

GUIDELINES FOR LIPOSUCTION

INTRODUCTION

World-wide as well as in India, liposuction is one of the most commonly performed cosmetic surgery procedure by plastic surgeons. However, in the general public, liposuction is also the procedure marred with multiple myths, misconceptions and controversies. In 2022, the image of liposuction was further tarnished by the unfortunate deaths following liposuctions, that were reported. Social media was abuzz with “expert” comments, some well-founded and several groundless opinions.

As the national aesthetic surgery association, Indian Association of Aesthetic Plastic Surgeons (IAAPS) decided to clear the air and define some basic guidelines for performing safe liposuction procedure. These guidelines are based on the study of current scientific literature and clinical experience. These guidelines are an attempt to understand current knowledge and define principles of practice in most cases, thereby assist plastic surgeons in clinical decision making. They should not be interpreted as all-encompassing and as inviolable dictum.

With this goal in mind a team was constituted to evaluate various aspects of liposuction surgery and to study the available literature on liposuction. Similarly, a survey was conducted wherein a detailed Google form was circulated among IAAPS members to collect data regarding current trends in liposuction surgery. There were 101 responses which were received and analyzed.

The data from the literature review and survey were collated and a basic set of guidelines were formulated. The guidelines are categorized under the following headings:

1. Training and qualification of surgeon performing liposuction.
2. Facility and infrastructure where liposuction is performed
3. Pre-operative evaluation of patient for liposuction
4. Type of anaesthesia for liposuction surgery
5. Liposuction surgery
6. Post-operative management after liposuction
7. Post-operative complications

TRAINING / QUALIFICATION OF SURGEON PERFORMING LIPOSUCTION

Liposuction must be performed by qualified plastic surgeons, with either M.Ch. (Plastic surgery) or DNB (Plastic surgery) degree. To ensure safer and better outcomes, young plastic surgeons should give themselves 3-6 months of training in liposuction by working with an experienced cosmetic surgeon or taking up a fellowship in cosmetic surgery. A plastic surgeon may also call upon an experienced cosmetic plastic surgeon for his / her early liposuction cases to work with them.

FACILITY WHERE LIPOSUCTION IS PERFORMED

IAAPS does not recommend performing liposuction surgery in an office setup with no operating room facility. In India, a significant number of plastic surgeons perform surgeries in either day care centres or in nursing homes. Nursing homes are smaller hospitals as compared to tertiary multi-specialty hospitals and may or may not have an intensive care facility.

We recommend that liposuction should not be performed at day-care centres if:

- Multiple surgeries are planned
- Patient is staying alone
- Patient has significant co-morbidities
- More than 5 litres fat aspirate is performed

In any of the above scenario, it is recommended that liposuction should be performed in a nursing home or hospital setup, with overnight inpatient admission facilities and adequate facilities to monitor patients post-operatively.

It is recommended that nursing home setups without an Intensive Care Unit (ICU) should have a formal / written understanding with a nearby tertiary hospital for transfer of patient for acute intensive care, if required.

It is recommended that the operating room staff (nursing and technician) should be well versed with liposuction procedure (eg. how to connect the infiltration fluid bottle, how to check the proper functioning of suction machine etc), basic management of medical emergency and other protocols of liposuction surgery (eg. showing the aspirated fat to relatives before disposal).

We recommend that the facility used to conduct liposuction surgery must have the following basic infrastructure:

- Dedicated operating room
- Adjustable operating table
- Anaesthesia machine
- Uninterrupted supply of gases (eg oxygen)
- Multiple IV stands
- High powered suction machines
- Fluid warmer chamber or Animec Infusion warmer
- Monitors to record: heart rate, oxygen saturation, blood pressure, continuous electrocardiogram, patient temperature probe, end tidal carbon dioxide (et-CO₂) and airway pressure.
Bispectral Index (BIS) monitor would be preferred.
- Warmer blankets / device (eg Bair Hugger system)
- Anti-deep venous thrombosis pump (eg Flowtron pump)
- Silicone pads for protection of pressure points
- Patient shifting roller or Patslide
- Trolley for shifting patients and adequate manpower
- Recovery area for immediate post-operative monitoring of patients

PRE-OPERATIVE EVALUATION OF PATIENT

1. PATIENT ASSESSMENT

A detailed medical, surgical and psychological history of the patient is mandatory. A proper history of ongoing medications must be sought, to rule out any potential drug interactions. It may be preferable to obtain this history in a written questionnaire format. Absolute contraindications for liposuction surgery would be – pregnant patient, severe cardiovascular disease and severe coagulation disorder. Relative contraindications would be – uncontrolled diabetes, uncontrolled psychological disorder, hyperthyroidism, peripheral vascular disease, acute deep venous thrombosis, unrealistic expectations.

It is recommended that total aspirate volume should be restricted to 8-10% of body weight per session, for safe liposuction. Liposuction for patients with BMI more than 35kg/m² should be approached with caution due to the higher incidence of serious adverse effects after liposuction, in such patients.

It is recommended that patients should be advised to stop smoking for at least 4 weeks prior to surgery.

2. PRE-OPERATIVE INVESTIGATIONS

We recommend that the following pre-operative investigations be advised to all patients scheduled for liposuction surgery – complete blood count, blood sugar fasting and post-prandial, blood urea nitrogen, serum creatinine, coagulation study (PT and aPTT), liver function test, triple H viral markers (HIV, HBsAg and HCV), chest X-ray and electrocardiogram. Hemoglobin of 10g% is acceptable for small volume liposuction (less than 2 litres), but should be at least 12g% for large volume liposuction. It is imperative to assess all the parameters on the hemogram report, so as to detect any subclinical or uncommon anaemia. We would also recommend a urine routine and microscopy examination, since it gives valuable insights into renal function as well as detects any urinary tract infection. In addition to the above investigations, we would recommend performing serum electrolytes, 2D echocardiography and thyroid function test, based on the age, medical history of the patient as well as for all large volume liposuctions (more than 5 litres). For patients with borderline diabetes or known diabetic patients we recommend advising glycosylated hemoglobin, since it provides better insights into cumulative blood sugar control. Further, we recommend an ultrasound of the abdomen in patients scheduled for abdominal liposuction, since it would confirm the absence any abdominal hernia; especially in a patient with bulky abdomen. These guidelines should be combined with good clinical judgement to advise any further investigations as per the patient's history and examination findings eg. pulmonary function test for an overweight or chronic smoker patient scheduled for large volume liposuction. We recommend that patients be referred to the anaesthesiologist for a pre-anaesthesia check-up prior to surgery. Patients with any known or detected medical or mental problem should be referred to a concerned specialist for assessment and clearance for undergoing liposuction surgery.

It is mandatory to obtain a valid, written and informed consent from all patients prior to surgery, wherein the consent form mentions the potential complications of liposuction surgery. Video consent is not recommended for all patients, but may be advisable in patients who are very demanding or indecisive, patients with re-do liposuction (especially if they were operated elsewhere before) or at the discretion of the surgeon. Photographic or animated video recording at pre-operative and post-operative stages is recommended.

ANAESTHESIA FOR LIPOSUCTION SURGERY

If there is no specific contra-indication, general anaesthesia would be the preferred form of anaesthesia for liposuction surgery, since it allows better airway control. General anaesthesia is also preferred by many plastic surgeons because for an awake patient, the operating room ambience, the sound and movements induced during liposuction may be stressful, which may lead to increased heart rate and blood pressure, leading to increased bleeding. However, true tumescent anaesthesia, local anaesthesia with sedation, spinal or epidural anaesthesia may be used as per the surgeon and anaesthetist's preference. We recommend that anaesthesia should be administered by a qualified anaesthesiologist only and the same (or their associate) should be present during the surgery to monitor the patient's parameters. It would be preferable to have a set of anaesthesiologists who would routinely work with the plastic surgeon during liposuction surgery. This would enable a more streamlined functioning in the operating room. We recommend that for all liposuction surgery intra-operative monitoring should routinely include – heart rate, blood pressure, oxygen saturation and electrocardiogram. Further, for large

volume liposuction the following parameters should also be routinely monitored – urine output (one hourly), et-CO₂, airway pressure and patient temperature. Bispectral Index (BIS) for monitoring depth of anaesthesia is preferred as it allows titrating doses of anaesthetic agents and reduces the incidence of intra-operative awareness. We recommend that liposuction surgeries should preferably be limited to 4 hours (moderate to large liposuction), but a maximum of 6 hours duration for megaliposuction (more than 10% of body weight).

LIPOSUCTION SURGERY

1. WETTING SOLUTION

Ringer's lactate solution is a preferred medium for wetting solution but normal saline is also a viable alternative.

Adrenaline is the most important addition to the wetting solution. It may be added as 1 ml per litre (concentration of 1:1,000,000) or a maximum of 2 ml per litre (concentration of 1:500,000) of wetting solution, such that the total dose does not exceed 0.07mg/kg body weight. The concentration used will depend on the total volume and the area to be infiltrated. Further, adrenaline should not be used in patients with severe hypertension, peripheral vascular disease, ischemic heart disease, phaeochromocytoma or hyperthyroidism. Lignocaine is routinely added to the wetting solution. The safe maximum dose of lignocaine should be considered as 35mg/kg body weight. Therefore, the maximum dose for an average 70kg person will be 2450mg of lignocaine. In India, lignocaine is commonly available as a 2% solution i.e. 20mg/ml. If 25ml of 2% lignocaine is added to a litre then 500mg of lignocaine is present in 1000ml wetting solution i.e. concentration of 0.05%. Accordingly, for an average 70kg person, maximum of 5 such one litre wetting solutions can be used (total dose 2500mg). However, if 30ml of 2% lignocaine is added to a litre then only 4 such wetting solutions can be used (total dose 2400gm). If more volume is required, then the concentration of lignocaine per litre solution must be reduced (more diluted). Sodium bicarbonate (10-12.5ml of 8.4%) may be added only when performing true tumescent liposuction. Currently, there is no evidence to recommend the addition of hyaluronidase or steroid (Triamcinolone) to the wetting solution.

We recommend that the maximum volume of infiltration should be restricted to 5 litres per session. If more volume is required, then it should be used in a staged manner i.e. infiltrate one area, complete the liposuction in that area and then infiltrate the next area, so that a very large volume of wetting solution is not infiltrated simultaneously (staged infiltration). Warming the wetting solution to 38-40⁰C is recommended in large volume liposuction, to prevent hypothermia. Infiltration pump for faster infiltration of the wetting solution may be used as per surgeon's preference.

2. POSITION:

Circumferential liposuction is recommended for optimal contouring. This necessitates turning the patient from supine to prone positions and vice versa. It is recommended that patients may be turned by shifting to a trolley and then turned back to the operating table. Patients may be directly turned on the operating table but one must ensure that adequate manpower is available to do so safely and smoothly.

Sensitive pressure points (supine – occiput, elbow and heels; prone – face, breasts, iliac crests and knees) must be suitably padded to prevent pressure injuries. Eyes must be padded and

protected at all times. It is preferable to use a gel horse-shoe head rest, especially when in prone position.

3. CANNULAE

Blunt tipped cannulas and smaller diameter cannulas are recommended. For most areas 3mm to 4.5mm cannulas are recommended and 2 or 2.5mm cannulas are recommended for face and neck regions. All cannulas and tubing must be meticulously decontaminated by washing or enzymatic cleaning and then sterilized.

4. PROCEDURE

The following recommendations are made:

- Incisions should be placed in hidden areas and creases.
- Liposuction should be performed from deep to superficial plane, by criss-cross tunneling.
- Superficial subdermal liposuction should be performed with caution to avoid contour deformities as well as skin ischemia.
- Avoid side-to-side movement of cannulas.
- Cannula is controlled by the dominant hand and guided by the non-dominant hand.
- Feathering the edges of liposuction area for smooth transition.
- It is preferable to under-correct than over correct.
- Avoid liposuction in zones of adherence.
- The incisions may be closed or kept open depending on the surgeon's preference. However, use of port protectors and meticulous closure of incisions would allow better healing of incisions.
- Preferably, a well-fitting compression garment should be applied.
- Although there is no specific maximum volume for liposuction; however extra care and precautions should be taken when performing large volume or megaliposuction or simultaneous multiple procedures. These may include choosing a well-equipped hospital facility for surgery, measures to prevent hypothermia, measures to prevent deep venous thrombosis, urinary catheterization for urine monitoring and overnight monitoring of patients in the hospital facility.
- The pre-operative history, examination as well as operative steps must be meticulously documented on the patient's records.

5. INTRA-OPERATIVE FLUID MANAGEMENT

The 5 key fluid elements that guide IV fluid management are - intravenous fluid administered, third space losses, volume of wetting solution infiltrated, total lipo-aspirate volume and urine output. Other parameters such as extent or duration of surgery, insensible losses, age of patient and history of cardio-pulmonary ailments are also relevant. Fluid overload is a concern in large volume liposuctions and crystalloids should be used for fluid replacement. We recommend the following measures:

i) Replace starvation fluid losses – Most patients are fasting for 10 hours prior to surgery. Anaesthesiologists generally use the Holliday-Segar 4-2-1 rule for determining starvation fluid replacement i.e 1st 10kg – 4ml/kg/hour, next 10kg – 2ml/kg/hour and then 1ml/kg/hour. Therefore, for an average 60kg female patient it works out as 100ml/hour of starvation i.e. 1000ml. Generally, half of this is given intravenously in the first hour of surgery and the rest is given gradually along with the maintenance fluids.

ii) Super-wet technique of infiltration of wetting solution is preferred. Since 30% of infiltrated fluid is generally aspirated out, 70% fluid remains in the tissues which is gradually absorbed by the body.

iii) Maintenance fluid should be adjusted as per the vital parameters and urine output. Generally, urine output should be maintained at 0.5-1ml/kg/hour in patients. As a thumb rule, maintenance fluids may be administered at the rate of 1.5-1.6ml/kg/hour for liposuction less than 5 litres and at the rate of 1.2-1.3ml/kg/hour for liposuction more than 5 litres. This rate should be reduced cautiously in elderly and in patients with cardiac ailments.

iv) For liposuction less than 5 litres – only maintenance fluid, along with super-wet infiltration is sufficient. For liposuction more than 5 litres – 0.25ml per ml of lipoaspirate over 5 litres should be given i.e. if the total aspirate is 8 litres, then $0.25 \times 3000 = 750\text{ml}$ crystalloids should be given over and above the basic maintenance fluids.

The intake and output of fluids during the operative as well as post-operative period should be recorded accurately.

Precise quantification of blood loss is difficult. Blood loss in the aspirate is evident, however concealed loss in the tissue spaces after liposuction is usually unaccounted. Further, hemoglobin / hematocrit is unreliable in the first 24 hours post-operatively due to dilutional factors. Dilutional anaemia, dilutional coagulopathy and consumptional coagulopathy are real possibilities after liposuction. A very low threshold must be set for raising the alarm when one encounters hemodynamic instability or diminishing urine output post-operatively. If significant blood loss is estimated, then small bolus of colloids is recommended instead of large volumes of crystalloids only. Artificial colloids must be avoided as they leak out of capillaries. Albumin is the preferred choice, since it stays in the intravascular compartment and thereby maintains effective intravascular volume and improves perfusion of vital organs especially kidneys.

Monitoring of urine output is sufficient for most cases, however in cases of megaliposuction dynamic monitoring like Stroke Volume variation (SVV) and Pulse Pressure variation (PPV) along with cardiac output monitoring would be preferred to guide fluid therapy.

6. NEWER DEVICES

Traditional suction-assisted liposuction (SAL) is still the gold standard for liposuction. Superficial subdermal liposuction can stimulate significant skin retraction and provide optimum contouring in well selected cases.

Selecting an energy based newer device for liposuction is entirely the surgeon's choice. There is very limited data and evidence available in the literature to support any particular device and therefore no specific recommendation is possible.

POST-OPERATIVE MANAGEMENT

All patients must be monitored closely following liposuction. The following vital parameters must be routinely monitored – heart rate, respiratory rate, oxygen saturation, blood pressure; on an hourly basis. Patients who have undergone small volume liposuction or tumescent liposuction can be discharged the same day as long as their vital parameters are normal, they are tolerating orals and are passing adequate urine. It is recommended that patients should be monitored overnight in the hospital, in the following cases – liposuction more than 5 litres, multiple procedures, patient with significant co-morbidities and if patient is staying alone. In addition to the routine monitoring of vital parameters, urine output, temperature, continuous electrocardiogram monitoring and supplemental oxygen is recommended in these patients. Similarly, measures to prevent hypothermia and to prevent DVT must be continued in these cases till the next morning. Fluid and electrolyte balance must be maintained by infusion of

intravenous crystalloids. If there has been significant blood loss, blood transfusion may be advised, especially if the pre-operative hemoglobin was low.

We recommend that patients must be encouraged for early ambulation – whenever possible on the same day or latest by next day morning.

Patients must be prescribed suitable antibiotics for 5 days. NSAIDs are recommended for post-operative analgesia. In some cases, opioids such as tramadol may be added or used as an alternative for pain relief (eg patient hypersensitive to NSAIDs or has history of bronchial asthma). Enzymatic anti-inflammatory medications are routinely used and help alleviate inflammation and swelling.

The incisions may be either closed or kept open as per the surgeon's preference. Bulky absorbent dressing must be applied in cases when incisions are kept open. In general, we recommend application of compression garment or dressing immediately after surgery. The garment should be moderately tight and evenly fitting. Patients are advised to wear the compression garment for 4-6 weeks after liposuction, depending on the inherent skin elasticity, the volume and area of liposuction.

It is recommended that patients are evaluated after 48 hours to assess their vital parameters and to inspect the liposuctioned area for any hematoma, excessive swelling, infection or skin ischemia. If there are no complications, then patients are re-evaluated after 7 days for suture removal, after which they can start having a normal bath. It is recommended that patients can be advised to resume non-strenuous routine work after 3-5 days following small volume liposuction and after 7-10 days following large volume liposuction. Patients can resume exercises and normal work after 3-4 weeks. Thereafter, patients must be assessed at 15-30 day interval for the first 3-6 months to monitor their recovery and for scar management.

Corrective procedure (touch-up liposuction or fat transfer) if required should be planned only after 3-6 months.

COMPLICATIONS

Liposuction may be associated with with a variety of complications, which may broadly be categorized as follows:

i) Local – Short-term complications: Edema, ecchymosis

Seromas, hematomas

Wound infection

Paraesthesia

Skin necrosis

Long-term complications: Contour deformity

Over-correction / Under-correction

Asymmetry

Hyperpigmentation

Skin laxity

Scar related – hypertrophy, hyperpigmentation of scar

Lymphedema

- ii) Systemic – Significant blood loss
 - Deep venous thrombosis / Thromboembolism
 - Pulmonary edema
 - Severe wound infection
 - Visceral perforation
 - Lignocaine toxicity
 - Fat embolism
- iii) Dissatisfied patient

Systemic complications such as significant blood loss, DVT, pulmonary embolism, pulmonary edema, significant wound infection, visceral perforation, lignocaine toxicity and fat embolism following liposuction can lead to patient mortality. **Protocols for the diagnosis and management of these complications is beyond the scope of these guidelines.** However, careful monitoring of patient, early detection of signs and symptoms as well as appropriate treatment can go a long way to prevent fatalities following liposuction. The following factors may contribute towards the occurrence of major complications: elderly patient, smoker, patients with co-morbid factors such as diabetes, hypertension, hypothyroidism or cardiac ailment, BMI more than 35, multiple procedures, mega-liposuction, fluid overload, tumescent anaesthesia, improper aseptic standards, technical deficiencies and practitioner inexperience.

It is imperative that all plastic surgeons must have a suitable professional indemnity cover.

It is recommended that when we encounter a patient with a post-operative complication, operated by another surgeon, we must be supportive towards the patient, must reassure the patient and must refrain from blaming the operating surgeon for the complication. We must explain the patient about the possible causes for the complication and outline the future course of actions to remedy the complication.

In the event of an unfortunate fatal complication following liposuction, the following measures are recommended:

- Honest yet sensitive counselling of patient's relatives as well as expressing sincere condolences to them.
- If violent response from relatives is anticipated, then help should be sought from local police.
- Ensure all the events are properly documented on the patient's records.
- Seek legal support at the earliest.
- Avoid discussing on social media.
- To avoid media speculations and misrepresentations, IAAPS should release an unbiased statement at the earliest, after discussing the case details with the involved plastic surgeon. Statements from involved doctors should be vetted by a legal team.
- Avoid passing the blame onto hospital, anaesthesiologist or other specialists. The entire team should stand calmly united.
- This can happen to any one of us, therefore we must support our colleague, refrain from undermining the involved doctors and maintain solidarity.
- Review and audit such events in an objective manner so that future incidents may be prevented.

SUMMARY

These guidelines are devised to assist plastic surgeons in making sound clinical decisions for liposuction surgery and are based on a detailed evaluation of current scientific literature and relevant clinical experience. These guidelines attempt to encapsulate principles of practice for liposuction which should meet the needs in majority of cases. These guidelines should not be construed as a rule nor should it be considered all-inclusive for proper care. There will be instances when a plastic surgeon may resort to other methods for meeting a particular patient's requirements. Standards of medical care in liposuction cannot be summed up in one set of guidelines as they will depend on multiple factors such as individual patient's goals and choices, patient's medical and mental health, surgeon preferences and evolving practice pattern. The status of the current scientific knowledge and technology will inevitably change, therefore these guidelines will require periodic review and updating by the association. However, the essence of all guidelines will be good clinical judgement and prioritizing patient safety.

