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A Multicenter Pilot Study of a Novel Allograft Adipose Matrix in Malar and Prejowl Volume Restoration

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Background: Allograft adipose matrix (AAM) offers a novel, off-the-shelf, and readily available natural option in the treatment of facial soft tissue volume and reconstructive deficits. AAM is a natural soft tissue supplement or replacement that can support cushioning and volume correction. A prospective multicenter pilot study evaluated AAM in facial volume restoration.

Methods: Eleven women (mean age of 55.8 ± 10.9 y) with midface volume deficit were followed up for 24 weeks after AAM treatment in this institutional review board–approved multicenter pilot study. The clinical safety and efficacy of the AAM treatment were evaluated using clinical scales and three-dimensional quantitative facial photography.

Results: AAM was safe to address facial volume deficits, with minor site-related adverse events and discomfort that resolved within 2–4 weeks. Observations also revealed facial volume improvements throughout the study with 91% positive responders. At week 24, the subject facial satisfaction scores revealed an 86% increase compared to baseline, along with a statistically significantly improved midface fullness compared to baseline.

Conclusion: AAM offers a natural and safe option for midface volume restoration and supports overall satisfaction and volume improvements. *(Plast Reconstr Surg Glob Open 2024; 12:e5523; doi: 10.1097/GOX.0000000000005523; Published online 24 January 2024.)*

INTRODUCTION

The treatment of soft tissue deficits and subcutaneous tissue atrophy is a significant clinical and social problem, particularly in the face.[1,2] Although fillers are composed of synthetic materials, autologous fat grafting (AFG) provides a natural treatment solution to address soft tissue deficits. AFG has the characteristics of the ideal natural solution: biocompatible, versatile, stable, and natural-appearing.[3–7] Aesthetic contouring using AFG has been shown to be efficacious in facial rejuvenation.[5] Despite the clinical success of AFG, there are challenges such as inconsistent graft retention, second site for harvesting, donor site morbidities, insufficient harvest, or excessive harvesting times.[4–7]

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An adipose-derived scaffold processed from donated deceased human tissue, suitable for allograft transplantation, was developed to address the challenges with AFG.[8–11] Allograft adipose matrix (AAM) offers a novel, off-the-shelf, readily available soft tissue matrix solution for volume restoration and remodeling. AAM is not a filler and provides an allogenic adipose solution with potentially similar clinical benefits to AFG (providing an autologous adipose solution), without requiring a harvest site, time for processing, and any morbidity of the AFG.[8–11] From the literature, several clinical studies support the safe use of AAM in various clinical applications, where cushioning and volume restoration were observed up to 6 months as a result of supporting the restoration of new adipose tissue.[8–11] This prospective multicenter clinical pilot study was designed to evaluate the safety and benefits of AAM in malar and prejowl volume restoration.

METHODS

AAM (Renuva; MTF Biologics, Edison, N.J.) is an allograft tissue aseptically processed without terminal

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sterilization from donated deceased human adipose tissue, which is recovered and screened according to the American Association of Tissue Banks and the US Food and Drug Administration regulations and guidelines. AAM is chemically disinfected to achieve a sterility assurance level equivalent to 10^{-6}.[12] The aseptically processed AAM has passed the ISO 10993 biocompatibility testing panel, and each lot (single donor) must pass USP <71> sterility testing and bacterial endotoxin screening using Limulus amebocyte lysate testing before being released.

Clinical Outcomes

The objective of this pilot study was to evaluate the clinical safety and effectiveness of AAM in malar and prejowl regions for volume restoration at 24 weeks posttreatment. This study protocol was institutional review board (IRB)–approved (Pro00028311) under Advarra Inc. (Columbia, Md.), which had oversight over all three study sites, and this trial was registered on ClinicalTrials.gov (NCT03652844). Clinical AAM safety was evaluated using a physician assessment of the subject's midface areas for adverse events and a subjective evaluation following treatment. Clinical assessments (Table 1) included tolerability (subjective/objective), discomfort (pain), and physician clinical grading (skin tone, smoothness, texture, and overall skin quality). Effectiveness was assessed by facial volume change over time up to 24 weeks for the areas injected using the validated four-point Medicis Midface Volume Scale (MMVS), the five-point Global Aesthetic Improvement Scale (GAIS), and the Subjective Facial Satisfaction Assessment. The MMVS is an objective measure of the severity of midface volume loss, and GAIS is a measure of the global aesthetic improvement in facial appearance ranging from worse to very much improved as compared to the pretreatment phase.

Finally, three-dimensional (3D) imaging was performed using the Canfield Scientific Vectra M3 Lift camera and analysis software (Canfield Scientific, Inc., Parsippany, N.J.) in an attempt to objectively quantify volume restoration and retention over time. Canfield Scientific provided the same training at each site to use the Vectra M3 Lift camera and conducted the analysis to ensure consistency in tabulated measurements. Pre- and posttreatment images of nonexpressive (nonsmiling and no smirking), relaxed facial tones were captured under the same photographic conditions. Volumetric measurements were performed through Vectra software by registering the baseline and follow-up images together and measuring the volume difference between the 3D images within the given area of interest. Distance maps visually showed the volume differences between the baseline and follow-up images, where positive volume increase is represented by blue, no volume change is green, and negative volume change is red.

Table 1. Clinical Assessment Scales

Subjective Tolerability	
Burning (0–4)	0 = None 4 = Worse
Itching (0–4)	
Stinging (0–4)	
Tingling (0–4)	
Investigator Objective Tolerability	
Erythema (0–4)	0 = None 4 = Worse
Edema (0–4)	
Discomfort (Pain) (0–10)	0 = No discomfort
	10 = Worst discomfort ever
Physical Clinical Grading Scores	
Skin tone (evenness) scale (0–4)	0 = Even, healthy color
	4 = Uneven, discolored appearance
Skin smoothness (visual) scale (0–4)	0 = Smooth appearance
	4= Severe, rough appearance
Skin texture (tactile) scale (0–4)	0 = Smooth, even feeling texture
	4 = Rough, uneven feeling texture
Overall skin appearance (0–4)	0 = Healthy, youthful skin appearance
	4 = Poor skin appearance
Effectiveness Assessment (Volume Improvement and Subject Satisfaction)	
MMVS (fullness) scale (1–4)	1 = Fairly full midface
	4 = Substantial loss of fullness
GAIS (improvement) scale (0–4)	0 = Worse
	4 = Very much improved
Subject facial satisfaction (−2 to +2)	−2 = Very dissatisfied
	+2 = Very satisfied

Takeaways

Question: Is AAM a novel option for the treatment of midface soft tissue deficits and volume restoration?

Findings: AAM is safe and provides midface volume restoration up to 24 weeks. Prospective clinical evaluation showed 86% increase in subject satisfaction, 91% positive responders, and significantly improved midface fullness.

Meaning: AAM offers a natural and safe option for midface volume restoration and provides an off-the-shelf option to AFG for soft tissue volume restoration.

Subject Selection

Each site treated at least three subjects. Healthy men or women were selected between the ages of 30 and 70 years who had a midfacial volume deficit of grade 3 or 4 on the MMVS and a body mass index of 18–30 kg/m^2. Subjects must have had no previous AAM treatment above the neck before enrollment and agreed to stay on a consistent skincare, diet, and exercise regimen for the study duration.

Exclusion criteria were as follows:

- Uncontrolled systemic disease;
- Significant history or current evidence of medical and/or psychological disorders;
- Dental work scheduled 4 weeks before/following AAM treatment;
- Pregnant or nursing women;
- Any systemic corticosteroid or immunosuppressive medications within 30 days before treatment;
- Topical steroids on the face within 14 days before/throughout the study;
- Botulinum toxin use within 6 months of study entry/throughout the study;

- Dermal fillers (eg, poly-L-lactic acid) in the treatment area within 2 years before treatment;
- Previous midface cosmetic plastic surgery, tissue grafting, or tissue augmentation with silicone, semipermanent fillers, or fat.

All subjects provided informed consent to participate in this IRB-approved study.

AAM Treatment

AAM was prepared per instructions for use. Bilateral sides of the malar and prejowl were treated with AAM, up to 2 mL per anatomic site (maximum 8 mL per subject). The nasolabial folds and periorbital anatomic sites were prohibited. AAM was injected deep into the subcutaneous plane where fat normally exists with a 20-23-gauge needle. A maximum of two ports was used with the fanning technique. The goal was to achieve volume correction only and not to over correct. Posttreatment, the clinician massaged the injection site using a manual rubbing action. At the clinician's discretion, a second injection of AAM (maximum 1 mL per anatomic site) could be provided at week 12.

Posttreatment, subjects could massage the treated areas for 5 minutes, five times per day, for 5 days. Tylenol was prescribed to manage any potential pain posttreatment, avoiding the use of anti-inflammatories. For the first few days, subjects were instructed not to wear clothing that might contact, rub, or irritate the treated areas and to contact their study team for any serious issues or issues that did not resolve within the first 48 hours posttreatment.

Data Analysis

Subject data at each time-point were evaluated by simple statistics, mean ± standard deviation (SD). Analysis of variance tests were performed for treatment fullness (time zero MMVS versus other time-points).

RESULTS

From the three different sites, 11 women, with an average age of 55.8 ± 10.9 years, were treated. The baseline Fitzpatrick skin type scale revealed that most subjects scored skin type II (36.4%) and skin type III (36.4%) (Table 2). Additionally, there were no significant differences for clinical grading per facial region (left or right side of face) as assessed by skin tone, smoothness, texture, and overall skin appearance pretreatment. Consequently, the left and right-side assessments were averaged to only differentiate between the anatomic sites and not the sides. The average AAM treatment volume injected subcutaneously into the adipose layer for the malar region was 1.4 ± 0.5 mL, and the prejowl region was 1.1 ± 0.4 mL.

Safety (Adverse Events)

There were no serious adverse events observed. Five subjects experienced minor adverse events related to the injection procedure (N = 4) and possibly associated with the injection (N = 1). The reported minor adverse events were injection site reactions such as bruising, slight erythema, a hardened knot, and tenderness. These reactions resolved within 4 weeks posttreatment without any further complications.

Table 2. Patient Demographics

Demographics	Patients
Overall average age (n = 11)	55.8 (10.9)
≤55 y average age (n = 8)	41.0 (8.7)
≥55 y average age (n = 3)	61.4 (4.3)
Sex	
Female	11 (100%)
Male	0 (0%)
Race	
White	10 (90%)
Black	0 (0%)
Hispanic	1 (9.1%)
More than 1	0 (0%)
Fitzpatrick	
I	2 (18.2%)
II	4 (36.4%)
III	4 (36.4%)
IV	1 (9.1%)
V	0 (0%)
VI	0 (0%)

Tolerability

Subjective tolerability scores revealed AAM was well-tolerated with mean scores lower than 1 (minimal) on a scale from 0 to 4 (0 = none; 4 = severe) in all categories (burning, itching, stinging, and tingling), indicating minimal issues with AAM treatment (Table 3). The majority of the observations occurred on the day of treatment and resolved within 3 days for the malar (itching, n = 4) and prejowl (itching, n = 4), with one subject needing 2 weeks (itching) in the prejowl (Table 3). From the clinician's perspective, objective tolerability (0 = none; 4 = severe) revealed low scores for erythema (malar 1.2 ± 0.9; prejowl 1.1 ± 1.0) and edema (malar 1.0 ± 0.8; prejowl 1.0 ± 0.8) on the day of treatment. By 2 weeks, all scores were below 1.0 (1 = minimal) with two patients resolved by 4 weeks (Table 3). Good tolerability for AAM was maintained throughout the study, with one exception of slight edema at week 24. The subjective discomfort data (0 = no discomfort; 10 = worst discomfort) corroborated these findings (Fig. 1) with low discomfort and resolution by 4 weeks.

Investigator Clinical Assessment

The clinical grading parameters, skin tone, smoothness, texture, and overall facial skin condition revealed improved skin condition throughout the study (Table 4). There was greater than 40% improvement in these parameters as early as 4 weeks. (**See figure, Supplemental Digital Content 1**, which shows percentage improvement of clinical grading assessment, **http://links.lww.com/PRSGO/D13**.) At 24 weeks, the percentage improvement relative to pretreatment for tone was 54.3% for malar and 58.1% for prejowl; for smoothness, 62.1% for malar and prejowl; and for texture, 60.0% and 61.9%. The overall clinical grading improvement was 60.0% for malar and 61.3% for prejowl regions.

Table 3. Subjective and Investigator Objective Tolerability of Malar and Prejowl Regions

Weeks	Subjective* Mean (±SD); n= No. Patients				Objective* Mean (±SD); n= No. Patients	
	Burning	Itching	Stinging	Tingling	Erythema	Edema
Malar region						
0	0.7 (0.9); n = 10	0.1 (0.3); n = 2	0.5 (0.8); n = 8	0.3 (0.6); n = 5	1.2 (0.9); n = 2	1.0 (0.8); n = 8
3 d	0.0 (0.0)	0.2 (0.4); n = 4	0.0 (0.0)	0.0 (0.0)		
2	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.2 (0.4); n = 4	0.2 (0.4); n = 3
4	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.2 (0.4); n = 2
12	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
24	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.1 (0.3); n = 1
Prejowl region						
0	0.6 (0.8); n = 9	0.1 (0.3); n = 2	0.5 (1.0); n = 6	0.1 (0.3); n = 2	1.1 (1.0); n = 8	1.0 (0.8); n = 8
3 d	0.0 (0.0)	0.2 (0.4); n = 4	0.0 (0.0)	0.0 (0.0)	-	-
2	0.0 (0.0)	0.1 (0.6); n = 1	0.0 (0.0)	0.0 (0.0)	0.2 (0.5); n = 2	0.3 (0.5); n = 3
4	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
12	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)
24	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

*Subjective/objective score assessment: 0–4 (0 = none; 4 = worse).

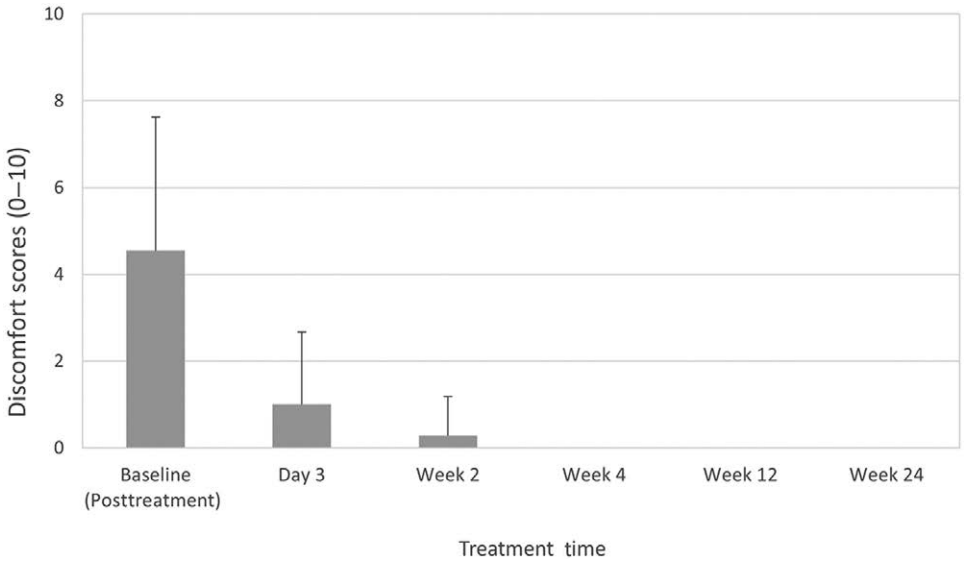

Fig. 1. Patient discomfort reduced by 2 weeks.

Volume Improvement and Subject Satisfaction

At baseline, the mean MMVS score was 3.1 ± 0.3 (1 = fairly full; 4 = substantial loss of fullness). Immediately posttreatment, the MMVS score was 2.3 ± 0.7, indicating a 25.8% improvement of midface volume. All MMVS scores were significant ($P < 0.001$) compared with the baseline (Fig. 2), with 51.6% improvement observed at 4 weeks, 45.2% at week 12, and 45.5% at week 24. Additionally, there was little change in posttreatment MMVS scores (2.0 ± 0.9) at weeks 4, 12, and 24, representing only a 13% difference. Therefore, the significant improvement of midface volume obtained post-AAM treatment was maintained throughout the 24-week study period.

The five-point GAIS provided insight into the global improvement evaluated by both the investigator and the subject. With the investigator GAIS, the percentage of subjects with facial volume deficit at improved/much improved/very much improved was 100% immediately posttreatment and at week 4. This changed slightly to 91% at week 12 and 82% at week 24 (Fig. 3A). Similarly, the subject GAIS was at 100% improvement immediately posttreatment and at week 4. This changed to 64% at week 12 and stayed unchanged at week 24 (Fig. 3B). The subject satisfaction data assessed the percentage of responders who had a change of at least +1 score improvement in facial satisfaction. The study had 91% positive responders and only 9% negative responders (Table 5). At screening, only 9% were satisfied, whereas 82% were dissatisfied/very dissatisfied. However, post-AAM treatment at 24 weeks, the percentage of dissatisfied/very dissatisfied changed from 82% to 9%, whereas 64% of the subjects were satisfied/very satisfied (Fig. 4). This is an 86% increase in patient satisfaction with the AAM treatment.

3D Facial Imaging

In quantifying the small volume AAM treatment, the volume retention did change over time in both the malar

Table 4. Tone, Smoothness, Texture, and Overall Clinical Grading for Malar and Prejowl Regions

Weeks (n)	Tone (±SD)	Smoothness (±SD)	Texture (±SD)	Overall (±SD)
Scale	(0–4, 0 = healthy; 4 = uneven)	(0–4, 0 = smooth; 4 = rough)	(0–4, 0 = smooth feeling; 4 = uneven feeling)	(0–4, 0 = healthy; 4 = poor)
Malar region				
Pretreatment (n = 11)	2.4 (1.0)	2.2 (0.8)	2.3 (0.8)	2.4 (0.9)
Posttreatment (n = 9)	2.1 (1.1)	1.8 (0.9)	2.0 (1.0)	2.0 (1.0)
2wk (n = 11)	1.4 (1.3)	1.1 (1.0)	1.4 (1.2)	1.3 (1.2)
4wk (n = 11)	1.4 (1.1)	1.1 (1.0)	1.2 (1.0)	1.3 (1.0)
12wk (n = 11)	1.4 (1.2)	1.0 (0.9)	1.1 (0.9)	1.2 (1.0)
24wk (n = 11)	1.2 (0.9)	0.9 (0.7)	1.1 (0.8)	1.0 (0.8)
Prejowl region				
Pretreatment (n = 11)	2.4 (1.0)	2.2 (0.8)	2.3 (0.8)	2.4 (0.9)
Posttreatment (n = 9)	2.1 (1.1)	1.8 (0.9)	2.0 (1.0)	2.0 (1.0)
2wk (n = 11)	1.4 (1.3)	1.1 (1.0)	1.5 (1.1)	1.4 (1.1)
4wk (n = 11)	1.4 (1.1)	1.1 (1.0)	1.2 (1.0)	1.4 (1.1)
12wk (n = 11)	1.4 (1.2)	1.0 (0.9)	1.1 (0.9)	1.2 (1.0)
24wk (n = 11)	1.1 (0.8)	0.9 (0.7)	1.0 (0.8)	1.0 (0.8)

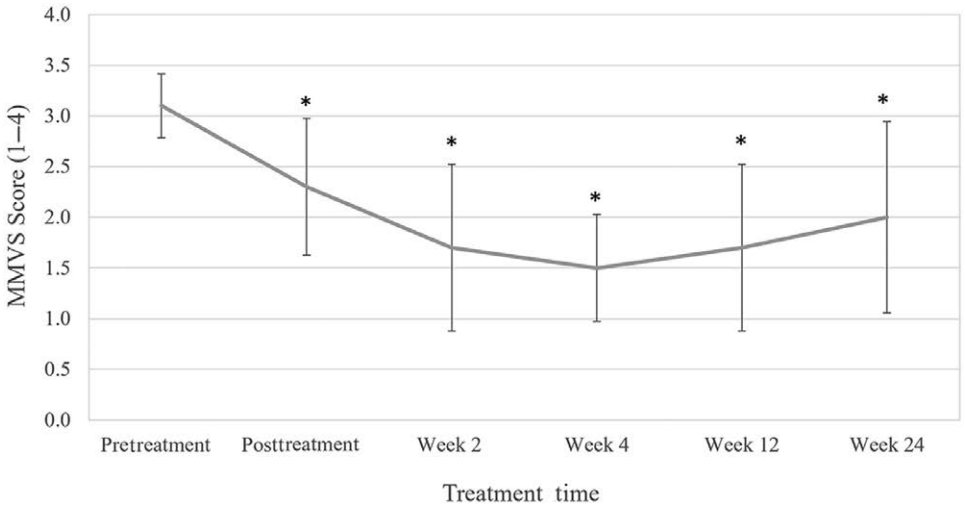

Fig. 2. MMVS assessment over time. Fullness was regained over time and is statistically significantly different compared with pretreatment (baseline). *Indicates statistical significance.

and prejowl regions. At 24 weeks, approximately 33 ± 30% positive volume was retained in the malar region, and 21.5 ± 15.2% positive volume was retained in the prejowl. Two cases of different ages are presented to visualize the 2D and 3D imaging over time. Case 1 is a 70-year-old woman, who was treated with an average of 1 mL in the malar region and 0.95 mL in the prejowl region. At 24 weeks, there was 59% retention in the malar region and 37% retention in the prejowl region (Fig. 5). Case 2 is a 56-year-old woman, treated with 2 mL in the malar and 1.5 mL in prejowl regions, and at 24 weeks, there was 57% retention in the malar and 14% in prejowl regions (Fig. 6).

DISCUSSION

Facial volume restoration can be accomplished naturally by AFG with graft retention rates varying from 20% to 90%.[13,14] This variability maybe attributed to the quality of the harvesting process, isolating the autologous fat and the technique of reinjecting the isolated fat.[2–4] After reinjection, the clinical challenges of fat necrosis and ischemia may also contribute to inconsistent graft retention.

AAM offers an exciting off-the-shelf alternative to AFG. AAM is not a filler. It is a soft tissue adipose matrix replacement, supporting volume restoration and cushioning in areas where native fat exists. AAM can be used for the reinforcement or supplemental support of underlying adipose tissue matrix layer due to damage or naturally occurring defects. Previous clinical studies have supported the safety and effective use of AAM for volume restoration.[9,10] A study investigating AAM to treat bilateral atrophic temples concluded that AAM is safe and well-tolerated, providing at least 6-month volume retention, improving skin quality, and restoring endogenous fat.[11] Adverse events associated with the AAM treatment were minimal (injection site-related), which resolved within 1 week, and 71% of subjects reported

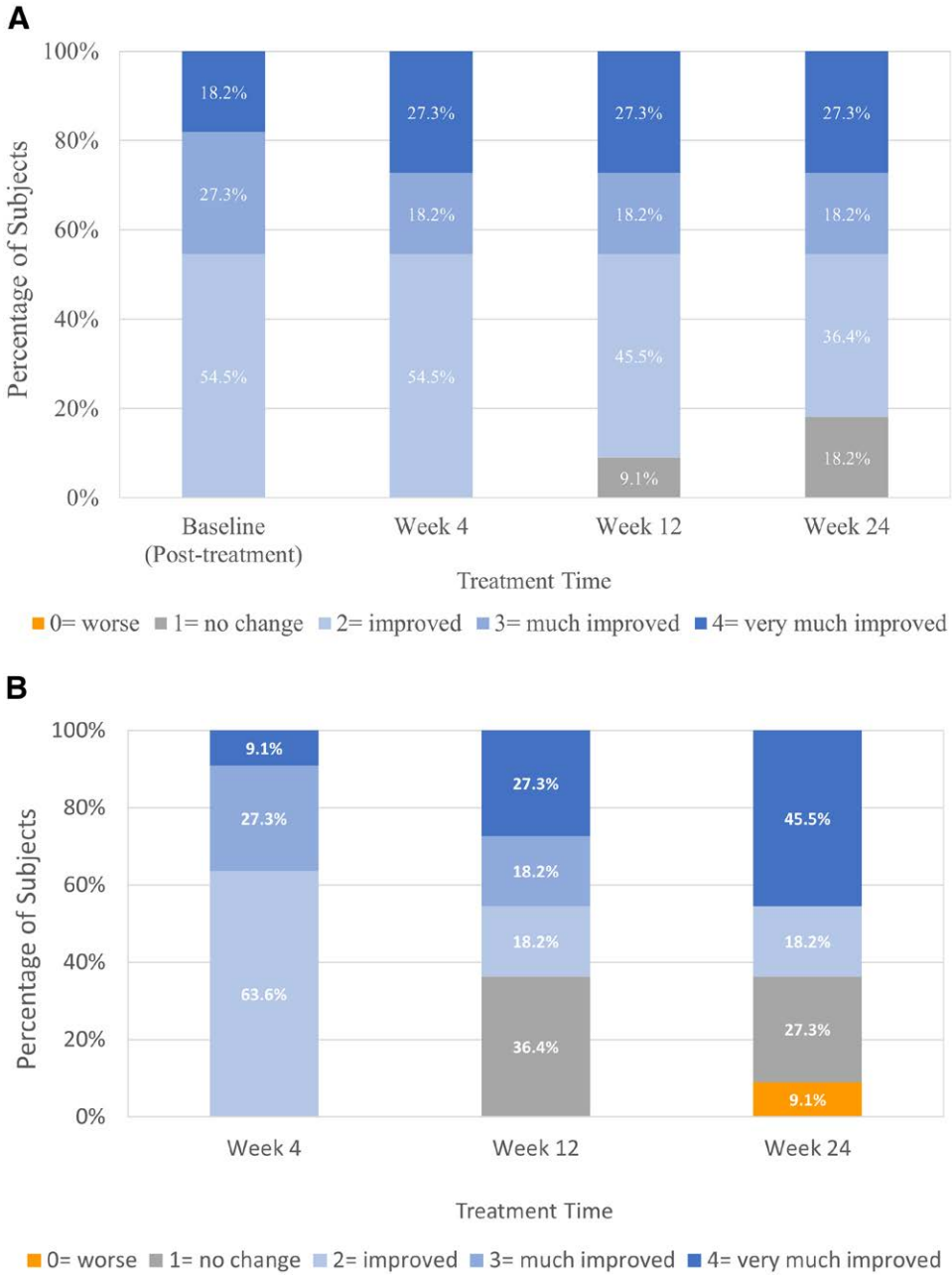

Fig. 3. Investigator and subject GAIS assessment over time. A, The overall investigator improvement averaged 82% and (B) the overall subject improvement was 64%.

being satisfied/very satisfied with the outcomes in the temple.

This prospective multicenter pilot study provided further evidence that AAM is safe and well-tolerated, now restoring volume deficit in the midface. Adverse events were minimal (injection site-related, itching), which subsided as early as 3 days and latest 2 weeks posttreatment. Erythema and edema scores were below 1.0 (minimal) at 2 weeks and were resolved within 4 weeks. There was improved clinical grading parameters for skin tone, smoothness, texture, and overall facial skin conditions at 24 weeks, which represents an overall improvement of 60% for malar and 61.3% for prejowl regions. These observed results are similar and aligned with good tolerability and overall improvement in skin quality to the atrophic temple study.[11]

Regarding subject satisfaction of AAM treatment in this study, there were 91% positive responders who had a change of at least +1 score improvement in facial satisfaction, compared with 9% negative responders. The subject dissatisfaction changed from 82% at baseline to only 9% at the end of 24 weeks, whereas satisfaction increased by 86%. Similarly, the investigator GAIS assessment was 82% improvement at 24 weeks, and the subject GAIS was 64%

Table 5. Percentage of Positive Responders with Positive Satisfaction Facial Rating (GAIS)

Subject Facial Appearance Satisfaction Rating	Response
+2	Positive
+1	Positive
+3	Positive
+3	Positive
+2	Positive
+4	Positive
+1	Positive
+1	Positive
+2	Positive
−1	Negative
+2	Positive
Positive responders	91%
Negative responders	9%

at 12 weeks and was maintained at 24 weeks. The results demonstrate comparable improvement scores to published GAIS scores with AFG used in the midface.[15,16] The improved satisfaction data suggest AAM is a promising option for facial volume restoration.

Apart from confirming AAM safety and demonstrating subject satisfaction in the midface, significant fullness improvement was also observed. Posttreatment baseline MMVS scores (2.3 ± 0.67) were significantly improved (P = 0.003) to pretreatment baseline scores (3.1 ± 0.32). There was significant fullness improvement at each subsequent time-point (2, 4, and 12 weeks, all P < 0.001; 24 weeks, P = 0.006) compared with pretreatment baseline MMVS scoring. Moreover, there was no significant change (P = 0.458) in the MMVS scores from weeks 12 and 24, which indicate the improved fullness from the AAM treatment can be maintained. These findings provide evidence that a significant improvement of midface volume can be achieved by the AAM treatment, by cushioning the subcutaneous region, and this volume retention can be maintained up to 24 weeks. Similar retention and fullness results were reported when AAM treatment was used to restore volume in atrophic temples (up to 24 weeks)[11] or in other deficit areas (wrist) up to 24 weeks.[10]

Finally, we attempted to quantify AAM volume restoration and retention. Previously, Kokai et al[9] had performed a semiquantitative correlation analysis between injected and retained volume. At 16 weeks, their analysis revealed, the average graft retention was approximately 47% when an average AAM volume of 3.9 ± 1.2 mL was injected in the wrist. However, marginal volume retention was observed with smaller injected volumes. Therefore, in this pilot study, a longer time-point was examined (24 weeks) with an attempt to quantify AAM volume retention through 3D imaging and volumetric analysis (Canfield Scientific Vectra M3). At 24 weeks, the data revealed there was 33 ± 30% positive volume retention in the malar region (maximum retention of 64%) with an average AAM treatment volume of 1.4 ± 0.5 mL, and in the prejowl region, 21.5 ± 15.2% positive retention with an average AAM volume of 1.1 ± 0.4 mL. These first quantitative results are within comparable range in the literature reporting AFG retention rates of 10%–88%[16,17] and 20%–90%.[13,14] However, in those studies, larger AFG volumes (10 mL) were injected compared with smaller AAM volumes used in this study (average 1.1–1.4 mL). Additionally, in those published studies, the retention calculations were based on injected volume compared with volume analyzed posttreatment, and not based on volume measured immediately postinjection, which is likely to be measured smaller than the actual volume (as we observed in our study). In contrast, in the present study, we performed our 3D volume measurement analysis for pretreatment, immediately posttreatment, and at later times (4, 12, and 24 weeks) posttreatment in an attempt to establish quantified AAM retention values relative to immediately posttreatment baseline values, to follow the actual treatment.

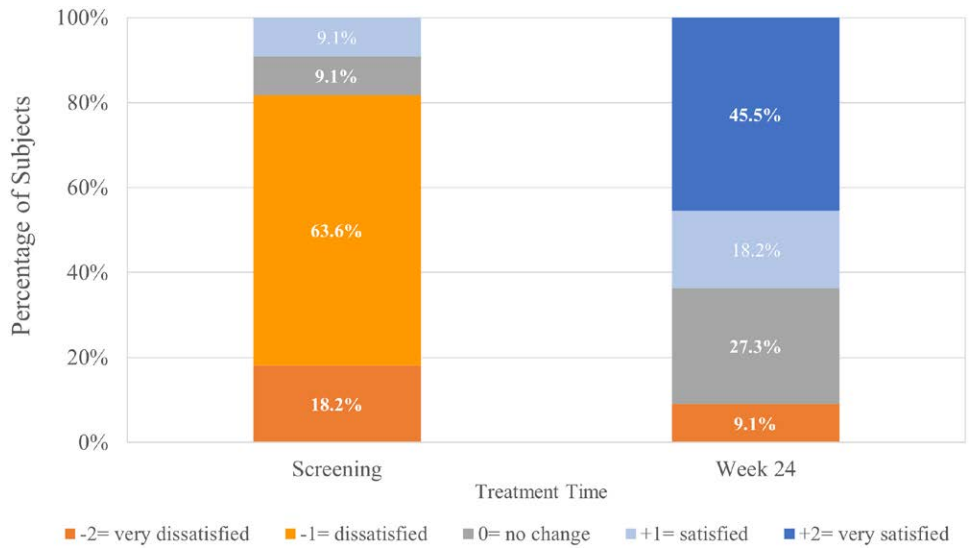

Fig. 4. Subject facial appearance satisfaction scores over time. Reported 86% improvement of facial appearance satisfaction at 24 weeks compared with baseline (pretreatment).

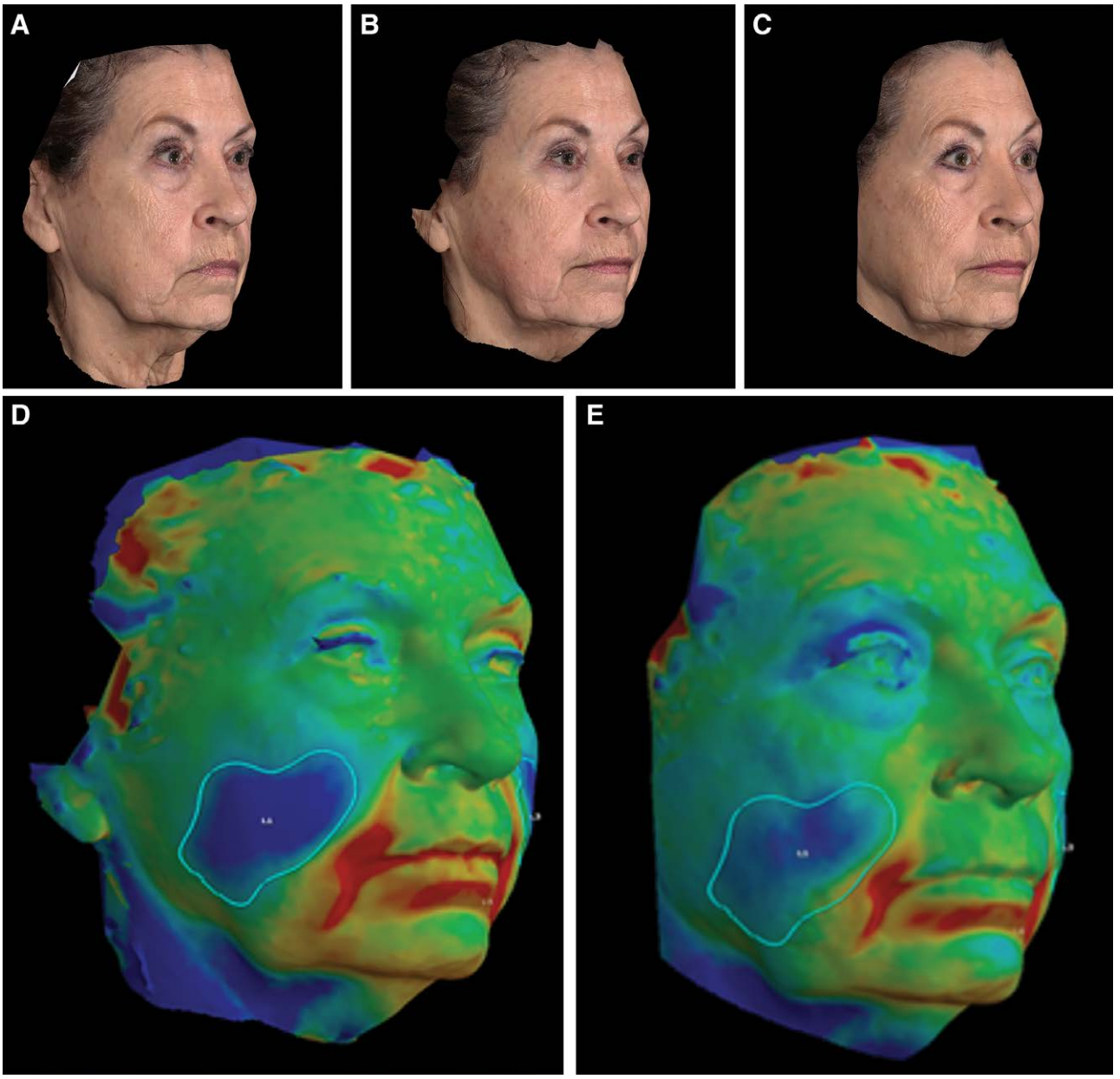

Fig. 5. A 70-year woman treated with an average of 0.95 mL AAM in the malar region and 0.95 mL in the prejowl region. A, Two-dimensional baseline pretreatment (week 0). B, 2D baseline posttreatment (week 0). C, posttreatment (week 24). Canfield imaging assessed malar and prejowl volumetric changes over time. D, Three-dimensional Canfield imaging baseline posttreatment (week 0). E, 3D Canfield imaging posttreatment (week 24). Posttreatment 3D images are normalized to pretreatment baseline image to establish a topographical map of volumetric changes. Blue hues represent positive volume change and green hues represent no volume changes [red hues represent negative volume changes but were not associated with area of interest (AOI) regions in this study]. At 24 weeks (6 mo), there was 59% retention in the malar region and 37% retention in the prejowl region.

Another variable that may have affected retention rates in this study is that relatively small AAM volumes (1.1 mL for prejowl and 1.4 mL for the malar) were used for facial volume restoration. Jacono et al[18] acknowledged the Vectra system limitation when measuring small volume changes. In the literature, typically higher volumes of AFG are used to treat one side of the midface (10 mL or higher).[16,17] From the 3D Vectra imaging/analysis, the average AFG retention was 32% at 1 year (10 mL injected/side).[16] With a different AFG system, the Vectra analysis found an average retention of 49% at 7 months.[16] Therefore, the variables affecting facial volume retention are not only the AFG volume but also the type of fat grafting system used to deliver the AFG. Keeping these factors in mind, the published literature retention numbers on AFG are comparable to reported data in this pilot clinical quantification of AAM to restore midface volume.

In closing, this pilot study established that small AAM volumes may have hampered the precision of the Vectra

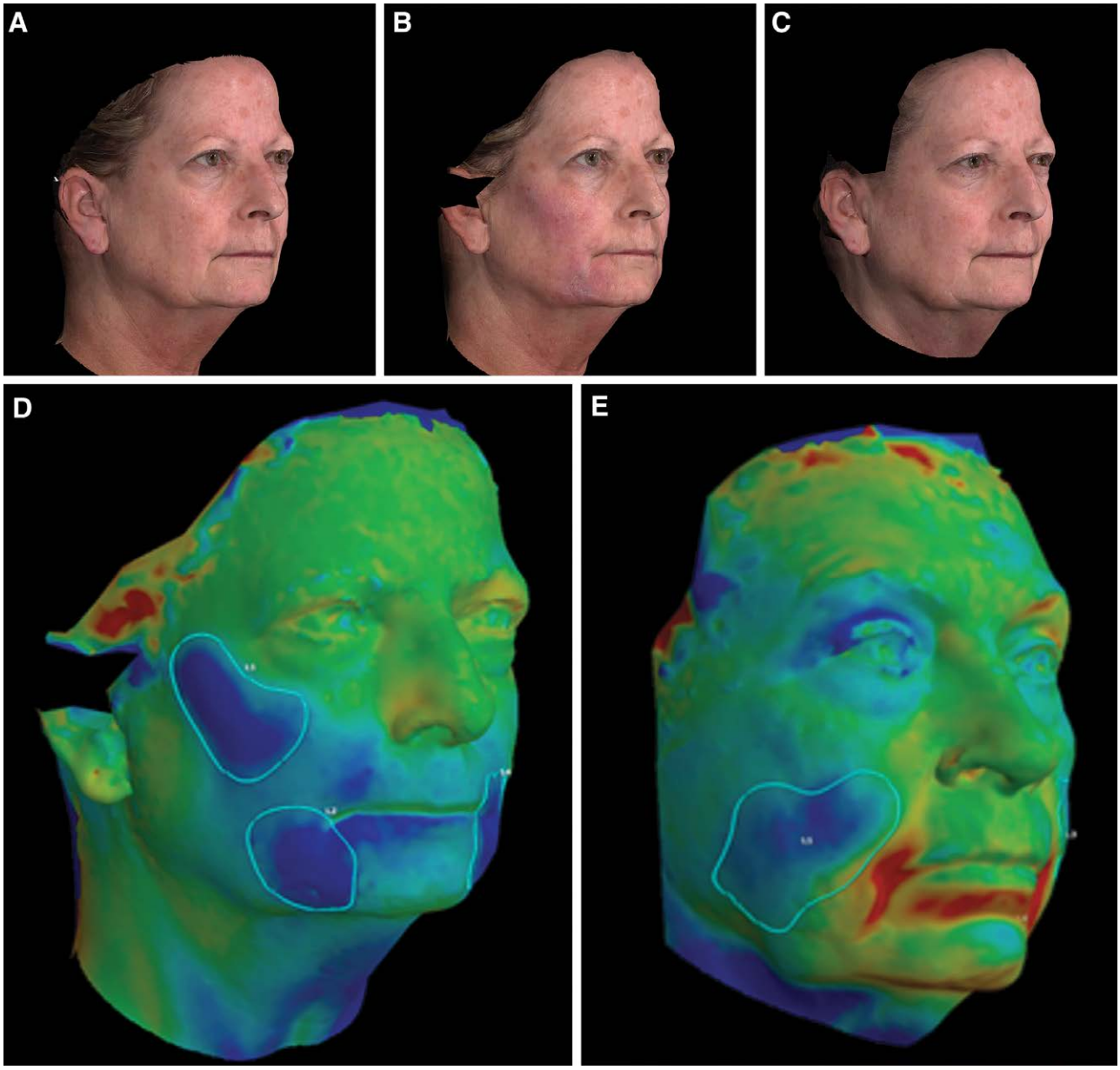

Fig. 6. A 56-year woman was treated with an average of 2 mL in the malar region and 1.5 mL in the prejowl region. A, Two-dimensional baseline pretreatment (week 0). (B) 2D baseline posttreatment (week 0). (C) posttreatment (week 24). Canfield imaging assessed malar and prejowl volumetric changes over time. D, Three-dimensional Canfield imaging baseline posttreatment (week 0). E, 3D Canfield imaging posttreatment (week 24). Posttreatment 3D images are normalized to pretreatment baseline image to establish a topographical map of volumetric changes. Blue hues represent positive volume change and green hues represent no volume changes [red hues represent negative volume changes but were not associated with area of interest (AOI) regions examined in this study]. At 24 weeks (6 mo), there was 57% retention in the malar region and 14% retention in the prejowl region.

quantitative analysis and hint to the potential limitations in assessing the small volume changes accurately. Other published studies using 3D imaging to quantify volume changes have used larger AFG volumes (10 mL) to treat facial deficits. A future study would include a larger population size with a longer follow-up. In addition, larger AAM volumes (4–6 mL) would be used to better quantify volume retention and correlate the observed positive subjective results.

CONCLUSIONS

This pilot study provides promising safety and clinical efficacy of AAM as a natural soft tissue alternative to restore and retain volume in the midface. AAM is an advantageous off-the-shelf option, avoiding a cumbersome AFG process of fat harvesting and processing. AAM treatment was safe and well-tolerated with comparable retention to AFG. At 24 weeks, AAM treatment resulted in 91% positive responders, an 86% increase in subject

facial satisfaction scores, and statistically significantly improved midface fullness scores compared to pretreatment baseline scores.

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DISCLOSURES

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