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The liquid facelift: First hands-on experience with facial water jet-assisted liposuction as an additive technique for rhytidectomy – a case series of 25 patients[☆]

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Summary Objective: Recently, water jet-assisted liposuction (WAL) was successfully applied by several other authors to remove fat and induce skin contraction in nonfacial body areas. Extending the range of indications for this new method, the authors of this article report on their first experience with its use in facial contouring, fat harvesting, and hydrodissection of the facial skin flap in rhytidectomy in a case series of 25 patients.

Methods: Twenty-five patients (median age: 56 years) had facelift surgery under sedation, and the WAL technique was used for facial contouring, fat harvesting for facial lipotransfer, and hydrodissection of the facial skin flap. Patients were monitored for discomfort during the procedure. Complications such as bleeding, postoperative swelling, and hematoma formation were observed during a 1-week follow-up period, and intensity was rated by two independent surgeons using a special grading system. Furthermore, a patient survey (FACE-Q) was performed to analyze the patients' satisfaction and perception of the postsurgical esthetic results.

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Ethical statement

The research project with all its procedures was granted approval by the local Ethical Committee and is in accordance with national law and the World Medical Association Declaration of Helsinki (1964) with its ethical principles for medical research involving Human Subjects and subsequent amendments.

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Results: The WAL technique can be applied under intravenous sedation without causing any discomfort in all treated patients [mean 1.16, standard deviation (SD) 0.31]. Intraoperative bleeding during WAL-assisted facial dissection was judged as not present at all times (mean 1.3, SD 0.32). Postoperative swelling (day 1: mean 1.82, SD 0.28; day 7: mean 1.18, SD 0.28) and hematoma formation following surgery (day 1: mean 1.58, SD 0.34; day 7: mean 1.18, SD 0.31) were judged as minor in all cases. Overall, no skin necrosis was detected. There was no need for revision surgery. More than half of our treated patients (n = 13) answered the FACE-Q questionnaire, verifying a high satisfaction rate with beneficial treatment results without the occurrence of any major complications.

Conclusions: The WAL technique seems to offer a safe and efficient treatment approach for facial contouring, facial fat harvesting, and simultaneous facial flap hydrodissection with only minor postoperative swelling and hematoma formation. Therefore, the authors believe that the WAL technique is a powerful and useful tool and should be used in modern facial plastic surgery. © 2017 British Association of Plastic, Reconstructive and Aesthetic Surgeons. Published by Elsevier Ltd. All rights reserved.

Introduction

Facial aging is a multimodal process that consists of three factors: the loss of elasticity of the superficial musculoaponeurotic system (SMAS, representing the major tissue-supporting facial structure); the skin itself, which is exposed to daily environmental strains and stresses; and the tendency of volume deflation and tissue-repositioning following continuous gravitational exposure.¹⁻⁴

The combined changes of all these aspects lead to the development of an aging face. The youthful appearance linked with the so-called “inverted triangle of youth” changes to a more rectangular shape as time progresses, resulting in classical signs of aging.⁵ Over the past decades, several attempts were made to address each factor of the facial aging process to halt or even reverse them. The first rhytidectomies, in the early 1900s, involved simply pulling up the skin.² A large step toward modern face lift procedures was associated with the discovery of the SMAS by Skoog et al in 1974, resulting in a multitude of surgical approaches in the following years.² In addition, the use of different peeling agents has become a widespread, well-researched, and accepted tool for facial resurfacing and rejuvenation.⁶ Superficial, medium depth, and deep peels were developed to address different kinds of rhytids and wrinkles in different facial areas. The last important factor that was addressed is the appearance of volume deflation. Recent discoveries of various facial fat compartments allow a precise restoration of age-related volume decrease.⁷ Moreover, autologous fat transfer and its different techniques are gaining an enhanced popularity – not only for rejuvenation but also in the field of reconstructive surgery. Therefore, a combination of the previously mentioned techniques should be used in a safe manner to achieve the best results for each patient.⁸

Many devices and techniques for correcting the deflation and repositioning sagged fat compartments to restore a natural, youthful appearance have been described in the scientific literature. In the facial region, especially, a very gentle method of liposuction needs to be applied to preserve the patency of the facial vascular plexus and prevent damage to the SMAS and nerve structures in this anatomically complex area.

Beginning in 2016, the authors of this article started to use water jet-assisted liposuction (WAL) in all our facelift procedures. At that time, WAL was a well-known and scientifically established technique for liposuction and fat harvesting in non-facial regions of the body.⁹⁻¹² In this publication, we want to share our experience with this method. A retrospective case series of our first 25 patient who were treated using the WAL technique are presented in this article.

Patients and methods

A retrospective analysis was performed on a cohort of 25 white, non-Hispanic patients (n = 17 female, n = 8 male; median age: 56 years; and range 48–69 years), who received a facelift with autologous fat transfer and additional WAL in our clinic in 2016. The objective was to evaluate the intraoperative applicability of this surgical approach and retrospectively evaluate patient satisfaction. The STROBE criteria were applied.

All treated patients had no previous history of facial or cervical liposuctions or rhytidectomies before our surgical procedure.

In all patients, the same surgeon (first author) performed the operations.

The face lifts were routinely performed as inpatient procedures under intravenous (IV) sedation with Dexmedetomidine 0.5 mg/kg/h, Propofol 1 mg/kg/h, and Remifentanyl 0.03 mg/kg/min with a standardized 24-h postoperative surveillance. After initial skin infiltration with lidocaine 5%, three stab incisions were made around the ear (supra-auricular, infra-auricular, and retroauricular), and one underneath the chin. The presurgically marked dissection areas were infiltrated in a deep subcutaneous plane with approximately 100 mL of modified Klein solution (2 mL of adrenaline, 10 mL of lidocaine 5%, and 10 mL of HCO₃ per liter of saline solution) using the infiltration mode on the WAL device (Body-jet eco, Humanmed AG, Schwerin, Germany) to achieve hydrodissection of the skin flap and vasoconstriction to prevent excessive bleeding.

After a waiting period of 7 to 10 min, the WAL technique was performed within the dissection areas using the aspira-



Figure 1 Intraoperative view after application of the modified Klein solution during the liposuction.

tion mode. Depending on the anatomy and the assessment of each individual case, liposculpturing of the jowls, neck, submandibular angle, and jawline/mandible was performed using a 3-mm blunt 2-hole cannula (Figure 1). In the facial and cervical areas without a given indication for liposculpturing, no vacuum was applied by leaving the cannula regulator hole open with the goal of improving the hydrodissection plane through the fanned movement of the cannula. This step allowed modulating the thickness of the flap during dissection (Figure 2). If autologous fat grafting was planned and enough facial fat was available, simultaneous harvesting was performed using a sterile lipocollector system (Lipocollector, Humanmed AG, Schwerin, Germany). If there was not enough donor fat within the facial region, it was harvested in areas with stubborn fat (e.g., abdomen and inner thighs) using the same device and technique. Subsequently, subcutaneous sharp scissors dissection of the remaining ligaments (Figure 3) was performed. In all patients, a modified SMAS plication technique for SMAS tightening and modulation was performed. At the end of the facelift procedure, the harvested non-centrifuged fat (Figure 4) was transferred to regions with a volume deficiency using a three-dimensional single drop seeding technique with blunt 0.7–0.9 mm cannulas (Tulip Enterprise, USA).

Follow-up examinations involved medical chart review and patient check-ups. Intraoperative patient discomfort was rated. Intraoperative bleeding and postoperative swelling and hematoma formation were evaluated on the first and seventh postoperative days. All ratings were completed by two independent surgeons, who followed the surgery and performed the follow-up examinations. Complications were classified on a 4-point scale from 1 (none) to 4 (extreme: requiring increase in the dose of the anesthetic agent apart from that mentioned in the protocol, revision surgery, or cortisone injection). A minor complication was defined as a postoperative incident that could be treated conservatively,



Figure 2 Intraoperative view after liposuction. Note the thickness of the dermal flap that was achieved by a very gentle WAL, facilitating three-dimensional facial sculpting.

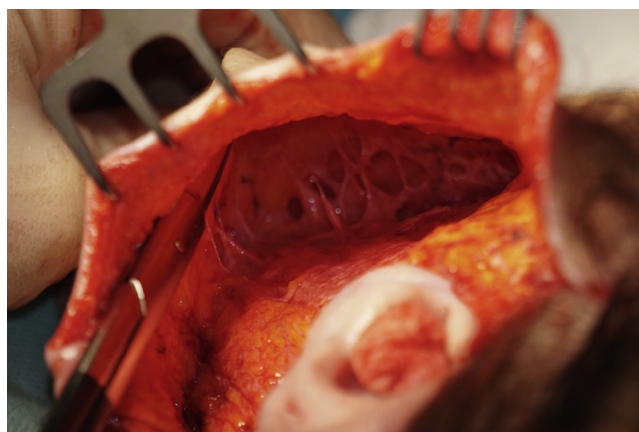


Figure 3 Intraoperative view after hydrodissection using the WAL technique. Note the bloodless operative field and the retaining ligaments, which now can be identified very easily and dissected sharply.

whereas a major complication always resulted in a surgical revision.

Moreover, the patients were asked to answer the postoperative module of the FACE-Q questionnaire to analyze the patients' satisfaction and perception of the postoperative aesthetic result.¹³ The FACE-Q instrument is composed of several independently functioning scales that measure outcomes for patients undergoing a multitude of cosmetic facial procedures. The FACE-Q instrument not only provides surgeons with valuable feedback but has the potential to produce information useful for future patients who are curious about postoperative results.¹⁴ All surgically treated patients received an online invitation to answer the postoperative module of the FACE-Q 1 month after completed surgery, and reminders were sent out after 1 week, 1 month, and 6 months.

The data were stored, processed, and analyzed with Excel (Microsoft Corporation, Redmond, WA, USA). The mean values and the SDs were calculated using this software.



Figure 4 Aspirated fat from WAL ready for injection. Note the smooth and wet emulsion of fat.

Results

The evaluation of intraoperative discomfort found that the WAL technique could be used with IV sedation without causing any discomfort in all the treated patients (mean 1.16, SD 0.31).

Furthermore, there was no detection of intraoperative bleeding during facial dissection after WAL use (Table 1). On the first day after surgery, postoperative swelling and hematoma formation were judged as minor and were almost completely disappeared on postoperative day 7 (Table 1, Figure 5). We observed no skin necrosis or sloughing of the facial skin.

Of the 25 treated patients, 13 answered the FACE-Q, with a 52% response rate. Detailed results are provided in Table 2.

Discussion

This retrospective study scientifically evaluates our first experience with the WAL technique as an add-on procedure in face-lift surgery. To our knowledge, this is the first scientific description of the use of the WAL method in the facial and cervical area before rhytidectomy. WAL is already an estab-

Table 1 Results of the evaluation of intraoperative patient discomfort, bleeding, and postoperative swelling and hematoma formation after 1 and 7 days after surgery with mean values and standard deviations (rating: 1 = not at all, 2 = little, 3 = moderately, and 4 = extremely with increase in the dose of the anesthetic agents apart from that mentioned in the protocol, revision surgery, or cortisone injection).

Patient	Intraoperative discomfort Mean	Intraoperative bleeding Mean	Postoperative swelling Mean		Postoperative hematoma Mean	
			One day	One week	One day	One week
1	1.5	1.5	2	1	1.5	1
2	1	1	1.5	1.5	2	1
3	1	1	1.5	1	1.5	1
4	1	1.5	2	1	2	2
5	1	1.5	1.5	1	1.5	1
6	1	1.5	2	2	1	1
7	1.5	2	1.5	1	1.5	1
8	1	1.5	2	1.5	1.5	1
9	1	1.5	1.5	1	1.5	1
10	1.5	1.5	2	1	2	2
11	1	1	2	1.5	1.5	1
12	1	1	1.5	1	1	1
13	1	1	2	1.5	2	1.5
14	1	1.5	1.5	1	1.5	1
15	2	1.5	2.5	1.5	1.5	1
16	1	1	2	1	2	1
17	1	1	1.5	1	1.5	1
18	1.5	1.5	2	1	2	1.5
19	1	1.5	1.5	1	1.5	1.5
20	1	2	2	1.5	2	1
21	1	1	2	1	1	1
22	1	1	2	1	1.5	1
23	1	1	2	1.5	1	1
24	2	1	1.5	1	1.5	1.5
25	1	1	2	1	2	1.5
Mean	1.16	1.3	1.82	1.18	1.58	1.18
SD	0.31	0.32	0.28	0.28	0.34	0.31



Figure 5 Case presentation of a 58-year-old female patient. Imaging: preoperative (top), 24 h postoperatively (center), and 1 month postoperatively (bottom) after a combined WAL-Omega face-lift with SMAS plication and face-to-face fat transfer.

lished and safe technique for liposculpturing and fat harvesting in non-facial areas of the body.¹⁵⁻¹⁷ The authors' interest is to extend its range of application and indications in a safe manner.

Other techniques using liposuction in the facial area have already been described scientifically and include the following: liposuction with vacuum suction in facial contour rejuvenation,¹⁸ isolated cervico-facial liposuction used for the treatment of aging,¹⁹ and the use of liposuction for the treatment of nasolabial folds.²⁰

The authors consider the WAL method to be a helpful tool for preparing a clearly visible surgical dissection plane and for facilitating subsequent sharp scissor dissection by minimizing soft tissue trauma while separating the tissue layers. False and true retaining ligaments seem unaffected by the WAL technique and can be easily identified and dissected sharply (Figure 3). This effect helps to reduce soft tissue trauma and may contribute to the observed reduction of postoperative hematoma formation and swelling.

The WAL as an additive procedure in facelift surgery can be used for the removal of localized subcutaneous fat deposits; it is especially helpful for reducing the bulkiness of the SMAS at certain key points such as the jowls, the area of Bichat, and the cheeks. This technique thereby allows three-dimensional facial sculpting; thus, the "inverted triangle of youth" can be restored.

A big advantage of the WAL method is that it extracts fat cells without mechanically destroying their integrity,^{21,22} producing a fat emulsion suitable for a face-to-face lipotransfer. This smooth and wet fat emulsion (Figure 4) allows very precise corrections of volume deficiencies, depressions, and

folds by using fine cannulas, and therefore, minimizing the occurrence of oil cysts and lumps. This positive effect of the WAL technique may contribute to a smaller rate of postoperative complications.

Further, because of its consistency, it is very suitable for intradermal fat grafting (Nanofat).²³ Fat extraction using the WAL system results in a higher amount of viable fat cells than manual extraction, leading to higher single-graft take rate and a higher predictability of postoperative outcome.^{21,22,24}

The authors observed no facial skin necrosis, skin sloughing, or hematoma formation. The application of WAL did not lead to discomfort during the procedure for our patients. Furthermore, little intraoperative bleeding occurred during sharp scissor dissection. Therefore, we assume that the constant water jet-assisted infiltration of Klein solution is helpful to maintain the anesthetic effect of lidocaine and the constricting effect of adrenaline over a prolonged period of time.^{11,12,25} Furthermore, the high-pressure infiltration flow of 60 mL/min during the WAL procedure seems to ensure the penetration of the Klein solution into deeper layers of the SMAS and into the dermal flap. This may be the reason why the WAL procedure led to only mild postoperative hematoma formation and swelling. On days 1 and 7 postoperatively, the visible signs of the surgical procedure were judged as minimal.

Although only half of our patients answered the postoperative questionnaire, the authors believe that these results are representative for the entire patient cohort. Nevertheless, this may have led to selection bias, and further investigation will be needed to verify the results of our preliminary

Table 2 Results of the FACE-Q questionnaire (52% Response rate).

Recovery early symptoms											
With your face in mind, in the first week after your facelift surgery, how much have you been bothered by											
	Not at all		A little		Moderately		Extremely		No answer		Total
swelling?	1	7.69%	4	30.77%	3	23.08%	5	38.46%	0	0%	13
tenderness?	1	7.69%	2	15.38%	6	46.15%	4	30.77%	0	0%	13
discomfort?	2	15.38%	2	15.38%	9	69.23%	0	0%	0	0%	13
feeling bruised?	2	15.38%	4	30.77%	3	23.08%	4	30.77%	0	0%	13
feeling sore?	3	23.08%	3	23.08%	5	38.46%	1	7.69%	1	7.69%	13
feeling that your face is tight?	0	0%	2	15.38%	4	30.77%	7	53.85%	0	0%	13
pain?	6	46.15%	4	30.77%	3	23.08%	0	0%	0	0%	13
numbness (loss of feeling)?	1	7.69%	2	15.38%	5	38.46%	5	38.46%	0	0%	13
stinging?	10	76.92%	2	15.38%	1	7.69%	0	0%	0	0%	13
tingling?	7	53.85%	4	30.77%	2	15.38%	0	0%	0	0%	13
throbbing?	9	69.23%	4	30.77%	0	0%	0	0%	0	0%	13
burning?	12	92.31%	1	7.69%	0	0%	0	0%	0	0%	13
feeling tired?	4	30.77%	7	53.85%	2	15.38%	0	0%	0	0%	13
itching?	7	53.85%	5	38.46%	1	7.69%	0	0%	0	0%	13
feeling lightheaded?	12	92.31%	1	7.69%	0	0%	0	0%	0	0%	13
headaches?	12	92.31%	0	0%	1	7.69%	0	0%	0	0%	13
feeling feverish?	13	100.00%	0	0%	0	0%	0	0%	0	0%	13
Satisfaction with facial appearance:											
With your entire face in mind, in the past week, how satisfied or dissatisfied have you been with:											
	Very dissatisfied		Somewhat dissatisfied		Somewhat satisfied		Very satisfied		No answer		Total
how symmetric your face looks?	0	0%	2	15.38%	3	23.08%	8	61.54%	0	0%	13
how balanced your face looks?	0	0%	1	7.69%	5	38.46%	7	53.85%	0	0%	13
how well-proportioned your face looks?	0	0%	1	7.69%	5	38.46%	7	53.85%	0	0%	13
how your face looks at the end of the day?	0	0%	1	7.69%	7	53.85%	5	38.46%	0	0%	13
how fresh your face looks?	0	0%	3	23.08%	5	38.46%	5	38.46%	0	0%	13
how rested your face looks?	0	0%	2	15.38%	6	46.15%	4	30.77%	1	7.69%	13
how your profile (side view) looks?	0	0%	0	0%	6	46.15%	7	53.85%	0	0%	13
how your face looks in photos?	0	0%	2	15.38%	6	46.15%	5	38.46%	0	0%	13
how your face looks when you first wake-up?	0	0%	2	15.38%	6	46.15%	5	38.46%	0	0%	13
how your face looks under bright lights?	1	7.69%	2	15.38%	5	38.46%	5	38.46%	0	0%	13

study, and to check for long-term results and patient satisfaction.

The modules of the FACE-Q questionnaire evaluated the early postoperative recovery phase during the first week after surgery, and the patients' overall satisfaction with their facial appearance.

Further studies are needed to investigate the beneficial effects of this new approach as adjunct in face lift surgery compared to the application of classical liposuction techniques. Consequently, the authors will be re-evaluating the present findings by initiating a randomized controlled trial.

Conclusions

The authors report on their first 25 patients who underwent WAL as an adjunct in facelift surgery. Under intensive patient surveillance, no patient discomfort was detected while performing this technique under intravenous sedation. There was no occurrence of intraoperative bleeding, and only minor

postoperative swelling and hematoma formation were detected during the given follow-up period. Overall, patients showed a high satisfaction rate.

Therefore, the authors believe that the facelift with additional WAL is a safe and useful technique that facilitates three-dimensional facial sculpting, simplifies the surgical elevation of the skin flap, and enhances the fat-taking rate and the predictability of the esthetic outcome. It may help to increase overall patient satisfaction by reducing intra and postoperative bleeding and postoperative swelling – resulting in a shorter recovery time. Because of the small number of patients included into this retrospective study, a larger patient cohort is urgently needed for further evaluation. Therefore, we suggest a prospective randomized study to obtain more distinct results.

Conflict of interest

None.

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