Management of Gynecomastia by High Definition Liposuction: Prepectoral Fat Liposuction vs Sparing, A Comparative Study

AHMED M. HEGAZY, M.D.*; MOHAMMED FAROUK, M.D.** and ATEF A. ALLAM, M.D.*
The Department of Plastic & Reconstructive Surgery, Faculty of Medicine, Tanta University, Tanta* and Bani Swaif University**, Egypt

ABSTRACT

Background: An athletic chest with a well developed pectoralis major muscle is one of the most appealing features in a beautiful male form. Gynecomastia and fat accumulation due to obesity are the most common causes that cosmetically downgrade the male chest area.

Material and Methods: This is a prospective randomized clinical study that took place in the period between 2014 to 2017 on 50 healthy males suffering from mild to moderate gynecomastia. The study compared the outcomes gynecomastia and chest area management by high definition liposuction with prepectoral fat liposuction vs. sparing prepectoralfat. There was no major complications in this study. All patients had good satisfaction rates and there was a substantial agreement between patients and authors regarding assessment of results according to Kappa statistical analysis (K=0.732).

Conclusion: The authors concluded that high definition liposuction including removal of prepectoral fat is better for gynecomastia patients with strong, sizable pectoralis major muscle as well as flat athletic abdomen as it show more of the beauty of the developed pectoralis major but worsen the shape of the chest (flatchest) in patients with weak pectoralis major and/or belly abdomen.

Recommendation: Sparing prepectoral fat is recommended in case of patients with weak and poorly developed pectoralis major muscle and/or belly abdomen while it will give persons with sizable pectoralis major a ballooned look (relatively exaggerated size of pectoral area).

INTRODUCTION

One of the most appealing characteristics of appealing male body is a well defined pectoral area, gynecomastia and fat accumulation due to obesity are the most common causes that cosmetically downgrade the male chest [1,2]. By definition gynecomastia is a benign enlargement of male breast tissue [3] that can be broadly classified into pseudogynecomastia and true gynecomastia. Aromatization of androgen into oestrogen in obese men can lead to an added element of glandular hyperplasia [4-6].

Relevant anatomical, pathological and aesthetic considerations:

Pectoralis Major muscle [7-9]: This muscle forms the bulk of male chest. Its tendon is (U) shaped in its cut section. The fibers of the lower sternocostal origin and those of the abdominal origin roll deeper to fibers from upper sternocostal origin to insert in the deep part of the tendon of the muscle thus the muscle is more bulky in its lower part Fig. (1).

The Nipple Areola Complex (NAC) in males lies at the 5th costal cartilage connected to pectoral fascia by the breast septum (Wuringer septum) making (NAC) follow the lower part of the muscle as arm moves [10]. The (NAC) lies higher to lower pectoral edge midpoint usually at the most projecting part of the muscle. The NAC tend to shift to lower position as the upper parts of muscle hypertrophy and also shift forwards as the lower part of the muscle hypertrophy eventually the NAC will look downward rather than forward when all muscle parts are massive enough Figs. (2-4) [11-13].

There are negative spaces that form the aesthetic subunits on athletic male chest. These include Fig. (5) [1,9]:

• Interpectoral rhomboid.
• Inferior pectoral triangle.
• The pectoralis-latissimus triangle.
• The subclavicular triangle.

• The pectoralis line: It separates male chest from abdomen aesthetically. It overlies the fifth rib and costal cartilage at the level of the lower edge of pectoralis major i.e level of the sixth costal cartilage. As gynaecomastia progress the junction between chest and abdomen becomes angular rather than horizontal giving the (sad pectoral appearance) also breast start to develop an infra-
mammary fold and upper breast border which goes down and up respectively as gynaecomastia worsen i.e. gradually develop a breast foot print as female breast Fig. (6) [1,14].

Aim of the work:

The aim of this work is to detect and confirm the aesthetic units in male chest that need to be managed by High Definition Liposuction (HDL) along with management of mild to moderate degrees of gynecomastia by comparing prepectoral fat liposuction versus prepectoral fat sparing.

PATIENTS AND METHODS

This study included 50 healthy adult male patients asking for aesthetic enhancement of the pectoral area and to correct gynecomastia. The whole study took the period between January 2014 to January 2017.

The patients chosen for the study were free from general diseases. Age was no issue as long as the general condition of the patient permit such surgery. Local examination included assessment of the pectoral region for muscular development, anomalies, degree of gynecomastia (Simon's grades I & II were chosen) [15] and presence of breast masses as well as axillae for pathology. All males with advanced gynecomastia (Simon's grade III) [15], those with pathological gynecomastia and previous surgery in the chest area were excluded. Full clinical history taking and clinical examination of the patients to exclude patients of pathological gynecomastia, to spot, record drug induced gynecomastia as well as chest bony cage and muscles. All patients had no abnormality regarding pre-operative laboratory investigations (CBC, BT, APTT, Random blood sugar) and breast ultrasound. All patients signed an informed consent including scientific photography.

Patients were randomly allocated to management of gynecomastia with chest liposuction with Prepectoral Fat Liposuction (PFL) or with Prepectoral Fat Sparing (PFS).

Patients' abnormal breast tissues were marked also midline and pectoral line and inferior edge of the muscle along to its tendon Fig. (7).

Patients were positioned supine and surgical draping was done allowing arms motion. The desired areas were infiltrated with equal amounts of fluid regarding bilateral aesthetic zones.

Two 5mm stabs were used one in each the areola just below each nipple and another one 5mm stab in hidden in the each anterior axillary fold. Protector sheathes were used to protect skin and areolas from contact friction burn. The tumescent technique was used for infiltration using Klien formula [16] and the entire liposuction procedure was done by 3mm cannula. Paired aesthetic negative spaces were completed bilaterally and symmetry assured before shifting to other area. Debubling of the deep fat was done by 3mm mercedes tip cannula, accelerator cannula for superficial layer and a sharp 3mm cannula (candy cane) was used to excise glandular tissue and disc. Superficial liposuction was done to maximize definition of the aesthetic landmarks of the area. Prepectoral fat was removed or preserved according to patient allocation in the study.

Wounds were closed by single stitch 5/0 proleneR. After surgery patients were put in a pressure garment with added compression by epifoamR in the pectoralis-latissimus triangle.

Post-operative care included wound care, pressotherapy sessions and Radio Frequency (RF) sessions for further reduction of edema and pain. Patients who wish to resume their sporting activities were allowed to go back to their sporting activity gradually after one month post operatively. Patients were finally assessed and photographed 6 months after surgery. The results were evaluated with pre-operative and postoperative photographs. The assessment considered surgeons' vs patients' level of satisfaction regarding the following 4 points questionnaire 1 mark awarded for positive response and non for negative response.

- Chest (pectoral area) bulk?
- Proper gland removal?
- NAC size?
- NAC projection (mammary disc)?

The surgical outcome was finally assessed using a scale of 1 to 4 (1 = Poor outcome, 2 = Fair outcome, 3 = Good outcome and 4 = Excellent outcome.

The data about the degrees of satisfaction of patients and surgeons were used to measure patient/surgeon agreement by Kappa statistics (No agreement $K = 0$, slight agreement $K$ = less than 0.2, fair agreement $K = 0.21$ to 0.4, moderate agreement $K = 0.41$ to 0.6, substantial agreement $K = 0.61$ to 0.8 and perfect agreement $K = 0.8$ to 1) [17].
RESULTS

This study included 50 male patients asking for aesthetic enhancement of the chest area and to correct gynecomastia in the period between January 2014 to January 2017. Age ranged between 22 and 45 years. Among them 27 were non athletes and 23 were athletes or ex-athletes (Table 1). Among athletes, all body builders gave positive history of anabolic steroids, insulin and growth hormone abuse (13 patient). Sixteen patients gave past history of stopping their sporting activity and gaining weight. Four patients came complaining of resistant fat and gynecomastia in the pectoral area.

Average suction volume from chest area was 520ml. The number of isolated chest liposuction was eleven cases compared to thirty nine cases included the entire trunk area. Average volume suction from all patients from all body parts was 4200ml.

We didn’t have any major complications in this study only one case had a seroma in the pectoralis-latissmus triangle evacuated by repeated syringe aspirations as outpatient procedure.

Average full return to full painless preoperative activity was shorter in athletes (33 days) compared to (41 days) in non-athletes.

Table (1): Patients’ distribution in each group according to their physique.

<table>
<thead>
<tr>
<th></th>
<th>PFL</th>
<th>PFS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Athletes</td>
<td>12</td>
<td>11</td>
</tr>
<tr>
<td>Non athletes</td>
<td>13</td>
<td>14</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

In this study, all patients were satisfied with the final size of their NAC even those who were complaining of large NAC before surgery (11 patients), there were no post-operative complaints of over projection of NAC (improperly reduction of the disc) also, there were no negative over all satisfaction rating for the results. Patient satisfaction outcomes are shown in the next tables according to their physique and group distribution in the following tables (Tables 2,3).

Kappa statistical analysis showed substantial agreement between surgeons and patients (K= 0.732).

Table (2): Patients’ satisfaction outcome data regarding (PFL) group.

<table>
<thead>
<tr>
<th></th>
<th>Athletes (12)</th>
<th>Non-athletes (14)</th>
<th>Total percentages (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>10 (83.33%)</td>
<td>2 (15.38%)</td>
<td>48%</td>
</tr>
<tr>
<td>Good</td>
<td>1 (8.33%)</td>
<td>2 (15.38%)</td>
<td>12%</td>
</tr>
<tr>
<td>Fair</td>
<td>1 (8.33%)</td>
<td>9 (69.23%)</td>
<td>40%</td>
</tr>
<tr>
<td>Total excellent &amp; good</td>
<td>91.6%</td>
<td>30.76%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Table (3): Patients’ satisfaction outcome data regarding (PFS) group.

<table>
<thead>
<tr>
<th></th>
<th>Athletes (11)</th>
<th>Non-athletes (14)</th>
<th>Total percentages (25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excellent</td>
<td>2 (18.18%)</td>
<td>9 (64.28%)</td>
<td>44%</td>
</tr>
<tr>
<td>Good</td>
<td>5 (45.45%)</td>
<td>4 (28.57%)</td>
<td>36%</td>
</tr>
<tr>
<td>Fair</td>
<td>4 (36.36%)</td>
<td>1 (7.14%)</td>
<td>20%</td>
</tr>
<tr>
<td>Total excellent &amp; good</td>
<td>63.63%</td>
<td>92.85%</td>
<td>80%</td>
</tr>
</tbody>
</table>

Fig. (1): Anatomy of the pectoral area and its deep structures [9].
Fig. (2): Superficial anatomy of the chest area and (NAC) aesthetic relations with pectoralis major muscle with different arm positions demonstrated by Eugen Sandow (1867-1925) [12].

Fig. (3): Superficial anatomy of the chest area and (NAC) aesthetic relations with pectoral is major with different demonstrated by Steve Reeves (1926-2000) [13].

Fig. (4): Wuringer septum connecting (NAC) to the pectoral fascia at the level of the fifth rib [10].
Fig. (5A): Negative spaces and aesthetic landmarks of male chest [1].

Fig. (5B): Levels of male pectoralis line (1) and female inframammary line (2) in relation to ribs [9].

Fig. (6): The “sad pectoral” deformity [1].

Fig. (7): Operative markings.
Fig. (8): PFS group: Clinical photography of 68kg, 45y. Old patient-total liposuction of 4000ml including 500ml from chest area. (A) Pre-operative. (B) Six months post-operative.

Fig. (9): PFS group: Clinical photography of 105kg 30y. Old patient with extensive acne and ritual scars-total liposuction of 7000ml including 1500ml from chest area. (A) Pre-operative. (B) Intraoperative. (C) Six months post-operative.
Fig. (10): PFS group: Clinical photography of 103kg, 34y. Old patient-total liposuction of 6000ml including 1000ml from chest area. (A) Pre-operative (B) Six months post-operative.
Fig. (11): PFS group: Clinical photography of 121kg, 34y. Old patient with extensive acne scars-total liposuction of 8000ml including 2000ml from chest area (A) Pre-operative. (B) Six months post-operative pictures showing oversized pectoral area.
Fig. (12): PFL group: Clinical photography of 98kg, 26y. Old patient—total liposuction of 3500ml including 1000ml from chest area. (A) Pre-operative. (B) Six months post-operative.
Fig. (13): PFL group: Clinical photography of 85kg, 29y. Old patient-liposuction of 800ml from chest area. (A) Pre-operative. (B) Six months post-operative.
Fig. (14): PFL group: Clinical photography of 55kg, 24y. Old patient-liposuction of 400ml from chest area. (A) Pre-operative. (B) Six months post-operative pictures showing flat chest.
Fig. (15): PFL group: Clinical photography of 98kg, 36y. Old patient-liposuction of 900ml from chest area. (A) Pre-operative. (B) Six months post-operative pictures showing flat chest.
DISCUSSION

The beauty of the pectoral area is one of the keys to beautiful male form in general and among athletes. In 1974 and 1975 Mr. Olympia championship, Arnold Schwarzenegger, Lou Frringo, Franco Colombo and Serge Nubert gave the till now undisputable best display of the beauty of the development of pectoralis major according to major body building sport magazine reflecting the aesthetic importance of the pectoral area [18].

Gynecomastia and fat accumulation due to over calories intake leading to distortion of the aesthetics of this area is the main reason for patients to seek treatment [19]. Liposuction with all what it is offering of minimal scarring is considered a great option of treatment especially if skin is expected to retract properly i.e. grades I and II (A & B) Simon's classification [15].

In this study, a full review of classifications of gynecomastia from 1944 till 2008 was done [5]. Both Webesters' gynecomastia classification "1944" to (Glandular, Fatty-Glandular and Fatty) also Bannayan and Hajdugynecomastia classification "1972" (Florid-Intermediate-Fibrous) didn't include skin status. Rohrich et al., "2003" (grade I: <250gm breast tissue with no ptosis-grade II: 250-500gm breast tissue with no ptosis-grade III >500gm breast tissue with grade I ptosis-grade IV: Like grade III with grade II and III ptosis to which (A) added for glandular type and (B) added for fibrous tissue type) is rather retrospective as it depends on tissue weight (it can't be used for pre-operative planning). Linking weight of removed tissues with degree of ptosis is not always accurate e.g. huge sized patient in Fig. (11) had 1000ml fat removed by suction from each breast (>500gm) and he had no ptosis. Cordova and Moschella classification "2008" (grade I: Increase in areolar diameter and protrusion-grade II: Hypertrophy of all breast elements NAC is above IMF by more than 1cm-grade III: Hypertrophy of all breast elements NAC is at or below IMF by less than 1cm-grade IV: Hypertrophy of all breast elements NAC is below IMF by more than 1cm).

In fact both Roerich et al., and Cordova and Moschella classifications depend on IMF. The aesthetic lower boundary of male chest is the pectoral line with the (NAC) just above its midpoint. Taking athletes from the era before steroids and growth hormone with natural formed muscles by diet and exercise is a proof that males have no inframammary line. The inframammary line is at a lower level at 7th costal cartilages in females [9] (Figs. 2-5). As breast tissue pathologically increase in size, an IMF appears and move downwards as breast size grow more and more i.e. the IMF in male is neither normal nor fixed in its level. Thus, we don't accept the Inframammary Fold (IMF) as a reference normal anatomical landmark. So, although relatively old, Simons' classification "1973" [18] seems more versatile when it comes to surgical planning. The disadvantages of Simons' classification in our opinion that it is subjective in its judgment on skin excess.

Fifty patients shared in this comparative study equally divided into two groups, one in which Prepectoral Fat was Spared (PFS) and the other in which Protectoral Fat was removed by Liposuction (PFL).

Analysis of the subjective results regarding patient satisfaction in PFL group higher satisfaction among athletes was found if compared to non-athletes (Table 2). Retrospective analysis of patient opinion showed that non-athletes felt that their chest became over flat while athletes felt their chest muscles became more shredded (Figs. 12-15). On the other hand, PFS group gave reversed results. The sparing of prepectoral fat gained more satisfaction among non-athletes but not among athletes. The athletes felt their chest to be over sized or ballooned in PFS group (Figs. 8-11).

We believe that these results are related to the development of pectoralis major muscle. Liposuction of the prepectoral fat will show the beauty of the developed muscle among athletes (Fig. 13) but will expose the deficient under developed muscle in non-athletes (Fig. 14). Also non athlete endomorphic subjects with belly abdomen even appear worse as bulging abdomen exaggerate the flattened chest (Fig. 15). Flat chest in neither normal nor aesthetic due to pectoralis major muscle bulk and its fibers arrangement mentioned before. On the other hand Sparing the prepectoral fat in athletes will give an over bulky chest in athletes but will hide the deficient muscle volume in non-athletes (Fig. 11).

Kappa statistical analysis proved the objective nature of our results. It showed substantial agreement between surgeons and patients (K=0.732).

Worth mentioning that with the new advances in liposculpture regarding conventional, ultrasonic, laser etc. and modern sharp liposuction cannuas any breast tissue of any kind and with any amount can be removed by liposuction. Skin retraction is the only challenge and the most effective element in choosing liposuction vs. resection in treatment of gynecomastia by surgery.
In this study there was an absence of major and permanent complication only one case with minor seroma responded to evacuation by syringe. None of our patients had a contact friction burn and hyper pigmentation (8%) compared to (0.03%) in similar study using UAL [20] and (30%) in Thomas et al., study using traditional liposuction [21]. This can be explained by the use of the protector sheath in our study if compared to Thomas et al., [21] and the capability of UAL cannula to burn the skin upon contact as it spread ultrasonic energy in UAL study [20]. There was no cases of prolonged tissue induration in our study compared to Hoyos study [22] who reported one case and in this case the UAL machine was calibrated on (80% continuous mode) this is specific complication to ultrasonic device excess energy beside mechanical trauma leading to fat necrosis in the residual fat. In our study fat was subjected only mechanical trauma thus no such complication happened.

The facts that (UAL) has its own specific complications like remote skin burn, port site burn and prolonged induration [22,23] makes our opinion disagree with of plastic surgeons that (UAL) ”VASER” is better than traditional suction regarding safety and uneventful recovery. Removal of all gynaecomastia tissue was easy as most gynaecomastia tissues in these early stages lies in the pectoralis-lattissmus triangle and little was over pectoral is major also modern sharp cannula made it easy to be completely removed with liposuction while sculpturing the muscle lower part without any need for open surgery in this series. All large NACs shrunk to accepted size by the end of follow-up period and no patient had a residual skin laxity with conventional liposuction. Proper history taking, clinical examination as well as proper investigations prior to surgery confirm diagnosis of gynecomastia and make the surgical procedure in this series none threatening regarding patient safety by making sure that there was no sinister pathology in their breasts before surgery.

The high patient satisfaction rate and substantial patients/doctors agreement in this series in our opinion is due to absence of serious or permanent complications, excellent hidden liposuction ports, proper port protection as wellas the cosmetic results.

All body builders shared in this study had a past history of hormonal abuse. All of them abused anabolic steroids and growth hormone with or without insulin to overcome the growth hormone induced insulin resistance. Extensive acne scars due to anabolic steroids abuse were demonstrated in some of our patients (Figs. 9,11), acne started few months after the onset of anabolic steroids abuse.

Conclusion and Recommendations:

• The development of pectoral is major is the key factor to decision of sparing or removing prepectoral fat. Prepectoral fat should be spared if the muscle is weak or poor in its girth and should be removed to avoid exaggerated chest bulge and to show the beauty of the developed muscle.

• In endomorphic patients, the management of the bulging epigastrum or better the entire abdomen will improve the look of the chest in general. Sparing of prepectoral fat would be even more important if the patient have abdominal fat accumulations mainly deep to abdominal muscles.

• The surgeon should not rush to NAC and open disc reduction NAC should be given a time chance for spontaneous shrinking and sharp liposuction should be tried as first choice to reduce the mammary disc. Unfortunately, 11 patients are not enough to give a cutting edge conclusion.

• Research work should be directed to more clinically useful classification of gynecomastia that helps pre-operative planning.

• Regarding the results of this work, 100% of our patients had nice skin recoil without redundancy with traditional liposuction and avoiding he risks of ultrasonic specific complications. We believe that conventional liposuction is still coping with superficial liposuction to the pectoral area as new horizon in plastic surgery for sculpting the human form as well as early stages of gynecomastia treatment. A surgeon with experience of a technique and good knowledge of the basic science relating to surgery as well as aesthetic concepts is the gold standard for a successful operation rather than the technique or the machine used.

Conflict of interests:

The authors of this work have no conflict of interests to declare.

REFERENCES


