

49 Water-Jet-Assisted Liposuction

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49.1

Introduction

Liposuction is an operation that removes lipocytes or bands of lipocytes from the subcutaneous/epifascial area of the skin. The procedure can shape the body by the internal removal of fat. This is done with the aid of a solid hollow needle via small incisions and reduces the number of adipocytes that store fat. Liposuction is today is one of the commonest treatments in the area of aesthetic surgery.

49.2

History

About 100 years ago techniques were invented to permanently remove fat. In the beginning, the results were fairly poor because of large incisions to excise fat causing big scars. Also, serious infections and bleeding were quite common.

In 1921, Dujarrier [1] introduced a defatting technique with the use of curettement for the inner side of the knee and the calves and applied it to a Parisian ballerina. The result was disastrous because one of her legs had to be amputated later on.

Further progress was made in 1964 by Pitanguy [2]. Nevertheless, large and visible scars were still not avoidable. Also in the early 1960s, Schrudde [1] presented his lipexheresis. He removed fat with small incisions of a specialized curette. Large loss of blood and infections as well as loose skin flaps could not be prevented.

It took until the year 1975 for the idea of fat suction to emerge. The first use fat suction were Fischer and Fischer [3]. They developed a motorized suction cannula with a revolving blade just behind the opening of the cannula. There was a single copy of the machine only and it was very expensive and difficult to reproduce.

The final breakthrough came with the new technique of using a suction machine in addition to blunter and finer cannulas by Illouz [4]. He noticed that sodium chloride with added hyaluronidase applied to

the tissue before the operation could significantly facilitate the fat suctioning. But high loss of blood and other complications were still a big risk.

Klein [5] (1987) increased the dose of adrenaline and lidocaine in the saline solution, originally proposed by Fischer, and this technique, now called tumescence technique, was widely spread around the world. This liquid is also required for ultrasound-assisted liposuction, which was introduced in the 1990s.

Between 1994 and 1998 496,245 liposuction procedures were performed in the USA.

A very different method to a controlled and gentle liposuction was introduced by the author in (2000) [6] when the method of water-jet liposuction was reported.

49.3

Risks

While liposuction has steadily been gaining popularity worldwide, the risk of the tumescent technique has been very much neglected. There are reports that in many liposuction deaths using the tumescent technique there was no obvious reason for the death [7, 8]. The patients were not ill, and with an age between 30 and 55 they were not old either. Some of them died during the operation, but most of them died a couple of hours later. Cardiac arrests were usually preceded by a decline of blood pressure and a reduction in heart rate. Others died of pulmonary edema, while their main cause of death were thromboembolic processes.

The chief ingredient of the solution used for tumescent liposuction is the local anesthetic lidocaine, which can only be absorbed by the body up to a certain limit. Anesthetists can hardly believe what quantities dubious or unsuspecting surgeons sometimes use. Whatever the reasons, risks and disadvantages of the tumescent technique are very often ignored or belittled by surgeons as well as patients. Reports about numerous cases of death and other grave complications pose serious questions about the safety of the tumescent technique though.

With operations that are not mandatory for health reasons, the danger of complications should not depend on the method of operation. Alongside local complications like overcorrection or undercorrection as well as dents and steps, other side effects caused by the drugs contained in the tumescent solution are a problem. Frequent publications about new cases of death after tumescent liposuctions make us search for better techniques. This is surely the main reason why many surgeons return to the “wet method” to focus all their skills and energy on reducing the dangers and risks to patients which are caused by specific methods.

49.4 Water-Jet-Assisted Procedure

The method of water-jet-assisted liposuction allows a controlled and selective removal of fat tissue within the epifascial/subcutaneous area via usage of a cannula system.

Principally every new method of liposuction should fulfill the following criteria:

- Increased safety for patient and doctor: the desired result is achievable as planned
- Improved process and results as opposed to commonly used methods
- Shorter operating times
- Reduced usage of drugs as well as application of a well-established method of anesthesia, which is reproducible

The method of liposuction is based on water-jet surgery. The water-jet technique has long been used in industry to cut all different kinds of materials. In medical science the water jet has already been used in parenchyma surgery. The method uses the energy of the pressurized fluid as well as a novel cannula system and suction unit.

49.4.1 Statistical Data

During the period from October 1999 until March 2003, 280 patients were treated with this new method of liposuction. The average age of these patients was 36 years for women and 33 years for men. The average weight was 70.5 kg (10.8 stones).

49.4.2 Cannula System

A specialized cannula is used in which an infusion tube and a nozzle are integrated as well as a suction

unit. An infinitely variable force pump dispenses the fluid in a controlled manner via a nozzle at the top of the cannula system. The cannula is attached to a common and well-proven suction device for liposuction.

49.4.3 Technique

A fan-shaped liquid jet decomposes the fat tissue into fragments that can be cleanly suctioned out. At the same time the solution and detached fat particles are suctioned via the opening in the cannula. The pressure of the slightly inclined water jet can be adjusted very precisely via a foot-operated switch. As working and hydraulic fluid, a 0.9% NaCl isotonic solution plus adrenaline additive is utilized. All other preparatory steps are identical to the ones used with other methods.

After the incision into the skin and the introduction of the cannula system into the epifascial fat tissue a new and different approach is used. The fan-shaped variably adjustable high-pressure jet fragments the fat into a state in which it can be suctioned off. The suction process, which happens at the same time as the fragmentation process, enables the surgeon to watch the aspirate in the suction tube in parallel. The appearance of the aspirate is very important to be able to judge the tunneling speed of the fat tissue that is being worked upon.

The different phases in the appearance of the aspirate can roughly be categorized into the following three phases:

1. A phase rich on intact cells
2. An emulsion phase
3. A sediment phase that mainly consists of fat cell wall fragments

The cannula can be inserted into the fat tissue very easily owing to the water jet, which works on the fat tissue at the same time. Because of the slow speed of penetration of the cannula the water jet has more time to decompose the fat into fragments that can then easily be suctioned off. Placing the spare hand on the outer skin, the surgeon is able to feel the height and position of the cannula and the water jet. The simultaneous suction of the fat tissue allows the surgeon to determine, at any time, the magnitude of the fat tissue that is to be removed. Borders and margins can be harmoniously aligned by adjusting the pressure of the water jet (Figs. 49.1–49.3). This method shortens surgery times significantly.

The tumescent method does not allow such a precise correction of margins because the area that is being worked on loses its original shape owing to the tumescent solution. The postoperative leakage of

fluid from the incisions with the tumescent method is largely reduced if not even stopped with the new water-jet method. A compression garment needs to be

worn as usual for about 4 weeks. The operation is carried out in an outpatient setting in the presence of an anesthesiologist. On the average the patient remains

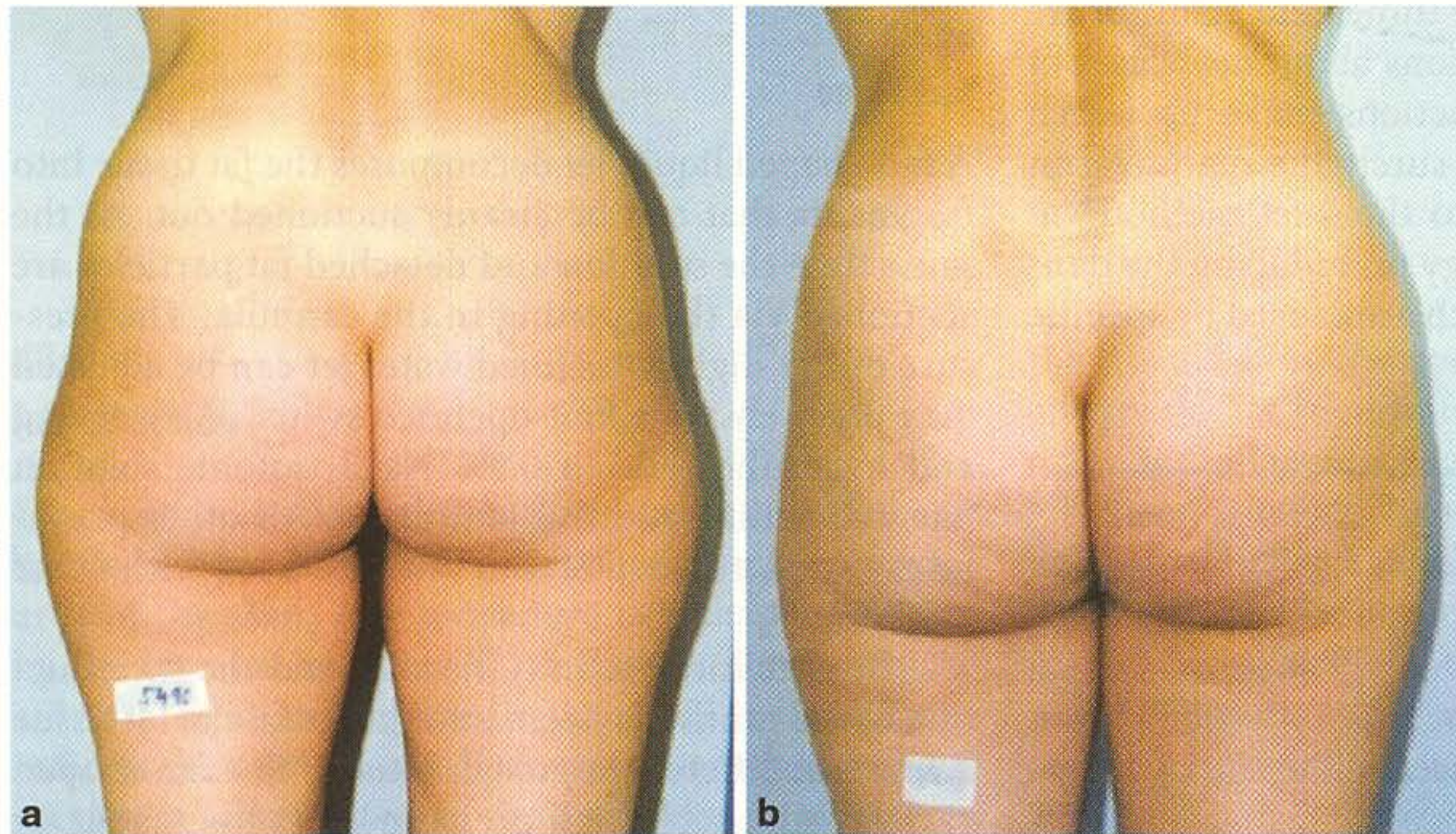


Fig. 49.1. **a** Preoperative patient with lipodystrophy of hips and thighs. **b** Postoperatively following water-jet-assisted liposuction

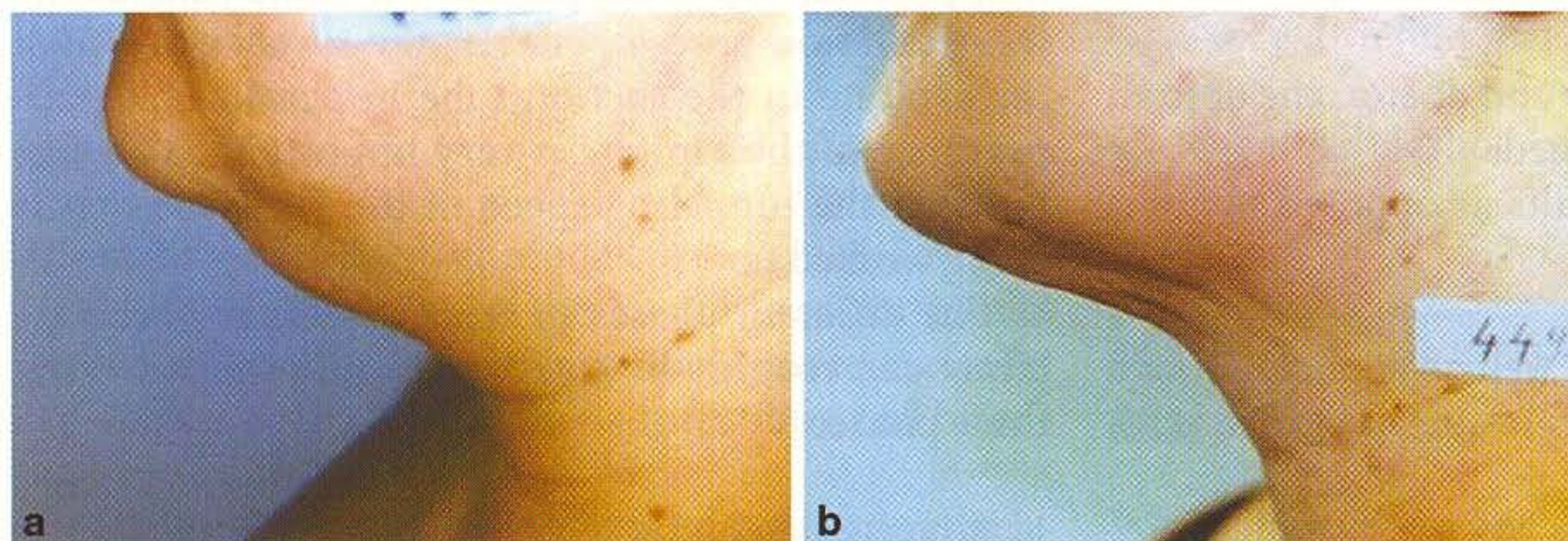


Fig. 49.2. **a** Preoperative patient with lipodystrophy of the neck. **b** Postoperatively following water-jet-assisted liposuction



Fig. 49.3. **a** Preoperative patient with abdominal lipodystrophy. **b** Postoperatively following water-jet-assisted liposuction

in the clinical center for 2-3 h after surgery before being discharged.

49.5

Results

The selective impact of the water jet in the fascio-cutaneous area on the fat tissue leads to a mechanical removal and rinse of individual fragments of tissue from their group of cells and, at the same time, a reduction of subcutaneous fat tissue in the fascio-cutaneous layer of the skin.

It has been noted by the author that surgery times can be reduced by more than 40%. This is mainly caused by the fact that the phase for the instillation of tumescent solution and the period until it takes effect with the tumescence technique does not apply for the water-jet technique. A large part of the saving in time arises from the fact that immediately after inserting the cannula and starting the water jet the suction process is started. The personal goal that was individually discussed with the patient before the operation was achieved in all but four cases. In these four cases a second operation was necessary because not enough fat tissue had been removed. These cases happened at the beginning of the introduction of the new method because the technique of operation had to be acquired in an autodidactic way.

49.6

Complications

No infections were noted in any of these cases. The occurrence of ecchymoses was very rare and in these few cases minimal. In one case a hematoma appeared in the medial area of the knee. In none of the cases was there a seroma that could be clinically established. The previous sensitivity of the skin of the treated areas returned after 3 days to 6 weeks.

In two cases (hip/upper abdomen), moderate asymmetry appeared which did not bother the patients. All transitions to neighboring areas that had not been treated could be modeled in a smooth and harmonic way. In none of the cases was there liquid that leaked from the incisions later than 24 h after the operation.

For postoperative pain therapy, an analgesic of type "Sympal" was prescribed. The average consumption was four pills until the third day after the operation.

49.7

Discussion

The targeted fragmented removal of the fat tissue allows the achievement of the desired result in a controlled and safe way. There is no direct relationship between the goal of the operation and the amount of aspirate. It is a characteristic of this method that it is possible to achieve a visible reduction in fat tissue and to contour the affected areas at the same time.

Liposuction is one of the commonest treatments in aesthetic surgery worldwide. These operations are mainly conducted with the tumescent technique and apply a subcutaneous infusion of an enormous amount of a solution made up of lidocaine or prilocaine as a local anesthetic as well as a solution with sodium chloride, adrenaline, sodium bicarbonate and more. After a period of between 30 and 60 min after infusion of the tumescent solution, the aspiration of the fat tissue is started via microcannulas.

The water-jet technique uses an isotonic sodium chloride solution with an additive of adrenaline in the ratio of 1 ml to 3 l of sodium chloride solution, which is suctioned off almost at the same time as the dissolved fat particles; therefore, no side effects are caused by the solution that is used as with the tumescent technique.

Another positive aspect of the new technique is that the pressurized NaCl solution achieves a fragmentation of the fat tissue in a very controlled manner and that the solution is suctioned off at the same time. This avoids a separate fragmentation step as with the tumescent technique. The removal of fat tissue and the molding of the surrounding area can start right from the beginning of the operation. Compared with other methods only little fluid remains in the tissue, which is perceived by the patient as being very pleasant.

One of the advantages claimed for the tumescent technique is that only local anesthetic is used and that, therefore, no anesthetist is required. This has proved to be more of a disadvantage because the risks of local anesthetics are incalculable and uncontrollable. There are no side effects from local anesthetic with the water-jet technique since local anesthetic tumescence is not used. This additionally increases the acceptance of the new method by patients. The cases of deaths reported where the operation was performed solely for cosmetic reasons are especially alarming.

Further clinical trials need to be performed for the water-jet technique of liposuction so that the first clinical experiences can be confirmed with a larger number of patients and to establish the significance that the water-jet technique will have for liposuction in the future.

49.8

Conclusions

The technique of water-jet liposuction is a safe, gentle and targeted method to remove subcutaneous fat build-ups. It offers a very good way for molding the tissue during the operation. Apart from the solution for the water jet no additional drugs are required; therefore, drug-related side effects are not to be expected. The method is simple, easily explained to the patient and quickly learned by the surgeon. It opens the door to new and safer possibilities in plastic surgery.

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