

Autologous Fat Grafting to the Superior Sulcus in Patients with Age-Related Enophthalmos



Andrew Malek, BS¹, Christopher Branstetter, BS¹, Rebecca Brantley, MD², Kamran Khoobehi, MD²

1) Louisiana State University Health – New Orleans, School of Medicine

2) Louisiana State University Health – New Orleans, School of Medicine, Department of Plastic and Reconstructive Surgery



Introduction

- Age-related enophthalmos results from eyelid sagging, brow drooping, or periorbital fat atrophy.
- Fat atrophy-related enophthalmos leads to classic “sunken eye appearance”, including ptosis, elevated brow, and increased upper eyelid length (sunken eye).
- Blepharoplasty or forehead lift is insufficient for this sunken eye patient cohort since the primary insult is atrophy of the pre-levator muscle aponeurosis fat pad.
- The objective of this study is to assess effectiveness of autologous fat grafting (AFG) in addressing atrophy-related changes for sunken eye patients.

Methods

- Retrospective review of sunken eye patients receiving AFG to superior sulcus
- Consecutive patients of a single surgeon from December 2012 - February 2024
- Exclusion criteria: concomitant upper face lift, forehead lift, or blepharoplasty
- Pre-operative photographs were compared to photographs at 3-month follow-up*
- Measurements:
 - Length of upper lid to orbital rim
 - Palpebral fissure height
 - Upper and lower marginal reflex distance (MRD)
- Descriptive and inferential statistics with significance set at $p < 0.05$

Results

Cohort overview

- Twenty-four total patients received AFG to 48 eyes during the study period. Of these, 6 (25%) received only AFG at the time of procedure, while 18 (75%) underwent lower face/neck lift at the same time as AFG to the eye.

AFG only

- Significant increases in upper marginal reflex distance (MRD) were noted in both eyes (Average Right eye (OD): 1.35 mm, $p=0.016$, Average Left eye (OS): 1.45 mm, $p=0.022$).
- No significant change to lower MRD bilaterally.

AFG + lift

- Similarly, a significant increase in bilateral upper MRD was found in patients who received AFG alongside facelift (OD: .90 mm, $p=0.004$, OS: .96 mm, $p=0.002$)
- No significant change to lower MRD bilaterally.
- Significant reductions in the distance from upper lid to orbital rim were also noted bilaterally (OD: 4.07 mm, $p<0.001$, OS: 4.05 mm, $p<0.001$).



Figure 1. Autologous fat grafting (AFG) to the superior sulcus. Top row: preoperative hollowing contributing to a sunken-eye appearance. Bottom row: postoperative restoration upper eyelid contour and orbital volume.

Post-Treatment Change in AFG-Only Measurements (mm)

	R. Eye	p-value	L. Eye	p-value
Lid to Orbital Rim	-3.14	0.095	-2.59	0.075
Palpebral Fissure	1.20	0.067	1.12	0.067
Upper MRD	1.35	0.016	1.45	0.022
Lower MRD	-0.22	0.726	-0.33	0.512

Table 1. Post-treatment change in periorbital measurements following autologous fat grafting (AFG) alone.

Post-Treatment Change in AFG + Facelift Measurements (mm)

	R. Eye	p-value	L. Eye	p-value
Lid to Orbital Rim	-4.09	<0.001	-4.04	<0.001
Palpebral Fissure	0.065	0.919	0.0849	0.898
Upper MRD	0.901	0.004	0.966	0.002
Lower MRD	-0.836	0.068	-0.895	0.062

Table 2. Post-treatment change in periorbital measurements following autologous fat grafting (AFG) with concomitant facelift.

Discussion

- AFG is successful in restoring volume in sunken eye patients.
- There was a significant reduction in upper eyelid sagging using upper MRD as proxy for ptosis, although not an alternative to ptosis correction.
- Qualitative improvements in frontalis wrinkles and tension were observed.
- Limitations to the study include qualitative patient selection by the surgeon rather than based on volume or measurements preoperatively, and the volume received was determined intraoperatively through clinical judgement.
- Future studies may focus on quantification of secondary improvements, result longevity, and larger cohorts of AFG-only patients.