Safety in liposuction using local tumescent anesthesia: a report of 1,107 procedures between 1998 and 2004

Segurança em lipoaspiração usando a anestesia local tumescente: relato de 1.107 casos no período de 1998 a 2004

Original Article

ABSTRACT

Introduction: Liposuction is a cosmetic procedure that removes undesired body fat. More recently, it has been associated with complications and deaths, raising concerns about the risk involved in the procedure. Since the tumescent technique was described by Jeffrey Klein, surgeons from around the world have contributed to the development of the technique, making liposuction with microcannulas and local anesthesia a safe and effective procedure that achieves its objective. Nevertheless, severe complications and deaths are described in the literature when the procedure is performed under general anesthesia or with IV drugs, or when there is a breach of the protocols recommended for local tumescent anesthesia. Therefore, it is necessary to establish protocols for liposuction procedures that use local tumescent anesthesia, to promote safety.

Objective: To demonstrate that using local tumescent anesthesia in liposuction is safe.

Methods: Retrospective study of medical records of 568 patients who underwent 1,107 liposuction procedures assisted by local tumescent anesthesia between 1998 and 2004.

Results: There were no deaths or complications that required hospitalization.

Conclusions: When standardized protocols are observed, liposuction assisted exclusively by local tumescent anesthesia was shown to be a safe procedure.

Keywords: lipectomy; anesthesia, local; safety.

RESUMO

Introdução: *A lipoaspiração é procedimento cosmético para remoção de gordura corporal indesejada. Recentemente, tem sido associada com alta morbidade e mortalidade levando a dúvidas quanto ao risco do procedimento. Desde a descrição da técnica tumescente por Jeffrey Klein, cirurgiões dermatológicos de todo o mundo contribuíram para o desenvolvimento da técnica, tornando a lipoaspiração com microcânulas e anestesia local tumescente procedimento seguro e eficaz em seus objetivos. Porém, sua combinação à anestesia geral, infusão intravenosa de drogas ou quebra dos protocolos sugeridos para anestesia local tumescente implicou sérias complicações e mortes relatadas na literatura. Dessa forma, torna-se necessário estabelecer protocolos para lipoaspiração com anestesia local tumescente, reiterando a segurança do método.*

Objetivo: *Demonstrar que a lipoaspiração usando anestesia local tumescente é procedimento seguro.*

Métodos: *Estudo retrospectivo dos prontuários de 568 pacientes submetidos a lipoaspiração utilizando anestesia local tumescente no período de 1998 a 2004.*

Resultados: *Nenhuma morte ou complicação que necessitasse de hospitalização ocorreu.*

Conclusões: *A lipoaspiração usando exclusivamente anestesia local tumescente, demonstrou ser procedimento seguro quando respeitados protocolos padronizados.*

Palavras-chave: *lipectomia; anestesia local; segurança.*

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INTRODUCTION

Since its advent in the 1970s,[1] liposuction has gained popularity and become the most frequently performed cosmetic surgery in the world.[2] In 1987,[3] Jeffrey Klein described the tumescent technique, a procedure that has revolutionized the field. The description of the technique, which combines a saline infusion with anesthesia in the subcutaneous region until the state of tumescence is achieved, as the only method of anesthesia, was a watershed in surgery. The local tumescent anesthesia (LTA) technique solved many medical and cosmetic problems associated with liposuction.[2] When initially developed in France and Italy in the 1970s,[4] the surgery was carried out under general anesthesia, without any infusion of liquids (dry technique); over the years, a small amount of liquid started to be infused (wet technique). Nonetheless, both methods were associated with heavy blood loss, and usually required blood transfusions.[5] In addition, the instruments used were cannulas with a 1 cm diameter, which were substituted in the beginning of the 1980s for 6 mm cannulas. These instruments caused damage to neurovascular bundles, occasionally leading to irregularities in the body contour, in addition to seromas and frequent hematomas.6 It was with the tumescent technique that microcannulas (diameter from 1-4 mm) with multiple orifices became popular.7 Many authors suggest that LTA-assisted liposuction is the gold standard for fat removal surgeries.[5-7]

Currently, one-third of liposuction surgeries in the US are carried out by dermatologists using the LTA technique;[5] the majority are performed in outpatient clinics or in well equipped practices.[8] In India, there is a growing number of dermatologists who perform this type of procedure. The requirements are: training in dermatology, followed by training in dermatologic surgery and obtaining a certification to perform liposuction.7 In Brazil, some dermatologists with specific training also perform liposuction.[9]

Many physicians, especially non-dermatologists, use techniques that are described as tumescent, but are not. As discussed above, the wet technique is different from the tumescent technique, as is the method that combines other types of anesthesia with local anesthesia. The inaccurate use of the terms "tumescent technique," "tumescent liposuction" or " tumescent anaesthesia" to describe any liposuction procedure that uses a subcutaneous infusion of anesthetic, or subcutaneous infusion combined with other types of anesthesia (such as general, intravenous or peridural), has been a source of confusion even in the medical community, with rumors and the publication of complications and deaths [10-24] attributed to the tumescent technique. However, when analyzed in detail, all such articles reveal techniques that cannot be considered tumescent liposuction as the procedure is known and studied by dermatologists.

The use of LTA as the sole method of anesthesia is the gold standard in liposuction for dermatologic surgeons. No fatalities have been published since the introduction of this procedure, and more serious complications are extremely rare.[2] Observing the proposed protocol, and understanding the pharmacological characteristics of the infiltrated substances, is essential for a successful procedure. The objective of this study is to evaluate the safety profile of 1,107 liposuction surgeries performed in the surgical rooms of a private practice between 1998 and 2004.

METHODS

In this retrospective study, records of 568 patients who sought the authors' private practice during the study period for the removal of localized fat using liposuction were reviewed. After explanations about the procedure's characteristics and a physical examination of the proposed treatment area, a decision about whether to perform the procedure was made. For patients with non-realistic expectations, as well as obese individuals who sought the surgery as a way to lose weight, the surgery was not recommended. For the latter group, it was explained that the objective of the procedure was not to lose weight, but rather to remove undesired localized fat.

For those going forward with the procedure, a standard evaluation for surgical risk was requested from the cardiologist (physical examination, thorax x-ray, electrocardiogram, complete blood count, biochemistry, complete coagulogram and routine urine examination). Patients whose ASA classes came up different from I or II (surgical risk classification of classes I to VI, described by the American Society of Anesthesiologists, according to the presence and severity of the disorders affecting the patient) had the procedure contraindicated. Additionally, an abdominal ultrasound was requested for patients seeking abdominal liposuction to check the competence of the abdominal musculature. Patients with abdominal hernias had the procedure contraindicated, due to the association of that disorder with the perforation of the intestine. The patients who complied with all selection criteria were photographed and measured, and later signed the term of consent.

Given the absence of a well established consensus in Brazil, the international dermatologic guidelines for liposuction using LTA, [25-28] mainly those used in the US, were followed.

PREOPERATIVE CARE

In all cases, 500 mg of azithromycin was administered the night before, two hours before and the day after the procedure. A bath with chlorhexidine soap was recommended in the morning on the day of the surgery.

The ingestion of vitamins, alcohol and medication that could interfere with the coagulation of the blood were discontinued one to two weeks prior to the procedure. It was advised that drugs that interfered with the enzymes of the cytochromes P4501A2 or P4503A4, by inhibition or competition, were suspended or substituted with appropriate equivalents. That measure aimed at avoiding that the lidocaine's bioavailability implied a serial level higher than 6 microg/ml, which, according to reports, has been associated with symptoms of anesthetic intoxication.8 In the morning on the day of the surgery, the ingestion, before breakfast, of a tablet of lorazepan 2 mg and a tablet of dimenhydrinate 50 mg + pyridoxine hydrochloride 10 mg (Dramin B6®) was recommended as a means of inducing conscious sedation.

SURGICAL TECHNIQUE

The procedures were performed in an outpatient surgical center containing reclining surgical tables, , surgical lights, resuscitation equipment (including drugs and defibrillator) and air conditioning, which was previously disinfected. The surgeon swabbed his/her hands and arms with iodated degerming solution, using surgical cap, , protection glasses, surgical mask, overcoat and sterile gloves. The surgical center's doors were adapted to allow the surgical table to pass through quickly in case of an emergency.

After cleaning the patient's skin with iodated solution, pictures for documentation and marking were taken with the patient standing up.

In all studied cases the tumescent solution (Table 1) was then infiltrated with blunt-tipped infusion cannulas attached to the saline solution equipment. The infusion continued until the tumescence state was achieved in the deep and superficial planes of the previously marked areas.

The solution was allowed to diffuse among fat lobules for 20-30 minutes, to optimize the effects of the adrenaline and lidocaine. In the sites where the state of tumescence (characterized by local edema and firmness) was not reached, reinfiltration was carried out.

After this phase, the patient was positioned more comfortably to allow the surgeon to start working. After each change in the patient's position, a new local application of iodated solution was carried out. Multiple millimetric incisions were made so that the fat panniculus could be reached in several directions. The cannulas used, varying from 2-4 mm, were those recommended by Klein. The amount of infused anesthetic solution was measured so that the rate of lidocaine did not exceed 35 mg/kg per patient. The total amount of aspirated liquid – a slightly red anesthetic solution due to its contact with blood and fat – was left to rest for 30 minutes so that the separation in two phases allowed the calculation of the total aspirated fat in liters.

After the procedure, 1% silver sulfadiazine cream was applied to the incision areas, which had not been sutured in order to allow the drainage of liquids from the areas that received surgical intervention. Geriatric absorbents were placed in those sites to provide comfort to the patient who was instructed to use compressive belt for 24 hours uninterruptedly. For patients who received abdominal liposuction, a marble was placed in the umbilicus to avoid unattractive tissue adhesions. In those cases, 5kg bags of rice were used to provide compression to the treated area during recovery. For the first day after the procedure it was recommended that the patient remain under supervision due to the probability of dizziness. On the second day, once the marble and absorbents were removed, recommendations for the use of continuous compression belt (during the day and night) and the duration of use were discretionary. For abdominal liposuction patients, a piece of cardboard was prepared and put in place from the second day. Post-operative visits were scheduled weekly during the first month and as needed afterwards. Everyday activities were progressively resumed, depending on levels of post-operative pain.

Table 1. Klein's solution

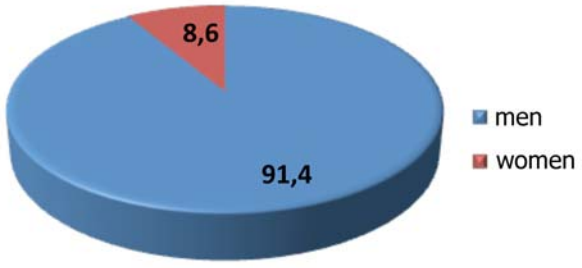
1,000 ml 0.9%	saline solution
1 ml 1/1,000	adrenaline
30-40 ml 2%	lidocaine without vasoconstrictor
10 ml 10%	sodium bicarbonate

RESULTS

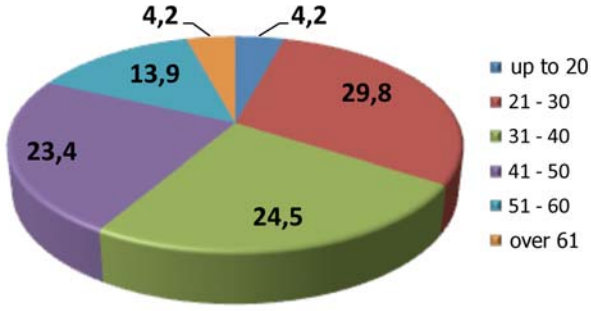
From 1998 to 2004, 568 patients were treated; 1,107 body areas received liposuction. The vast majority (519 or 91.4%) of the patients were women (Graph 1). Ages ranged between 15 and 77 years, with 77.7% between 21 and 50 years (Graph 2). Demand was higher among patients who weighed between 61 and 80 kg (62.9%) (Graph 3).

Liposuctioned patients were either at their normal weight (measured using body mass index) or presented overweight, reinforcing the idea that the liposuction is not aimed at treating obesity, but rather at removing localized adipocytes, to provide a more harmonious corporeal contour.

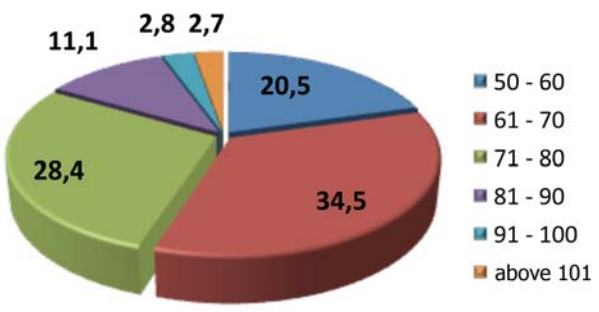
The most frequently liposuctioned areas were the abdomen, waist, coccyx region, dorsum and axillae (Graph 4). The sites where the procedures carried out in isolation were the abdomen, neck, inner thigh, outer thigh and hips. The abdomen, waist and coccyx region was the most frequent combination.



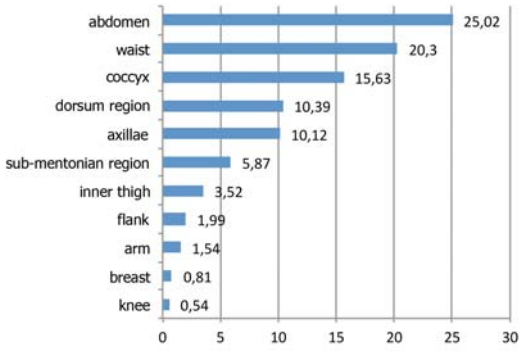
Graph 1: Distribution of patients by gender



Graph 2: Distribution of patients by age group



Graph 3: Distribution of patients by body weight



Graph 4: Distribution by treated area

Table 2. Injected and aspirated volumes

Procedure	Injected volume (ml)			Aspirated volume (ml)		
	Min	Max	Average	Min	Max	Average
Abdomen	1000	6000	2956	300	4800	2119
Waist	1000	2600	1647	400	1750	1000
Inner thigh	1500	5000	2722	750	4000	1733
Dorsum region	800	2000	1277	350	1300	727
Outer thigh	1000	4000	2328	800	2800	1428
Chin	200	500	308	80	300	145

Table 3. Degree of improvement observed by patients after surgery

Minor	0%-25%	0
Regular	25-50%	0
Moderate	50%-75%	0
Excellent	75%-100%	100%

The amount of injected tumescent solution and the aspirated volume of adipocytes varied according to the region and particular need of the case (Table 2), always observing the limit of 35 mg/kg. The abdomen and inner thigh received the greatest injected amounts (averages of 2.956 ml and 2.722 ml, respectively).

The patients' evaluation revealed an excellent degree of satisfaction (improvement of 75 to 100%) (Table 3).

SAFETY

The potential serious complications involved in this procedure (pulmonary or fat embolism, necrotizing fasciitis, sepsis, deep vein thrombosis, hyperhydration or lidocaine intoxication) as well as hospitalization, lawsuits or death, did not happen in our study. In none of the cases the amount of blood loss justified IV fluid replacement.

The guidelines on the maximum amount of fat removed (5-7% of the patient's weight, in liters of fat) were always observed, with a preference for performing additional surgeries should a greater amount of adipocytes need to be removed (beyond the safety limit). In the cases where a greater amount of fat was removed, drains were placed in the incision to facilitate the drainage of fluids, which were eliminated in a maximum of 72 hours after the procedure.

The following complications were observed in 1.8% of patients (Table 4): persistent hyperchromia in the scars (more than six months), infection in the wall with suppuration (in two patients who neglected the antibiotic therapy), allergy to the adhesive plaster of the bandage, seroma, persistent edema (more than three months), ecchymoses, hypertrophic scar and prolonged pain. There was a need for analgesia (dipyrone or paracetamol) after 21 days in only seven patients (1.2%). Hypertrophic scars were excised and sutured after six months; hyperchromias were treated with a combination of tretinoin, hydroquinone and topical corticosteroids; and the seromas were drained. Infections were treated with cephalexin (500 mg, 6 times a day for seven days; cases of persistent edema were treated with asiaticoside 40 mg/day in the morning and 400 mg/day of vitamin C and E, in addition to lymphatic drainage three times a week for three months. Ecchymoses were treated with topical heparinoid 72 hours after the procedure, 3 times a day.

Touch-ups due to imperfections were necessary in 26 patients (precisely the first cases). The orthostatic technique was used in these cases, with the patient being examined intraoperatively in several positions (including the standing position, to help visualize imperfections and their immediate correction).

DISCUSSION

This study documented and analyzed data from 568 patients who sought the authors' private practice during the study period for treatment of localized fat by liposuction using only LTA. Due to reports of liposuction resulting in fatal complications, which imply misleading conclusions about the safety of the procedure, such analysis was deemed important.

The development of the liposuction technique in the 1970s was marked by several complications and disastrous cosmetic results. The development of the tumescent technique with microcannulas by the dermatologist Jeffrey Klein was the watershed moment that marked the end of fatal complications and the improvement of the final cosmetic result.

Table 4. Complications in liposuction assisted by local tumescent anesthesia

Complications observed: 1.8% of the total
Persistent hyperchromia in the scars (more than 6 months)
Infection of the wall with suppuration
Allergy to the adhesive plaster
Seroma
Persistent edema (more than 3 months)
Hypertrophic scar
Ecchymoses
Lasting pain

There were no reports of serious infectious complications in this study, which can be explained by the use of azithromycin the night before the procedure and two days afterwards, and by the characteristics of the anesthesia. It is possible that both the lidocaine and the bicarbonate present in the solution had a bactericidal effect; additionally, the surgical incisions were left open so that spontaneous drainage could occur under compression to create an anterograde flow of fluids, avoiding retrograde contamination.[29-31] Furthermore, the cannulas were blunt and sterilized, with limited access to the subcutaneous layer of skin, and did not penetrate the fascia. This characteristic, combined with the disinfected surgical environment, can also help explain the low infection rates.

One of the great risks in the use of LTA in liposuction is the lidocaine intoxication This risk is eliminated, however, if the dose recommended by Klein is observed (35 mg/kg of patient weight). Currently some studies assert that a 55 mg/kg dose is safe and effective.[32] The present study, nevertheless, maintained the dose initially described as safe and had no complications associated with intoxication. It is important to note that a good pre-operative patient history, which identifies the use of substances that could increase the bioavailability of lidocaine, is essential. It is also important to highlight that the use of adrenaline in the anesthetic solution, in addition to the lipophilic characteristics of the substance, slows the systemic absorption of lidocaine,[2] which contributes to the safety of the procedure. In the present study there were no cases of intoxication for the anesthetic.

A recent publication[33] described 72 cases of important complications that occurred after liposuction procedures. Of these cases, four (of 17 cases in which tumescent anesthesia was used) resulted in death. Nevertheless, there are no descriptions of techniques, preventing the assessment of whether the correct protocol was used. Therefore it is not possible to determine whether the liposuction technique exclusively used LTA or whether the appropriate protocols were followed. All other cases of fatal complications described in the studied literature make reference to cases in which the general or peridural anesthesia was combined with LTA.

The risk of perforation is largely decreased with the exclusive use of LTA under conscious sedation, and is not described in the cases observed, in which the appropriate protocols were followed. An explanation for that is the space created by the anesthetic infiltration in the subcutaneous layer, distancing the cannula from the deep structures. In addition, a conscious patient reacts immediately to a cannula that touches the muscular structure, unlike a patient under general anesthesia. It is important to note that cases of abdominal hernia constitute a contraindication to the procedure, and are excluded in the preoperative period through ultrasonography. .

In the study of 1,107 liposuction procedures using only LTA according to the appropriate protocols, no serious complications occurred. These findings are compatible with the literature reviewed. In the present analysis, the liposuction technique described has proved advantageous, with a low risk of problems for the patients.

CONCLUSIONS

As there were no deaths, hospitalizations, serious processes or complications in the 1,107 described cases in which LTA was used observing the international dermatologic protocols, the procedure can considered safe.

In the literature reviewed, in the cases in which serious and even fatal complications were described, either another type of anesthesia was used or LTA was described without providing details about the protocol that was followed.

In order to prevent complications during liposuction surgery assisted by LTA, it is important that the international protocols and consensus developed by dermatologist physicians are strictly observed. Other protocols that associate combined anesthesias must be refuted. ●

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