

Large-Volume Circumferential Liposuction with Tumescent Technique: A Sure and Viable Procedure

[Cosmetic Special Topic]

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Abstract [TOP](#)

During a 4-year period, 152 female and 9 male patients underwent large-volume liposuction, with ages ranging from 19 to 65 years (mean of 36 years), with a weight previous to surgery between 57 and 126 kg (mean of 72 kg). Tumescent liposuction was done simultaneously by two surgeons in several corporal areas according to the necessities of each case. In 28 patients (17 percent), 500 ml of whole blood was required previous to the surgery by self donation. By means of liposuction, volumes between 5 and 22.3 liters (mean of 8.7 liters) were obtained with an average relation of 860 cc of fat for 140 cc of liquid. The reduction of hemoglobin and hematocrit at 1 week after surgery was of 3.8 g and 12 percent, respectively. The weight after surgery during the patient's follow-up varied from 54 to 111 kg, with an average of 66 kg. Major complications were not presented. Minor complications consisted of two superficial cutaneous necroses (1.2 percent) and 18 seromas (11.2 percent), which were drained without leaving sequelae; 24 patients (14.9 percent) presented postsurgical palpable irregularities, visible in only 8 patients (5 percent); 148 patients (92 percent) expressed important satisfaction with the results of the surgery, with the remaining 13 (8 percent) expressing some disagreement due to persistent irregularities. These complications had a direct relationship to some factors of the surgical technique and some characteristics of the patients. The amount of fat liposuctioned, the ideal height-weight relationship of the patient, the diameter of the cannulas used, and the experience acquired during the time were the most important factors that were associated with the complications. Based on these results, we concluded that large-volume circumferential liposuction with tumescent technique is a viable and sure alternative to achieve improvement of the body contour and weight loss.

Liposuction is one of the techniques of aesthetic surgery that is very gratifying to the doctor and the patient. Its utilization has

revolutionized in an important way a great diversity of surgical techniques, because liposuction by itself has undergone multiple modifications. It has evolved rapidly from the dry technique described by Schrudde,¹ to the wet and superwet techniques advocated by Illouz and Fodor,^{2,3} up to the tumescent technique reported by Klein.⁴ Recently, the use of internal or external ultrasonic energy has been high-lighted to facilitate the extraction of fat.⁵ Undoubtedly, one of the most important advances in the techniques is the infiltration of large volumes of fluid into the fatty tissue to suction significant quantities of fat with minimum bleeding.^{3,6,7} Besides reducing bleeding, this technique has demonstrated multiple benefits.⁸⁻¹³ In this study, we present our experience of large-volume liposuction utilizing tumescent infiltration.

Although there are scientific works and clinical reports of large-volume liposuction, there are still doubts about the benefits of this type of procedure. In the same way, there are few clinical reports of large series of patients with liposuction greater than 5 liters. Likewise, there are no clinical reports of large-volume tumescent liposuction done simultaneously by two surgeons. So in this study, we present our experience with this technique done in several corporal areas according to the necessities of each case.

Patients and Methods [TOP](#)

During a period of 4 years, from July of 1994 to June of 1998, liposuction was carried out in 161 patients (152 female and 9 male). In all patients, 5 liters or more was suctioned. Weight previous to surgery varied from 57 to 126 kg, with a mean of 72 kg, and with ages between 19 and 65 years, with a mean of 36 years. According to the ideal height-weight relationship of Thorn and Cahill,¹⁴ 72 patients (45 percent) were between 10 and 25 percent overweight, 29 (18 percent) were between 26 and 50 percent overweight, and 5 (3 percent) were more than 50 percent overweight ([Table I](#)). All the patients underwent laboratory analysis previous to surgery, including hemoglobin; hematocrit; prothrombin time; thromboplastin partial time; glucose, urea, and creatinine serum levels; and urinalysis. In those patients older than 45 years or with extensive medical histories, a complete medical evaluation was carried out before surgery by an internal medicine doctor, including a resting EKG. Additional procedures were done in 89 patients, which are indicated in [Table II](#). In all the patients,

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liposuction was carried out in a circumferential form in the abdomen, flanks, and lumbosacral region; adding liposuction in the trochanteric region, lower and upper scapular regions, medial thighs, arms, and neck according to the necessities of each patient. Some patients are presented in [Figures 1 through 6](#).

Age	Sex	Weight	Height	Volume	Procedure	Follow-up
24	F	70	160	5.5	Liposuction	1 year
31	F	65	155	9.2	Liposuction	2 years
32	F	75	165	11.4	Liposuction	3 years
27	F	80	170	12.6	Liposuction and Mammary implants	3 months

TABLE I Characteristics of Treated Patients

Procedure	No. of Patients
Backpack fat infiltration	96
Mammary implants	32
Mastopexy and mammary implants	19
Breast reduction	7
Mesotherapy	5

TABLE II Additional Procedures Done in Conjunction with the Liposuction



Fig. 1. Patient 1: a 24-year-old woman before and 1 year after removal of 5.5 liters of fat. Liposuction was done in the abdomen and inferior lumbar regions, hips, and medial thighs. She had a predisposition to the formation of hypertrophic scars, which developed in the anterior abdomen and lumbar regions.



Fig. 2. Patient 2: a 31-year-old woman who had had two pregnancies, before and 2 years after surgery with liposuction of 9.2 liters. She underwent circumferential thoracoabdominal liposuction in the trochanteric, hips, and medial thigh regions.

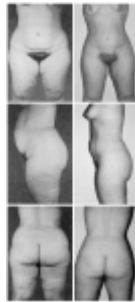


Fig. 3. Patient 3: a 32-year-old woman before liposuction and after 3 years of follow-up. The patient had had three pregnancies and underwent extraction of 11.4 liters. The liposuction was done in a circumferential form in the thoracoabdominal areas. She also had liposuction in the trochanteric region and in the medial, anterior, and posterior thighs.



Fig. 4. Patient 4: a 27-year-old woman before and 3 months after surgery. She had a previous abdominoplasty carried out by another surgeon. She underwent liposuction with extraction of 12.6 liters and placement of mammary implants in the same surgical time. The liposuction was done in a circumferential form in the thoracoabdominal areas and in usual form in the trochanteric region and in the medial, anterior, and posterior thighs. Hyperpigmented scars appeared 3 months postoperatively.



Fig. 5. Patient 5: a 24-year-old woman before surgery and after 2 weeks of follow-up showing some edema, ecchymosis, and hyperpigmented scars. A previous abdominoplasty was carried out by another surgeon. Liposuction with extraction of 15.2 liters was done in a circumferential form in the thoracoabdominal areas and in usual form in the trochanteric region and in the medial, anterior, and posterior thighs.



Fig. 6. Patient 6: a 19-year-old woman shown before and 8 months after surgery. Circumferential thoracoabdominal liposuction was performed with extraction of 22 liters. She also underwent thigh liposuction, including the anterior, medial, and posterior areas, and liposuction of the neck and arms.

Surgical Technique ^{TOP}

All patients received prophylaxis 6 hours before surgery with 1 g of cephalexin, continuing for 24 hours after the procedure. In the immediate preoperative period, a single dose of 1 g of hydrocortisone was given; 141 patients (88 percent) were operated on under regional anesthesia with a peridural blockade with lidocaine; the remaining patients were handled with inhaled general anesthesia. The areas to be liposuctioned were marked before the surgery with the patient standing up. Those patients whose calculated suction was more than 8 liters were monitored with a urinary catheter. In all patients, circumferential liposuction was done in the thoracoabdominal region, including the abdomen, flanks, and lumbosacral and lower scapular regions. Liposuction was added in the usual form in the arms, trochanters, medial thighs, and neck when it was suitable. Liposuction was carried out after preparation of the area with tumescent technique, infiltrating 1 liter of 0.9% saline solution + 1 mg of adrenaline. The volume of injected fluid was proportional to the volume calculated to be extracted by means of the liposuction. With the patient in ventral decubitus, liposuction was carried out in all the posterior regions of the body, including the flanks and lumbosacral regions. In the same manner, liposuction was carried out in the medial thighs, trochanters, and lower and higher scapular regions when this was suitable. Subsequently, the patient was rotated to a dorsal decubitus position to continue the liposuction in the anterior regions of the body, including the entire abdomen and flanks, carrying out liposuction in the trochanteric region, medial thighs, neck, and arms when it was necessary. Two surgeons simultaneously carried out the liposuction with two Cosmetech aspirating machines, model SSB-IV (Cosmetech, Alpino, Calif.). The two surgeons performed the liposuction in all the areas in an alternating manner. The surgery was done with one surgeon in front of the other to obtain the intercrossing of tunnels in all the regions treated. The principal surgeon guided the operation and decided which areas required more or less extraction of fat, determining in the same manner the ending of liposuction in each zone. Initially, liposuction was done in deep planes utilizing Mercedes cannulas of 5 and 4 mm in diameter, finishing and regularizing the area in a superficial plane with Mercedes cannulas of 3 mm in diameter. Now the liposuction is done utilizing only 4-, 3-, and 2-mm cannulas. The percentage of areas with liposuction in all the patients is indicated in [Table III](#). Drainage was used for the posterior and anterior thoracoabdominal regions for a period of 5 to 7 days, placing them in the intergluteal incision and in the pubic region, respectively. Additional surgical procedures were carried out after liposuction. The handling to replace intravenous fluids was carried out basically with crystalloid solutions. This replacement consisted in administering an average of 300 cc of intravenous fluids for each liter of aspirated material, making minimal adjustments according to the amount of bleeding calculated in the aspirated fluid. The determination of liquid administration was done while continuously considering permissible blood loss on the basis of appropriate formulas. Usually, the extraction of the first 6 to 7 liters did not have a greater percentage of blood than 10 percent of the aspirated material, so the reposition was with 300 cc of crystalloids for every liter aspirated. This includes the basal requirements for insensible water loss. After the 7th to 8th liter liposuctioned, the volume of blood was greater, augmenting the amount of crystalloids administered considering the urinary volume. In those patients for whom it was planned to suction more than 10 liters, a single unit of whole blood was administered in the postoperative period. This blood unit was obtained in the majority of the cases 10 to 15 days before the surgery by means of self blood donation. The peridural catheter was left 12 hours after surgery for analgesia. Mobilization out of bed was indicated the first day and hospital discharge 24 to 36 hours after surgery. All the patients were managed with an elastic garment for 6 weeks after surgery. Also, therapeutic massages and/or ultrasonic therapy were indicated for 2 weeks in the liposuctioned areas.

Liposuctioned Area	Patients	%
Abdomen	301	100
Flanks	301	100
Lumbosacral	301	100
Lower scapular region	127	79
Trochanters	92	57
Medial thighs	61	38
Upper scapular region	41	26
Neck	28	17
Arms	18	11

TABLE III Quantity and Percentage of Liposuctioned Areas

Results [TOP](#)

The follow-up period of the patients ranged from 3 months to 4 years with a mean of 21 months. The range of postoperative weight ranged from 54 to 111 kg with a mean of 66 kg and an average weight loss of 6 kg. A reduction of 1 to 7 sizes was presented with an average of 2.6 was presented. The suction quantities by means of liposuction ranged from 5 to 22.3 liters with a mean of 8700 ml. An average of 86 percent was constituted of supernatant fat and 14 percent of infranatant liquid. The decrease in the level of hemoglobin and hematocrit up to 1 week after surgery was an average of 3.8 g and 12 percent, respectively. The surgical time exclusively for liposuction ranged from 1.5 to 2.75 hours with an average of 2.25 hours. In 28 patients (17 percent), 500 ml of whole blood was transfused in the postoperative period. In all of them, this was indicated before surgery and handled as a self blood donation. Major complications were not present; 52 patients (32.2 percent) presented minor complications. Eighteen patients (11.2 percent) had seromas that required drainage with a syringe. In two patients (1.2 percent), superficial necrosis occurred, one in the flank and the other in the periumbilical region. In both patients, the affected area remained with skin pigmentation. Twenty-four patients (14.9 percent) presented palpable irregularities of the liposuctioned area, especially in those who had large volumes of fat suctioned. From these, irregularities were visible in only eight patients (4.9 percent). Even though the hyperpigmentation scar was common during the first postoperative weeks, this was evident during the follow-up in only eight cases (4.9 percent). The summary of these complications is presented in [Table IV](#). A correlation was made between these complications and some factors of the surgical technique, likewise with the most important characteristics of the patients. The results of these correlations are presented in [Table V](#). Finally, 92 percent of the patients expressed great satisfaction with the results.

Type of Complication	Patients	%
Palpable visible irregularities	24	14.9
Seromas	18	11.2
Scar hyperpigmentation	8	4.9
Cutaneous necrosis	2	1.2
HYPER	52	32.2

TABLE IV Complications

TABLE V Patients and Complications*

Discussion [TOP](#)

From its beginning in the late 1970s, liposuction has constituted one of the more gratifying and revolutionary techniques in body sculpture. The dry technique¹ had its limits in the quantity of fat extraction, because it produced considerable bleeding. The arrival of the wet technique² permitted greater quantity of fat extraction but continued with an important limit due to the bleeding produced. With the wet technique, aspiration of more than 1500 ml requires multiple blood transfusions, because the blood loss could be higher than 45 percent of the total aspirate volume.^{15,16} The infiltration of large fluid quantities in the adipose tissue to be liposuctioned changed the concept that liposuction was exclusively for extraction of small amounts of fat.^{12,17} Initially, body remodeling techniques were indicated for removing small fat deposits. The tumescent technique presented the option of suctioning large volumes of fat with minimum risk.^{13,18,19} The tumescent technique, among other advantages, has allowed administration of larger quantities of adrenaline and lidocaine into the areas to be liposuctioned²⁰⁻²² than those usually indicated in the pharmacology textbooks.²³ This technique has favored the possibility of suctioning significant quantities of fat with minimal bleeding, less edema, and less postoperative ecchymosis. This also permits multiple anesthetic options and analgesia after surgery.^{9-12,22} In our 4 years of experience with tumescent infiltration, we found the same advantages as other authors with this technique. We have suctioned large quantities of fat with minimum morbidity. Bleeding, ecchymosis, and postoperative edema have been limited. All our complications, including those most frequently observed such as irregularities and seromas, have been reduced as the experience has increased. This reduction has decreased from 51 percent during the first 2 years to 18 percent during the last 2 years, demonstrating that the experience and the learning curve play important roles in this surgical procedure. Similarly, seromas have not been a problem during the past year of the study. To diminish this problem, we leave drainages for a minimum of 5 days, because there is no inconvenience in leaving the drainages longer. These seromas were more frequent when we used to remove drainages at the second or third postoperative day. The irregularities that are common with this type of technique have considerably diminished upon utilizing thin cannulas to regularize the liposuctioned area. Irregularities had a 50 percent decrease when utilizing cannulas of only 4, 3, and 2 mm instead of 5, 4, and 3 mm. Also, postsurgical massages and ultrasound therapy have helped if they were begun between 2 and 3 weeks after surgery. Doing circumferential liposuction in the thoracoabdominal area has permitted a significant improvement of the contour and figure of the patient. In the past 2 years, we have not had cutaneous suffering, which has been a result of a more careful handling of the thinned tissues during and after surgery. The presence of these minor complications is related to the amount of fat extracted as is indicated in [Table V](#). With more fat liposuctioned, more fibrosis and therefore more skin irregularities exist. In the same way, with more tunnelization, the probability of seromas is greater. Also, skin hyperpigmentation produced by a more severe friction in cases of larger-volume liposuction may appear. All these correlations are demonstrated in [Table V](#). Almost all the complications had a greater incidence when the amount of aspirated fat was greater. We had a lower incidence of skin necrosis and seromas in patients with an aspiration of more than 15 liters. This lower incidence occurs because a great number of these patients were operated on during the last 2 years of the study when the experience was superior, leaving the drainages in place longer and handling the thinned tissues more carefully as was indicated before. Similarly, the ideal height-weight relationship had a direct correlation with the complications. The incidence of complications was greater among patients who were more overweight. Improvement of the technique and the increasing experience have also permitted a considerable diminution of these problems. Cutaneous flaccidity has not been a problem; a very good retraction has been achieved because of the use of superficial liposuction like that described by Gasperoni and Salgarello.²⁴ Our volume of blood loss is similar to that described by other authors.^{11,25-27} In our patients, we have not needed lidocaine in the infiltrated solutions, because the majority of the procedures were carried out with regional anesthesia by means of peridural blockade, leaving the catheter for postoperative analgesia. The presence of hyperpigmentation in the area of the scars is common during the first

postoperative weeks due to the skin burn produced in the area of friction of the cannulas, even though this hyperpigmentation disappears within 6 months. Likewise, our surgical time was reduced when we performed the liposuction with two machines and two surgeons. This also reduces all the inconvenience of a prolonged surgery time, and we have not found that doing the liposuction with two surgeons has contributed to the presence of complications. We have not had complications due to fluid overload, because the reposition parameters of fluids had been adequate to the concepts of tumescent and superwet liposuction.[9,12,17,27](#) The use of self-donated blood in the immediate postoperative period has been employed to favor and accelerate the recovery of the patient subjected to liposuction of 10 liters or more. Before using blood transfusion, this type of patients presented asthenia and adynamia as a consequence of the extracted volume. Now, by means of using 1 unit of blood transfusion, this inconvenience has disappeared. Liposuction has sustained an important evolution in a very short period of time. The only similarity that exists between the initial and current techniques is that all are utilized for the purpose of fat extraction. However, the dry, wet, and tumescent techniques and, more recently, techniques assisted with internal or external ultrasound should be considered as surgical procedures with more differences than similarities. Among all these techniques of liposuction, significant differences exist, including indications, handling of surgery, morbidity, bleeding, aspirated volume, postoperative disturbance, and results, to mention only some of the most important. It is for this reason that we should consider each of these techniques quite differently and should not expect the same results when using dry, wet, or tumescent techniques. In our hands, the tumescent technique has resulted in a safe way to remove significant quantities of fat and to significantly improve the body contour and the patient's self-esteem with minimal morbidity. Although controversial studies exist concerning the impact large-volume liposuction could represent in total body fat and in health improvement,[28,29](#) the loss of weight that results from this procedure is a very important additional advantage worthy of consideration.

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REFERENCES [TOP](#)

1. Schrudde, J. Lipexeresis as a means of eliminating local adiposity. *Aesthetic Plast. Surg.* 4: 215, 1980.
[\[Context Link\]](#)
2. Illouz, Y. G. Body contouring by lipolysis. A 5-year experience with over 3000 cases. *Plast. Reconstr. Surg.* 72: 591, 1983.
[\[Medline Link\]](#) [\[CrossRef\]](#) [\[Context Link\]](#)
3. Fodor, P. B. Wetting solutions in aspirate lipoplasty: A plea for safety in liposuction (Editorial). *Aesthetic Plast. Surg.* 19: 379, 1995.
[\[CrossRef\]](#) [\[Context Link\]](#)
4. Klein, J. A. The tumescent technique: Anesthesia and modified liposuction technique. *Dermatol. Clin.* 8: 425, 1990.
[\[Medline Link\]](#) [\[Context Link\]](#)
5. Zocchi, M. Ultrasonic liposculpturing. *Aesthetic Plast. Surg.* 16: 287, 1992.
[\[Medline Link\]](#) [\[CrossRef\]](#) [\[Context Link\]](#)
6. Klein, J. A. Tumescent technique for regional anesthesia permits lidocaine doses of 35 mg/kg for liposuction. *J. Dermatol. Surg. Oncol.* 16: 248, 1990.
[\[Medline Link\]](#) [\[Context Link\]](#)
7. Meusch, R., and Lillis, P.J. Liposuction: The tumescent technique. *Dermatol. Nurs.* 3: 255, 1991.
[\[Medline Link\]](#) [\[Context Link\]](#)
8. Cárdenas-Camarena, L., and Gonzalez, L. E. Large-volume liposuction and extensive abdominoplasty: A feasible alternative for improving body shape. *Plast. Reconstr. Surg.* 102: 1698, 1998.
[\[Fulltext Link\]](#) [\[CrossRef\]](#) [\[Context Link\]](#)
9. Pitman, G. H., Aker, J. S., and Tripp, Z. D. Tumescent liposuction: A surgeon's perspective. *Clin. Plast. Surg.* 23: 633, 1996.
[\[Context Link\]](#)
10. Samdal, F., Amland, P. F., and Bugge, J. F. Blood loss during liposuction using the tumescent technique. *Aesthetic Plast. Surg.* 18: 157, 1994.
[\[CrossRef\]](#) [\[Context Link\]](#)
11. Klein, J. A. Tumescent technique for local anesthesia improves safety in large-volume liposuction. *Plast. Reconstr. Surg.* 92: 1085, 1993.
[\[CrossRef\]](#) [\[Context Link\]](#)
12. Lillis, P. J. Liposuction surgery under local anesthesia: Limited blood loss and minimal lidocaine absorption. *Dermatol. Surg. Oncol.* 14 :1145, 1988.
[\[Context Link\]](#)
13. Hanke, C. W., Bernstein, G., and Bullock, S. Safety of tumescent liposuction in 15,336 patients: National survey results. *Dermatol. Surg.* 21: 459, 1995.
[\[CrossRef\]](#) [\[Context Link\]](#)
14. Thorn, G. H., and Cahill, G. F., Jr. Obesity. In *Harrison's Principles of Internal Medicine*. New York: McGraw-Hill, 1977. Pp. 270-275.
[\[Context Link\]](#)
15. Courtiss, E. H., Choucair, R. J., and Donelan, M. B. Large-volume suction lipectomy: An analysis of 108 patients. *Plast. Reconstr. Surg.* 89: 1068, 1992.

[\[Medline Link\]](#) [\[CrossRef\]](#) [\[Context Link\]](#)

16. Hetter, G. P. Blood and fluid replacement for lipoplasty procedures. *Clin. Plast. Surg.* 16: 245, 1989.

[\[Medline Link\]](#) [\[Context Link\]](#)

17. Klein, J. A. The tumescent technique: Anesthesia and modified liposuction technique. *Dermatol. Clin.* 8: 425, 1990.

[\[Medline Link\]](#) [\[Context Link\]](#)

18. Clayton, D. N., Clayton, J. N., Lindley, T. S., and Clayton, J. L. Large volume lipoplasty. *Clin. Plast. Surg.* 16: 305, 1989.

[\[Medline Link\]](#) [\[Context Link\]](#)

19. Hanke, C. W., Bullock, S., and Bernstein, G. Current status of tumescent liposuction in the United States: National survey results. *Dermatol. Surg.* 22: 595, 1996.

[\[CrossRef\]](#) [\[Context Link\]](#)

20. Ostad, A., Kageyama, N., and Moy, R. L. Tumescent anesthesia with a lidocaine dose of 55 mg/kg is safe for liposuction. *Dermatol. Surg.* 22: 921, 1996.

[\[CrossRef\]](#) [\[Context Link\]](#)

21. Klein, J.A. Tumescent technique for regional anesthesia permits lidocaine doses of 35 mg/kg for liposuction. *J. Dermatol. Surg. Oncol.* 16: 248, 1990.

[\[Medline Link\]](#) [\[Context Link\]](#)

22. Samdal, F., Amland, P. F., and Bugge, J. F. Plasma lidocaine levels during suction-assisted lipectomy using large doses of dilute lidocaine with epinephrine. *Plast. Reconstr. Surg.* 93: 1217, 1994.

[\[CrossRef\]](#) [\[Context Link\]](#)

23. Goodman, L. S., and Gilman, A. *The Pharmacological Basis of Therapeutics*. New York: Macmillan, 1985.

[\[Context Link\]](#)

24. Gasperoni, C., and Salgarello, M. MALL liposuction: The natural evolution of subdermal superficial liposuction. *Aesthetic Plast. Surg.* 18: 253, 1994.

[\[CrossRef\]](#) [\[Context Link\]](#)

25. Samdal, F., Amland, P. F., and Bugge, J. F. Blood loss during suction-assisted lipectomy with large volumes of dilute adrenaline. *Scand. J. Plast. Reconstr. Surg. Hand Surg.* 29: 161, 1995.

[\[Context Link\]](#)

26. Samdal, F., Amland, P. F., and Bugge, J. F. Blood loss during liposuction using the tumescent technique. *Aesthetic Plast. Surg.* 18: 157, 1994.

[\[CrossRef\]](#) [\[Context Link\]](#)

27. Matarasso, A. Superwet anesthesia redefines large-volume liposuction. *Aesthetic Surg. J.* 17: 358, 1997.

[\[Context Link\]](#)

28. Matarasso, A., Kim, R. W., and Kral, J. G. The impact of liposuction on body fat. *Plast. Reconstr. Surg.* 102: 1686, 1998.

[\[Fulltext Link\]](#) [\[CrossRef\]](#) [\[Context Link\]](#)

29. Samdal, F., Birkeland, K. I., Ose, L., and Amland, P. F. Effect of large-volume liposuction on sex hormones and glucose-and lipid metabolism in females. *Aesthetic Plast. Surg.* 19: 131, 1995.

[\[CrossRef\]](#) [\[Context Link\]](#)