Anesthesia Considerations in Large-Volume Lipoplasty

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Background: *Large-volume lipoplasty is becoming more common and has been proven to be safe and effective. Large-volume lipoplasty is normally performed with the patient under general anesthesia. Techniques of general anesthesia and fluid management are important factors in improving the safety of large-volume lipoplasty.*

Objective: *Certain important considerations in anesthesia and perioperative management can improve outcomes in large-volume lipoplasty. Our objective is to present our protocol and technique for general anesthesia in large-volume lipoplasty*

Methods: *Large-volume lipoplasty (5 to 18.5 L) was performed on 32 patients under general endotracheal anesthesia. Important considerations included proper selection of patients, low flow of anesthesia gases, prevention of hypothermia, deep vein thrombosis prophylaxis, intraoperative fluid ratio of 1, Foley catheter to monitor urine output, and postoperative overnight or longer monitoring in a well-equipped hospital. Maintaining the endotracheal cuff pressure between 20 to 30 mm of water helped to reduce incidence of sore throat. Addition of lidocaine in wetting solution helped to reduce requirement of general anesthetic agents and as a result, postoperative recovery was faster and more pleasant.*

Results: *Major complications did not occur in any patients. Minor complications encountered were nausea, vomiting, and shivering and occurred in about 25% of patients. All patients were able to walk without support 4 hours after surgery. In spite of minor complications, all patients reported the postoperative recovery to be better than expected.*

Conclusions: *General anesthesia for large-volume lipoplasty is safe. Postoperative recovery can be made faster and more pleasant by following these recommendations.* (Aesthetic Surg J 2007;27:607–611.)

Large-volume lipoplasty (more than 5 L of total aspirate)[1,2] is becoming more common as the need for these procedures increases and more surgeons become convinced of its safety. Unfortunately, a higher incidence of complications has been associated with these procedures with the worst of these resulting in death.[3,4] In response to mounting concern over the safety of large-volume lipoplasty, we present our experience with anesthesia and fluid management in a total of 32 patients over last 2 years.

Patients and Methods

Large-volume lipoplasty with suction-assisted lipoplasty (SAL) was performed on a total of 32 patients under general endotracheal anesthesia. All cases of large-volume lipoplasty, with or without abdominoplasty, were included in the study. This study was partly retrospective (first 10 cases) and partly prospective. The youngest patient was 22 years old, and the oldest was 56 years old (mean, 24 years). Female patients dominated the series (81%). All the concerned areas were addressed in a single sitting with the patients in both prone and supine positions. Volume of aspirate ranged from 5 to 18.5 L (mean, 7.4 L). In 34.4% of patients, SAL was combined with abdominoplasty. Aspirated volume in patients with concurrent abdominoplasty varied from 5 to 8 L. The duration of surgical procedure ranged from 3 to 5 hours with a three-surgeon team. All patients were healthy, falling into either the American Society of Anesthesiologists (ASA) 1 or ASA 2 anesthesia criteria. Preoperative weights ranged from 60 to 115 kg. Body mass indices (BMIs) ranged from 27 to 41 (Table). All patients were committed to healthy dietary habits and regular exercise. Intermittent pneumatic compression devices were used in all patients for DVT prophylaxis.

The anesthesia technique

All patients were carefully evaluated for fitness for anesthesia and the procedure. This included careful physical examination and complete laboratory workup, which included complete blood counts, liver function tests, renal function, baseline electrolytes, and coagula-

Table. BMI, infiltration volume, procedure, and aspirate volume

Patient	BMI	Fluid infiltrated in liters	Procedure performed	Aspirate volume in liters
1	27	5	Lipoplasty	5
2	30	5	Lipoplasty + Abdominoplasty	5
3	29	6	Lipoplasty	6.5
4	29	7	Lipoplasty	7.2
5	29	6.5	Lipoplasty + Abdominoplasty	7
6	28	5	Lipoplasty	5.1
7	32	7.2	Lipoplasty + Abdominoplasty	7.5
8	29	7	Lipoplasty + Abdominoplasty	7.1
9	28	6	Lipoplasty	6.5
10	33	8	Lipoplasty + Abdominoplasty	9
11	36	9	Lipoplasty	11
12	33	8.5	Lipoplasty	8.8
13	32	7.5	Lipoplasty + Abdominoplasty	7.8
14	33	6	Lipoplasty + Abdominoplasty	6.5
15	29	5	Lipoplasty	5.6
16	27	5.5	Lipoplasty	6.1
17	28	6	Lipoplasty	6.7
18	34	7	Lipoplasty	8.8
19	41	11	Lipoplasty	18.5
20	32	7	Lipoplasty	8.5
21	33	7.5	Lipoplasty + Abdominoplasty	8
22	31	7	Lipoplasty	8.1
23	29	5.5	Lipoplasty	5.7
24	33	5	Lipoplasty	6.2
25	29	4	Lipoplasty	5
26	30	6.5	Lipoplasty	7
27	32	7	Lipoplasty	7.3
28	30	6.5	Lipoplasty + Abdominoplasty	7.1
29	29	6.5	Lipoplasty + Abdominoplasty	7
30	28	6	Lipoplasty	6.2
31	29	6.5	Lipoplasty + Abdominoplasty	7
32	34	8	Lipoplasty	9

tion profile. Other tests included electrocardiography and echocardiography to detect any subclinical cardiac problem when indicated. Patients with a history of asthma and smoking underwent pulmonary function testing. No premedications were given to patients in the ASA class 1 group. Patients in the ASA class 2 group were given their regular medications before surgery. Because the patients were marked in the standing position, no sedatives were given before surgery. An occasional anxious patient was counseled and reassured.

All operations were performed with the patients under general endotracheal anesthesia. Fentanyl and midazolam were used for baseline analgesia and sedation. Propofol was used for induction of anesthesia. Atracurium was used for intubation and maintenance of relaxation. Armored tubes with high-volume, low-pressure cuff were used for endotracheal intubation. After induction of anesthesia, patients were placed in the prone position first for lipoplasty of the posterior aspect. The anterior aspect was treated in with the patient in the supine position. Care was taken to pad and position the patient properly. Eyes were lubed and padded. With the patient in the prone position, extra caution was used to avoid external pressure on the eyes. For the prone position we used a special spinal frame with elevated arm rests and a head rest to maintain the head in a neutral position to avoid any pressure on the eyes. Pressure points on extremities were padded with silicone gel

padding. Frequent positional checks were performed during the surgical procedure. Anesthesia was maintained with oxygen, nitrous oxide and sevoflurane in low flows (total flow rate of 500 to 700 mL/min). Additionally, intraoperative infusion of propofol 500 mg + fentanyl 100 µg + midazolam 5 mg was used in all the patients at rates varying from 7 to 10 mL/h. The endotracheal tube cuff pressure was monitored hourly and maintained at 20 to 30 cm of water with a Portex cuff pressure gauge (Sims Portex Ltd., Kent, UK), keeping in mind the diffusion of nitrous oxide into the cuff.

Intraoperative monitoring included electrocardiography tracings, noninvasive blood pressure, pulse oximetry, core temperature monitoring, end-tidal CO_2 readings, fraction of inspired oxygen (FiO_2), agent monitoring, peripheral nerve monitoring, and urine output. Urethral catheterization was a must, and it was the single most important guide for fluid management. In addition, all patients received intravenous antibiotics (amoxicillin + clavulanic acid 1.2 gm intravenously at induction and every 12 hours), steroids (dexamethasone 8 mg intravenously at induction and after 12 hours), H_2 receptor blockers (ranitidine 50 to 100 mg intravenously before induction and after 12 hours, continued orally as long as nonsteroidal antiinflammatory drugs (NSAIDs) were given), antiemetic medication (metoclopramide 10 mg, dexamethasone after induction, and ondansetron 8 mg before reversal of anesthesia and every 12 hours afterward) and an NSAID (diclofenac, 100 mg) in the form of a suppository (except in patients with asthma). Body temperatures were maintained with a heated airflow blanket placed over all areas not included in the surgical field and by keeping the operating room temperature at about 22° to 23° C. Core body temperature was maintained above 36° C. All fluids were warmed to near body temperature to avoid hypothermia. Continuous communication between the surgeon and anesthesiologist was essential to avoid problems.

Fluid management

All areas to be treated were injected with large volumes of prewarmed diluted epinephrine solution until turgor of the tissue is appreciable equally on both sides. Effective vasoconstriction was achieved in about 10 to 15 minutes. The constitution of wetting fluid used was 1:1000 epinephrine 1 mL, preservative-free lidocaine 500 mg, and 7.5% sodium bicarbonate solution 25 mL added to each liter of the normal saline solution. The purpose of adding lidocaine to the wetting solution was to reduce the requirement of intraoperative anesthetic agents. We have observed that this makes postoperative recovery faster and more pleasant. Maximum dose of lidocaine used was 50 mg/kg body weight.[2,5]

The total volume of wetting solution used in each case was estimated on the basis of the expected amount of total aspirate. Superwet technique was used in all cases. Meticulous calculations of intake (wetting solutions volume, intravenous fluid volume) and output (aspirated volume and urine output) were tabulated during and after the procedures to aid in fluid management decision.

The simplest and the most effective way to manage intraoperative fluids was to maintain an intraoperative fluid ratio of 1 and maintain a urine output of 1 to 1.5 mL/kg/h.[6] The intraoperative fluid ratio is defined as tumescent fluid volume + intraoperative fluid replacement ÷ the volume of the aspirate.[6]

In patients in whom the volume of the aspirate exceeded more than 5000 mL, 500 mL of colloid (hydroxyethyl starch 6%) was given and, for the aspirates exceeding 10,000 mL, one additional unit of 500 mL of the same volume expander was given, the logic being to replace inevitable blood loss, which is extremely difficult to quantify because it is mixed with the aspirate. The rest of the fluid replacement consisted of crystalloids, predominantly Ringer's lactated solution. Minor adjustments in fluids infused can be made depending on the rate of urine output. Urine output was not calculated in the fluid calculations, as adequate output automatically signifies adequate replacement.

Surgical technique

Suction-assisted lipoplasty was performed in all of our patients. Lipoplasty was performed in superficial, middle and deep levels depending on the nature of the area to be suctioned. The 3- and 4-mm cannulas were used in most occasions. A 5-mm cannula was rarely used. The surgical endpoint was determined by visual symmetry comparisons and the pinch test. Circumferential lipocontouring was performed in all patients. The posterior aspect was treated first, with the patient in the prone position, and then the anterior aspect with the patient in the supine position.

Postoperative management

Pressure garments were placed on the patients immediately after reversal of anesthesia. All patients received nonsedative analgesics, such as diclofenac (tramadol was used in patients with asthma) for 5 days after surgery.

The patients were kept in the hospital overnight for monitoring of vital parameters, and additional crystal-

loids, 2 to3 L, were given until the next morning, even though patients started taking oral liquids within 4 hours. A urinary catheter was left in place until the next morning. Patients were encouraged to move about as soon as possible. Patients in whom the aspirate was less than 10 L were kept in the hospital for 1 day, and patients in whom the aspirate was more than 10 L and those who underwent simultaneous abdominoplasty were kept in the hospital for 2 days. An intermittent pneumatic compression device (IPCD; Flowtron, Huntley Healthcare, Bedfordshire, UK) was used in all patients during surgery and was continued overnight for patients who underwent simultaneous abdominoplasty. In patients who underwent only lipoplasty, an IPCD was used for a few hours after surgery, until the patients could walk about. Low molecular weight heparin (nadroparin calcium [Fraxiparine] 0.3 once daily subcutaneous) was administered in patients more than 40 years old, those with a history of major surgery, and those receiving hormone replacement therapy and birth control pills in the postoperative period until the patient was mobilized adequately.[7] A complete hemogram and electrolyte and protein levels were obtained on the first postoperative day.

Results

Major complications were not encountered in any patients. Minor complications that occurred (in 28% of patients) were as follows: nausea and vomiting (5 patients [15.6%]), shivering (2 patients [6.2%]), and sore throat (2 patients [6.2%]).

All minor complications lasted less than 6 hours. In spite of minor complications, all patients reported postoperative recovery to be better than expected.

The postoperative hemoglobin level dropped between 2 to 4 g/dL in 24 hours after the procedure. The hemoglobin level did not go below 9 g/dL in any of the patients. Blood transfusion was not required in any patient.

Discussion

To minimize the risk of morbidity and death during large-volume lipoplasty, 5 pillars of safety must be strictly adhered to.[8] Patients must be selected appropriately for the procedure. The surgeon must be properly trained and educated in lipoplasty techniques and have a thorough understanding of the physiological changes that occur with regular- and large-volume lipoplasty. The anesthesiologist working with the surgeon must also be well trained and have a complete understanding of the physiology associated with infusion and removal of large volumes of fluids. The facility where the procedure is performed must be fully equipped to deal with any problem or complication that may occur during or after the procedure. The facility should preferably be certified and accredited by a nationally recognized surgery accreditation body. The support staff working in the operating room and recovery room should be thoroughly trained and familiar with the procedure, care, and recovery of the patient.

It is important that only patients in the ASA 1 and ASA 2 groups with good hematocrit values undergo large-volume lipoplasty because they can safely tolerate the volume changes and fluid shifts that occur.[1,8]

Although some reports cite cases treated with the patients under regional anesthesia,[4] in our opinion general anesthesia with endotracheal intubation is the safest and most comfortable choice for patients, surgeon, and anesthesiologist. The choice of anesthetic agents and pain killers is governed by the need to have early recovery and early mobilization.

Proper fluid management is the key to successful management of large-volume lipoplasty. The aim is to have an intraoperative fluid ratio of around 1 and to achieve urine output of at least 1 mL/kg/h. Urine output of more than 1 mL/kg/h indicates positive fluid balance, and, hence, urine output need not be replaced as a fluid loss. Use of the superwet technique minimizes the chance of fluid overload.[6] Blood transfusion is not mandatory even when the lipoaspirate exceeds 10 L. Karmo et al[9] have shown that there is no correlation between the postoperative drop in hemoglobin level and the volume aspirated. The postoperative hemoglobin level and clinical judgment should be combined to decide whether blood transfusion is essential. Prevention of hypothermia is also an important aspect because there is some evidence to indicate the possibility of hypothermic coagulopathy and, hence, increased bleeding.[3] Addition of lidocaine to the wetting solution reduces the requirement of intraoperative general anesthetic agents. Lidocaine toxicity was not encountered in any patient. Although NSAID use is reported to increase risk of bleeding, we did not come across any clinically significant bleeding. Maintaining the endotracheal cuff pressure between 20 to 30 cm of water helps to reduce incidence of sore throat.

At least 1 day of hospital stay is mandatory to keep a close watch on the vital parameters and hemodynamic stability of the patient. Major complications reported with large-volume lipoplasty include pulmonary thromboembolism, fat embolism, hypothermia, fluid overload, and lidocaine toxicity.[2,10-13] Most of these complications are avoidable by proper patient selection and preventive measures.

Conclusions

Large-volume lipoplasty can be a safe and effective procedure when patients are carefully selected and when proper anesthesia and surgical techniques are properly followed. The key points are to have early recovery, early mobilization, meticulous maintenance of fluid balance, and maintenance of normothermia. The complication rates are extremely low. ■

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