

Laserlipolysis. Liposuction with Nd:YAG laser.

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ABSTRACT

This article illustrates the authors' experience in the utilisation of the Nd:YAG laser for the treatment of lipodystrophy, a procedure known as *laserlipolysis*. Histological studies are used to demonstrate the physical principle of the action of laserlipolysis on the lipo-cell and the effects on adjacent tissues.

Keywords: laserlipolysis, laser liposuction, Nd:YAG laser, peristaltic pump, photothermia.

INTRODUCTION

Nowadays the trend is towards the search for less invasive treatments. Despite the evolution of liposuction, one of the most frequent surgical procedures of plastic surgery, many patients continue to be reluctant to subject themselves to this type of operation. Their fears are related to the recovery times, the requirement for a general anaesthesia, pain in the post-operative period and the inevitable interruption of normal everyday routine.

From a medical point of view, instead, the principal concern lies in the haemodynamic repercussions due to the potential blood loss associated with the removal of fat.

In this study we illustrate our experience with laserlipolysis using the Nd:YAG laser at 1064 nm in the treatment of lipodystrophy.

PREVIOUS RESULTS

In 1994 and in 1999 Apfelberg^{1,2} published some results of a multicentric study, approved by the FDA, based on the action of the Nd:YAG (40 W) laser on fat tissue. The laser

beam acted only on the fat tissue that was contained within the cannula, coagulating the blood vessels. Despite the results being partial, a reduced blood loss, shorter recovery time, less oedema, pain and ecchymoses were observed, as well as greater comfort in the post-treatment period. The study was interrupted. In 1997 and 1999, Cook^{3,4} utilised a laser for the vaporisation of subcutaneous facial tissue. In 2001, Schavelzon⁵ demonstrated the results achieved through the use of laserlipolysis in the strict sense.

MATERIALS AND METHODS

In laserlipolysis we use a laser system of the Nd:YAG type with 1064 nm emission associated with a HeNe source as guide beam. The system is regulated to emit 150 mJ of energy at a frequency of 40 Hz, totalling a power of 6 W. The laser beam is conducted through an optical fibre of 300 micron inserted within a stainless steel microcannula of 1 mm diameter and variable aspiration.

Since this is a surgical treatment, a clinical and laboratory evaluation is previously carried out, and the patient is invited to sign an informed consent form. The technique is indicated in the treatment of localised lipodystrophy and irregularities of the fat tissue in health patients, preferably non-smokers and with a weight close to the ideal. Preoperative photographic documentation must be made and conserved. In general tumescent local anaesthesia is opted for (the presence of the anaesthetist in the surgical premises is required). The

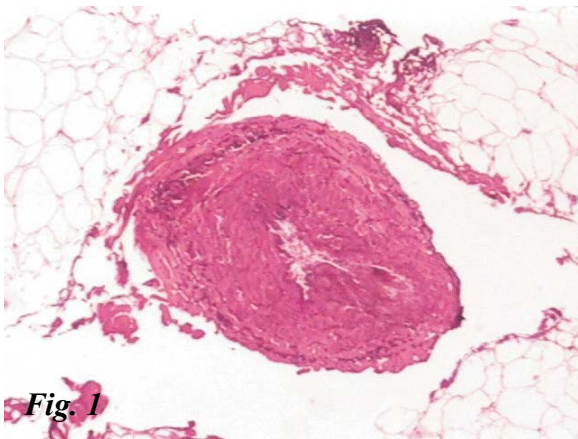


Fig. 1

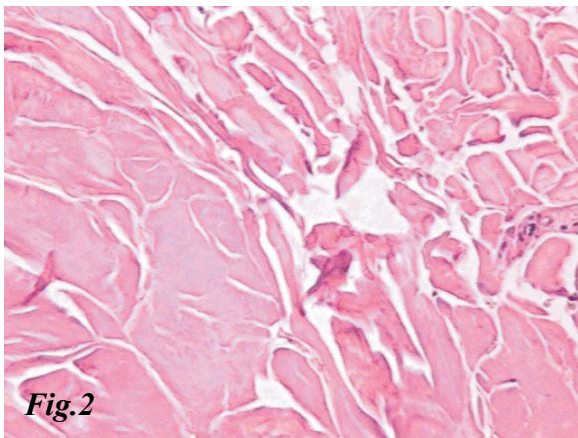


Fig. 2

solution is injected with the help of a tumescent pump conceived precisely for this purpose.

A microcannula is introduced through small incisions, advancing and retreating in the fat tissue at different levels of depth, including the subcutaneous tissue. These movements are facilitated by the laser itself. In contact with the fat tissue, the low power laser beam (maximum 6 W) produces an effect known as “*selective photo-hyperthermia*”: when the light energy strikes an adipocyte it is transformed into heat. The increase in temperature causes the rupture of the delicate capsule which surrounds the fat cell (photothermic action) releasing the oily substance contained within (Fig. 3). This oily solution produced by the laserlipolysis, together with the residue of the cells, remains spread over the treated area, and is then drained. This is performed using a cannula of 2 millimetres, multi-aperture, coupled to the same peristaltic pump (with an inverted flow rotation) which is used for the infusion of the

tumescent solution. The operation continues with a traditional liposuction, with slightly compressive bandaging, analgesics and generic treatments. In general the procedures are all of an outpatient nature, and the patients can return to their normal activities starting from the second day after the operation. A manual drainage is performed from the first week after the operation.

In a period of 28 months, 1,734 procedures were carried out in three plastic surgery centres⁶. Of the total number of patients, 82% (1421) were female and 18% (312) male. The age ranged from 15 to 78 years. The tumescent solution used contains on average 1 mg of adrenaline, 15 ml of molar bicarbonate of soda and 15 ml of Lidocaine at 1% (or more, depending on the case) for each litre of saline solution.

RESULTS

The results achieved through laserlipolysis are similar to those obtained with traditional liposuction methods. In terms of complications, we had a case of a small burn of a diameter of 1cm which cicatrised without further consequences; fourteen cases of asymmetry and one seroma.

DISCUSSION

The laserlipolysis performed with the Nd:YAG laser, associated with a tumescent anaesthesia utilising a peristaltic infusion pump, proves to be a method featuring a low blood loss, a low incidence of ecchymoses and greater comfort in the post-operative period. The action of the laser facilitates the treatment of denser areas, such as in gynecomastia or in repeat operations, with less effort and fatigue for the surgeon. The visualisation of a luminous spot, originating from the HeNe laser, which proves to be transluminescent through the skin, means that the performance of the treatment is fairly precise. Histological studies highlight positive effects, such as the coagulation of the small blood vessels of the fat tissue (Fig. 1), the rupture of the adipocytes, the reorganisation

of the reticular dermis and the coagulation of the collagen of the fat tissue (Fig. 2).

CONCLUSION

Laserlipolysis represents a method for the treatment of lipodystrophy which, in our study, features certain advantages over traditional liposuction, principally in relation to the enhanced quality of post-operative recovery. This procedure represents an efficient method for the treatment of irregularities of the corporeal contours. Among the disadvantages we might mention the need for training and for knowledge of the physical principles of lasers, greater operational time and the elevated cost of the system.

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