

Comparison of laser-assisted liposuction and traditional liposuction combined with endoscopic surgical excision of grade II gynecomastia

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Abstract

Background Surgical excision and liposuction of fatty element are the standard in the treatment of grade II gynecomastia. The aim of this study is to evaluate the combined use of laser-assisted liposuction and endoscopic surgical excision.

Methods Thirty male patients with grades IIa and IIb were included. Fifteen patients underwent laser-assisted liposuction followed by endoscopic excision of glandular tissues (group I), and 15 patients underwent conventional (vacuum assisted) liposuction and endoscopic surgical excision (group II).

Results Patients of group I showed good to excellent outcome with mild edema, indurations, and ecchymosis. Group II patients showed also overall satisfactory results but with moderate to severe edema, ecchymosis, and hematomas.

Conclusions Endoscopic surgical excision of grade II gynecomastia combined with traditional or laser-assisted liposuction can achieve satisfactory aesthetic results. Furthermore, the combined use of laser liposuction failed to show superior aesthetic results than traditional liposuction. However, the use of laser-assisted liposuction offers additional advantages such as intraoperative (less bleeding, less operative time) or postoperative either immediately (less pain, indurations, ecchymosis, and edema) or late as improved skin tightness.

Level of Evidence: Level III, therapeutic study

Keywords Traditional liposuction · Endoscopy · Laser lipolysis · Gynecomastia

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Introduction

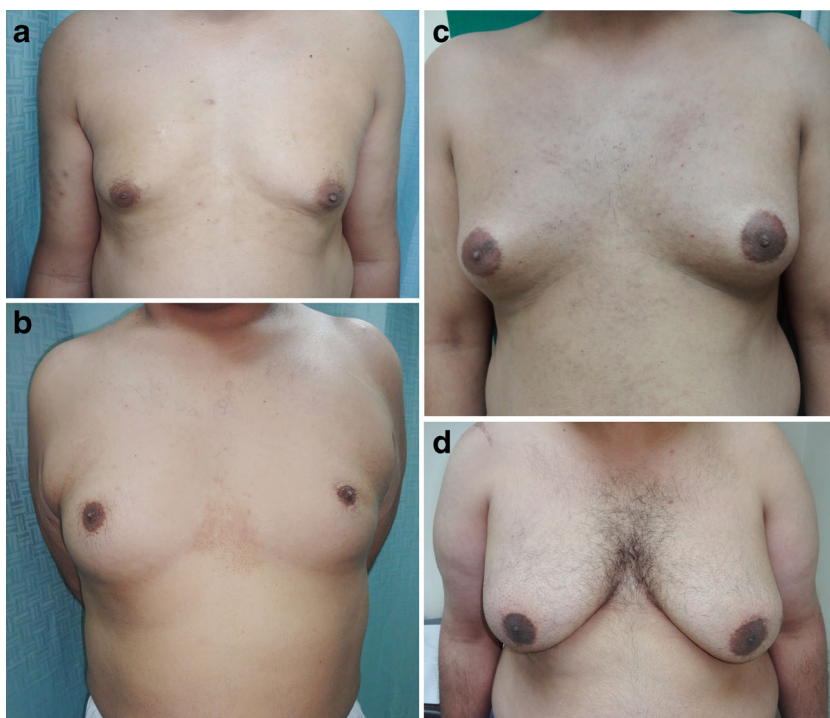
The term gynecomastia is derived from Greek words meaning female breast. It is defined as the presence of palpable breast tissue in males and is common in normal individuals, particularly in the newborn period, at puberty, and in the elderly [1]. It has variable incidence ranging from 30 to 60% of men [2–6], and it is mostly bilateral, but it may sometimes be unilateral or asymmetric [7]. Gynecomastia is different from pseudogynecomastia, which is an accumulation of excess fat in a male breast [8]. It is believed that most cases of gynecomastia are caused by an imbalance of estrogen to androgen ratio [9, 10].

Depending on morphology and volume, gynecomastia is classified, according to Simon, [11] into the following: I: Minor breast enlargement without skin redundancy, IIa: Moderate breast enlargement without skin redundancy, IIb: Moderate breast enlargement with minor skin redundancy, and III: Gross breast enlargement with skin redundancy that mimics female breast ptosis (Fig. 1).

Although the condition may be symptomatic, psychological aspects of surgical treatment are at the same importance to restore normal body image with minimal scar [12]. Paulus Aegineta (635–690 AD) had been the first to describe reduction mammoplasty for gynecomastia using a semilunar inframammary incision [13]. The surgical correction of gynecomastia significantly changed in the last decades from open surgery to less invasive procedure including liposuction or combined liposuction and surgery through different incisions [14–19]. Endoscopic excision of gynecomastia has emerged as a new less invasive approach.

Liposuction represents the other arm of gynecomastia treatment. Traditional liposuction can work well in loose areas; however, in dense areas such as gynecomastia, it is difficult.

Fig. 1 Patients photos showing different grades of gynecomastia. **a** Grade I. **b** Grade IIA. **c** Grade IIB. **d** Grade III



Refinement in liposuction emerged laser-assisted liposuction to overcome this special problem.

Although endoscopic excision and laser-assisted liposuction of gynecomastia offer new advantages, combination of both modalities has not been studied before.

In our previous work, we studied the effectiveness and safety of combining laser liposuction and abdominoplasty [20]. The aim of this work is to study the benefits and drawbacks of combined both laser-assisted liposuction and endoscopic excision of glandular tissues (group I) in comparison to conventional liposuction combined with endoscopic excision of glandular tissues (group II).

Patients and methods

This study included 30 male patients complaining of grade II gynecomastia (either IIA or IIB). Patients with pseudogynecomastia, unilateral gynecomastia, patients with female-like breast (grade III gynecomastia), and patients receiving anticoagulant or antiplatelet drug therapy were excluded.

All patients were referred to endocrinology clinic to exclude secondary causes of gynecomastia. Physical examination included breast size, consistency, skin excess, suspicious masses, and nipple areola position in relation to inframammary fold.

Preoperative ultrasound was done for all patients to confirm the presence of glandular tissue and fatty tissues and excludes presence of non-palpable breast masses.

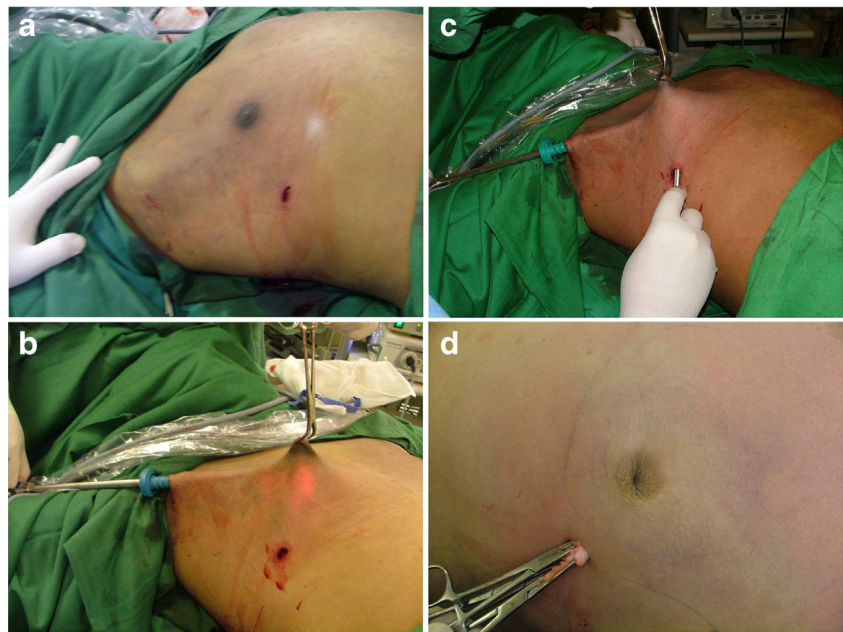
The study was approved by the local ethics committee. The benefits and possible drawbacks were discussed with all patients and informed consent was obtained. Patients who accepted the treatment underwent combined laser-assisted liposuction and endoscopic excision of glandular tissues (group I). Patients who refused this new treatment were treated by conventional (vacuum assisted) liposuction and endoscopic excision of glandular tissues (group II).

All surgical procedures were performed under general sedation using IV Profolol or general anesthesia and by the same surgical team. Patients were marked in the upright position to map the areas of liposuction and surgical excision. Two small incisions 15–20 mm were made laterally at the anterior axillary line above and below the level of nipple areola complex. Liposuction tumescent was injected through these incisions. About 250–350 cc of tumescent was injected depending on the breast size.

In group I, laser-assisted liposuction was done using 1320 nm ND YAG (Cool Lipo™, New Star Lasers, 12 J, 40 Hz). The endpoints of laser procedure were tactile warmth and ease of cannula advancement during the procedures, with skin temperature not exceeding 34 °C.

In group II, a liposuction triple-hole cannula (usually size 4) connected to a vacuum was used for liposuction of the whole breast fatty tissue. Liposuction was continued until feeling only glandular tissue. Liposuction also was done to chest wall beyond markings of the breast and below the inframammary line in order to fade the edges between breast and chest wall. The lipoaspirate was mixed very gently until it becomes a homogenous solution. Then, a sample of the

Fig. 2 The steps of surgical technique. **a** Liposuction is completed through the lateral scars. **b, c** Endoscopic surgical dissection and excision. **d** Removal of the breast tissue after dissection



aspirate was taken and sent to laboratory to examine the hemoglobin and RBC content.

After liposuction (either traditional or laser-assisted), endoscopic excision of glandular tissue was carried out using a rigid laparoscope \varnothing 10 mm, 300 mm, 0° (Richard Wolf laparoscopy, Germany). The endoscopic camera was introduced through the upper lateral incision to enable visualization of the remaining tissue, and scissor was introduced through the lower incision for dissecting remaining fibroglandular tissue. After complete dissection of glandular tissue, it was removed en bloc or divided into two or three pieces and extracted through the lower incision (Fig. 2). Closure of incision using 5/0 polydioxanone (PDS) sutures was done and dressing also was applied without drains.

Postoperatively, patients received perioperative antibiotic and analgesic. Preoperative and postoperative digital pictures were taken at least 3 months after operation using Nikon-coolpix 995 digital camera (3.3 Mpx, $\times 5$ optical zoom).

Results were interpreted by evaluating the aesthetic outcome of breast shape, the incidence of complications, hospital stay, and time of operative procedure. The degree of aesthetic outcome was evaluated based on surgeon assessment and patient satisfaction. The digital photos were also assessed by an independent physician. The assessment criteria are adopted from the BREAST-Q scale [21] and included overall breast shape, overall shape in relation to chest wall, nipple areola position and shape, skin tightness, residual skin and/or glandular excess, over-resection, psychosocial relief, and scar quality. Each item was graded as 0 (not accepted), 1 (accepted), and 2 (satisfactory). Results were graded as excellent (>75%), good (51–75%), fair (26–50%), and poor (<25%) based on degree of improvement. Complications (hematomas,

seromas, nipple areola sensation deficit, nipple areola loss) were graded into either absent (0), mild (1), or moderate to severe (2).

Statistical analysis was performed using repeated measures, Fisher's exact, and Chi-square tests (SPSS version 15). A *p* value of < 0.05 is considered statistically significant.

Results

This study included 30 male patients complaining of grade II gynecomastia over a period of 2 years (2013–2014). Patients' age ranged from 18 to 36 years with mean of 23.4 years. The follow-up period ranged from 6 to 15 months with mean of 8.3 months. Eleven patients (6 patients in group I and 5 patients in group II) were overweight. The mean value of lipoaspirate in both groups was 685 ml (SD, 398.6) and the mean of excised breast parenchyma was 71.2 g (SD, 18) per each breast.

In group I, patients' age ranged from 18 to 36 years with mean of 24.6 years. Seven patients had gynecomastia grade IIa and eight patients had grade IIb. All patients of grade IIa had excellent outcome. Regarding the eight grade IIb patients, three patients had excellent outcome and four patients had good outcome. All patients showed substantial improved skin tightness with improved skin redundancy. No visible skin irregularities were recorded except for two patients that had minimal irregularities which required no treatment (Table 1) (Fig. 3).

In group II, patients' age ranged from 22 to 36 years with mean of 22.3 years. Nine patients had gynecomastia grade IIa and six patients had grade IIb. All patients of grade IIa had

Table 1 Summary of aesthetic improvement in both groups

Aesthetic outcome				
	Excellent	Good	Fair	Poor
Group I	11	4	–	–
Group II	9	4	2	–
GI: GII	Fisher's exact $p > 0.05$			

excellent outcome. Regarding the six grade IIb patients, four patients had good outcome and two patients had fair outcome. All patients showed satisfactory improvement in breast shape and redundancy with moderate improvement of skin tightness. Visible skin irregularities were recorded in two patients. All these results were statistically insignificant in relation to group I ($P > 0.05$) (Table 1) (Fig. 4).

Regarding complications in group I, no hematoma was recorded and two patients had seromas that treated by aspiration and compression. One patient had transient tingling sensation in nipple and areola of one breast that resolved after 3 months. Postoperative ecchymosis was mild in all patients and disappeared after 8–12 days. Postoperative edema was mild and faded within 6–8 weeks (Table 2).

In group II, two patients developed hematoma that required aspiration and compression. In addition, three patients had seromas; two out of the three patients needed aspiration and compression, while the third patient had mild seroma that faded by compression alone. Postoperative ecchymosis was moderate to severe in all patients and disappeared after 15–20 days. Postoperative edema was mild to moderate and subsided within 8–10 weeks. No sunken areola deformity, areola

necrosis, infection, or hypertrophic scarring was recorded in both groups. No recurrence or secondary operations were recorded in any patients during study time (Table 2).

All patients in group I were discharged home at same day of surgery except for two patients who stayed additional day upon their request. In group II, ten patients discharged home at same day of surgery and five patients spent another day due to postoperative pain that required opioid analgesics. Operative procedure time ranged from 85 to 110 min with mean of 98.3 min in group I, whereas, in group II, operative procedure ranged from 90 to 135 min with mean of 108.6 min.

Our clinical observation of less blood loss in laser lipolysis group was confirmed by the measurements of the lipoaspirate hemoglobin and RBC content (Fig. 5a, b). Laboratory measurements revealed that laser lipolysis group had lower mean values of both hemoglobin and RBCs content. Furthermore, this lower values were statistically significant in comparison to traditional liposuction group (P value $< .05$) (Table 3).

Discussion

Surgical treatment of gynecomastia aims at adequate treatment of the disease while minimizing apparent scarring. Combined liposuction and excision ensure adequate treatment of the disease [14–19].

The inframammary lunate incision was used at first [13]; then subcutaneous mastectomy with semicircular intra-areolar incision remained the treatment of choice [22]. Thereafter, less

**Fig. 3** Preoperative and postoperative views of a 23-year-old male patient of group I



Fig. 4 Preoperative and postoperative views of a 21-year-old male patient of group II

invasive techniques such as liposuction alone [16, 17], minimally invasive surgical excision, or both of them were described [14, 15, 23–28].

Traditional open resection leaves inframammary or periareolar visible scar that may be more disappointing than the original problem [13, 29, 30]. The intra-areolar incision or Webster incision also has limited exposure [31]. In addition, more serious complications can occur such as over-resection leading to breast asymmetry, nipple tethering to pectoral muscles, or unsatisfactory outcome in up to 50% of cases [32].

Surgery and liposuction have been combined in different manners. Excision through a single puncture incision of the areola combined with an incision for liposuction at the anterior axillary fold has been described [33] or through one periareolar stab incision [34]. Morselli [28] removed the gland in pieces utilizing a pull-through technique, and incisions are placed in the mammary crease or anterior axillary fold.

Tumescent liposuction was also combined with blind scissor dissection [35]. Liposuction and vacuum-assisted biopsy device excision of breast tissue was also reported [25, 36].

The endoscope-assisted subcutaneous mastectomy opened a new field in gynecomastia management [37]. Ohyama et al. in 1998 [38] described transaxillary endoscopic-assisted removal of glandular tissue in gynecomastia through a 4 cm incision. Endoscopic resection of gynecomastia was used in different manners; some authors used it only to supervise pull-through excision [39], and others used it to perform direct excision alone [40, 41] or in combination with liposuction [42, 43].

Another method of endoscopic resection in the form of arthroscopic cartilage shaver combined with liposuction was used achieving good results [44–46]. In endoscopic procedures, trans-axillary incisions [40, 42] or periareolar incisions [39] could be used alone or combined [43].

Teimourian and Perlman [14] in 1983 described liposuction-assisted excision. Fat in gynecomastia consists of firm fibrous connective tissue and compact adipose tissues, which makes conventional liposuction more difficult to perform. If force is exerted repeatedly, it causes great damage to the tissues. For that, interventional ultrasound-assisted liposuction [47–49], external ultrasound-assisted lipoplasty [50], and power-assisted lipoplasty [51] have been developed in the 1990s.

Laser-assisted liposuction is another step in treatment modalities. Apfelberg [52, 53] studied laser-assisted liposuction in the early 1990s, and then multiple studies followed [54–57]. Various wavelengths, including 924, 968, 980, 1064, 1319, 1320, 1344, and 1440 nm, have been used [58].

The 1320 nm wavelength demonstrates greater fat absorption with less tissue penetration and scatter. Therefore, it may be safer for treatment [59]. However, these claims are not well

Table 2 Summary of complications in both groups

	Group I	Group II
Nipple necrosis	–	–
NAC loss of sensation	–	–
Residual skin or gland	–	–
Skin irregularities	2 (+)	2 (+)
Wound infection	–	–
Wound dehiscence	–	–
Edema and indurations	+	++
Ecchymosis	+	++
Pain	+	++
Hematoma and seroma	2	5

N.B. absent (–), mild (+), moderate (++), and severe (+++)



Fig. 5 Reduced blood content in the lipospirate from laser liposuction side in comparison to traditional liposuction

supported, and which wavelength is ideal in laser lipolysis is a matter of debate [58]. Rho et al. [60] and Trelles et al. [61] were the only who used laser lipoplasty in gynecomastia. They concluded that gynecomastia can be treated effectively and safely with laser lipolysis.

Our technique takes the advantages of both these two refinements in the management of gynecomastia. Laser-assisted liposuction group achieved overall good to excellent aesthetic outcome with greater patient satisfaction that can be attributed to better skin tightening and fat lipolysis in this dense area. However, this finding is based on subjective assessment only and needs to be confirmed objectively using permanent ink or tattoo for example. It is important also to mention that the traditional liposuction also achieved comparable results regarding aesthetic outcome. This clinical finding between both groups was confirmed statistically (P value <0.05).

Regarding the surgical trauma, laser lipolysis is associated with less trauma compared to traditional liposuction leading to less postoperative edema, indurations, and postoperative pain. In addition, laser liposuction causes coagulation of vessels which results in less intraoperative bleeding which makes the glandular resection easy and fast. This is manifested by

reduced operative time in the laser liposuction group. Furthermore, vessel coagulation causes less postoperative ecchymosis and postoperative hematoma formation. This reduced blood loss was observed clinically and confirmed in the laboratory.

Endoscopic glandular excision offers resection under vision which minimizes over resection and aesthetic deformity or under resection leading to less satisfactory results and more recurrence. Excision under vision also allows good control of any bleeding even if minor bleeding that minimizes complications and reduces postoperative down time. Reduced postoperative pain is a sequel of both reduced trauma by laser liposuction and minimal access incisions through endoscopic surgery.

Balch [62] introduced the transaxillary approach to minimize scarring. The transaxillary incision leaves hidden scar, but its main disadvantage is the difficulty during glandular resection [44] and long operative time [63, 64]. These drawbacks could be overcome by the use of endoscopy that allows under vision resection and shortening of the operative procedure time that is helped by the reduced bleeding secondary to the effect of laser lipolysis. The main disadvantage of our technique is the cost of equipments which are not available in every institution. In addition, the technique needs to some extent slightly slow learning curve. We used a relatively big size cannula (usually size 4) to avoid blockage during liposuction which relatively resulted in bigger scars. However, this scar facilitated removal of breast tissue as one block.

Further randomized blindly controlled studies using objective assessment on larger patient population are warranted in further researches. This study confirmed objectively the clinical observation of reduced blood loss following laser lipolysis. This reduced blood loss is statistically significant in comparison to traditional liposuction [65].

Finally, the literature is very rich with numerous techniques that achieve satisfactory results. Each surgeon can choose the best technique in his hands, and this does not mean that it is the ideal treatment modality.

Table 3 Mean values of blood loss in both groups

		Mean	SD	Test of sig (repeated measures test)	p value
Blood loss	HB-1	.0869	.0987	33.542	0.00*
	HB-2	.348	.407		
	RBC/L-1	1.679	1.486	5.742	0.031*
	RBC/L-2	3.673	1.381		

There is a statistically significant difference between both groups with lower values of laser lipolysis group *RBC/L1* RBC measured with laser liposuction, *RBC/L2* RBC measured with traditional liposuction, *HB-1* HB measured with laser liposuction, *HB-2* HB measured with traditional liposuction

*Sig p value

Conclusion

Endoscopic surgical excision of grade II gynecomastia combined with traditional or laser-assisted liposuction can achieve satisfactory results. Furthermore, the combined use of laser liposuction failed to show superior aesthetic results than traditional liposuction. However, the use of laser-assisted liposuction offers additional advantages such as less bleeding and operative time, less pain, indurations, ecchymosis, and edema; and improved skin tightness.

Compliance with ethical standards

Ethical approval For this kind of retrospective study formal consent is not required.

Conflict of interest Yasser Abdallah Aboelatta and Mohammed Mahmoud Abdelaal declare that they have no conflict of interest.

Patient consent For this type of study informed consent is not required.

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