

# Comparison of Lipoaspirate Extracted Using Active Filtration, Low Pressure Decantation and Traditional Suction Decantation in Autologous Fat Grafting

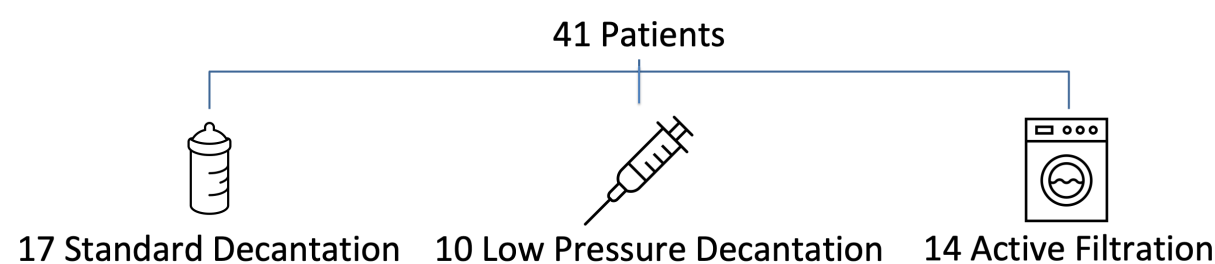
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## Background

Autologous fat grafting is a common technique used to enhance aesthetic outcomes in post-mastectomy breast reconstruction patients. Various methods of autologous fat transfer exist on the market. Percentage of graft take has been historically variable and may be difficult to predict. Adipose tissue extracted during the procedure comprises of adipocytes and a stromal vascular fraction consisting of preadipocytes, fibroblasts, immune cells, and adipose stromal cells (ASCs). ASCs are the primary mediators of androstenedione to estrogen aromatization, which may be of concern for patients with a history of hormone receptor positive breast cancer. Given the relative paucity of biochemical data, this study aimed to examine whether the method of fat processing influences the degree of aromatase expression in lipoaspirates extracted from breast cancer patients, as well as whether grafting technique affected the volume of fat retained after grafting.

## Methods

A prospective randomized control trial enrolled 41 patients aged  $\geq 18$  with a history of previous breast surgery (either complete or partial mastectomy) undergoing revision breast reconstruction with fat grafting. Patients were randomized into one of three study arms distinguished by the method of autologous fat transfer (active filtration, low pressure decantation, and standard decantation) in an attempted equal ratio. To assess aromatase expression, qRT-PCR for aromatase gene CYP19A1 was used to compare the relative aromatase expression in each patient sample. To assess fat graft volume retention, a pre-operative 3D scan of the upper torso was taken as baseline and compared to a 3-month post-operative 3D scan. Autodesk Meshmixer was used to evaluate volume changes.

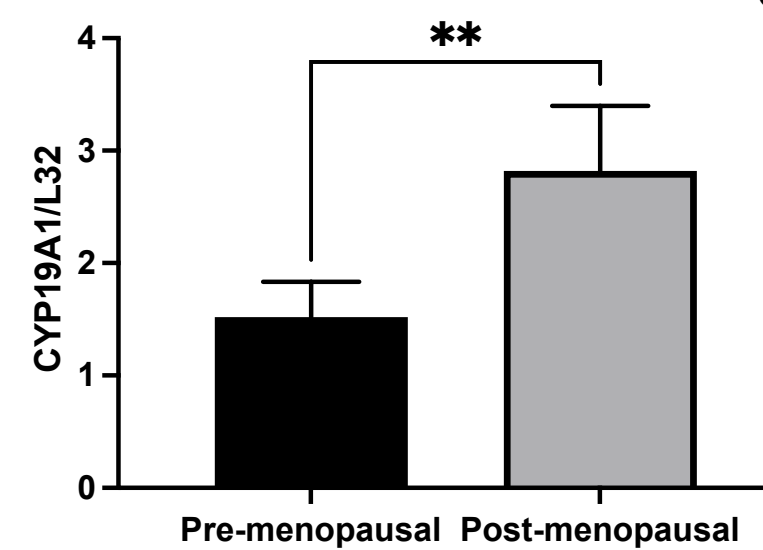


## Aromatase expression

In pooled analysis across all samples, aromatase expression was positively correlated to BMI and menopausal status ( $p < 0.05$ ). Subgroup analysis showed a stronger correlation between aromatase and BMI for samples collected in traditional suction decantation (A) ( $p < 0.05$ ), and a stronger effect of menopausal status on aromatase expression in samples in low pressure decantation (C) ( $p < 0.05$ ).

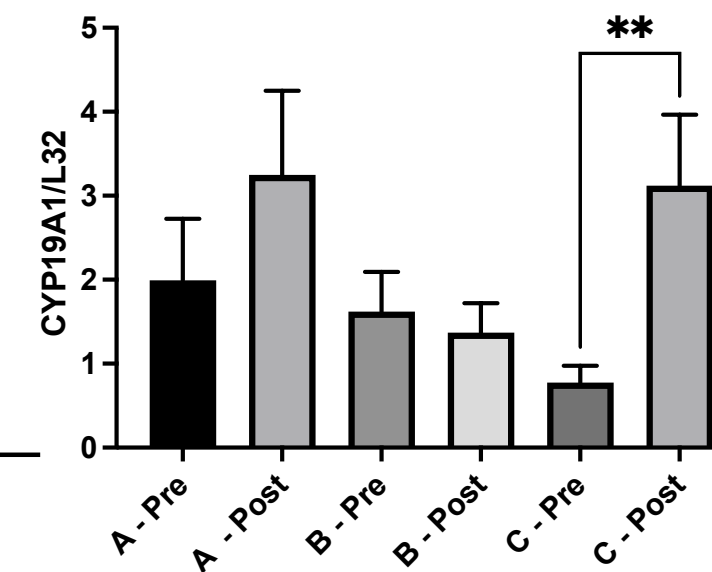
## Results

Menopausal Status and Relative Aromatase Expression



Aromatase expression was calculated as a delta delta compared to a control housekeeping gene.

CYP19A1 Expression by Menopausal Status



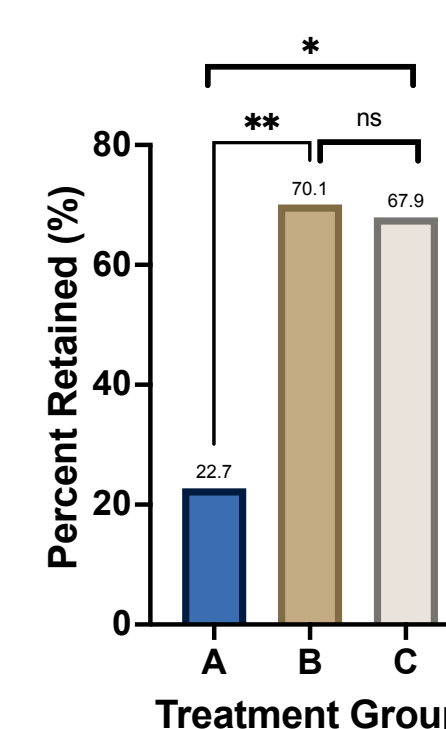
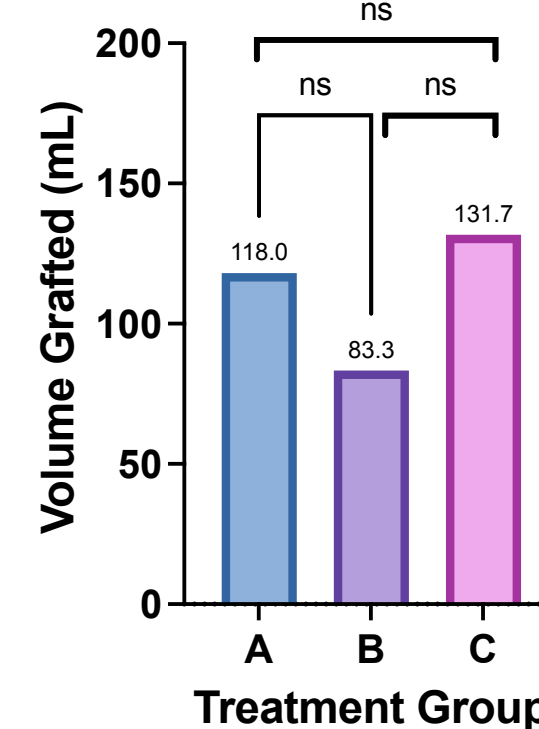
A: Traditional decantation  
B: Active filtration  
C: Low pressure decantation

## Graft volume retention

The volume of fat injected during initial fat grafting did not differ significantly among the three methods of fat grafting ( $p > 0.05$ ).

At 3 months postoperatively, standard decantation (A) exhibited significantly less fat graft retention than active filtration (B) and low-pressure decantation (C) ( $p < 0.05$ ).

## Volume Injected at Surgery Grafted Volume Retained (%)



## Conclusions

Significantly greater fat graft retention was seen at 3 months postoperatively when grafting using active filtration or low-pressure decantation. A possible explanation is that these methods may have led to higher levels of cell viability by way of reduced cellular debris and other inflammatory components that may contribute to tissue resorption and necrosis.

The observed stronger correlation between BMI and menopausal status in the tissue processed using the traditional and low-pressure decantation may reflect a greater component of adipose stromal cells in these extracted lipoaspirates. Active filtration may remove more ASCs. Reduced chronic inflammation, which has been linked to lower aromatase/ASC levels, may offer longitudinal benefits for patients with a history of breast cancer. Further immunohistochemistry studies are needed to examine whether active filtration and low-pressure decantation lead to lipoaspirates with more concentrated viable adipocytes, progenitor cells, and factors for angiogenesis.

## References

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