Ratio of Adipocytes and Adipose-Derived Stem/Stromal Cells in the Graft

Recent studies indicate that ASCs in the graft are key components to contribute adipogenesis and angiogenesis after fat grafting. If the graft tissue is ASC deficient in number, it may be reasonable to normalize stem cell density in graft tissue.[6] There are theoretically 2 ways to improve the adipocyte/ASC ratio in the graft (ASC condensation): one is to reduce the number of adipocytes and tissue volume, and the other is to increase the number of ASCs (**Fig. 2**).

Reducing the number of adipocytes and tissue volume can be done by mechanical removal of adipocytes, such as mechanical crushing/mincing, aggressive centrifugation, and ultrasonic cavitation. Such destructive processes have to be done with great care, because too much damage, heat, or pressure to the tissue could kill ASCs as well. Increasing the number of ASCs can be done by supplementing freshly isolated SVF or cultured/purified ASCs to the graft (cell-assisted lipotransfer).[2] SVF can be achieved through collagenase digestion or other ways if extra liposuction aspirates are available. ASCs can be purified readily and expanded by adherent culture of SVF, and can also be banked in a liquid nitrogen for a long period if needed.

Adipose-Derived Stem/Stromal Cells Condensation by Reduction of Adipocytes and Tissue Volume

Reduction of adipocyte number in the tissue without losing ASC viability, which leads to tissue volume reduction and ASC condensation at the same time, can be done by various methods, such as aggressive centrifugation, mechanical crushing or mincing, and ultrasound cavitation.

Centrifugation not only separates water and oil from fat tissue, but also mechanically breaks some adipocytes, depending on the magnitude of centrifugal force, although ASCs in the tissue

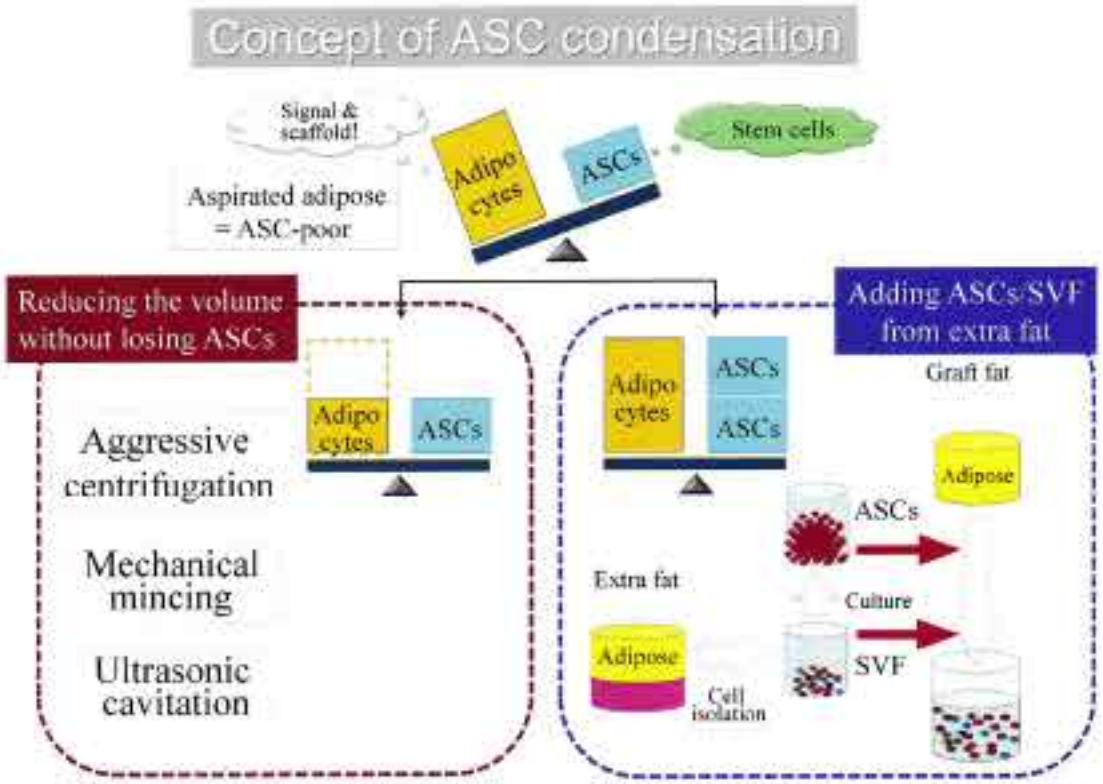

Fig. 2. Two concepts for adipose-derived stem/stromal cell (ASC) condensation in the graft tissue. Aspirated fat tissue is relatively ASC-poor compared with intact adipose tissue, and there are 2 concepts to normalize the ASC number in the tissue. One is to reduce the number of adipocytes without losing ASCs, which results in substantial volume reduction. After this process, adipose tissue and ASCs are condensed with a greater ratio of ASCs/adipocytes. Another is to supplement freshly isolated stromal vascular fraction (SVF) or culture expanded ASCs. Isolated ASCs cannot function unless they are properly incorporated into the tissue.