Cureus
Part of SPRINGER NATURE

Open Access Original Article

Human Adipose Tissue Allograft for Facial and Body Volume Loss Shows Favorable Safety and Aesthetic Outcomes

Review began 07/07/2026
Review ended 10/14/2026
Published 11/17/2026

© **Copyright** 2026
Beccio. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

DOI: 10.7759/cureus.119824

Michelle Beccio [1]

1. Medical Aesthetics, Beleza Clinic, Columbia, USA

Corresponding author: Michelle Beccio, mandaprabe@gmail.com

Abstract

Background: Soft tissue volume loss has become an increasingly recognized aesthetic concern, with more patients seeking minimally invasive, natural options to restore and maintain a youthful appearance. Dermal fillers, biostimulators, and autologous adipose are current choices; however, each has its own limitations pointing to a need for new technologies. Human adipose tissue allograft (hATA) is a novel off-the-shelf alternative to autologous adipose that retains native tissue structure and functions while lacking immunogenic components, allowing allogeneic use of the tissue. hATA eliminates limitations of autologous adipose such as liposuction, which can cause donor-site morbidity, and adipose processing, which is linked to variable outcomes due to lack of standardization.

Methods: This retrospective study included 15 patients with facial and body soft tissue losses. hATA implantation was performed in-office under local anesthesia using a blunt-tip cannula between 21G and 18G. Standardized photographic review was used to assess effectiveness. Adverse events were assessed for safety.

Results: Photographic review revealed volume augmentation and improved contour for all patients, with a durable effect observed throughout a follow-up average of 4.8 months (range, 1.5-12 months), with longer-term follow-up ongoing. Results of photographic review correlated with patient satisfaction. There were no product safety issues and only minor, procedure-related transient bruising and swelling.

Conclusion: This first aesthetic series demonstrates that hATA is a safe and well-tolerated alternative to dermal fillers and autologous fat grafting for patients with soft tissue volume loss. Study findings warrant further prospective studies with larger cohorts and longer follow-up.

Categories: Plastic Surgery, Dermatology
Keywords: adipose allograft, aesthetics, fat restoration, natural, volume

Introduction

Subcutaneous adipose is a deep layer of the skin that provide structural support and insulation to underlying tissues [1]. Among the structural elements of the face and body, adipose tissue is distinct in its role of providing soft tissue volume, contour, and fullness that convey youthfulness [2]. Loss of adipose tissue can occur due to aging, weight loss, trauma, surgical procedures, and conditions like lipodystrophy [3]. Together, subcutaneous adipose losses alter aesthetic appearance and negatively affect self-confidence and overall quality of life.

In response, restoring lost tissue volume has become a central trend in aesthetic medicine. Patients are increasingly seeking treatments that enhance a youthful appearance through minimally invasive procedures that require little downtime. This demand has driven the widespread popularity of injectables, which offer immediate improvements in contour and fullness without the need for surgery [4,5].

Dermal fillers remain among the most commonly used of these interventions, offering predictable handling, rapid results, and versatility across a range of applications [5]. However, their effects are generally temporary, as fillers gradually degrade or redistribute over time [6-8]. In addition, they do not fully integrate with host tissues, which limits their ability to achieve a natural appearance and long-term restoration.

For patients seeking natural and longer-lasting alternatives, autologous adipose grafting has become an important option. It can provide durable and natural-looking results, but requires a surgical harvest and processing of adipose tissue, which introduces donor site morbidity and yields variable outcomes due to differences in technique and processing methods [9-11].

To address the growing demand for a natural alternative to dermal fillers and autologous adipose, a human adipose tissue allograft (hATA) was developed. By preserving the native structural and cellular components

of adipose, hATA combines the biologic advantages of autologous adipose grafting with the consistency and convenience of an off-the-shelf product [12].

To date, clinical experience with hATA has focused primarily on applications where restoration or supplementation of adipose tissue is desired. Early studies have demonstrated favorable safety and clinical outcomes in indications such as plantar fat pad restoration and diabetic pre-ulcerative lesions, supporting the biologic integration and function of transplanted adipose tissue [12-14]. As clinical experience with hATA continues to expand, its use is now being explored for aesthetic soft tissue volume restoration.

This report presents the first aesthetic applications of hATA for restoring soft tissue volume in the face and body, offering early insights into its safety and effectiveness.

Materials And Methods

Product description

hATA (Lipoderma®, Britecyte, Inc., USA) is a hATA designed for supplemental support and reinforcement in underlying adipose tissue defects or damage. The product is regulated in the US as a human cells, tissues, and cellular and tissue-based product (HCT/P) under Section 361 of the Public Health Service (PHS) Act and 21 Code of Federal Regulations (CFR) Part 1271 [15].

Manufacturing is performed in partnership with LifeLink Tissue Bank, a US Food and Drug Administration (FDA)-registered and Association for Advancing Tissue and Biologics (AATB)-accredited facility that also holds licensure in multiple US states (including Florida, California, Maryland, and New York). Subcutaneous adipose tissue is recovered from deceased donors. All donors undergo comprehensive medical and social history screening, as well as infectious disease testing, consistent with FDA, AATB, and state-specific requirements. Tissue recovery, processing, and distribution are performed in accordance with these standards.

hATA is supplied as a ready-to-use 1.5 mL cryopreserved allograft contained within a sterile cryogenic vial, packaged in dual peel pouches. The product can be stored frozen for up to five years at −40°C or colder, or for up to 12 months under standard refrigerated conditions between 0°C and 10°C [15].

Patient selection

This retrospective review included patients seeking soft tissue volume restoration for aesthetic purposes, with volume loss attributed to aging, weight reduction, or prior procedures. During consultation, patients were counseled on available minimally invasive options for volume restoration, most commonly dermal fillers. Risks, benefits, and expected outcomes of each option were reviewed, and patients were given the opportunity to ask questions prior to selecting their preferred treatment. Those electing to proceed with hATA provided written informed consent before implantation.

De-identified data were extracted from medical records in compliance with the Health Insurance Portability and Accountability Act (HIPAA). The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Due to the retrospective nature of the study, Advarra Institutional Review Board (IRB) waived the need of obtaining informed consent.

hATA preparation and implantation technique

hATA in this series was prepared and administered in an office-based setting. To prepare hATA, the product was taken from refrigerated storage, the outer pouch was removed, and the vial was left in the inner pouch on a clean surface to warm it up for approximately 30 minutes. Once warmed up, the vial was retrieved from the inner pouch, gently agitated to break tissue aggregates, and the graft withdrawn into a syringe using an 18G needle. The 18G needle was then replaced with a new sterile cannula for implantation. For facial delivery, a 21G blunt-tip microcannula (21G × 50 mm) was typically used, while an 18G microcannula was employed for body treatments. Smaller cannulas or needles are not recommended to ensure preservation of the tissue integrity and prevent clogging of a cannula by the tissue. Local anesthesia was achieved using 2% lidocaine with epinephrine as a field block, and the skin was prepared with Betadine or Hibiclens prior to creating a small entry site with a sterile 18G needle.

For the midface, jawline, and chin, hATA was implanted using a fanning technique and/or retrograde injection within the subcutaneous layer, with distribution tailored to the individual treatment area. Care was taken to achieve even placement throughout the region to support both immediate contour restoration and longer-term tissue integration. All procedures were performed under sterile conditions to ensure patient safety and product integrity.

For temples, hATA was implanted in a periosteal plane under the temporal muscle using retrograde injection with a 21G blunt-tip microcannula.

For body areas (abdominal and thigh), hATA was implanted within subcutaneous adipose tissue using 18G blunt-tip microcannula with retrograde fanning technique. Small boluses were applied where further tissue elevation was needed.

hATA volume for each patient was determined based on the anatomical location, the degree of volume loss, and the desired aesthetic outcome. In addition, published data on autologous adipose tissue implantation volumes for different anatomical regions, along with the treating provider's clinical experience with dermal fillers, were used to help guide volume selection.

Post-procedure protocol and outcome assessments

Post-procedure instructions included application of cold compresses to reduce swelling. Patients were discouraged from massaging or manipulating the injection site to avoid contamination. No other post-care treatment was necessary due to the intrinsic quality of the product. Patients were counseled that mild swelling, bruising, or tenderness could occur and typically resolve within several days. Over-the-counter acetaminophen was permitted for discomfort, while non-steroidal anti-inflammatory drugs were generally avoided to minimize bruising risk. Patients were instructed to monitor for signs of redness, blanching, excessive swelling, or other unexpected reactions and to contact the treating provider if such events occurred. Follow-up visits were scheduled at monthly intervals.

Clinical outcomes

Because these cases represent the first reported aesthetic applications of hATA, the primary focus of this retrospective analysis was to assess safety, including any product-related adverse events. At each follow-up visit, the sites of hATA implantation were examined for swelling, pain, erythema, bruising, lumps and bumps, firmness, tenderness, itching, and hyper/hypopigmentation. In addition, each patient received different volumes of hATA implanted in different regions of the face and body with variable follow-up duration, which precludes any quantitative assessments. Aesthetic outcomes were evaluated through serial standardized photographic review. Images were assessed by one unblinded investigator and one blinded clinician with advanced training and experience in aesthetic medicine, who compared the last follow-up photographs with baseline and rated the overall aesthetic appearance as either "improved" or "not improved". Ratings for the unblinded and blinded investigators were in agreement. Patients were also asked whether they are satisfied or not with their appearance. Photographs were taken using an iPad (10th generation), at a distance of 24 inches, and using a Torjim Double Softbox 5000k 85W on a black background for most cases. For several patients, a grey background was used. Frontal, oblique (45°), and lateral (90°) facial views were captured in a neutral facial expression. Photographs were taken before and immediately after hATA implantation, and at 30 days, 90 days, 120 days, and six months.

Results

Between August 2024 and April 2025, 15 patients with soft tissue loss received hATA. Patient demographics, indications, and outcomes are summarized in Table *1*.

Case	Gender	Age	Region	Number of Implantations	Initial Volume Implanted (mL)	Secondary Volume Implanted (mL)	Latest Follow-Up (months)	Photographic Review at Latest Follow-Up	Patient Satisfaction at Latest Follow-Up
1	F	35	Jawline, Midface, Chin	1	4.5	N/A	12	Improved	Satisfied
2	F	61	Thighs	2	15.0	3.0	4	Improved	Satisfied
3	F	54	Temples, Midface, Jawline	2	12.0	3.0	4	Improved	Satisfied
4	M	49	Abdomen	1	6.0	N/A	5	Improved	Neutral
5	F	22	Midface	1	3.0	N/A	5	Improved	Neutral
6	F	53	Mentum and Jawline	1	6.0	N/A	3	Improved	Satisfied
7	F	53	Temples, Midface	1	7.5	N/A	3.5	Improved	Satisfied
8	F	54	Temples, Midface	2	6.0	6.0	4	Improved	Satisfied
9	F	52	Temples, Midface, Jawline	2	7.5	10.5	8	Improved	Satisfied
10	F	65	Temples, Midface	2	6.0	6.0	4	Improved	Satisfied
11	F	52	Jawline	1	6.0	N/A	1.5	Improved	Satisfied
12	M	65	Midface and Jawline	2	16.5	7.5	7	Improved	Satisfied
13	F	53	Midface and Jawline	1	15.0	N/A	1.5	Improved	Neutral
14a	F	53	Neck	2	3.0	3.0	6	Improved	Satisfied
14b			Abdomen	1	10.5	N/A	4.5	Improved	Satisfied
15	F	66	Midface, Jawline and Perioral Area	1	9.0	N/A	3	Improved	Satisfied

TABLE 1: Patient demographics and implant details

Of the 15 patients who received hATA, two were male and 13 were female, with a mean age of 53 years (range, 22-66 years). The most frequently implanted regions were the midface (n=10) and jawline (n=7), followed by the temples (n=4). Other regions included the abdomen (n=2), thighs (n=1), mentum (n=1), neck (n=1), and perioral area (n=1). The mean volume of hATA implanted across all sites was 10.78 mL per patient. By region, the average volume was 10.62 mL for face and neck, and 11.50 mL for body. The mean follow-up was 4.8 months (range, 1.5-12 months), with longer-term follow-up ongoing. Immediately following hATA implantation, improvements in contour, skin texture, and soft tissue volume were visibly apparent, contributing to high satisfaction among most patients. Blinded photographic review comparing baseline and most recent follow-up images confirmed aesthetic improvement in all cases, demonstrating enhanced contour and volume augmentation (Table *1*, Column 9). Photographic outcomes were consistent with patient-reported satisfaction scores, supporting an overall positive clinical response to hATA. 12 (80%) out of 15 responded that they are satisfied with the outcome, and three (20%) were neither satisfied nor dissatisfied (neutral) (Table *1*, Column 10).

No product-related adverse events were reported. Procedure-related events included transient bruising in 15% of patients and swelling in 80% of the patients, and typically resolved without intervention within three to four days.

Three representative cases are presented below.

Case 1: Facial volume restoration

A 35-year-old woman presented with facial volume loss associated with glucagon-like peptide-1 (GLP-1)-induced weight reduction. She had a history of prior use of dermal filler. 3 mL of hATA was implanted with a 21-gauge cannula at the ramus and mandible to enhance the gonial angle. An additional 1.5 mL was implanted in the zygomatic area to augment malar volume and in the mandibular body to extend the mentum. The procedure was performed without complication.

At 12 months of follow-up, photographic review confirmed improved facial contour and midface support, consistent with the patient's reported satisfaction (Figure *1*).



FIGURE 1: Case 1 images before and 12 months after 4.5 mL of hATA was implanted show improved volume and contour in the midface, jawline, and chin

hATA: Human adipose tissue allograft

Case 2: Post-liposuction contour irregularity

A 62-year-old woman presented with contour irregularities of the inner thighs following liposuction performed 20 years earlier. She had a history of prior treatment with poly-L-lactic acid (PLLA) and radiofrequency therapy. 15 mL was bilaterally implanted in the anterior thigh using an 18-gauge, 70 mm cannula with a retrograde implantation technique. Two days later, an additional 3.0 mL was implanted using the same technique and entry points.

The procedure was well tolerated with no complications. Photographic review confirmed improved thigh contour and correction of surface irregularities at five months post procedure (Figure *2*). The patient reported being satisfied.



FIGURE 2: Case 2 images before and five months after 18 mL of hATA was implanted show sustained volume restoration in the upper thighs

hATA: Human adipose tissue allograft

Case 3: Facial volume restoration

A 54-year-old patient presented for treatment of acne scarring and age-related facial volume loss. She had previously undergone a blepharoplasty and fat grafting five years ago. A total of 15 mL of hATA was implanted using a 21-gauge, 50 mm cannula across two sessions. Implantations were performed at the temples (periosteal plane, fanning technique), malar region, jawline, and directly into the site of acne scarring. Serial photographic review confirmed improved contour of the midface with enhanced jawline definition, consistent with the patient's reported satisfaction at four-month follow-up (Figure *3*).



FIGURE 3: Case 3 images before and four months after 15 mL of hATA was implanted show improved volume and contour in the midface, jawline, and temples

hATA: Human adipose tissue allograft

Additional case photographs are shown in Figures *4*-*16*.



FIGURE 4: 49-year-old man - before and five months after 6 mL hATA was implanted in the abdominal area

hATA: Human adipose tissue allograft



FIGURE 5: 22-year-old woman - before and five months after 3 mL hATA was implanted in the midface area

hATA: Human adipose tissue allograft



FIGURE 6: 53-year-old woman - before and three months after 6 mL hATA was implanted in the mentum and jawline areas

hATA: Human adipose tissue allograft



FIGURE 7: 53-year-old woman - before and four months after 7.5 mL hATA was implanted in the temples and midface areas

hATA: Human adipose tissue allograft



FIGURE 8: 54-year-old woman - before and four months after 12 mL hATA was implanted in the temples and midface areas

hATA: Human adipose tissue allograft



FIGURE 9: 52-year-old woman - before and one month after 18 mL hATA was implanted in the temples, midface, and jawline areas

hATA: Human adipose tissue allograft



FIGURE 10: 65-year-old woman - before and four months after 12 mL hATA was implanted in the temples and midface areas

hATA: Human adipose tissue allograft



FIGURE 11: 52-year-old woman - before and eight months after 6 mL hATA was implanted in the jawline area



FIGURE 12: 65-year-old man - before and two months after 16.5 mL hATA was implanted in the midface and jawline areas

hATA: Human adipose tissue allograft

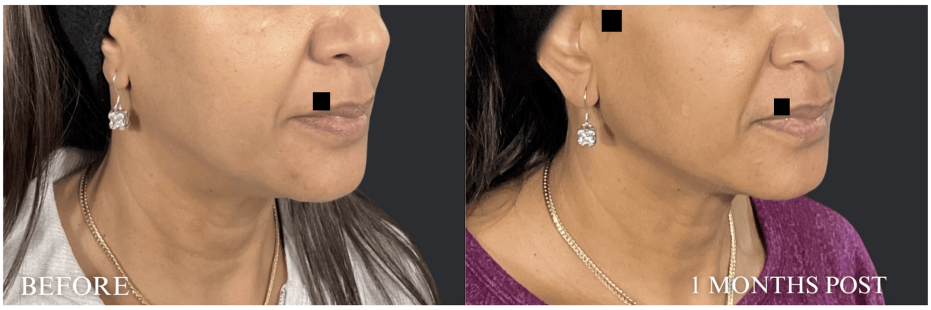


FIGURE 13: 53-year-old female - before and one month after 15 mL hATA was implanted in the midface and jawline areas

hATA: Human adipose tissue allograft



FIGURE 14: 53-year-old woman - before and six months after 6 mL hATA was implanted in the neck

hATA: Human adipose tissue allograft

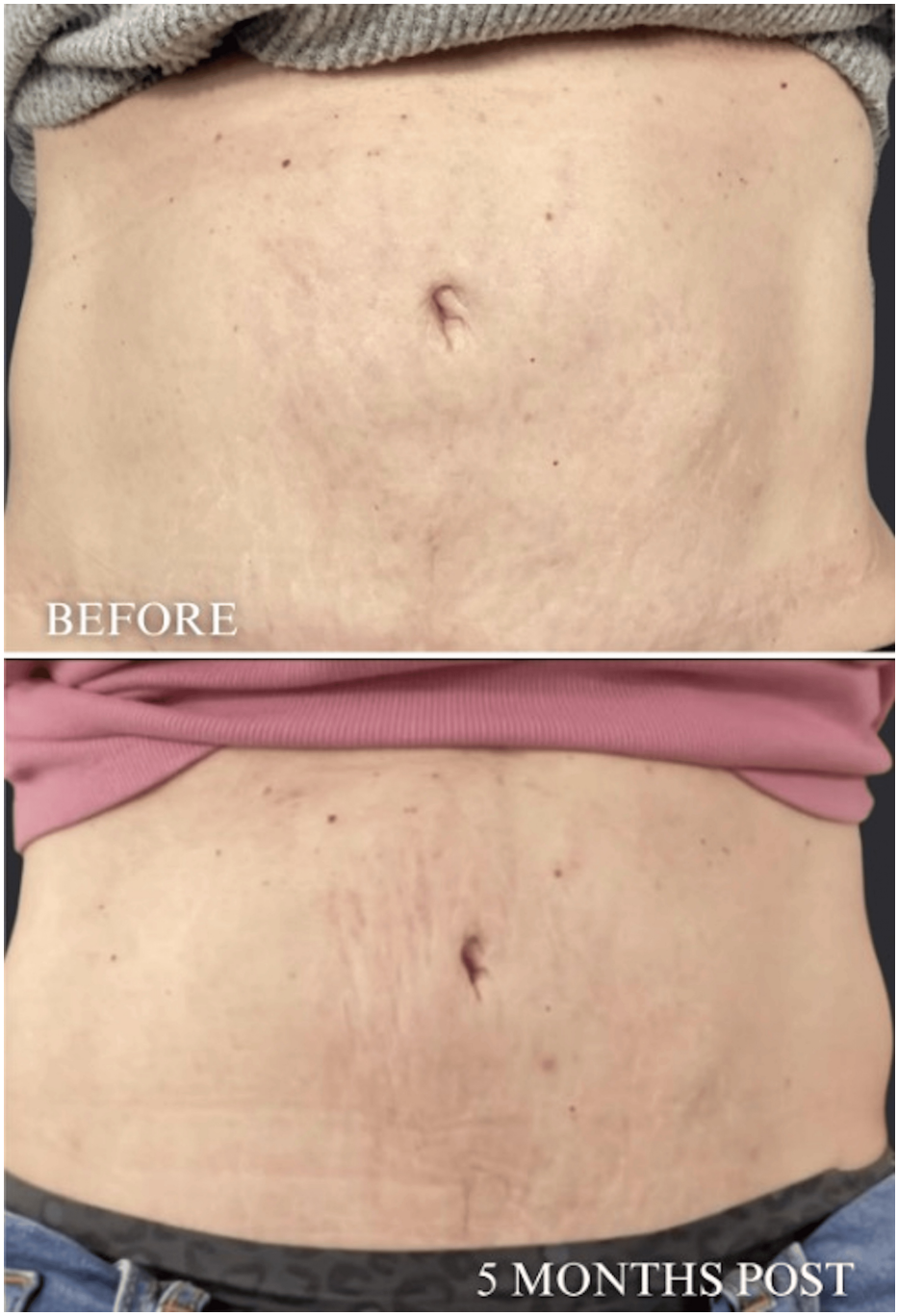


FIGURE 15: 53-year-old woman - before and five months after 10.5 mL hATA was implanted in the abdomen

hATA: Human adipose tissue allograft



FIGURE 16: 66-year-old woman - before and two months after 9 mL hATA was implanted in the midface, jawline and perioral areas

hATA: Human adipose tissue allograft

Discussion

Soft tissue volume loss has become a well-recognized driver of aesthetic procedures, as changes in contour and fullness are closely tied to perceptions of youthfulness and attractiveness. As current options, dermal fillers and autologous adipose grafting, have serious limitations, patients are increasingly seeking more natural and less invasive options to augment lost volume [1-5].

Autologous adipose grafting has over a century of use in plastic and reconstructive surgery for restoration of lost volume [16]. A recent systematic review of autologous adipose grafting for facial rejuvenation reported high patient satisfaction of approximately 80%, but also noted considerable variability in outcomes, with volume retention ranging from 13% to 68% at 12 months. The number of required treatment sessions also varied, from one to four, with an average interval of just over four months between procedures [17].

These findings suggest that while autologous adipose grafting is a natural and effective option for soft tissue restoration, its broader clinical utility is limited by several challenges. The procedure requires liposuction to obtain donor adipose tissue, which introduces additional invasiveness and the potential for donor-site morbidity [9-11]. It is further constrained by the availability of donor fat, making it unsuitable for patients with insufficient reserves. Outcomes are highly variable due to differences in harvesting and injection techniques, donor tissue quality, and patient-specific factors, all of which contribute to unpredictable resorption rates and inconsistent long-term results. These limitations highlight the need for alternatives that preserve the biologic benefits of adipose tissue while eliminating the need for liposuction and providing greater consistency, accessibility, and predictability.

Historically, allogeneic adipose tissue was not utilized due to concerns regarding immune-mediated rejection [18,19]. However, recent advances in adipose tissue processing have enabled its safe use in allogeneic applications. Adipose allograft matrix (Renuva®, MTF Biologics, USA) and structural adipose filler (alloClae™, Tiger Aesthetics, USA) are two such technologies. Both employ detergent-based processing to remove lipids and cellular components while preserving the extracellular matrix (ECM) and growth factors. The adipose allograft matrix retains the biochemical composition but not the native honeycomb structure of adipose tissue whereas the structural adipose filler preserves this structural honeycomb architecture [20,21].

In contrast, hATA preserves both the ECM honeycomb structure and native adipocytes - the lipid-filled cells responsible for providing cushioning and volumetric support to underlying tissues and organs. Pre-clinical studies have confirmed that hATA implantation does not elicit an immune response; instead, the graft becomes populated by host cells, undergoes vascularization, and remodels over time into integrated host tissue [13]. These findings have been further supported by clinical studies demonstrating safe and durable outcomes following hATA implantation for plantar fat pad defects [12-14].

The present aesthetic series builds on this foundation, demonstrating that hATA is a safe, well-tolerated, and effective option for patients with soft tissue volume loss. Photographic assessment concluded an improved appearance for all patients, which is in line with patient-reported satisfaction, with the majority of patients describing themselves as satisfied or very satisfied - comparable to outcomes reported with dermal fillers and autologous fat grafting. Future studies are required to confirm this observation. One of the great advantages of hATA is that it is intended for correction of adipose defects in any part of the body and face, whereas dermal fillers have more restricted uses.

Anecdotally, certain implant regions appeared to respond more favorably than others; for instance, although

not formally measured, the midface seemed to demonstrate a more consistent volumetric augmentation than the temples, a finding that warrants further study. This observation aligns with published literature describing regional variability in outcomes with both fillers and fat grafting [22]. The implantation of hATA in this study was based on implantation and protocols established for other aesthetic modalities.

hATA is an alternative to autologous fat grafting, and it is therefore appropriate to adapt implantation techniques and clinical applications used for autologous fat. However, hATA is supplied as a 1.5 mL unit and is more suitable for the correction of small-volume defects. Although in most cases both hATA and autologous fat are placed subcutaneously, the literature also describes the use of autologous fat injections into or beneath muscle, with some reports suggesting longer graft survival in muscle [23]. In the setting of volume restoration of non-adipose soft tissues, autologous fat grafts do not differentiate into other tissue types. For example, autologous fat grafting is an effective approach for breast reconstruction or for volume augmentation in cases of muscle dystrophy; however, grafted fat does not become glandular tissue in the breast nor does it differentiate into muscle following lower-leg augmentation [24,25]. The primary goal of both autologous fat grafting and hATA implantation is to achieve desired aesthetic outcomes through augmentation of lost volume.

Optimization of hATA implantation techniques and standardization of protocols for each facial and body regions should result in consistent outcomes especially for known areas with poor volume retention like temples. Additionally, providers noted that the overall quality and appearance of the skin seemed improved in patients following hATA treatment, though this was not formally evaluated and remains a subjective observation.

Importantly, no product-related adverse events occurred. Procedure-related adverse events were limited to early mild, transient bruising or swelling, consistent with the types of events commonly reported in the literature for dermal fillers and autologous fat grafting [8,26,27]. However, in contrast to dermal fillers and autologous adipose, there were no erythema, nodularity, firmness, tenderness, itching, and skin discoloration at the injection site in any patients after hATA applications. There were no hATA-related adverse events observed in any patients.

Taken together, these findings suggest that hATA represents an important step forward in aesthetic medicine by combining the biologic advantages of adipose with the consistency of an off-the-shelf product. While larger, prospective studies with longer follow-up are needed to confirm these findings and characterize the long-term durability of hATA, early clinical experience supports it as a promising option for reliable and natural soft tissue restoration.

Limitations

This study is limited by its retrospective design, small sample size, heterogeneous patient population, short and variable duration of follow-up, and subjective assessment of outcomes. No direct comparator group was included, making it difficult to draw conclusions relative to other treatment modalities.

Conclusions

This case series adds meaningful data to the existing literature and highlights the need for larger, controlled clinical studies. The treatment was well-tolerated, with no product-related adverse events reported. Improvements in contour and volume were consistently observed on photographic review and aligned with patient-reported satisfaction. hATA offers a natural, versatile alternative to current treatments, addressing the growing demand for minimally invasive biocompatible options that restore soft tissue volume in a more physiologic way without additional procedures and downtime. hATA provides patients and health care providers from both medical aesthetics and surgery with a practical, off-the-shelf solution that combines convenience with durability. Larger prospective studies with standardized outcome measures and longer-term follow-up are warranted to confirm these findings and to further define the role of hATA in modern aesthetic practice.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Michelle Beccio

Acquisition, analysis, or interpretation of data: Michelle Beccio

Drafting of the manuscript: Michelle Beccio

Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. Advarra Institutional Review Board issued approval N/A. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** Michelle Beccio declare(s) personal fees from Britecyte. MB is a consultant for Britecyte, Inc. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Ottaviani E, Malagoli D, Franceschi C: The evolution of the adipose tissue: a neglected enigma . Gen Comp Endocrinol. 2011, 174:1-4. 10.1016/j.ygcen.2011.06.018
2. Rohrich RJ, Pessa JE, Ristow B: The youthful cheek and the deep medial fat compartment . Plast Reconstr Surg. 2008, 121:2107-12. 10.1097/PRS.0b013e31817123c6
3. Coleman SR, Grover R: The anatomy of the aging face: volume loss and changes in 3-dimensional topography. Aesthet Surg J. 2006, 26:S4-9. 10.1016/j.asj.2005.09.012
4. Beasley KL, Weiss MA, Weiss RA: Hyaluronic acid fillers: a comprehensive review . Facial Plast Surg. 2009, 25:86-94. 10.1055/s-0029-1220647
5. Annual Plastic Surgery Statistics 2025 . (2025). Accessed: July 30, 2026: https://www.plasticsurgery.org/documents/news/statistics/2025/plastic-surgery-statistics-report-2025.pdf.
6. Rohrich RJ, Bartlett EL, Dayan E: Practical approach and safety of hyaluronic acid fillers . Plast Reconstr Surg Glob Open. 2019, 7:e2172. 10.1097/GOX.0000000000002172
7. Rzany B, Cartier H, Kestemont P, et al.: Full-face rejuvenation using a range of hyaluronic acid fillers: efficacy, safety, and patient satisfaction over 6 months. Dermatol Surg. 2012, 38:1153-61. 10.1111/j.1524-4725.2012.02470.x
8. DeLorenzi C: Complications of injectable fillers, part I . Aesthet Surg J. 2013, 33:561-75. 10.1177/1090820X13484492
9. Fontes T, Brandão I, Negrão R, Martins MJ, Monteiro R: Autologous fat grafting: harvesting techniques . Ann Med Surg (Lond). 2018, 36:212-18. 10.1016/j.amsu.2018.11.005
10. Wederfoort JL, Hebels SA, Heuts EM, van der Hulst RR, Piatkowski AA: Donor site complications and satisfaction in autologous fat grafting for breast reconstruction: a systematic review. J Plast Reconstr Aesthet Surg. 2022, 75:1316-27. 10.1016/j.bjps.2022.01.029
11. Rohrich RJ, Sorokin ES, Brown SA: In search of improved fat transfer viability: a quantitative analysis of the role of centrifugation and harvest site. Plast Reconstr Surg. 2004, 113:391-5. 10.1097/01.PRS.0000097293.56504.00
12. Regulski MJ, Saunders MC, McCulloch SE: Adipose tissue allograft for the management of a pre-ulcerative plantar lesion in a diabetic neuropathic patient. Clin Case Rep. 2024, 12:e9330. 10.1002/ccr3.9330
13. Regulski MJ, Saunders MC, McCulloch SE, Danilkovitch A: Pilot study: human adipose tissue allograft for fat pad defects in patients with preulcerative lesions. Plast Reconstr Surg Glob Open. 2024, 12:e6404. 10.1097/GOX.0000000000006404
14. McGinness K, Peck B, Javed U, Hitto A, Lundberg T, Ricks D: Fat pad augmentation using human adipose allograft yields durable closure in recalcitrant plantar ulcers. Wounds. 2025, 37:333-9. 10.25270/wnds/25015
15. Lipoderma™ Package Insert. Accessed: October 20, 2026: https://orderlipoderma.com/#training.
16. Billings E Jr, May JW Jr: Historical review and present status of free fat graft autotransplantation in plastic and reconstructive surgery. Plast Reconstr Surg. 1989, 83:368-81. 10.1097/00006534-198902000-00033
17. Groen JW, Krastev TK, Hommes J, Wilschut JA, Ritt MJ, van der Hulst RR: Autologous fat transfer for facial rejuvenation: a systematic review on technique, efficacy, and satisfaction. Plast Reconstr Surg Glob Open. 2017, 5:e1606. 10.1097/GOX.0000000000001606
18. Locke M, Windsor J, Dunbar PR: Human adipose-derived stem cells: isolation, characterization and applications in surgery. ANZ J Surg. 2009, 79:235-44. 10.1111/j.1445-2197.2009.04852.x
19. Patrick CW Jr: Tissue engineering strategies for adipose tissue repair . Anat Rec. 2001, 263:361-6. 10.1002/ar.1113
20. Kokai LE, Schilling BK, Chnari E, et al.: Injectable allograft adipose matrix supports adipogenic tissue remodeling in the nude mouse and human. Plast Reconstr Surg. 2019, 143:299e-309e. 10.1097/PRS.0000000000005269
21. Fanniel V, Atawneh I, Savoie J, Izaguirre-Ramirez M, Marquez J, Khorsandi C, Hill S: Advancing soft tissue reconstruction with a ready-to-use human adipose allograft. Bioengineering (Basel). 2025, 12:612. 10.3390/bioengineering12060612
22. Lv Q, Li X, Qi Y, Gu Y, Liu Z, Ma GE: Volume retention after facial fat grafting and relevant factors: a systematic review and meta-analysis. Aesthetic Plast Surg. 2021, 45:506-20. 10.1007/s00266-020-01612-6
23. Tsimponis A, Dionyssiou D, Papamitsou T, Demiri E: The effect of host tissue and radiation on fat-graft survival: a comparative experimental study. JPRAS Open. 2023, 38:134-46. 10.1016/j.jpra.2023.08.009
24. Yanaga H, Koga M, Nishina H, Tanaka Y, Yanaga K: Successful fat-only whole breast reconstruction using cultured mature adipocytes and conditioned medium containing MCP-1. Sci Rep. 2023, 13:18998. 10.1038/s41598-023-45169-1
25. Skorobac Asanin V, Sopta J: Lower leg augmentation with fat grafting, MRI and histological examination . Aesthetic Plast Surg. 2017, 41:108-16. 10.1007/s00266-016-0716-8
26. Colon J, Mirkin S, Hardigan P, Elias MJ, Jacobs RJ: Correction: Adverse events reported from hyaluronic acid dermal filler injections to the facial region: a systematic review and meta-analysis. Cureus. 2023, 15:c125. 10.7759/cureus.c125
27. Fang HA, Soto E, Pigg R, et al.: The safety of fat grafting: an institutional retrospective review . Ann Plast Surg. 2022, 88:S473-7. 10.1097/SAP.0000000000003234