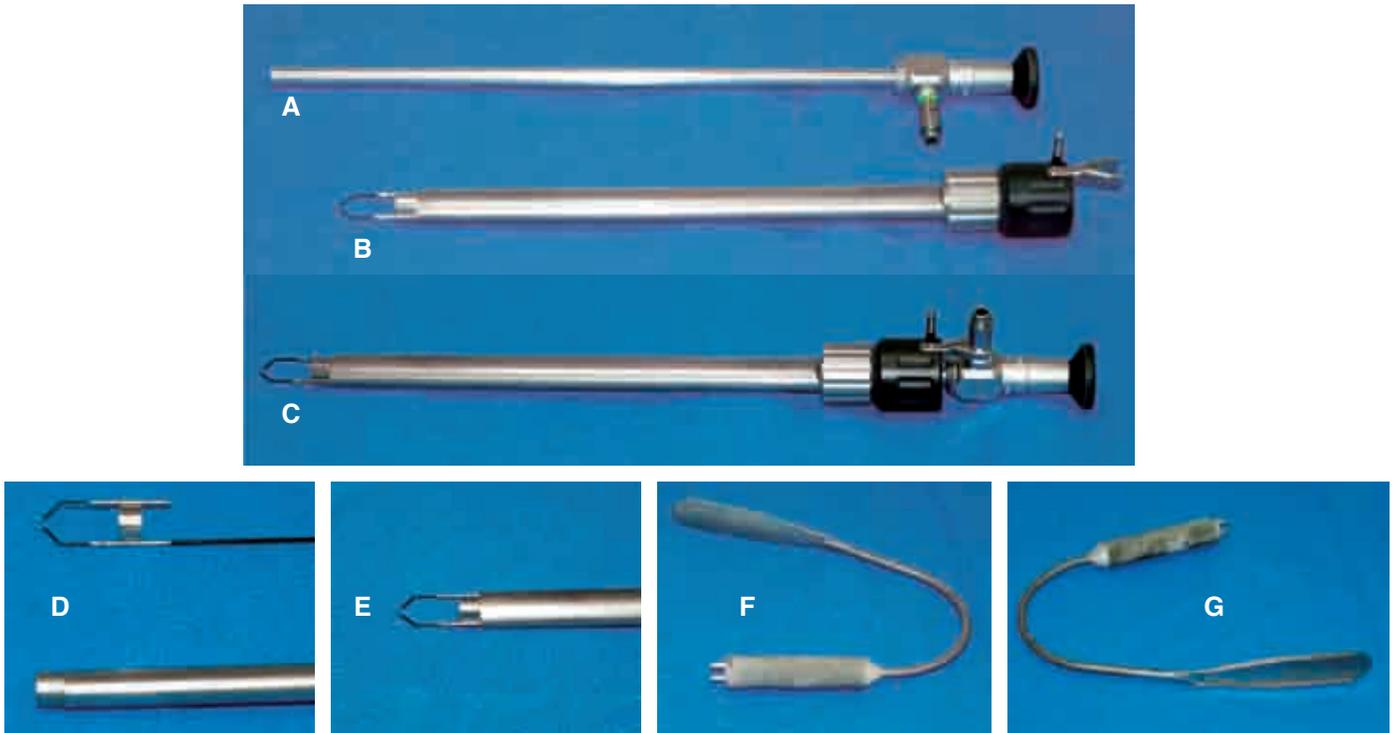
Retromuscular implant placement is not recommended for bodybuilders because of the risk of secondary implant displacement and distortion. Retroglandular implantation may yield unsatisfactory results in patients with small gland volume. Subfascial implant placement provides an interesting option when using the axillary route (see Chapter 15). Anatomic dissections, as described by Benito-Ruiz, have actually shown this thick and solid antepectoral fascia, related to segments I and II, as being looser and less easily dissected with respect to segment III. The benefits of this implant space are many compared with the retroglandular compartment. The benefits include implant support by the fascia primarily in the upper part of the breast, improved parenchyma-implant interface quality, and less contact with the mammary gland; furthermore, with added safe coverage, there will be no glandular debris in back of the implant.

EQUIPMENT AND INSTRUMENTATION

I have used instrumentation developed specifically for endoscopic axillary breast augmentation (Karl Storz, Tuttlingen, Germany) since 1996.



The endoscopic unit consists of a camera head, a camera reader, a light source, and a monitor



Instrumentation includes (A) an endoscope: 0 degrees, 10 mm, 30 cm; and (B and C) an endodissector with an introduction socket for the endoscope. At its distal end (D and E), the endodissector features a pawl-fitted monoterminial loop. The distal end of the endodissector includes an insert plug for the monoterminial wire. The instrument has two functions: endoscopic vision, while the monoterminial section loop within the endoscopic field can cut tissues and ensure coagulation. Thus both functions can be performed holding the endodissector in the dominant hand (F). The endodissector has a valve-fitted retractor with canals for smoke aspiration (G). The retractor is handled with the other hand, thereby releasing the surgeon from the constraint associated with the conventional three-instrument endoscopic procedure: endoscope, coagulator, and retractor.

The monoterminial endoscopic forceps is a supplementary instrument used to control bleeding.

PERIOPERATIVE ENVIRONMENT

Three aspects of the medical and surgical perioperative environment are worth mentioning: the patient's medical preparation, the operating procedure, and optimization of the result.

Identifying multiple possible antiinflammation and antioxidation courses of action is essential for improving outcomes:

- Reducing surgical trauma leads to significant improvement of inflammatory syndrome. Anatomic detachment procedures and careful hemostasis substantially reduce postoperative inflammation and pain, as well as the risk of any complications occurring. Instead of the typical pain–contracture–lowered tissue oxygenation vicious circle, a virtuous circle is set off with muscle relaxation, an improved tissue oxygen supply, an efficient healing process, and less secondary effects.
- The shorter operating time reduces the period of anesthesia, the quantity of drugs injected, and thus the potential for adverse effects of these drugs, as well as certain complications, while improving postoperative recovery. The latter is associated with limited nonsurgical procedures carried out outside the operating theater, analyzing the different surgical steps, and differentiating those that are useful from those that are unnecessary. This implies running through a precise operative strategy involving the medical team.
- Medical and paramedical preparation improves the breast's capacity to react to surgical intervention. Nutrition and micronutrition, phytotherapy, homeotherapy, osteotherapy, and physiotherapy are all helpful.
- Providing patients with a comfortable environment throughout leads to patient compliance to the program and helps to overcome their anxiety.

PATIENT PREPARATION

The focus of patient preparation is on fighting inflammation. The preoperative program includes phytotherapy, homeotherapy, and physiotherapy, which not only presents the advantage of improving the repair capacity of the body, but also of having the patient participate in the surgical process. Phytotherapeutic management, which is started 1 month before the procedure, targets the body's defenses and wound healing. It comprises the following:

- Administration of a powerful antioxidant (curcuma); an antiinflammatory (bromelain); and a wound-healing activator (zinc). These components are found in Cica Derm (Sofibio Laboratories) and in health food stores.

- Iron sulfate and copper sulfate supplementation (14 mg/day and 500 µg/day, respectively) by means of the administration of supplements such as Oligobiane FeCu (PiLèJe Laboratory), because a deficit in those substances has a negative impact on the defense mechanisms of the organism.
- A B-vitamin complex supplementation (B₁, B₃, B₂, B₉) to regulate the organism's acid-base balance, such as with Salvénium (Sofibio Laboratories).

The typical homeotherapeutic regimen is composed of arnica, phosphorus, and opium. The physiotherapy addresses three treatment issues: lymphatic drainage started a few days before the operation; reduced muscle tension through osteopathic manipulations before and after the operation, and resolution of scar nodes. In a study conducted by Crombez, Bozzetto, and Delmar, a noteworthy improvement of the wound-healing process was noted after the vicious cycle of the patient's pain-avoiding rolled-up posture of the shoulder, which exacerbates the pain, had been corrected.

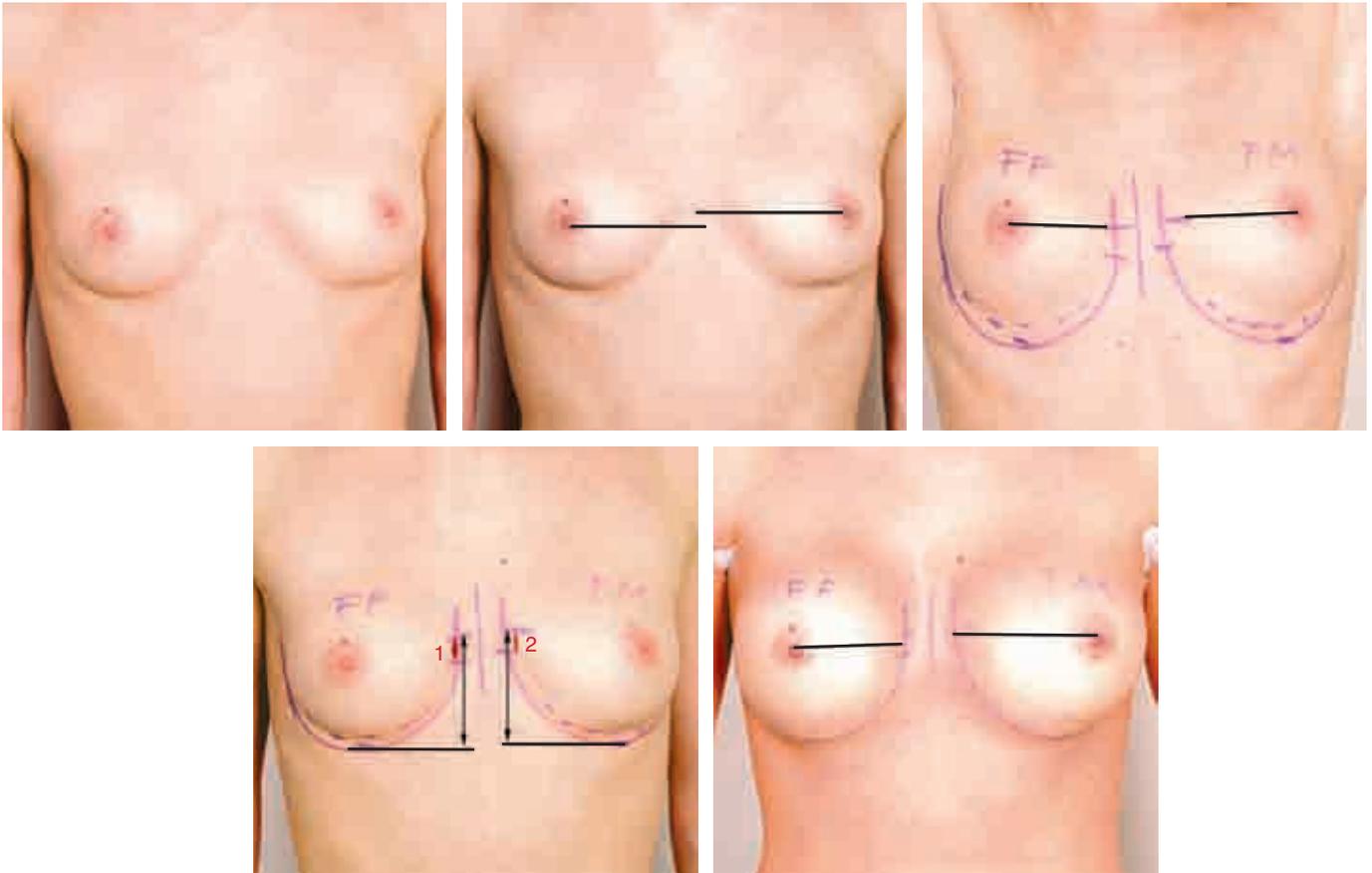
PREPARATION OF OPERATIVE SITE

This is the crucial stage that leads to reduction in operating times and postoperative morbidity. Burkhardt and colleagues noted that preparation of the operating site theoretically controls the risk of implant contamination by *Streptococcus epidermidis* and *Staphylococcus aureus*, which are found in the sweat glands of the armpit. Such contamination is a source of periimplant capsule formation through the development of a quiescent biofilm. To reduce the risk of contamination, axillary hair is removed with a wax application 3 days before the operation, and a local antiseptic disinfectant is applied twice a day. Substantial time is saved by performing a number of procedures before and not during the operation, such as marking the surgical field.

OPERATIVE TECHNIQUE

MARKINGS

The preoperative markings are done in the surgeon's office with the patient standing upright and while the preoperative photographs are displayed, using a dermatographic pen (not a felt-tip marker). This provides the most precise outline. The preoperative marking out of the future submammary sulcus is one of the keys to predicting the outcome of the procedure and to saving surgical time. Submammary sulcus position requires careful planning, as shown in the following clinical case.



This patient had moderate atrophy. Her areolas were somewhat low and asymmetrical (the left areola was higher and more lateral) with moderate breast asymmetry evaluated at 20 g.

The base of the future breast was assessed. It had a 12.5 cm width and a 13 cm height. The patient indicates what she wants by moving the breast in all the quadrants: in this case, the patient's desired projection was approximately 4 cm. Anatomic implants were proposed. The right breast was augmented with (Inamed/Allergan) FF 290 and the left breast with FM 270. The volume was confirmed by having the patient insert a silicone shell of the appropriate size inside her bra.

With the patient's arms at her sides, a horizontal line is drawn that passes through both nipples, and the sternal border is marked. The patient is asked to lift her arms to a 45-degree angle and to place her hands on her head. This abduction simulates the elevation of the areola after anatomic implant placement, according to the average projection. Another horizontal line drawn through the nipples is marked at the sternal border.

In this patient, it can be seen that there is more elevation of the areola on the right side than on the left, because the breast is smaller. Therefore the surgical plan incorporates implant placement with a greater projection for the right breast to compensate for any asymmetry when positioning the areolas. The future submammary sulcus level is obtained by carrying half of the implant height, counting from the upper sternal marking.

With round implants, the arms are lifted at a 90-degree angle, because the submammary sulcus is lower (the implant projection is less and the summit is higher).

On postoperative day 1 the horizontal position of the upper markings is noted with respect to the rising point of the areola.

OPERATING ROOM SETUP AND PATIENT POSITIONING

The patient is instructed to take a povidone-iodine (Betadine) shower on the day before and on the morning of surgery. The patient is intubated while in the dorsal decubitus position. Anesthesia is induced according to the following criteria: intubation, controlled blood pressure without hypotension (the risk of postoperative bleeding increases with low perioperatively controlled hypotension), rapid-action curare with retropectoral implants, no blood pressure spikes, and progressive arousal.



Prophylactic antibiotic treatment is administered with one injection of cefazolin. The patient's arms are extended crosslike without exerting any tension in the axillary region; the endoscopic unit is located at the foot of the operating table. The surgical drapes are arranged so that the surgeon may stand between the patient's head and shoulder.

PATIENT PREPARATION

A Betadine scrub and an alcohol-Betadine-based disinfection are done, and the segment III distances are checked.

INFILTRATION

One percent lidocaine hydrochloride is infiltrated into the incision site. The detached implant space and pectoralis major muscle are then infiltrated with 1 ampule of ropivacaine 7.5 mg and 1 ampule of clonidine to create the longest pain-free postoperative environment possible (24 hours). This is a key strategy in preventing pain-relieving shoulder rolling and enables rapid mobilization.

INCISIONS

The incision is 3 to 5 cm long at the apex of the axillary fossa, as measured 1 mm from the axillary fold chestward. One must avoid cutting too low, because the scar will become visible and too far removed from the operating field to permit conservative detachment. This incision is transfixing *without* skin detachment, which is a source of retraction. The surgical wound site is again swabbed with Betadine.

DISSECTION

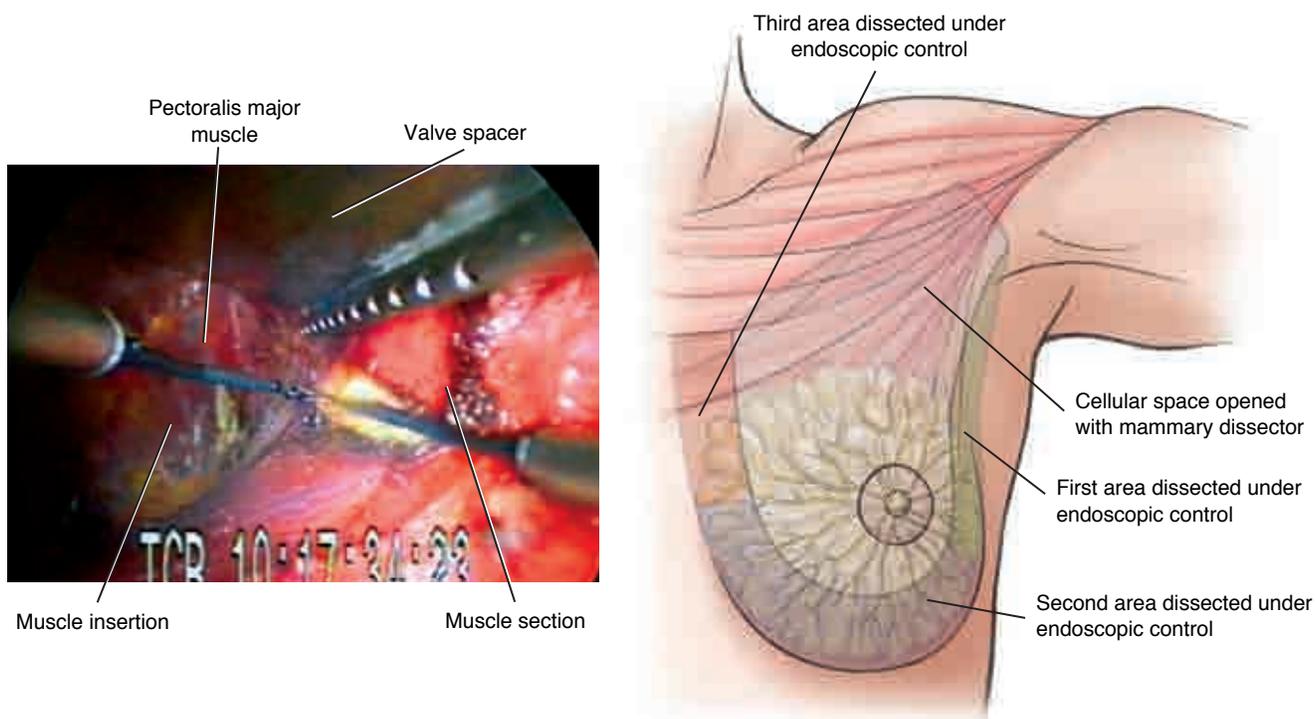
The deep surface of the deep axillary aponeurosis is detached by pushing the axillary lymph nodes backward, while sparing the ramus perforans of the second intercostal space and the small branches of the lateral thoracic artery.



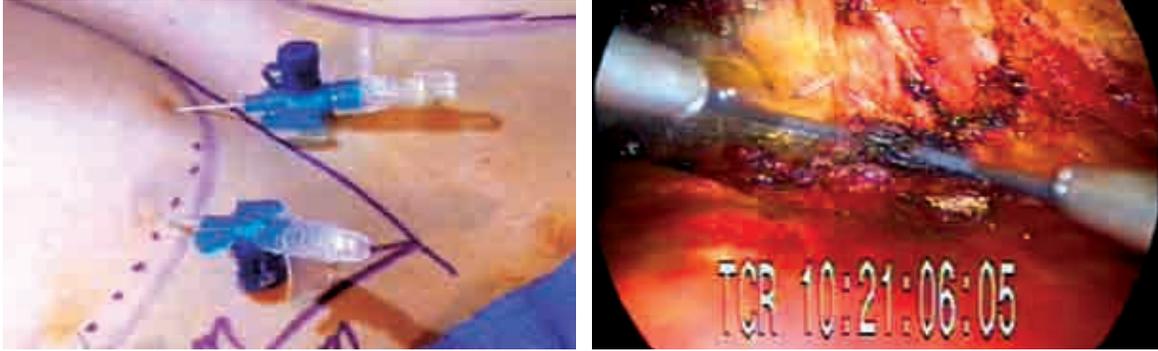
The dissection is then directed downward and inward to avoid too high an approach to the pectoralis major muscle. During this procedure, the electrocautery unit is limited to coagulation to minimize the risk of Mondor's syndrome from developing burns. The outer border of the pectoralis major is immediately seen without any bleeding or trauma. The retroglandular detachment requires opening the pectoralis fascia to gain access to the retroglandular plane. The external muscle border guides retropectoral detachment downward and inward. With the muscle pushed upward, the intermuscular detachment plane is evident.

The detachment planes include the following:

- Retroglandular detachment, loose in its first portion, is carried out using a mammary separator up to the junction of the adherent zones, which are limited at their inner aspect by the emergent pedicles of the anterior cutaneous branches of the third and sixth intercostal spaces and at their inferior aspect by the mammary suspensory ligaments and the emergent vasculature.
- Subfascial detachment is associated with more bleeding but meets the same requirements as the retroglandular approach.
- Retropectoral intermuscular detachment is a loose, cell-rich space opening easily under the mammary separator as far as the meeting point of the adherent zones, limited inwardly by the sternal insertions of the pectoralis major, and downward by the costal insertions of the pectoralis major.

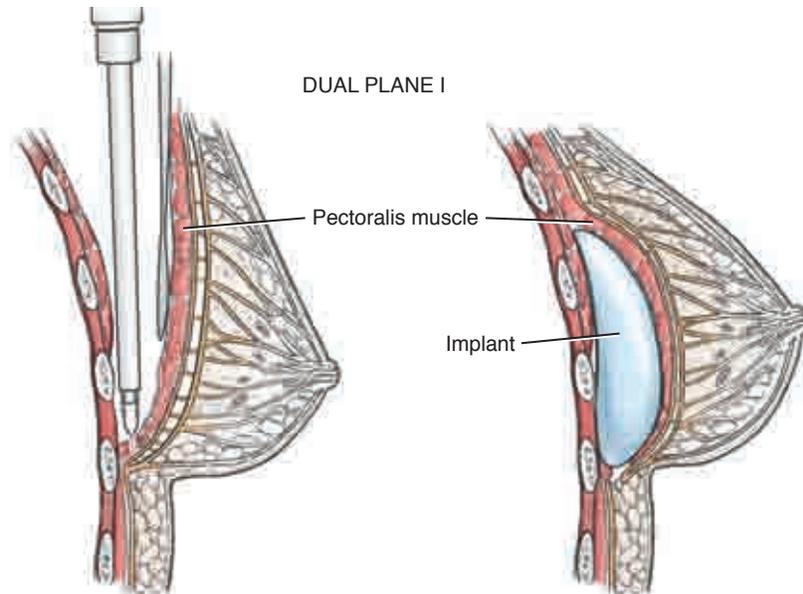


The valve separator and the endodissector are introduced to permit endoscopic visualization. The endodissector allows detachment under visual control as well as efficient management of bleeding.

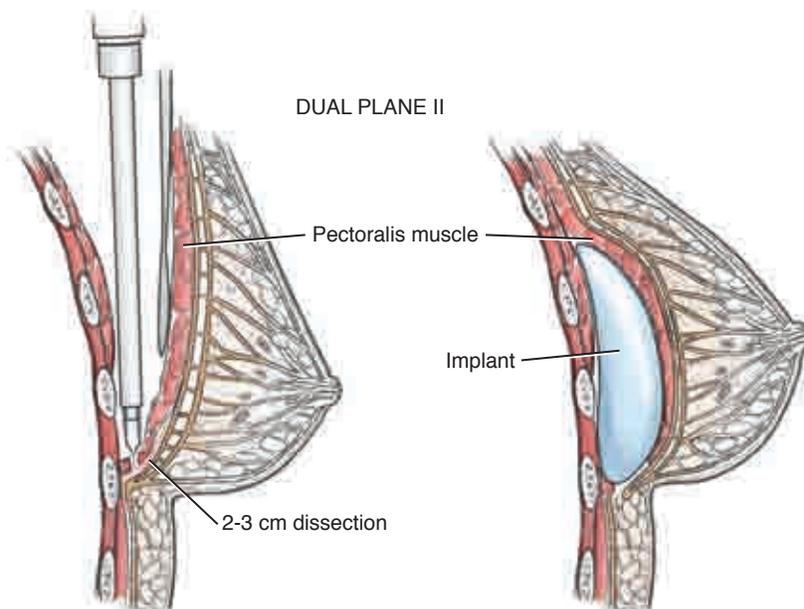


Retroglandular detachment is carried out flush to the pectoral aponeurosis as far as the boundaries of the markings that were drawn beforehand. The limits are visualized by means of sheathed transfixing needles inserted according to the markings. Dividing the fascia superficialis avoids secondary implant descent and sets the lower limits of the implant pocket.

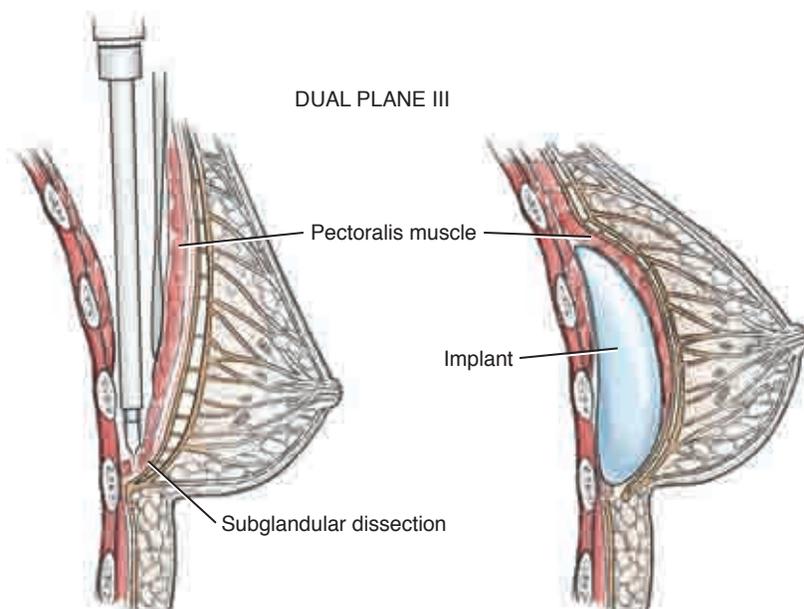
Retromuscular detachment includes the following mixed glandular-pectoral detachment types:



Dual plane I is obtained by dividing the lower insertion of the pectoralis major caudally to the fifth inner intercostal space, so as to preserve the nervous ramus of the fifth anterior cutaneous branch; the two section edges must be spaced by 2 cm to prevent scar symphysis. This surgical pocket is made possible by supplementary dissection of the mammary gland beneath the pectoralis major, thus creating a situation similar to that of retroglandular detachment.



Dual plane II is obtained by endoscopically guided retrograde release of the lower portion of the pectoralis major. It runs more than 1 to 2 cm from the upper pectoralis major edge with respect to the lower areola border.



Dual plane III is obtained by double anteropectoral and posteropectoral detachment, beginning with the posteropectoral detachment, as in dual plane I. The endodissector anticipates any bleeding from the newly formed implant space by monopolar coagulation of the transfixing vessels to the pectoralis major (subareolar rami perforantes).

A surgeon's "no touch" approach is used: only the operating surgeon may handle the implants with talcum-powdered gloves. Disinfection of the implant and operation site includes the following:

- Antibiotic solution: gentamicin 80 mg diluted with 20 mg of serum
- Disinfection of the border surfaces and incision edges
- Injection of the antibiotic solution into the implant space
- No prolonged exposure of the implant to air
- Rapid closure of the surgical wound site

FIXATION AND CLOSURE

At the conclusion of the procedure, the implant space is dry (nonhemorrhagic) and in most cases does not require placement of a drain. In our 48-case series, only four cases required drainage. Single-layer wound closure is done using single-thread 1.5 Monocryl suture.

A dressing is applied to the surgical wound, with no bandages and no bra.

SPECIAL PROBLEMS

DOUBLE-BUBBLE DEFORMITY

Transverse bipartitioning of the gland using Puckett's technique eliminates the risk of double contour in a number of cases in which a short segment III and high submammary sulcus are present. This technique consists of a horizontal transection of the gland at the areola, providing for a flattening of the lower part of the gland. It can be carried out through the endoscopically guided axillary route where it is associated with dual plane III type of detachment.

TUBEROUS BREAST DEFORMITY

Likewise, radial incisions of the retracted submammary sulcus (tuberous breasts) are carried out after dual plane I or plane II type of detachments. The submammary sulcus is then marked out with sheathed transfixing needles.

POSTOPERATIVE CARE

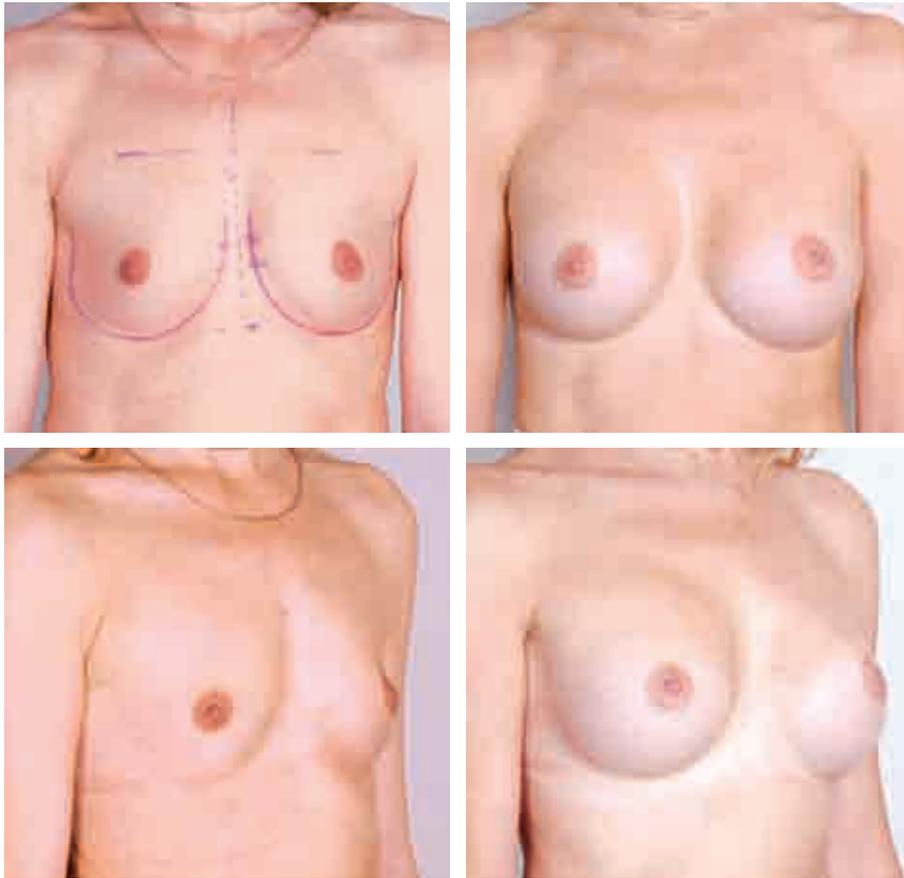
Preoperative, perioperative, and postoperative assessment of endoscopic axillary breast augmentation is planned to provide an early return to activities of daily living within 3 days and to assist in predicting the outcome, in most cases, as well as the postoperative morbidity.

Effective postoperative management ensures a predictable, quality result. Such management is primarily aimed at controlling the inflammatory syndrome, which can cause many secondary effects and complications such as pain, edema, muscle contracture, pain-relieving postures, delayed healing, implant migration, tissue retraction, and contractile capsules. Generally speaking, inflammatory syndrome is one of the major causes of unsatisfactory outcomes.

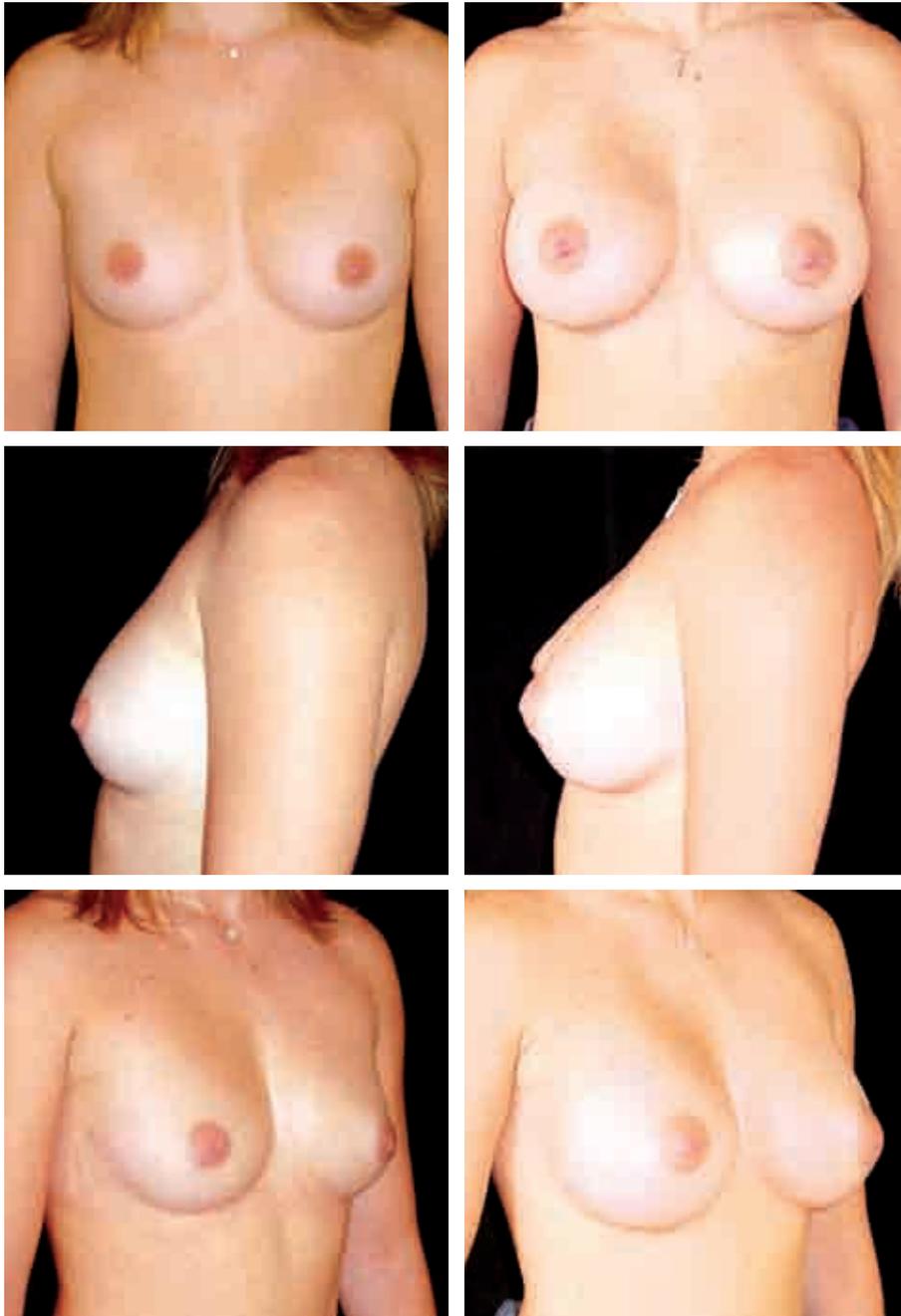
Surgical measures are available to provide better control of inflammatory syndrome, the combination of which ensures effectiveness:

- Compliance to the preoperative and postoperative medical prescription stimulates effective tissue repair.
- Mobilization and resumed physiologic movement through immediate, gentle and painless arm lifting and motion, through pectoral muscle stretching exercises, by means of osteopathic treatment in the struggle against pain-caused shoulder rolling. A currently published study conducted with an osteopathy treatment center managing pain-reducing postures in endoscopic axillary breast augmentation patients presenting with shoulder rolling showed that a clear correlation exists between rapid return to social-professional life and pain-relieving shoulder-rolling correction.
- Improved lymphatic drainage by avoiding the wear of restraining devices or compressive bandages; lymphatic drainage started at 4 days postoperatively.
- The absence of pain during the first 24 hours is essential for recovery and rapid reintegration into social and professional activities. It has been shown that 80% of long-term surgery-associated pain is related to acute pain episodes; hence the importance of the perioperative infiltration of ropivacaine, whose half-life is increased by the use of clonidine.

RESULTS



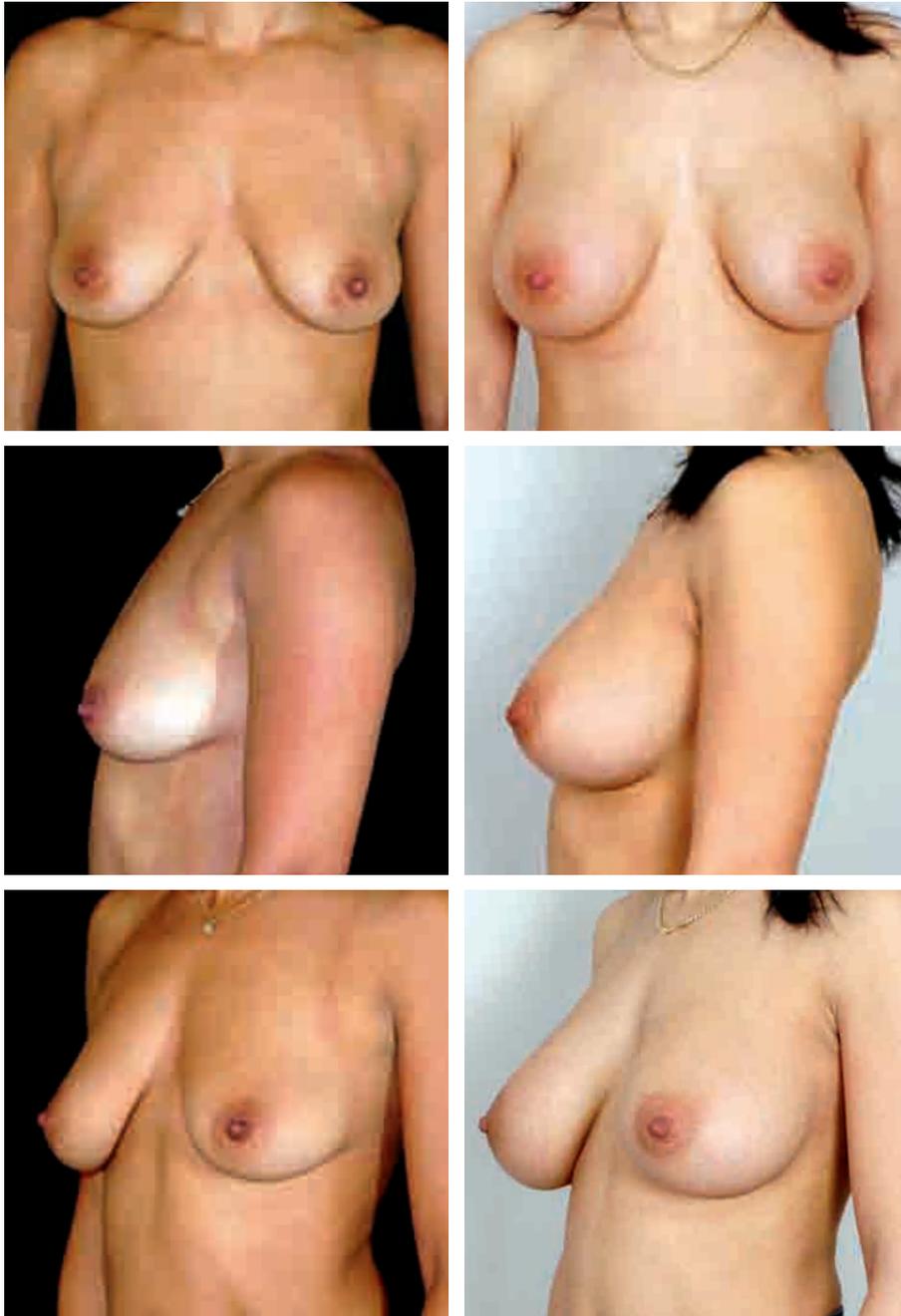
This 39-year-old woman's preoperative cup size was A/B, and she wanted her breasts to be a full C cup. She had moderate asymmetry. The postoperative result is shown 6 months after subpectoral dual plane breast augmentation with a 350 cc anatomic implant on the right and a 375 cc implant on the left.



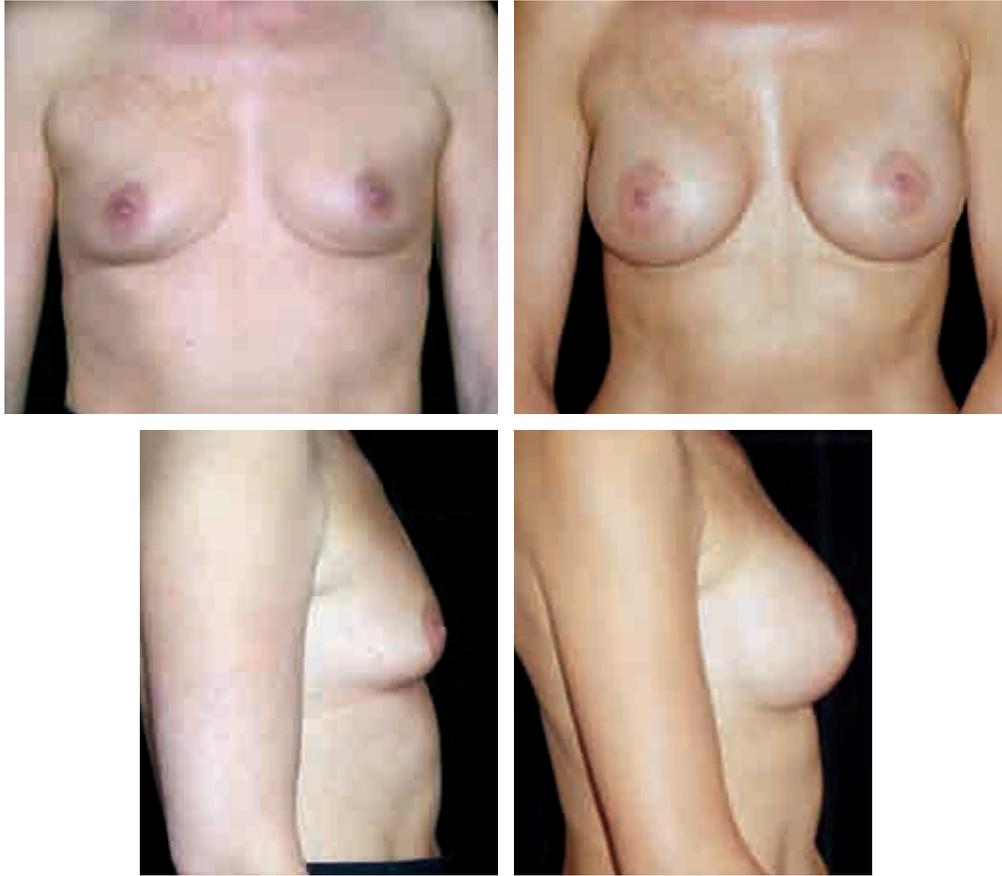
This 25-year-old patient's preoperative cup size was A, and she wanted her breasts to be a C cup. Her postoperative result is shown 7 months after subglandular breast augmentation with anatomic implants, 208 cc on the right and 220 cc on the left.



This 39-year-old patient was a B cup preoperatively, and she wanted her breasts to be a C cup. She had minimal breast asymmetry. Her postoperative result is shown 7 months after a subpectoral dual plane II procedure with 240 cc implants.

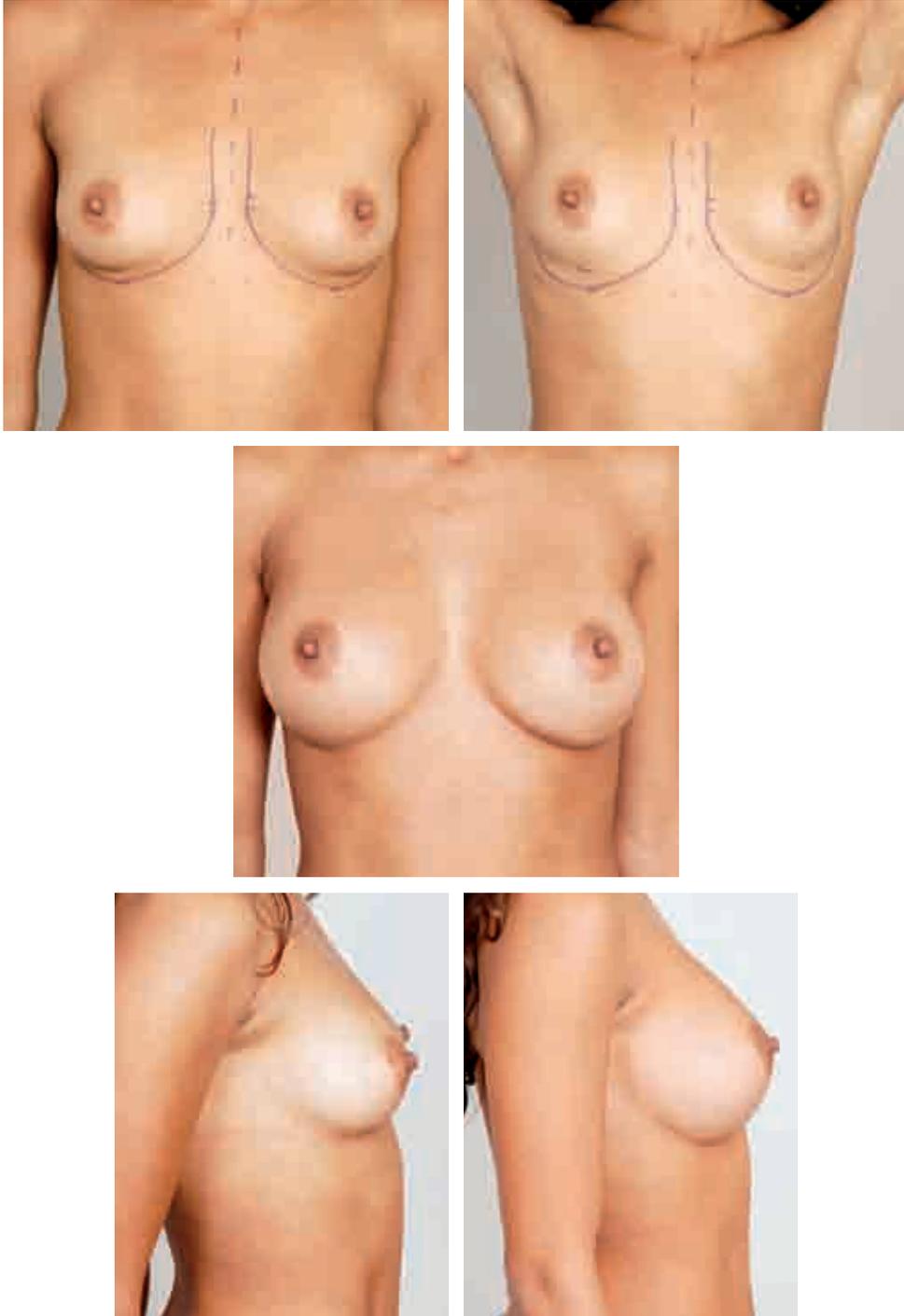


This 31-year-old woman wore a B cup and wanted her breasts to be a D cup. She did not want to have any scars or a mastopexy. Her postoperative result is shown 7 months after subpectoral dual plane III augmentation with 350 cc implants.

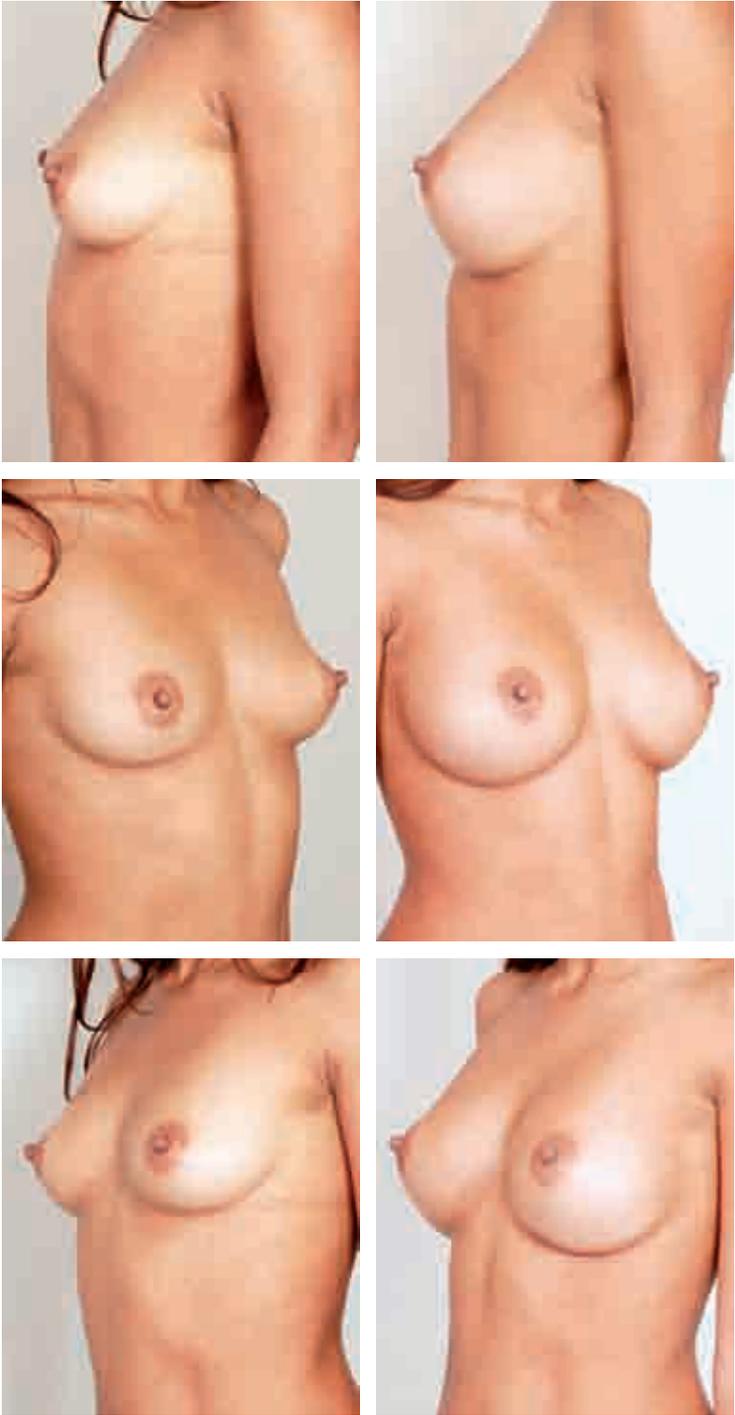


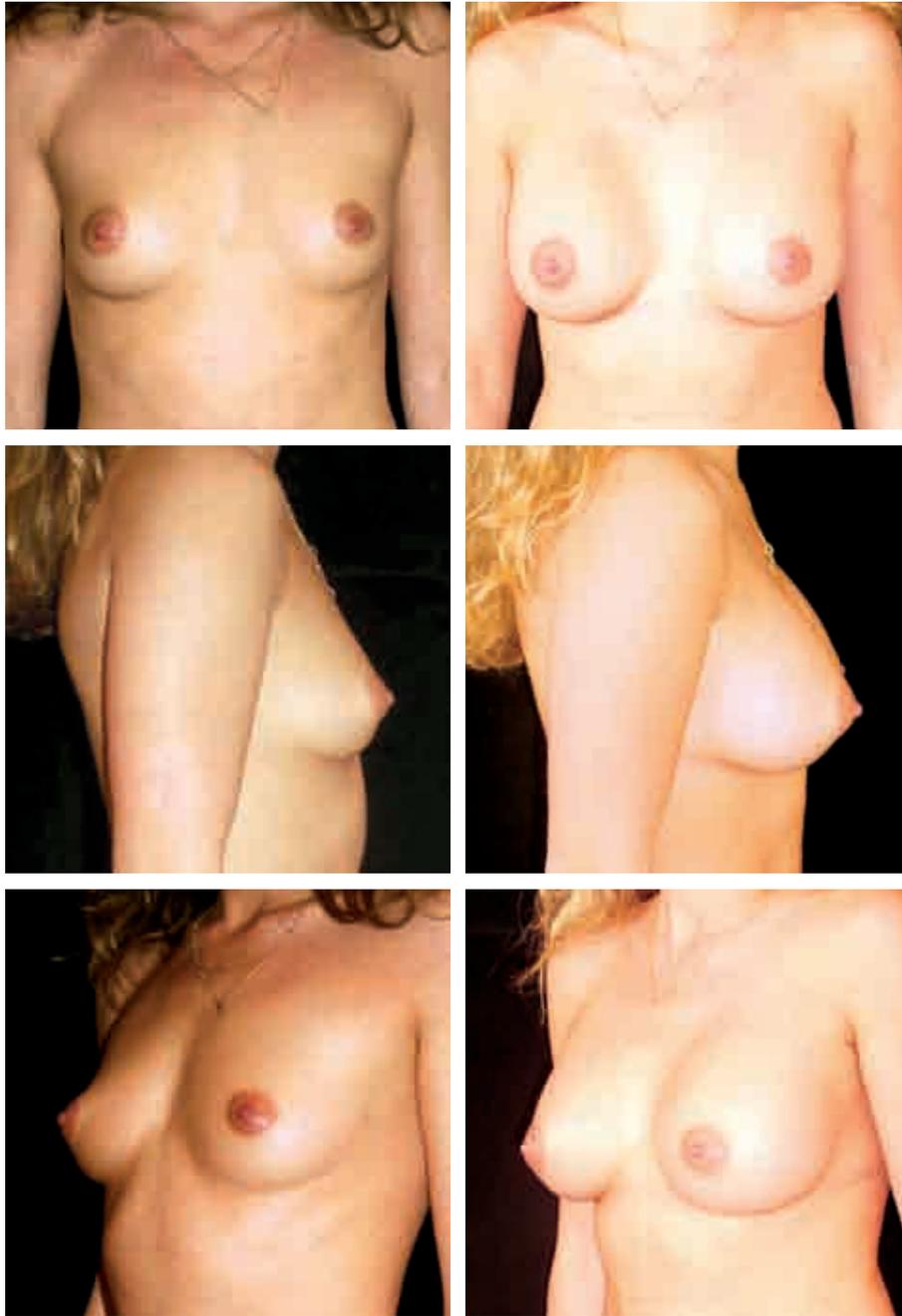
This 49-year-old patient's preoperative cup size was A, and she wished to be a B/C. She had moderate asymmetry of her breasts. The result is shown at 6 months with subpectoral dual plane I augmentation with anatomic 280 cc implants.





This 24-year-old nulliparous patient wore a B cup and wished to be a C cup. She is shown 6 months postoperatively after a subpectoral dual plane I procedure with an implant of 240 cc in the right breast, and 260 cc in the left.





This 27-year-old patient wore a B cup and wanted her breasts to be a C cup. She had minimal asymmetry of her breasts. Her result is shown 8 months after sub-muscular dual plane I augmentation with a low-profile 280 cc implant on the right, and a 300 cc implant on the left.

OUTCOMES AND COMPLICATIONS

We conducted a prospective study on 48 patients who had bilateral primary endoscopic axillary breast augmentation in 2004. Women who had not scrupulously complied with the protocol were excluded. Thirty-five endoscopic axillary breast augmentation cases (73%) were carried out using anatomically textured silicone cohesive gel implants, and 13 endoscopic axillary breast augmentation cases (27%) were carried out using round cohesive silicone gel-filled implants.

Our study data demonstrated that the operating time period ranged from 33 minutes for the shortest procedure to 96 minutes for the longest (five cases each took more than 60 minutes for hemostasis reasons), with a 47-minute average. The implant sizes ranged from 160 cc to 550 cc using anatomic-shaped implants.

Pain at postoperative day 1 was rated using a 0 to 5 scale, as follows:

- Rated 0: 5 patients
- Rated 1: 22 patients
- Rated 2: 10 patients
- Rated 3: 8 patients
- Rated 4: 1 patient
- Rated 5: 2 patients

There was no significant difference in the occurrence of pain between the prepectoral and retropectoral cases. One patient experienced chronic pain because of a hematoma-complicated breast with pain rated at 5. Eighty-nine percent of endoscopic axillary breast augmentation patients were able to resume social/professional activity within 3 days, according to the previous protocol. Thirty-seven of the 48 patients characterized their pain from 0 to 2. This demonstrates that the more we reduce minor problems, the less pain occurs, and there is a more predictable relationship between inflammatory syndrome and pain.

Complications occurring in our study are listed in the table. Vacuum drains were placed in four patients and were withdrawn after 24 hours; one woman developed a drain-associated hematoma.

Complications Following Endoscopic Axillary Breast Augmentation in a Population of 48 Patients at 1-Year Follow-up

Complication	Number	Patients (%)	Implants (%)
Capsular contracture III-IV	0	0	0
Reoperation	2	4.1	2
Hematoma	1	2	1
Chronic pain	1	2	1
Infection	0	0	0
Submammary sulcus malposition	2	4.1	2
Drain	4	8.3	6.2
Mondor's syndrome	8	16.6	13.2

The problem concerning secondary implant descent has been resolved by dividing the fascia superficialis using a monopolar endodissector at the future submammary sulcus level. It appears that the space under this fascia is loose and is easily forced open by the implant. Surgical scarring is equivalent to a suture closure of the submammary sulcus approach.

The work of Burkhardt and colleagues concerning sepsis has shown that a significant infectious risk exists for the transareolar routes, which are connected to epithelial and mucoid debris accompanying the implant on placement. Such contamination correlates with the risk of implant-related capsule formation by the presence of a periprosthetic biofilm. Hence it is advisable to select techniques that avoid the transglandular passage. The higher septic risk usually associated with the axillary approach, according to the medical literature, has been contradicted by more recent publications that find no increased surgical septic risk compared with the submammary approach.

The risk for hematoma is cited in the literature as ranging from 2% to 10.3%, depending on the series. In a series of 749 patients undergoing breast augmentation surgery, Gabriel and colleagues reported that 7.3% had to be reoperated for hematoma. Hematoma prevention is achieved by combining the following factors: limited perioperative hypotension, progressive arousal from anesthesia, rigorous hemostasis, rapid procedure, and preoperative management. Hematoma is related to neither the route of access nor to drainage.

Reduction of or loss of areola-nipple complex sensitivity is related to tissue detachment, and much less to the selected route of access. Risks are increased in cases of a traumatic, nonanatomic dissection, too large an implant space, and significant post-operative pain.

Secondary operations for implant replacement, capsulotomy, capsulectomy, and reconstruction of the implant space influence the choice of approach. Any route of access should provide effective and safe reoperation potential. The areolar and submammary routes meet those criteria because they provide direct access to the implant space. The axillary route provides indirect access, which is vastly compensated for by the use of endoscopy. This constitutes a strong argument against noncontrolled axillary incisions. Secondary conversion is always possible.

The problems of postoperative dysesthesia or anesthesia merit some comment. The subglandular implant space seems more exposed to sensitivity disturbances than the subpectoral space. In fact, the deep branch is more vulnerable during a retroglandular implant procedure. As early as 1976, Courtiss and Goldwyn demonstrated that retroglandular detachment is as much involved in areola-nipple complex-related sensory disorders as areolar incisions, and the shifting of areolar incisions does not have any effect on sensitivity. However, submuscular implant placement does not protect against the risk of denervation. Sparing the lateral cutaneous branch of the fourth intercostal nerve meets two requirements: atraumatic detachment of the implant space and lateral boundary of the anterior axillary line, which sheds light on sensitivity disorders as related to implant size. Recovery in cases of postoperative hypoesthesia or anesthesia of the areola-nipple complex is frequent because of the nervous supply network. Kompatscher and colleagues conducted a study to assess sensitivity disorder related to implant surgery over a 2-year postoperative period and demonstrated that subjectively, 80% of patients considered their areola-nipple sensitivity to be normal, whereas their objective evaluation revealed increased sensitivity thresholds regarding vibration and pressure, although erection was judged normal. These results show the importance of the psychological factor concerning breast shape recovery, which is closely related to retained sensibility. This subjective erogenous sensitivity must be correlated to the cosmetic quality of results and should be taken into account when obtaining objective measurements. Finally, clinical examinations reveal evidence that dysesthesia cases involving the inferior pole of the breast are related to nervous trauma at the submammary sulcus level.

An analysis of the results shows that overall management of a surgical operation, and more particularly the technique of endoscopic axillary breast augmentation, improves the operative experience as well as the outcome. The reduction of the operating time period, the use of less traumatic procedures, the standardization of the technique, adequate patient selection, the nonsurgical medical environment provided, and the patient's compliance to the protocols set up will help control inflammation and avoid complications.

Caveats

- Traumatic tissue traction should be avoided.
- No perichondrial or periosteal trauma should occur.
- It is important to spare the sternal insertions of the pectoralis major muscle above the fifth intercostal space.
- To reduce the intermammary space, the pectoralis major costal digitations should be released above the fifth intercostal space. This is an effective maneuver that induces no areolar dysesthesia with respect to sensitivity supplied by the fourth lateral cutaneous branch.
- The anterior axillary line should not be crossed over to preserve the lateral cutaneous nervous branches supplying the areola.

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