Ultrasonic Liposuction in the Treatment of Gynecomastia

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Background: Ultrasound-assisted liposuction is a technique that is widely used all over the body for minimal access lipectomy. Recently, it has been reported to be especially suitable for the treatment of gynecomastia. To date, however, there is only one published study that specifically addresses ultrasound-assisted liposuction as a treatment modality for gynecomastia.
Methods: A review was undertaken of all the gynecomastia patients treated with ultrasound-assisted liposuction by a single surgeon over a 3-year period. Thirteen consecutive patients (aged 16 to 57 years) with bilateral, diffuse, soft to moderately firm gynecomastia were studied.
Results: There were no early postoperative complications of hematoma, seroma, infection, or thermal injury. Similarly, there were no treatment-induced asymmetries, contour deformities, or irregularities. One patient requested "touch-up" ultrasound-assisted liposuction for "residual" breast tissue several months after an initial satisfactory correction of chest contour. None of the patients required initial open-excision or skin-reduction procedures. Patients were asked to rate their cosmetic results in four categories on linear analogue scales with a maximal score of 10. The average scores were 9.1 for overall satisfaction, 9.2 for scars, 9.2 for shape, and 8.9 for improved self confidence.
Conclusion: Ultrasound-assisted liposuction is an effective treatment modality in patients with homogenous soft to moderately firm gynecomastia, giving good cosmetic results and a high level of patient satisfaction. (*Plast. Reconstr. Surg.* 116: 646, 2005.)

Traditionally, the surgical options for the treatment of gynecomastia have included open excision, conventional liposuction, or combinations of these. In the last decade, ultrasound-assisted liposuction has been introduced as a new treatment modality for gynecomastia.[1–5] Early reports have suggested that ultrasound-assisted liposuction results in less postoperative bruising and swelling, a smoother breast contour, better postoperative skin contraction, and a lower rate of intraoperative conversion to open excision.[2,3,6,7] Ultrasound-assisted liposuction's reported use in gynecomastia, however, largely has been restricted to anecdotal reports[8] or case studies that include other treatment modalities.[5] Studies that specifically address the treatment of gynecomastia with ultrasound-assisted liposuction have originated from one center, thus far,[3,9,10] and have used the no-longer-manufactured Lysonix 2000 ultrasonic liposuction machine (Lysonix Inc., Capinteria, Calif.), which, in 2004, was re–engineered to produce the Lysonix 3000 (Byron Medical Inc., Tucson, Ariz.). Furthermore,

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none of the published studies have reported on patient satisfaction with the cosmetic outcomes. A study was, therefore, undertaken to review a single surgeon's early experience with this treatment modality in the management of gynecomastia using the Mentor Contour Genesis machine.

Patients and Methods

Study Design

This was a retrospective review of all gynecomastia patients treated with ultrasound-assisted liposuction by a single surgeon at the Cambridge BUPA Lea Hospital over a 3-year period. All patients were preoperatively assessed by the same surgeon, who recorded the characteristics of their breasts in terms of size, consistency, skin quality, presence or absence of ptosis, and degree of inframammary fold development (Table I). Preoperative and postoperative photographs were taken by a medical photographer.

Operative Technique

All patients were treated under general anesthesia on a day-case basis. Preoperatively, they were marked in the upright sitting position. The inframammary fold, breast boundary, and planned stab-incision sites were drawn on each breast. Concentric topography-type marks centered on the most prominent portion of the breast also were made. After induction of anesthesia, preparation, and draping, the breast was infiltrated with a wetting solution through a stab incision located inferolaterally in the inframammary crease. The fluid consisted of Hartmann's solution containing 1 ml of 1 in 1000 solution of adrenaline and 30 ml of 1% lignocaine per liter. Each breast was infiltrated at a rate of 400 mls/minute to a volume equal to the estimated volume of fat to be evacuated, thus using the superwet technique[11,12] (Table II). Ultrasound energy using the Mentor Contour Genesis machine (Mentor Medical Systems, Santa Barbara, Calif.)[7] was then applied with a hollow probe, which also allowed simultaneous aspiration. The amplitude was set at 85 percent, except in cases of exceptionally fibrous breasts, when it was increased to 95 percent. Suction during ultrasound application was set at the machine's maximum of 10 ml/minute. Five patients had an additional anterior axillary line incision when it was believed that adequate treatment of the breast or disruption of the inframam-

TABLE I

Ultrasound-Assisted Liposuction Treatment Details Showing Infiltration and Evacuation Volumes and Emulsification Times

Patient	Age (yr)	Side	Size	Consistency	Skin Excess	Ptosis	Skin Quality	Developed IMF*
1	35	R	Moderate	Soft	No	No	Good	No
		L	Moderate	Soft	No	No	Good	No
2	23	R	Large	Firm	No	No	Striae	Yes
		L	Large	Firm	No	No	Striae	Yes
3	20	R	Small	Soft	No	No	Good	No
		L	Small	Soft	No	No	Good	No
4	32	R	Moderate	Moderate	No	No	Good	Yes
		L	Moderate	Moderate	No	No	Good	Yes
5	40	R	Small	Soft	No	No	Good	Yes
		L	Small	Soft	No	No	Good	Yes
6	57	R	Moderate	Moderate	No	No	Fair	Yes
		L	Small	Moderate	No	No	Fair	No
7	23	R	Large	Firm	No	No	Good	No
		L	Large	Firm	No	No	Good	No
8	16	R	Moderate	Moderate	No	No	Good	No
		L	Large	Moderate	No	No	Good	Yes
9	17	R	Moderate	Firm	No	No	Good	No
		L	Moderate	Firm	No	Yes	Good	Yes
10	30	R	Small	Moderate	No	No	Good	Yes
		L	Small	Moderate	No	No	Good	Yes
11	34	R	Moderate	Soft	No	No	Good	No
		L	Small	Soft	No	No	Good	No
12	24	R	Large	Firm	No	No	Good	Yes
		L	Moderate	Firm	No	No	Good	Yes
13	47	R	Small	Firm	No	No	Good	No
		L	Small	Firm	No	No	Good	No

*Inframammary fold.
R, right; L, left.

TABLE II
Preoperative Characteristics of the Breasts Treated in This Series

Patient	Side	Infiltration Volume (ml)	UAL* Aspirate (ml)	SAL† Aspirate (ml)	Total Aspirate (ml)	U.S. Time (min:sec)
1	R	700	200	600	800	7:00
	L	700	200	600	800	6:40
2	R	716	190	310	500	5:01
	L	477	200	360	560	6:02
3	R	508	300	300	600	9:17
	L	563	300	325	625	9:03
4	R	450	300	250	550	9:45
	L	413	300	250	550	10:37
5	R	507	150	150	300	6:44
	L	426	100	270	370	7:28
6	R	495	200	285	485	5:35
	L	540	200	285	450	7:00
7	R	500	300	400	700	7:00
	L	500	300	400	700	7:00
8	R	353	300	250	550	7:41
	L	387	300	300	600	8:15
9	R	464	100	350	450	7:07
	L	530	150	400	550	8:54
10	R	400	100	150	250	3:24
	L	402	100	200	300	4:26
11	R	342	200	150	350	8:49
	L	284	200	100	300	7:29
12	R	479	250	300	550	11:10
	L	284	200	150	350	8:10
13	R	408	200	200	400	8:02
	L	365	220	250	470	8:02

*R, right; L, left; UAL, ultrasound-assisted liposuction; tSAL, suction-assisted liposuction.

mary fold was not being obtained from the single inframammary crease access. Routine intraoperative skin protection (Fig. 1) consisted of a plastic port inserted in the incision (through which the ultrasonic probe was passed), a wet towel, continuous saline irrigation (40 ml/hour), a probe sheath, use of continuous probe movements, and avoidance of end-hits. Treatment was continued until the primary end-points (loss of tissue resistance and blood in the aspirate) and/or the secondary end-points (treatment time and volume) were reached (Table II).[7,13–15] Ultrasound application was followed by fat evacuation and final contouring using two traditional Mercedes liposuction cannulae (sizes 4.6 and 3.7 mm). The stab incisions were closed with 5/0 Vicryl absorbable sutures and steristrips. The dressing consisted of K-Y Jelly (Johnson & Johnson, New Brunswick, N.J.), Reston Foam (3M, St. Paul, Minn,), and a commercial compression garment. All patients were instructed to keep the garment on constantly, for the first 7 days, and then to continue wearing it, except for when bathing, for a total of 6 weeks.

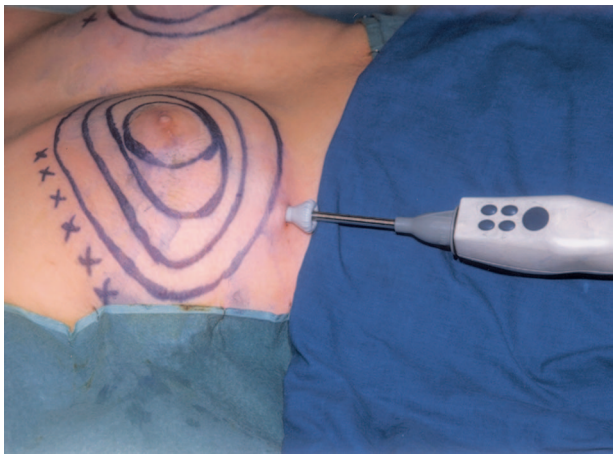

FIG. 1. Intraoperative photograph of the Mentor Contour Genesis handpiece showing the controls and the external sheath, which covers the hollow probe. Further ultrasound-assisted liposuction safety precautions include the plastic skin protector and a wet towel.

Postoperative Assessment

All patients were followed up in clinic at 1, 4, and 12 weeks. The patients were routinely photographed at about 3 months after surgery. All patients were asked to fill in a self-assessment sheet consisting of linear analogue scales[1–10,16] for four categories on which they rated their surgical results (Fig. 2).

RESULTS

Thirteen consecutive patients with bilateral gynecomastia, aged 16 to 57 years (mean = 30, median = 27), were treated. All had diffuse breast enlargement without discrete, hard subareolar lumps. The sizes were recorded as small, medium, or large, and consistency as soft, moderate, or firm. There was no preponderance of any one characteristic (Table I).

The average volume of tumescent fluid infiltrated per breast was 469 ml (range 284 to 716 ml). The total volume aspirated in both ultrasonic and conventional liposuction phases averaged 504 ml (range 250 to 800 ml). The mean emulsification time per breast was 7.5 minutes (range 3.4 to 11.2 min) with an average of 214 ml (range 150 to 300 ml) aspirated during this phase (Table II). There was no trend toward shorter or longer emulsification times with progression through the study group.

There were no early postoperative complications of hematoma, seroma, infection, or thermal injury. Similarly, there were no treatment-induced asymmetries or contour deformities from overtreatment. There were no residual lumps or irregularities detected in any of the patients during their postoperative assessments. None of the patients required skin-reduction procedures, although one patient, the oldest in the series (57 years) had a small, residual skin fold, that he did not find distressing (Fig. 3). The first patient in the series requested a second procedure for further reduction 6 months after his first surgery (despite the initial satisfactory correction of chest

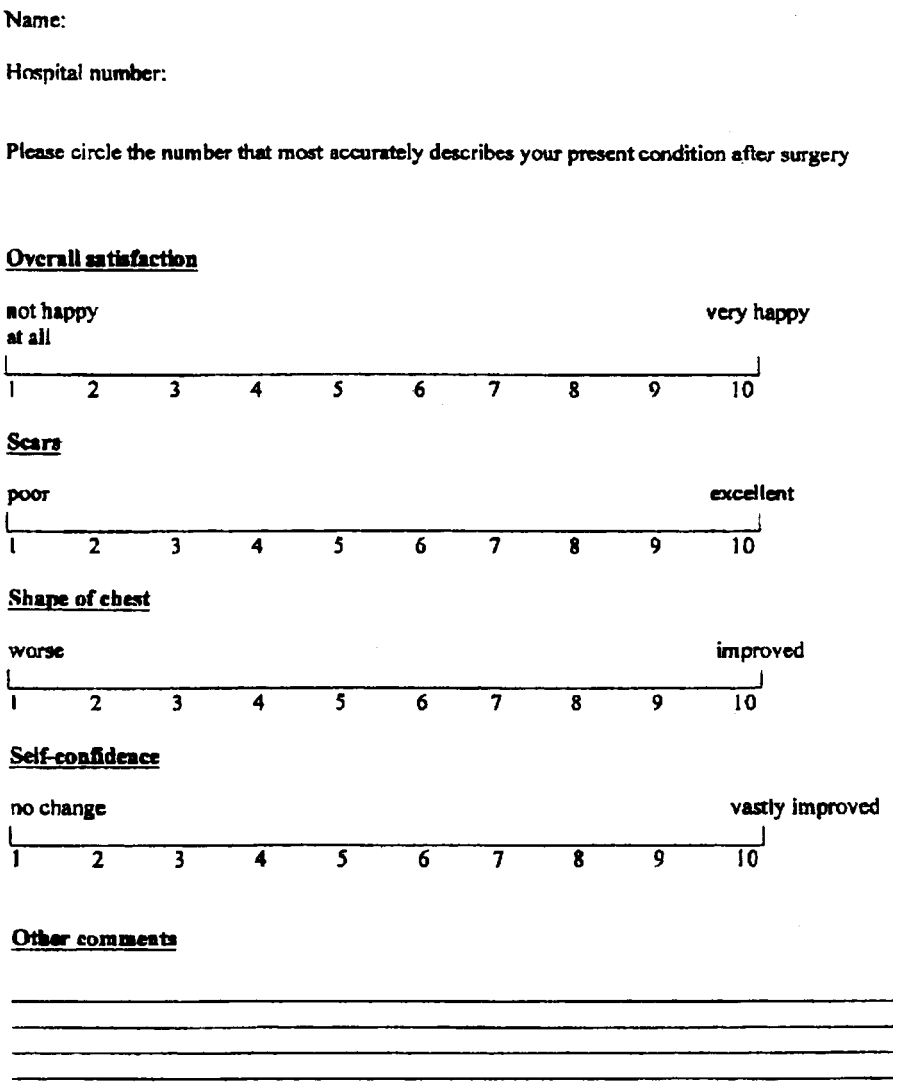

FIG. 2. Assessment sheet used for individual patient evaluation of cosmetic outcomes.

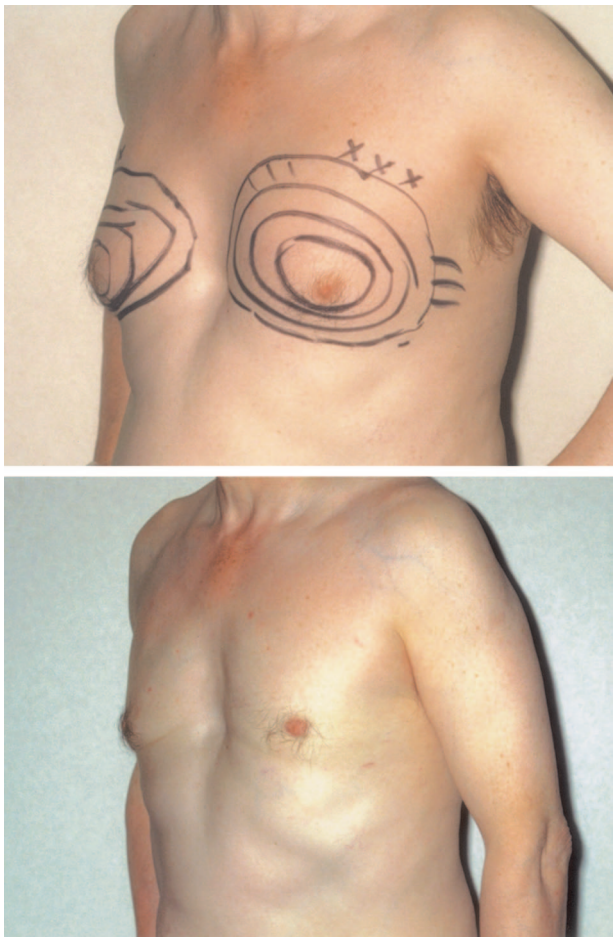

FIG. 3. (*Above*) Preoperative and (*below*) postoperative appearance of a 57-year-old man (patient no. 6 in Table I) treated with ultrasound-assisted liposuction. The small residual skin fold was not noticed by the patient.

contour), as he wanted a more radical result than what was initially achieved.

Ten of the 13 patients returned their assessment sheets. The average scores out of 10 for all but the improvement in self-confidence were greater than 9; overall satisfaction, 9.1[7–10]; scars, 9.2[8–10]; improvement of chest contour, 9.2[7–10]; and improvement in self-confidence, 8.9.[7–10] (Fig. 4).

Representative cases of the results in large (Fig. 5) and small breasts (Fig. 6) are illustrated.

DISCUSSION

Ultrasound-assisted liposuction is said to offer a number of advantages compared with other surgical techniques used in the treatment of gynecomastia and, thus, has been recommended as the preferred treatment of this condition.[2,4,17–19] Open excision is associated with a periareolar scar, which usually settles well postoperatively.[7] On occasion however, it can be unsightly if there is postoperative areolar retraction, scar widening, hypertrophy, or keloid formation.[20,21] Traditional or suction-assisted liposuction does not result in any obvious scars, but, since gynecomastia can have a firm fibrous consistency, additional open excision may be necessary in as many as 50 percent of patients treated with this modality.[7,8] None of the patients in the present ultrasound-assisted liposuction series required intraoperative conversion to open excision to achieve a satisfactory chest contour and breast consistency. Only one patient requested further surgery 6 months after ultrasound-assisted liposuction and initial satisfaction with his result.

In this series, there was a subjective observation of less bruising than in conventional liposuction.[7] This is consistent with the reports of others using ultrasound-assisted liposuction who have documented less bruising[5] and faster resolution of the little bruising that resulted. This finding, however, is not universal; others have found no significant difference in the amount of blood loss or postoperative ecchymosis when comparing ultrasound-assisted li-

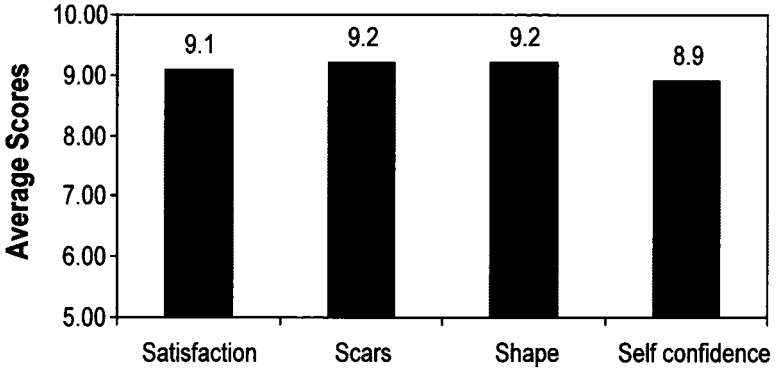

FIG. 4. Graph of the average scores given by patients for all categories on the self-assessment sheets.

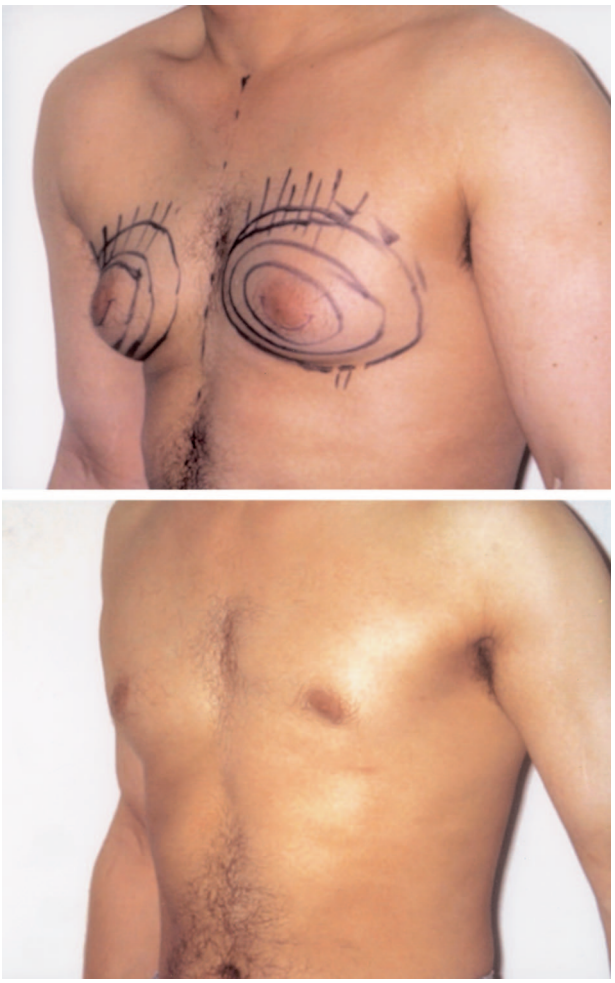

FIG. 5. Patient (no. 2 in Table I) with well-formed breasts (*above*) successfully treated with ultrasound-assisted liposuction. He was very happy with his resultant chest contour (score = 10) (*below*).

posuction with suction-assisted liposuction at other sites.[2,22]

Ultrasound-assisted liposuction promotes skin retraction,[1,18] an effect that is thought to be due to its effects on the dermis and on the subcutaneous fibrous septae. This stimulation of skin retraction by ultrasound-assisted liposuction is especially relevant for obese patients, those with large breasts (Fig. 5), or older patients (Fig. 3). The application of ultrasound energy superficially to enhance this effect is controversial, as it undoubtedly increases the risk of skin necrosis secondary to both direct thermal injury and damage to the subdermal vascular plexus.[2–4,15,17,23,24] In fact, Maxwell and Gingrass[3] were able to decrease their incidence of skin necrosis to 0 by abandoning superficial subdermal ultrasound-assisted liposuction. In our series, subdermal ultrasound application was avoided, as a rule, as it was believed that the degree of skin retraction achieved by adhering to deep and superficial, but not subdermal, ultrasound-assisted liposuction application techniques was adequate in most cases. The one exception was a patient with small gynecomastia who was primarily interested in noninvasive nipple areolar size reduction. Only one of the patients, the oldest patient in the series (age 57), had a residual skin-fold post treatment. He was assessed preoperatively as having moderate- to large-sized breasts and less skin elasticity compared with the younger patients (Fig. 3). He did exhibit some skin retraction, although this was not as vigorous as that seen in the younger patients. This did not, however, detract from his high satisfaction with the cosmetic outcome of his surgery. None of the patients required residual skin excision intraoperatively or subsequently.

Ultrasound-assisted liposuction offers the additional benefits of easier and possibly more accurate contouring, by virtue of the ease of movement of the probe.[5,6,15] The ultrasound energy emulsifies the fat at the tip of the probe and so probe excursion requires little effort on the surgeon's part.[3,4,25] This is in contrast to traditional liposuction, which requires significant physical exertion to achieve adequate lipectomy. Surgeon fatigue is probably not a significant factor when treating the small gynecomastia areas, but better control is always a desirable goal. In addition, the ultrasound-assisted liposuction tends to better feather the edges of the treatment area and is efficient at disrupting the inframammary fold if well formed. On the male chest, a sharp demarcation between treated and untreated areas or a defined inframammary fold detracts from the final result and should be avoided.[5] The ultrasound-assisted liposuction contouring was supplemented with small standard liposuction cannulae (sizes 4.6 mm and 3.7 mm) to further smooth the transition zone and to avoid the visible tunnels often seen with large cannulae. Contour irregularities, residual lumps, or skin dimpling were not present in any of the patients.

A byproduct of the ultrasound waves is heat; cutaneous burns in the form of superficial contact and deep internal burns are a potential complication.[4,6,15] A commercial plastic skin-protection port provided by Mentor and a wet towel interposed between the skin and the probe to avoid any inadvertent contact burns[15,18] were always used in all patients (Fig.

FIG. 6. This patient (no. 12 in Table I) with hypopituitarism had moderately firm, asymmetrical gynecomastia that required an additional superior-anterior, axillary fold incision to apply criss-crossing, ultrasound-assisted liposuction, and a high amplitude setting of 95 percent. (*Left*) Preoperative view. (*Right*) Postoperative view.

1). Additionally, avoidance of end-hits[2,4,6,18] and strict continuous movement of the probe[18,24] while energy was being applied formed part of the standard operative protocol. A probe sheath and continuous cold saline irrigation, which helps to cool the probe and sheath, also were used in every instance (Table III). None of the patients experienced complications of thermal burns or skin necrosis.

Ultrasound-assisted liposuction in a dry environment increases the risk of overlying skin necrosis.[4,24] In addition to cooling the probe, continuous irrigation reduces this danger by ensuring that the treatment area does not become 'dry' from the aspiration occurring during the ultrasound application phase. This is not a problem with the solid probes initially used for ultrasound-assisted liposuction.[26] However, with the hollow probes that have become standard, energy application and aspiration occurs simultaneously making irrigation vital to maintain the wet environment.[14] A comprehensive discussion of the various ultrasound technologies is beyond the scope of this paper. However, it should be mentioned that the Mentor Contour Genesis machine, similar to the Lysonix 2000 in the production of ultrasound energy, operates at a higher set frequency and lower maximum amplitude, and "may feel slightly less powerful in certain clinical settings."[27]

TABLE III
Safety Precautions Undertaken during the Treatment of Gynecomastia

Skin guard
UAL probe sheath
Irrigation
Wet towel interposed between probe and skin
Continuous probe movement
Avoidance of end-hits

Demyelination-type injury is a known side effect of ultrasound-assisted liposuction,[4,28,29] but the resultant paraesthesias have been found to be completely reversible. In the present small study, despite the almost universal complaint of breast numbness in the early postoperative period, none of the patients had residual paraesthesias at their 3-month check-up.

Although ultrasound-assisted liposuction can be attempted for all types of gynecomastia with variable results,[5,10] the present small but unselected series did not have any patients with hard subareolar discs or breast ptosis. It is recognized, therefore, that the findings of our study are only valid for diffuse gynecomastia

with soft to moderate consistency and estimated volumes of less than 500 ml.

CONCLUSIONS

In this series, good to excellent cosmetic results were obtained with consequent high patient-satisfaction rates, minimal demand for revisional surgery, and without intraoperative conversion to open excision. Ultrasound-assisted liposuction is, therefore, an effective treatment modality in gynecomastia patients with diffuse (homogenous) soft to moderately firm gynecomastia. The fat-emulsification process of ultrasound-assisted liposuction, rather than the avulsion of suction-assisted liposuction, means that relatively firm breasts, previously resistant to traditional liposuction, can now be treated without the need for open excision. Meticulous surgical technique and strict safety precautions are important in avoiding complications.

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