

Laser Lipolysis

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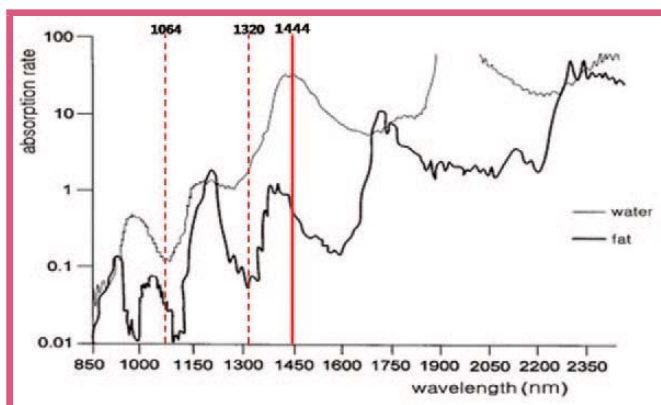
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The first body contouring operation can be dated back to 1920. This operation was performed by a Gynaecologist Charles Dujarrier who used an intrauterine curette to contour the legs of a ballet dancer. In 1976, the concept of liposuction with a hollow curette was developed by Fischer. Then, there were a lot of evolutions in liposuction in terms of techniques and technologies. The new technologies include motor assisted, ultrasonic, water-jet, laser and radiofrequency.

Laser lipolysis means using laser to destroy the cell membrane of adipocytes. In 1988, Hukki reported using 1064nm Nd Yag laser for subcutaneous fat¹. In theory, infrared vibrational bands could be used for selective photothermolysis of lipid rich tissues. In a study by measuring the absorption spectra of human fat, promising bands near 1210 and 1720nm were identified². However, only 1064nm Nd Yag laser, 1320nm Nd Yag laser and 1444nm Nd Yag laser are used for laser lipolysis in the market. Different wavelengths showed different absorption coefficients by water and fat tissue. The wavelength, pulse duration and maximum power of the laser machine will affect the result of fat ablation and the outcome of treatment³.



Mechanism of Laser Lipolysis

The laser works on the fat in twofold mechanisms: photoacoustic and photothermal effects.

When the laser is fired, plasma forms early in the laser pulse from disintegration of tissue in focal volume. Plasma expands outwards creating shock waves and acoustic waves which result in mechanical destruction of adipocytes. The photothermal effect may act on the proteins on the adipocyte membrane by denaturation of protein. Therefore, the contents of adipocytes are released into the extracellular space.

The laser also targets the water as chromophore. When water absorbs the laser light, the light energy is converted to heat energy. The dermis and fibrous septa are heated up. Immediate protein contraction may occur. Collagen synthesis is stimulated and skin tightening will appear with time. Therefore, laser lipolysis is good for patients with localised fat collection and mild skin laxity⁴.

Histology

Scanning Electron Microscopy of human fat specimens after laser irradiation shows destructive changes of the adipose tissues with crater formation. Preservation of nerves was shown in the histological study by Blugerman and Schaulzon. Fat removal without laser lipolysis showed intact fat cells. Fat removal following laser lipolysis showed disruption of cell walls.

Biochemical

Fat elimination is so gradual that an increase in circulating lipid levels is not measurable⁵. Most of the triglycerides are excreted via the kidneys. The rest becomes lipoprotein in the liver.

Surgical Procedure

Pre-operative contouring line of localised fat is marked. Skin is disinfected and the operative field draped. Small incisions are made under local anaesthesia at concealed sites. Tumnescent solution is infiltrated via an infiltration cannula. Tumnescent solution is composed of saline solution, lignocaine, adrenaline, and sodium bicarbonate.

A thin cannula (around 1mm wide hollow metal tube) with the optical fibre is pushed into the subcutaneous layer via the incision. The laser is delivered through the optical fibre. The cannula is passed in repeated strokes with fanlike back and forth movements in different layers. The non-dominant hand stabilises the skin and guides the cannula. The aiming beam of the laser machine will indicate the position of the fibre's tip. The size of the aiming beam on the skin surface also gives a tip about the depth of treatment. Cross-tunnelling via different incisions is important for smooth result.

Laser lipolysis should be stopped when the signs of end point appear.



- The treated area becomes soft
- Loss of resistance for the passage of the laser probe
- Heat perception by the guidance hand

If skin laxity is present, the cannula can be passed in the subdermal layer to heat the dermis.

After laser lipolysis, the fat is liquefied and oily emulsion gushes out from the incisions. For small area treatment, the lysate can be aspirated or left alone. The body will eliminate the fat via the lymphatic system. For a large area, the fat should be sucked out as traditional liposuction. This step is more gentle and easier.

Advantage of Laser Lipolysis

- Small incisions - even a needle puncture is large enough for advancement of the cannula.
- The Fine cannula is suitable for superficial liposculpture and fibrotic area.
- Suction of liquefied fat is more gentle and easier. This results in shorter downtime in terms of bruising and swelling.
- Post operative pain is less because of preservation of nerves during laser lipolysis.
- Skin tightening is an additional effect aside from fat removal.

Disadvantage of Laser Lipolysis

- Cost of laser machine and consumable are expensive.
- There is potential risks of laser injury to the patient and staff.

Personal Opinion

Laser lipolysis is suitable for small areas, fibrotic regions, revision areas, areas with lax skin and facial areas where scar is not acceptable. For large area treatment, its advantage may not be superior to other technologies. However, its skin tightening effect is another weapon. Correction of the nasolabial fold, jaw and Marionette lines by facial sculpturing with subdermal laser treatment is a good option.

References

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