

hydro surgery

news

New Breast Augmentation Study Demonstrates Highly Predictable Results Produced with Water-jet Assisted Fat Transfer

Newly published prospective study shows 76% (+/- 11%) graft survival six months after autologous fat transfer to the breast.

For the first time a quantification of the lasting volume gain after autologous fat transfer to the breast has been published. A prospective clinical study with 85 patients evaluated the new water-jet assisted fat transfer as an effective and reproducible method for fat grafting to the breast. The study verified a permanent take rate (volume gain) of 76±11% of the grafted fat.

The assessment of volume gain was done by preoperative and postoperative MRI spectroscopy over a time period of 6 months. The method described in this study is based on the use of water-jet assisted liposuction (body-jet®) for fat harvesting, and the application of the LipoCollector™ system for sterile collection and separation of fat tissue for direct reinjection ("BEAULI™ method"). These new results open up new perspectives in the field of plastic surgery, and will make water-jet assisted liposuction and fat transfer with the body-jet® and LipoCollector™ the most favored system for fat harvesting and fat transfer procedures.

Extracts from the Study

The authors Ueberreiter, Cromme, von Finckenstein, Herold, Tanzella and Vogt delineate that "after numerous experiments with free fat transfer since 1893, many promising methods and results of large-volume fat grafts have been published recently. A common disadvantage was the length of the procedure and a lack of proof of effectiveness."

They developed a new water-jet assisted fat transfer method for simple and reliable fat grafting, and named it the BEAULI™ method (Berlin Autologous Lipotransfer). The method was evaluated in a prospective clinical

Results

- "The breast volume control using BrainLab™ Software and MRI verified a permanent take rate (volume gain) of 76±11% of the grafted fat."
- "The average operating time including the liposuction was 92 minutes for a bilateral breast augmentation, which is not much more than the time required for conventional breast-enlargement surgery with implants."
- "The volume of transplanted fat tissue per breast ranged from 120.0 cc to 292.5 cc with an average transplantation volume of 184.4 cc."
- "Almost all of the procedures were performed on an outpatient basis under local anesthesia and Remifentanyl sedation. Only mild discomfort in the breast area was reported in the postoperative period."
- "No cases of infection were observed; in two patients, subcutaneous granulomas (histologically confirmed) were identified but required no specific treatment. No oil cysts were observed."
- Fat tissue injections were applied "only subcutaneously and intramuscularly," never into the glandular tissue.

The authors conclude that "the potential uses of this method for cases of permanent implant removal following capsular contracture, for total or partial breast reconstruction, or for the general correction of volume deficiencies are promising and open up new perspectives in the field of plastic surgery."

study with 85 patients in two centers in Germany. Indications were a general lack of breast volume, either genuine or resulting from surgical procedures.

Methods & Results

The fat tissue was harvested using the "BEAULI™ method," which involves the harvesting of very small fat particles (lipocyte clusters) by means of Water Assisted Liposuction (body-jet®, human med® AG, Germany) and reinjection of the fat after separation from superfluous water and fibrous tissue using the LipoCollector™ (human med® AG, Germany). "All procedures were performed in a standardized pattern, with measurements taken preoperatively, at day 1 postoperatively, and after 1 week, 4 weeks, 3 months, and 6 months postoperatively. Subsequent check-ups are to be continued on a yearly basis. An MRI of the breasts was taken preoperatively and 6 months postoperatively.

For the cosmetic patients, generally two fat grafting procedures (in 80% of patients), with an average volume gain of ½ bra-cup size (or 100-150 cc) per individual breast per procedure, were required. In patients who had undergone implant removal, a satisfactory breast volume was usually attained after only a single procedure. For complete reconstruction after cancer surgery, four to five grafting sessions were necessary. An extension of the skin envelope and improvement of existing scars were also observed."

The Method

"On the day of the procedure, liposuction was performed, primarily on abdominal and flank areas, as well as the outer and inner thighs. The choice of harvest site was based on the patient's preferences. At the beginning of the procedure, the harvest sites were preinfiltrated with Klein's standard tumescent solution (composition:

500 mg lidocaine, 1 mg epinephrine, and 12.5 ml sodium bicarbonate 8.4% per liter of solution) using the body-jet®; the aspiration procedure began immediately with no waiting period. Infiltration and aspiration were performed using the same solution. The solution was heated to 35°C in order to prevent excessive cooling, which could damage the harvested fat cells."

The Use of body-jet® & LipoCollector™

"The aspiration was performed using a pulsating water jet with the body-jet® at Range 1. During the procedure, the fat was separated from the fluid in the LipoCollector™. This device has a special pre-filter that traps fibrous material, which would otherwise clog the thin injection cannulas. The fat harvested through continuous irrigation and aspiration via the body-jet® cannula passes into the LipoCollector™, where it is separated from the excess fluid by a mesh filter.

The fluid is then conducted out of the container, and the filtered, washed fat remains on the operating table, sterile and ready for reinjection. The aspiration is performed with a low vacuum of -0.5 bar in order to minimize cell damage. The continuous irrigation with tumescent solution during the aspiration process makes it possible to harvest fat through the tiny suction holes (0.9 mm) in spite of the low vacuum of -0.5 bar (7.25 PSI). With this procedure, it takes an average of 60 minutes (with preinfiltration) to harvest 600 ml of pure, transplantable fat tissue."

Fat Tissue Transfer & Reinjection

"The harvested fat is then removed from the container using 1mm BEAULI™ extraction cannulas with 50-cc syringes. These syringes are placed in an upright position in a special holder on the table for 10 minutes. Any fluid that collects at the bottom of the syringe is removed before the fat is transferred to 10-cc syringes. The 10-cc syringes are then used to reinject the fat with the BEAULI injection cannulas (Fig.1).



Figure 1. BEAULI injection cannula

The harvested fat is reinjected through a small stab incision located approximately 5 cm laterocaudal to the breast. Owing to the length of the cannula, all quadrants can be reached through a single incision. The fat was infiltrated exclusively into the layer of subcutaneous fat tissue and the pectoralis muscle area. In general, approx. two thirds of the fat tissue was injected into subcutaneous fat, and one third, intrapectorally. The surgeon located the pectoralis muscle by palpating the nearest rib with the dull end of the cannula and then guided the cannula directly above the ribs, maintaining continuous contact with them during the injection procedure."

When distributing the fat, the surgeon was careful not to apply too much tension to the tissue in order to avoid exposing the fat cells to additional pressure. The "(net) volume of fat transplanted per individual breast and per procedure ranged

from 120 cc to 292.5 cc with an average volume of 184.4 cc per individual breast."

Key Factors

The authors summarize that "In the more than 100 years since the first published report of a transplantation of free fat to the breast, no significant negative effects have been observed, especially with respect to the development of carcinoma, even with long-term follow-up. Now that the option of adipose tissue transplantation is no longer controversial, the main issue is rather the general feasibility of the procedure with a reasonable operating time. The key factors for success are the careful handling of the fat, a low vacuum pressure, and the distribution of tiny adipose tissue particles over a well-vascularized bed."

Shorter Procedure Times

It was demonstrated in the study "that it is possible to fulfill all of these requirements with considerably shorter operating times using water-jet assisted liposuction (WAL):

- Through continuous irrigation with water, the fat can be harvested using cannulas with very small holes (0.9 mm in diameter) and low vacuum (0.5 bar/7.25 PSI).
- The fat harvested in this manner does not require centrifugation. The percentage of fluid (on average 30%) in the harvested fat tissue allows for easy reinjection with 10-cc syringes and an even distribution of the fat in the recipient tissue.
- The average operating time was 92 minutes for a bilateral breast augmentation, which is not much more than the time required for conventional breast-enlargement surgery with implants. Here, we must keep in mind that the liposuction procedure is also part of the operation, and is included in this time frame."

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Fig. 6 Status post two fat-transfer procedures six months apart

Jet Assisted Fat Transfer (J-AFT):

The New Standard in Fat Grafting

Fat transfer is considered the future of aesthetic medicine. The advantages of using a patient's own fat are significant. Fat is a biocompatible, natural filler that is readily available and inexpensive. The success of autologous fat transfer rests principally in the hands of the surgeon. Fat cell survival and long-lasting volume augmentation are determined by the methods of fat harvesting and re-injection. Unsuitable techniques during extraction and graft preparation will cause reduced fat cell survival and damage to fat cells, leading to necrosis or calcification.

Currently, many different technologies and devices are being marketed for the purpose of autologous fat transfer. However, fat

grafting has been problematic for two reasons, the first being the collection of sufficient quantities of viable fat for transfer and the second being the predictability of the results of fat augmentation. In many procedures the fat harvesting stage itself was traumatic due to cell damaging liposuction techniques.

This paper substantiates the position of many surgeons that Jet Assisted Fat Transfer (J-AFT) using water-assisted liposuction (WAL) combined with its comfortable LipoCollector™/FillerCollector™ systems for harvesting, filtering and transferring of autologous fat tissue currently represents the most efficient unique technology for fat grafting.

New published clinical studies support the high quality of transferable fat tissue and the predictable persistence of injected fat in the target areas when using Jet-Assisted Fat Transfer.

Relevant Clinical Publications on Jet-Assisted Fat Transfer (J-AFT)

1. Fat survival after fat grafting

The results of fat harvesting by water-assisted liposuction (WAL) and subsequent autologous fat transfer are also described in a recent study by C. Herold and K. Ueberreiter: "The use of mamma MRI volumetry to evaluate the rate of fat survival after autologous lipotransfer" (See Reference 1).

In this study autologous fat transfer was performed using water-jet assisted liposuction (body-jet®) to harvest fat tissue for subsequent autologous fat transfer to the breast. The results of the study are summarized as follows:

"Preoperative and postoperative MRI volumetry in patients before and six months after autologous lipotransfer revealed a mean volume augmentation of 147 ± 18 ml. In these patients, 72 ± 11 % of the transplanted fat tissue persisted in the area of injection six months after surgery."

In order to assess the rate of fat survival after autologous fat transfer the authors have developed a reproducible and exact tool for volume analysis. Sixteen patients were treated for breast augmentation. Six patients received silicone breast augmentation. Ten patients were treated with autologous lipotransfer using the LipoCollector™ for fat harvesting in combination with water-jet assisted liposuction ("BEAULI" = body-jet® + LipoCollector™ II).

The volume of silicone implants was calculated in six healthy patients with silicone breast augmentation using the BrainLab © I Plan Software.

In the same technique, volumetry was performed in 10 patients before and six months after autologous lipotransfer using water-jet assisted liposuction (body-jet) and the LipoCollector for collection and transferring.

• Results for autologous fat transfer: Preoperative and postoperative MRI volumetry in patients after autologous lipotransfer revealed a mean volume augmentation of 147 ± 18 mL. In these patients, 72 ± 11 % of the transplanted fat tissue persisted in the area of injection six months after surgery.

• Results for silicone implants: The comparison of the implant volumes calculated with MRI volumetry with the official volumes given by the manufacturer showed a very low mean deviation of 2.1 ± 1.5 %.

The authors conclude that "MRI volumetry is a useful tool for the fast, exact and reproducible volume analysis of breast tissue. Especially after autologous lipotransfer, where MRI examinations are performed on a regular basis to exclude possible complications, the use of these data to evaluate the rate of fat tissue survival is appealing and due to the high exactness of the method also reasonable."

2. Reproducible method for volume assessment after fat grafting

Four more publications deal with this method of exact and reproducible volume analysis after autologous fat transfer.

1. Herold et al.: **Does the Injection Plane Matter in Autologous Fat Transplantation?** Aesth. Plast. Surg. 2010 March 24. The authors observe that "serial MRI might detect and quantify in more detail the transplanted autologous fat in its given plane."

2. Herold et al.: **Magnetic resonance imaging-based breast volumetry in breast surgery: a transfer from neurosurgery.** Plast. Reconstr. Surg. 2010 Jan;125(1):17e-19e

3. Herold C, Knobloch K, Rennekampff HO, Ueberreiter K, Vogt PM: **Magnetic resonance imaging-based progress control after autologous fat transplantation.** Plast Reconstr Surg. 2010 Nov;126(5):260e-261e.

"The advantage of magnetic resonance imaging-based breast volumetry is the fact that often magnetic imaging data are available to rule out implant rupture, and for breast cancer screening. The use of magnetic imaging-based volumetry is intriguing because the navigation software is often available in the hospitals where neurosurgical units are on call."

4. Herold et al.: **MRI-Based Breast Volumetry Evaluation – Evaluation of Three Different Software Solutions.** J Digit Imaging. 2010 Jan 12.

"MRI-based volumetry is a powerful tool to calculate both native breast and silicone implant volume in situ. All software solutions performed well and the measurements were close to the actual implant sizes. The use of MRI breast volumetry may be helpful in: (1) planning reconstructive and aesthetic surgery in asymmetric breasts, (2) calculating implant size in patients with missing documentation of a previously implanted device and (3) assessing post-operative results objectively."

3. Report on body contouring and fat harvesting

Another recent study by G.H. Sasaki et al., "Body-jet® (WAL) Experience in 50 Consecutive Patients: Body Contouring and Lipo-Harvesting" reported fat harvesting prior to autologous fat transfer with body-jet liposuction. (See Reference 2)

In this study thirty-one patients had their fat harvested for augmentation in eight anatomical sites.

Method: "The abdominal fatty tissues were removed under reduced negative pressure at 450-500mm Hg, collected and separated from the infranate at room temperature in the sterile container (LipoCollector II) without washing or centrifugation, and loaded into 1-10ml syringes. Fat grafting technique was performed within one to two hours after harvesting.

Depending on the structural requirements, the blunt-tip microcannula (human med infiltration cannula) deposited the fat micro droplets in a fan-shaped pattern at varying levels in the supraperiosteal, submuscular and/or subcutaneous planes. Volume restoration was completed when a slight overcorrection was achieved. Fat aliquots from five patients were incubated with tryptan blue dye within an hour and 8 hours after extraction.

Dye exclusion demonstrated that about 90% of adipocytes expelled the dye after an hour, while less than 10% of cells were free of dye after 8 hours from aspiration." (Tryptan blue test of vitality: vital cells expel tryptan blue because intact cell membranes are not permeable for the dye.)

Post-operative Result, Morbidity and Recovery: "Patients were satisfied with their improved body contouring and tissue accommodation after body-jet® liposuction and fat grafting. Patient response to the degree of intraoperative and post-operative pain (visual analog scale from 1-10) averaged levels of 1-3. Almost all patients were able to resume their normal pre-surgical routines by one to two weeks, depending on the extent and number of treatment sites. About 3% of patients developed nodularities that resolved themselves after 3 months without treatments. There were no incidences of infections, seromas, hematomas, skin changes, or permanent nerve injuries. No patient required resuscitation or experienced any recognized lidocaine side-effects within 24 hours after surgery. To date, there has been no request for revision surgeries. The results of fat augmentation have been gratifying at the three to eight month evaluation periods but will require longer and more sophisticated quantitative assessments."

Conclusion: "On the basis of our limited clinical experience, body-jet® represents a safe and effective addition to our armamentarium of liposuction devices and has the potential to improve our efforts for fat harvesting and grafting."

4. Fat harvesting with WAL

The study by Y. Surlémont, "Liposuction et greffe de tissu adipeux assistée par hydropression et hydrofiltration: bilan après 9 mois d'utilisation," also reports about WAL fat harvesting for autologous fat grafting.

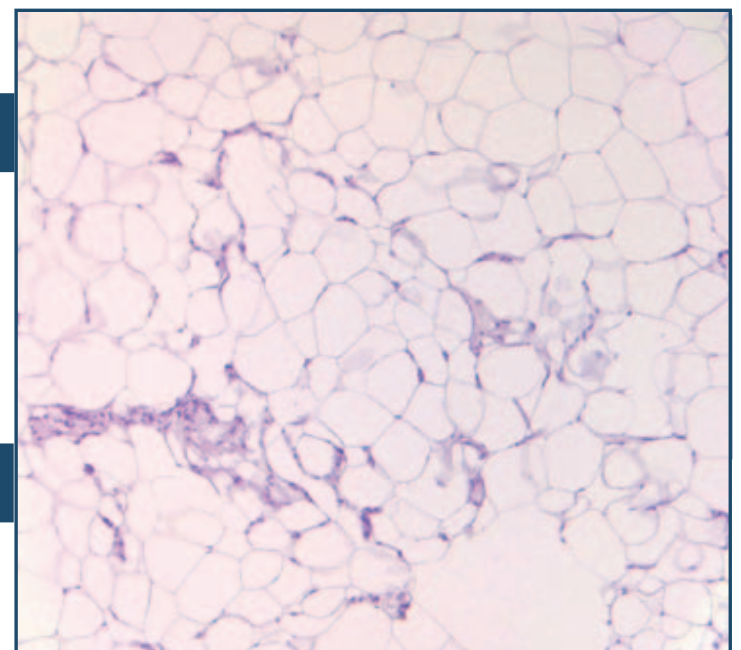
After body-jet® liposuction the harvested fat was reinjected for autologous fat transfer.

It is concluded that the body-jet® procedure is less traumatizing and less painful, resulting in faster recovery. The required time and morphologic results of adipocyte tissue grafting with the body-jet® and LipoCollector™ are equivalent to manual aspiration (See Reference 3).

5. Intact lipocytes in the WAL aspirate

Another study by D. Krahl and J.J. Stutz investigated the immunohistologic properties of fat cells in the WAL aspirate: "Water-Jet Assisted Liposuction for Patients with Lipoedema: Histologic and Immunohistologic Analysis of the Aspirates of 30 Lipoedema Patients." After water-assisted liposuction with the body-jet®, a histologic and

immunohistologic analysis was carried out on the lipocytes in the WAL aspirate. The results show that the adipocytes in the aspirate had a very high rate of vitality: "In 28 of the 30 investigated lipoaspirates (= 30 patients), the lipocytes were found to be predominantly (>70%) intact." (See Picture 2 and Reference 4)



Picture 2:
Intact fat tissue with strands of connective tissue in WAL aspirate (body-jet®)
Source: J.J. Stutz, D. Krahl: Water-Jet Assisted Liposuction for Patients with Lipoedema: Histologic and Immunohistologic Analysis of the Aspirates of 30 Lipoedema Patients. Aesth. Plast. Surg. (2009) 33: 153-162

References

- C. Herold, K. Ueberreiter, F. Cromme, M. N. Busche, P. M. Vogt: **The use of mamma MRI volumetry to evaluate the rate of fat survival after autologous lipotransfer.** Handchir Mikrochir Plast Chir 2010; 42: 129- 134.
- G.H. Sasaki, A. Tevez, M Gonzalez: **Body-jet® (WAL) Experience in 50 Consecutive Patients: Body Contouring and Lipo-Harvesting.** White Paper, Part I and Part II, Gordon H. Sasaki, Pasadena, CA, USA.2010.
- Y. Surlémont: **Liposuction et greffe de tissu adipeux assistée par hydropression et hydrofiltration: bilan après 9 mois d'utilisation.** XXle Congrès de la Société française de chirurgie Esthétique (SOFCEP), Cannes, April 2009.
- J.J. Stutz, D. Krahl: **Water-Jet Assisted Liposuction for Patients with Lipoedema: Histologic and Immunohistologic Analysis of the Aspirates of 30 Lipoedema Patients.** Aesth. Plast. Surg. (2009) 33: 153-162.

New Treatment of Capsular Contracture with Autologous Fat Grafts



Interview with Klaus Ueberreiter M.D., Ph.D.

by Inge Matthiesen Ph.D.

Dr. Ueberreiter, you have now completed a new study on the treatment of capsular contracture with autologous fat grafts collected by water-jet assisted liposuction. What is the background of this new treatment?

With increasing numbers of patients with silicone implants for breast augmentation or reconstruction we are confronted by more and more cases of capsular contracture. This is the most common complication after breast augmentation with silicone implants. A rate of about 10% of Baker III and IV occurrence within 10 years after primary aesthetic implantation seems realistic.

For the patient this means disfiguration and pain, and after reoperation procedures, frequently the constant fear of reoccurrence.

What is the standard treatment today?

The standard treatment consists of an implant exchange and a complete or partial capsulectomy. Not a few patients endure the consequences of capsular contracture after several reoperations for lack of financial means or the high incidence of reoccurrence.

What are the advantages of this new method?

The one stage procedure of implant removal and lipofilling proved to be highly efficient with good to excellent results and high patient satisfaction

Can you comment on some first results of your study?

In our first 30 patients we removed the implants and grafted an average gross volume of 260ml of fat tissue per breast without performing capsulectomy. The drainage time was 2 days. We observed that the shape of the breast changed to a more natural form and feel. Negative side effects like oily cysts did not occur, in two cases we saw small granulomas (about 5 mm diameter). The time of the overall procedure was 70 ± 15 min. The definite average take rate (volume gain) was 75% of the grafted fat volume.

How did you verify these results?

Magnetic resonance imaging (MRI) of the breasts was performed in 35 patients after aesthetic augmentation preoperatively and 6 months postoperatively, a clinical examination and photo documentation was done on day 1 and 8, and after 4 weeks, 12 weeks and 6 months postoperatively.

What are the key points of the new procedure?

The procedure includes implant removal and lipofilling of the subcutaneous and intramuscular space in one step. The procedure consists mainly of two principles:

- Fat harvesting: We used water-jet assisted liposuction with the body-jet®, a device emitting a water beam for infiltration and suction in one step. A basic infiltration was applied by means of the body-jet® using Range 2-3, and its infiltration cannula. The solution used was a classical tumescence solution described by Klein which was warmed to 37 to 38 °C (98-100 °F). After 10 minutes we started liposuction using a 3.8 mm cannula with effective suction openings of 0.9 mm. Thus the harvesting of very tiny parcels of fatty tissue is possible, ready for immediate



Capsular contracture after implants 370cc subcutaneously placed, and treatment with one fat graft of 270cc gross volume – result after 10 months.

refilling with the small BEAULI™ injection cannulas. By adjusting the negative pressure of the body-jet® to -0.5 bar (7 PSI) we avoid additional destruction of cells. Lower negative pressure is usually ineffective and leads to frequent obstruction of the suction device..

- Fat collection and separation: We used the LipoCollector™, a sterile fat collection device which separates the fat from water (tumescence fluid), rough connective tissue and other cell debris in a sterile container on the instrumentation table. The washed fat is thus ready for reinjection. The fat is removed from the collector by means of BEAULI™ aspiration cannulas into 50 cc syringes (for an easier count of fat cell volume and to avoid contact with air) and from there transferred into 10 cc syringes.

How long does the procedure take? Do you need centrifugation of the fat tissue before reinjection?

Centrifugation is not necessary, it costs a lot of time and destroys part of the cells. The collection of sufficient volumes of fat tissue (average 500-600 ml) takes about 30-45 min.

What is your conclusion regarding this new method?

Fat grafting meanwhile is a safe and effective method of volume replacement in breast reconstruction. We could add a time sparing and effective procedure to resolve and improve cases of capsular contracture in which the patients did not want an implant exchange.

New Breast Augmentation Study...Cont'd. from Page 1

Volume Gain & Fat Tissue Survival

- "The (net) volume of transplanted fat tissue per breast ranged from 120 cc to 292.5 cc with an average volume of 184.4 cc."
- "According to the MRI results, the average rate of fat tissue survival was 76 ± 11 %."

"Almost all of the procedures were performed on an outpatient basis under local anesthesia and remifentanyl sedation. Only mild discomfort in the breast area was reported in the postoperative period. Only in isolated cases, a more substantial hematoma formation was observed. The procedure was so painless and uncomplicated that most patients (more than 80%) opted for a second fat transfer procedure."

Side Effects

"No cases of infection were observed; in two patients, subcutaneous granulomas (histologically confirmed) were identified but required no specific treatment. No oily cysts were observed."

Two Fat Transfer Procedures Required for Cosmetic Indications

"When the augmentation was performed for cosmetic indications, most patients

requested a second fat-transfer procedure (85% of the patients in this indication group). One patient with a very small breast requested a third fat transfer." (see Fig. 6)

The authors state that "for the patients undergoing the procedure of breast reconstruction following mastectomy, it was clear from the beginning that more than one fat-transfer session would be required to achieve satisfactory results because the existing layer of tissue was very minimal (1-3 cm) as recipient tissue. In these cases, three to five fat-transfer procedures were planned and performed. Owing to the very low morbidity associated with this surgical procedure, the repeated procedures were also well tolerated by the patients." (see Fig. 7) Also it was shown that "for the second and subsequent augmentations, a larger transplantation volume was possible owing to the increased thickness of the recipient tissue."

Breast - Circumference Measurements

"Breast-circumference measurements offered a good representation of the changes in breast volume over the postoperative period. The strongest swelling was observed after one week, with the swelling decreasing relatively rapidly up

to the fourth week. After three months, all swelling had subsided, and from this point, the breast volume remained constant.

Based on the measurement data, autologous fat transfer can achieve about a half-cup increase in breast volume, as a general rule of thumb. This method is therefore suitable for patients primarily seeking a modest gain in breast size and who are also interested in the benefits of liposuction. This method is not suitable for smokers or patients with a BMI of less than 18. It is also not appropriate for individuals interested in a substantial increase in breast size in a single surgical procedure (e.g., from cup size A to C)."

Outlook

The authors conclude that "the potential uses of this method for cases of permanent implant removal following capsular contracture, for total or partial breast reconstruction, or for the general correction of volume deficiencies are promising and open up new perspectives in the field of plastic surgery."


* Ueberreiter, K.; von Finckenstein, J. G.; Cromme, F.; Herold, C.; Tanzella, U.; Vogt, P. M.: BEAULI™ – A New and Easy Method for Large-Volume Fat Grafts. Handchir Mikrochir Plast Chir 2010; 42(6): 379-385. (Article in German)



Fig. 7 Breast reconstruction through four fat-transfer procedures

The Safety of Autologous Fat Transfer - Survey of published clinical data

Publications	Key Results	Number of Patients
K. A. Gutowski and the ASPS Fat Graft Task Force: Current Applications and Safety of Autologous Fat Grafts: A Report of the ASPS Fat Graft Task Force. ASPS Fat Graft Task Force, February, 2009	Autologous fat grafts were harvested by liposuction and subsequently transferred into various recipient sites of the body. Of the 283 patients, most had satisfactory results, as reported by the patients and/or independent panels of surgeons. Follow up ranged from 1 month to 10 years. Eight procedures (2.8%) were deemed unsuccessful (1 failure in patient receiving fat grafting to improve symptoms associated with radiotherapy damage; 7 breasts (2.5%) showed no improvement from recontouring after reconstruction).	283
E. Delay, S. Garson, G. Tousson, R. Sinna: Fat injection to the breast: technique, results, and indications based on 880 procedures over 10 years. Aesthet. Surg. J. 2009 Sep-Oct; 29(5):360-376	Autologous fat grafts were harvested by liposuction from the abdomen or in some cases from the inner thighs, depending on the patient's natural fat deposits. "CONCLUSIONS: Lipomodelling, because of a low complication rate and positive results, presents a new option for plastic, reconstructive, and aesthetic surgery of the breast. Pre- and postoperative examination by a radiologist specialized in breast imaging is necessary to limit the risk that a cancer may occur coincidentally with lipomodelling." "Oncologic follow-up at 10 years postoperatively (for the first patients) showed no increased risk of local recurrence of cancer or development of a new cancer. Results were highly satisfactory for both patients and surgeons. Complications included one case of infection at the harvest site, six cases of infection at the injection site, and one case of intraoperative pneumothorax that was successfully treated in the recovery room with no later consequences. The incidence of fat necrosis was 3%, with most cases occurring early in the surgeon's experience."	880
M. L. Zocchi, F. Zuliani: Bicompartmental Breast Lipostructuring. Aesth Plast Surg (2008) 32:313-328	Autologous fat from liposuction procedures was reinjected into the body for breast lipostructuring. In summary, the authors "wish to highlight a formerly controversial procedure that, thanks to recent technical and clinical progress, has become a safe and viable alternative to the use of alloplastic materials for breast augmentation for all cases in which additive mastoplasty with implants is either unsuitable or unacceptable by the patient herself."	181
M. Missana, I. Laurent, L. Barreau, C. Balleyguier: Autologous fat transfer in reconstructive breast surgery: Indications, technique and results. European Journal of Surgical Oncology (EJSO), Volume 33, Issue 6, Pages 685-690, 2007	Fat harvested by liposuction was used for fat grafting in reconstructive breast surgery. The authors conclude: "Autologous fat transfer is now a routine procedure in our clinic due to its simplicity, safety, and reproducibility. It is systematically proposed to all of our patients as the final, perfecting procedure of breast reconstruction, irrespective of the technique used for the initial reconstructive procedure, but also to repair certain conservative treatments. The mean follow-up period for the patients was 11.7 months, ranging from 1 month to 3.2 years. The panel judged improvement to be good to very good in 64 breasts (86.5%) and moderate in 10 breasts (13.5%) primarily due to lack of available adipose material for harvesting."	69
G. Rigotti, A. Marchi et al.: Determining the Oncological Risk of Autologous Lipoaspirate Grafting for Post-Mastectomy Breast Reconstruction. Aesthetic Plastic Surgery; Springer online 1432-5241; March 2010.	The study investigates the oncological risk of autologous lipoaspirate grafting after liposuction. Results: "Statistical comparison of disease-free survival curves revealed no significant differences in relapse rate between the two patient subgroups before fat grafting and after fat grafting. Although further confirmation is needed from multicenter randomized clinical trials, our results support the hypothesis that autologous lipoaspirate transplant combines striking regenerative properties with no or marginal effects on the probability of post-mastectomy locoregional recurrence of breast cancer."	137
Y.G. Illouz et al.: Autologous fat transplantation to the breast: a personal technique with 25 years of experience. Aesthetic Plast Surg. 2009 33(5); 706-715.	Fat harvested by liposuction was used for autologous fat transplantation. Conclusion: "In the last 25 years the results of autologous fat transplantation have been predictable and satisfying on the condition that the treatment is performed in stages with small quantities of adipose tissue fat injected in each treatment session. To prevent major complications the final expected result should not be the aim of a single procedure. Mammary lipografting is a procedure that can be offered to patients for breast reconstructive and cosmetic purposes."	820
Scott L. Spear et al.: Fat Injection to Correct Contour Deformities in the Reconstructed Breast. Plastic Reconstructive Surgery (2005) 116:1300-1305.	Fat harvested by liposuction was used for autologous fat transfer. Conclusion: "Our experience indicates that overall it is a safe technique that can improve or correct significant contour deformities that otherwise would require more complicated, riskier procedures to improve."	37
A. Mojallal et al.: Influence of the Recipient Site on the Outcomes of Fat Grafting in Facial Reconstructive Surgery. Plastic and Reconstructive Surgery: August 2009, Vol. 124, Issue 2: 471-483	The study investigated fat grafting after liposuction in facial reconstructive surgery. Results: "The average follow-up period was 23 months. The overall satisfaction rate of patients was 74 percent. The average score for subjective evaluation was 14.5 of 20. The objective score was 13.9 of 20. The results were significantly different depending on the aesthetic subunit of the face. The best results were achieved in the malar (89 percent good results) and lateral cheek areas (84 percent good results). The poorest results were registered for the lower and upper lip areas (34 percent and 31 percent good results, respectively). Minor complications were observed in 3 percent of the cases. Conclusions: Fat tissue grafting is a simple, efficient, and reproducible technique for restoration of facial volumes. In the absence of functional disorders, it is the authors' first choice in the decision-making process for the treatment of facial soft-tissue deficiencies."	100
M. Keck, J. Janke, K. Ueberreiter: Viability of Preadipocytes In Vitro: The Influence of Local Anesthetics and pH. Dermatol Surg 2009;35:1251-1257	Liposuction as the standard method for fat harvesting for subsequent autologous fat transfer generally uses tumescent solution to prepare the fat tissue for aspiration. The study investigates the effect of tumescent solution, including local anesthetics, on the viability of the harvested fat. Conclusion: "The viability after incubation with tumescent solution (1 L of 0.9% NaCl solution plus 25mL of 1% articaine plus epinephrine 1:200,000 plus 25mL of bicarbonate) is almost as high as in the control. "Clinical practice shows that the use of tumescent solution leads to sufficient anesthesia. Therefore, the use of tumescent solution for infiltrating the donor site can highly be recommended. With a vitality rate of approximately 80%, lidocaine is still acceptable for infiltration of the donor site. Articaine and epinephrine, as well as ropivacaine, show a moderate loss of cell viability."	N/A
Y. Xie, D.N. Zheng et al: An integrated fat grafting technique for cosmetic facial contouring. Journal Plast Reconstr Aesthet Surg. Feb. 2010. 63(2):270-276.	Aspirated fat was used for facial contouring. Results: "The absorption was found variable in different patients. Long-term follow-up proved that final correction after 1-3 injections of autologous fat had persisted for many years. Obviously improved facial contour was evident in most patients after autologous fat transplantations. More than 73.5% of the patients in this series were assessed as satisfactory by all 3 observers (patient, surgeon, and layer person). Between 12.0% and 21.7% of the patients were mostly satisfactory. Less than 4.8% of the patients were unsatisfactory. Conclusions: Autologous fat grafting to the face is a safe and reliable option to improve facial contour in patients. The transplanted fat can survive well in the face with our integrated fat grafting technique. More than one injection may be required to achieve optimal outcome."	83



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