



human med

Water-Jet Fat: Viable
and Sustainable

How to get best results in fat grafting?

A consideration for your clinical practice and routine

Contents: 1 • Fat harvested with water-jet is viable and sustainable

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1. Fat harvested with water-jet is viable and sustainable

Fat cells are a very delicate and sensitive material. They are easily damaged or destroyed when treated inaptly.

The harvest technique and graft preparation have a substantial influence on the outcome of fat grafting. In order to obtain good results in autologous fat transfer it is essential to use a suitable, gentle method for fat harvesting and transferring.

(The ASAPS Fat Graft Task Force* concludes: "To avoid contamination and maximize tissue viability, exposure to air and mechanical damage should be minimized."; K.A.Gutowski: Current Applications and Safety of Autologous Fat Grafts: A Report of the ASPS Fat Graft Task Force 2009)

Water-jet assisted liposuction & lipotransfer is the only validated method – with clinical evidence documented in many publications. The data prove lowest donor site morbidity, very good results after fat grafting and 90 % fat cell viability.

Fat Grafting and Lipofilling

Present and new indications for autologous fat transfer in plastic & reconstructive surgery:

- Breast augmentation (aesthetic and reconstructive)
- Correction of soft tissue defects
- Scar treatment
- Natural „filler“ for face and hands
- The use of cryopreserved fat tissue and adipose stem cells

Lipofilling – What determines the fat quality? The fat quality depends on

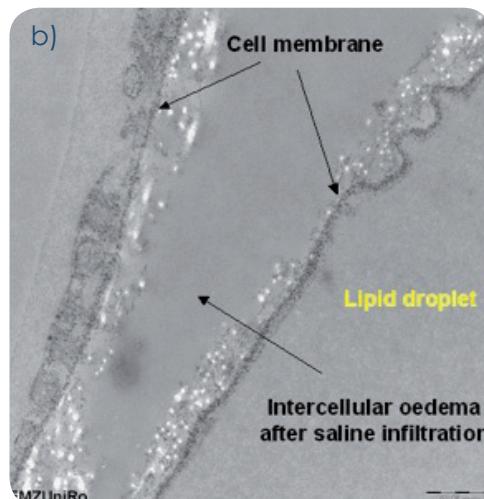
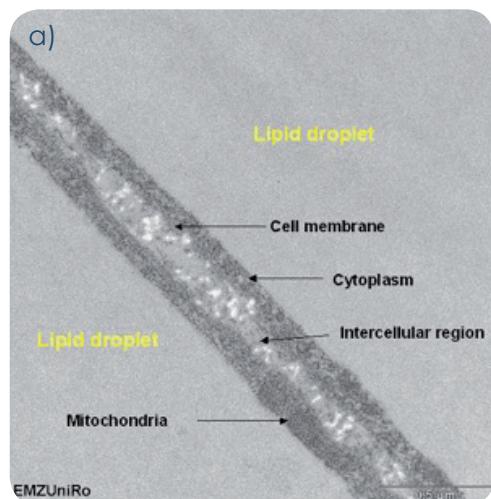
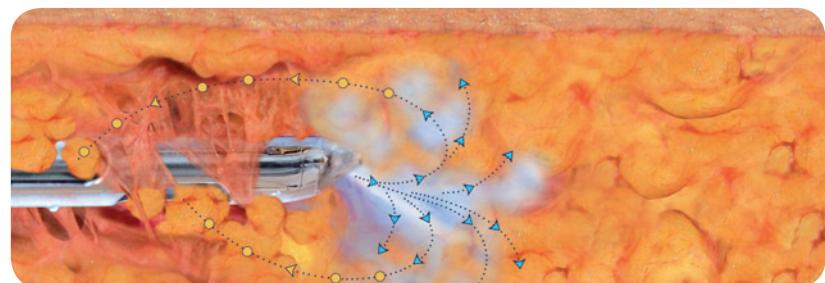
- Method of fat harvesting and transfer.
- Viability of individual fat cells
- Lobular size (size of cell clusters)
- Content of mesenchymal stem cells (ACS or SVF)
- Exposure to mechanical stress (e.g. centrifugation, shear forces)
- Exposure to air and oxygen
- Selection of the local anaesthetic

Cell-protective fat harvesting with body-jet:

- a) Vacuum -500 mbar
- b) Infiltration RANGE 1 or 2
- c) Use of body-jet® evo
Lipocollection mode
- d) Gentle closed-loop filtering and removal of drugs and unwanted cell components with LipoCollector® or FillerCollector®

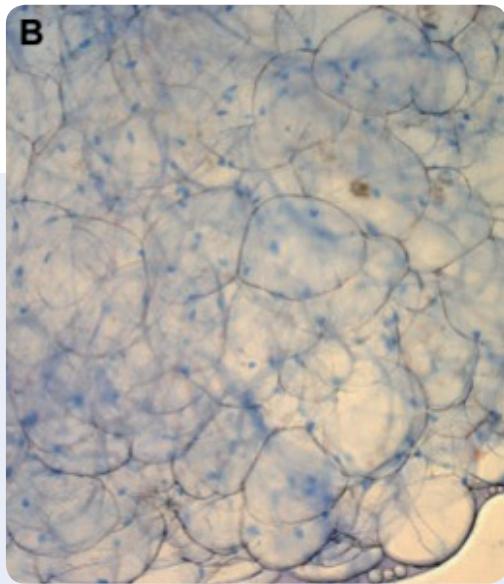
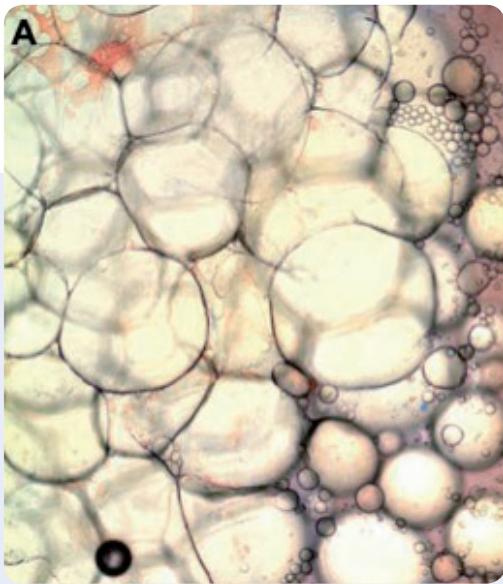
2. The gentle effect of the water-jet spray

A unique method: Simultaneous infiltration and aspiration. The water-jet gently transforms the tissue structure and prepares the tissue for atraumatic aspiration through the special WAL cannula.



Gentle separation of fat cell clusters from the donor site - viewed by the electron microscope.

- a) Adipose tissue – normal finding prior to infiltration.
- b) Gentle separation of fat cell clusters from the donor site.



3. High viability of fat cells harvested with water-jet Histological Assessments

a) Study by Gordon H. Sasaki: "Water-Assisted Liposuction for Body Contouring and Lipoharvesting : Safety and Efficacy in 41 Consecutive Patients".

Published in Aesthetic Surgery Journal 2011 31: 76

"Fat aliquots from five randomly selected patients were incubated with trypan blue vital dye to determine the percentage of adipocytes that absorbed and expelled the dye within one hour and six to eight hours after extraction. Microscopic assessment after trypan blue dye exclusion test methodology demonstrated that about **90 %** of adipocytes absorbed and released the dye one hour after aspiration, indicating **cell viability**."

This **histocytological study** demonstrated that **90 % of** adipocytes absorbed and expelled trypan blue

dye within one hour of exposure, indicating **viability of cells** (A). The same aliquot of cells was incubated at room temperature for 6 - 8 hours. Retention of the blue dye indicated a loss of cell function (B)."

b) D. Krah M.D.: Immuno-histopathological investigation of the effect of the water-jet

The study focused on

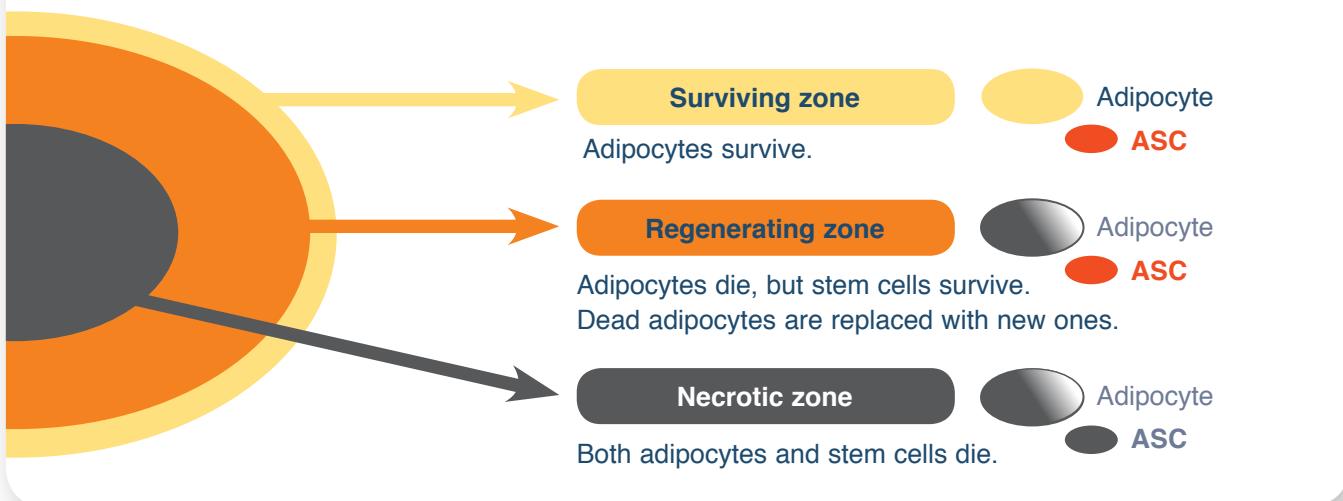
- Alterations of the fat tissue exposed to the water jet in different RANGES
- Effects on the individual lipocytes.
- Alterations of blood vessels and lymph vessels.

The results show that **90 % of the fat tissue remains viable up to body-jet® RANGE 2 or 3.**

body-jet RANGE	Number of spray jets in one spot	Preservation of fat tissue viability (%)	Integrity of blood vessels	Integrity of lymph vessels	Hematoma
2	3	90	0	0	0
2	5	90	0	0	0
3	3	90	0	0	0
3	5	70	0	0	0
4	3	70	0	0	0
4	5	50	0	0	0

Quantification: 0 = without histological changes, (+) = minor, + = some, ++ = remarkable, +++ = impressive histological changes.

“Three zones” from the periphery after grafting



4. Optimum lobular size of fat harvested with water-jet

According to a recent publication* by Dr. Kotaro Yoshimura of the University of Tokyo, there are three zones of transplanted fat grafts or lobules. “The most superficial zone is the “surviving zone”, which is less than 300 μm thick. In the surviving zone, both adipocytes and adipose-derived stromal cells (ASCs) survive. The second zone is the “regenerating zone” (up to 1,200 μm), the thickness of which varies depending on the microenvironmental conditions such as vascularity of and attachment to the surrounding tissue. In this zone, adipocytes die as early as day 1, but adipose-derived stromal cells survive and provide new adipocytes to replace the dead ones. The most central zone is the “necrotic zone” ($>1,200 \mu\text{m}$), where both adipocytes and adipose-derived stromal cells die, no regeneration is expected, and the dead space will be absorbed or filled with scar for-

mation.” The above picture* shows a conclusive schema for the three zones of transplanted fat cell clusters.

(* Kotaro Yoshimura M.D. et al: The Fate of Adipocytes after Nonvascularized Fat Grafting: Evidence of Early Death and Replacement of Adipocytes. Plastic and Reconstructive Surgery. May 2012; 1081-1092.)

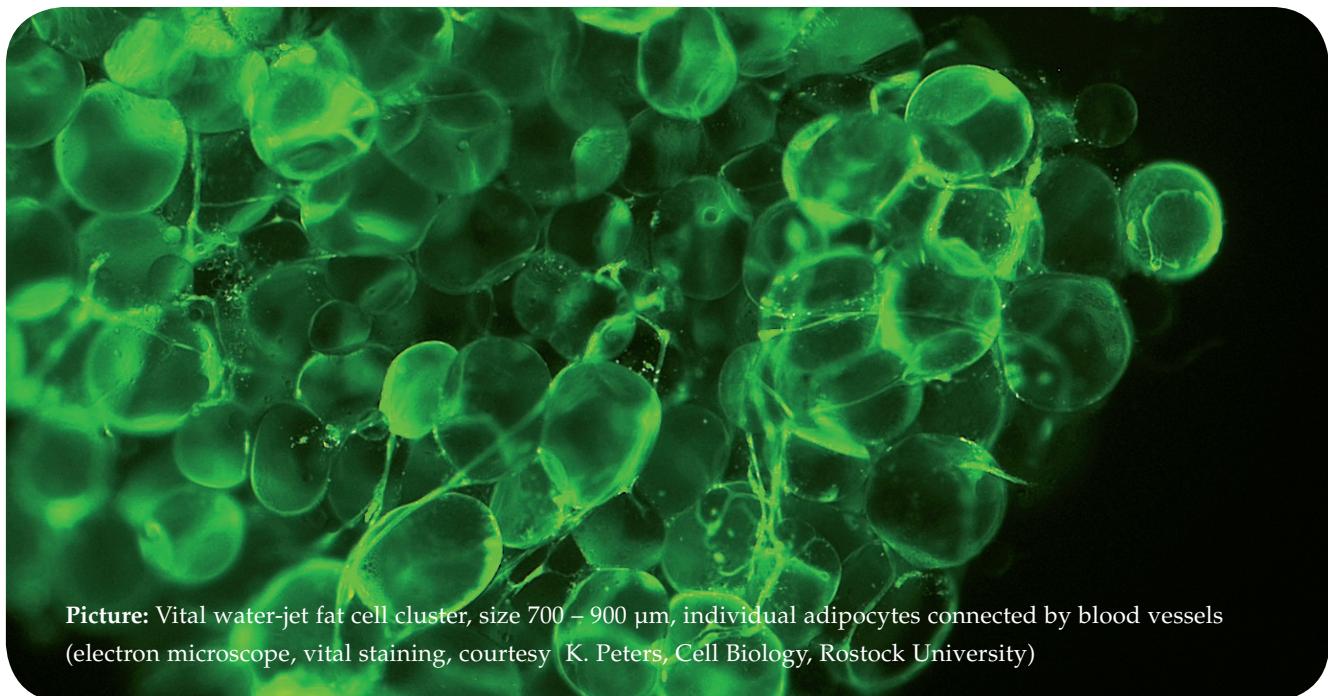
Fat tissue clusters harvested by water-jet assisted technology have a diameter of about 700 bis 900 μm .

This is the main cause for the high graft survival of up to 87 % after water-jet assisted fat transfer/BEAULI method.**

(** see published study results by Klaus Ueberreiter et al., 2010)

Large fat cell clusters with a diameter of 1,200-2,000 μm (as harvested by other liposuction techniques) will develop ischemic necrosis and oily cysts.

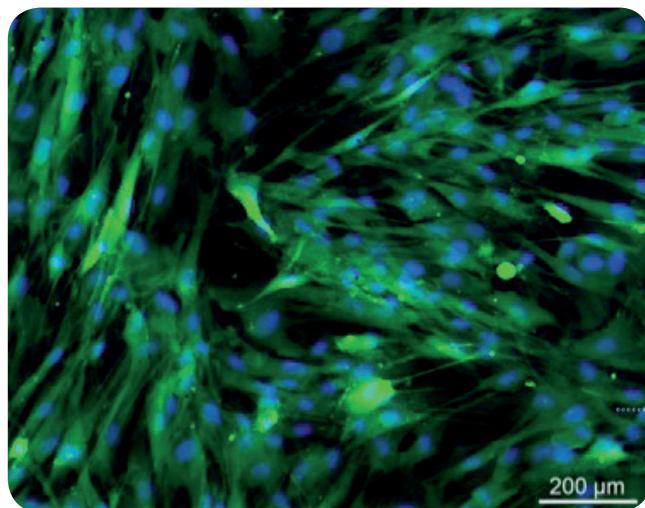
body-jet® cell clusters with a diameter of 0.7 – 0,9 mm will survive in the recipient tissue after transplantation.



5. Content of mesenchymal stem cells

body-jet®/LipoCollector® fat contains 20 - 40 Mio adipose stem cells per 100 ml

- 1 • Water-jet fat tissue contains 40 to 100 times more multipotent stem cells as compared to bone marrow.
- 2 • These adipose stem cells are multipotent, they can differentiate into almost every type of cell and tissue (e.g. fat, vascular, muscle, bone, cartilage, nerve).
- 3 • The newly developed human med system for the intra-operative separation and subsequent clinical application of adipose stem cells combines human med's key knowledge in the field of water-jet technologies and in the gentle harvesting and transplantation of fat cells, with the long-standing expertise of renowned University research centers.



Picture: Adipose stem cells (nucleated) harvested by water-jet; vital staining, digitally overlaid; courtesy K. Peters, Rostock University

Exposure to mechanical stress

Many studies confirm the negative effect of mechanical stress, centrifugation and shear forces to the fat cells. The water-jet method avoids these negative effects. Centrifugation is not required. The small water-jet fat lobules are less vulnerable to shear forces than larger fat lobules. They are injectable also via small cannula without being damaged.

Exposure to air and oxygen

Also exposure to oxygen and contamination by ambient air can have a harmful effect on fat cells. The water-jet system avoids these negative effects by using a closed system for harvesting and transferring (LipoCollector® or FillerCollector®).

Viability of Preadipocytes

In Vitro:

The Influence of Local Anesthetics and pH

Substance	pH	Mean Viability Nonbuffered	+/- % Buffered
Lidocaine	6,0	76.5 +/- 10.5	69.1 +/- 9.7
Articaine + epinephrine	4,4	65.3 +/- 11.2	53.0 +/- 12.9
Ropivacaine	4,8	58.8 +/- 14.2	55.6 +/- 14.5
Prilocaine	4,2	21.7 +/- 12.8	44.3 +/- 12.5
Tumescent solution	5,2	89.4 +/- 7.4	80.4 +/- 8.3
Sodium chloride	7,2	92.8 +/- 3.5	80.1 +/- 10.1

6. Conclusions for water-jet assisted liposuction and lipotransfer

- 1 Very high viability of fat cells and stem cells.
- 2 Very low donor site morbidity.
- 3 Numerous published studies demonstrate the success of water-jet assisted fat grafting („BEAULI Method“).
- 4 The only validated method for fat grafting and lipofilling.
- 5 Highest clinical evidence for fat grafting.
- 6 Most suitable for soft tissue augmentation, cryopreservation and stem cell harvesting and application.

7. Selection of Published Results

- 1 • Ueberreiter K, von Finckenstein JG, Cromme F, Herold C, Tanzella U, Vogt PM: BEAULI™- a new and easy method for large-volume fat grafts] Handchir Mikrochir Plast Chir. 2010 Dec;42(6):379-85.
- 2 • Herold C, Ueberreiter K, Cromme F, Grimm M, Vogt PM: Is there a need for intrapectoral injection in autologous fat transplantation to the breast? – An MRI volumetric study. Handchir Mikrochir Plast Chir 2011; 43: 119 – 124.
- 3 • Sasaki GH: Water-Assisted Liposuction for Body Contouring and Lipoharvesting - Safety and Efficacy in 41 Consecutive Patients. Aesthetic Surgery Journal 2011;31:76.
- 4 • Araco A, Gravante G, Araco F, Delogu D, Cervelli V: Comparison of Power Water – Assisted and Traditional Liposuction: A Prospective Randomized Trial of Postoperative Pain. Aesth. Plast. Surg. 31:259265, 2007.
- 5 • Man D, Meyer H: Water Jet-Assisted Lipoplasty. Aesthetic Surg J 2007;27:342–346.
- 6 • Ueberreiter K, Tanzella U, Cromme F, Doll D, Krapohl BD: One stage rescue procedure after capsular contracture of breast implants with autologous fat grafts collected by water assisted liposuction („BEAULI Method“). GMS Interdisciplinary Plastic and Reconstructive Surgery DGPW 2013, Vol. 2, ISSN 2193-8091.
- 7 • Münch DP. Breast Augmentation with Autologous Fat – Experience of 96 Procedures with the BEAULI™-Technique. HandchirPlastChir 2013;45:80-92.
- 8 • Wolter A, Scholz T, Diedrichson J, Liebau J. Surgical Treatment of Gynecomastia: An Algorithm. HandchirPlastChir 2013;45:73-79.
- 9 • Stutz JJ, Krah D: Water Jet-Assisted Liposuction for Patients with Lipoedema: Histologic and Immunohistologic Analysis of the Aspirates of 30 Lipoedema Patients. Aesthetic Plast Surg. 2009; 33(2):153-62.

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