

# Endermologie After External Ultrasound-assisted Lipoplasty (EUAL) Versus EUAL Alone

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**Background:** Endermologie, despite its moderate success in the temporary reduction of the appearance of cellulite, has proven unsuccessful compared with lipoplasty for body contouring.

**Objective:** The purpose of this study was to determine whether a body contouring program combining Endermologie with lipoplasty would produce better long-term body contouring results than lipoplasty alone.

**Methods:** A prospective study comparing 2 closely matched, nonrandomized groups of 25 women each was conducted. Those in group 1 underwent external ultrasound-assisted lipoplasty (EUAL) to the superficial and deep subcutaneous areas of the flanks, hips, and thighs, followed in 10 days by a 20-week Endermologie course. Those in group 2 underwent only EUAL to the superficial and deep subcutaneous areas of the flanks, hips, and thighs. Patient evaluation preoperatively and 9 months postoperatively included standardized 35-mm photography; standardized circumferential body measurements of the waist, hips, thighs, knees, and calves; and body composition analysis. Patient satisfaction was assessed through the use of a questionnaire.

**Results:** No significant complications were noted in either group. The average volume of aspirate in the 2 groups was not significantly different (group 1, 2000 mL; group 2, 2100 mL), nor were the results of standard circumferential body measurements and body composition analysis. There was, however, a reduction in the rates of subsequent revisional surgery in the 2 groups (revision rates: group 1, 4%; group 2, 12%). The results of objective blind grading demonstrated no statistically significant difference ( $P = .30$ ) in body contouring between the 2 groups (group 1, 92% improvement; group 2, 87% improvement). However, a statistically significant ( $P < .005$ ) difference was noted for reduction in the appearance of cellulite between the 2 groups (group 1, 50% improvement; group 2, 0% improvement). Patient satisfaction was 96% in group 1 and 92% in group 2.

**Conclusions:** Endermologie after EUAL improves postoperative results with respect to reduction in the appearance of cellulite and reduces the rate of subsequent revision but demonstrates no significant improvement over EUAL alone with respect to body contour improvement.

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**E**ndermologie is a system of lifestyle alterations that includes dietary restriction, exercise, proper water intake, and a series of soft tissue massages with the ES-1 vacuum/roller device (LPG Systems, Valence, France). This system has been shown to be moderately successful at temporarily reducing the appearance of cellulite, but it does not produce body contouring results comparable to those associated with lipoplasty.<sup>1</sup> Lipoplasty has been generally considered the standard treatment for body contouring during the last 20 years, whether performed with traditional methods,<sup>2</sup> the tumescent technique,<sup>3</sup> or internal or external ultrasound assist.<sup>4-6</sup> Its role in cellulite reduction is limited. Most experienced surgeons avoid performing aggressive superficial liposculpture in areas of dense cellulite.<sup>7,8</sup> External ultrasound-assisted lipoplasty (EUAL) has been demonstrated to have neither a beneficial nor a detrimental effect on cellulite.<sup>1</sup>

In this study, we sought to determine whether patients whose treatment combined EUAL with a postoperative program of Endermologie demonstrated improved long-term body contouring results in comparison with patients who underwent EUAL alone.

## Materials and Methods

### Patients

This prospective study compared 2 nonrandomized groups of women, closely matched with respect to age, height, and weight (Table 1). Those in group 1 (N = 25) underwent EUAL to the superficial and deep subcutaneous areas of the flank, hips, and thighs, followed after 10 days by a full course of 20 weekly Endermologie treatments. Those in group 2 (N = 25) underwent EUAL alone to the superficial and deep subcutaneous areas of the flanks, hips, and thighs. Improvement in body contour and reduction of cellulite were the goals in both treatment groups.

### Operative procedures

All of the women in the study underwent EUAL treatment with the superwet technique under local standby anesthesia.<sup>9</sup> After local anesthetic was injected, the Silberg External Ultrasound Assist device (Wells Johnson Corp., Tucson, AZ) was used for 10 minutes per area at 30 W/cm<sup>2</sup> in continuous mode.<sup>4,5</sup> Superficial and deep subcutaneous layers of the flanks, hips, and thighs were treated. After treatment with EUAL, traditional 3- to 4-mm hollow Mercedes tip cannulas were used at a vacuum setting of 1 atm con-

tinuous to aspirate the emulsified fat. Lipoplasty in the hip and thigh region was circumferential. Additional sites treated in some patients included the abdomen (n = 32), knees (n = 30), and ankles (n = 3). The volume aspirated was taken to be equal to the amount of supernatant fluid after 15 minutes of settling.

All patients wore compression garments postoperatively for 2 weeks. Measurements were taken during the week before surgery and again at 9 months postoperatively. Proper diet, exercise, and appropriate water intake were strongly encouraged for both groups during the course of treatment.

### Endermologie treatment

All Endermologie treatments for the patients in group 1 were performed by the same registered nurse technician. Patients wore body stockings during all treatments. The Endermologie device used in this study was the ES-1 vacuum/roller device, which was operated in accordance with the manufacturer's recommendations. Power settings were gradually increased over the course of the treatments according to patient comfort level. The main areas of treatment were the trunk and lower extremities, especially the flanks, hips, and thighs.

### Evaluation

Methods of evaluation included standardized 35-mm photography, standardized circumferential body measurements, and body composition analysis. Body composition measurements included percent body fat, fat mass, total body water, lean body mass, body weight, and impedance. Measurements of body weight and mass were made in pounds. Body composition analysis was performed through use of a Tanita BFA-305 Bioelectrical Impedance Analyzer (Tanita Corporation of America, Skokie, IL).

Four physicians performed objective blind grading of the standardized 35-mm photographic results, focusing on body contour improvement and reduction in the appearance of cellulite. The graders were asked to rate improvement as 0%, 25%, 50%, 75%, or 100%.

Patient satisfaction was assessed through use of a questionnaire. Each patient was asked to provide a "yes" or "no" answer as to (1) whether she was pleased with the results, (2) whether she would do it again, and (3) whether she would recommend the treatment to her friends. Only those patients who gave affirmative answers to all 3 questions were assessed as satisfied.

**Table 1. Characteristics of the 2 treatment groups**

Characteristic	Value ( $\pm$ SD)		P value*
	Endermologie + EUAL (N = 25)	EUAL alone (N = 25)	
Mean age (y)	28.55 $\pm$ 6.25	29.02 $\pm$ 7.11	.76
Mean height (in)	65.63 $\pm$ 2.51	66.10 $\pm$ 2.73	.81
Mean weight (lb)	132.39 $\pm$ 12.45	129.89 $\pm$ 11.56	.68

\*Determined through the use of paired *t* tests.

**Table 2. Results of circumferential body measurements (in)**

	Mean change ( $\pm$ SD)*		P value†
	Endermologie + EUAL (N = 25)	EUAL alone (N = 25)	
Waist	-1.35 $\pm$ 0.33	-1.29 $\pm$ 0.30	.75
Hip	-1.82 $\pm$ 0.51	-1.75 $\pm$ 0.45	.80
Right thigh	-1.21 $\pm$ 0.29	-1.26 $\pm$ 0.31	.77
Left thigh	-1.18 $\pm$ 0.33	-1.27 $\pm$ 0.29	.81
Right knee	-0.45 $\pm$ 0.15	-0.43 $\pm$ 0.11	.78
Left knee	-0.47 $\pm$ 0.14	-0.41 $\pm$ 0.14	.75
Right calf	0.26 $\pm$ 0.08	-0.22 $\pm$ 0.05	.67
Left calf	0.28 $\pm$ 0.09	-0.25 $\pm$ 0.06	.68
Mean	-0.842	-0.831	.88

\*Results include measurements for all patients. Not all patients were treated in each area listed.

†Determined through the use of paired *t* tests.

Overall assessment of results was performed by analyzing the percentage of improvement noted from the objective blind photographic grading and the results of the patient questionnaire. Means and SDs were presented throughout this study. Student *t* tests at the level of  $P < .05$  were accepted for statistical significance. All statistics were analyzed and reviewed with the assistance of the New York Presbyterian Hospital Academic Computing Center.

### Results and Complications

The composition of the 2 study groups is presented in Table 1. The 2 groups were closely matched, and no statistically significant difference was found between them with respect to age, height, or weight. No significant complications were noted in either group. The average volume of aspirate in was 2.0 L in group 1 and 2.1 L in group 2, a statistically nonsignificant difference.

The results of the standardized circumferential body measurements for groups 1 and 2 are presented in Table 2.

No statistically significant difference was demonstrated between the 2 treatment groups. The results of the body composition analysis are shown in Table 3. Measurements of percentage body fat, fat mass, total body water, lean body mass, body weight, and impedance also demonstrated no statistically significant difference between the 2 groups.

Analyses of the objective blind photographic evaluation and patient satisfaction survey are presented in Table 4. The results of objective blind grading demonstrated a mean 92% improvement in body contouring in group 1 and a mean 87% improvement in group 2; this was found to be a statistically nonsignificant difference ( $P = .30$ ). The results of objective blind grading demonstrated a mean 50% improvement in the appearance of cellulite reduction in group 1 and a mean 0% improvement in group 2; this was found to be a statistically significant difference ( $P < .005$ ). A revisional "touch-up" contouring procedure performed with the patient under local anesthesia was required in only 4% of those in group 1 and

**Table 3. Results of body composition analysis**

	Mean change ( $\pm$ SD)		P value*
	Endermologie + EUAL (N = 25)	EUAL alone (N = 25)	
Body fat (%)	-2.2 $\pm$ 0.40	-2.1 $\pm$ 0.56	.76
Fat mass (lb)	-2.28 $\pm$ 0.51	-2.45 $\pm$ 0.61	.45
Total body water (lb)	+0.52 $\pm$ 0.15	+0.58 $\pm$ 0.12	.33
Lean body mass (lb)	-2.12 $\pm$ 0.56	-2.33 $\pm$ 0.65	.37
Body weight (lb)	-5.89 $\pm$ 1.78	-5.25 $\pm$ 1.56	.30
Impedance ( $\Omega$ )	-16.71 $\pm$ 4.90	-17.39 $\pm$ 5.01	.45

\*Determined through the use of paired *t* tests.

**Table 4. Results of objective blind photographing and patient satisfaction**

	Result ( $\pm$ SD)		P value*
	Endermologie + EUAL (N = 25)	EUAL alone (N = 25)	
Revisional surgery (%)	4	12	—
Cellulite reduction (%)	50 $\pm$ 16.9	0 $\pm$ 0.00	.001
Body contour improvement (%)	92 $\pm$ 3.5	87 $\pm$ 4.2	.32
Patient satisfaction (%)	96 $\pm$ 1.2	92 $\pm$ 2.3	.24

\*Determined through the use of paired *t* tests.

12% of those in group 2. Patient satisfaction was 96% in group 1 and 92% in group 2, a difference that is not statistically significant. Patients from each treatment group are illustrated in Figures 1 through 4.

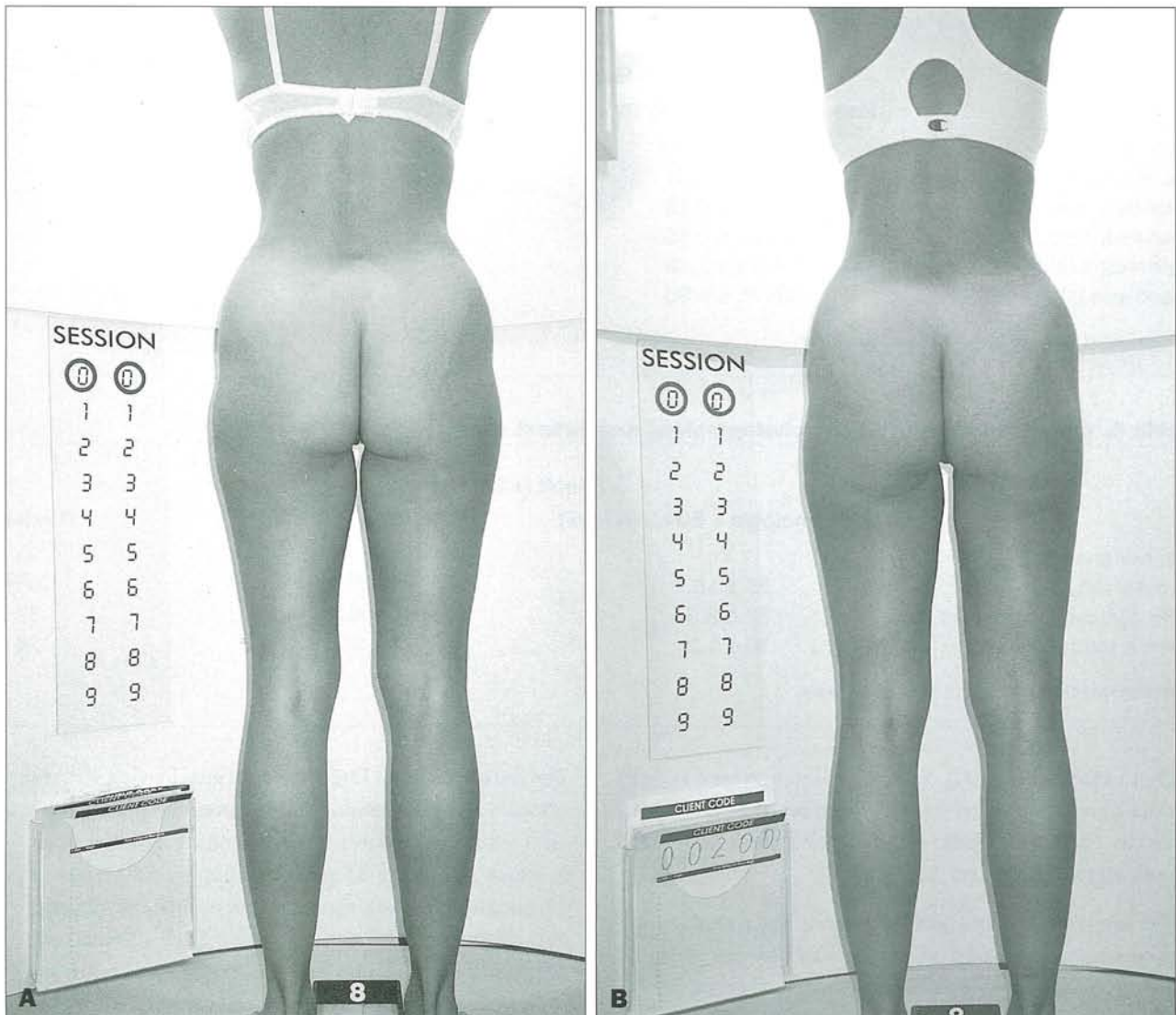
Concurrent weight loss of 5 lb or more was noted in all patients with dramatic body contour improvement (90%+). In these patients, EUAL alone aesthetically recontoured the body, while the concurrent weight loss enhanced the patient's "reduced" silhouette.

## Discussion

Body contouring surgery with suction-assisted lipoplasty has made tremendous strides in the past 2 decades with the addition of technologic advances and more sophisticated techniques.<sup>2-10</sup> Techniques that are adjunctive to suction-assisted lipectomy have been introduced sparsely and have advanced forward at a much slower pace. In 1991, Endermologie was introduced into the United States by LPG USA (Ft. Lauderdale, FL) as a noninvasive method for body contouring and temporary reduction in the appearance of cellulite. An unpublished Endermologie (LPG USA) study was used in recent years as evidence to persuade the US Food and Drug Administration to grant a license to Endermologie "as effective in the temporary reduction in the appearance of cellulite."

The effectiveness of Endermologie in achieving either non-invasive body contouring or improvement of cellulite has received mixed reviews.<sup>1,11-13</sup> In a study by Ersek et al<sup>11</sup> in which only 39 of 85 patients completed a 14-session, 45-minute treatment regimen (630 minutes in all), the authors came to the conclusion that Endermologie was only mildly effective for fat mobilization and body contouring and that its effects were maximized by weight loss. In a LaTrenta<sup>1</sup> study of 72 patients who underwent a 20-week, 40-minute treatment regimen (800 minutes in all), Endermologie was found by objective blind grading to produce a mean improvement of 25% in body contour that was largely proportional to weight loss. Every Endermologie patient who demonstrated significant improvement in body contour had a weight loss of greater than 7.5 lb. This study compared a closely matched, non-randomized group of Endermologie-treated patients with a group that underwent EUAL. It found that successfully treated Endermologie patients, unlike successfully treated EUAL patients, did not truly alter the basic contours of their bodies but rather reduced their body forms proportionally, as seen in patients who lose significant amounts of weight.

With respect to the treatment of cellulite, LaTrenta<sup>1</sup> found that a 50% reduction in the appearance of cellulite

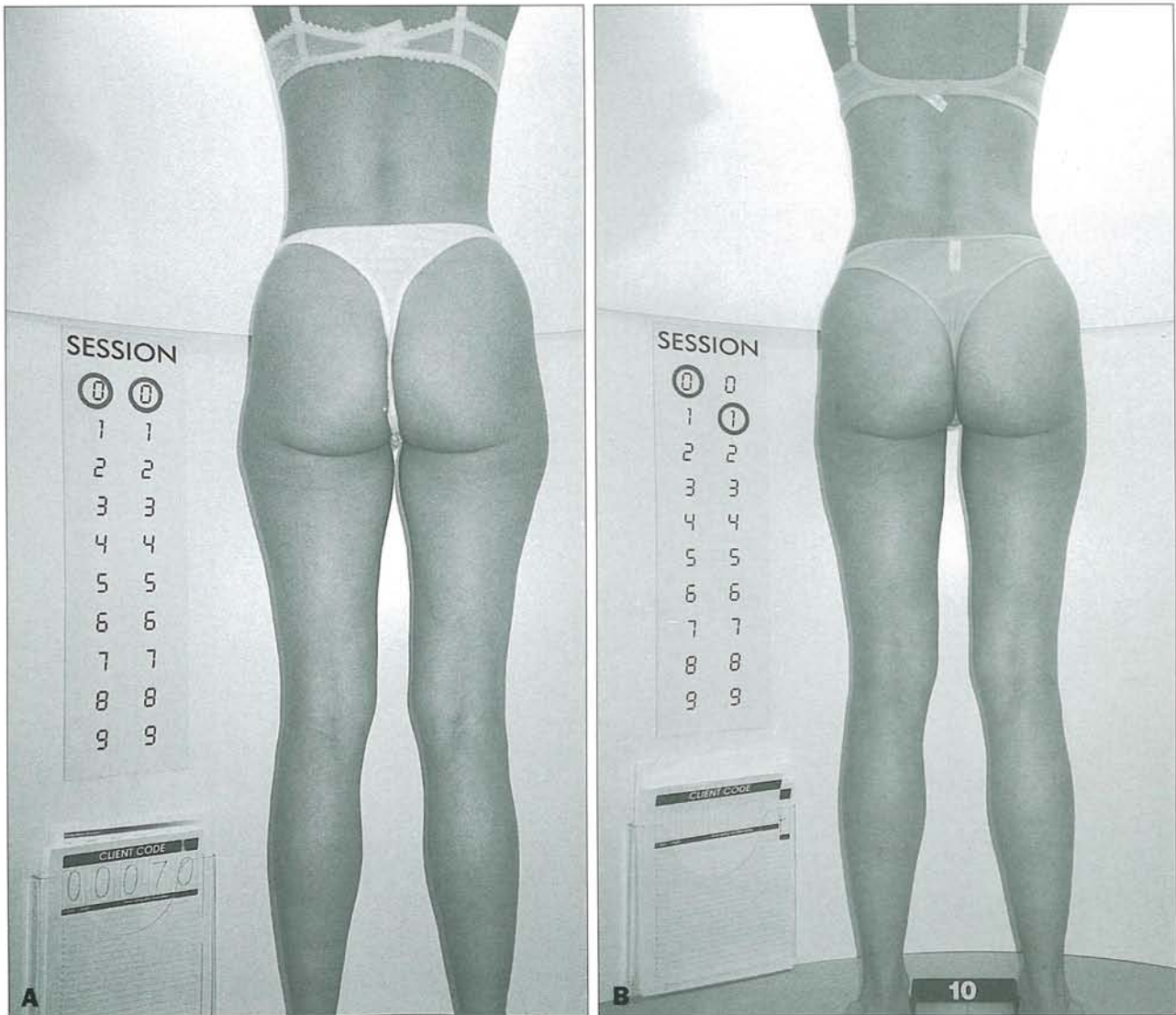


**Figure 1.** A group 1 patient who underwent average-volume EUAL and Endermologie. **A,** Pretreatment views of a 29-year-old woman who complained of bulges in the flanks, hips, and thighs. **B,** Posttreatment views 9 months after 2.2-L EUAL of flanks, hips, and thighs and a 20-week Endermologie course. She was judged to have a 90% improvement in body contouring with concurrent weight loss and a 50% improvement in the appearance of cellulite.

was achieved by patients who underwent a full 20-week, 40-minute regimen of Endermologie. Blind photographic grading of results by 4 physician observers was used in this study. However, among the patients who achieved body contour improvement with Endermologie, only those who underwent concurrent weight loss achieved a modest “softening” of cellulite (mean improvement of 50% by objective blind photographic grading). In randomized, controlled clinical trials, Collis et al<sup>13</sup> found that among 35 patients undergoing Endermologie treatments for 1 or both legs, the patients’ own evaluations of treatment efficacy indicated that only 10 of 35 treated legs (roughly 30%) had their cellulite appearance

improved by a 12-week, 20-minute regimen (240 minutes in all). The authors concluded that whatever improvement in cellulite appearance patients had derived from Endermologie probably resulted from the adjunctive exercise, dietary modification, and increased water intake that patients sustained during the treatments.

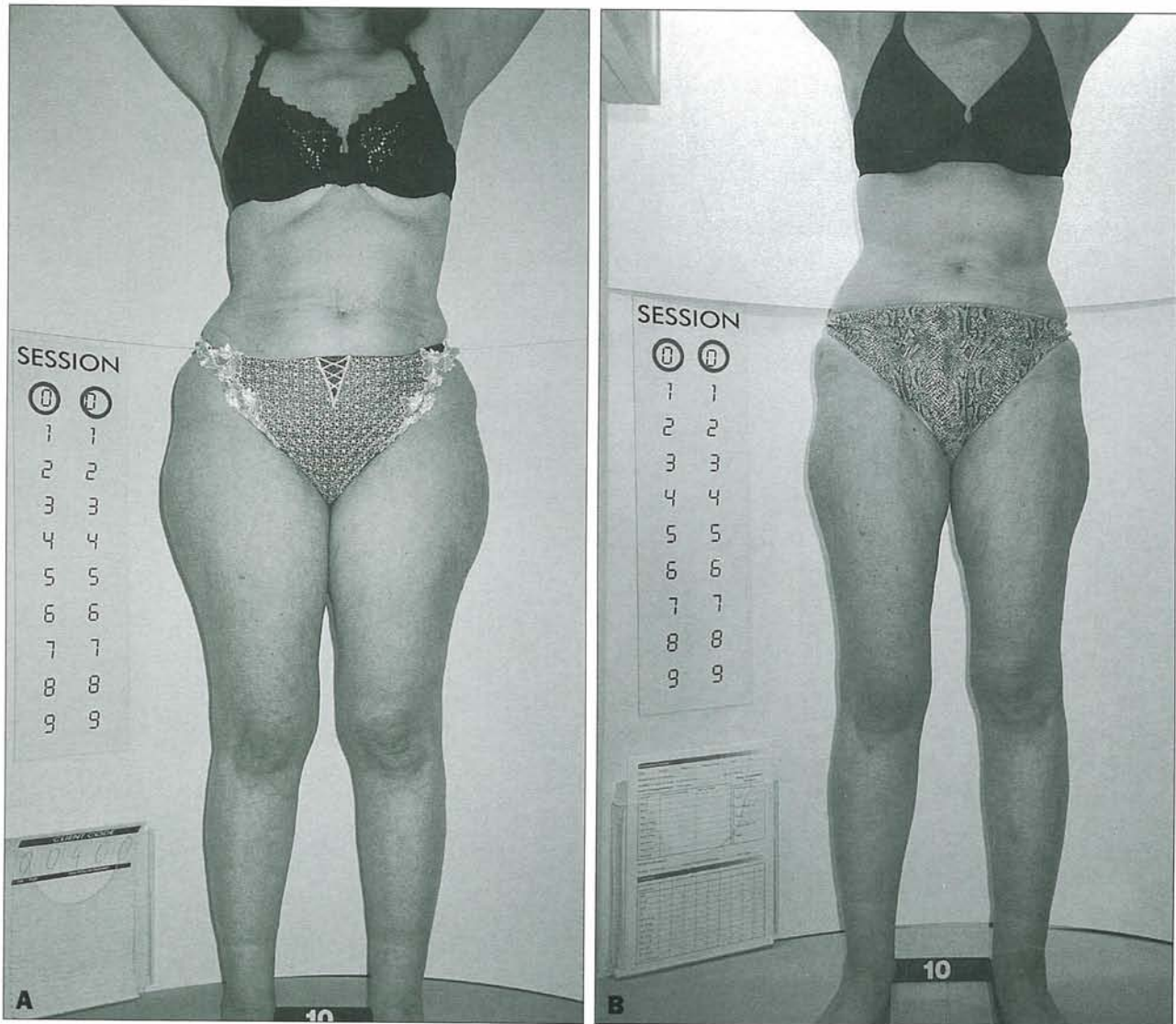
Although these studies have not found Endermologie to be in and of itself beneficial for producing long-term and lasting clinical results, a growing body of basic scientific research demonstrates that Endermologie produces profound physiological<sup>14</sup> and moderate anatomical<sup>15</sup> effects. A sustained improvement in cutaneous blood and lym-



**Figure 2.** A group 2 patient who underwent average-volume EUAL alone. **A,** Pretreatment views of a 30-year-old woman who complained of bulges in the flanks, hips, and thighs. **B,** Posttreatment views 9 months after 2.0-L EUAL of flanks, hips, and thighs. She was judged to have a 85% improvement in body contouring and a 0% improvement in the appearance of cellulite; she required a revisional "touch-up" procedure in the left hip.

phatic flow, as well as an accumulation of a dense longitudinal collagen band netting in the mid and deep subdermis with distortion and disruption of adipocyte membranes, has been demonstrated in porcine models.<sup>14,15</sup> Hence, if Endermologie works at all in improving the appearance of cellulite, its mechanism of action is in the production of a thicker, more perfused, and more hydrated subcutaneous layer.<sup>16</sup> This implies that improved clinical results would necessarily correlate with a sustained, maximized, and extended series of Endermologie massages in addition to patient weight loss, proper hydration, and nutrition. The twice-weekly, 10-minute Endermologie sessions continuing for 12

weeks (240 minutes in all) in the study by Collis et al<sup>13</sup> produced only minimal improvement (roughly 30%) in cellulite. The weekly 40-minute Endermologie sessions continuing for 20 weeks (800 minutes in all) in the LaTrenta<sup>1</sup> study produced only moderate improvement (50%) in cellulite appearance. Before Endermologie is relegated to the "recycle bin" as a treatment for cellulite, perhaps we should consider that the optimal Endermologie regimen for patients has not yet been determined. Further consideration is all the more appropriate given that several studies have shown that patients are highly satisfied by Endermologie.<sup>1,11,17</sup> Perhaps, as Dabb<sup>18</sup> has suggested, an optimized combination of improved nutri-

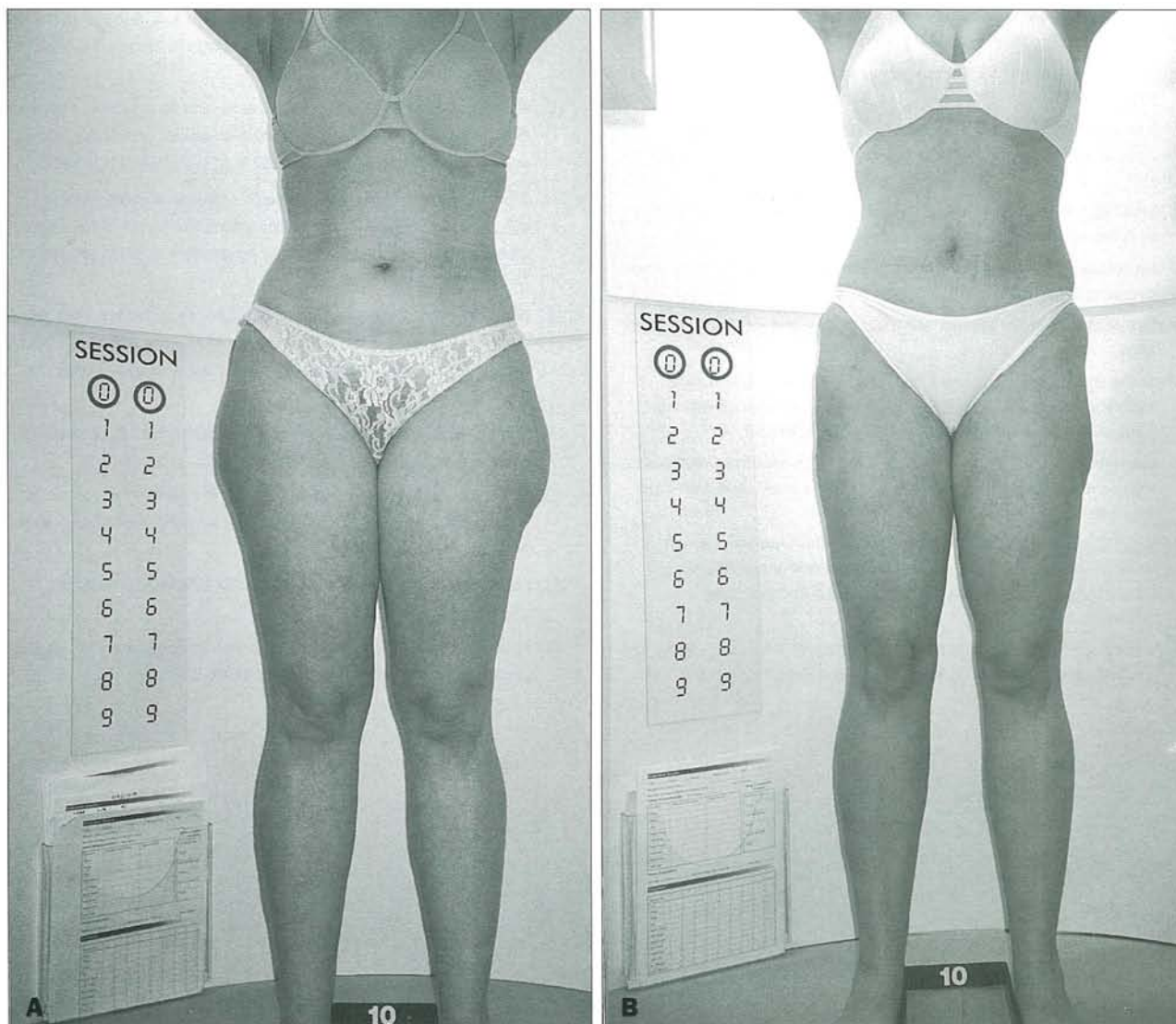


**Figure 3.** A group 1 patient who underwent large-volume EUAL and Endermologie. **A,** Pretreatment view of a 40-year-old woman who complained of bulges in the abdomen, flank, hips, thighs, and knees. **B,** Posttreatment view 9 months after 5.0-L EUAL of abdomen, flanks, hips, thighs, and knees and a 20-week Endermologie course. She was judged to have a 95% improvement in body contour with concurrent weight loss and a 25% improvement in the appearance of cellulite.

tion, sustained mechanical massage, and small-volume multiple lipoplasty procedures is a more logical alternative to the traditional methods of single-hit, high-volume lipoplasty to improve long-term "total" body contouring results. A prospective randomized controlled trial comparing Dabb's treatment regimen with more traditional methods of achieving improved body contour and cellulite reduction might be warranted.

Many aesthetic surgeons acknowledge that despite a shift to smaller-diameter cannulas and the extended wearing of pressure garments postoperatively, fine rippling, skin surface irregularities, and asymmetry continue to be nag-

ging postoperative problems after lipoplasty regardless of the type of body contouring used.<sup>19,20</sup> Fodor<sup>21</sup> was the first to recommend Endermologie as an adjunct to tumescent lipoplasty specifically to minimize the problem of postoperative skin surface irregularity. In a study of 143 patients who underwent intraoperative postlipoplasty Endermologie, Fodor and Watson<sup>22</sup> found that postoperative ecchymosis and swelling dissipated rapidly and that postlipoplasty surface irregularities were reduced in the long term. The authors noted that comparative contralateral studies were not performed and that their findings were subjective.



**Figure 4.** A group 2 patient who underwent large-volume EUAL alone. **A**, Pretreatment view of a 35-year-old woman who complained of bulges in the abdomen, flanks, hips, thighs, and knees. **B**, Posttreatment view 9 months after 4.9-L EUAL of abdomen, flanks, hips, thighs, and knees. She was judged to have a 90% improvement in body contour with concurrent weight loss and a 0% improvement in the appearance of cellulite; she required a revisional “touch-up” procedure in the left hip.

The present study suggests that a combined Endermologie/EUAL treatment regimen can improve both cellulite appearance and body contouring; however, the effect on body contouring is not significantly greater than that provided by EUAL alone. The reduced need for revisional “touch-up” procedures in the Endermologie/EUAL group (4%) versus the EUAL group (12%) hints that in some manner, a program of postoperative Endermologie can redistribute malpositioned, weakly adherent subcutaneous fat accumulations in the postlipoplasty patient and achieve a more pleasing contour. Ironically, perhaps the

best use for Endermologie to achieve improved body contouring is in the postlipoplasty patient. ■

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