Comparison of the Effect of Suction-Assisted Lipectomy Devices on Survival of Adipose Tissue Graft

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We read with interest Hsiao et al's *Aesthetic Surgery Journal* article "Fate of Fat Grafting In Vivo and In Vitro: Does the Suction-Assisted Lipectomy Device Matter?" The authors evaluated the effect of 2 suction-assisted lipectomy devices, namely traditional suction-assisted liposuction (TSAL) and vibration amplification of sound energy at resonance (VASER).[1] One portion of lipoaspirates obtained by these 2 devices was implanted into nude mice to assess fat survival and regeneration, whereas another portion was used to obtain adipose tissue–derived stem cells (ASCs), in order to compare the proliferative and differentiation potential of ASCs. Isolation of fat by 2 devices from the same donor/patient (left and right side) and implantation of both types of fat grafts in a single mouse are notable; however, certain aspects—particularly the type of assay selected and the time period as well as the resultant conclusion and explanation—have created uncertainty that needs proper clarification for better understanding.

Autologous fat grafts have been widely used as a natural filler for volume restoration in certain conditions such as congenital deformities and complex traumatic wounds. Fat transplantation is a common procedure performed by aesthetic and plastic surgeons to successfully correct body anomalies. However, compromised survival of grafted fat at the site of transplantation remains a major limitation. A significant portion of grafted fat (up to 70%) is absorbed after transplantation, making the outcomes less satisfactory.[2,3] The unpredictable absorption of grafted fat has led to harvesting and processing procedures being revised to improve fat grafting outcomes.[4] Similarly, fat graft preenrichment strategies have been suggested to enhance the survival of grafted fat.[3] The fat harvesting procedure, as the first step in fat grafting, is of prime importance, however, and requires careful evaluation.

There is a lack of consensus regarding the effect of harvesting devices on angiogenesis. Hsiao et al are of the view that angiogenesis in the grafted fat is due to invasion of host blood vessels. This claim, however, is without any experimental proof of the origin of angiogenesis. Interestingly, contrary to their claim, they concluded that enhanced angiogenesis is due to the increased angiogenic potential of ASCs contained in grafted fat.

In Hsiao et al's study, ASCs were enzymatically isolated and their proliferative and differentiation potential were compared in vitro.[1] However, no information is provided about the passage at which the assays were performed. In the current scenario, it is important to conduct assays at primary passage (eg, with flow cytometry), preferably before culturing, because the effect of liposuction technique/device on the biological characteristics of ASCs will either be adjusted in latter passages, or the affected cells will die and be excluded from the assays. Therefore, performing the assays at later stages does not correctly depict the effect of

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the liposuction device on cell characteristics. Furthermore, although ASCs are an important type of regenerative cells in lipoaspirates, it is necessary also to assess the effect of the device on other types of cells in the lipoaspirate.

The selection of a proliferation assay (ie, WST-1 assay) to compare the effect of harvesting devices can be questioned. The WST-1 assay is usually performed to assess the proliferation and viability of cells after a chemical treatment (eg, treatment with a toxic chemical). However, Hsiao et al cultured 10,000 ASCs after primary passage (the exact passage number is not provided). In our opinion, they have cultured healthy (unaffected) ASCs for proliferation assay in both groups because most of the affected ASCs (if there was any potential effect of the liposuction devices) were excluded during media changes and subsequent subculturing. Accumulative population doublings may be a more relevant assay in this case to determine the effect of liposuction devices on proliferation.

Fat graft survival is usually assessed by measuring the percentage retention of grafted fat by magnetic resonance imaging (MRI) or B-mode ultrasound.[3-5] Hsiao et al, however, measured the final survival of grafted fat by sectioning implanted graft and excluding the area occupied by vacuoles. This may represent the survival of individual cells in a specific portion of graft but not survival of fat grafts as a whole.

Out of 17 patients, lipoaspirates from 10 patients were used for in vivo study (n = 5) to investigate fat survival and for in vitro study (n = 5) to isolate ASCs and to determine their proliferative and differentiation potential; however, no information was provided about the lipoaspirates of the 7 remaining patients. Interestingly, for most assays, the differences between TSAL and VASER were increased more at 12 weeks than at 4 weeks. Increased differences in the latter stages may be due to internal in vivo conditions instead of the effect of the liposuction devices.

A persistent issue with fat grafting is inconsistent fat retention. Improving fat graft survival requires novel strategies along with improvements in existing methods. Fat harvesting methods are critical for better fat retention and satisfactory outcomes, and therefore must be evaluated carefully.

Disclosures

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