

## LIPOSUCTION

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**Abstract :** Liposuction is a fairly recent technique in the armamentarium of plastic surgeons to restore body contours. It is only since mid 1980s that the procedure has become standardized, safe and widely practiced. Liposuction has evolved over the last two decades with the introduction of the tumescent and super-wet techniques, ultrasonic assisted liposuction, power assisted liposuction and laser lipolysis. These advances have made possible the removal of larger volumes of fat with negligible blood loss and relatively trifling complications. It is essentially a body contouring procedure where localized collections of fat are sucked out to restore shape. However, with the mega liposuctions being practiced by a few surgeons its usefulness has been extended to include obese patients. Liposuction is also a useful adjunct in management of gynaecomastia, lipomas, breast reduction etc.

### HISTORY

The concept of removing excess fat from localized body sites is credited to Charles Dujarrier, who in France in 1921, attempted to remove subcutaneous fat using a uterine curette on the calves and knees of a ballerina. An inadvertent injury of the femoral artery led to amputation of the leg of the dancer. This unfortunate complication arrested further progress in this field and but it sure was a valiant attempt of the time.

Schrudde in 1964, revived interest in this procedure and extracted fat from the leg, gaining access through a small incision with a curette, but was faced with the daunting task of managing difficult hematomas and seromas that resulted from this technique. Subsequently, Pitanguy favored an en bloc removal of both fat and skin to remove excess thigh adiposities, however the extensively noticeable incisions did not allow the technique to become popular.

### MODERN LIPOSUCTION

Modern liposuction began with Giorgio Fischer and Arpad Fischer in 1974. They developed the technique of crisscross tunnel formation from multiple access sites with their improved cannulae and demonstrated good results with fewer complications. Kesselring and Meyer in 1978 published results of a sharp curettage aided by suction. The technique could not gain much acceptance in view of the significant complications.

Pierre Fournier of Paris, France improvised on the Fischer's liposculpture technique and was the initial advocate of the 'dry technique' in which no fluids were infiltrated prior to liposuction. Illouz, began favoring the "wet technique" in which a solution of hypotonic vasoconstrictor saline and hyaluronidase was infiltrated into the adipose tissue prior to aspiration.

Julius Newman was the first to use the term "Lipo Suction". The first articles on liposuction appeared in literature in July 1984. Ever since, lipo-aspirations and fluid managements have added a greater safety dimension. Ultrasonic liposuction was developed by an Italian surgeon, Michael Zocchi.

### INTRODUCTION

Liposuction is more of an art rather than a surgical procedure. Principal indications for liposuction are fat deposits in the gluteo-crural areas, hips and the abdomen. While the ideal body shape is trim and athletic, a well contoured shoulder and chest, a flat abdomen and a narrow hip and thigh area are sought-after shapes.

An increase in fat content can be either hypertrophic or hyperplastic. An increase in total fat cell numbers is hyperplastic obesity. It predominates as body fat levels exceed 40 kg and is more resistant to dieting and

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Fig.1a. Pre operative view of a 21 years old girl showing localized fat deposits in the trochanteric area (the riding breeches).



Fig.1b. Post operative view at 1 year following correction by liposuction.

exercise regimens. In those cases where the actual number of fat cells remains stable, the cells increase or decrease in their volume with weight gain or loss.

Localized fat accumulation patterns also vary by race and age patterns. Decrease in the subcutaneous fatty layer and elevations in intra-abdominal fat contents are seen with increasing age. Women have a proportionately higher percentage of body fat than men. They have a gynaecoid pattern of fat deposition characterized by increased deposits over the lateral thigh (fig.1 a&b), buttocks (fig.2 a&b) and truncal (fig.3 a&b) region while men show an android pattern that centres on the truncal region. Liposuction is effective in changing contour as it permanently removes fat cells that are unevenly distributed. The remaining adipocytes can still store fat. For that reason, liposuction cannot prevent further weight gain, it but rather affects weight distribution.

Fat in the trunk and extremities has a superficial and a deep layer. The superficial layer is composed of small dense pockets of fat separated by



Fig.2a. Preoperative view of a 42 yrs old female showing fat deposits in buttocks.



Fig. 2b. Post operative view after 2 years following liposuction.

vertical well-organized fibrous septae. The deeper fat layer is organized more loosely, with loose areolar fatty tissue interspersed with less regular fascial septae intervening between the pockets. Vertical septae originate from the fascia and extend upward toward the dermis.

Liposuction (suction assisted lipectomy) was initially advocated for the treatment of localized collections of fat and for the removal of less than

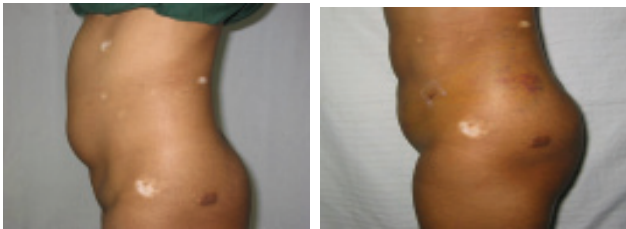


Fig.3a. Pre operative view of a 32 years old female with localized fat deposits in the abdomen. Fig. 3b. Post operative view at 8 months following liposuction (total aspirate - 3.0 liters).

1500 ml of material. However, many patients wished to have multiple areas treated or had diffuse collections of fat. In such instances, the removal of over 1500 ml of material and circumferential lipectomy are necessary to present optimal aesthetic results. However, when over 1500 ml of material is removed, anesthetic requirements, fluid replacement, and treatment of blood loss become important if the procedure is to be performed safely.

**OTHER INDICATIONS**

Somewhat applications of liposuction were pioneered by surgeons of other specialties. Liposuction could be used to remove lipomas, angioliomas, and improve hyperhidrosis. Liposuction techniques can assist in hematoma evacuation. It is also routinely used for breast reduction, to facilitate skin flap movement, for gynecomastia ( fig 4 a & b) etc.

**TUMESCENT ANESTHESIA**

Tumescent liposuction uses large volumes of very dilute, hypotonic solutions of a vasoconstrictor agent that is gently injected into the subcutaneous fat and it virtually eliminates blood loss (fig.5). It also permits the procedure to be done under regional anesthesia with sedation. Local anesthesia may be supplemented for areas proximal to the level of the regional anesthesia.

Maximum safe dose of tumescent lidocaine was a major issue in contention. Limits of lidocaine dosage have been reported to be 35 mg/kg to 50 mg/kg. It has now been demonstrated that the peak lidocaine concentration in the blood occurs at approximately 12 hours of initiating of the tumescent infiltration as against the two hours as was originally conceived. The stinging pain originally associated with infiltration of local anesthesia as a result of the acidic pH of commercially available lidocaine has been eliminated by adding sodium bicarbonate to the anesthetic solution.

**EVOLUTION OF INSTRUMENTATION**

The standard cannulae of the 1980's were huge, having diameters of 6 to 10 mm. These instruments caused damage to neurovascular bundles and occasionally led to uneven contours, seromas or hematomas. Illouz and Fournier popularized liposuction using their newer generation of the blunt-tipped cannulae and the 'wet technique'.

Cannulae used today are extremely small, some with an inside diameter of less than 0.6 mm. Blunt-tipped cannulae are standard as they decrease



Fig.4a. Pre-operative view of a 22 years old male with gynecomastia. Fig. 4b. The patient underwent suction assisted lipectomy. Post operative view after 6 months.



Fig.5. Liposuction – A 2.2 liter aspirate containing fat and wetting solution seen in the collection jar of the suction machine. Appreciate the minimal loss of blood following tumescent infiltration.

injury to blood vessels and reduce bleeding. The use of multiple side ports allows for efficient evacuation of fat. Manual systems consisting of syringes and cannula tips have also been developed as some surgeons prefer the use of quiet, disposable instruments. Aspiration units were developed by manufacturers in consultation with surgeons and have gradually become more powerful and quieter and allow for an efficient, pleasant surgical environment.

**SURGICAL TECHNIQUE**

Precise and accurate pre operative marking is essential for a good result. With the patient standing, areas to be treated are outlined with a fiber tip marking pen. Areas to be avoided or areas for fat grafting are also separately identified. Port sites per area are defined to allow cross-tunneling aspiration to minimize surface abnormalities

The patient is prepared circumferentially in the torso and the lower extremity as these can be treated without repeated prepping and repositioning. The patient's skin is painted with 10 percent povidone iodine solution while he/she stands next to a sterile draped operating table. Upon completion of the skin preparation, the patient lies on the table and is sedated or is given regional anesthesia as required.

All areas to be treated are injected with large volumes of a dilute epinephrine solution till turgor of the tissues is appreciable equally on both sides. Effective vasoconstriction is achieved in about ten minutes, but the effect is more pronounced after about twenty minutes.

Tumescent Fluid		
1.	Normal Saline	1000 cc
2.	Distilled Water	300 cc
3.	Inj. Adrenaline	1 amp
4.	Inj. Hyalase	1 amp
5.	Inj. Triamcinalone	10 mg

The intense local vasoconstriction reduces blood loss to insignificant amounts for most procedures. If lidocaine is used in the tumescent solution a profound and long standing anesthesia is created at the local site. Local anesthesia lasts 6 to 10 hours into the post operative period and patients rarely require additional analgesia in the first few hours after surgery.

The desired planes of fat removal are created without suction as it increases instrument control by preventing an inadvertent removal in the sub-dermal fat layer. Thus contour irregularities can be obviated. Access incisions are placed at the periphery of operative field in concealed areas and are used separately for all areas as removing all fat from a single incision may lead to a depression around the access site.

The cannulae move parallel to the fat plane with their openings

directed away from skin surface in a to and fro motion along the same path. The site is changed when the aspirate tends to become blood stained. Feathering of the peripheral areas is done once the basic earmarked areas have been contoured.

The end point of liposuction is a smooth overall shape and contour. The 'skin pinch' should be less than an inch. If done bilaterally, it should look symmetrical. Aspirate volumes from bilaterally symmetrical areas should be approximately the same, although, the volume of the preoperative injection will influence the volume of the aspirate.

Port sites are excised to improve cosmesis as they sustain friction burns. They are closed with a loose deep dermal, absorbable suture. Absorbant dressings are applied to prevent spoilage of compressive binders and dressings.

The authors prefer small diameter cannulae (2 to 5 mm) as they permit small access incisions and the scars are inconspicuous. They also produce fewer surface irregularities and give a smoother finish. The Mercedes-Benz cannulae (diameter ranges from 1.8 to 2 mm) are preferred to treat limited areas of fat deposits and they allow better skin retraction.

#### POST OPERATIVE CARE

Early ambulation is encouraged within 24 hours for mobilization of third space fluid shifts, to expedite recovery, and to prevent deep vein thrombosis. Prolonged sitting is avoided for 3 to 4 weeks. Pressure garments are worn for 3 to 12 weeks (fig.6). Pressure (finger tip) massage or an ultrasonic massage is advised for persistent oedema, pain or firmness.



Fig. 6. The pressure garment which the patient wears continuously for 3 to 6 months following liposuction.

#### DISCUSSION

The use of unprecedented large doses of the tumescent solution with dilute epinephrine produces intense and widespread capillary constriction in the targeted fat, which in turn greatly delays the rate of absorption of the drug. Larger cannulae remove fat rapidly but there is a risk of removing too much fat which can produce skin depressions and irregularities. An attempt to make a small change in the direction with a large cannula results in a tendency to re-enter a pre-existing tunnel within the fat. This, lack of precise control, results in skin irregularities. Large bore cannulae are suitable only in those cases where the panniculus is to be excised to correct abdominal ptosis (fig.7 a&b). Microcannulae with an external diameter of less

than 3 mm can remove fat very efficiently and are effective in achieving a smoother contour with better control.

Fat layers are treated from deep to superficial, in sequence, in parallel tracks. As the procedure is moved more superficially, cannula size can be decreased along with suction intensity to help decrease the risk of irregularity on surface layers. Most traditional liposuction treatment involves removal of the deeper layers of fat. Superficial liposuction is done in individuals with flaccid or less elastic skin to aid better skin retraction. It is done with a very narrow cannula to make multiple closely spaced tunnels in the sub-dermal fat to affect an undermining of the tissue.

#### HIGH VOLUME LIPOSUCTION

For the significantly obese, a safe and limited surgical intervention that achieves even a minimally acceptable aesthetic contour of their profile in proportion to the body structure greatly enhances their self esteem. This is the prime indication for large volume liposuction. In most of these instances the technique should be combined with a block dermolipectomy. The earlier concerns with large volume liposuctions were that patients are exposed to prolonged procedure and anesthesia, high doses of lidocaine / adrenaline, and fluid shifts. However, as practiced by the authors the procedure is very safe with minimal potential for complications.

#### ULTRASONIC ASSISTED LIPOSUCTION (UAL)

High ultrasonic energy produced by passing electrical energy through a piezoelectric crystal creates microcavities in a liquid or semi liquid medium during the expansion cycle of the sound wave. This property of microcavitation is used in UAL. There is an enhanced fat removal with minimal blood loss, improved skin retraction and safer large-volume procedures with the UAL. It is especially indicated in male patients and in areas of dense, fibrotic fat.

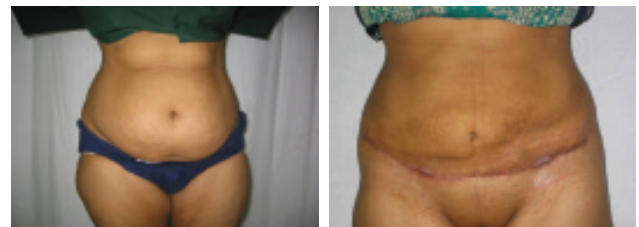


Fig.7a. Pre operative view of a 35 year old female showing abdominal wall ptosis and excessive fat deposit. Fig.7b. Post operative view at 6 months following suction assisted lipectomy with mini abdominoplasty.

#### POWER ASSISTED TECHNIQUES (PAL)

Power Assisted Liposuction (PAL) is the liposuction using devices that use power supplied by an electric motor or compressed air to produce either a rapid in-and-out movement or a spinning rotation of an attached liposuction cannula. It makes the physical process of liposuction easier for the surgeon who may then direct their faculties towards better sculpturing.

#### COMPLICATIONS

An unsatisfied patient is by far the most common complication and it often is a result of the patient's unrealistic expectations. Careful and accurate communication between patient and surgeon helps the

patient make a well-informed decision and obviates many a fact justifying consultation in the post operative period.

Minor complications include superficial irregularities of the skin, seroma, haematoma, focal skin necrosis, allergic reactions to drugs, visible or disfiguring scars, discoloration of the skin, fainting during or after surgery, temporary bruising, numbness or nerve injury and temporary adverse drug reactions.

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