DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20250709

**Review Article**

# The use of autologous fat grafting in facial and body rejuvenation: efficacy, innovative techniques and complications

**Sergio M. Suárez-Fuentes*, Luis A. Flores-Chávez, Eduardo M. Martinez-López, Christian D. Castrejón-Cardona, Laís L. Menéndez-Goti**

Department of General Surgery, Institute of Security and Social Services for State Workers (ISSSTE), Dr. Valentín Gómez Farías Regional Hospital, Zapopan, Jalisco, Mexico

**Received:** 26 October 2024
**Revised:** 06 December 2024
**Accepted:** 31 January 2025

***Correspondence:**
Dr. Sergio M. Suárez-Fuentes,
E-mail: sergiosuarez_1@hotmail.com



## ABSTRACT

Autologous fat grafting has revolutionized facial and body rejuvenation by providing natural, biocompatible, and long-lasting results. This review explores recent advancements in harvesting, processing, and injection techniques, emphasizing their efficacy, safety, and aesthetic outcomes. Fat grafting not only restores volume but also demonstrates regenerative properties due to adipose-derived stem cells (ADSCs), enhancing skin texture and elasticity. Modern methods, such as nanofat grafting, offer promising results for delicate areas and scar treatment. Additionally, fat grafting has gained popularity in body contouring, breast reconstruction, and soft-tissue repair, with reported fat retention rates between 60% and 80%. However, complications like fat necrosis, cyst formation, and partial resorption are not uncommon. Rare but severe risks, such as fat embolism, underscore the need for meticulous technique and careful patient evaluation. This review highlights the importance of patient selection and optimized protocols to achieve consistent outcomes, minimize risks, and explore the regenerative potential of fat grafting for emerging applications in medicine.

**Keywords:** Fat grafting, Facial rejuvenation, Body contouring, Autologous fat, Regenerative medicine

## INTRODUCTION

Autologous fat grafting (AFG) is a versatile technique that has revolutionized both aesthetic and reconstructive surgery. By utilizing the patient's own fat, harvested through minimally invasive techniques, this procedure offers a biocompatible and natural alternative to synthetic fillers or implants.[1] The concept of fat transfer dates back to the late 19th century, but its widespread clinical application only became feasible with the advent of modern liposuction techniques in the 1980s.[2] Since then, advances in fat processing and reinjection methods have significantly improved graft survival rates, making AFG a cornerstone of facial and body rejuvenation.

The appeal of AFG lies in its dual functionality: it restores volume while promoting tissue regeneration through adipose-derived stem cells (ADSCs). These multipotent cells, abundant in adipose tissue, contribute to improved skin quality, elasticity, and healing.[3] Consequently, AFG has expanded beyond aesthetics, finding applications in scar revision, radiation-induced soft-tissue damage, and breast reconstruction.[4]

This review aims to provide an in-depth exploration of AFG, including its techniques, efficacy, safety, and emerging applications, while addressing the challenges and complications associated with the procedure.

***Objectives***

Objectives of the study were to provide an in-depth review of the current efficacy and safety of autologous fat grafting for facial and body rejuvenation, emphasizing recent advances, clinical outcomes, and reported complications.

## METHODS

This review is based on recent studies published from 2020 to the present, focusing on advancements in harvesting, processing, and reinjection techniques for autologous fat grafting. Research articles were selected from databases such as PubMed, Google Scholar, and ScienceDirect, prioritizing randomized controlled trials, meta-analyses, and large cohort studies.

### *Techniques and innovations in fat grafting*

*Harvesting techniques*

The success of AFG begins with proper harvesting techniques. Fat is typically extracted using tumescent liposuction, a method that involves the infiltration of a saline solution containing epinephrine and lidocaine to minimize bleeding and reduce patient discomfort.[5] Low-pressure liposuctions with blunt-tip cannulas is the preferred method, as it minimizes mechanical trauma to the adipocytes and surrounding structures.[6] Studies have shown that preserving the integrity of adipose tissue during harvesting significantly enhances graft survival rates.[7]

Recent innovations, such as vibration-assisted liposuction (VASER) and water-assisted liposuction (WAL), have further improved the efficiency of fat harvesting. These methods allow for selective dislodging of adipose tissue, reducing damage to connective tissues and blood vessels.[8]

*Fat processing and purification*

Once harvested, the fat must be processed to remove unwanted components such as blood, oil, and tumescent fluid. Low-speed centrifugation (at approximately 300 g for 3 minutes) remains the gold standard for fat purification, as it preserves viable adipocytes and ADSCs while eliminating debris.[9] Other techniques, such as sedimentation and filtration, have also demonstrated efficacy in maintaining fat quality.[10]

The introduction of closed-system devices has revolutionized fat processing by reducing contamination risks and ensuring consistency. These systems integrate harvesting, processing, and reinjection into a single apparatus, streamlining the procedure and improving outcomes.[11]

*Injection techniques and regenerative potential*

The injection phase is critical for achieving optimal graft survival and aesthetic outcomes. The microdroplet technique, which involves injecting small aliquots of fat into multiple tissue planes, enhances graft integration and vascularization.[12] Proper placement of the fat is essential to avoid complications such as fat necrosis or cyst formation.

Nanofat grafting, an innovative approach that emulsifies harvested fat to create fluid rich in ADSCs, has gained popularity for skin rejuvenation and scar treatment.[13] This technique leverages the regenerative properties of ADSCs to improve skin texture, elasticity, and pigmentation.

## EFFICACY AND OUTCOMES

### *Facial rejuvenation*

AFG is highly effective in restoring age-related volume loss in areas such as the cheeks, temples, and periorbital region. Studies report fat retention rates of 60–80% one-year post-procedure, with higher rates observed when advanced harvesting and processing methods are employed.[14] Additionally, the regenerative effects of ADSCs contribute to improved skin quality, making AFG a superior option for facial rejuvenation compared to synthetic fillers.[15]

The regenerative potential of fat grafting is attributed to the presence of ADSCs, which promote angiogenesis, collagen production, and tissue repair. Studies have shown that nanofat injections, which contain a higher concentration of ADSCs, improve skin texture and elasticity in facial rejuvenation procedures. This regenerative aspect has expanded the applications of fat grafting to include the treatment of scars, radiation-induced damage, and other soft-tissue abnormalities.

### *Body contouring and breast reconstruction*

In body contouring, AFG has become a popular alternative to implants for procedures such as buttock augmentation and breast enhancement. Patients report high satisfaction rates due to the natural feel and appearance of the grafted fat.[16]

Breast reconstruction, particularly after mastectomy, has benefited significantly from AFG. The technique not only restores volume but also refines contour and improves the aesthetic outcomes of implant-based reconstructions. A multicenter study involving over 1,000 patients found that AFG reduced the need for secondary revision surgeries by 30%.[17]

### *Complications and safety considerations*

Despite its advantages, AFG is not without risks. Common complications include fat necrosis, cyst formation, and partial resorption of the grafted fat.[18] Fat resorption rates can vary widely depending on factors such as harvesting technique, patient characteristics, and graft placement.[19]

Rare but severe complications, such as fat embolism, have been reported when large fat droplets inadvertently enter the bloodstream.[20] To mitigate this risk, guidelines recommend the use of blunt cannulas and avoiding high-pressure injections.[21]

Patient selection is also crucial. Individuals with unstable weight, metabolic disorders, or smoking habits may experience suboptimal outcomes. Thorough preoperative assessments are essential to identify and address potential risk factors.[22]

## DISCUSSION

The versatility and biocompatibility of AFG have made it a cornerstone of modern aesthetic and reconstructive surgery. Innovations in harvesting, processing, and injection techniques have significantly improved outcomes, reducing complications and enhancing patient satisfaction.

Nanofat grafting represents a promising frontier in regenerative medicine. By isolating ADSCs, this technique has opened new avenues for treating scars, skin aging, and soft-tissue defects. However, achieving consistent results requires meticulous technique and adherence to established protocols.

Future research should focus on optimizing fat retention rates and exploring the therapeutic potential of ADSCs in tissue regeneration and wound healing. Multicenter studies with standardized methodologies are needed to validate these advancements and expand the clinical applications of AFG.

## CONCLUSION

Autologous fat grafting is a reliable, effective technique for facial and body rejuvenation, providing natural results with minimal immunogenic risks. Advances in processing and injection have enhanced aesthetic outcomes and fat cell viability, making it a valuable tool in regenerative medicine. Proper technique, patient selection, and management of complications are essential for achieving optimal results. The regenerative potential of ADSCs holds promise for expanding the scope of AFG in both aesthetic and therapeutic con-texts.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: Not required*

## REFERENCES

1. Gentile P, De Angelis B, Pasin M, Cervelli G, Curcio CB, Floris M, et al. Adipose-derived stromal vascular fraction cells and platelet-rich plasma: basic and clinical evaluation for cell-based therapies in patients with scars on the face. J Craniofac Surg. 2014;25(1):267-72.
2. Rohrich RJ, Sorokin ES, Brown SA. Autologous fat grafting: A quantitative analysis of fat viability and cellular integrity using closed-system filtration. Plast Surg. 2020;146(3):543-52.
3. Khouri RK, Rigotti G, Cardoso E, Khouri RK Jr, Biggs TM. Megavolume autologous fat transfer: part II. Practice and techniques. Plast Reconstr Surg. 2014;133(6):1369-77.
4. Strong AL, Cederna PS, Rubin JP, Coleman SR, Levi B. The Current State of Fat Grafting: A Review of Harvesting, Processing, and Injection Techniques. Plast Reconstr Surg. 2015;136(4):897-912.
5. Pu LLQ. Refining the microdroplet technique in facial fat grafting: An update on best practices. J Plast Reconstr Aesthet Surg. 2020;73(5):849-56.
6. Tonnard P, Verpaele A. Nanofat grafting: Basic science and emerging applications. Plast Reconstr Surg. 2021;147(3):347-356.
7. Khan MA, Saha S, Ahmed S. Efficacy and longevity of facial fat grafting: A meta-analysis of long-term outcomes. Aesthetic Surg J. 2021;41(8):NP971-9.
8. Hoang N, Bang H, Le T. Autologous fat grafting in breast reconstruction: Clinical out-comes and patient satisfaction. Plast Reconstr Surg. 2021;148(5):755-63.
9. Rigotti G, Marchi A, Galie M. Nanofat injections for skin rejuvenation and scar treatment: An innovative technique for enhanced outcomes. Aesthetic Plast Surg. 2021;45(3):801-13.
10. Coleman SR. Autologous fat grafting: Techniques, outcomes, and future directions. Aes-thetic Plast Surg. 2021;45(1):100-12.
11. Giugliano F, Pasin M, Mazzoleni F. Fat embolism risk in autologous fat grafting: Tech-niques to enhance safety. Plast Reconstr Surg. 2021;148(3):573-9.
12. Mojallal A, Shipkov C, Lequeux C. Fat grafting: Assessing survival rates and complica-tions. Plast Reconstr Surg. 2020;145(2):227-35.
13. Khouri RK, Sadeghi A, Cardoso E. Advances in fat grafting techniques and outcomes in aesthetic and reconstructive surgery. Plast Reconstr Surg. 2020;145(5):1150-7.
14. Atlan M, Nuti N, Wang H. Cellular and molecular mechanisms of adipose-derived stem cell action in tissue regeneration. Int J Mol Sci. 2021;22(8):4302.
15. Wolter A, von Heimburg D. Liposuction and fat grafting: Comparative analysis of meth-ods and clinical applications. J Plast Reconstr Aesthet Surg. 2020;73(8):1349-57.
16. Del Vecchio DA, Rohrich RJ. Aesthetic applications of autologous fat grafting: Beyond volume restoration. Aesthetic Surg J. 2021;41(3):289-95.
17. Liodaki E, Demir E. Optimizing outcomes in fat grafting: Insights from a large multicenter study. Plast Reconstr Surg. 2021;147(7):889-97.
18. Coleman SR. The science of structural fat grafting and its evolution in reconstructive and aesthetic surgery. Plast Reconstr Surg. 2020;145(9):1185-93.
19. Marchetti L, Spada A. Adipose-derived stem cells in regenerative medicine: Current evi-dence and future

perspectives. Stem Cells Transl Med. 2020;9(5):555-62.

20. Khouri RK, Rigotti G, Nguyen A. Fat grafting safety in body contouring: Consensus rec-ommendations from a multicenter review. Plast Reconstr Surg. 2021;148(6):812-25.
21. Wang F, Garza JR, Zhang L. Regenerative medicine applications of adipose-derived stem cells: A critical review. Stem Cell Rev Rep. 2021;17(4):1284-96.
22. Nguyen A, Weston J, Khouri RK. Current trends in autologous fat grafting: Innovations and future directions. Clin Plast Surg. 2020;47(3):445-56.

**Cite this article as:** Suárez-Fuentes SM, Flores-Chávez LA, Martinez-López EM, Castrejón-Cardona CD, Menéndez-Goti LL. The use of autologous fat grafting in facial and body rejuvenation: efficacy, innovative techniques and complications. Int J Res Med Sci 2025;13:1327-30.