and colleagues[27] reported that cell-assisted lipotransfer using SVF cells did not contribute to improve the outcomes.

Kølle and colleagues[28] reported a randomized, placebo-controlled trial to compare the volumizing effects of ASC-enhanced fat graft and regular fat graft in the same patients. In this study, ASCs were expanded by adherent culture and 20 million cultured ASCs were supplemented to 1 g fat graft, showing a significantly greater volume retention (80.9%) in ASC-supplemented group compared with 16.3% in the nonadditive control.

Taken together, the results of fat grafting with SVF/ASC supplementation seem to be affected by many factors. There is no standard or optimized method of SVF isolation and cell supplementation to the graft tissue. SVF contains many other cells, such as leukocytes, and some may have unfavorable effects on fat grafting. The number of ASCs isolated in SVF through collagenase is only 10% to 20% of those contained in the original tissue. ASCs have to be attached to the tissue or cells to function properly and avoid unwanted migration or differentiation.[29] Volume retention is not a reliable index to evaluate fat grafting results because oil cyst formation from large fat necrosis also increases the clinical score of volume retention. Further studies are necessary to achieve clinical benefits of ASCs with greater magnitude and consistency.

Further Condensation of Adipose-Derived Stem/Stromal Cells for Other Therapeutic Use

Fresh SVF and cultured ASCs have been used in numerous clinical trials, including autoimmune diseases, osteoarthritis, and myocardial infarction. These trials are expecting ASCs to reduce immunoreaction, release growth factors, and/or accelerate tissue repair and angiogenesis. However, there are other attempts to prepare ASC-containing tissues by removing adipocytes from adipose tissue and further condensing ASCs. Both adipocytes and ASCs are needed for tissue enlargement (adipose regeneration after fat grafting), but therapies for improving the quality (vascularity, inflammation, elasticity, and healing capacity) of tissue may not need any adipocytes. Fat grafting is showing clinical success for rejuvenating and revitalizing tissue. Such new types of processed adipose tissue (without adipocytes) are expected to be used in the future as an alternative to fat grafting for treating stem cell-depleted tissues.

SUMMARY

Adipose tissue has many types of cells other than adipocytes, which can be extracted as a cell pellet called SVF, which contains ASCs, vascular endothelial cells, pericytes, adipose-resident macrophages, and lymphocytes, among others. Condensation of grafting adipose tissue is a key to achieve better volumizing effects (better volume retention) by fat grafting. Because aspirated fat tissue is relatively poor in stem cells (ASCs), condensation of ASCs in the graft is another issue for seeking better volumizing and regenerating effects. One way to improve the adipocyte/ASC ratio in the graft (ASC condensation) is to reduce the number of adipocytes and tissue volume, and the other way is to increase the number of ASCs. ASC condensation can be done by mechanical removal of adipocytes, and increasing the number of ASCs can be achieved by supplementing freshly isolated SVF or cultured/purified ASCs to the graft (cell-assisted lipotransfer). Clinical trials of fat grafting with supplementation of SVF/ASCs suggested beneficial effects of supplementation, although further studies are needed to confirm and achieve benefits of ASCs with greater magnitude and consistency. For nonvolumizing purposes, such as revitalization of stem cell-depleted tissue and treatment of inflammatory conditions, a new style of processing of adipose tissue may be utilized in the future.

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