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Theory and Practice of Liposuction

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INTRODUCTION

Liposuction was first introduced in Paris by Dr. Giorgio Fischer, a gynecologist, who used a suction machine to remove fat from some of his patients after performing a D&C. Four years later a French plastic surgeon by the name of Dr. Yves-Gerard Illouz was the first to utilize the technique in a purely cosmetic way. It worked well and was quickly investigated by a group of American doctors that brought the technology and procedure to the United States in the early 1980's where it was very enthusiastically embraced. The technique and technology has advanced through several different "generations" from simple crude tubes (cannulas), ultrasound (LipoSelection) and now laser-assisted liposuction (SmartLipo).

PHYSIOLOGY OF FAT CELLS

Most of the fat in our body exists as a layer (adipose tissue) in the subcutaneous space between the muscle and the skin surface. There are also fat deposits deep to the muscles of the face and abdomen and around our internal organs. Fat mostly serves to provide nutrient (energy) storage and also affects our body's shape and contour. Fat is a dynamic endocrine and highly metabolic tissue. Adipose tissue metabolizes the lipids and fatty acids you absorb from your food and converts them into fat as a means of energy storage. Usually, this would be fats that exceed what you needed immediately for exercise. Adipocytes convert sugar to fat and vice versa by using its metabolic machinery. The main function of fat cells is to provide a metabolic cushion to even out nutrient resources and provide stored energy for times when foods are scarce. Fat tissue exists as a static number of cells that do not migrate around the body or multiply. Since the cells are very fragile, they are loosely attached by a "stroma" of nerves and blood vessels that nourish the cells.

THE TWO ANATOMIC LOCATIONS OF FAT

You are born with a finite number of fat cells in your body. These do not multiply and divide and they do not travel around the body or renew themselves like skin cells. They are distributed according to certain male/female patterns and according to your family genetics. There are different anatomic locations and types of fat in the body. The first one (which we are most concerned with) is the subcutaneous (under the skin) fat layer. This is the fatty distribution that can be treated very successfully with liposuction. Wherever there is fat in the subcutaneous area, it can be removed by liposuction. It is situated between the deeper muscle layers and the skin surface. It provides cushion, warmth, shape, contour and a gliding interface between the muscles and the skin. This superficial fat layer is often comprised of different levels, both superficial and deep. Occasional blood vessels and nerves course through the fat layer on the way to the skin.

The second layer of fat is a deeper layer which is quite specific in function and localized to specific compartments or locations such as eyelid fat, buccal fat pads in the face, subplatysmal fat in the neck, and the omentum fat organ in the abdomen. These areas can only be treated by direct surgical excision.

TECHNIQUE OF LIPOSUCTION

Liposuction techniques are separated into the broad categories of standard liposuction, ultrasonic liposuction and, laser-assisted liposuction.

Common to all these techniques is the now well accepted method of local anesthesia called tumescent, (swollen) anesthesia. This is where a dilute anesthetic solution consisting of adrenalin (to constrict the

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blood vessels and decrease bleeding) and novacaine (to numb the treated areas) is injected into the fat which is to be liposuctioned and this area becomes bloated (tumescent technique). In addition to providing anesthesia and decreasing bleeding, this extra fluid helps to loosen the fat cells prior to liposuction and creates a fluid medium where ultrasonic energy and laser energy is more efficiently dissipated. Next, small incisions are made and thin stainless steel tubes (cannulas) are inserted, connected to a suction source, and the fat is removed. This can be done with cannulas directly connected to a suction machine, or to a syringe, or a reciprocating "power-assisted" machine that provides the "in and out" motion so the surgeon does not get tired.

Ultrasonic liposuction consists of the same anesthetic technique for standard liposuction but, with an ultrasonic energy source connected to the cannula. This is inserted into the fat and the ultrasonic vibrations at the tip of the cannula liquefy the fat cells. After this ultrasonic energy is applied, the liquefied fat cells are more easily removed by standard liposuction. The ultrasonic cannula gets very hot so the skin must be protected to prevent burns. There are several machines for this purpose that differ in the types of probes and tips and how they distribute the ultrasonic energy source. Ultrasonic liposuction is especially useful in situations where the fat is not easily removed, such as in athletes, patients that have had liposuction before, or in difficult areas such as the hips, flanks or male chest.

Laser assisted liposuction simply means to use a laser energy source introduced into the tissues by a very small cannula directly under the skin. This liquefies the fat cells, breaks up the collagen strands, and stimulates the collagen to contract. This is followed by standard liposuction to remove the fat cells.

Cannulas come in different shapes and sizes and diameters with different holes at the ends, all designed to removed certain quantities of fat in certain areas of the body. The cannulas are introduced by small incisions at locations near the area to be liposuctioned, usually hidden in skin creases or under garment lines. The tunnels created by liposuction are crossed to make a grid like pattern to insure an even surface contour, and less fat is taken toward the edges to blend in or feather out the liposuctioned areas with the non-liposuctioned areas. Since this is a procedure that occurs at the surface of the body, through small incisions, and does not violate major tissues, bone, or muscle or enter major body cavities such as the lungs or abdomen, it can be relatively comfortable and associated with minimal pain.

BODY RESPONSE TO LIPOSUCTION

There are two ways the body responds to liposuction: locally and systemically.

The local response to liposuction is, of course, the one we want. This is where the contour improvement is seen. As fat is removed, the elastic fibers in the skin cause the skin to contract and mold down over the reduced fatty framework. This response is seen virtually immediately. Over time the collagen in the skin also contracts and shortens to maintain this skin contour. Fat removal is extremely technical and must be removed in different areas and in different quantities depending on the amount present and the contour desired. Your body will only "give up" a certain amount of fat despite how much suction is done, so there is an endpoint to the result. If too much fat is removed or there is a problem healing due to bleeding and scar tissue, a "dent" may result. If not enough fat is removed or your body does not give it up, a "bump" may result. Overall, once the fat cells are removed, they do not grow back. The fat cells remaining in the treated areas do not multiply. For this reason, your results are permanent. If you gain weight you will see more fat accumulation in the areas not treated since there is the normal number of fat cells there. At the same time, treated areas will not accumulate as much because there are fewer fat cells.

Systemic response to liposuction has only recently begun to be studied and understood. After the fat cells are removed, especially if there is a substantial volume, then the heart has to work less to circulate blood and glucose to these tissues. Blood pressure may improve and blood glucose levels may improve. Diabetics have been known to show improvement as well.

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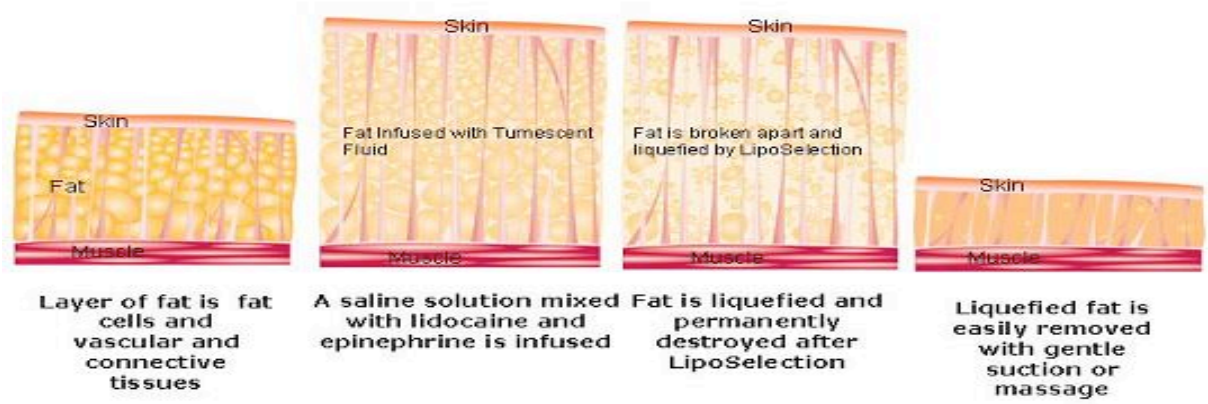
SEQUENCE TO LIPOSUCTION



This is the normal skin/fat/muscle relationship. Note the presence of the subcutaneous fat layer between the muscle and the skin.

Here tumescent anesthetic is added. Note the effect of bloating up the fat layer and stretching the blood vessels and nerves

This section demonstrates where liposuction has been performed creating "tunnels" in the fat layer. These tunnels are different diameters depending on the cannulas used. Note how tunnels go between blood vessels and nerves

The result: note how the thickness of the fat compartment is reduced. The smaller layer of fat and smaller contour is due to the skin molding down over the reduced fatty framework.

LONGEVITY OF LIPOSUCTION RESULT

You can expect to maintain your results for the rest of your life as long as you maintain your weight in a stable range.