COSMETIC

Gynecomastia Treatment through Open Resection and Pectoral High-Definition Liposculpture

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Background: Male chest definition surgery and patients complaining of breast tissue overgrowth have been increasing in recent decades. After the authors' first report of pectoral etching in 2012, patients and surgeons became more aware about gynecomastia resection when performing pectoral enhancement. The authors present their experience with pectoral high-definition liposculpture in addition to inverted-omega incision resection for gynecomastia.

Methods: The authors reviewed their records on pectoral high-definition liposculpture between January of 2005 and October of 2019 in four surgical centers in Colombia. Inclusion criteria were as follows: men diagnosed with gynecomastia and body mass index less than or equal to 32 kg/m^2 , adequate skin elasticity, and general good health. Photographs were taken preoperatively and 1, 3, 6, and 12 months postoperatively. Follow-up ranged from 2 months to 3 years.

Results: Gynecomastia resection plus high-definition liposculpture was successfully performed in 436 consecutive men (open inverted-omega incision resection, n = 132; liposuction, n = 304). Ages ranged from 18 to 66 years. Fat grafting volume ranged from 50 to 300 cc in each pectoral muscle. Minor complications (3.2 percent) included prolonged swelling, bruising, asymmetries, and residual gynecomastia. Major complications (1.6 percent) included unilateral hematoma and localized infection. No necrosis, systemic infection, or muscle paralysis was reported. A nonstandardized survey showed a very high satisfaction index.

Conclusion: Gynecomastia treatment combining high-definition liposculpture to male breast tissue resection through a new, almost invisible incision allowed us to achieve an athletic and natural appearance of the male pectoral area with a very low rate of complications. (Plast. Reconstr. Surg. 147: 1072, 2021.)

CLINICAL QUESTION/LEVEL OF EVIDENCE: Therapeutic, IV.

he number of patients asking for pectoral enhancement through liposuction has been increasing in recent decades. Some individuals are not even aware of or are ashamed of gynecomastia and would not directly request treatment for it. Gynecomastia is defined as a benign condition of the male because of mammary tissue overgrowth¹ and can occur in as many as three of four teenagers²; this is different from pseudogynecomastia, which is basically adipose tissue deposits. Pectoralis muscle development and shape are strongly correlated to male aesthetic standards, which is the reason why its anatomical features and some surgical approaches to achieving such standards have already been

From private practice.

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described.³ Techniques include fat extraction around and over the pectorals to improve definition, but most of them neither succeed with augmentation for the volume-deficient chest, nor solve other problems such as gynecomastia.⁴ Treatments have been focused on overall resection and/or combination with other procedures⁵⁻⁷ but often lack an aesthetic approach, and results are far from pleasant for most patients. In 2012, we described different biotypes for the male pectoral treatment, including patients with gynecomastia. We also outlined the pectoral anatomical zones, where negative spaces and transition and deep resection zones became the cornerstones for muscular and athletic definition.⁸ Pectoral inferior pole liposuction plus superior pole lipoinjection was one of the most frequently performed procedures, in some cases with the addition of gynecomastia resection. We have used overlapping techniques of liposuction plus open resection for patients in which fat aspiration is usually not enough. Several techniques (conventional, ultrasonic, power-assisted, or combined) for pectoral fat extraction have been described,^{9–13} but they usually leave visible scars around the areola, which are a great concern for men who regularly expose their chest (e.g., at the beach, the pool, at home).

ANATOMY AND ARTISTIC ANATOMY

Pectoralis major muscles are well-developed muscles in men that evolved and allowed them to become hunters and leaders with the capability to use tools. In recent decades, general population surveys and social media posts suggest the well-developed torso as one of the main aesthetic features of male beauty,¹⁴ because its appearance reflects the disposition and development of the pectoral muscles. Although it perfectly resembles the muscle mass itself, the surrounding areas must also be treated to produce optimal definition.¹⁵ Specific anatomical regions have been previously categorized for muscularization and treatment to create a perfect contour but also improve projection.⁷

The pectoralis muscle is divided into superior (greatest volume) and inferior poles, and around them there are five "hollow" areas (negative spaces) that further enhance the projection and definition the male chest⁸: the subclavicular triangle, pectoral-latissimus triangle, pectoralis line, subpectoral triangle, xiphoid rhombus, and pectoralis resection triangle (Table 1). [See Video (online), which demonstrates key steps for gynecomastia open resection through an inverted-omega shaped incision: anatomy analysis, markings, incisions, high-definition liposculpture, open resection, and fat grafting are explained. A 42-year-old male patient

Area	Limits and Landmarks	Treatment
1. Interpectoral (xiphoid) rhombus	Area between the inferior medial borders of the pectoralis muscle, the xiphoid process, and the origin of the rectus abdominis muscle at the midline; its definition will aid the torso's natural appearance after surgery	Deep and smooth superficial liposuction
2. Subpectoral triangle	Area delimited by the pectoral line and the lateral border of the rectus abdominis muscle that ultimately links the pectoral with the abdominal muscular definition	Thorough subdermal and intermediate liposuction must be performed to limit the border between the chest and the abdomen
3. Pectoral- latissimus dorsi muscle triangle	Area between the lateral border of the pectoralis muscle and the lateral border of the latissimus dorsi muscle; even though it actually goes beyond the pectoral area, it is important to expand the concavity to this limit for optimal contour	Smooth subdermal liposuction; expanding the negative space toward the back will increase the depth effect and subsequently improve the chest athletic appearance
4. Subclavicular triangle	Area outlined by the subclavicular line, the deltoid muscle, and the upper border of the pectoralis muscle; in certain individuals, this area retains fat that obscures the muscle anatomy	A smooth transition has to be performed between the deltoid and the pectoralis muscles
5. Pectoralis line	Horizontal line along the inferior border of the pectoralis muscle, usually 1 cm below the nipple; the accurate definition of this line is the key to create a muscular appearance (without it, the patient will appear fat and/or frail)	This line tilts upward when the muscle is in contraction, creating another line that follows the muscular movement; the zone between these two lines is called the "dynamic transition zone"; this area must be treated as a negative space that softens while going toward the upper pole
6. Resection triangle	This area is delimited by the inferior and lateral borders of the pectoralis muscle and a line connecting the midpoint over both pectoralis lines with the lateral insertion of each pectoralis muscle	Deep and superficial liposuction; progressive removal of fat tissue and gland is performed while we move in the direction of the lower vertex of the triangle

Table 1. Pectoral Negative Spaces and Specific Treatment for Each Area



Fig. 1. Body types and pectoral definition. Because the negative spaces are critical in the natural and athletic appearance of the pectoral area, it is also important to describe some general landmarks according to each body type. In the athletic patient, inferior pole fat grafting is strongly avoided, whereas it is recommended for the thin patient and is optional in the obese patient. Also, thorough deep liposuction must be performed in the obese patient in the lateral torso and the superior and lateral abdomen. However, careful definition must be performed in the pectoralis-latissimus dorsi triangle in the thin patient and in the athletic patient.

who underwent gynecomastia resection through inverted-omega incision plus high-definition liposculpture is shown preoperatively, 48 hours postoperatively, and 3 months postoperatively. Fat grafting was performed in both upper poles with 200 cc adipose graft injection each.] These areas are specific landmarks for the way liposuction is going to be performed, depending on the body type^{16,17}: fat, athletic, or thin (Fig. 1). We present our experience with the hybrid technique for gynecomastia resection through VASER-assisted (Solta Medical, Bothell, Wash.; Bausch Health Companies, Inc., Laval, Quebec, Canada) liposuction plus open resection with a new inverted-omega incision.

PATIENTS AND METHODS

We retrospectively reviewed our data for techniques on gynecomastia resection, including inverted-omega incision and high-definition liposculpture. A total of 436 male patients were consecutively operated on by the first author (A.E.H.) between January of 2005 and October of 2019 in four surgical centers in Colombia: Santa Barbara Medical Center, Evolution Surgical Center, and Dhara Clinic in Bogota, D.C.; and Clinica Foscal in Bucaramanga, Santander (Table 2). Patient age ranged from 18 to 62 years, with a mean of 39 years. We used third-generation ultrasound for fat emulsification (VASER) and power-assisted liposuction (MicroAire PAL; MicroAire Surgical Instruments, LLC, Charlottesville, Va.) for dynamic definition liposculpture and gynecomastia resection.

An anesthesiologist conducted the preoperative evaluation, including routine laboratory values such as white and red blood cell counts, platelet count, creatinine, blood urea nitrogen, prothrombin time, and partial thromboplastin time. Electrocardiography and chest radiography in addition to cardiology assessment were

Table 2.	Patient	Distribution	in	Surgical	Centers
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Institution	No. of Patients	Period
Evolution Surgical Center (Bogota, D.C.)	56	2005-2009
Santa Barbara Medical Center (Bogota, D.C.)	81	2009-2013
Dhara Clinic (Bogota, D.C.)	282	2014-2019
Clinica Foscal (Buraramanga, Santander)	17	2009-2013

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compulsory for patients aged 40 years or older. Patients with a body mass index above 31 kg/m^2 and/or those following bariatric surgery were excluded. Photographs were obtained at the preoperative appointment and at 1, 3, 6, and 12 months after surgery. The follow-up period ranged from 2 months to 3 years (mean, 10 months). Each patient was informed of the purpose, methods, sources of funding, any possible conflicts of interest, institutional affiliations of the authors, the anticipated benefits and potential risks of the study and the discomfort it may entail, and poststudy provisions and outcomes according to the Declaration of Helsinki. They were also informed of the right to refuse to participate in the study or to withdraw consent to participate at any time without reprisal. A freely given informed consent was signed for each patient participating in our report.

Surgical Technique Markings

We use a color code for the markings to ease the intraoperative recognition of all the previously discussed zones. In standing position, we first mark visible fat deposits for deep liposuction. Next, the pectoralis muscle is divided into upper and lower poles, and we also mark the depressions or areas that lack projection (e.g., the upper pole), which may need fat grafting. Surface anatomy is drawn afterward with the different areas for superficial liposculpture ("hollow" areas; see Anatomy and Artistic Anatomy section), which are outlined by the negative spaces (concavities to be performed to enhance the muscular appearance¹⁸) around the pectorals (Table 1).

Finally, the entire gland bud is marked and its area beyond the pectoralis muscle limits for selective extraction by open resection and/or



Fig. 2. Artistic anatomy for the pectoral area: Negative spaces surrounding the pectoral muscles are one of the most important features in high-definition liposculpture. Specific areas are numbered as in the text: 1, interpectoral rhombus; 2, subpectoral triangle; 3, pectoralis–latissimus dorsi triangle; and 4, subclavicular triangle. Resection triangle is delimited in *yellow* where deep liposuction must be performed in obese and gynecomastia patients. The inverted-omega incision is performed for breast tissue open resection. For fat grafting, access can be achieved through the omega incision with a small straight cannula, or the anterior axillary fold incision (when no open resection is performed) with a long-curved cannula. Starting at the subpectoral space and then in the intramuscular layer, the relation of intramuscular/subpectoral amount of graft is usually kept at a 2:1 ratio. Note the shape and length of the omega incision and the surrounding structures that need to be defined for an optimal pectoral etching.



Fig. 3. Inverted-omega incision. This is a versatile enlargement of the initial liposuction stealth incision at the nipple. It is made by grabbing the whole breast tissue plus the nipple-areola complex, then a horizontal extension (5 mm) is created on both sides without trespassing on the areola limit. It will allow a complete resection of the enlarged breast tissue (quadrants dissection) by pull-through technique.

liposuction (Figs. 2 and 3). Areas for additional liposuction rely on the patient's body biotype.

Step 1: Infiltration and Emulsification

Under general anesthesia, stealth incisions (5 mm) are performed over anatomical creases for

access (nipple incision, anterior axillary folds, and umbilicus). We use tumescent solution for infiltration with 1000 cc of normal saline, 50 cc of 1% lidocaine, and 1 ampoule of epinephrine 1:1000. We start in the deep layer followed by the superficial layer. We wait 5 minutes for the solution to



Fig. 4. A 39-year-old overweight man with true gynecomastia. Breast tissue open resection through inverted–omega–shaped incision was performed in addition to dynamic definition liposculpture in the torso with bilateral 150 cc of upper pole fat grafting. Almost 4300 cc of fat aspirate was removed in this patient. Note the new projection of the pectoral area with a complete absence of residual breast tissue in the postoperative photographs (*below*) compared to the preoperative photographs (*above*).

distribute and vasoconstriction to occur. Then, fat emulsification is performed with the VASER ultrasound system. Deep fat fragmentation is performed at 80 percent continuous mode with a 2.9-mm or a 3.7-mm two-ring probe. A VASER sharp-tip probe is used at 90 percent continuous mode for mammary tissue emulsification. We usually follow a volume infiltration versus fat removal ratio of 2:1.

Step 2: Liposuction

Vigorous deep fat aspiration is performed using a 4.0-mm Mercedes cannula, with or without MicroAire Power-Assisted Liposuction, over the subpectoral area, the triangular area lateral to the muscle, and the axillary fat pad over the superior lateral border of the pectoral beneath the clavicle and the deltoid muscle (note that other body areas are also subject to superficial and deep lipoplasty as part of dynamic definition liposculpture¹⁸). In the superficial layer, artistic sculpting of the horizontal line inferior to the pectoralis muscle is achieved by aspiration with a 3.0-mm Mercedes cannula (note that arms must be completely adducted to avoid unnatural results, because arm abduction tilts the inferior border of the pectoralis muscle).

We perform smooth subdermal liposuction with a 3.0-mm Mercedes cannula over the negative spaces and carve the area between the major pectoralis and the rectus abdominis muscle, which will also aid in the abdominal muscular definition (Fig. 2). This is achieved by using Vent X cannulas (Sound Surgical Technologies, Denver, Colo.) or MicroAire Power-Assisted Liposuction cannulas. The junction between the superficial and the deep zones is blended to produce a smooth definition of the pectoralis muscle (lateral and inferior) in the same way the subclavicular triangle is treated.

Step 3: Gynecomastia Resection and Fat Grafting

Concerning the pull-through technique,^{19,20} the decision regarding open resection versus



Fig. 5. An athletic 42-year-old patient with breast tissue overgrowth. Note the lack of volume in the upper pectoral area, but also the female appearance of the right breast in the preoperative photographs (*above*). A new muscular and natural appearance is achieved (*below*) by gynecomastia open resection and dynamic definition chest liposculpture with bilateral 200 cc and 50 cc fat graft in the upper and lower poles, respectively. Almost 3800 cc of fat aspirate was removed in this patient. Note that abdominal etching was a great challenge because of the medical history of peritonitis following a perforated appendix requiring laparotomy approximately 10 years before high-definition liposculpture surgery.



Fig. 6. An obese 48-year-old man with pseudogynecomastia in which dynamic definition liposculpture was enough for pectoral etching and muscular definition. Almost 5200 cc of fat aspirate was removed in this patient. No omega incision was needed. Abundant adipose deposits are noted in the abdominal and pectoral areas in the preoperative photographs (*above*). The upper pectoral pole was grafted with 200 cc on each side by a multilayer approach. A great volume enhancement is notable in the post-operative photographs (*below*).

liposuction is made intraoperatively. Deep liposuction with a 4.0-mm basket cannula must be performed over the resection triangle in obese patients or when gynecomastia is present (before open resection), sometimes extending to the limits of the fatty area beyond the pectoralis muscle. If excessive glandular tissue remains, an invertedomega–shaped incision is extended around the nipple. We dissect the glandular breast mass into quadrants to make it easier for removal. The superficial bud is then pulled out through the incision, ensuring complete extraction (Fig. 3). This approach allows us an intradermal closure, preserving the aesthetics of the areola-nipple

Table 3. Survey Results

Score	No. Patients (%)		
Total no. of patients	159		
Score			
Excellent results	121 (76.1)		
Above expectations	27 (16.9)		
Average results	6 (3.7)		
Below expectations	3 (1.8)		
Bad results	2 (1.2)		

complex. We have to take into account that isolated definition of the chest with or without gynecomastia resection is hardly ever considered as a single procedure because patients may end up with an unnatural appearance. Moreover, a key high-definition premise is the 360-degree approach instead of a single-muscle-group treatment; and male patients most often request a fulltorso high-definition liposculpture at our office.

Fat Grafting

Adipose tissue is harvested using a 4-mm Mercedes blunt cannula into an empty, sterile bottle trap. One gram of cefazolin is added to the trap. We use decantation to separate viable adipose cells from the saline and detritus. The pectoralis major muscle is grabbed, and a 3-mm blunt cannula connected to a 60-ml syringe filled with adipose supernatant is inserted through the anterior axillary fold incision into the intramuscular layer (Fig. 2). The ratio of intramuscular-tosubpectoral fat grafting is approximately 2:1. In most cases, the graft is placed on the superior pole to enhance the muscular projection. We usually

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Fig. 7. Sad pectorals: markings before surgery have to be drawn with the arms in the standing resting position (adduction), because once on the surgery table, the arm abduction will tilt the pectoralis muscle (*left*), which could end up in bilateral sad pectoral shape. If residual gynecomastia is present, asymmetry in the pectoral line could result in a unilateral sad pectoral (*right*). Interestingly, some patients have angulated pectorals as a normal anatomical variation. We just have to follow our markings (with the arms in resting position) supported by the underlying anatomy, in which case this will be considered a natural and expected result.

do not graft the inferior pole, to avoid a "glandular" appearance in the athletic patient, although doing so may be mandatory for the thin patient and optional for the fat patient (Fig. 1). Curved cannulas are commonly used for grafting to minimize the risk of rib-cage damage. A long (40-cm) 4-mm Mercedes cannula is used for the interpectoral area definition.

Finally, Blake drains (Ethicon, Inc., Johnson & Johnson, Somerville, N.J.) are placed in the subcutaneous space through the inguinal incisions. Once surgery is finished, patients are immediately dressed up in postoperative garments and foams and then transferred to the recovery unit. All patients receive 2 g of cefazolin, 8 mg of dexamethasone, 8 mg of ondansetron, 75 mg of diclofenac, and 50 mg of tramadol during surgery.

RESULTS

Three hundred four of the 436 cases (70 percent) of true gynecomastia or pseudogynecomastia resection were achieved by means of dynamic definition liposculpture and 132 (30 percent) by inverted-omega open resection. Pathology analysis reported normal breast tissue in all cases where open resection was performed. Dynamic definition liposculpture was performed in all patients, with some of them also including arm, back, abdomen, and upper and lower limb definition. Pectoral fat grafting was performed in 284 patients, with volumes ranging from 50 to 300 cc and with an average of 200 cc in each pectoral area (including subpectoral and intramuscular). A new athletic and muscular appearance of the male chest was successfully achieved through gynecomastia resection and dynamic definition liposculpture (Figs. 4 through 6). A nonstandardized survey was conducted during postoperative appointments to assess the patient satisfaction index (n = 159); results are showed in Table 3.

Minor complications [n = 14 (3.2 percent)]included prolonged swelling $[n = 11 (2.5 \text{ per$ $cent})]$, bruising [n=7 (1.6 percent)], asymmetries [n = 5 (1.2 percent)], and residual gynecomastia [n = 3 (0.7 percent)]. An oblique shape of the inferior pectoral border ("sad pectorals") (Fig. 7) occurred in five patients (1.2 percent) because of

Type of Complication	No. Patients (%)
Minor	14 (3.2)
Prolonged swelling	11 (2.5)
Prolonged bruising	7 (1.6)
Asymmetries	5(1.2)
Résidual gynecomastia	3 (0.7)
Major	7 (1.6)
Superficial hematoma	3(0.7)
Retropectoral hematoma	1(0.2)
Superficial infection	2 (0.5)
Abscess formation	$\frac{1}{1}(0.2)$

Table 4. Complications

underlying muscle anatomy; however, in two cases (0.5 percent), it occurred because of gynecomastia misdiagnosis in the preoperative evaluation. These latter two cases were subject to a second procedure under local anesthesia to remove the remaining breast tissue. Two patients (0.5 percent) had abnormal skin retraction below the nipple: one required in-office liberation under local anesthesia, whereas the condition resolved spontaneously in the other (Table 4).

Major complications [n = 7 (1.6 percent)]included unilateral hematoma $[n = 4 (1 \text{ per$ $cent})]$ and infection [n = 3 (0.7 percent)]. Two superficial hematomas required manual drainage; one resolved with physical means and one retropectoral hematoma required ultrasoundguided drainage. Two superficial infections were treated merely with systemic antibiotics (ampicillin-sulbactam 375 mg administered orally three times per day for 7 days), whereas the other required ultrasound-guided abscess drainage (Fig. 8) in addition to the antimicrobials. No necrosis, systemic infection, or muscle paralysis was reported.

DISCUSSION

Since our first description of pectoral etching in 2012,⁸ several authors have reported multiple improvements and citations in their articles.^{4,13,21} Nevertheless, gynecomastia treatment has been challenging because patients face a substantial concern about aesthetic and unnatural results. The inverted-omega incision has allowed us to decrease the risk of residual breast tissue that will, at some point, relapse.²²⁻²⁵ Moreover, dynamic definition liposculpture was enough for most patients, whereas the pull-through technique was reserved for those with true breast tissue overgrowth (gynecomastia), regardless of whether they were fat or thin. This new approach combines superficial, intermediate, and deep lipoplasty with fat grafting in addition to gynecomastia resection with the aim



Fig. 8. Localized infection in a 36-year-old man after gynecomastia open resection plus dynamic definition liposculpture and fat grafting. Ultrasound-guided drainage and physical means were needed in addition to 7-day antibiotic treatment (375 mg ampicillin-sulbactam administered orally three times per day). No systemic infection was reported, and complete resolution was achieved after 2 weeks.

of reproducing the normal superficial anatomy and improving the athletic definition of the pectoral area, because the first author (A.E.H.) is the creator and developer of the high-definition liposculpture technique with 18 years of experience.¹⁸ A long learning curve is required to obtain the results reported in this study; however, the technique is considered easily reproducible and safe.

Although misdiagnosis of gynecomastia has led to undertreatment of the pectoral area and might result in relapse and/or pitfalls,^{26,27} it is now easier to recognize the breast tissue enlargement that could end up in open resection by following the markings in the preoperative period. As mentioned before, gynecomastia management remains challenging because of its visual results and sometimes residual deformities, which mostly delays surgical decisions and treatments within most patients. Gynecomastia surgical management is sometimes delayed because of anatomical abnormalities and/or previous residual deformities in some patients. The pull-through technique (through an inverted-omega incision) combined with dynamic definition liposculpture and fat grafting has improved outcomes, with high satisfaction among patients. This incision (inverted-omega) is a versatile extension of the initial stealth incision for liposuction that will barely affect the aesthetics



Fig. 9. An obese 39-year-old man with gynecomastia and abundant adipose tissue deposits. We performed a complete brachial dermolipectomy over the axilla to improve both arm and the chest contours, in addition to circumferential abdominoplasty and liposculpture. Approximately 6100 cc of fat aspirate was removed in this patient. No omega incision was needed. Abundant adipose deposits with redundant skin are noted in the abdominal and pectoral areas in the preoperative photographs (*above*). Each pectoral muscle (upper pole) was grafted with 250 cc of fat using a multilayer approach. An improved contour in the abdomen and torso is noted in the postoperative photographs (*below*), with the chest appearing very masculine and natural.

and shape of the areola and/or the nipple. Severe gynecomastia patients are not common in our country and are usually rare in private practice. They are usually treated by surgeons affiliated with their health insurance and subsequently out of our patient spectrum. One patient was included in our revision; in this patient, we performed complete axillary fold resection to lift up the entire pectoral skin (Fig. 9) in addition to circumferential abdominoplasty and liposculpture. Further clinical studies must be conducted to evaluate how successful the procedure could be without skin excision in severe gynecomastia presentations.

Fat grafting is also crucial for our results,⁸ and because the main aesthetic outcome is an athletic chest, the greater the projection and definition of the

muscles, the more muscular the appearance. This is achieved not only by intramuscular and subpectoral fat grafting to the upper pole, but also because of the definition of the surrounding negative spaces, which allows the eye to appreciate a greater depth of the visual contour and creates a greater sense of projection (artistic anatomy and high-definition liposculpture concepts¹⁸). Although implants have been widely used for pectoral enhancement, many patients complain of its fictitious and unnatural appearance.^{28–30} In contrast, multilayer lipoinjection combined with muscle definition has become the treatment of choice for pectoral augmentation.^{4,8,31} In our experience, the graft injection in multiple planes has somehow improved its survival, but further focused and comparative studies need to be carried out to support our theory.

CONCLUSIONS

Gynecomastia resection through the invertedomega incision and dynamic definition liposculpture are safe and reproducible techniques for the management of male patients with chest contour defects. Multilayer fat grafting and high-definition liposculpture are fundamental to ensure the natural athletic appearance of the postoperative male chest. Further studies need to be performed to compare fat graft survival and long-lasting results, although our follow-up period included patients with up to 2 years of follow-up with promising results. A high satisfaction index can be reached with this improved technique, although the survey used in this study is not standardized. The inverted-omega incision for breast tissue resection is a new option for those patients in which liposuction or other techniques may not be sufficient for gynecomastia definitive treatment.

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PATIENT CONSENT

Patients provided written consent for the use of their images.

REFERENCES

1. Blau M, Hazani R. Correction of gynecomastia in body builders and patients with good physique. *Plast Reconstr Surg.* 2015;135:425–432.

- Ersek RA, Schaeferele M III, Beckham PH, Salisbury MA. Gynecomastia: A clinical review. *Aesthet Surg J.* 2000;20:381–386.
- 3. Mentz HA, Ruiz-Razura A, Newall G, Patronella CK, Miniel LA. Pectoral etching: A method for augmentation, delineation, and contouring the thoracic musculature in men. *Plast Reconstr Surg.* 2007;120:2051–2055.
- Pilanci O, Basaran K, Aydin HU, Cortuk O, Kuvat SV. Autologous fat injection into the pectoralis major as an adjunct to surgical correction of gynecomastia. *Aesthet Surg J.* 2015;35:NP54–NP61.
- 5. Aiache AE. Male chest correction: Pectoral implants and gynecomastia. *Clin Plast Surg.* 1991;18:823–828.
- Hammond DC, Arnold JF, Simon AM, Capraro PA. Combined use of ultrasonic liposuction with the pull-through technique for the treatment of gynecomastia. *Plast Reconstr Surg.* 2003;112:891–895; discussion 896–897.
- Ramon Y, Fodor L, Peled IJ, Eldor L, Egozi D, Ullmann Y. Multimodality gynecomastia repair by cross-chest power-assisted superficial liposuction combined with endoscopic-assisted pullthrough excision. *Ann Plast Surg.* 2005;55:591–594.
- Hoyos A, Perez M. Dynamic-definition male pectoral reshaping and enhancement in slim, athletic, obese, and gynecomastic patients through selective fat removal and grafting. *Aesthetic Plast Surg.* 2012;36:1066–1077.
- 9. Ratnam BV. A new classification and treatment protocol for gynecomastia. *Aesthet Surg J.* 2009;29:26–31.
- Aksam E, Aksam B, Demirseren ME. A practical way for nipple-areola complex reshaping in circumareolar reduction of gynecomastia. *Aesthet Surg J.* 2015;35:NP186–NP187.
- Johnson RE, Murad MH. Gynecomastia: Pathophysiology, evaluation, and management. *Mayo Clin Proc.* 2009;84:1010–1015.
- Waltho D, Hatchell A, Thoma A. Gynecomastia classification for surgical management: A systematic review and novel classification system. *Plast Reconstr Surg.* 2017;139:638e–648e.
- 13. Rasko YM, Rosen C, Ngaage LM, et al. Surgical management of gynecomastia: A review of the current insurance coverage criteria. *Plast Reconstr Surg.* 2019;143:1361–1368.
- Watson A, Murnen SK, College K. Gender differences in responses to thin, athletic, and hyper-muscular idealized bodies. *Body Image* 2019;30:1–9.
- Hoyos AE, Millard JA. VASER-assisted high-definition liposculpture. *Aesthet Surg J.* 2007;27:594–604.
- Rubins DK. The Human Figure: An Anatomy for Artists. New York: Penguin Books; 1976.
- 17. Simblet S, Davis J. Anatomy for the Artist. New York: DK Publishing; 2001.
- Hoyos A, Prendergast PM. High Definition Body Sculpting. Berlin: Springer-Verlag; 2014.
- Bracaglia R, Fortunato R, Gentileschi S, Seccia A, Farallo E. Our experience with the so-called pull-through technique combined with liposuction for management of gynecomastia. *Ann Plast Surg.* 2004;53:22–26.
- 20. Morselli PG. "Pull-through": A new technique for breast reduction in gynecomastia. *Plast Reconstr Surg.* 1996;97:450–454.
- Caridi RC. Defining the aesthetic units of the male chest and how they relate to gynecomastia based on 635 patients. *Plast Reconstr Surg.* 2018;142:904–907.
- 22. Ladizinski B, Lee KC, Nutan FN, Higgins HW II, Federman DG. Gynecomastia: Etiologies, clinical presentations, diagnosis, and management. *South Med J.* 2014;107:44–49.
- 23. Fagerlund A, Lewin R, Rufolo G, Elander A, Santanelli di Pompeo F, Selvaggi G. Gynecomastia: A systematic review. J Plast Surg Hand Surg. 2015;49:311–318.
- 24. Monarca C, Rizzo MI. Gynecomastia: Tips and tricks. Classification and surgical approach. *Plast Reconstr Surg.* 2013;131:863e–865e.

- Rohrich RJ, Ha RY, Kenkel JM, Adams WP Jr. Classification and management of gynecomastia: Defining the role of ultrasound-assisted liposuction. *Plast Reconstr Surg.* 2003;111:909– 923; discussion 924–925.
- 26. Persichetti P, Berloco M, Casadei RM, Marangi GF, Di Lella F, Nobili AM. Gynecomastia and the complete circumareolar approach in the surgical management of skin redundancy. *Plast Reconstr Surg.* 2001;107:948–954.
- 27. Petty PM, Solomon M, Buchel EW, Tran NV. Gynecomastia: Evolving paradigm of management and comparison of techniques. *Plast Reconstr Surg.* 2010;125:1301–1308.
- 28. Benito-Ruiz J. Buttock implants for male chest enhancement. *Plast Reconstr Surg.* 2003;112:1951.
- 29. Horn G. A new concept in male chest reshaping: Anatomical pectoral implants and liposculpture. *Aesthetic Plast Surg.* 2002;26:23–25.
- Pereira LH, Sabatovich O, Santana KP, Picanço R. Pectoral muscle implant: Approach and procedure. *Aesthetic Plast Surg*. 2006;30:412–416.
- **31.** Mizoguchi T, Kijima Y, Hirata M, et al. Histological findings of an autologous dermal fat graft implanted onto the pectoralis major muscle of a rat model. *Breast Cancer* 2015;22:578–585.