Commentary

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Commentary on: Isolation and Differentiation Potential of Human Mesenchymal Stem Cells From Adipose Tissue Harvested by Water Jet-Assisted Liposuction

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In this article, Meyer et al examine the yield of mesenchymal stem cells (MCSs) with water jet-assisted liposuction (WAL).[1] WAL uses simultaneous infiltration and suction to dissect and extract fat during liposuction. Using water to dissect tissues is an idea that evolved in the last century and was later geared towards the dissection of fat in 2001.[2] Since that time, a number of studies have suggested advantages to the use of WAL, including decreased pain, decreased intraoperative swelling, better contouring, and decreased need for anesthesia.[3-5]

The gentle nature of WAL has been utilized in the treatment of lipoedema, where clinicians noted that this aspiration method may induce less trauma to lymphatics.[6] With the evolution of fat grafting, the utility of WAL for fat harvest has been explored.[5] Harvest method can certainly impact graft healing and affect the characteristics of the graft.[7] In this study, the authors sought to characterize the mesenchymal stem cell (MSC) content of fat grafts harvested by WAL, including yield and plasticity. Additionally, they assessed the viability of the graft material using a live/dead assay. The highly bioactive MSCs within fat grafts are capable of transforming into a number of different cell types, and can assist in tissue remodeling through paracrine effects to improve vascularity and even decrease the effects of radiation skin changes.[8] Moreover, higher concentrations of MSCs within a fat graft have been correlated with increased graft survival.[9] The concept of enriching fat grafts with autologous MSCs, or "cell-assisted-lipotransfer," continues to be an exciting area of research.[10-12]

Meyer et al present strong evidence in a well-conducted study that WAL harvested fat has favorable characteristics for fat grafting. They show preserved graft architecture with highly viable grafts as assessed by live/dead staining. The yield of stromal vascular fraction (SVF) from WAL harvested fat is reasonably high, with an average of 6.1×10^5 cells per gram of tissue and a high fraction of CD34 positive cells. The MSCs isolated from WAL harvested fat are adherent to tissue culture plastic and proliferate in culture. The authors further show MSC functional benchmarks including calcium deposition and accumulation of intracellular lipid when the cells are cultured in a defined differentiation medium. A clear strength of the study is the use of multiple human subjects for tissue collection.

The authors compare their results to previously published methods of isolation, noting a higher yield of cells in the SVF per milliliter of lipoaspirate using WAL. This study would certainly be stronger if the authors performed a direct head-to-head comparison of fat harvested by WAL and other techniques. The authors discuss that it is difficult to compare data across experiments/scientists considering the wide range of methods used in the literature. Another way to further validate the efficacy of WAL in fat grafting would be to implant the fat in an animal model and assess healing over time. Furthermore, with collagenase digestion

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posing regulatory challenges in many regions, there is increasing interest in mechanical methods for isolating SVF. It would be very interesting to measure the nucleated cell fraction in the aqueous portion of the WAL aspirate to determine if the water stream could dislodge stromal cells from the fat tissue. In another published study, Yin et al did present a head-to-head comparison of WAL versus conventional liposuction with the only variable being water-jet assistance.[13] Their findings agree with the findings of Meyer et al. Moreover, Yin et al show impressive in-vivo data of increased fat graft retention and decreased apoptosis with WAL.

We applaud the authors on this well conducted study validating the quality of fat harvested by WAL, including a favorable MSC yield and cell function. WAL harvested fat has been applied successfully for total breast reconstruction, and this study provides data to support the tissue quality for this application. We look forward to more clinical reports using this technology, and to more basic scientific studies examining the tissue product of WAL harvest.[14]

Disclosures

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REFERENCES

1. Meyer J, Salamon A, Herzmann N, et al. Isolation and differentiation potential of human mesenchymal stem cells from adipose tissue harvested by water jet-assisted liposuction. *Aesthet Surg J*. 2015;35(8):1030-1039.
2. Wanner M, Jakob S, Schwarzl F, Honigmann K, Oberholzer M, Pierer G. Water jet dissection in fatty tissue [Article in German]. *Swiss Surg*. 2001;7(4):173-179.
3. 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. *Aesthetic Plast Surg*. 2007;31(3):259-265.
4. Man D, Meyer H. Water jet-assisted lipoplasty. *Aesthet Surg J*. 2007;27(3):342-346.
5. Sasaki GH. Water-assisted liposuction for body contouring and lipoharvesting: safety and efficacy in 41 consecutive patients. *Aesthet Surg J*. 2011;31(1):76-88.
6. Stutz JJ, Krahl 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):153-162.
7. Fisher C, Grahovac TL, Schafer ME, Shippert RD, Marra KGRubin JP. Comparison of harvest and processing techniques for fat grafting and adipose stem cell isolation. *Plast Reconstr Surg*. 2013;132(2):351-361.
8. Phulpin B, Gangloff P, Tran N, Bravetti P, Merlin JL, Dolivet G. Rehabilitation of irradiated head and neck tissues by autologous fat transplantation. *Plast Reconstr Surg*. 2009;123(4):1187-1197.
9. Philips BJ, Grahovac TL, Valentin JE, et al. Prevalence of endogenous CD34+ adipose stem cells predicts human fat graft retention in a xenograft model. *Plast Reconstr Surg*. 2013;132(4):845-858.
10. Matsumoto D, Sato K, Gonda K, et al. Cell-assisted lipotransfer: supportive use of human adipose-derived cells for soft tissue augmentation with lipoinjection. *Tissue Eng*. 2006;12(12):3375-3382.
11. Kølle SF, Fischer-Nielsen A, Mathiasen AB, et al. Enrichment of autologous fat grafts with ex-vivo expanded adipose tissue-derived stem cells for graft survival: a randomised placebo-controlled trial. *Lancet*. 2013;382(9898):1113-1120.
12. Grabin S, Antes G, Stark GB, Motschall E, Buroh S, Lampert FM. Cell-assisted lipotransfer. *Dtsch Arztebl Int*. 2015;112(15):255-261.
13. Yin S, Luan J, Fu S, Wang Q, Zhuang Q. Does water-jet force make a difference in fat grafting? In vitro and in vivo evidence of improved lipoaspirate viability and fat graft survival. *Plast Reconstr Surg*. 2015;135(1):127-138.
14. Hoppe DL, Ueberreiter K, Surlemont Y, Peltoniemi H, Stabile M, Kauhanen S. Breast reconstruction de novo by water-jet assisted autologous fat grafting--a retrospective study. *Ger Med Sci*. 2013;11:Doc17.