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Extensive Ultrasonic Liposuction in Gynecomastia: An Alternative Approach without Surgical Gland Excision

Jinekomastide Geniş Alanda Ultrasonik Liposuction: Cerrahi olarak Gland Çıkarmadan Alternatif Yaklaşım

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ÖZET

Amaç: Göğüs duvarı üzerinde yapılan cilt ve gland çıkarma işlemler genellikle hastaların tolere etmesi zor olan belirgin izlere sebep olabilmektedir. Cerrahi olarak gland çıkarmadan geniş alanda ultrasonik liposuction yaklaşımını tanımlamaktır. Ayrıca yöntemin komplikasyonları azaltma ve kozmetik sonuçları iyileştirme konusundaki etkinliğini araştırdık.

Gereçler ve Yöntem: Rohrich II ve III evre jinekomasti hastalar cilt kalitesine göre değerlendirildi. Kriterleri karşılayan 46 hastaya Şubat 2021 ile Nisan 2023 tarihleri arasında kıdemli yazar tarafınca ultrasonic liposuction uygulandı. Bu hastalar, standart liposuction ile birlikte periareolar mastopeksi ve gland eksizyonunu uygulanan 58 hasta ile karşılaştırıldı.

Bulgular: Çalışmada geniş alanda ultrasonik liposuction uygulanan hastaların %8.7'lik bir komplikasyon oranına sahip olduğunu bulundu. Toplam hastalardan sadece bir tanesinde seroma komplikasyonu yaşadı ve hastaların üçünde residual meme dokusu/pitoz gözlendi. Hastaların hiçbirinde revizyon cerrahisi gerekmedi. Buna karşılık, periareolar mastopeksi ve gland çıkarmayı içeren kontrol grubunun komplikasyon oranı daha yüksekti (%10.3).

Sonuç: Yara kontraksiyonu için plastik cerrahinin temel prensiplerini kullandık. Yara iyileşme mekanizmalarını geniş bir yüzeye dağıtarak, göğüs duvarında belirgin bir iz oluşturmadan cerrahiye göre daha iyi kozmetik sonuçlar elde ettik.

Anahtar Kelimeler: Geniş Alanda Liposuction, Jinekomasti Cerrahisi, Meme Pitozu, Ultrasonik Liposuction, Vaser Liposuction

ABSTRACT

Aim: Skin and gland removals made on the chest wall may result in noticeable scars that can be challenging for patients to tolerate. This study aimed to define an extensive ultrasonic liposuction approach without surgical excision for gynecomastia. We also investigated its effectiveness in reducing complications and improving cosmetic outcomes.

Materials and Methods: Gynecomastia patients with Rohrich grades II and III were evaluated according to skin quality. 46 patients who met these criteria underwent ultrasonic liposuction performed by the senior author between February 2021 and April 2023. These patients were compared with 58 who underwent surgery using suction-assisted liposuction combined with peri areolar mastopexy and glandular excision.

Results: Our study found that patients who underwent extensive ultrasonic liposuction had a complication rate of 8.7%. Of the total number of patients, only one experienced a seroma complication, and three experienced residual breast tissue/ptosis. None of the patients required revision surgery. In comparison, the control group that underwent peri-areolar mastopexy and glandular excision had a higher complication rate (10.3%).

Conclusion: We used the basic principles of plastic surgery for wound contraction. Distributing the wound healing mechanisms to a broad surface allowed us to achieve better cosmetics without forming a noticeable scar on the chest wall.

Keywords: Breast Ptosis, Extensive Liposuction, Gynecomastia Surgery, Ultrasonic Liposuction, Vaser Liposuction

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INTRODUCTION

Gynecomastia refers to the non-cancerous enlargement of male breast tissue, resulting from an upsurge in both fatty and glandular elements within the breast. The progression of gynecomastia generally occurs in two stages: florid and fibrous phases, which typically become evident after a year. Once the periductal tissue and surrounding stroma undergo fibrosis and hyalinization, the process becomes irreversible, rendering glandular hypertrophy resistant to medical interventions (1). In this phase, glandular tissues do not respond to medical treatment (2). In such instances, surgical intervention is generally regarded as the standard approach (3). Back in 1973, Simon et al. introduced a clinical classification system for gynecomastia levels that still maintains wide usage today (4).

Gynecomastia surgery necessitates a meticulous tripartite evaluation encompassing the dimensions of glandular hypertrophy, adipose tissue excess, and dermal redundancy (5). A spectrum of surgical modalities exists to address these facets (6). Diverse liposuction methodologies combined with reduction mammoplasty and Nipple Areolar Complex (NAC) repositioning facilitated by varied scar and pedicle strategies are widely covered in the literature (7, 8). Regardless of the fibrous histological component, liposuction and ultrasound-assisted liposuction (UAL) manifest as potential surgical alternatives (9, 10). Ultrasound-assisted liposuction (UAL), which is an alternative to conventional liposuction (CL) methods, uses ultrasonic sound waves to break up the oil and aspirate the tissue in liquid form (11).

Within the ambit of minimally invasive interventions, procedures such as liposuction-assisted minimal incision surgery have garnered favor due to their propensity for diminished postoperative complications, expedited convalescence, and enhanced aesthetic outcomes (10). It is noteworthy that cases featuring pronounced skin redundancy may not yield optimal results through such minimally invasive techniques. Gynecomastia surgery encompasses both immediate and delayed complications. In the early phase, potential issues encompass hematoma, seroma, infections, and necrosis of the nipple. After surgery, delayed complications may manifest as persisting breast tissue, hypertrophic scarring or keloids, sensory numbness, asymmetry, and variations in contour like overcorrection or undercorrection. Notably, patients grappling with moderate to extensive gynecomastia coupled with compromised skin elasticity are more susceptible to encountering contour irregularities, transverse peri-areolar wrinkles, and prolonged discernible scars. As a result, numerous plastic surgeons are actively engaged in devising innovative techniques aimed at effectively addressing severe gynecomastia while minimizing visible scarring. It has been previously reported that complications such as bleeding, bruising, and fluctuations on the surface of the skin are less common in UAL than in CL procedures (12).

This study focused on individuals diagnosed with Rohrich grade II and III gynecomastia. The surgical approach was commenced using ultrasonic liposuction, followed by suction-assisted liposuction. The main goal of this study was to evaluate the effectiveness of the liposuction-only technique in reducing complications and improving cosmetic results.

MATERIALS AND METHODS

Prior to the procedure, each patient underwent a comprehensive physical consultation aimed at delineating the morphological classification of the gland and identifying the optimal surgical strategy. Thorough medical records were procured for all participants, encompassing preoperative laboratory assessments with complete blood counts and coagulation parameters. Furthermore, an endocrinological profile was meticulously conducted to eliminate any underlying hormonal irregularities, culminating in the exclusion of three participants from the study. Moreover, a definitive p hysical consultation and ultrasonography were utilized to observe the glandular structures, and patients were selected as candidates if their breast glands were smaller than 3x3cm. Patients who had a larger breast gland were considered candidates for surgical gland excision. Meanwhile, patients were screened for any potential neoplastic processes, which resulted in the exclusion of one participant from the study.

Patients presenting with Rohrich grade IIA, IIB, and III gynecomastia were systematically assessed with meticulous consideration given to their skin quality (Table 1). The distinction between glandular and adipose tissues was ascertained using the pinch test methodology as outlined by Rohrich et al. (9)

Table 1. Classification of breast hypertrophy and pitosis by Rohrich[14]

Grade*	Classification of breast hypertrophy and ptosis
Grade I	Minimal hypertrophy (< 250 g of breast tissue) without ptosis
I A	Primary glandular
I B	Primary fibrous
Grade II	Moderate hypertrophy (250-500 g of breast tissue) without ptosis
II A	Primary glandular
II B	Primary fibrous
Grade III	Severe hypertrophy (>500 g of breast tissue) with grade I ptosis Glandular or fibrous
Grade IV	Severe hypertrophy (>500 g of breast tissue) with grade II or III ptosis Glandular or fibrous

* 14. Rohrich RJ, Ha R-Y, Kenkel J-M, et al. Classification and management of gynaecomastia: defining the role of ultrasound-assisted liposuction. Plast Reconstr Surg 2003; 111:909-923.

Table 2. Extensive ultrasonic liposuction algorithm for gynecomastia treatment. Suction assisted liposuction + ultrasonic liposuction was used for 46 patients.

Rohrich Grade14	Procedure	Number of Patients
I A	Suction assisted liposuction	
I B	Suction assisted liposuction +/- Ultrasonic liposuction	
II A	Suction assisted liposuction + Ultrasonic liposuction	16
II B	Suction assisted liposuction + Ultrasonic liposuction	18
III	Suction assisted liposuction + Ultrasonic liposuction	12
IV	Gland Excision or Free NAC* or İnferior pedicle method	

* Free NAC

The patients were divided into two groups: conventional liposuction and ultrasonically assisted liposuction (UAL), and randomization was applied to this division.

Approval from the Local Ethics Committee (Number: AU-MB#113) was secured, and patients provided written informed consent through a formal consent form. Following the conclusive elimination of ineligible cases, a total of 46 patients meeting the stipulated criteria underwent surgery with the supervision of the senior author during the period spanning February 2021 and April 2023 (Table 2). Comprehensive photographic documentation was conducted from five distinct angles, and subsequent evaluations occurred on the 7th day, 1st ,6th, 12th months postoperatively.

Surgical Procedure

All patients underwent ultrasonic liposuction without any surgical breast tissue removal under general anesthesia. The chest wall, lateral thoracic wall, and upper abdominal area were marked, shaved, and prepared for infiltration anesthesia. All patients received one dose of an intraoperative intravenous broad-spectrum antibiotic. Tumescent infiltration using 1500 ml ringer lactate, 30 ml lidocaine, and epinephrine (1:1,000,000) per breast was performed using an automatic infiltration device without exceeding the recommended dosages (13).

The average operation duration was 100+/-20 minutes, including the infiltration of the entire solution within 14+/-2 minutes. After complete infiltration of fluid, liposuction was planned through three separate incisions located over the anterior axillary line, lower lateral level of the inframammary fold, and thorax midline (Figure 1). Ultrasonic liposuction was applied for 60+/-10 minutes on the total chest wall, lateral thoracic wall, and upper abdominal areas using a Vaser® device on continuous mode at 100% energy until ensuring total liquidization of the fat and glandular tissue (Video 1). Suction-assisted liposuction was applied to all areas mentioned for homogeneous mobilization, and the equalization of fat liposuction was tested by a skin pinch test. A skin pinch test less than 2 cm was considered adequate (Figure 2) (Video 2).
After completion of liposuction, patients were brought to a 30-degree Trendelenburg position for skin re-draping (Figure 3). Skin was completely elevated from the chest wall and

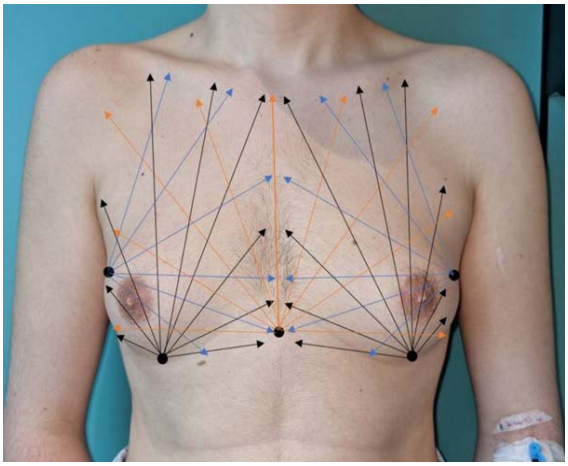

Figure 1. Liposuction incision sites and direction of liposuction. Three separate incision located over the anterior axillary line, lower lateral level of inframammarian fold and thorax midline.

Figure 2. Skin pinch test less than 2 cm was considered adequate.

Video 1. Liquidization of fat and glandular tissue using ultrasonic liposuction

Video 2. Skin pinch test application during the ultrasonic liposuction procedure

Figure 3. After completion of liposuction, patient was brought to 30 degrees Trendelenburg position for skin redraping.

Figure 4. Tensoplast® was applied to the whole chest wall stabilizing the redistributed skin flap

Figure 5. A 27 years old patient with Grade II B gynecomastia who underwent extensive ultrasound assisted liposuction operation. Preoperative images (a, b, c, d, e) and postoperative (f, g, h, i, j) first week images of the patient.

Figure 6. A 34 years old patient with Grade III gynecomastia with a residual breast tissue/ pitosis. Preoperative images (a, b, c) and postoperative 3rd month (d, e, f) images.

redistributed to the desired position, allowing the change of the NAC. Incisions were closed using absorbable sutures. No drains were used after the operation. Tensoplast was applied to the whole chest wall, stabilizing the redistributed skin flap (Figure 4). The gynecomastia corset was dressed over the Tensoplast to ensure hemostasis.

Since the procedure was extensive and there was a lot of tissue damage, one night of hospitalization and postoperative strong analgesia were provided to improve the comfort of the patients.

RESULTS

The patients were separated into two groups, UAL and SALS, with surgical excision (Table 3). Suction aspiration volumes were not evaluated because they vary greatly depending on the body size and body mass index of each patient. In the UAL group, most of the patients (82%) were discharged on the same day. The remaining 8 patients were discharged the day after due to an increase in their comfort and pain control. The chest wall stabilizing Tensoplast bandage was removed on the 7th day of the operation (Figure 5). The remarkable edema on the chest wall persisted for up to one month. On SALS with surgical excision, 22% of the patients were discharged 8 hours after surgery. The remaining patients were discharged the day after.

Extensive ultrasonic liposuction was applied to 46 patients; one had a seroma that needed to be aspirated using a syringe. Three of the patients experienced residual breast tissue/ ptosis (Figure 6). None of the patients requested revision surgery. The

Table 3. Patient characteristics of UAL and SALS with gland excision groups.

Patient characteristics	Patients with UAL only n:46	Patients with surgical excision n:58
Mean Age, years ± SD	40.5 ± 8.3	44.3 ± 9.2
Follow-up Time, months ± SD	25 ± 2.7	24 ± 3.4
Rate of discharge from hospital at first day	82%	22%
Complication rates	8.7%	10.3%

Table 4. Complication and revision comparison of ultrasonic liposuction versus suction assisted liposuction combined with peri areolar mastopexy and glandular excision.

Complication	Patients with UAL only n:46	Patients with surgical excision n:58
Infection	0	0
Large Hematoma	0	1 (Placed Bedside Drain)
Limited Hematoma	1 (Not required)	2 (Not required)
Seroma	1 (Aspiration required)	1 (Aspiration Required)
Contour Irregularities	0	2 (Surgical Correction)
Total Nipple Necrosis	0	0
Partial Nipple Necrosis	0	1 (No intension required)
Saucer-like deformity	0	0
Residual Breast Tissue/ Pitosis	3	1

overall complication rate in our series was found to be 8.7% (Table 4).

Fifty-eight patients in our control group were operated on using suction-assisted liposuction combined with periareolar mastopexy and glandular excision. One had a large unilateral (left) hematoma, which required the placement of a bedside drain. Two had limited hematomas that did not require evacuation. Seroma was aspirated in one patient. One patient required revisions for contour irregularities. Partial nipple necrosis was observed in one patient but healed without surgical intervention. Residual breast tissue/ptosis was observed in one patient. The total complication rate in our control series was found to be 10.3%.

DISCUSSION

Numerous surgical modalities are available, each aiming to attain a masculine chest contour while mitigating visible scarring. The decision-making process for technique selection crucially involves factors like the relative placement of the nipple-areolar complex and the inframammary fold, the surplus of skin, and the glandular-to-adipose tissue ratio. Furthermore, evaluating skin health and the potential for cutaneous ptosis assumes significance, given their sway over the preferred surgical avenue (5). In our utilization of the extensive liposuction approach, our patient selection process encompassed an evaluation of both skin quality and the extent of surplus skin, as detailed in Table 2.

This approach centers on a fundamental principle: the strategic relocation of excess skin from the breast tissue and chest wall, subsequently anchoring it all over the chest wall, and increasing the skin contraction as much as possible. This deliberate placement facilitates a gradual re-draping of the skin over time, capitalizing on the diminishing laxity of the skin. Notably, our observations have indicated that extensive liposuction performed on the area, starting from the clavicle on the superior border, the anterior axillary line, and the abdominal region on the inferior border, contributes to enhanced re-draping of the skin.

This leads to a reduced frequency of contour irregularities as the wound contraction mechanisms are equally distributed throughout the chest wall. Secondly, this approach allowed us to change the position of the NAC without making an incision on the chest wall if there was an evident asymmetry. In this approach, we aim to position the NAC as high as possible to decrease the chance of skin accumulation on the inframammary fold. A crucial aspect of our approach was to minimize the thickness of the skin flap as much as possible, aiming to amplify the potential for secondary skin contracture. We aim to keep the skin flap thickness less than 2 cm on the pinch test.

Another key point of the approach was to change the position of the patient to a 30-degree Trendelenburg position to decrease the effects of gravity. After position changes, the skin flap should be elevated far from the chest wall and pulled to a superior position. Then the elastic adhesive bandages should be placed vertically to ensure the positioning of the skin flaps. After proper bandaging, a corset should be used for 4 weeks. We recommend removing the bandages on day 7 to ensure the safety of the patient by facilitating skin adherence to the underlying fascia. The subsequent techniques in liposuction are classified as standalone or combined approaches for addressing gynecomastia, either in conjunction with glandular excision or as independent methods: syringe liposuction, axillary-incision liposuction, peri-areolar-incision liposuction, sternal-incision liposuction, power-assisted liposuction, ultrasonic liposuction, laser-assisted liposuction, and cross-

chest liposuction (14-18).

Instead of making an incision under the NAC, we utilized three different entry points to achieve better homogenization of the fat tissues. Incisions made on the NAC may cause tissue damage, which might deform this area and cause burn damage if a laser device is utilized. The use of ultrasound-assisted liposuction helped us to tunnelize and preserve vascular structures while being able to harvest all the fat accumulations under the superficial fascia of the chest wall. In addition, ultrasound-assisted liposuction provides effective disintegration of breast tissues. In this way, tissues that cannot be removed with standard liposuction can be removed from the area. In addressing cases of high-grade gynecomastia marked by ptosis and superfluous skin, several methods have been employed, including reduction mammoplasty coupled with the free transplantation of the nipple-areolar complex (NAC), as well as modified breast-reduction techniques utilizing I- or T-shaped patterns. Another approach involves subcutaneous mastectomy with skin reduction, executed through concentric skin excisions such as the 'Benelli type', 'inverted T', or lateral wedge resection, as described in the literature (19).

It is noteworthy that these methods have demonstrated a tendency to produce less-than-ideal outcomes, characterized by the persistence of residual scars and deformities in the nipple region, as documented in relevant literature instances (16, 20). Using liposuction only prevents the inverted nipple deformity and possible NAC necrosis, as we observed none in our series. A comprehensive review of existing literature underscores that breast amputation complemented by a free nipple graft or the application of the wise model breast reduction technique stands out as a superior choice in situations marked by significant skin redundancy and notable ptosis (8, 21, 22). Nevertheless, it is crucial to recognize that these techniques proficiently tackle the pertinent issue. They may concurrently lead to the emergence of noticeable, sizeable scars on the chest. For instance, instances of employing an elongated, horizontal incision to facilitate total mastectomy and free NAC transplantation revealed an approximate 33% incidence of hypertrophic scarring (19). Our approach allowed us to prevent any scarring around the NAC and minimize the chance of keloid formation. Also, patients are observed to heal within 2 weeks with minimal swelling, which resolves in 4 months in total. Zocchi et al. have delineated ultrasound-assisted liposuction (UAL) as a valuable approach for gynecomastia treatment (23). Building upon this foundation, researchers like Rohrich et al. and Gingrass et al. have delved into these applications, broadening the understanding of their utility (24,25).

Comparatively, ultrasonic liposuction offers several advantages over standard aspiration-assisted liposuction in the context of gynecomastia treatment. Ultrasonic liposuction is sensitive to fatty tissue, it contracts the skin more and causes less damage to the tissues compared to conventional liposuction (26). It exhibits the capability to effectively extract substantial adipose tissues within the fibrous parenchymal framework of the male breast, resulting in minimized bruising. Moreover, it alleviates the physical demands placed on surgeons during high-volume procedures. Beyond these benefits, ultrasonic liposuction empowers surgeons to achieve more comprehensive contouring of the outcomes, leading to enhanced results (27). Ultrasonic liposuction stands out for its capacity to effectively refine the contours of the treatment area and disrupt inframammary wrinkles, given proper shaping (19). An additional advantageous outcome can arise from the stimulation of skin contractility (23). particularly valuable in addressing excessive skin in advanced instances of gynecomastia. This technique has found application as a standalone approach in patients with pseudo-gynecomastia devoid of glandular enlargement or associated indicators. However, it is noteworthy that while it can address the skin redundancy concern, it might not always yield optimal recovery outcomes (28).

The limitations of this study included a small patient sample size and a relatively short follow-up period. Despite high patient satisfaction, international patient satisfaction scoring was not utilized. This method is effective for patients with glandular tissue smaller than 3 x 3 cm. However, surgical excision should be considered if larger breast glandular tissue is detected on ultrasonography. We strongly recommend employing extensive liposuction to mitigate or enhance potential contour issues, surgical adjunctive methods such as inframammary fold (IMF) elimination, equalization liposuction, 3-point cross liposuction, and superficial liposuction, which encourage skin contraction through ultrasonic means, coupled with prudent usage of compression corsets. While promising outcomes have been documented, a comprehensive investigation of this approach within larger patient cohorts is warranted to further substantiate its efficacy.

CONCLUSION

Extensive ultrasonic liposuction provides a homogeneous spread of the excess skin and greatly reduces or eliminates the amount of skin fold formation. This approach reduces the need for possible skin excision, thus reducing the visible scars. Using the basic principles of plastic surgery, such as utilizing primary and secondary contractures like a skin graft and distributing the wound healing mechanisms to a broad surface, gave us the precision to achieve better cosmetics without forming a noticeable scar on the chest wall.

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