WAL and Autologous Fat Transfer: A new, effective autologous fat grafting method for breast augmentation

Interview with Klaus Ueberreiter M.D., Asklepios Klinik Birkenwerder/Berlin
by Inge Matthiesen

Question: What has triggered the introduction of this new fat transplantation method?
Dr. Ueberreiter: Through the publications of Sydney Coleman in New York, micro-fat grafting has been gaining popularity since the mid-90s and is now being used worldwide for the correction of tissue deficits in the facial area. It wasn’t long before the use of autologous fat for breast enhancement as an alternative to silicone implants was also being discussed.

Question: Have advances since been made in the use of this method for breast augmentation?
Dr. Ueberreiter: In March 2007, Coleman presented the results of a study on breast augmentation with autologous fat (1); Zocchi and Delay, from Italy and France, published additional findings. Since then, autologous fat transfer has been generally accepted as a surgical option for breast enlargement.

Question: What are the disadvantages of previously used methods and the advantages of the new method you have developed?
Dr. Ueberreiter: The previously used methods of micro-fat grafting with intermediate steps such as centrifugation are very time-consuming and associated with long surgery times. Whereas fat cells that have been aspirated from tissues using the body-jet® are already washed, and the blood content of the aspirate is very low. In our studies, we have been able to prove that this fat contains the same number of vital fat cells and fat stem cells (preadipocytes) as the fat harvested using previous methods. This is the first method for fat har- vesting that requires only slightly more time for liposuction while significantly decreasing the overall procedure time.

Question: Can you describe the method in a little greater detail?
Dr. Ueberreiter: Fat removal with the body-jet® represents an especially gentle form of liposuction, since the fat can be harvested using various tests, including imaging procedures (MRI), both prior to and six months after the surgery. The entire procedure takes only two hours.

Question: Can you briefly summarize the advantages of this new procedure?
Dr. Ueberreiter: Since October 2007, we have been conducting a prospective controlled study on breast augmentation; the results we have seen with the more than 30 patients who have undergone the procedure to date are very promising. These results are being examined using various tests, including imaging procedures (MRI), both prior to and six months after the surgery. After the study is completed in April 2009, we will analyze and publish the data.

Question: Have there still been reports published on this topic since the issue was first raised?
Dr. Ueberreiter: Yes. There have been numerous reports published on this topic since the issue was first raised. In particular, we have published various reports, e.g. by Stutz, Araco and Meyer, please refer to pages 2 and 3 of this issue.

Question: Are there still problems associated with the masking or mimicking of possible tumor tissue in imaging procedures?
Dr. Ueberreiter: No. There have been numerous reports published on this topic since the issue was first raised.

Question: Dr. Ueberreiter, can you tell us a little more about possible fat regenera- tion and the number of fat grafts that are required?
Dr. Ueberreiter: The first results are showing that an increase of breast volume of more than one cup size requires two fat grafts. For breast reconstruction following tumor resection, about four to five fat grafts are required, whereby this method is much less traumatic for the patient than a free tissue transfer, for example from the abdomen.

Question: How long do the trans- planted cells remain in the tissue?
Dr. Ueberreiter: The integrated cells will remain in the tissue permanently. After approximately six weeks, about 80% of the transplanted cells have been integrated into the host tissue.

Question: How are the transplanted cells used for the correction of tissue deficits in the facial area?
Dr. Ueberreiter: Fat is being used for facial reconstruction. The entire procedure takes only two hours. Furthermore, the vitality and the integration rate of the fat cells harvested using this gentle procedure are very good.

The entire surgery can be performed on an outpatient basis under local anesthesia with light sedation.

(2) Publications by Stutz, Araco and Meyer, please refer to pages 2 and 3 of this issue.
The influence of local anesthetics on the vitality of the pre-adipocytes

According to a study by Ueberreiter, Keck and Janke, the selection of the local anesthetic has a great impact on the vitality of the pre-adipocytes. In this investigation, human pre-adipocytes from the fat cell aspirate of 9 patients after liposuction with the body-jet® have been incubated with a variety of local anesthetics. Afterwards the vitality of the cells was tested by FACS analysis.

**Conclusion:** Only Lidoacaine and Artsacine/Epinephrine are applicable for the preparation of infiltration solution for liposuctions for the purpose of autologous fat harvesting.

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**Results**

<table>
<thead>
<tr>
<th>Local anesthetic</th>
<th>Percentage of vital pre-adipocytes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prilocain</td>
<td>23.7%</td>
</tr>
<tr>
<td>Ropivacain</td>
<td>38.8%</td>
</tr>
<tr>
<td>Artsacine, Epinephrine</td>
<td>65.3%</td>
</tr>
<tr>
<td>Lidocain</td>
<td>76.5%</td>
</tr>
<tr>
<td>Controls (NaCl)</td>
<td>92.8%</td>
</tr>
</tbody>
</table>

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**Smooth and gentle on blood and lymph vessels – intact lipocytes**

In a new study by Stutz and Krahl published in Aesthetic Plastic Surgery in 2008, the authors are concluding:

“A paradigm shift has occurred with the introduction of water-jet assisted liposuction. For this method no tumescence (firm-elastic infiltration condition with high tissue pressure) is necessary. Likewise no pre-infiltration period for the homogenisation of the adipose tissue is required. The aspiration procedure is started immediately after the anaesthesia has taken effect.”

“The traumatic, anatomically appropriate procedure of water-jet assisted liposuction (WAL, body-jet®) available today represents a promising treatment for lipoedema patients who generally suffer from severe subjective and objective impairment. Liposuction treatment can bring long-term improvement if the operative technique focuses on lymph vessel preservation. Immunohistological analyses show minimal evidence of lymph vessel structures in liposuptions.”

“The histological analysis of the aspirations documents a relatively specific removal (apheresis) of primarily intact lipocytes with low vascular amount. In the liposuptions of 28 of the 30 investigated liposuptions (patients), the lipocytes were found to be predominantly (>70%) intact.”

“Penetration of water into the corium and/or the epidermis would lead to scarring and/or the epidermis would lead to scarring. This would lead to a tightening of the tissue which could be seen as a firming effect.”

The impact of the body-jet® water spray on vascular and nervous structures was analyzed by immunohistochemical staining. Samples representing all three specimens vessels and nerves were marked by CD34 and S100 in order to investigate them for lesions of that structures.

“In all specimens neither in the dermis nor in the subcutis or adjacent muscles a rupture or lesion of vessels or nerves was observed.”

The researchers conclude that “no vessels or nervous structures were destroyed in the corium/epidermis or in the muscle tissue, even with deep penetration. Our findings indicate that no scarring is to be expected after the edema recedes, but a slight reactive fibrosis is possible. This would lead to a tightening of the tissue which could be seen as a firming effect.”

“Wherever strands of connective tissue in the subcutis do not cushion the water jet, depending on the thickness of the fibres, multiple successive connective tissue strands effectively shortened the range of action. No destruction of connective tissue was seen.”

“Penetration of water into the corium and/or the epidermis would lead to scarring and/or the epidermis would lead to scarring.”

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**Investigation on tissue effects of water-assisted liposuction with the body-jet®**

In a recent investigation at the University of Greifswald, the effect of the body-jet® water spray has been studied on different tissue structures including:

- skin
- adipose tissue
- adjacent muscle tissue
- blood vessels and nerves

All samples were exposed to the five application ranges (Range 1 to 5) of the body-jet® water jet with a 3.5 mm infiltration cannula. The duration of the saline spray application was 30 seconds within a space of one centimeter in all five ranges. This procedure represents a substantially increased impact on the tissues, as normal application times would only be up to 5 seconds and while moving the cannula. Special attention was focused on the affection of vessels and nervous structures.

The researchers conclude that “no vessels or nervous structures were destroyed in the corium/epidermis or in the muscle tissue, even with deep penetration. Our findings indicate that no scarring is to be expected after the edema recedes, but a slight reactive fibrosis is possible. This would lead to a tightening of the tissue which could be seen as a firming effect.”

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Clinical Reports on the use of water-assisted lipoplasty (WAL) with the body-jet®

Water-assisted lipoplasty with the body-jet® is being described in the literature for the first time with 280 patients treated from October 1999 on (1). Since then, the body-jet® is used for lipoplasty in Europe (e.g. in the UK, The Netherlands, Spain, Switzerland, Austria, Germany), in the USA, in Asia (e.g Japan, Korea, Hong Kong, Singapore), in Australia, Saudi Arabia, Iran, Brazil, Venezuela, Australia and many other countries. Clinical publications and postmarket surveillance reporting do not indicate any case of a major adverse event.

Clinical data on the safety of WAL with the body-jet®

For WAL with the body-jet® the incidence of complications and adverse events is very low. In a study by Taufig (1), it is reported that no infections occurred in any of the 280 patients. In one case of 280 a hematoma appeared in the medial area of the knee. In none of the 280 patients treated from October 1999 onwards, did any of the 280 patients develop infections. In one case of 280 a hematoma appeared in the medial area of the knee.

How to use the five ranges (RANGE 1–5) of the body-jet®

As described in the body-jet® Instructions for Use, the application of the fan shaped water spray (saline spray) of the body-jet® can be adjusted in five ranges (RANGE 1–5), according to the plastic surgeons requirements.

RANGE 1 to 5 are all providing the safe administration of saline via the body-jet® cannulae into the adipose tissue in order to loosen and separate the fat cells during the infiltration and aspiration process.

The effect of the body-jet® ranges (RANGE 1–5) on adipose tissue and on vital structures like connective and muscle tissue, blood and lymph vessels, and nerves has been investigated in various histopathological studies.

The results of these studies indicate that in the RANGES 1–5 of the body-jet® no damage is produced to connective tissue, muscular tissue, blood and lymph vessels, and nerve tissue. The largest range of action and the maximum loosening (swelling) effect on the fat tissues is achieved at RANGES 1 and 2, and RANGE 3, according to a study by H. de Groot.

Rationale on the selection of the body-jet® pressure RANGES:

During a lipoplasty procedure the pressure RANGE is selected by the surgeon depending on

1. the phase of the procedure (infiltration phase, aspiration phase),
2. the anatomical area that is to be treated,
3. the condition/consistency of the tissue.

Accordingly, the following recommendations on the selection of the RANGES 1–5 are provided, based on the experience of the body-jet® users (publications, study results).

1. Regarding the phase of the procedure: During the infiltration phase (loosening of fat tissue by infiltration of saline solution into the intercellular space), RANGES 2 or RANGES 3 is recommended because of optimum range of action and maximum loosening (swelling) effect. During the following aspiration or suction phase RANGES 1, 2, 3 or 4 are recommended depending on the anatomical area, the condition of the tissue and the desired speed of liposuction.

2. Regarding the anatomical area that is to be treated: In small and/or vulnerable areas (e.g. like the inner knee area or chin area), RANGES 1 or 2 would provide the best and most gentle effect. The RANGES 2, 3 and 4 are applicable for standard procedures of liposuction, e.g. of the upper/lower abdomen, flanks and thighs, according to the surgeon’s demands.

3. Regarding the condition of the tissue: RANGE 5 would only be used in highly fibrous fat tissues, e.g. during secondary liposuction procedures, and RANGES 2, 3 and 4 for regular tissue conditions.

The applied RANGE is increased with increased tissue rigidity.
Safe and quick wound cleaning with the new debri-jet®

International presentation of a new wound debridement

By J.J. Stutz M.D.

For many years lymphedema was not considered surgically treatable. Only in recent years have increasing numbers of reports from Scandinavia been published that consider surgical measures to be successful in addition to the very important conservative treatment. In a limited number of cases good results can be expected using lymph node transplants. Sufficient lymph nodes must be available on the contralateral side for this procedure.

In 2002 H. Briëtson (1) published seven-year results after liposuction for secondary arm lymphedema, achieving almost complete reduction of edema formation due to dry liposuction. The author emphasized the improvement in mobility which in these cases could not be achieved using conservative treatment. In this context M. Fohls (2) reported that 5% of 400 lymphedema patients showed no results after a four-week intensive conservative decongestive therapy with CPT (complex physical therapy) but rather continued to increase in size. Quality of life studies with lymphedema patients, however, have recently shown that improved mobility of the extremities contributes far more to the quality of life than edema reduction alone. At this particular point the debulking procedure of liposuction comes into effect. On the basis of our extensive experience with liposuction for lipedema, we employed this technique for non-pitting lymphedema and immunohistologically processed the aspirate, finding no D2-40 antibodies to lymphatic endothelium present. This demonstrates that waterjet-assisted liposuction does not cause damage to the lymphatic vessels when done correctly. At the same time the edema could, however, be significantly reduced. The number of non-pitting lymphedema patients treated with W AL is admittedly low and the follow-up investigation period is comparatively short, nevertheless the previous results are very promising.

Disadvantages of previous surgical methods

- Painfulness and requirement of general anesthesia including problems with anesthetic complications
- Delination of the necrotic margin (necrotic margins persist post-operatively or healthy tissue is being “sacrificed”)
- Bleeding that limits visibility, and pain reactions
- Pathogens may remain in the wound and cause recurrent infections

Development of the debri-jet®

The application of a pressure-regulated waterjet to the necrotic area facilitates quick and effective wound debridement by substantial prevention of bleeding combined with immediate removal of debris material. The necrotic margins are well visualized.

Advantages of the debri-jet®

- Non-invasive, selective and protective surgical technique: healthy tissue is not removed.
- Better cleaning of the wound: waterjet rinsing cleans more effectively than all other surgical procedures such as scraping, cutting, shaving.
- Removal also of hardened (partially granulated) debris by softening and rinsing off.
- Hygienic removal of loosened wound debris via a closed system.
- Improved wound healing and increased circulation using the pulsed waterjet alternating with the applied vacuum.

Functional operation of the debri-jet®

A planar waterjet applied tangentially to the wound surface softens and loosens wound debris and necrotic tissue quickly, completely, and painlessly, and the dispersed particles can be suctioned off in the operational step. The device contains a hand piece with a disposable flexible applicator that adjusts to the wound site (see Fig.). Integrated into the hand piece is a pressure sensor. When the applicator is placed on the wound and the opening of the hand piece sealed with a finger, a vacuum is created that is measured by the sensor. At a defined vacuum the waterjet is produced. When the applicator is removed from the wound or the opening of the hand piece is uncovered the water supply is immediately interrupted. This switching off feature in combination with the flexible applicator minimizes the formation of aerosol and thus avoids contamination and the risk of infection.

New surgical treatment option for lymphedema

The most recent member of the AquaShape family is the new AquaShape® LipoCollector™. The LipoCollector™ facilitates collecting up to one liter of filtered fat during a W AL procedure.

AquaShape® Family

As shown above, water-jet assisted liposuction (W AL) is a particularly gentle method, postoperative pain and bruises are remarkably less with W AL compared to traditional methods. Also, W AL does not require large tumescent per-infiltra tion, which helps to reduce the risk of side effects while the contours of the target area remain visible.

Several new products have been developed to support this new approach. Today, the AquaShape® product family consists of the body-jet®, as well as the new AquaShape® mobile and the AquaShape® LipoCollector™. The AquaShape® mobile is a small portable water-jet device. It has been designed to facilitate the entry into the W AL world, and can be used with any suitable vacuum pump. The combination of already available suction equipment with the AquaShape® mobile provides potential for savings. (*)not available in USA.

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Gesamtherstellung:
Max Press GmbH & Co. KG
www.maxpress.de

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Druck: Tarprint Casimir GmbH & Co KG
www.tarprint.de

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