

Noninvasive Mechanical Body Contouring: (Endermologie) A One-Year Clinical Outcome Study Update

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Abstract. LPG Endermologie is a machine-assisted massage system that allows positive pressure rolling, in conjunction with applied negative pressure to the skin and subcutaneous tissues (LPG Endermologie U.S.A. (800-222-3911)). Endermologie was originally developed in the late 1970s in France to soften scars and standardize physical therapy; however, patients treated with the LPG machine also showed improvement in body contour and skin texture. Since then, Endermologie machines have been used in France, the United States, and many other nations as an alternative method to altering fat distribution in the subcutaneous plane. The authors have continued their study of determining the safety and efficacy of this machine. Since our last report in March 1997 (Ersek RA et al., *Aesth. Plast. Surg.* 21(2):61–67, 1997), we have compiled records of 85 additional patients. With this larger patient pool, we can expect more statistically accurate results. This study is composed of 85 women between the ages of 21 to 61. The study group exhibited a wide range of body habitus, initial weights, and final results. Out of 85 patients, 46 patients completed seven sessions of treatment and showed a mean index reduction* in body circumference of 1.34 cm, while 39 patients who completed 14 sessions of treatments showed a mean index reduction in body circumference of 1.83 cm. A decrease in mean body circumference index was seen regardless of loss or gain in patients' weight in most cases.

Key words: Endermologie—Cellulite—Fat redistribution—Massage therapy

History

In the late 1970s, Louis Paul Guitay (LPG) suffered muscle and skin damage as a result of a motor vehicle accident. The scarring that resulted was treated by therapeutic massage to soften this tissue and restore muscle function. These massage sessions, which lasted 3–4 hours a day, consisted of rigorous routines of manually rolling the skin in order to regain elasticity. Guitay was unsatisfied with these massages because the therapy was time consuming, labor intensive, and the outcome varied widely based on the skill of the individual therapist. As a result, Guitay designed the Endermologie system, which used a mechanical method to produce the same effect as the manual massages. This mechanical system allowed the therapy to be performed quicker and in a more consistent fashion.

Soon after, these machines were used to treat trauma and burn scars similar to those suffered by Guitay. During this therapeutic use, physicians quickly noticed its ability to reduce the appearance of cellulite and alter fat distribution in patients. The manner which this is accomplished is theorized to be by the stretching of the vertical connective tissues and stimulation of lymphatic flow as a result of the extreme pressure difference and the rolling motion as dictated by the technique.

This positive pressure from rollers combined with the negative pressure from suction is believed to cause sublethal damage to the subcutaneous fat cells. As these damaged fat cells heal, they rebuild in such a way that results in an improved contour of the skin and better distribution of subcutaneous fat. Though the fat layer is altered, this mechanical force does not affect the overlying skin, bones, or muscles.

The cosmetic use of LPG Endermologie has been widespread in Europe, Japan, and South America for the past decade [4]. Recent approval of the system and the machine in the United States has allowed for the use of

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*See Materials and Methods for formulation of index.



Fig. 1. (A) Patient TE seen after the first session. (B) Patient TE seen after the 14th session. This patient's mean circumference loss was 4.62 cm, with a corresponding weight loss of 7.68 kg.

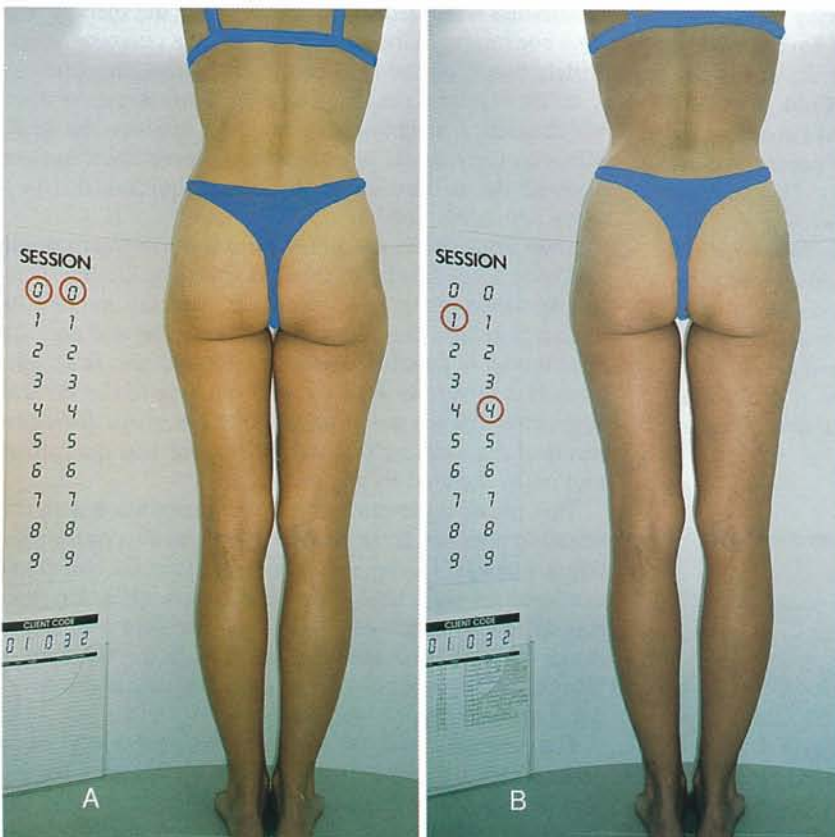


Fig. 2. (A) Patient FD seen before the first session. (B) Patient FD seen after the 14th session. This patient's mean circumference loss was 1.38 cm, with a corresponding weight loss of 0.45 kg.

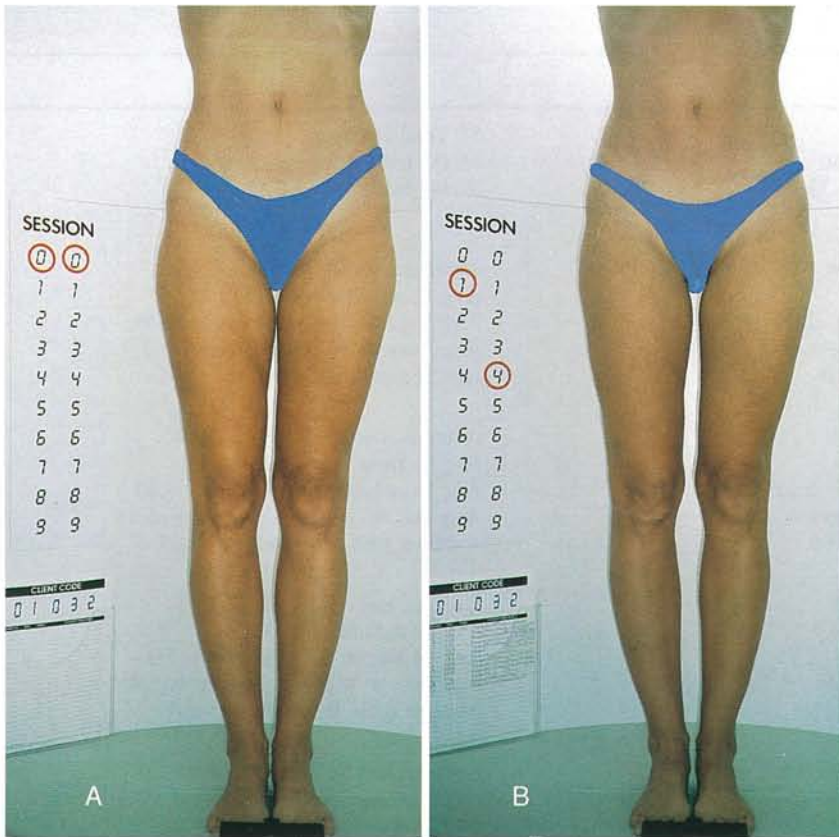


Fig. 3. (A) Patient FD (frontal view) seen before the first session. (B) Patient FD (frontal view) seen after the 14th session.

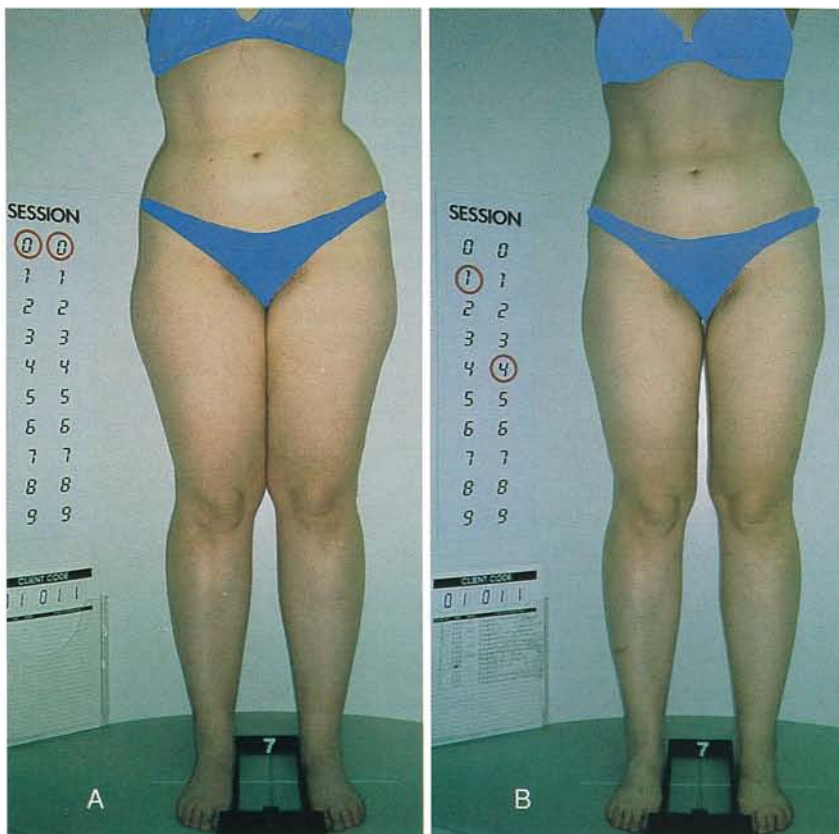


Fig. 4. (A) Patient FT seen before the first session. (B) Patient FT seen after 14th visit. This patient's mean circumference loss was 5.74 cm, with a corresponding weight loss of 6.37 kg.

Table 1. Summary of data collected from 85 patients in the past year. Average weight and circumference loss of each area as well as total body measurement calculations

LPG Endermologie	
Pt w/both measurement = 6	85 Total Patients
Pt w/only 7-wk measurement = 46	46 Pts treated for only 7 wk
Pt w/only 14-wk measurement = 33	39 Pts treated for 14 wk
Measurements	
Waist	
Average loss @ 7 wk = 1.34	Average loss @ 14 wk = 2.05
Avg % reduction = 1.67	Avg % reduction = 2.54
Avg % reduction – gainers = 2.74	Avg % reduction – gainers = 3.65
Average loss @ 7 wk – gainers = 2.21	Avg. loss @ 14 wk – gainers = 2.9
Average gain @ 7 wk = -1.9	Average gain @ 14 wk = -1.01
Hip	
Average loss @ 7 wk = 1.85	Average loss @ 14 wk = 3.19
Avg % reduction = 1.81	Avg % reduction = 2.96
Avg % reduction – gainers = 2.11	Avg % reduction – gainers = 3.62
Average loss @ 7 wk – gainers = 2.16	Avg loss @ 14 wk – gainers = 3.85
Average gain @ 7 wk = -1.86	Average gain @ 14 wk = -2.53
Thigh	
Average loss @ 7 wk = 1.19	Average loss @ 14 wk = 1.93
Avg % reduction = 1.9	Avg % reduction = 3.03
Avg % reduction – gainers = 2.71	Avg % reduction – gainers = 3.9
Average loss @ 7 wk – gainers = 1.66	Avg loss @ 14 wk – gainers = 2.44
Average gain @ 7 wk = -1.41	Average gain @ 14 wk = -2.5
Knee	
Average loss @ 7 wk = 0.97	Average loss @ 14 wk = 1.28
Avg % reduction = 2.36	Avg % reduction = 2.91
Avg % reduction – gainers = 3.03	Avg % reduction – gainers = 4.05
Average loss @ 7 wk – gainers = 1.24	Avg loss @ 14 wk – gainers = 1.72
Average gain @ 7 wk = -0.8	Average gain @ 14 wk = -1.54
Calf	
Average loss @ 7 wk = 0.58	Average loss @ 14 wk = 0.71
Avg % reduction = 1.55	Avg % reduction = 1.84
Avg % reduction – gainers = 1.94	Avg % reduction – gainers = 2.12
Average loss @ 7 wk – gainers = 0.73	Avg loss @ 14 wk – gainers = 0.82
Average gain @ 7 wk = -1.03	Average gain @ 14 wk = -0.49
Weight	
Average loss @ 7 wk = 0.99	Average loss @ 14 wk = 1.29
Avg % reduction = 1.5	Avg % reduction = 1.84
Avg % reduction – gainers = 2.87	Avg % reduction – gainers = 3.6
Average loss @ 7 wk – gainers = 1.84	Avg loss @ 14 wk – gainers = 2.41
Average gain @ 7 wk = -0.84	Average gain @ 14 wk = -1.11
Average age = 38.2	
At 7 wk	
Total mean body circumference loss = 1.19	
Average % Reduction = 1.86	
Avg % reduction – gainers = 2.51	
Total mean body circumference loss – gainers = 1.6	
Total mean body circumference gain = -1.4	
Median circumference loss = 1.29	
% of patient with gain in mean body circumference = 15.22 (7 out of 46)	
% of patient with gain in weight = 28.57 (12 out of 42)	
Average weight gain = 0.84	
Median weight loss = 0.68	

Table 1. Continued

At 14 wk

Total mean body circumference loss	= 1.83
Average % Reduction	= 2.66
Avg % reduction – gainers	= 3.47
Total mean body circumference loss – gainers	= 2.35
Total mean body circumference gain	= -1.61
Median circumference loss	= 1.38
% of patient with gain in mean body circumference	= 12.82 (5 out of 39)
% of patient with gain in weight	= 32.43 (12 out of 37)
Average weight gain	= 1.05
Median weight loss	= 0.9

All measurements are recorded using the metric system: circumference and weight are measured in centimeters (cm) and kilograms (kg).

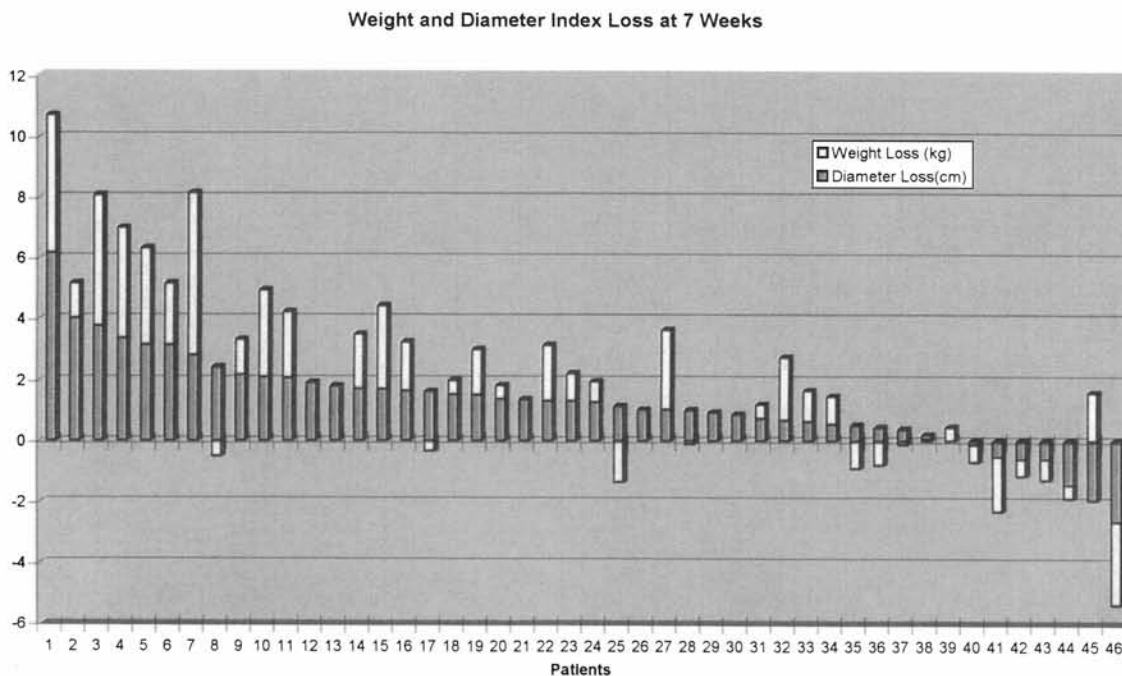


Fig. 5. This chart depicts the weight and circumference changes of the 46 patients after 7 LPG endermologie sessions. Negative values denote weight and circumference gain while positive values denote weight and circumference loss.

LPG Endermologie system in helping to reduce the appearance of cellulite and distribution of fat in the subcutaneous plane [5]. Other physicians have also found the Endermologie system to produce a measurable difference in circumference measurements regardless of weight change in the same time frame [2].

This body contouring system has also been used by others in conjunction with liposuction. This combination of techniques may help to shorten the recovery period of liposuction and allow the results of liposuction to be more predictable [6].

Materials and Means

Included in this report are 85 of our LPG Endermologie patients who fulfilled the requirements for the study. Of

the 85 patients, 46 underwent the treatment for 7 weeks, while 39 patients completed the entire 14-week treatment.

Each patient included in our study had 45-min LPG Endermologie sessions with a trained LPG technician. These treatments were conducted once or twice every 1–2 weeks. Treatments varied only in intensity of the negative pressure applied, which was determined by patient tolerance. We have included all of our patients who conformed to the protocol and had completed seven or 14 sessions (Figs. 1–4). Patients whose treatments were at irregular intervals or who did not complete at least seven sessions were not included.

Patients were encouraged to drink eight to ten glasses of water per day and to maintain a low-fat diet; however, no specific diet plans were recommended to our patients.

Table 2. Overall body circumference and body weight measurements of individual patients after seven consecutive sessions

Patients with only 7 treatment sessions		
Patients	Mean circumference loss	Corresponding weight loss
TJ	6.16	4.55
SC2	4.02	1.14
BH	3.75	4.32
HS	3.36	3.63
TC2	3.14	3.18
LS	3.12	2.04
SS1	2.8	5.34
PD	2.4	-0.51
MR2	2.17	1.14
ML	2.09	2.84
MC	2.06	2.16
WK	1.91	—
WL	1.8	0
HT	1.71	1.77
GA	1.69	2.73
MM	1.64	1.59
SC1	1.62	-0.34
BT	1.52	0.46
HM	1.51	1.48
HJ22	1.37	0.45
NB	1.35	—
TV	1.31	1.82
TC1	1.31	0.9
SS2	1.27	0.68
SD	1.13	-1.36
FC	1.02	—
RJ	1.02	2.61
MS1	1	-0.11
MA	0.93	—
HR	0.86	—
PC	0.73	0.46
RB	0.68	2.05
PK	0.63	1.02
AC	0.55	0.91
RA	0.51	-0.91
HB	0.44	-0.8
WB	0.38	-0.12
KD	0.08	0.11
PJ	0	0.45
SE	-0.13	-0.57
SM1	-0.51	-1.81
LL	-0.59	-0.57
MS2	-0.6	-0.69
RP	-1.44	-0.45
BM	-1.94	1.59
WV	-2.65	-2.73

Before the initial LPG treatment, patients were weighed and circumference measurements were taken of the patient’s waist, hips, thighs, knees, and calves. Identical weight and circumference measurements were collected at the seventh and the 14th visit.

The circumference losses of each of the locations were

Table 3. Overall body circumference and body weight measurements of individual patients after 14 consecutive sessions

Patients with 14 treatment sessions		
Patients	Mean circumference loss	Corresponding weight loss
SS3	11.37	10.91
KP	7.33	—
FT	5.74	6.37
TE	4.62	7.68
RM	3.27	0.69
WM	3.1	3.64
QL	3.02	-1.14
JA	2.7	-0.46
SM2	2.43	2.72
RT	2.37	8.98
MD2	2.37	1.59
OL	2.32	1.48
AA	2.13	1.25
HL	1.75	0.11
RL	1.75	2.16
BJ2	1.61	1.36
HJ1	1.53	1.37
LD	1.48	1.37
FW	1.41	2.5
FD	1.38	0.45
MR1	1.31	-0.34
WR	1.3	1.14
MD1	1.29	1.36
WJ	1.28	-0.8
SM3	1.28	0.11
BL	1.13	1.59
FM	1.1	0.29
LC	0.98	0.34
SC3	0.9	-0.06
WA	0.89	-0.23
LP	0.64	—
HC	0.54	-1.6
MR3	0.53	0.68
FS	0.01	-0.23
PM2	-0.52	-0.57
PM1	-0.73	-0.57
KT	-1.22	0
BJ1	-1.71	-2.72
WD	-2.43	-3.86

calculated by taking the difference between the initial circumference and the same measurement taken after seven and 14th sessions. This data is then compiled into a mean body circumference loss by taking the average of the difference at each of the five locations. All measurements were included in the calculations regardless of whether the patient exhibited a positive (loss), negative (gain), or zero (neither loss nor gain) change in circumference.

Two index categories were established. The first index represents the mean body circumference loss of 46 patients who had undergone seven sessions as well as six patients who completed all 14 sessions and had recorded results after the seventh session (33 patients did not have

Weight and Diameter Loss at 14 weeks

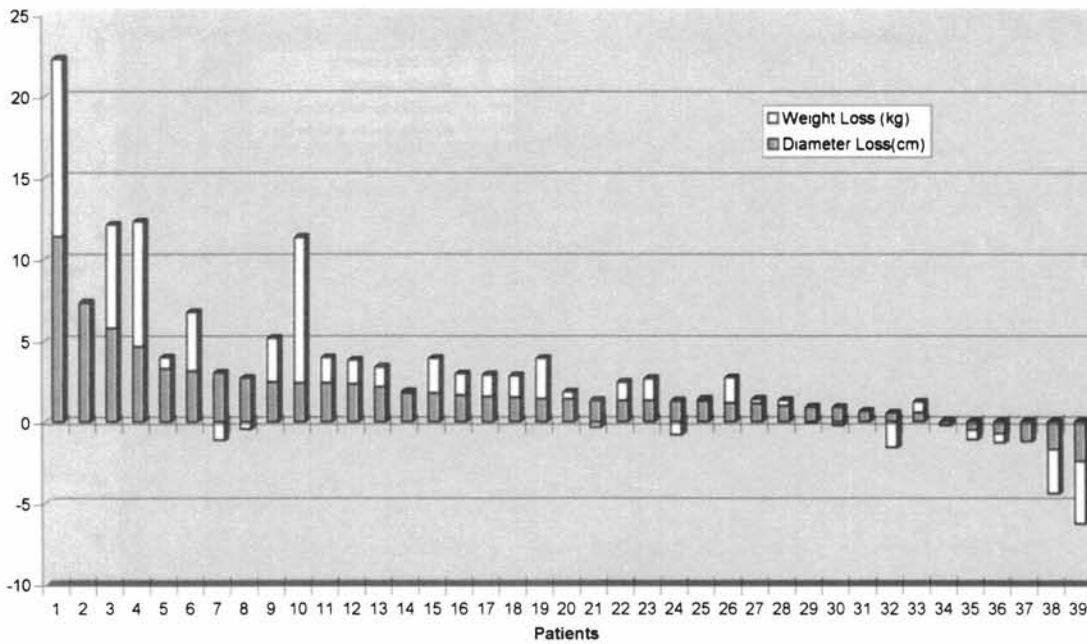


Fig. 6. This chart depicts the weight and circumference changes of the 33 patients after 14 endermologie sessions. Negative values denote weight and circumference gain while positive values denote weight and circumference loss.

recorded results at the seven session mark). The second index represents the mean body circumference loss of 39 patients who had completed all 14 sessions. These two indices indicate the average loss or gain in body circumference of the patients represented in this study.

Two other index categories were established to track the weight fluctuation in the same manner as for the body circumference. The first mean index was established by taking the average weight loss between the first and seventh session of 41 patients who had undergone only seven sessions (weights of five patients were not recorded). The second mean index was established by taking the average weight loss of the 37 patients who had completed all 14 sessions (weights of two patients were not recorded).

Results

From these analyses (Table 1), we discovered that after seven consecutive sessions, patients showed an overall decrease in body circumference and body weight (Fig. 5, Table 2). Patients lost an average of 1.34 cm from each location (a 2.17% reduction). More specifically patients lost an average of 1.34 cm from the waist, 1.85 cm from the hip, 1.95 cm from the thigh, 0.97 cm from the knee, and 0.58 cm from the calf. However, 7 out of these 46 patients (15.22%) had gains in their mean body circumference with a mean body circumference gain of 1.4 cm. If we do not include the patients with gains in our analysis, the mean body circumference loss of our patients was 1.78 cm (2.88% reduction). The median circumference

loss was 1.29 cm. Within this same period of time, our patients lost an average of 0.99 kg (a 1.5% reduction). However, 12 out of 42 patients (28.57%) reported an average gain in weight of 0.84 kg. Excluding patients with weight gains, the average weight loss was 1.84 kg. The median weight loss was 0.68 kg. 50% of patients who gained weight still showed a loss in mean body circumference.

After 14 consecutive sessions, we again discover an overall decrease in body circumference and body weight (Fig. 6, Table 3). Patients lost an average of 1.83 cm from each location (a 2.65% reduction). The 39 patients lost an average of 2.05 cm from the waist, 3.19 cm from the hip, 1.93 cm from the thigh, 1.28 cm from the knee, and 0.71 cm from the calf. Of these 39 patients, five (12.82%) averaged circumference gains of 1.61 cm. If the gains are not included in our calculations, then the mean body circumference loss is 2.35 cm (3.47% reduction). The median circumference loss was 1.38 cm. After 14 sessions, our patients report an average weight loss of 1.29 kg (a 1.84% reduction). If we exclude the 12 out of 37 patients (32.43%) who gained weight, then the average weight loss was 2.41 kg. The median weight loss was 0.90 kg. Of the patients who gained weight (75%), those still showed a loss in mean body circumference.

Discussion

Our studies indicate that there is a general correlation between body circumference loss and weight loss for patients who completed seven and 14 sessions (Figs. 7,

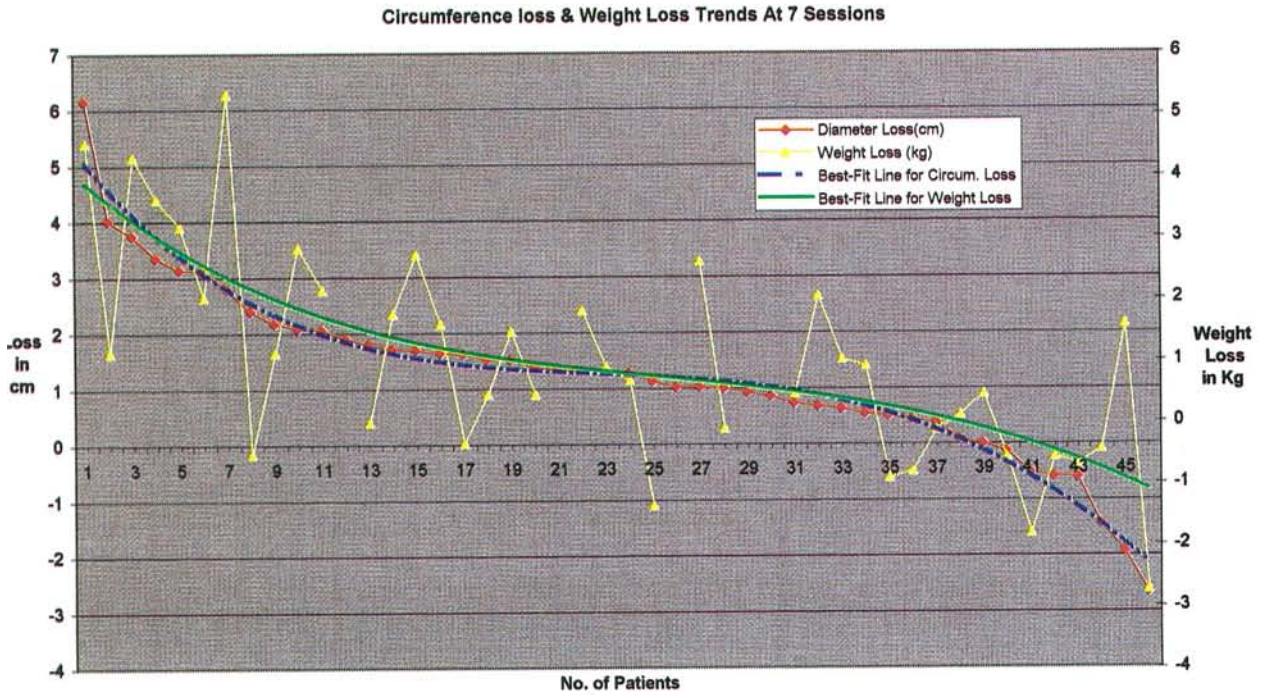


Fig. 7. This chart shows the general correlation between body circumference loss and weight loss for the 46 patients who underwent 7 endermologie sessions. The solid and dotted trend lines are 4th order best-fit lines based on data points plotted from weight and circumference loss of each patient.

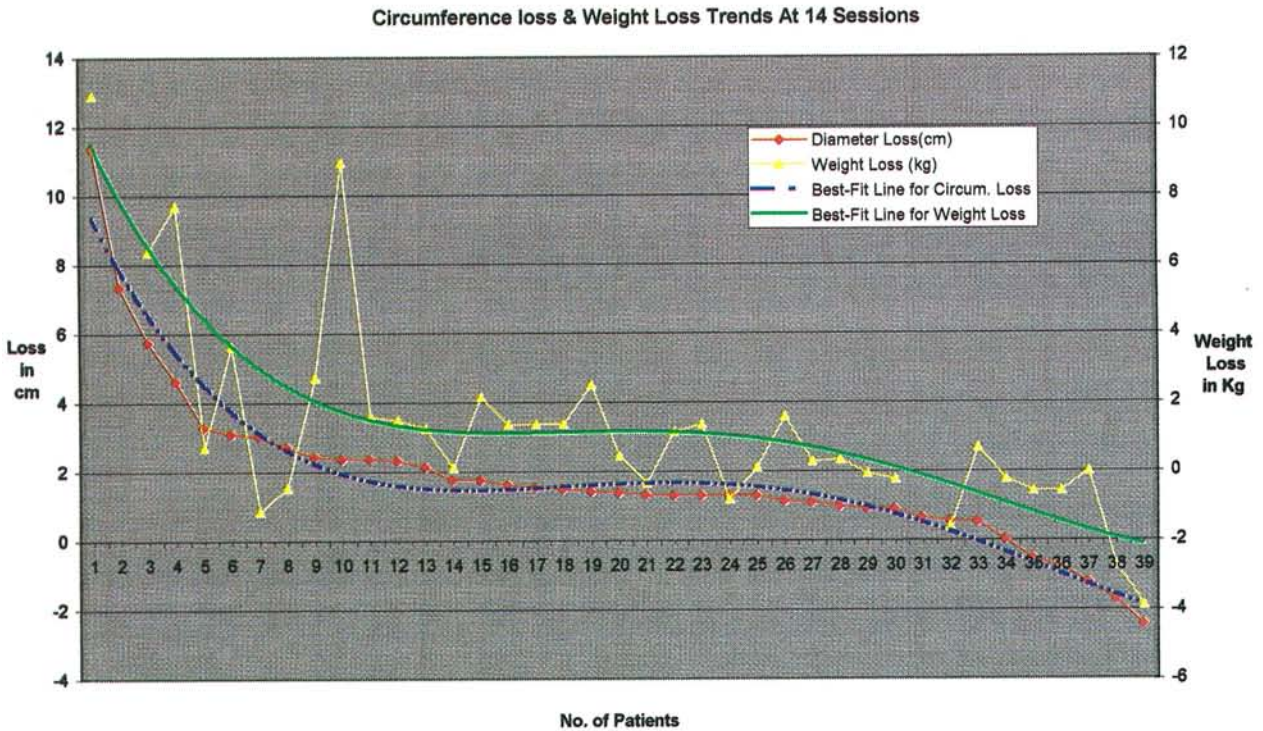


Fig. 8. This chart shows the general correlation between body circumference loss and weight loss for the 39 patients who underwent 14 Endermologie sessions. The solid and dotted trend lines are 4th order best-fit lines based on data points plotted from weight and circumference loss of each patient.

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8). Fourth order best-fit curves were plotted using Microsoft Excel 97 based on data from weight loss and circumference loss after the seventh and 14th session using the least-squares method. From these charts we can see that the best-fit curves for weight loss and circumference loss are nearly parallel indicating that weight loss and circumference loss are very closely interrelated. However, as our results indicated, 50% of our patients who gained weight still showed a loss in mean body circumference at seven weeks, and 75% of patients who gained weight after 14 weeks also showed a loss in mean body circumference. The same can be also seen graphically in charts 1 and 2. This suggests that with the Endermologie system, body circumference loss can be accomplished without body weight loss; although most circumference losses accompany weight losses.

Even though 12.82% of our patients gained mean body circumference after 14 sessions, 75% of those who gained body circumference still were evaluated to have attained "good improvement" on their goal of treatment of either eliminating cellulite or localized bulges. Some of the patients who gained weight were treated over the holiday season and admitted that they developed bad eating habits during this same time period. Patients who have shown the greatest improvement with the Endermologie system were either participating in a diet program and/or exercise regime.

Conclusion

From these observations, we conclude that the LPG Endermologie system is an effective method for fat mobilization and body contouring. Nearly all of our patients who have undergone this procedure wished to eliminate

cellulite or localized bulge and 90% reported favorable improvements in those areas.

Although no specific diet program was recommended to our patients, it can be seen that there is a connection between body circumference reduction and weight loss. Thus, Endermologie should be advocated along with proper diet and exercise management to the patients in order to reap the maximum benefit.

The results from our study vary widely, but significant measurement loss was seen in most cases regardless of weight change. With this greater patient pool, our results are more statistically significant and more reliable than before. However, these results should still be regarded as preliminary figures and we encourage our colleges to develop a double-blind protocol in a controlled setting to better understand the effects and mechanism of action of this method.

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