

Effectiveness of Adipose Derived Stem Cells (ASC) Enriched Fat as a Facial Filler - Randomized Triple Blinded Study

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Introduction

Autologous fat grafting is increasingly used in plastic surgery. However, resorption rates ranging from 25% to 80% have been reported. Therefore, methods to increase graft viability are needed.

The objective of this study is to design a triple-blinded trial, to compare the survival of fat grafts enriched with autologous adipose-derived stem cells (ASCs) versus non-enriched fat graft as facial filler.

Methodology

30 participants underwent two liposuctions 14 days apart; one for ASC isolation and *ex vivo* expansion, and another for the preparation of fat grafts. Two purified fat grafts were taken from the second liposuction. One graft was enriched with ASCs and the other without ASCs serving as a control depending on the sequence of randomization, to which the patient, clinician and the researcher were blinded. The volumes of injected fat grafts were measured by MRI immediately after injection and after 90 days. The primary goal was to compare the residual graft volumes of ASC-enriched grafts with those of control grafts.

Adipose derived stem cells - isolation and culture

Isolation: During tumescent liposuction the plastic surgeons infuse subcutaneous tissues with saline solution containing lidocaine anesthesia with epinephrine via a cannula and then remove both the liquid and fat under suction [1]. This generates finely minced fragments of fat whose size depends on the size of the cannula. ASCs can be isolated from the adipose tissue by first washing the tissue sample extensively with phosphate buffered solution (PBS) containing 5% penicillin/streptomycin (P/S). Upon removal of debris, place the adipose tissue sample in a sterile tissue culture plate with 0.075% collagenase Type I [2]. Incubate it for 30 min at 37°C, 5% CO₂, and then neutralize collagenase activity by adding 5 ml of alpha MEM containing fetal bovine serum (FBS, Atlanta, GA). The Stromal vascular fraction (SVF), containing ASCs is obtained by centrifuging the sample at 2000 rpm for 5min.

Culture: Add fresh stromal medium to the culture plate. Maintain cells in a humidified incubator at 37°C with 5% CO₂. For harvesting viable ASCs, add a small volume (250-500 µl) of warm PBS to wells.

Replace PBS with 500 µl of Trypsin/EDTA solution (0.5%) [3]. Place in incubator for 5 min. Verify under microscope that more than 90% of cells have detached and then add 500 µl of stromal medium to neutralize the trypsin reaction. Centrifuge at 1200 rpm for 5 min. Aspirate the supernatant and suspend the cells in small volume of stromal medium. Cells can be counted with hemocytometer. Repeat the procedure to increase the culture yields.

Results and Discussion

Our study is the first of its kind which gives an insight to objectively assess the survival rate of stem cell enriched fat grafts, routinely used as facial fillers and for facial rejuvenation. It clearly showed the stem cell enriched fat grafts had better survival as more volume was retained at the end of 3 months indicating better survival and less resorption of fat. This difference also reached statistical significance. 30% average difference of volume of fat retained was objectively noted through MRI rendered volumetric analysis, on comparing both the groups.

Conclusion

Although previous studies claim that stem cell enriched fat has better survival, our study is the first of its kind which objectively analyses the volume of fat retained in the stem cell enriched group vs. the control group. Confounding factors were minimized as the study was conducted on the same patient, with similar recipient site (face), by the same surgeon, with similar technique. There was no subjective bias as results were evaluated based on objective analysis. To the best of our knowledge this is the only randomized triple blinded study to date.

References

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