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Refinement Techniques for Male Chest Definition Using Ultrasound-Assisted Liposuction: A 4-Year-Experience

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Abstract

Background: This study investigates the aesthetic outcomes and safety of ultrasound-assisted liposuction (UAL) in male chest definition for gynecomastia. Recognizing the importance of patient satisfaction and safety, the research explores the integration of UAL with a systematic zoning strategy based on gynecomastia severity.

Objectives: The primary aim is to assess aesthetic outcomes post-surgery, with specific objectives focused on gynecomastia severity classification, pre-and post-operative asymmetry, chest anthropometry changes, surgical procedures, complications, and patient satisfaction.

Patients and Methods: A cohort of 42 male participants underwent UAL for gynecomastia, with demographic data, severity classification, and chronic illness recorded. Pre- and post-operative asymmetry, chest anthropometry, surgical procedures, complications, and patient satisfaction were meticulously evaluated.

Results: Demographically, the cohort exhibited a mean age of 33.25 years and a BMI of 27.95. Gynecomastia severity varied, with 9.5% fatty, 19% glandular, and 71% mixed breast density. Significant differences were observed in pre-and post-operative asymmetry, chest circumference, and areolar diameter. Surgical procedures, including fat aspirated volume and duration, aligned with established practices. Complications were infrequent, with a 59.5% patient satisfaction rate.

Conclusion: The integration of UAL with a systematic zoning strategy demonstrates favorable aesthetic outcomes and safety in male chest definition for gynecomastia. The study supports the continued exploration of UAL in refining gynecomastia procedures, with the need for larger-scale investigations.

Key Words: *Gynecomastia – Ultrasound-Assisted Liposuction – Male Chest Definition – Aesthetic Outcomes – Patient Satisfaction.*

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Ethical Committee: This study has been approved by the Departmental Ethical Committee of both the Faculty of Medicine, Zagazig University and Saudi German Hospital, Riyadh.

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Introduction

The importance of defining the male chest extends beyond cosmetic concerns, encompassing both physical and psychological aspects. A well-defined chest wall contributes to a masculine aesthetic appearance, influencing self-perception, confidence and fostering improved mental well-being **[1]**.

Thus, exploring techniques for precise chest wall definition in conditions like gynecomastia, becomes pivotal in addressing not only aesthetic desires but also holistic health and self-esteem **[2]**.

Liposuction, an essential element in male chest definition, strategically targets excess fat deposits to sculpt and contour specific regions, including the pectoralis, subpectoral areas, and surrounding regions. This precise approach aims to create a harmonious chest contour by selectively removing adipose tissue, contributing to a more sculpted and masculine appearance. By focusing on these defined areas, liposuction plays a crucial role not only in addressing aesthetic concerns but also in enhancing overall body proportionality. This is quite important in conditions like gynecomastia, where excess fat or glandular tissue may disrupt the natural contours of the male chest **[3,4]**.

The Ultrasound-assisted liposuction (UAL) procedure goes beyond merely achieving aesthetic goals. This transformative impact is rooted in the precision facilitated by ultrasound technology, ensuring a smoother and targeted removal of both fatty tissue and glandular components. This nuanced approach aligns with patients' desires for compre-

hensive improvements, fostering a deeper sense of satisfaction and confidence in individuals undergoing male chest definition procedures **[5,6]**.

UAL holds particular significance in male chest wall definition, especially in gynecomastia cases, due to its enhanced precision and effectiveness. In contrast to traditional liposuction methods, UAL employs ultrasound technology to liquefy and emulsify fat, making it easier to extract. This method allows for a more targeted and thorough removal of both fatty tissue and glandular components, facilitating smoother and more precise contouring, reducing the risk of irregularities and optimizing aesthetic outcomes **[7,8]**.

The aim of this study to assess aesthetic outcomes and patient satisfaction following a refined surgical approach for male chest definition in gynecomastia. Specifically, it investigates the effectiveness of combining UAL with a structured approach based on the six-zones principle, evaluating the impact on chest contour, symmetry, and patient-reported satisfaction. This refined approach is expected to be more effective due to its precision in targeting both fat and glandular tissue. This novel combination aims to optimize outcomes, minimize irregularities, and enhance patient satisfaction, contributing valuable insights to male chest definition procedures.

Patients and Methods

Patients:

This is a retrospective cohort study including 42 patients with varying degrees of gynecomastia, categorized by severity and type, ensuring a diverse representation of cases. The duration of the study was between November 2019 and November 2023. The departmental ethical committee of both the Faculty of Medicine, Zagazig University and Saudi German Hospital, Riyadh was obtained. The Declaration of Helsinki principles were followed during the conduction of this study. Informed consent, acknowledging the nature of the procedure, potential risks, and benefits were obtained from all patients. This study has excluded patients with gynecomastia secondary to medical causes. Hormonal assessments to identify hormonal imbalances contributing to gynecomastia.

Patients were subjected to an assessment of medical history to identify any underlying health conditions or factors influencing gynecomastia, ensuring a holistic understanding of each patient's situation, Comprehensive preoperative assessment of the patient's chest wall, gynecomastia type, grade and severity by both clinical examination and ultrasound evaluation.

Surgical technique:

Patient marking was done in the standing position. Six zones were marked to help in managing the depth and volume of aspiration required to sculpt the contour as planned in Fig. (1). All procedures were performed under general anesthesia in the supine position with the arms at 90 degrees of abduction. Ultra-short 3-4mm stab incision, one for each side, were placed in the skin fold identified by the junction of the anterior axillary line with the arms. Another incision was placed in the lower border of each areola. The tumescent solution (1 liter of saline + 1 cc of adrenaline 1:1000 + 20 cc lignocaine 1%) was infiltrated in the deep and superficial layers. The ultrasound Probe (Two ring 5 mm probe) was used to emulsify the fat and break through the fibro-glandular tissue, using a 60-70% energy setting. The lateral border of the pectoralis was defined by applying the ultrasound probe superficially.

Using 3 and 4-mm manual or power-assisted liposuction cannulas were used. Systematic contouring and sculpting of the chest to achieve the desired aesthetic outcome according to zones ensuring natural-looking contours was done, where in zone 1 there was no liposuction performed aiming to emphasize the shape and contour of pectoralis anteriorly. Zone 2 was considered a transitional zone, where judicial liposuction was performed. Zone 3, Retroareoral, deep liposuction combined with surgical removal of the remaining glandular tissue by sharp dissection and pulling out, using super-cut scissors. Zone 4, below and lateral to the pectoralis, and zone 5 represents the fat compartment in the lateral chest wall between the inferolateral border of the pectoralis and serratus anterior muscles. Both zones (4 and 5) were extensively aspirated, aiming for a high definition of the chest contour. The medial border of the pectoralis was defined by deep liposuction of zone 6, lying between both sides. Hemostasis was ensured and closure with fine absorbable sutures was done. Fig. (2).

Postoperative care:

Standard care was delivered, including wearing compression garment and follow-up assessment with support, managing any discomfort or swelling, and to monitor recovery, and addressing any concerns promptly. Patients underwent a minimum 6-month follow-up.

Health-Related Quality of Life (HRQOL) assessment using a paper-based Short Form 36 Health Survey (SF-36) in a Structured Questionnaire tool, Preoperative Baseline Assessment and Postoperative Follow-up Assessments were collected. An adjusted Arabic language version was used.

Statistical analysis:

Statistical analysis of collected data variables was done using IBM SPSS statistics for windows, Version 23.0. Armonk, NY: IBM Corp. Both qual-

itative and quantitative data were characterized by percentages & counts. Minimum & maximum values, as well as the mean, SD, & median, were used to describe the quantitative data. There was a two-tailed test for significance in all of the statistical comparisons. Significant differences are shown by a level of p-value ≤0.05, highly significant differences are indicated by a p-value <0.001, & non-significant differences are denoted by a p-value >0.05. Independent t-test, Pearson correlation coefficient, & Chi-square (X^2) test of significance were the tests that were utilized.

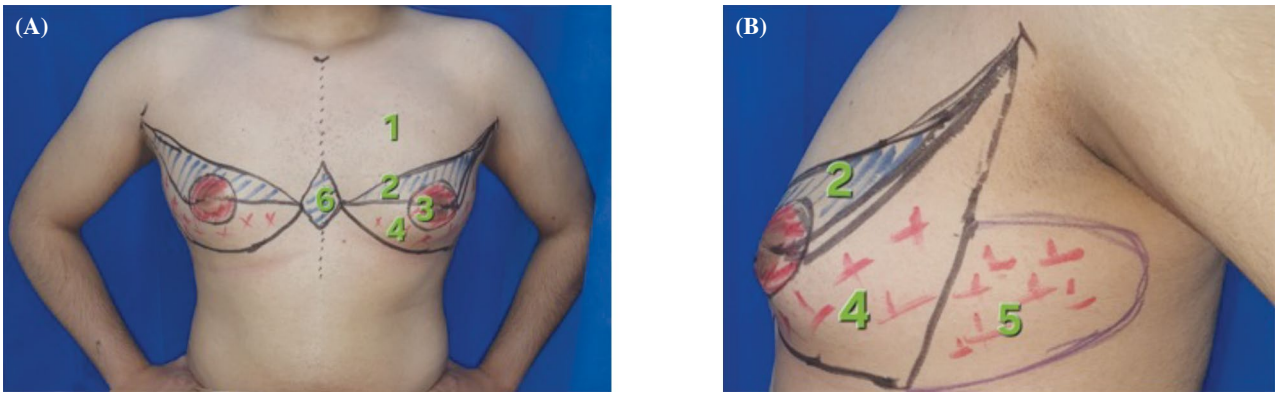

Fig. (1): Preoperative marking in the standing position, frontal (A) and lateral (B) views. The six zones distinct markings are shown: Zone 1 above the line from axilla to xiphisternum. Zone 2 Below this line down to the areola. Zone 3 Retroareoral area. Zone 4 below and lateral to the pectoralis down to the inframammary fold. Zone 5 Lateral chest area anterior to the latissimus border. Zone 6 above the sternum between the two breasts.

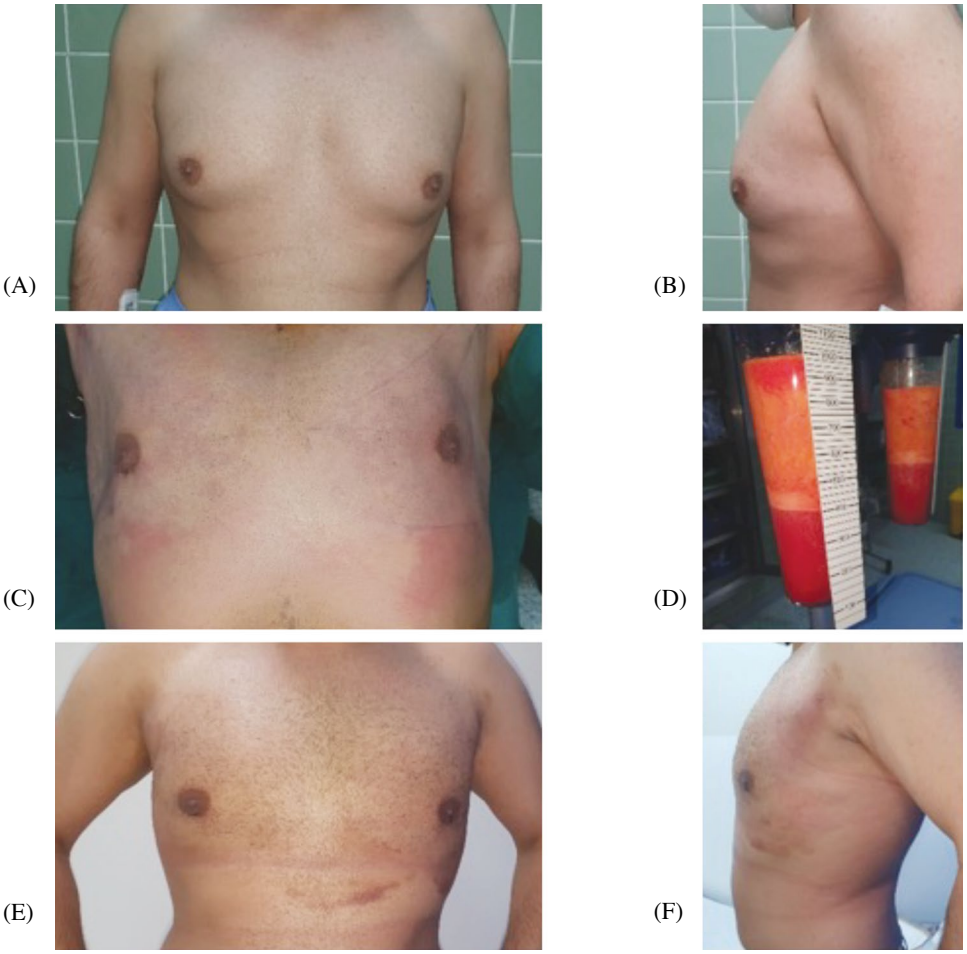

Fig. (2): Preoperative Frontal view (A) Showing, bilateral grade II gynecomastia (mixed type) with observed mild asymmetry. The lateral view (B) Highlights protrusion adipose distribution along the pectoralis major and serratus muscles. Intraoperative (C,D): Male chest definition procedure, supine position, showing the volume and quality of lipoaspirate and gland excision. The lipoaspirate container, visibly positioned in the surgical field, indicates a consistent and homogenous aspirate volume of around 600 ml of pure fat on each side. Postoperative: Frontal view (E) Showing a reduction in chest volume with improved symmetry, resulting in a well-defined contour. In the lateral view (F), The chest contour exhibits a more sculpted appearance, with a marked reduction in lateral protrusion contributing to enhanced symmetry.

Results

The demographic profile of the studied group (n=42) revealed a mean age of 33.26 years (SD ± 7.76), a mean weight of 81.33 kg (SD ± 8.41), a mean height of 170.66 cm (SD ± 4.63), and a mean BMI of 27.95 (SD ± 2.99). Table (1).

The classification and grades of gynecomastia indicated that 9.5% had a fatty breast density, 19% had glandular, and 71% had mixed density. Severity grades were distributed as follows: 4.8% mild, 47.6% moderate, and 47.6% severe. Chronic illnesses included 4.8% with hypertension, 2.4% with DM2, and 92.8% without any chronic illnesses. Table (2).

The pre-operative and post-operative distribution of asymmetry showed a statistically significant difference ($p \leq 0.001$). Pre-operatively, 35.7% presented asymmetry, which was corrected in 23.8% post-operatively. Residual asymmetry was observed in 4.8%, and 71.4% had no asymmetry. Table (3).

Surgical procedures involved a mean total fat aspirated volume of 1028.8 cc (SD ± 349.4), and a mean procedure duration of 95 mins (SD ± 17.6), with gland excision performed in 88% of cases.

Complications were infrequent in the form of 3 cases experiencing seroma treated with repeated aspiration, 1 hematoma evacuated under local anesthesia and 1 partial necrosis of the central nipple only that managed conservatively and eventually resulted in supple pigmented scar. Table (4).

Chest measurements among the studied group demonstrated a statistically significant reduction in pre-op and post-op chest circumference ($p=0.005$) Figs. (3-8). The mean pre-op chest circumference was 104.97cm (SD ± 10.08), post-op was 99.21cm (SD ± 8.16), and the reduction was 5.76cm (SD ± 2.38). The areolar diameter also showed a highly significant improvement ($p \leq 0.001$), with a mean pre-op diameter of 33.19 mm (SD ± 4.89), post-op diameter of 27.9 mm (SD ± 3.1), and an improvement of 5.28mm (SD ± 2.32). Table (5).

Patients' satisfaction levels were high with 59.5% significantly positive and 35.7% somewhat positive while only 4.8% reported no significant change. Fig. (9).

In summary, the refined surgical approach demonstrated favorable outcomes in terms of chest anthropometry, asymmetry correction, and patient satisfaction, with minimal complications observed.

Table (1): Demographic data among the studied group.

Characteristics	Studied Group (No. 42)
Age (years)	Mean ± SD: 33.26±7.76
Weight (Kg)	Mean ± SD: 81.33±8.41
Height (cm)	Mean ± SD: 170.66±4.63
BMI	Mean ± SD: 27.95±2.99

Table (2): Classification and grades of gynecomastia.

Characteristics	Studied Group (No. 42)
Type of Breast Density	Fatty: 4 (9.5%) Glandular: 8 (19%) Mixed: 30 (71%)
Severity Grade	Mild: 2 (4.8%) Moderate: 20 (47.6%) Severe: 20 (47.6%)
Chronic Illness	Hypertension: 2 (4.8%) DM2: 1 (2.4%) Absent: 39 (92.8%)

Table (3): Distribution of asymmetry pre-post operative.

Characteristics	Studied Group (No. 42)	*p*-value
Asymmetry pre-operative	Present: 15 (35.7%) Absent: 27 (64.3%)	≤0.001
Asymmetry post-operative	Corrected: 10 (23.8%) Residual asymmetry: 2 (4.8%) No asymmetry: 30 (71.4%)	

p-value <0.05 was statistically significant.

Table (4): Surgical procedure among the studied group.

Characteristics	Studied Group (No. 42)
Total Fat Aspirated Volume (cc)	Mean ± SD: 1028.8±349.4
Procedure Duration (mins)	Mean ± SD: 95±17.6
Gland Excision	Yes: 37 (88%) No: 5 (12%)

Table (5): Breast measurements among the studied group.

Characteristics	Studied Group (No. 42)	*p*-value
Pre-op Chest Circumference (cm)	Mean ± SD: 104.97±10.08	0.005
Post-op Chest Circumference (cm)	Mean ± SD: 99.21±8.16	
Chest Circumference Reduction (cm)	Mean ± SD: 5.76±2.38	
Areolar Diameter Pre-op (mm)	Mean ± SD: 33.19±4.89	≤0.001
Areolar Diameter Post-op (mm)	Mean ± SD: 27.9±3.1	
Areolar Diameter Improvement (mm)	Mean ± SD: 5.28±2.32	

p-value <0.05 was statistically significant.

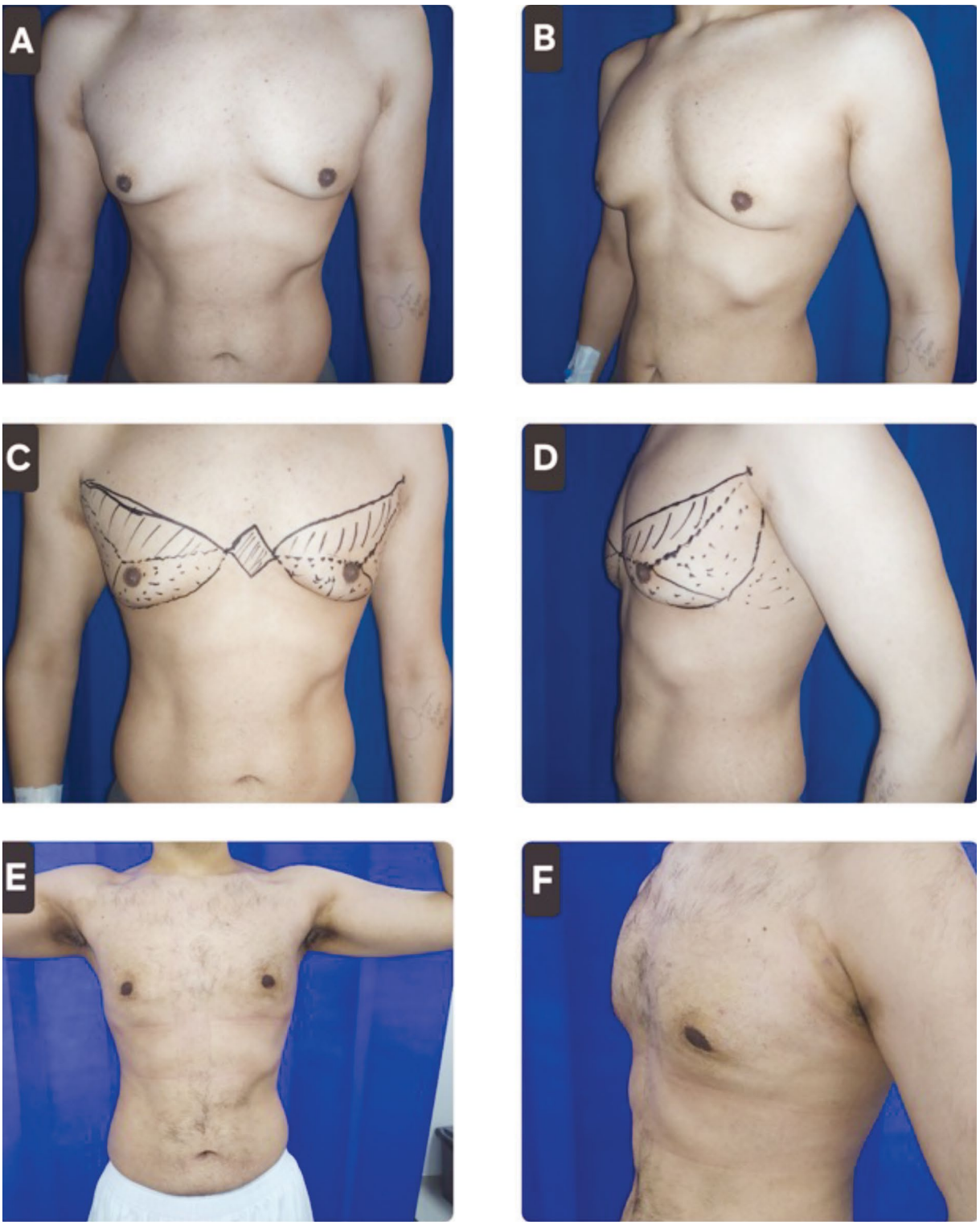

Fig. (3): Preoperative (A,B), Marking (C,D) and Postoperative (E,F) views of grade II gynecomastia, with subtle asymmetry. Chest contour and nipple positions are notably corrected.

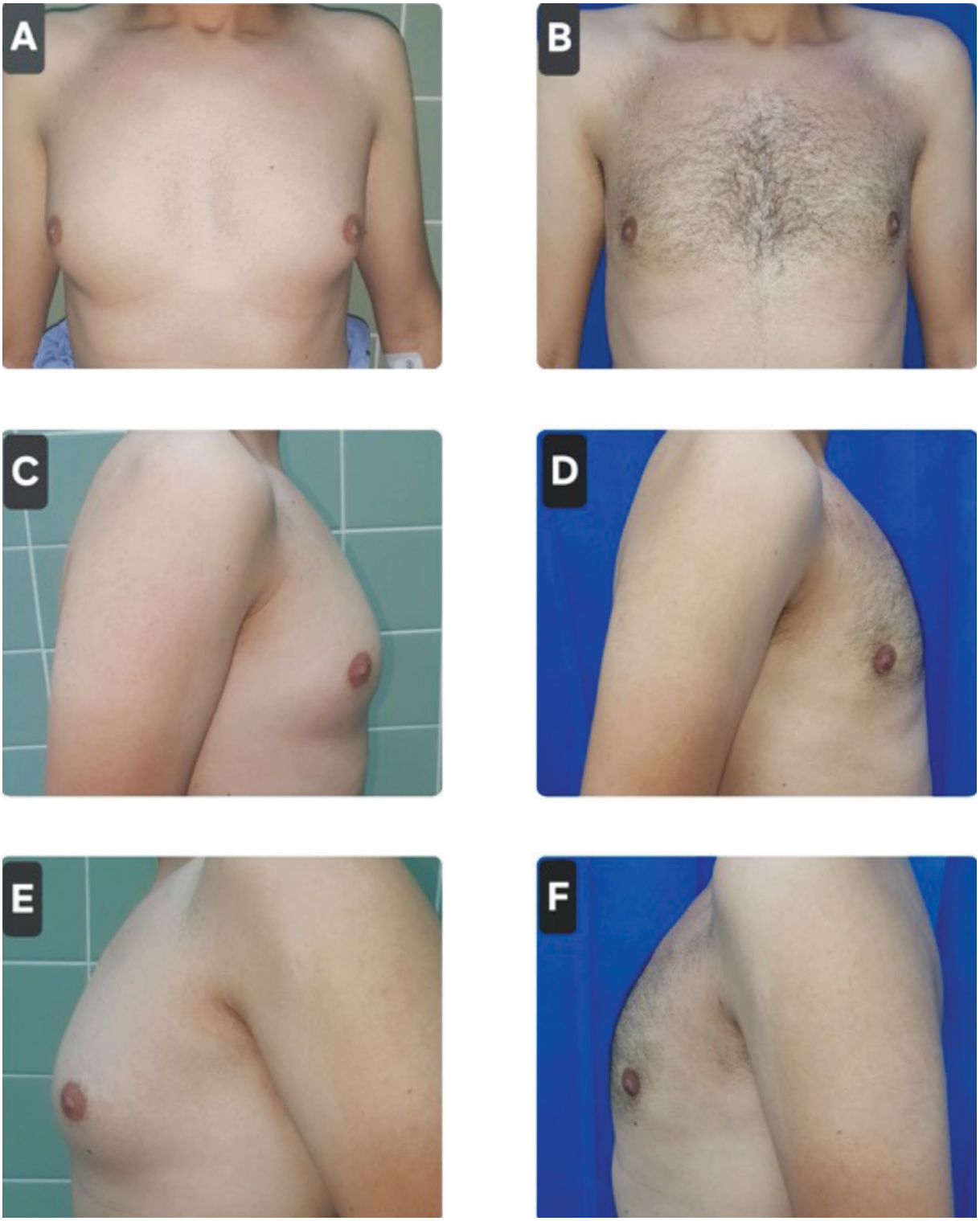

Fig. (4): Grade II gynecomastia with moderate enlargement of breast tissue. Frontal and, lateral views show remarkable deformity and contour correction.

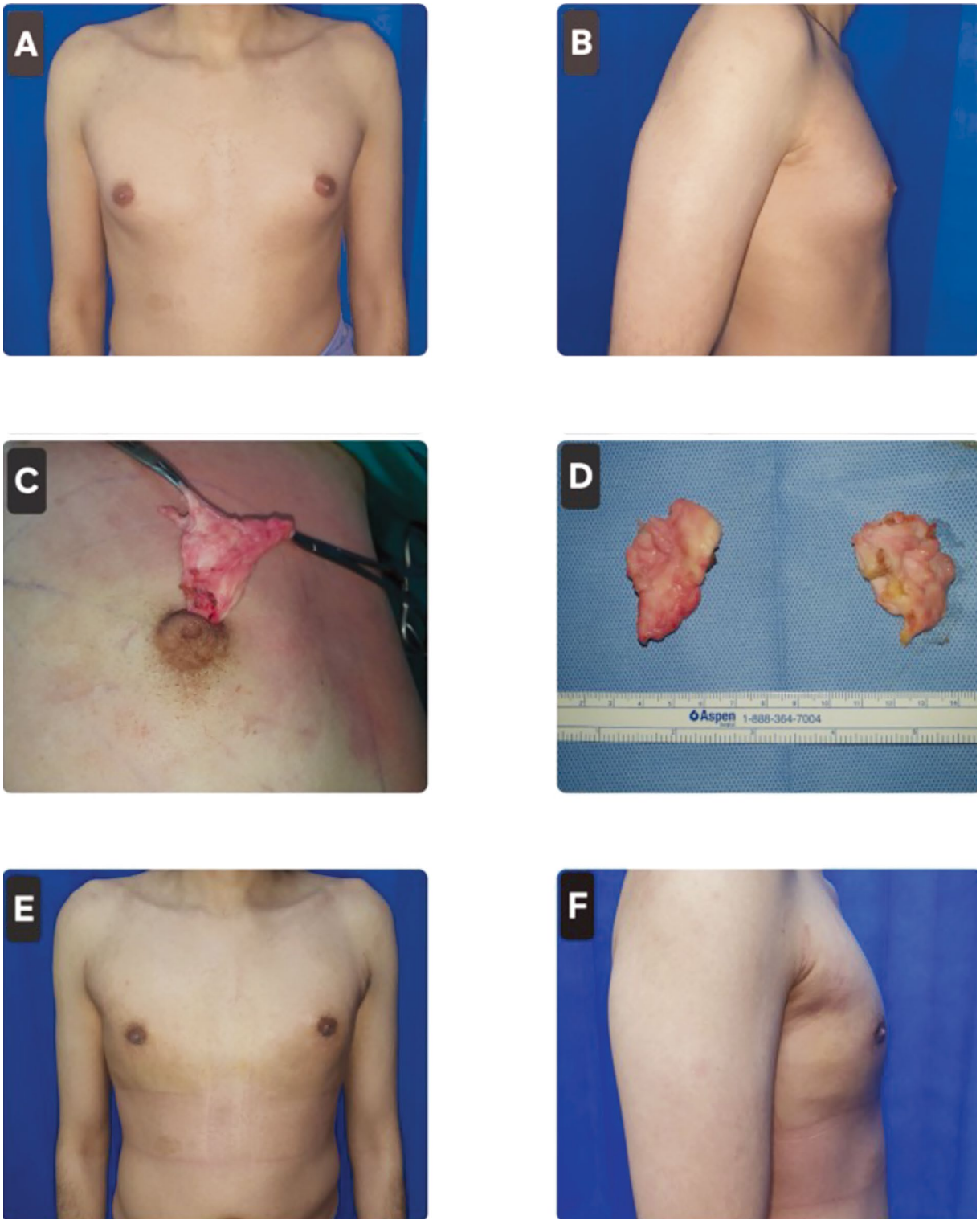

Fig. (5): (A,B) Comprehensive views capturing glandular type gynecomastia. (C,D) intraoperative view showing the glandular tissue extracted through small areolar opening. (E,F) Postoperative chest contour enhancement.

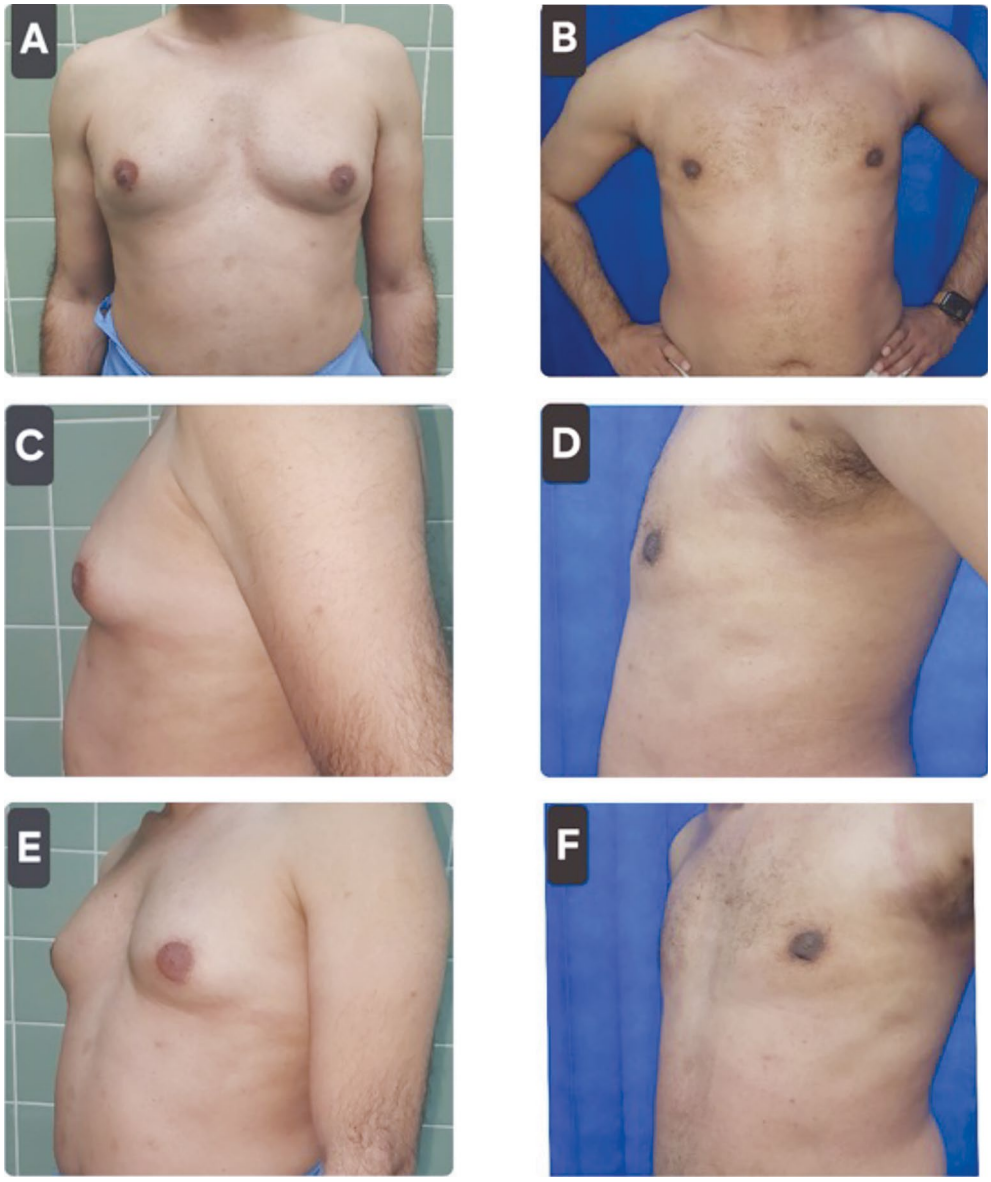

Fig. (6): Improved chest wall contour and appearance postoperative by combined excision and liposuction of grade III gynecomastia. Areolar diameter and position show significant improvement.

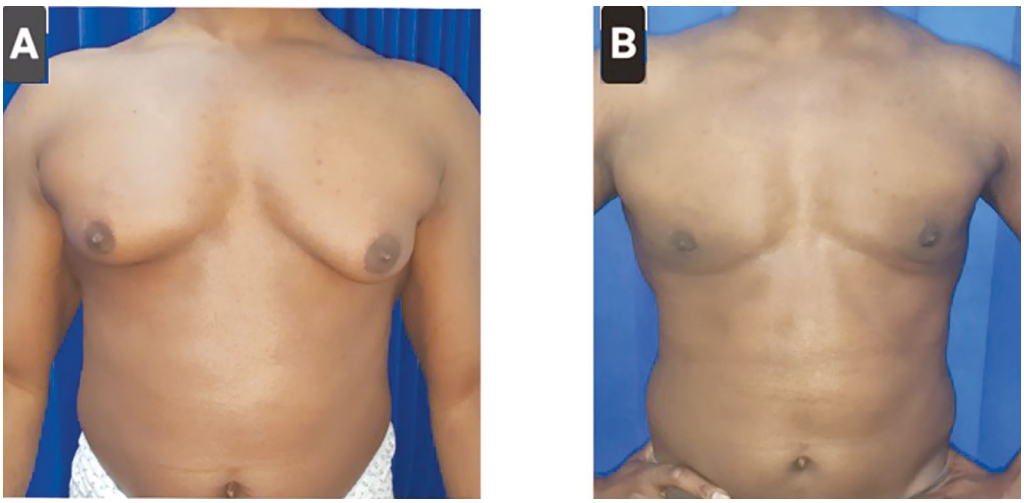

Fig. (7)

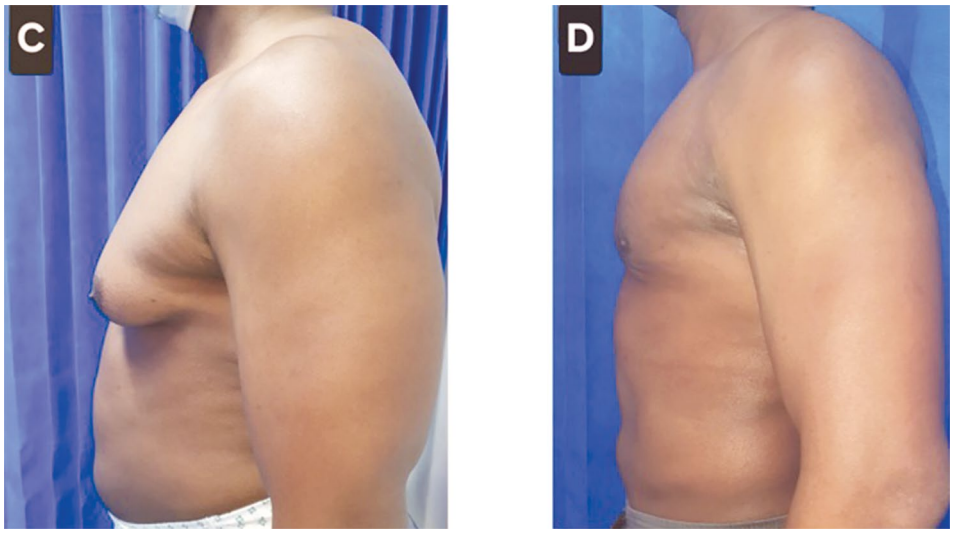

Fig. (7): An excellent outcome post comprehensive liposuction for grade III gynecomastia in athletic person with obvious asymmetry and different nipple size and position. Notice the postoperative skin contraction.

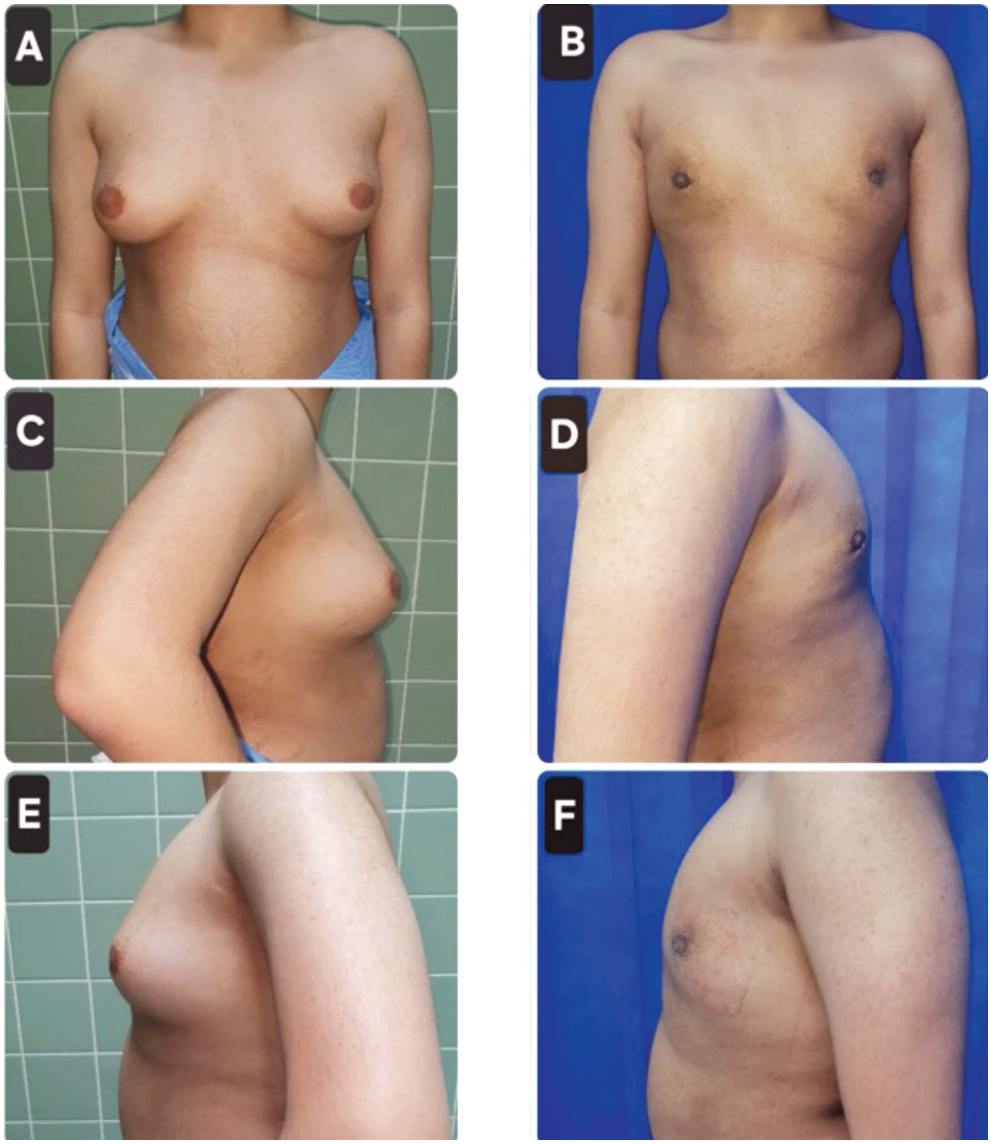

Fig. (8): A severe form of grade III mixed gynecomastia with minor residual asymmetry. Overall good contour was achieved.

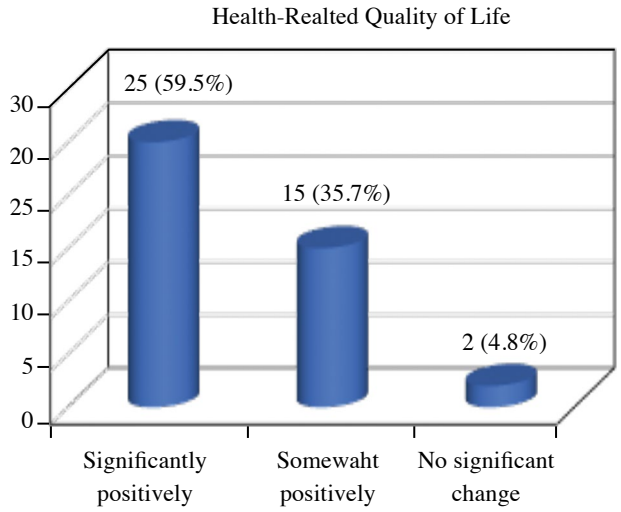

Fig. (9): Patient Satisfaction among the Studied Group.

Discussion

The demographic characteristics of our study cohort showed a mean age of 33.25 years and a BMI of 27.95 **[9-11]**. Our study identified a distribution of 9.5% fatty, 19% glandular, and 71% mixed breast density. Our results were consistent with similar studies, showing patients with all grades of gynecomastia represented. The specific distribution is as follows: 23 (30.6%) with grade I, 27 (36 %) with grade II, 17 (22.6%) with grade III, and 8 (10.6%) with grade IV **[10,12,13]**. The concordance of these results suggests that our cohort represents a diverse range of gynecomastia presentations, allowing for a comprehensive evaluation of the ultrasound-assisted liposuction (UAL) technique.

Comparing pre- and post-operative asymmetry, our findings of a highly statistically significant difference align with the outcomes reported by Abdelrahman I et al. **[14]**. The consistency in these results underscores the effectiveness of UAL in addressing asymmetry, a common concern in gynecomastia cases.

A noteworthy aspect of our study is the assessment of chest anthropometry, with statistically significant differences observed in pre-and post-operative chest circumference and areolar diameter. These findings resonate with studies by Yoo KH et al., **[15]** and Shaaban EH et al. **[16]**, highlighting the impact of UAL on both chest contour and areolar dimensions.

Regarding surgical procedures, our study's mean total fat aspirated volume of 1028.8 cc and procedure duration of 95 minutes are consistent with the findings of Maher S et al. **[17]**, Hasanyn MA et al. **[18]**, and Xia ZN et al. **[19]**. These results suggest that our refined surgical approach aligns with established practices, contributing to the procedural standardization in UAL for male chest definition.

Complications were infrequent in our study, with rates comparable to those reported by Xia ZN et al. **[19]**, Harinatha S. et al. **[20]**, and Caridi RC. **[21]**. This reaffirms the safety profile of UAL in gynecomastia procedures and emphasizes the importance of meticulous surgical techniques.

Patient satisfaction outcomes, with 59.5% reporting significantly positive changes, are consistent with the high satisfaction rates reported by Hoyos et al. **[4]**. This underscores the positive impact of UAL on patient-reported aesthetic outcomes and overall contentment.

In this study, in the pursuit of refining male chest high-definition images, the ultrasound probe was meticulously used to delineate the chest wall with enhanced precision in contouring anatomical lines. This is because it precisely identifies subcutaneous fat layers and delineates the underlying chest musculature.

We have also adopted a meticulous systematic zoning strategy, as delineated by clinical studies on gynecomastia treatment that has guided the strategic allocation of attention to specific anatomical regions. Sculpting not only the anterior chest but also addressing the lateral chest wall allows for targeted and nuanced liposuction in areas characterized by varying degrees of fibrous and adipose tissue by modifying the 5 zone concept of Tahseen H et al., **[22]**. In other words, our comprehensive understanding of the unique topography of each zone enabled a customized and harmonious contouring of the chest.

We have focused on strategically addressing the fat compartment between the pectoralis major and serratus muscles, aiming to provide a three-dimensional sculpting effect. This targeted intervention seeks to enhance lateral chest wall definition, contributing to a more sculpted and aesthetically pleasing result. The significance of addressing the lateral chest wall fat compartment is underscored by the anatomical considerations highlighted in studies such as that by Tahseen H et al., **[22]**. Qadeer A et. Al., **[23]**.

The fat distribution between the pectoralis major and serratus muscles can substantially impact the overall chest contour. Tahseen's work emphasizes the effectiveness of ultrasonic liposuction in precisely sculpting these intricate areas, aligning with the principles of our approach. Moreover, the lateral chest wall is a critical zone for achieving a harmonious transition between the chest and flank. This is supported by studies emphasizing the importance of a multiplanar approach in male chest definition procedures **[6,22]**.

In mixed type 3 patients, the approach has prioritized the achievement of a natural and aesthetically pleasing outcome. A key facet of our technique

involves the complete excision of glandular tissue coupled with a diffuse and wide lipo-sculpting strategy. This approach aligns with the principles elucidated by several studies emphasizing the significance of thorough glandular removal for effective gynecomastia treatment. Our technique incorporates a sound delicate awareness for preserving the blood supply to the nipple/areola complex **[4]**.

Preserving the blood supply to the nipple/areola complex is a critical aspect of our surgical strategy, aimed at preventing complications such as dish deformity or sunken areola. This approach emphasized the importance of preserving vascularity to prevent undesirable postoperative outcomes. By allowing the nipple/areola complex to derive its blood supply widely from the skin, we mitigate the risk of ischemic complications and contribute to a more natural postoperative appearance when compared to glandular excision with conservative localized liposuction **[24]**.

Conclusion:

Our study contributes valuable insights into the refined liposuction zone's approach in utilizing UAL for gynecomastia correction. While acknowledging the limitations of our single-center non-interventional study and the need for larger-scale investigations, our results align with existing literature, supporting the continued exploration of UAL in refining male chest definition procedures. However, an interventional clinical trial is needed to compare the results and outcomes to the traditional liposuction techniques. This encourages future research endeavors. Additionally, studies exploring the economic impact and virtual follow-up assessments could enhance the breadth of knowledge in this evolving field.

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